



Exploration & Production

## GENERAL SPECIFICATION

### STRUCTURAL

#### GS STR 104

**Design and fabrication of technical cubicles for  
offshore oil installations**

|      |       |                                                                       |
|------|-------|-----------------------------------------------------------------------|
|      |       |                                                                       |
|      |       |                                                                       |
| 01   | 10/03 | Updated to be in line with GS CIV 404 – Change of Group name and logo |
| 00   | 02/01 | First issue                                                           |
| Rev. | Date  | Notes                                                                 |



## Contents

|                                                                 |           |
|-----------------------------------------------------------------|-----------|
| <b>1. Scope .....</b>                                           | <b>3</b>  |
| <b>2. Reference documents.....</b>                              | <b>3</b>  |
| <b>3. Functions .....</b>                                       | <b>6</b>  |
| <b>4. Design methods .....</b>                                  | <b>7</b>  |
| 4.1 Fire resistance .....                                       | 7         |
| 4.2 Installation conditions.....                                | 8         |
| 4.3 Main structure .....                                        | 10        |
| 4.4 Cubicle construction.....                                   | 13        |
| <b>5. Construction methods .....</b>                            | <b>16</b> |
| 5.1 Welding.....                                                | 16        |
| 5.2 Assembly - Fitting of equipment and accessories.....        | 18        |
| 5.3 Corrosion protection.....                                   | 18        |
| 5.4 Dimensional tolerances.....                                 | 18        |
| <b>6. Transport and installation methods .....</b>              | <b>19</b> |
| 6.1 Weight monitoring .....                                     | 19        |
| 6.2 Preparation for transportation - Packaging and crating..... | 19        |
| 6.3 Installation.....                                           | 19        |
| <b>7. Quality procedures .....</b>                              | <b>19</b> |
| <b>Appendix 1 Decision flow diagrams .....</b>                  | <b>21</b> |

## 1. Scope

To define rules governing the design of transportable, prefabricated technical cubicles of less than 150 T for offshore oil installations.

To define the specifications applicable to the studies, supply, construction, fitting out and installation of transportable, prefabricated technical cubicles for offshore oil installations.

These specifications may be applied in full or in part for premises incorporated in the structure of an offshore oil installation.

Special provisions, specific to each project (layout, climatic conditions, programme, function, equipment, etc.), shall be covered by appropriate job specifications.

## 2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Where there are local regulations, their instructions and those of the standards or codes to which they refer shall always be applied, in addition to or in place of the instructions in this document.

### Standards

| Reference        | Title                                                                                                         |
|------------------|---------------------------------------------------------------------------------------------------------------|
| ISO 834          | Fire resistance tests. Elements of building construction (for Class A: standard curve; for Class H: HC curve) |
| ISO 3008         | Fire tests of door assemblies                                                                                 |
| ISO 3009         | Fire test of window assemblies                                                                                |
| ISO 1182         | Non-combustibility                                                                                            |
| ISO 5657         | Ignitability – Ignition properties                                                                            |
| ISO R 1996       | The curve of background noise                                                                                 |
| EN 287           | Approval testing of welders for fusion welding                                                                |
| ISO 15614 Part 1 | Specification and approval of welding procedures for metallic parts                                           |
| ISO 1184         | Non-combustibility - Essai de réaction au feu des produits de construction - Essai d'incombustibilité         |
| ISO/TR 3956      | Principles of structured Fire-engineering Design                                                              |
| ISO/TC92/SC2/WG6 | Sealing of passageways through fire-break walls                                                               |
| IEC 60079-13     | Construction and use of rooms or buildings protected by pressurization                                        |
| IEC 60034        | Rotating electrical machines                                                                                  |

**Professional Documents**

| Reference                                                                      | Title                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AISC                                                                           | Specification for the design, fabrication and erection of structural steel for building, or equivalent                                                                                                                                                                                                                                                                                                  |
| API RP 500 B                                                                   | Recommended Practice for Classification of Areas for Electrical Installations at Drilling Rigs and Production Facilities on Land and on Marine Fixed and Mobile Platforms                                                                                                                                                                                                                               |
| Department Of the Energy<br>– Health and Executive<br>Safety (D.O.E. – H.S.E.) | Offshore installations – Guidance on design, construction and certification (4 <sup>th</sup> Ed., 1990) : <ul style="list-style-type: none"> <li>- Department of Energy, Hydrocarbon Fire Test standard and Procedure</li> <li>- First Action Level of 85 dBa</li> <li>- A guide to the Offshore Installation (Safety Case) SI 1992/2885, Regulation 4, Safety cases for fixed installations</li> </ul> |
| D.O.E. Section 24                                                              | Materials other than steel and concrete                                                                                                                                                                                                                                                                                                                                                                 |
| D.O.E. Section 52                                                              | Noise and vibration                                                                                                                                                                                                                                                                                                                                                                                     |
| Bureau VERITAS (BV)<br>B.V. June 2000                                          | BV Publications (12.93)<br>Rules for the classification of Steel ships – Part F, chapter 6<br>Comfort on board COMF & 7 Refrigerating installation – Additional Class Notations                                                                                                                                                                                                                         |
| British Standards (BS)<br>BS 476<br>BS 5345<br>BS 2475<br>BS 4727              | Fire Safety<br>Fire Tests on Building Materials and Structures<br>Code of Practice for selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres<br>Octave and One Third Octave Band Pass Filters<br>Glossary of Electrotechnical, Power, Telecommunications, Electronics, Lighting and Colour Terms                                                 |
| Institute of Petroleum (I.P)                                                   | Model Code of Safe Practice for the Petroleum Industry                                                                                                                                                                                                                                                                                                                                                  |
| N.M.D                                                                          | Norwegian Maritime Directorate (N.M.D) - Regulation for Mobile Offshore Units                                                                                                                                                                                                                                                                                                                           |
| N.P.D. Guidelines                                                              | Acts, regulations and provisions for the Petroleum Activities                                                                                                                                                                                                                                                                                                                                           |

**Regulations**

| Reference      | Title |
|----------------|-------|
| Not applicable |       |

**Codes**

| Reference               | Title                                                                                                                                                        |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IMO-MODU code           | (Mobile Offshore Drilling Unit) Chapter 9                                                                                                                    |
| AWS D 1.1               | Structural Welding Code - Steel                                                                                                                              |
| SOLAS Res. A653 (16)    | Recommendation on improved fire test procedures for surface flammability of bulkhead, ceiling and deck finish materials (supersedes A.516(13) and A.564(14)) |
| SOLAS Res. A517 (13)    | Recommendation on fire test procedures for "A", "B" and "F" class divisions                                                                                  |
| SOLAS Res. A166 (ES.IV) | Guidelines on the evaluation of fire hazard properties of materials                                                                                          |
| SOLAS Res. A472 (XII)   | Improved recommendation on test method for qualifying marine construction materials as non-combustible (supersedes A.270(VIII))                              |
| I.M.O – 844E            | Fire Test Procedures (Ed. 1993) Regulation 3, 3(1) & 3(2) Chapter II-2 SOLAS 1982                                                                            |

**Other documents**

| Reference      | Title |
|----------------|-------|
| Not applicable |       |

**Total General Specifications**

| Reference  | Title                                                                            |
|------------|----------------------------------------------------------------------------------|
| GS COR 350 | External protection of offshore and related structures and equipment by painting |
| GS COR 450 | External protection of structures and equipment by painting. Maintenance works   |
| GS ELE 001 | Electrical design criteria                                                       |
| GS ELE 031 | Design of earthing and bonding systems                                           |
| GS ELE 079 | Electrical apparatus for explosive gas atmosphere                                |
| GS ELE 081 | Lighting                                                                         |
| GS ELE 161 | Electrical cables                                                                |
| GS STR 001 | Weight monitoring and weighing offshore units                                    |
| GS STR 103 | Design and fabrication of skids and equipment supporting structures              |
| GS STR 201 | Materials for offshore steel structures                                          |
| GS SAF 216 | Area classification                                                              |
| GS SAF 253 | Impact area, restricted area and fire zones                                      |
| GS SAF 337 | Passive fire protection                                                          |

### 3. Functions

A technical cubicle is a closed and covered construction, with openings, cable entries and/or conduits, containing technical equipment, big enough to accommodate people needing to work or remain inside.

The transportable and entirely prefabricated cubicles are factory fitted, ready for installation or insertion on a fixed or floating offshore platform. They can also be built into the main framework of a structure.

The term technical cubicle covers the following spaces (non-exhaustive list):

- Electrical, instrumentation, communication and air conditioning plant rooms
- Offices, stores, workshops
- Kitchens, refectories, toilets, watch rooms
- Radio rooms, control rooms, modular accommodation premises, temporary shelters
- Laboratories (subject to studies specific to this type of activity).

These areas can be “inhabited” or “uninhabited” and provide “vital functions” or “secondary functions”, according to the definitions below.

- **Inhabited areas**

Accommodation - Shelter pending evacuation.

Areas regularly and continuously occupied: offices, workshops, laboratories, watch rooms and radio rooms, control rooms, kitchens, refectories, modular accommodation rooms.

- **Uninhabited areas**

Personnel are present in these areas only occasionally and for short periods.

- **Vital functions**

Safety: protection of personnel, shelter pending evacuation, process control and installation safety functions, communications, emergency power supply, fire-fighting.

Production: determined by the risks: pollution, aggravation of an accidental situation, loss of production (importance of the function to production and time/cost of replacement).

- **Secondary functions**

All others not included in the above.

The structure is defined by contractual documents. In the event of contradiction between documents, the following order of precedence shall apply:

- Job specification
- Basic drawings
- Specifications.

If necessary, account must be taken of additional or planned future equipment in the job specification.

The life of a structure is normally 20 years.

## 4. Design methods

### 4.1 Fire resistance

The level of fire resistance for each segregated area should be defined in the **general safety design**. It is important to assess the level of risk and the consequences of damage caused by fire in the cubicle. The **decision flow diagrams** in the appendix are based on the "inhabited" or "uninhabited" nature of the areas and whether the functions provided are "vital" or "secondary".

In the absence of a general safety design or job specifications, passive fire protection shall be provided in accordance with Chapter 9, sections 9.1 and 9.2 of **MODU - (Rules governing the construction and equipment of mobile offshore drilling unit equipment)** and « **I.M.O 844-E Regulation 3, 3(1) & 3(2) Chapter II-2 SOLAS Fire Test Procedures** ». Fire protection system shall comply with **GS SAF 337**.

The required resistance values are as specified below. The tests establishing these values shall adhere to the specifications laid down in the following standards:

- **ISO 834**
- **ISO 3008**
- **SOLAS Chapter II-2 and MODU Code**
- **N.M.D Regulations Part VI p.358**
- **N.P.D acts-regulations and provisions for the Petroleum Activities Vol 2, 01/06/98**
- **I.M.O 844E Fire Test Procedures**

Active fire protection, if required, shall be the subject of a job specification.

#### 4.1.1 Fire resistance of walls and floors

The fire resistance of the walls and elements of construction shall be established, if required, according to the following criteria:

- Load-bearing capacity
- Thermal insulation
- Imperviousness to smoke and flames.

The fire resistance tests on the elements of construction shall be performed in accordance with the conditions described in **ISO 834** and **SOLAS Resolutions A.653 and A.517**.

The design of the structure shall take into account technical report **ISO/TR 3956** will special regard to the connection between real fire exposure and the heating conditions of the standard fire resistance test (**ISO 834**).

The normalized temperature-time curve governs the "class A" tests.

The "hydrocarbon (HC) fire curve" temperature-time curve - "NPD" - governs the "class H" tests.

Doors and closures are tested in accordance with **ISO 3008**.

Any glass elements (bulls-eye windows, port holes) shall be tested in accordance with **ISO 3009**.

#### 4.1.2 Reaction and resistance to fire of equipment and materials

All equipment and materials shall be compliant with the following standard tests:

- Non-combustibility: [ISO 1182](#) - criteria according to Appendix A of this standard
- Ignitability/Combustibility: [ISO 5657](#) - combustion time less than or equal to 5 seconds
- Toxic gases (pending the publication of an ISO standard, the following paragraph shall apply).

The materials used must not, in case of fire, release gases such as hydrocyanic acid or hydrochloric acid in quantities greater than those indicated below: the total mass of materials shall be such that for every m<sup>3</sup> of volume in the room, the total quantity of nitrogen and chlorine contained and liable to be released in hydrocyanic acid or hydrochloric acid form cannot exceed 5 grams and 25 grams respectively.

Material performance shall be in accordance with [DOE-HSE Section 24](#)

Materials must be tested in accordance with the requirements of [Regulation 3 of Chapter II-2 of SOLAS, IMO-844E Fire Test Procedures](#).

A standard fire test may be the test in [Regulation 3\(b\) of Chapter II-2 of SOLAS, IMO-844E Fire Test Procedures](#) or in [BS 476 : Part 20, 21 and 22](#).

Hydrocarbon fire test means a test conducted in accordance with the Department of Energy Hydrocarbon Fire Test Standard and Procedure.

#### 4.1.3 Passages through classified walls

These passages or entries shall conform to the specifications and tests of resolution A 754 (18) of the International Maritime Organization (IMO) and the systems employed shall comply with the requirements of [ISO/TC92/SC2/MG6](#).

### 4.2 Installation conditions

#### 4.2.1 Installation in classified areas

The area classification plan is given in the project-specific documentation.

The areas classification shall comply with [GS SAF 216](#) and [GS SAF 253](#).

Classification of areas of the Installation into hazardous and non-hazardous should be carried out in accordance with a recognised international standard or code for protection of electrical apparatus and conductors, both inside and outside of enclosed areas. These include :

- [BS 5345 Part I, 1976 and Part II, 1983](#)
- [I.P. Model Code of Safe Practice Parts 1 and 8](#)
- [MODU Code](#)
- [API RP 500B](#)

##### 4.2.1.1 Consequences on cubicle design

Normally, cubicles installed in zone 1 or 2 areas are pressurized. They are fitted with air locks with automatically closing doors. The interior of such an air lock is classified as a zone 2 area and all electrical equipment must be safe.

The area and air lock are pressurized by the air conditioning/pressurizing system to a pressure of 50 Pa relative to the outside environment. Because of this, all entries and exits must be air tight.

If pressurization is not required (toilets, storage, etc.), all electrical equipment must be safe.

With air conditioning/pressurizing installations, it is important to specify the importance and degree of redundancy for the function in the general safety design.

Lighting and electrical equipment installed in the cubicles shall conform to the requirements of IEC 60079-13.

The lighting equipment shall comply with GS ELE 081. And electrical equipment shall be in accordance with GS ELE 001, GS ELE 161 and GS ELE 031.

#### 4.2.2 Installation in non-classified areas

Cubicles installed in non-classified areas do not need to be pressurized relative to the outside environment.

However, when installed in geographic areas where climatic conditions may affect the operation of the equipment inside, air conditioning and/or pressurization may be required.

#### 4.2.3 Normal conditions of service

The climatic conditions of the site are defined in the project's job specification.

If necessary, the cubicle is kept pressurized, with the air intake in an unclassified area.

The following internal conditions are maintained in normal operation:

##### 4.2.3.1 Inhabited rooms with vital and/or secondary functions

- Inside temperature: temperature difference of 8°C relative to the outside temperature with a minimum temperature of between 20°C and 23°C
- Relative humidity: 50 % ± 10 %
- Pressure: 5 mm column of water minimum (50 Pa), if required.

##### 4.2.3.2 Uninhabited rooms with personnel present occasionally or for short periods

- T min.: 19°C
- Tmax.: 30°C or outside temperature less 8°C
- Relative humidity: 50 % ± 10 % or 70 % max
- Pressure: 5 mm column of water minimum (50 Pa), if required.

The temperatures given above represent average conditions. Contractual values for each project may be defined in the job specification.

#### 4.2.4 Means of evacuation

These shall comply with section 9.3.1 of the MODU Code.

Arrangement of means of escape routes includes the provisions of I.M.O Resolution A.757(18) and Regulation II-2/28.1.5.1 to 28.1.5.5 of SOLAS Convention.

At least two different main evacuation routes shall be provided. These routes shall be adequately dimensioned for use of standard stretchers (2200 x 650 mm).

In general, all internal corridors shall have a clear width of not less than 1400 mm for two way traffic. One way traffic corridors, corridors which do not make part of main transport routes, shall have a minimum width of 1000 mm. All corridors shall provide sufficient space for stretcher transport. Every evacuation route shall be readily accessible, un-obstructed, well marked by painted tram lines (if possible), illuminated and have a non-slip surface.

All internal doors on escape routes shall have a clear width of at least 800 mm and shall open in the direction of evacuation. And all external door on escape route shall have a clear width of at least 900 mm.

### 4.3 Main structure

This section concerns:

- All frameworks, main and secondary
- All panels contributing to the strength of the structure (hull structure, floors, etc).

All the documents needed for the definition and complete justification of the structure concerned shall be established. They include:

- Design, including choice of materials
- Justification by computation
- Drawings
- Weight monitoring, according to specification **GS STR 001**.

The design of structural assemblies and external walls is such that:

- There is no shape that might cause retention of fluids
- The corrosion inhibiting coating can be applied and maintained easily and inaccessible hollow bodies are hermetically sealed
- Production and maintenance inspections can be carried out easily.

Justifications for these structures by computation must be made according to recognized and approved rules, in each of the phases in the life of the cubicle (from construction through to commissioning):

- Construction
- Lifting
- Loading
- Transportation
- Installation (installation by crane, skidding, etc, according to the chosen installation procedure)
- In place (possible stacking of another cubicle).

#### 4.3.1 Materials for the main structure

Materials for the main structure shall be chosen in accordance with **GS STR 201**.

This specification concerns mainly metal structures. However, if materials other than steel are used, they shall satisfy the criteria set out in sections 4.1 and 4.4. Load assumptions, combinations and the content of all studies remain applicable. In this case, before any study, a

procedure for verifying the materials chosen and all their properties (results of pulling tests, compression tests, bending tests, impact tests on the product and its links) must be clearly defined. **The CONTRACTOR must supply all the elements needed to justify the proposal.**

If the material chosen is steel, the structure must be made of tempered carbon steel, and comply with American (ASTM) or European (EN) product standards.

For structures designed to be lifted offshore, pad-eyes and main structural elements bearing the lifting forces must be made of steel with guaranteed impact strength. The minimum values required are:

- 27 j. for the average of three samples
- 23 j. for the individual value
- Test temperature: 20°C below the ambient temperature predicted for the lifting work.

The use of steel with a guaranteed minimum yield strength greater than 360 MPa shall be subject to the agreement of the OWNER.

In a full thickness welded angular assembly, if the thickness (e) of the element being fitted and if the thickness (s) of the receiving element satisfy the condition  $1.5 e + s > 5.5$  (cm), the steel of the receiving element must be designed to ensure a short through necking property of 35 % minimum. The certification of non Z35 grade steels by through thickness testing shall not be allowed.

If the chosen material is aluminium, the structure must be made with series 6000 materials and comply with US or European product standards.

The Constructor shall establish a procedure detailing his organization for the acceptance, storage and identification of materials. This procedure must be included in the Quality Plan.

#### 4.3.2 Structural calculations

##### 4.3.2.1 Individual load

The loads and stresses of the structure must be clearly explained in the study documents.

This section defines the individual loads to be taken into account in the overall structural checks.

###### 4.3.2.1.1 Dead loads

The dead loads taken into account in the studies, in each of the configurations concerned, shall be, for each item, the maximum weight (the weight of an element or assembly including its "tolerances" and "provisions").

The floor loads shall be applied to the free areas of the floors and shall not under any circumstances be used to represent equipment loads:

- For electricity and instrumentation cubicles, refectories, watch rooms, the uniformly distributed operating load to be taken into account shall be  $2.5 \text{ kN/m}^2$
- For workshop type rooms, the load shall be  $5.0 \text{ kN/m}^2$ .

Load weightings (Ks) according to the element being calculated:

| Element calculated            | Ks   |
|-------------------------------|------|
| Flooring and joists           | 1    |
| Main structure                | 0.5  |
| Action on receiving structure | 0.25 |

#### 4.3.2.1.2 Climatic loads

**Wind:** in the absence of any specific indication in the job specification, the wind speed for computation purposes shall be 30 m/s, form factor  $C_s = 1.5$ .

**Snow:** snow loadings shall be indicated in the job specification.

#### 4.3.2.1.3 Lifting loads

Two main lifting situations can be envisaged, each with its own dynamic load and static redundancy coefficients:

- **First case:** lifting is performed on land or onto a ship in a port. Coefficient: 1.5 for lifting points and surrounding areas, and 1.15 for other areas.
- **Second case:** lifting is performed at sea. Coefficient: 2 for lifting points and surrounding areas and 1.35 for other areas.

When placing the package at sea, the structure at the contact points and surrounding areas must withstand an overall impact load of 1.5 g.

To facilitate lifting operations, it is important to provide pad-eyes or attachment devices for tug lines rated for a load of 10 % of the weight of the package.

#### 4.3.2.1.4 Transportation loads

Packages may be transported by road and/or sea, installed in a structure or otherwise.

In the absence of data in the job specification, acceleration forces transmitted to the package by sea transportation shall be:

- Roll and pitch :  $\pm 0.9$  g (horizontal acceleration)
- Heave :  $\pm 0.4$  g (vertical acceleration)

The handling and dismantling of equipment must be planned accordingly.

### 4.3.2.2 Combined loads

To check out the structure as a whole, the following combinations shall be applied:

| Load                                                | In place   | Lifting        | Transport      | Installation   | Loading and positioning |
|-----------------------------------------------------|------------|----------------|----------------|----------------|-------------------------|
| Dead loads: structure                               | x          | x              | x              | x              | x                       |
| Dead loads: equipment                               | In service | Out of service | Out of service | Out of service | Out of service          |
| Floor overloads                                     | x          |                |                |                |                         |
| Environment                                         | x          |                | x              |                |                         |
| Dynamic and static redundancy coefficient (lifting) |            | x              |                |                |                         |
| Roll or pitch + heave                               |            |                | x              |                |                         |
| Impact coefficient (placement)                      |            |                |                | x              |                         |
| Stresses due to loading or final positioning        |            |                |                |                | x                       |

### 4.3.2.3 Checks

Structural justifications by computation must be based on recognized rules (International standards, Professional recommendations, National regulations, etc.).

The methods of verification must be clearly described and accepted beforehand by the OWNER.

#### 4.3.2.3.1 Permitted deformations

Under load, including working loads, deflections must not exceed the following values:

- Joists 1/250 of clear span
- Beams 1/375 of clear span
- Static equipment support 1/375 of clear span
- Dynamic equipment support 1/1000 of clear span
- Travelling overhead crane 1/500 of clear span

### 4.4 Cubicle construction

The acceptance of equipment and materials shall be decided on the basis of the following criteria:

- Consequences for the safety of personnel and equipment
- Consequences for the environment
- Consequences affecting maintenance of structures, in a corrosive marine environment
- Financial consequences and/or affects on the weight of the structure.

Unless otherwise indicated, the materials used shall be classified as fire resistant in accordance with sections 4.1.1 and 4.1.2.



For a material or design to be acceptable with respect to regulations, it is essential, and sufficient, to include the proof that the material or design has been approved by an official organization, backed up by a valid certificate.

An exception shall be made for floor and wall coatings which may be classified as flame retardant material.

Asbestos-based materials are prohibited.

All fixings (ties, supports, etc.), fasteners and bolts shall be of stainless steel material.

#### 4.4.1 Heat insulation (non-fire classified)

Regardless of the fire resistance classification, walls and floors for which thermal insulation is required are:

- The external walls and floors of rooms in which ambient temperature is controlled (heating-air conditioning)
- Walls and floors separating temperature-controlled rooms and non-temperature-controlled rooms.

The coefficient of thermal transmission of external walls and floors must be defined and taken into account in calculating the power of the air conditioning installation, if required.

Internal temperature and relative humidity conditions are defined in section 4.2.3 above, unless otherwise specified in the job specifications.

All materials for insulation or for any other duty shall be asbestos-free, non-combustible, non-hygroscopic, and delivered with approved certificates and compliant with the relevant regulations concerning health and safety.

#### 4.4.2 Acoustic insulation

The curve of noise emissions is as defined in [ISO R 1996](#).

The sound level inside the cubicles must not exceed the limits set by national regulations, according to the environment of each area and assuming normal operation.

In the absence of regulations, the limits shall be:

- 70 dB A in cubicles where personnel do not remain for long periods
- 55 dB A in cubicles where personnel remain for long periods, including control rooms
- 45 dB A in cubicles where personnel rest, including radio rooms.

Acoustic performance shall be in accordance with the requirements of :

- [BS 2475](#)

Noise level shall be in accordance with :

- [I.M.O Resolution A.468\(XII\)](#)
- [DOE-HSE Section 52](#)
- [BV Rules for the Classification of Steel Ships Part F Chapter 6 Section 1-2-3](#)
- [BS 4727 Part 3 Group 08](#)

Noise levels of equipment shall be according to [IEC 34](#).

The absolute noise limit shall be 85 dB (A) under normal operating conditions.

#### 4.4.3 Water tightness

The cubicle must be water tight.

The roofing must be constructed so as not to allow water retention at any point.

Running water must not collect, it must flow freely down the walls.

Frames, doors, port holes shall be sealed against any ingress of water.

#### 4.4.4 Air tightness

The walls of air conditioned and/or pressurized cubicles and their various assemblies are made in such a way as to render the construction impervious to the ingress of air from the outside or leakage of air from the inside.

Permitted leaks are those that are controlled, created by the provision of a discharge valve and fans for battery rooms.

#### 4.4.5 Doors

All doors to the outside are fitted with anti-panic bars and open outward.

Sills should be of stainless steel 316 L.

Doors are fitted with door closers. The capacity of the door closer shall be determined according to the weight and size of the door and the effects of the wind.

All hardware is of marine corrosion resistant stainless material.

Generally, doors on outer walls shall be A 60 or AO according to **I.M.O** Resolutions testing following :

- **A 414 Regulations**
- **and A 649 Regulations**

The doors must offer the same fire resistance as the walls in which they are installed.

They shall be in 316 L grade (AISI 316) stainless steel, double walled with thermal insulation incorporated. They shall be fitted with a sealing joint adapted to the groove into which they must fit.

All hardware (hinges, door handles, escutcheons, etc.) shall be of AISI 316 stainless steel quality and shall be provided with lifetime grease lubrication.

Unless otherwise stipulated in the job specification, dimensions of doorways shall be as follows:

- Access doors : 900 x 2100 mm
- Internal doors : 800 x 2100 mm
- Double doors : 1400 x 2100 mm
- Emergency exits : 1000 x 2100 mm

#### 4.4.6 Access for equipment

For taking equipment in or out, a bolted breach panel shall be provided, mounted on hinges if necessary, of a size that is appropriate to the equipment being taken in or out, and of the same construction and the same classification as the wall concerned.

#### 4.4.7 Air lock

If required, access to air conditioned and/or pressurized rooms shall be via an air lock that is wide and deep enough to enable the outer door to be opened and closed independently of the opening of the inner door. Both doors shall open outward in the escape direction.

#### 4.4.8 Glazed frames and bulls-eye windows

Glazed frames and bulls-eye windows are fixed. Their classification shall be the same as the walls and doors in which they are fitted.

#### 4.4.9 Floor coverings

Floor coverings must be of a flame retardant rating, as must the skirting boards.

#### 4.4.10 Technical raised floor

If a technical raised floor is installed, it must comply with the following specifications:

- Flame retardant tiles
- The raised floor must support a spot load of 450 daN at any point on a tile
- If necessary, special tiles will be used for the distribution of conditioned air. The tiles will have an air flow adjustment system that can be operated without dismantling, defined in the air conditioning and/or pressurization job specification
- A sucker for handling tiles shall be provided
- The raised floor shall stop at electrical and air conditioning equipment.

Inside the raised floor, the bottom part of separating bulkheads and air locks shall be extended by identical bulkheads or isolating fascias ensuring the continuity and equivalent classification of the said bulkheads.

Electrical continuity in the earthing system must be ensured regardless of floor type.

#### 4.4.11 Suspended ceiling

If a suspended ceiling is fitted, it must be classified as non-combustible (suspension rods and tiles or sheets).

#### 4.4.12 Internal fittings

The dimensions and definition of the rooms, internal partitioning, access ways, furniture, electrical system, instrumentation, fire protection, air conditioning/pressurization shall be defined in the appropriate job specifications.

## 5. Construction methods

### 5.1 Welding

#### 5.1.1 Welding products

The welding products must comply with an AWS or European standard.

The use of welding products providing a deposit with low diffusible hydrogen content (less than 10 cm<sup>3</sup> per 100 g of metal deposited) is mandatory when:

- The thickness of one of the elements to be assembled is > 15 mm, and
- The minimum guaranteed yield strength of one of the elements to be assembled is > 300 MPa.

### 5.1.2 Welding specification

Before commencing work, the CONSTRUCTOR must draw up a welding specification for all of the construction. This must be kept available in places where welding work is carried out.

The specification shall include:

- An identification drawing or an inventory of welded joints
- For each type of weld, a description of the welding procedure according to [AWS D 1.1](#) or [ISO 15614](#) Part 1
- Qualification test reports concerning the welding procedure
- An indication of the extent of the destructive and non-destructive tests, specifying the techniques used for the tests
- Acceptance test certificates for the products used.

### 5.1.3 Welding procedure qualifications

The procedures applied to pad-eyes and main structural elements bearing lifting forces shall be qualified according to [AWS D 1.1](#) or [ISO 15614](#) Part 1.

### 5.1.4 Qualification of welders and operators

Welders and welding operators shall be qualified according to [AWS D.1.1](#) or [EN 287.1](#).

### 5.1.5 Miscellaneous provisions

#### 5.1.5.1 Continuous welding

All assemblies shall be executed by continuous welding to avoid the risk of corrosion. This provision does not apply inside air conditioned rooms, provided that the instructions of section 6.2 are applied.

#### 5.1.5.2 Proximity of welds

The distance between the edges of two full penetration welds must be greater than 50 mm.

#### 5.1.5.3 Climatic conditions

All welding work stops when the temperature of the metal falls below -10°C. Between -10° and 0°, if no preheating is included in the welding procedure, preheating to 50°C must be provided.

#### 5.1.5.4 Preheating

The minimum temperature must be in line with the temperature defined in the welding procedure qualification document. This shall be checked before starting welding.

### 5.1.6 Non-destructive inspections

The Constructor must draw up non-destructive inspection procedures. These must be included in the Quality Plan.

#### 5.1.6.1 Qualification of non-destructive inspection personnel

The non-destructive inspection operators shall be level 2 qualified (COFREND, ASNT TC 1A or equivalent).

#### 5.1.6.2 Nature and extent of non-destructive weld inspections

All preparations must be 100 % visually inspected before welding.

Non-destructive inspections must be carried out after at least 24 hours after the end of welding, according to the table below:

|                                                     |                 | Full penetration welds           | Non-penetration welds                  |
|-----------------------------------------------------|-----------------|----------------------------------|----------------------------------------|
| Pad-eyes                                            |                 | Ultrasound or 100 % radiographic | 100 % magnetoscopic or dye penetration |
| Main structural elements incoming to lifting points | lifting at sea  | 100 % ultrasound or radiographic | 100 % magnetoscopic or dye penetration |
|                                                     | lifting on land | 10 % ultrasound or radiographic  | 100 % magnetoscopic or dye penetration |
| All welds                                           |                 | 100 % visual                     | 100 % visual                           |

#### 5.1.6.3 Acceptance criteria and repairs to tolerance defects

The acceptance criteria are as defined in [AWS D 1.1](#).

Any welded repairs or tolerance defects must be identified and entered in the inspections file.

### 5.2 Assembly - Fitting of equipment and accessories

The fitting instructions and procedures must comply with the MANUFACTURERS' instructions and manuals.

In particular, for the constituent elements of a fire resistant wall, the level of classification must be retained. Certification by an independent organization may be required.

### 5.3 Corrosion protection

Protection by painting shall be based on specifications [GS COR 350](#) and the project's job specification, if there is one.

### 5.4 Dimensional tolerances

The dimensional tolerances are those stipulated by the computation code used (AISC or equivalent), with the following additions.

In any of the cubicle's critical assembly planes on the structure (excluding mechanical fixing), no point shall deviate by more than 10 mm in both directions of the plane and 6 mm at right angles.

The axes of the main elements must be located within 13 mm of their theoretical positions and no point may deviate by more than 19 mm horizontally and 13 mm vertically.

The flatness of uncoated bulkheads and decks shall be checked according to the table below:

| Permitted bow (mm) | Between two stiffeners or over 800 mm maximum | Over a length of 2 m |
|--------------------|-----------------------------------------------|----------------------|
| Deck               | 3                                             | 10                   |
| Coated bulkhead    | 10                                            | 15                   |

Safety rails and handrails: the top, when installed on site, must be straight and level to the eye.

Landings and staircases: the levels and horizontal positions must, when installed on site, be within 75 mm of the theoretical positions.

## 6. Transport and installation methods

### 6.1 Weight monitoring

The weight of the structure shall be monitored in accordance with specification **GS STR 001**.

### 6.2 Preparation for transportation - Packaging and crating

Due account must be taken of the carriage and handling of the cubicle from the place of construction to the place of installation.

Equipment installed in the cubicles must be secured to withstand the movements generated in transportation. Air drying means must be provided for long term transportation and storage situations.

For transportation by sea, wherever possible marine standard packaging should be provided.

### 6.3 Installation

If the lifting equipment is included in the supply, it shall be rated in accordance with recognized rules (international standards, professional recommendations, national regulations, etc.). The methods of verification must be clearly described and accepted beforehand by the OWNER.

Lifting situations are as defined in section 4.3.2.1.

## 7. Quality procedures

Before the commencement of the service and construction, a quality plan must be established, detailing all of the design, study, procurement, construction and inspection actions. These must be the subject of detailed procedures.

These actions include, in particular and by no means exhaustively:

- Execution of the drawings of the level or levels for each trade or discipline, with details of execution, coordination plans, justifying design notes for the dimensioning of lifting apparatus, structure, floors and all details to provide a clear understanding of the structure
- Creation and monitoring of the detailed study, construction and progress schedule, all trades
- Coordination of studies and of execution of the various trades
- Proposal or necessary submission of models or samples before ordering

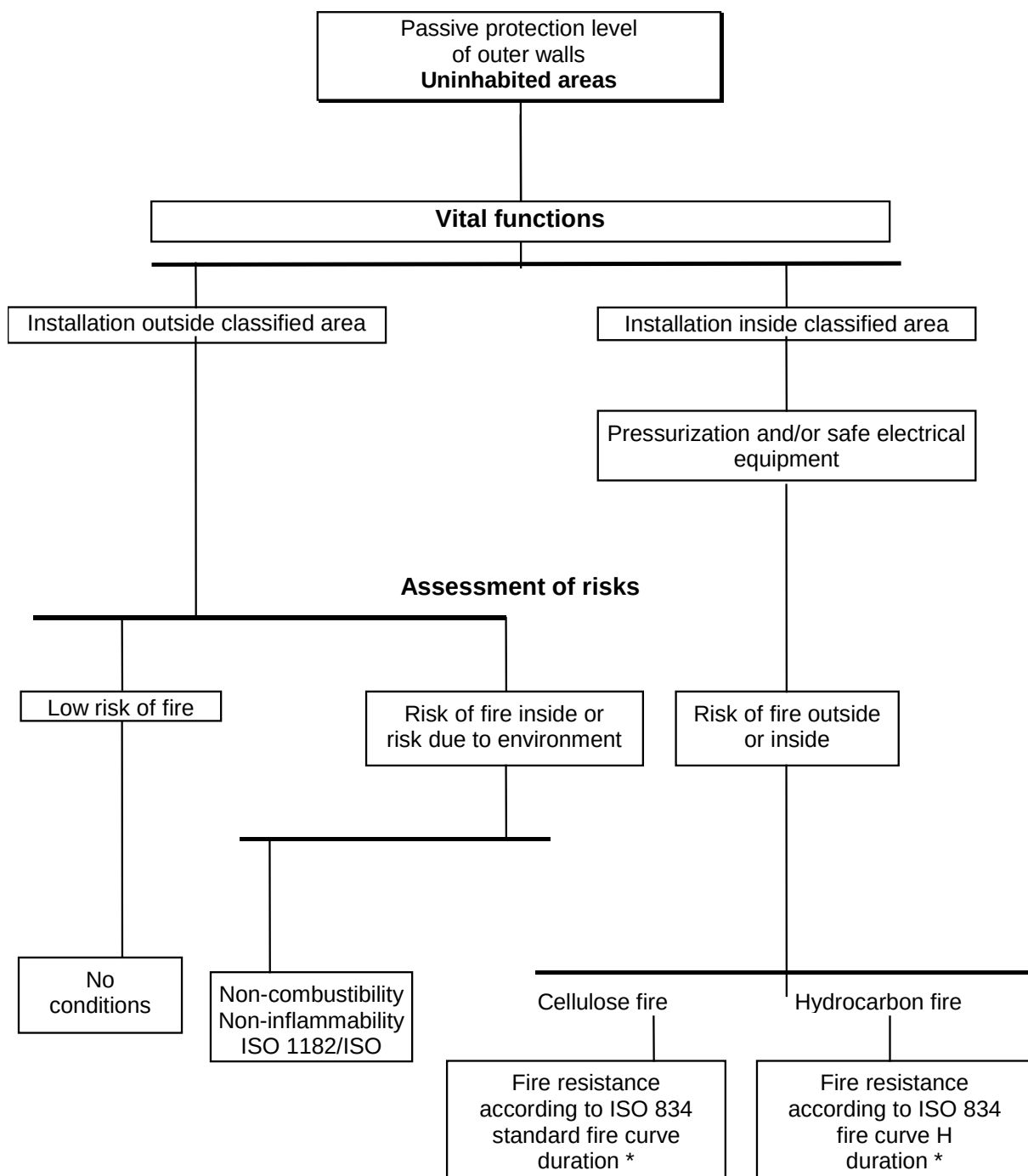


- Supply of copy orders (non-priced) with requisitions
- All the work of the cubicles as defined in this specification
- Supply of all elements, materials and equipment needed to carry out the work according to trade practises
- Supply of certificates of conformity and test certificates issued by an approved organization, as well as detailed assembly and construction drawings in accordance with the tests (walls, floor, junction between bulkhead/ceiling/floor, frame, door, passageway, etc.)
- Any test for checking the correct execution and operation of the installations, including the provision of personnel, equipment and supplies of the necessary consumables
- Preparation for transportation, including loading, chocking and interior dehumidifying
- Updating of "As built" drawings
- Manuals and assembly drawings.

All of these shall be supported by documentation included in the end of project. documentation.

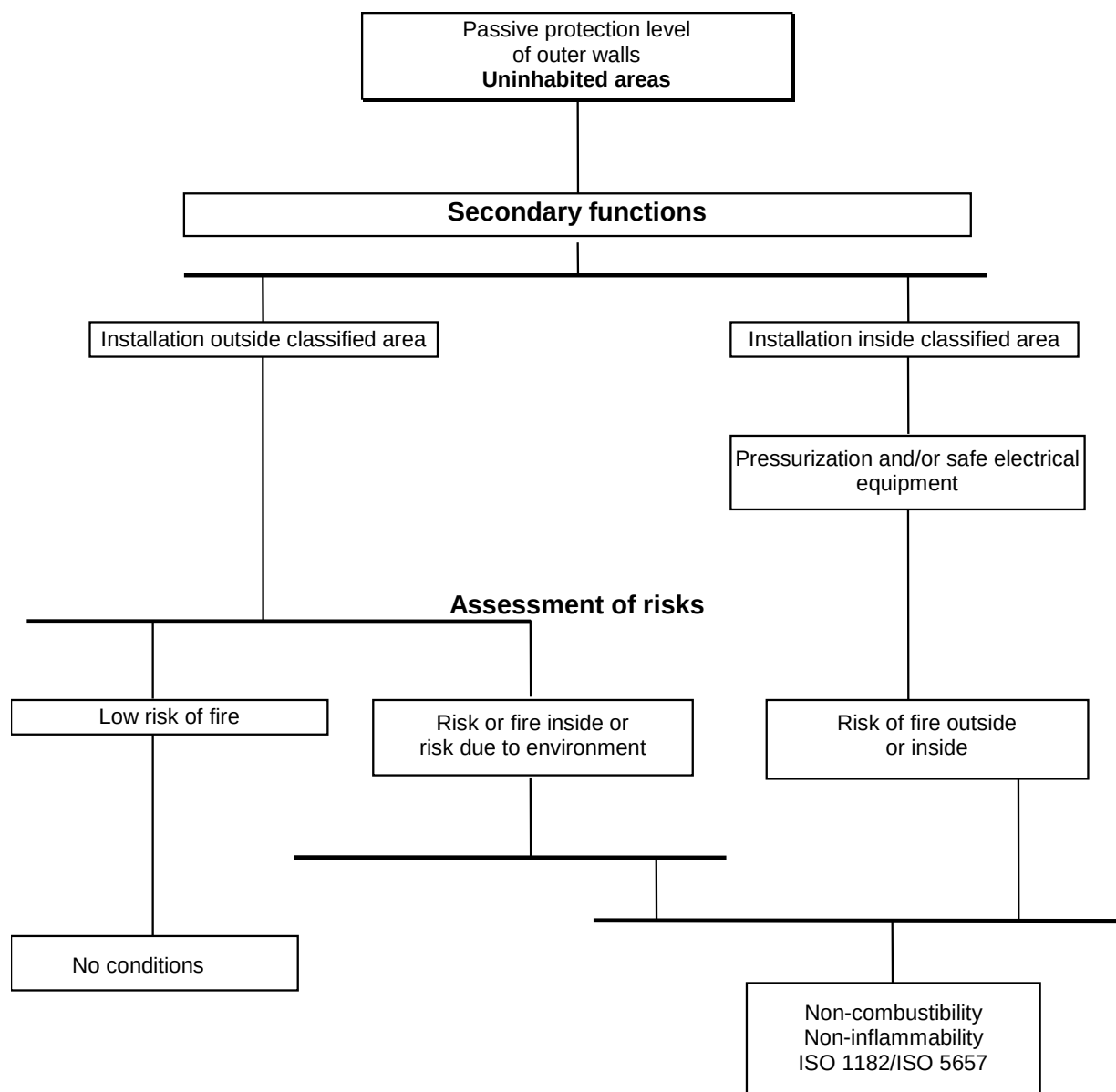
The Quality Plan must cover all of the actions needed to complete the work successfully, under the responsibility of the CONTRACTOR, but also of the SUBCONTRACTORS and SUPPLIERS. It must be consistent with the construction program and specify times allotted. The OWNER shall include his own operations in the Quality Plan (document review, inspection points or stoppage points).

## Appendix 1 Decision flow diagrams



\* Duration to define according to safety  
Function: 60 mm (min according to assessment of risks)  
Production: to be defined according to consequences 0 to 60 mm.

### Non-regulation - Excluding project - Specific risks



**Non-regulation - Excluding project - Specific risks**