

Architectural components and equipment

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Foreword

The NORSOK standards are developed by the Norwegian petroleum industry to ensure adequate safety, value adding and cost effectiveness for petroleum industry developments and operations. Furthermore, NORSOK standards are, as far as possible, intended to replace oil company specifications and serve as references in the authorities' regulations.

The NORSOK standards are normally based on recognised international standards, adding the provisions deemed necessary to fill the broad needs of the Norwegian petroleum industry. Where relevant, NORSOK standards will be used to provide the Norwegian industry input to the international standardisation process. Subject to development and publication of international standards, the relevant NORSOK standard will be withdrawn.

The NORSOK standards are developed according to the consensus principle generally applicable for most standards work and according to established procedures defined in NORSOK A-001.

The NORSOK standards are prepared and published with support by The Norwegian Oil Industry Association (OLF), The Federation of Norwegian Industry, Norwegian Shipowners' Association and The Petroleum Safety Authority Norway.

NORSOK standards are administered and published by Standards Norway.

Annex A is normative.

Introduction

Main changes from second edition to third edition are in summary:

- general reformatting;
- inclusion of operational experience feedback from recent projects;
- inclusion of new section for handrails guard rails and barriers;
- inclusion of door selection tables;
- inclusion of "Items to be specified" in each section;
- deletion of floor screed, tiles and galvanised steel from prefabricated bathroom units;
- section on provision stores rewritten;
- section on signs rewritten;
- Annex A: CDS-201 is revised. CDS-204 and CDS-209 are deleted.

1 Scope

This NORSOK standard defines the minimum functional requirements for design and construction of architectural components and equipment to be installed and used on offshore installations in the petroleum industry.

This NORSOK standard is primarily applicable to fixed installations. The standard may also be used for mobile installations for which, however, other requirements may be applicable.

2 Normative and informative references

The following standards include provisions and guidelines which, through reference in this text, constitute provisions and guidelines of this NORSOK standard. Latest issue of the references shall be used unless otherwise agreed. Other recognized standards may be used provided it can be shown that they meet or exceed the requirements and guidelines of the standards referenced below.

2.1 Normative references

ISO 140-3,	Acoustics - Measurements of sound insulation in building and building elements - Part 3: Laboratory measurements of airborne sound insulation of building elements
ISO 354,	Acoustics - Measurement of sound absorption in a reverberation room
ISO 717-1,	Acoustics - Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation
ISO 15138,	
EN ISO 14122 (all parts),	Safety of machinery – Permanent means of access to machinery -
IMO Res.A 653,	Recommendation on improved fire test procedure for surface flammability of bulkhead, ceiling and deck finish material
IMO Res.MSC 61(67),	Adoption of the international code for application of fire test procedures – Part 2: Smoke and toxicity
NORSOK C-001,	Living quarters area
NORSOK H-001,	HVAC (Heating, ventilation and air conditioning)
NORSOK H-CR-002,	Piping and plumbing
NORSOK M-501,	Surface preparation and protective coating
NORSOK N-003,	Actions and action effects
NORSOK R-004,	Piping and Equipment Insulation
NORSOK S-001,	Technical safety
NORSOK S-002,	Working environment
NS 17305,	Aluminium - Wrought aluminium AlSi1Mg
NS-EN 10025,	Hot rolled products of non-alloy structural steels - Technical delivery conditions
NS-EN 12600,	Glass in building – Pendulum test – Impact test method and classification for flat glass
SOLAS Regulation,	CHAPTER II-I PART B: Subdivisions and stability. Regulation 15 – Openings in watertight bulkheads in passenger ships

2.2 Informative references

None

3 Terms, definitions and abbreviations

For the purposes of this NORSOK standard, the following terms, definitions and abbreviations apply.

3.1 Terms and definitions

3.1.1

can

verbal form used for statements of possibility and capability, whether material, physical or casual

3.1.2**may**

verbal form used to indicate a course of action permissible within the limits of this NORSOK standard

3.1.3**shall**

verbal form used to indicate requirements strictly to be followed in order to conform to this NORSOK standard and from which no deviation is permitted, unless accepted by all involved parties

3.1.4**should**

verbal form used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required

3.1.5**primary stairway**

stairs which are part of major personnel traffic routes and main emergency escape ways

3.1.6**secondary stairway**

all types of stairs, which are not part of major personnel traffic routes and main emergency escape ways, and which do not provide access to machinery and equipment skids

3.1.8**flight**

sequence of steps between two landings

3.1.9**going**

horizontal distance between the edges of two consecutive nosings

3.1.10**pitch**

angle between the pitch line and its projection on the horizontal surface

3.1.11**nosing**

top edge at the front of the step

3.1.12**pitch line**

straight line touching the top of tread nosings

3.1.13**rise**

height between two consecutive tread surfaces

3.1.14**tread**

horizontal surface on which the foot is placed

NOTE Same as step.

3.1.15**stringer**

flanking framework element supporting the steps

3.1.16**left or right handed doors**

doorleaf location at open position, when viewed from doorleaf side of wall/ bulkhead

3.1.17**clear opening width**

net distance between insides of frame

3.1.18**clear opening height**

net vertical distance between floor/deck finish and inside of frame

3.1.19**dry fix insulation**

certified, incombustible insulating material which is supplied in a dry, stable and ready-to-use state from the manufacturer without requiring any further preparation or treatment before application, as opposed to spray-on insulation

3.1.20**spray-on insulation**

certified, incombustible insulating material which is supplied as a semi-wet substance, requiring further preparation, treatment and curing time after application

3.1.21**partition system**

modularised wall system, solid skin or double skin cavity system, with all necessary reinforcements, bracings, frames, insulation and installation aids

3.1.22**ceiling system**

modularised ceiling system, compatible with the wall system, and being either suspended or self supporting, with all necessary reinforcements, frames, insulation and installation aids

3.1.23**external prefabricated wall**

external, prefabricated, structurally self supporting wall system, with built-in penetrations, trims, braces, cut-outs, lifting lugs, supports, equipment, elements, insulation, materials, installation aids, etc., complete and ready for installation on specified external location

3.1.24**internal panels wall system**

internal, prefabricated, structurally self supporting wall system, with a flat surface, having built-in penetrations, trims, braces, cut-outs, supports, equipment, elements, insulation, materials, installation aids, etc., complete and ready for installation on specified internal location

3.1.25**cassette wall system**

prefabricated cassette wall system, comprising louvred and plated (explosion relief or fixed) panels in various combinations, with vertical or horizontal supports, internal drainage system, sound attenuators, built-in frames, reinforcements, penetrations, flashings, trims, lifting lugs, fixings and all other materials and work required for a successful installation on the specified location

3.1.26**wind shield panels**

a prefabricated windshield panel system, with flat or corrugated trapezoidal shaped profiles, penetrations, flashings, trims, lifting lugs, fixings and all other materials and work required for a successful installation on the specified location

3.1.27**heat shield panels**

prefabricated heat-shield panel system comprising

- frames of stainless steel rod in a ladder type construction with woven stainless steel wire mesh facing sheets,

- perforated stainless steel plates,
- stainless steel expanded metal panels.

3.1.28

conductive flooring

floor covering which is conductive

NOTE Measured in 10^4 to 10^5 Ohms resistance.

3.1.29

semi-conductive flooring

floor covering which is semi-conductive

NOTE Measured in 10^6 to 10^8 Ohms resistance.

3.1.30

non-conductive flooring

floor covering which is non-conductive

NOTE Measured in 10^9 to 10^{11} Ohms resistance.

3.2 Abbreviations

AISI	American Iron and Steel Institute
CE	Conformité Européen
HTCC	helicopter traffic control centre
HVAC	heating, ventilation and air conditioning
ID	identity
IP	ingress protection
LCI	life cycle information
LQ	living quarters (accommodation)
NCS	Natural Colour System
NVE	Norges Vassdrags- og Elektrisitetsvesen (Norwegian authority)
PC	personal computer
PSA	Petroleum Safety Authority
PVC	polyvinyl chloride
NMD	Norwegian Maritime Directorate
RAL	Deutsches Institut für Gütesicherung und Kennzeichnung e.V., Bonn
SOLAS	safety of life at sea
TV	television
UHF	ultra high frequency
VHF	very high frequency

4 Common requirements

4.1 General

This NORSOK standard specifies minimum requirements of a general nature. All detailed and project specific requirements, shall be specified in relevant data sheets and schedules, e.g. type, brand, quantity, capacity, dimensions, etc. The user group shall participate in the selection process, in accordance with operator/company requirements. The equipment lists contained in this NORSOK standard are of a typical/general nature. The establishing of basic, project specific data sheets shall be performed at an early date by the individual project, as a basis for pricing and further development.

Achieving a fit for purpose level of functionality and safety within the different areas shall be a governing requirement. As a result, where necessary minor detail requirements are not stated in this NORSOK standard or data sheet, these shall be allowed for.

Suppliers may propose, and correspondingly justify, alternative solutions in order to reduce life cycle costs, providing the level of function and safety are maintained.

All architectural supplies described in this NORSOK standard shall be installed as complete and finished units, comprising all the work and materials required for a successful installation and intended use. All components, equipment and elements shall be set plumb and level. The installed work shall be true, clean and free from any faults, marks and damage. It shall withstand severe abuse.

Standard, fit for purpose products shall be used, unless a purpose made solution is required. Where relevant, the selection of all furniture, equipment and accessories shall be co-ordinated and standardised on the entire installation.

The work shall always be performed by qualified personnel, and in accordance with the producer's/manufacture's written procedures and instructions.

Life cycle costs, design life expectancy and minimalization of environmental impact shall be reflected and given governing attention, in selection of components and their detailing.

All supplies shall be properly protected and preserved throughout all project phases. The preservation shall not be removed before mechanical completion. Cleaning shall be performed in accordance with manufacturers' guidelines prior to preservation. Preservation shall be applied in a manner that does not leave tape marks or stains. It shall be easy to remove.

Data sheets and schedules are attached to certain clauses in this NORSOK standard. They shall be used to specify all requirements related to that clause, complete with all accessories and systems. The data sheets and schedules shall be continuously updated throughout the various project phases, until all required information is available prior to commencement of procurement and fabrication activities.

Preliminary and final weight data of equipment and products shall be given.

Prototypes and/or preassemblies of purpose made items shall be made available for inspection and verification prior to delivery. This shall upon request from operator/company, include the following items as a minimum:

- cabin(s) including shower/bathroom;
- kitchen purpose made consoles;
- cold table and cold storage room(s);
- standard office arrangement;
- doors;
- coffee bar unit;
- reception unit;
- central control room operator desk and emergency room operations table;
- laboratory fume cabinets and workstation;
- crane cabin;
- drillers cabin.

The inspections shall be performed at an early stage, to allow adjustments to be made without affecting the overall production schedule.

Structural reinforcement of walls, floors and ceiling constructions shall be provided as required.

4.2 Certification

All materials, components and equipment shall be provided with necessary test reports and certificates from relevant recognised authorities, confirming compliance with project and regulatory requirements.

The standards listed in guidelines to the PSA Facilities Regulations, paragraph 11, shall be used to determine the technical fire qualities of materials. In addition IMO Res. MSC 61(67) and IMO Res. A653 shall be used, as well as the relevant requirements in NORSOK S-001.

Documentation of acoustic properties shall be in accordance with ISO 140-1, ISO 354 and ISO 717-1. For noise and vibration control, special attention shall be given to applicable clauses of NORSOK S-002.

4.3 Penetrations

A penetration dossier shall be developed for all areas on the installation.

Penetrations, including field run penetrations shall, as far as practical, be of standardised types, and located in areas of lowest fire-rating/fire-load. Penetrations shall not reduce the strength and fire/blast, acoustic, gas and water tightness integrity of the divisions in which they are installed.

Valid fire certificates from a recognised authority shall be documented in compliance with governing body regulations. Where certificates are not available, test reports from a recognised authority shall be provided. The certificates/test reports shall be compiled in a separate certification dossier and referred to in the penetration dossier. The certification dossier shall be presented to operator/company prior to start of fabrication. Certification shall also be provided for multiple penetrations. Pipe penetrations shall be tested and installed as described in NORSOK R-004.

Any 3D modelling systems shall be configured to reflect the actual penetration cut-out sizes.

If penetrations are exposed to weather or subject to mechanical damage, suitable protective cover shall be provided. Mechanical protection at exposed areas (e.g. transport routes) shall be able to withstand heavy abuse.

Deck penetrations exposed to frequent moisture or hosing down shall have a permanently elastic seal on top. This requirement is also applicable for cable penetrations, unless these have a fail safe detailing for drainage.

Penetrations requiring additional insulation to maintain the fire, thermal or acoustic requirements shall have this clearly indicated in the penetration dossier.

Multi table transit penetrations shall have fire insulation at flanges only where strictly required to comply with the applicable fire certificate. Detailing shall allow effective access for maintenance and re-pulling of cables. Adjacent insulation detailing shall be arranged to allow maintenance access, without having to remove or replace large sections of lining and insulation.

Penetration types for cables, piping and ducting shall be co-ordinated with the relevant disciplines.

Penetrations that are likely to be exposed to excessive movement and vibrations (e.g. those located close to rotating type pumps, emergency generators etc., or for piping systems where "hammering" effects are likely to occur during commissioning or operation) shall withstand the vibration without functional deterioration. Minimum service clearance to sleeves shall allow for vibrational, mechanical and thermal movement. Mastic type penetration seals shall have the applicable sleeve and pipe surfaces degreased as required, to achieve permanent adhesion.

A sufficient number of openings for temporary cables shall be provided adjacent to doors during the construction phase. Details of these openings, including methods of sealing after use, shall be shown in the penetration dossier.

Penetrations in walls located below raised access floors should be grouped together in yard sacrificial plate areas.

In order to avoid hot work, sand blasting and touch-up during later phases, additional penetrations shall be provided for future services in accordance with respective discipline spare capacity requirements.

4.4 Master lock and key suiting system

A master lock and key suiting system shall be developed and delivered for the entire installation in accordance with operator/company requirements. A practical storage system for spare keys shall be part of the supply. The name of the installation, operator/owner, room name and number shall be inscribed on the key holders. Certain key holders (e.g. to cabins) shall also have the lifeboat station number included, if applicable.

Three coded and labelled keys per lock shall be issued directly to the operator/owner.

The key cylinders and locks shall be adjusted to allow locking without excessive use of force. Keys shall have a smooth fit in their cylinders, to reduce breakage.

Further requirements for door locks are given in Clause 7.

4.5 Materials

All materials shall be resistant to corrosion in a saliferous environment. The materials, components and equipment shall be as light as possible, without adversely affecting compliance with any requirements. Alternative materials may be used for all supplies, providing they comply with relevant requirements.

Drilling through fire-rated deck head plates or floating floors shall not be used as a fixing method for equipment.

Components specified with a brushed stainless finish should have a grit between 180-220, for ease of cleaning.

Equipment and processes shall not emit dust, fumes or other contaminants, which may impair health. A list of chemicals applicable to each supply shall be provided. The list shall include adhesives, finishes and filler material, and all required cleaning and maintenance agents. Selection and documentation of hazardous chemicals shall satisfy the requirements of NORSOK S-002.

4.6 Identification

Each major component, furniture and equipment item shall be provided with a discreetly placed and securely fixed name plate showing the manufacturer's name, equipment type, model, serial number, fire rating, etc., as appropriate. For doors and windows with a B-rating or stricter, the relevant fire certificate number shall be included on the identification plate. Rated penetrations shall have identification of applicable fire rating, and reference to relevant certificate number.

Where applicable, equipment with environmental declaration marking shall be selected.

4.7 CE marking

Contractor shall be responsible for compliance with CE marking, and provision of documentation in accordance with regulatory requirements.

4.8 Tagging

The following items shall be tagged and coded, in accordance with project requirements:

- doors (all doors with the exception of lightweight B type doors that are not connected to a system);
- control cabinets;
- air reservoirs;
- equipment permanently connected to power supply;
- items connected to instrument air supply;
- medical oxygen systems (fixed type);
- refrigeration systems;
- other equipment requiring regular maintenance/documentation for the operational phase.

4.9 Life cycle information (LCI)

LCI shall be developed and transferred to operator/company in accordance with project requirements. The information shall be available for engineering, preparations for operations, start-up, maintenance, repair, modifications and decommissioning of equipment and systems.

The LCI shall include both information to be submitted to operator/company, and information to be retained by the supplier on behalf of operator/company.

All LCI shall be transferable in digital format.

The final LCI shall reflect the as-built status at take-over by the operator/company.

4.10 Installation, operation and maintenance manual

All supplies shall be provided with an installation manual, as a minimum.

Components and equipment to be in regular use, or requiring inspection and maintenance, shall in addition be provided with an operation manual and an inspection/maintenance manual.

4.11 Function testing

All installed equipment and systems shall be formally function tested to comply with functional requirements as part of mechanical completion/commissioning activities. Equipment, which is damaged, or equipment which does not perform as specified, shall be identified in accordance with project procedures, and rectified or replaced without delay.

4.12 Equipment follow up

Each supply shall include a quantity of appropriate paint and/or foil, to allow minor repairs during the installation phase.

4.13 Architectural finishes schedule

A detailed architectural finishes schedule shall be developed for all internal areas. The schedule shall specify the manufacturer coding and colour reference for each proprietary architectural element.

The schedule shall also include the colour references for all internal painted surfaces.

For bulk components and equipment packages, manufacturer's standard colours shall generally be used, where changes will result in a cost increase. Where manufacturer standard topcoats are used, a repair/maintenance procedure shall be supplied for acceptance by the project.

Topcoats shall be denoted by RAL or NCS coding. The surface shall have a minimum reflectance factor of 70 %, except where non-slip surfaces are required, or in areas where low reflectance factor are required, e.g. in control rooms, inside of crane cabins, etc.

Sample boards in A3 size, illustrating the proposed finishes and colour scheme, shall be provided for acceptance by the operator/company.

4.14 Architectural colour coding schedule

4.14.1 General

A detailed architectural colour coding schedule shall be developed for all external areas on the entire installation, and include graphic illustration(s) of the overall view. The schedule shall also include parts of the installation that are below water level.

Colours shall be selected to enhance perception of the installation as a coherent whole, emphasise orientation and escape/access routes, and allow for standardisation of topcoat types throughout the installation. Application method shall be part of colour selection criteria.

Stainless steel, metallized carbon steel and aluminium surfaces shall not be painted, unless specified otherwise by the operator/project.

For bulk components and equipment packages, manufacturer standard colours shall generally be used, where changes will result in a cost increase. Where manufacturer standard topcoats are used, a repair/maintenance procedure shall be supplied for acceptance by the project.

Topcoats shall be denoted by RAL or NCS coding. The surface shall in general have a minimum reflectance factor of 70 %, except where non-slip surfaces are required.

Topcoat application shall be in accordance with NORSOK M-501.

Where topcoats are used at non-visible areas such as within shafts voids and under insulation, the colour should be standardised as far as practical throughout the installation. The colour should be white/off-white.

The architectural colour coding schedule does not cover piping and ductwork systems coding.

Upon request, samples of the main topcoat colours shall be provided.

4.14.2 Identification and safety colours

Identification and safety colour coding requirements shall take precedence.

Escape routes outside “clean” areas with applied floor finishes shall be marked with traffic yellow RAL 1023.

A uniform approach shall be adopted for safety marking of stairs in external and unmanned area escape routes.

Fire equipment cabinets, firemen's equipment containers, fire water equipment cabinets, etc., shall be traffic red RAL 3020. Exempted are fire water cabinets inside the LQ, which may be painted white/off-white with red lettering, to match the interior overall colour scheme better.

First aid cabinets shall be painted emerald green RAL 6001.

4.15 Company specified items

Operator/company specific requirements deviating from the requirements stated herein should be included as an addendum to this NORSOK standard in the contract documentation. Otherwise, they shall be established during the project by cooperation between the project and the operator/company.

As a minimum, the following items from this clause require specification by the operator/company:

- master lock and key suiting system;
- required prototypes and/or preassemblies of purpose made items;
- user group participation in the selection process for elements and equipment.

5 Stairs

5.1 General requirements

All stairs on a field installation except those providing means of access to machinery or equipment skids shall comply with these requirements.

Other stairs, stepladders and ladders that provide access to machinery or equipment skids shall comply with the requirements of EN ISO 14122 (all parts).

Stairs shall be provided in daily frequented areas where there is a height difference between levels of more than 350 mm, and where a ramp cannot maintain the functional requirements. For height differences of less than 350 mm, a ramp solution shall be used.

Main internal stairway(s) and all emergency stairways in or adjacent to the LQ shall always be defined as primary stairways.

Stairways in escape routes shall be designed to allow for transportation of injured personnel by use of standard stretchers (length x width = 2 200 mm x 650 mm).

Secondary stairways, including spiral stairs and inclined and vertical ladders, may be used for access to isolated areas or areas with little personnel traffic. Inclined ladders shall be used in preference to vertical ladders where space permits.

For internal stairs, selection of materials and construction shall give due attention to ease of cleaning/maintenance, and to the appropriate reduction in impact sound insulation and reverberation times.

5.2 Stair width

The minimum width of a stairway shall be 1 000 mm measured between the inside of handrails. For secondary stairs with limited traffic, a width of less than 1 000 mm may be accepted on the basis of individual written justification.

Continuous stairways with access to more than two levels shall be minimum 1 200 mm wide, measured between the inside of handrails.

Primary stairways shall have a minimum width of 1 200 mm measured between inside of handrails. Wider stairways may be required if specified by the project.

5.3 Stair pitch and proportion

The maximum pitch of stairs shall not exceed 38°.

The following formula shall be used in determining the stair proportion:

GOING + TWICE THE RISE = 630 mm +/- 30 mm

The maximum rise shall be 190 mm.

Treads shall be evenly spaced. The maximum allowable deviation of the rise dimension in a single flight of stairs is +/-5 mm, including the first and last riser of every flight. Stairs for areas requiring installation contingency, may incorporate an adjustment facility. The projection of the treads shall overlap one another with minimum 20 mm.

5.4 Nosing

All nosings shall have a non-slip surface with secure and permanent fixing on top of the flooring material. Internal stairs shall have nosings, which allow efficient cleaning.

5.5 Flight

There shall be a maximum of 16 risers in any single stair flight.

There shall be a minimum of two risers for any flight in a stair that has more than one flight.

In long, straight stairways, after a maximum of 36 risers in consecutive flights, there shall be a change in direction of minimum 30°, or a landing of minimum 2 000 mm length.

5.6 Treads and landings

Each stairway shall have a landing at the top and bottom of every flight. There shall be an intermediate landing when two or more flights converge between deck levels. The depth of the landing shall not be less than the width of the stair.

Treads shall withstand a foot load of 2 000 N (200 kg) on an area of 100 mm x 100 mm at any position without permanent deflection.

For internal stairs, treads and landings shall be constructed in a material suitable for the stair's function and location, e.g. flat plate, flat plate for application of screed and floor finishes, checkered plate, low-density punched hole plate or open grating. Flat plate for application of screed and floor finishes shall be provided for the main internal stairways in the LQ.

For external stairs, treads and landings should be made of open grating. Grating openings shall not allow a 20 mm diameter ball to pass through at any point. This applies above places where personnel are likely to be present. Otherwise 35 mm diameter is acceptable. Low-density punched plate shall be used for treads and landings in external areas where open grating is not suitable. Maximum openings in the plate shall be as above.

Grating types and detailing of stairs shall be coordinated with the method of escape-way marking/painting of the stairs.

Where external stair treads and landings form part of a fire rated deck, all walking surfaces shall be made of non-slip checkered plate. Treads and landing surfaces shall be sloped for drainage as necessary.

All treads shall have a toe plate of minimum 50 mm height. All landings shall have a toe plate of minimum 100 mm height. Openings between toe plate and decks or gratings shall not exceed 10 mm.

The floor finish for internal stairways shall also cover the side walls (stringer) and be finished with a U-shaped profile at the top.

5.7 Headroom

Clear headroom (free height) shall be maintained in all stairs, and shall be a minimum of 2 300 mm measured vertically above the pitch line of the stair.

5.8 Company specified items

Operator/company specific requirements deviating from the requirements stated herein should be included as an addendum to this NORSOK standard in the contract documentation. Otherwise, they shall be established during the project by cooperation between the project and the operator/company.

6 Handrails, guardrails and barriers

6.1 General requirements

This subclause applies to handrails, guardrails and barriers that are not part of a machine or equipment skid. For handrails, guardrails and barriers that are part of a machine or equipment skid, see EN ISO 14122 (all parts).

All handrails and guardrails shall be solidly designed for personnel protection, and shall resist the accidental impact of a falling person, in any direction and at any point.

NOTE The scenario may be a person falling down a stairway, hitting the hand- and guardrail on the landing with considerable force.

Generally, handrails should be designed for 1,5 kN/m², acting horizontally on top of the supports. Any additional loads to be supported by the hand- and guardrails shall be avoided. If applied, however, such loads and forces shall be verified by structural calculations in each case, where structural members shall be dimensioned accordingly, e.g. support of minor equipment such as light fittings (not flood lights), signs, cable trays, etc. General structural loading conditions are covered in NORSOK N-003.

The hand- and guardrail system consists typically of a continuous handrail at the top to be grasped by the hand, or just a continuous top-rail when hand support is not required, knee-rails placed parallel with the handrail to prevent accidental passage of a body, vertical stanchions for anchorage of the guardrail system, and a solid toe plate at the bottom to prevent the fall of minor objects.

Decks, gangways and platforms higher than 500 mm shall be equipped with hand- and guardrails.

Handrail and guardrail supports shall normally be arranged at a maximum c/c distance of 1 500 mm. Handrail fixings to internal partition systems shall be reinforced for permanent stability, as required.

The top of the handrail shall be minimum 1 100 mm above the finished floor or deck. Exempted is the top of handrails around the lowered helideck perimeter walkway, where the height shall be minimum 1 400 mm. The distance between stanchions shall in this case be maximum 750 mm.

Vertical openings between horizontal knee-rails, handrails and toe plates, shall not exceed 380 mm.

The toe plate shall have a minimum height of 100 mm, and a clearance of maximum 10 mm to the deck.

A stanchion shall be provided in each corner (change of direction), unless stanchions are provided on either side of the corner, at a maximum c/c distance of 350 mm from the corner.

There shall always be at least two stanchions before and after a corner.

Hand- and guardrails shall not cause hindrance or injury to personnel. Sharp corners, rough edges, welds with burrs, etc., are not acceptable. Bolts, nuts and screws shall have a user-friendly design, which will not catch fingers or any part of a body in motion.

The multi-barrier principle shall apply for the complete hand- and guardrail system, where a single fault shall not cause a system failure. Any weaknesses or faults developed over time shall be detectable by visual inspection.

The installed hand- and guardrail system, complete with all its parts and fixing details, shall be practically maintenance free. It shall be constructed of a solid non-corrosive material.

6.2 Handrails

All handrails shall provide a continuous, smooth handgrip, without any sharp angles, rough edges, obstructions, protruding brackets, or similar. The handgrip area shall be without screws and bolts, unless they are completely recessed.

The distance between the handrail and any obstruction shall be minimum 50 mm in internal LQ areas. In other areas the minimum distance shall be 100 mm.

All handrails in LQ shall have a low maintenance finish, e.g. brushed stainless steel or suitable hardwood.

The outside diameter of the handrail shall be between 25 mm to 50 mm.

6.3 Prefabricated handrails and guardrails

Prefabricated hand- and guardrail systems shall be of a robust, non-corrosive type. All connections between elements shall be securely fixed by lock nuts and through bolts, or self-tapping screws. Setscrew type connections are not acceptable as a permanent fixing method. The fixed connections shall not loosen or weaken by normal use, wind and platform vibrations.

The width of the system shall be as small as possible to optimize the use of space in gangways, etc.

The hand- and guardrail system shall be installed in accordance with the latest issue of the manufacturer's written instructions and procedures. All installation personnel shall be given necessary theoretical and practical training, prior to installation.

Compliance with all requirements shall be verified before handrails and guardrails are taken into use. Assembly correctness, fixing details and correct torque are of particular importance. Demounted and remounted hand- and guardrails shall be rechecked. Areas containing unfinished hand and guardrails shall be temporally sealed off for personnel access.

6.4 Handrails and guardrails in stairs

All stairs shall have a handrail and guardrail on each side of every flight and every open intermediate landing. Handrails and guardrails shall be parallel to the pitch line of the stair flights and shall be level at open landings. Top of handrail shall be positioned minimum 1 000 mm (measured vertically) above the tread pitch line, and minimum 1 100 mm above landings and decks. The handrail shall be continuous from the top to the bottom of the stairway and shall be terminated in a safe manner at both ends.

Stairs shall have intermediate knee-rails parallel with the handrail, or other barrier of sufficient strength.

Handrails without intermediate knee-rails are sufficient, when walls surround the stairway.

Handrails on flights that are 180° to each other shall have a minimum of 100 mm clear distance between rails or between rails and supporting structures, to avoid the possibility of catching hands and fingers.

6.5 Gates

Self-closing gates shall provide access through guardrails, as required. The gates shall have the same design and strength as the surrounding guardrails. It shall open towards a deck or platform, and have a firm outward stop, to prevent accidents. A safe and user-friendly opening/locking device shall be provided.

6.6 Flexible barriers

A "heavy duty" type flexible barrier, with adequate elastic properties, shall be installed around material handling areas and truck operating areas. It shall be constructed in a solid non-corrosive material, which can withstand mechanical impact from containers and trucks. The system shall allow for easy replacement of any damaged element. A container guide system shall be provided, when required.

The barriers shall be bolted to welded foundations, to avoid leakages and penetrations through fire rated decks or bulkheads.

The barriers shall also provide personnel protection. Ordinary handrails and guardrails shall be avoided in areas where they may be subjected to mechanical damage from material handling.

6.7 Company specified items

Operator/company specific requirements deviating from the requirements stated herein should be included as an addendum to this NORSOK standard in the contract documentation. Otherwise, they shall be established during the project by cooperation between the project and the operator/company.

7 Doors

7.1 General requirements

Doors, with associated equipment and hardware shall be designed and arranged according to ergonomic principles so that the potential for injury to persons is eliminated.

Door assemblies shall be easily operable in a hazardous or accidental situation.

Doors shall have a clear opening of at least 750 mm width x 2050 mm height from floor finish/deck. Doors to cabin bathrooms, toilets, and doors that are not escape routes for more than one person may have a width of less than 750 mm. On mobile installations, other requirements to dimensions of doors may apply. For doors to prefabricated bathroom units refer also to relevant clause of this NORSOK standard.

Panic bars shall be provided on doors in areas where there is a risk of congestion or panic.

Threshold detailing and door arrangement shall stop all ingress of water from decks.

Automatic opening devices should be installed on doors used frequently for transport and handling of goods.

If a hangar door is required for the installation, it shall be adequately dimensioned regarding strength, fire rating and exposure to use.

A preliminary door schedule shall be developed as part of the conceptual design phase. It shall be continuously updated throughout the various project phases, until all required information is specified prior to procurement of the doors.

With the exception of B15 type lightweight doors and special doors (e.g. water tight doors and doors to provision stores etc.) the same supplier should be used for all doors on the installation in accordance with operator/company requirements. This should also apply for doors to mechanical packages to the extent possible.

7.2 Opening force

The opening force (i.e. the initial force required to open a door) as measured with a dynamometer or similar device, shall not exceed the following limits for doors in frequent use (i.e. doors in major traffic and escape routes and doors likely to be used at least 10 times a day) when these doors are in a level position:

Hinged doors	:	65 N
Sliding doors	:	50 N

For all other doors the following limits shall not be exceeded:

Hinged doors	:	130 N
Sliding doors	:	105 N

The maximum acceptable opening force in an accidental situation shall never exceed 250 N for doors in main escape routes.

The above maximum opening forces shall be verified by the supplier prior to purchase and by the project as part of the mechanical completion activity.

On floating/mobile installations, the maximum acceptable opening forces under accidental heeling conditions shall be evaluated and resolved on a project by project basis during the conceptual phase.

Unless specified otherwise by the project, all escape route doors and fire sectioning doors on floating/mobile installations, shall be self-closing for a static heel of 3,5 degrees in accordance with SOLAS regulation.

The design shall optimise the use of materials and construction methods to provide doors that are as light as possible.

7.3 Fire rating and fire test requirements

Fire rated doors shall be certified to have the same fire rating as the divisions in which they are installed. Any additional components that are required to comply with the fire rating (e.g. exposed frame insulation covering and associated flashing) shall be part of the supply.

7.4 Acoustic requirements

Doors with acoustic requirements shall, as a minimum, have the same sound reduction requirement as the division in which they are installed. A lower sound reduction value for the door may be accepted if it can be documented that the overall door/wall assembly meets the required sound reduction value (R_w) for the division.

7.5 Materials

The material thickness of frames and door leaf plates shall be sufficient to provide robust and rattle free doors, suitable for the location and intended use. Heavy abuse from mechanical and natural forces and requirements to minimum repair and maintenance shall be given due attention.

Carbon steel doors shall be in accordance with NS-EN 10025, S235 JRG2 or equivalent.

Stainless steel shall be type AISI 316L, or alternatively AISI 316 with a maximum carbon content of 0,05 %. The stainless steel material shall be of the white pickled and passivated condition.

Aluminium shall be of seawater resistant type.

Alternative materials (e.g. composite, etc.) may be used, as long as such materials comply with all relevant requirements.

Doors shall be suitably preserved for transportation and storage, and for protection against damage throughout the construction phase. The door surface finish, after preservation removal, shall be stain resistant and require minimum maintenance. For doors that shall not be painted/coated, a procedure for stain removal (without dismantling the door) shall be part of the supply. Heavy-duty preservation, resistant to weld spatter, angle grinding grit and potential damage from other construction activities shall be in place immediately following installation.

All door leaves, with the exception of doors in un-insulated prefabricated cassette walls and V-doors, shall be of a double plate, sandwich type construction and fully insulated without any air pockets. Insulation fibres shall be sealed to prevent any fibres being released to the environment. Insulation within door-leaves shall not sag following continuous use.

Gasket seals shall permanently maintain the specified integrity of the door throughout the door's specified design lifetime. Gaskets shall be glued or mechanically fixed in such a way that they can easily be replaced. Gaskets shall be of a design that maintains elasticity and allows for latching and full perimeter sealing of door-leaves during continuous heavy use, without requiring excessive force or slamming. Special attention shall be paid to the gasket sealing of doors at LQ perimeter, to applicable doors at zone 1 classified areas and to doors that shall maintain an air pressure differential.

7.6 Painting

All carbon steel surfaces shall be sandblasted, prepared, primed and painted with a coating system in accordance with project requirements. Stainless steel surfaces shall not be painted, unless specified otherwise in the door schedule. Aluminium doors shall be anodised. B-rated type doors and internal doors where specified, may be provided with baked-on electrostatic powdered epoxy/polyester coating or PVC foil.

The internal face of unpainted external door leaves and frames to recreation rooms and other accommodation areas shall be painted to match the internal colour scheme.

7.7 Hinged doors

All hinged doors and the active leaf of all hinged double doors shall be self closing and self latching, unless specified otherwise in the door schedule.

Doors shall be provided with at least three hinges, and doors higher than 2 500 mm shall be provided with at least four hinges. A continuous piano hinge may also be used. The hinge design shall facilitate easy removal of the door. There shall be a lubrication nipple on each hinge, unless the hinges are guaranteed maintenance free.

Each hinge shall be fixed to the door leaf with a minimum of three screws. The hinge design and the fixing method to the frame and door leaf shall ensure that no buckling of the leaf or frame occurs during continuous normal use throughout the design life of the door. Thin plate doors (with faceplates of less than 2 mm thickness) shall have additional reinforcement inside the door leaf on the hinge side to satisfy this requirement. Hinges welded to door leaf are not acceptable.

The meeting edge of double door leaves shall have a continuous seal and overlap that satisfies all integrity requirements for the double door, without gaps at gasket joints.

The door leaf or the gasket shall be easily adjustable after the door has been installed to ensure proper closure and compression of all seals when closed.

7.8 Sliding doors

All sliding doors shall be self-closing, having an adjustable speed reduction brake to stop the door from closing or opening (on floating installations) too quickly. In addition, doors on floating or mobile installations shall be self-latching. They shall have fail-safe protection against falling down from their tracks and guides, and overturning.

All sliding doors shall be provided with a track housing which protects and encloses the top, front, back and ends of the track mechanism. The housing shall be of the same material as the door frame. The front panel of the track housing shall be hinged and have a fail-safe hold open device, allowing for easy inspection and maintenance of the mechanism. For H-rated doors the front panel of the track housing may be bolted, if required, for compliance with fire regulations. The panels shall not open unintentionally. The track housing on external doors shall provide maximum weather protection to the sliding mechanism. Track housings located in areas with suspended ceilings shall have the front panel hinges located below the level of the ceiling, to allow easy access to the mechanism without dismantling the ceiling panels.

Handles on sliding doors shall have an ergonomically correct grip for easy manual opening of the doors by personnel wearing gloves. Handgrips at frame side shall be designed to avoid accidental crushing of fingers.

Suspension track, rollers, top and bottom roller guides, latch, handles, etc. shall be in stainless steel. All doors shall be easily removable from their tracks.

Doors with counterweights shall be of a chain and cogwheel construction.

Recesses in the floor, which may collect moisture or contamination, shall not be used at sliding door installations.

7.9 Hardware and accessories

Generally, all hardware (inclusive hinges) shall be in stainless steel, unless specified otherwise in the door schedule. Visible surfaces shall have a brushed finish.

Door handles shall be of brushed stainless steel AISI 316 and shall be of a consistent type and design for the whole installation.

Door handles shall be solid with a minimum 8 mm spindle. Lock screws in spindles shall be of a type that does not need periodical re-tightening. Lever handles shall be secured on the backside of the escutcheon plate to stop side movement. The escutcheon plate shall encompass the lock cylinder (where applicable), and shall be properly secured, with local reinforcement in the door leaf, to prevent any movement, deflection or other weaknesses. Handles with roller bearing mountings may be required in areas of continuous heavy use.

The inactive leaf of B-rated double doors shall have flush bolts at top and bottom, adjustable to give a rattle free closing. The inactive leaf of all other double hinged doors shall have a heavy duty stretching latch, which is operated by a single lever handle and locks the leaf into the frame at the top and at the threshold at the bottom. The inactive leaf in escape-way doors shall have automatic release flush bolt and door leaf co-ordinator.

Doors shall normally be supplied with a single mortise latch and locking mechanism, provided they meet the specified performance requirements. All latch systems shall be removable and replaceable without any alteration to the door leaf. For doors in LQs the latching mechanism shall be recessed into the door leaf.

All striker plates shall be adjustable to ensure proper latching.

Door stops shall be provided for all doors to prevent damage to adjacent surfaces.

Panic devices shall be suitable for the specified door type and shall override the door lock (stainless steel rim latch with cross bar or similar).

Kick plates (300 mm height) and trolley protection plates (800 mm height) in brushed stainless steel shall be provided for hinged doors in relevant traffic areas. Trolley protection plates shall be provided to both sides of doors in kitchen area, scullery, provision stores and laundry.

Kick plates and trolley protection plates shall be mechanically fixed with flush fixings. There shall be no sharp or protruding edges.

It shall be possible to fit all doors with a temporary "hold open device" for use in the construction phase. Temporary "hold open devices" may be an integral part of the door closer system or a purpose made device. The temporary "hold open devices" shall be removed prior to commissioning. Certain doors (e.g. all cabin doors) shall be fitted with permanent "hold open devices", of a type compatible with the safety philosophy, to ease cleaning in the operational phase.

Electro-magnetic door holders, connected to the fire and gas system, shall be provided for certain corridor doors that are to be kept open in a normal use, all in accordance with operator/company requirements. The door holders shall have a manual release button. Door leaves and wall systems shall be suitably reinforced for fixing of door holders where required.

Door leaves shall be properly reinforced at hinges, locks, handles, closer devices and any other places where hardware is to be attached to the door.

Doors in transport routes where frequent movements of heavy pallets and goods are anticipated (e.g. to main internal storage areas and to kitchen storage from lay-down decks) shall have leaves and frames reinforced as necessary.

The frames and door leaves for all cabin doors shall be delivered with pre-drilled holes for fixing of door closers. This should also apply to other relevant doors.

7.10 Automatic opening devices

Doors that do not meet the specified opening force stated earlier in this subclause, or are frequently used for personnel, truck and trolley traffic, shall be provided with automatic opening devices.

The opening device shall be activated by a handle on the door leaf or a push-button, approximately 900 mm above the floor level. The handles and the push-buttons shall be located on both sides of the door. Sensors, which are safe in a fire may also be used, where appropriate.

Certain doors may be fitted with a pull-wire opening device on both side of the door. Such devices shall be carefully positioned for convenient use in accordance with the user requirements, e.g. fork lift truck operators.

The system shall incorporate a time laps mechanism to close the doors slowly, easily adjustable from 10 s to 2 min 30 s.

Care shall be taken to avoid structure borne and airborne noise emission from the automatic opening devices.

The doors shall be designed to return immediately to the open position upon meeting any resistance while closing. "Resistance" in this context shall be interpreted as meaning "any part of the human body". Where self opening doors have to be located in a manner which may create crushing or squeezing situations for personnel in the opening path of the door, special override or detecting devices may be required, dependent on location.

Doors with opening devices shall not "self-open" under the action of fire.

Manual override devices or emergency release valves shall be located approximately 1 750 mm above the floor, and have a self-explanatory arrangement for use.

Doors with inset personnel doors, shall not be operable if the personnel door is not properly closed.

Pneumatic assisted doors shall have moisture extractors fitted in air supply lines. Pneumatic systems shall not be supplied with pressure safety valves unless specified otherwise by the project. Control cabinets shall have permanent signs or labels for identification.

Instrument fittings and tubing shall be carefully coordinated with the project standard at an early stage prior to selection of supplier.

Unless otherwise specified by the project, pneumatic doors in escape routes shall be fitted with emergency air reservoirs to enable four complete activations (opening and closing) of the doors in the event of plant air failure.

Each air reservoir shall have a maximum capacity of 20 litres.

Pneumatic cylinders will be sensitive to contamination when air supply is disconnected. Consequently, the cylinder arrangement shall allow for simple disconnection from the door-leaf when the air supply is stopped for any period of time. Screw sealing plugs of same material as pneumatic supply lines shall be part of the pneumatic assembly supply. Plugs should be kept near the fitting by a safety chain.

Pneumatic system components in exposed weather conditions and in naturally ventilated areas shall be stainless steel AISI 316. This includes components inside and outside of the pneumatic control cabinets.

Electrical opening devices may be used provided that zone 1 classified area requirements and IP ratings are satisfied.

All doors with automatic opening devices shall have appropriate CE marking.

7.11 Thresholds

All required thresholds shall be dimensionally as low as possible, without impairing function with regard to fire rating, noise reduction, and ability to stop ingress of water.

The maximum height between the top of threshold and adjacent floor finish shall not be more than 25 mm. Doors used for regular passage of trolleys or forklift trucks, shall have the thresholds arranged to provide an absolute minimum of obstructions. This may be achieved by using thresholds with integral "ramps", or by using deck levelling screeds and associated floor-finishes to create local ramps to compensate for threshold heights. Door thresholds in forklift truck transport routes shall be detailed to withstand passage of the truck with its forks in the lowered position.

The maximum allowable threshold height shall be specified for each door type in the door schedule, together with heights of any associated ramps.

All doors shall have stainless steel thresholds. Doors that have painted or coated frames shall have either a brushed stainless steel threshold or a brushed stainless steel cover plate, minimum 1 mm thick, for the entire length, and down to the floor on both sides, leaving no gaps and sharp edges.

Fixing of thresholds shall not be by bolting through the fire rated deck below, and shall maintain the project standard of corrosion protection. For all sliding doors, large double-hinged doors and doors in areas with uneven deck plates, thresholds shall be fixed to doubling plates that are welded to the deck by the fabricator.

7.12 Frames

Door frames shall be installed, as appropriate, by either bolting through air tight isolation gaskets, or by a continuous fillet weld all round. Frames shall be reinforced at hinges, locks and closer device positions. Detailing shall minimise galvanic corrosion.

To reduce transmission of forces from the bulkhead into the door-frame, which may affect proper alignment and operation of doors, the maximum plate buckling at the perimeter of the cut-out shall be 5 mm along a straight edge. Where buckling is in excess of this, or where required for structural reasons, the cut-out shall be terminated at a welded angle profile into which the door frame may be welded or bolted.

7.13 Door locks

Doors shall be provided with locks in accordance with operator/company requirements. Non-lockable doors shall be fitted with "blind" escutcheon plates or blind cylinders. Lockable doors requiring key cylinder only on one side, shall have a wing shaped thumb-turn on the other side (normally inside), which overrides the lock mechanism. Certain doors shall be supplied with a "break-glass" unit to house a key or a thumb-turn.

Doors to cabins shall be lockable for privacy, with a thumb-turn on the inside. It shall be possible to unlock the door from the corridor side in an emergency. This may be achieved by locating a minimum of two pass keys in "break-glass" boxes at strategic positions on each cabin area level.

None of the doors in escape routes shall be lockable in the operational phase. Requirements for temporary locking of doors during the construction phase shall be agreed between the project and the operator/company.

All bathroom cubicle doors, solarium doors and doors to toilets and shower rooms etc., shall be fitted with inside thumb-turn and outside indicator.

Doors to high voltage electrical rooms shall be lockable. They shall open outwards from the room. They shall be equipped with a manual panic device, e.g. a vertical panic bar or push-button operated device that is operable from inside the room by the use of the knee, elbow or other part of the body, also by a person who is crawling. All in accordance with governing authority requirements.

High voltage rooms and certain local equipment rooms may require "break-glass" units for emergency access, if indicated in the door schedule. Such units shall be located by the door.

7.14 Vision panels

Vision panels shall be installed as required for orientation or safety reasons, and always in pendulum doors and doors in corridors and stairways. Doors with electro-magnetic door holders are exempted.

The vision panels shall be positioned to ensure good line-of-sight through the panel whilst operating the door. This may require the vision panel to be positioned off-centre in the door leaf.

The vision panels shall be an integral part of the certified door. The glazed area shall be approximately

200 mm x 500 mm (width x height) or 400 mm x 400 mm (width x height), and consist of tempered security glass. The vision panels shall not impair the function of the sliding door sealing.

7.15 Tolerances

All parts shall be supplied free from distortion. Face sheets shall be flat and shall not vary by more than 2 mm. Doors and frames shall be fabricated within tolerances on overall dimensions of 2 mm.

7.16 Tagging, marking and coding

Doors shall be tagged, marked and coded in accordance with project requirements. A tag plate shall be discreetly fixed to the door assembly, providing as a minimum, manufacturer's name and address, fire rating, sound insulation rating, project tag number and door number as listed in the door schedule. For all doors, the tag plates shall be fixed to an easily accessible but mechanically protected location.

7.17 Internal doors

The B-rated doors shall be fully compatible with the relevant proprietary B-rated partition systems.

B-rated folding doors are part of the partition supply, and are covered in Clause 10.

Internal A, B and non-rated doors requiring large glazed surfaces shall be included in the door schedule. The glazed area shall consist of laminated or tempered security glass, divided into at least two panes that are separated by horizontal muntin member(s). The glazing shall be an integral part of the certified door.

Doors being an integral part of an internal glazed partition system are covered in Clause 8, and are part of the glazed partition supply. The doors shall nevertheless comply with this subclause.

7.18 External doors

All external doors shall be robust stainless steel or aluminium sliding doors. Doors in recessed and sheltered entrances may be hinged.

The door leaf shall be a sealed unit, totally impervious to moisture. Sliding doors shall be mounted on the outside of the walls. The doors shall withstand the extreme environmental design conditions on the specified field location. The relative humidity shall be calculated at 100 %.

Detailing shall stop any pools of water on external decks from passing through the door construction.

Where weather tightness is required, weather tight seals shall be added. The weather tightness shall be verified by hose testing from the outside after installation. The water pressure shall be at least 0,2 MPa (2 bar), and the nozzle shall be held at a distance of maximum 1,5 m from the door. No leakage shall be accepted.

On floating production units, drill-ships, semi-submersibles etc., weather-tight doors may be required on or above freeboard decks. In addition to the sealing requirement stated above, these doors shall be designed for a strength equivalent to or better than that required for the weather-tightness of the structure in which they are positioned. The strength shall be verified by calculations.

7.19 "Gas-tight" doors

"Gas-tight" doors are normally located in the perimeter of areas where an air pressure differential shall be maintained, or where specified in the door schedule.

"Gas-tight" doors shall maintain a pressure differential between adjacent areas, where the allowable leakage rate shall not exceed $0,5 \text{ m}^3/\text{m}^2 \text{ h}$ at 50 Pa (5×10^{-4} bar) over-pressure, following prolonged use, or as specified by the project. A satisfactory test certificate shall be provided with each door type.

A pressure relief port and/or air lock is required for hinged doors separating areas of high differential pressure. It shall not reduce the door's specified fire rating and sound reduction properties.

7.20 Blast resistant doors

Certain doors shall be designed to withstand blast over-pressures. The magnitude of the static and dynamic design pressure (in bar), including impulse duration, shall be in accordance with project requirements.

The door shall be reinforced as required to maintain the given fire rating, integrity and operability (for escape), after the expected blast. Satisfactory laboratory test results (certificates) from a recognised laboratory shall be supplied with all blast resistant doors. The doors shall have been subjected to a full blast test followed by a fire test.

7.21 Explosion relief doors

Explosion relief doors are normally installed in external walls containing explosion relief panels. The doors shall have explosion relief panels, which open at an over-pressure of 0,005 kPa (0,05 bar), built into the door leaves. It shall be possible to open the door leaf up to a minimum of 60 % after an internal explosion. The panels and parts of the door shall not cause flying debris during the explosion.

The door frame, stiles and rails shall withstand an explosion over-pressure of minimum 0,01 MPa (0,1 bar) and remain in place.

7.22 Louvred doors

Louvred doors are normally installed in louvred walls providing natural ventilation to interior areas. The louvred doors shall be designed to maximise the passage of air through the louvres, whilst minimising the penetration of water to the interior.

7.23 Inset personnel doors

Inset personnel doors are doors set within larger hinged or sliding door leaves, as an integral part of the total door assembly. These doors shall be self-closing and self-latching.

7.24 Water tight doors

Doors or hatches within watertight bulkheads shall be certified to meet the applicable design pressures, see applicable NMD requirements.

All doors to be tested before installation at design pressure + 5 mWC (meter water column).

Hydraulically operated water tight doors shall be in accordance with current SOLAS Regulation. In addition to the requirements stated therein, it is strongly recommended that hydraulically operated water tight doors are equipped with a safety device to prevent accidental crushing injuries to personnel.

The central operating console at the bridge/control room shall then have a "master mode" with the following three modes of control:

- "local control" mode which allow any door to be locally opened and locally closed after use without automatic closure, with the safety device to prevent accidental crushing active;
- "door closed" mode which shall automatically close any door that is open, with the safety device to prevent accidental crushing active;
- "door closed safety override" mode which shall automatically close any door that is open, with the safety device to prevent accidental crushing not active.

NOTE Any proposed deviation to the above recommendation should be evaluated on a case by case basis with the operator/company.

Closing of doors shall be fail-safe. In the event of loss of control power the door shall close automatically.

Doors shall have a mechanical locking device to prevent the door from opening accidentally in an emergency.

Watertight doors shall be certified to have, as a minimum, the same fire rating as the divisions in which they are installed.

Arrangement of operation and local operation of the door shall be according to SOLAS Regulation, 15.7.1.5 and 15.7.4.

It shall not be possible to remotely open any door from the central operating console, see SOLAS Regulation, 15.8.3.

Alarm and indication on bridge/control room shall be according to SOLAS Regulation.

Control, alarm, and indication local on door shall be according to SOLAS Regulation.

A warning light shall be positioned on each side of the door and shall be active when the door is in "Door closed" mode.

The degree of protection for the electrical components shall be according to SOLAS Regulation, 15.7.6.

Electrical system shall be according to SOLAS Regulation, 15.7.7 and 15.7.8.
Control circuit and indication circuit shall be made separately.

Doors shall have a maximum of 20 mm threshold without recess. Hinged plates shall not be used.

Detailing of thresholds in material handling routes shall be carefully coordinated, with reference to the material handling report, in order to achieve a functional threshold that is as low and obstruction free as possible.

7.25 Emergency escape hatches

Emergency escape hatches shall be easy to open by a single individual from both sides, and shall have a minimum clear opening of 800 mm x 800 mm on fixed installations. On mobile installations, other requirements may apply. All emergency escape hatches shall be hinged.

Emergency escape hatches shall be of the same construction and quality as personnel doors, and shall be listed in the door schedule.

7.26 Inspection hatches

Horizontally arranged inspection hatches on top of decks shall be splash proof and detailed to be flush with the deck, with no protruding appurtenances likely to be a tripping hazard. They shall have fail-safe sealing detailing.

All inspection hatches shall be hinged wherever possible.

Inspection hatches in insulated bulkheads or decks shall be detailed to allow opening without causing damage to the adjacent insulation.

Inspection access panels in lightweight partition systems are covered in Clause 10.

7.27 Function testing/commissioning of doors

General function testing of all doors shall be carried out as part of the mechanical completion activities. Full perimeter gasket sealing, latching and compliance with specified opening pressure limits shall be formally verified. All adjustments shall have been completed, to ensure the fire- and smoke barrier properties are maintained.

Doors and hatches shall have recommended lubricants applied to hinges, mechanisms and gaskets as required at mechanical completion, in accordance with manufacturers' maintenance procedures.

Automatic opening devices shall be fully adjusted to comply with specified operation. Instrument quality air shall be provided if necessary, to allow for adjustment. Following adjustment, pneumatic cylinders shall be disconnected until air supply is permanently available. Air supply shall be checked for moisture content and contamination prior to permanent reconnection. Disconnected pneumatic tubing shall be sealed with screwed metal plugs of the same material as the tubing.

The function testing shall be performed by qualified/certified personnel.

7.28 Door schedule

A door schedule shall be developed based on attached data sheet, specifying all requirements for each door. All hardware, accessories and systems to be part of each door supply shall be included.

7.29 Door selection

It is of utmost importance that correct fit-for-purpose door types are selected, e.g. thin plate domestic/LQ category doors shall not be selected for use in medium or heavy-duty areas and vice versa. Table 1 to Table 3 shall be used to establish suitable door and escape hatch types for the respective areas of the installation. The door type codes shall be included in the door schedule in data sheet CDS-201, see Annex A. Special doors or doors that are part of equipment packages (e.g. provision stores) are not covered by Table 1 to Table 3.

Table 1 – Light and medium duty doors

	INTERNAL	INTERNAL	INTERNAL	EXTERNAL
CATEGORY/ ENVIRONMENT	Domestic/LQ	Domestic/LQ Light industrial/Utility	Medium industrial/Utility	Medium Industrial / LQ
USAGE	Personnel use only	Personnel/Infrequent mechanical handling	Personnel/Mechanical handling	Personnel/Mechanical handling
VENTILATION	Controlled	Controlled	Controlled	Open
TYPE OF AREA	Accommodation areas, cabins, offices, laboratories, control rooms, workshop offices, stores etc.	Accommodation areas, offices, laboratories, control rooms, switchboard rooms, workshop offices, stores etc.	Machinery rooms, workshops, switchboard rooms, main circulation routes, mud handling areas etc.	LQ laydown. Access / Emergency exits
EXPOSURE	Not exposed to weather. Not exposed to mechanical impact. Doors subject to occasional washdown shall be stainless steel.	Not exposed to weather. Not exposed to mechanical impact. Doors subject to occasional washdown shall be stainless steel.	Not exposed to weather. May be exposed to mechanical impact. Doors subject to occasional washdown shall be stainless steel.	Exposed to weather. May be exposed to mechanical impact.
MATERIAL	MS-SS-AL	MS-SS-AL	MS – SS -AL	SS-AL
RATING	B or non	A or non	A or non	A or non
DOOR TYPE CODE	L1	L2	M1	M2
DESCRIPTION	Thin plate light duty door leaf. For bolting into lightweight partition. Normally part of partition supply.	Thin plate light duty door leaf (normal plate thickness <1,5 mm). For bolting into bulkheads or prefabricated walls.	Stiffened plate medium duty door leaf (plate thickness min. 2 mm). For bolting into bulkheads or prefabricated walls.	Stiffened plate medium duty door leaf. (plate thickness min. 2mm). For bolting or welding into bulkheads or prefabricated walls. Weather tight seals where required.*

* Where weather tightness is a requirement for type M2 doors, weather tight seals shall be added. Weather tightness shall be verified by hose testing from the outside after installation.