



Exploration & Production

GENERAL SPECIFICATION

CIVIL WORKS

GS EP CIV 402

**Design and construction of oil field laboratory on
production installations**

03	10/08	General review
02	10/05	Addition of "EP" root to GS identification
01	11/03	Change of Group name and logo
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Rev.	Date	Notes

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1. Scope

The document defines the minimum requirements to be observed for the design, construction and installation of onshore and offshore oil and gas field laboratories (on platform, FPSO, FPU and central laboratory in subsidiary). This document isn't applicable to central group laboratory such as CSTJF and refineries.

Special requirements specific to each project (layout, climatic conditions, schedule, function, equipment, etc.) shall be covered by one or more job specifications. This Standard Specification shall not under any circumstances replace current regulations that supplement or amend it.

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 national regulations, their particular requirements, and those of the standards or codes to which they refer, must be applied, supplementing or amending the provisions of this document.

If there are no mandatory national regulations, international regulations, standards and codes shall be applied.

If there are no applicable international standards and codes, the national codes and standards shall be applied, as selected from those listed below according to the cases in hand, which shall mandatorily be defined in the project's job specification.

In the absence of any particular specifications from the OWNER, French national regulations shall be applied.

In the absence of a specific exemption, duly justified by the CONTRACTOR and agreed by the OWNER, codes and standards of different origins may not be used in whole or in part.

If certain points in these regulations need to be clarified, the CONTRACTOR shall describe and justify the changes and/or additions to be made so that they can be adapted to the nature and environment of the structure. Such proposals shall be considered acceptable only when they have been examined and approved by the technical inspection authority appointed to verify the project, and agreed in writing by the OWNER.

A definitive list of regulations, standards and codes proposed by the CONTRACTORS shall be taken from the reference documents defined in this specification and the project's job specification.

Only the main standards are mentioned, so the list is by no means exhaustive; the CONTRACTOR shall be responsible for compliance with any secondary standards and other standards dealing with the subject matter of this document.

Standards

Reference	Title
BS 476 Part 8/Part 21	Methods for determination of the fire resistance of loadbearing elements of construction
IEC 529	Degrees of protection provided by enclosures
IEC 7913 (1982)	Matériel électrique pour atmosphère explosive (Electrical equipment for explosive atmospheres)
ISO 1182	Non-combustibility
ISO 13819 Part 1 (1995)	General requirements. Fixed steel structures (superstructures)
ISO 15138 WD	Petroleum and natural gas industries - Offshore production installations - Heating, ventilation and air-conditioning
ISO 15544	Petroleum and Natural Gas Industries - Offshore Production Installations - Requirements and Guidelines for Emergency Response
ISO 1716	Determination of calorific potential
ISO 3008	Fire resistance tests. Doors and shutter assemblies (A class)
ISO 3009	Fire resistance tests. Glazed elements
ISO 3864	Safety colours and safety signs
ISO 5657	Ignitability
ISO 6309	Fire protection; safety signs bilingual edition
ISO 834	Fire resistance tests. Elements of building construction (for Class A: standard curve; for Class H: HC curve)
ISO R 1996	Sound-proofing curves
ISO R 234	Courbe conventionnelle pour matérialiser l'action d'un feu type "bâtiment" (Standard curve for demonstrating the action of a "ship" type fire)
ISO TR 14564	Signalétique (Signposting)
ISO/DIS 13702 (1996)	Petroleum and natural gas industry. Control and mitigation of fire and explosions. Requirements and guidelines
ISO/DIS 834	Courbe de montée en température pour matérialiser l'action d'un feu "type hydrocarbure" (Temperature rise curve to demonstrate the action of a "hydrocarbon" type fire)
NF P 41-201 (05.1942)	Distribution d'eau. Code des conditions minimales d'exécution (Water distribution. Code of practise for minimum execution conditions)
NF T 51-073 (09.77)	Matières plastiques. Comportement au feu. Méthode d'essais de mesure de ... des fumées (Plastic materials. Behaviour in fire. Method for testing, measuring, ... fumes)

Reference	Title
NF X 10-702 (04.86)	Méthode d'essais au feu. Emission de fumée (Fire test method. Smoke emissions). Essais de mesure. Densité fumée (Measurement tests. Smoke density)
RILEM standards	Réunion Internationale des Laboratoires d'Essais de Matériaux

Professional Documents

Reference	Title
API RP2A-LRFD (1993.07)	Recommended Practise for planning, designing and constructing fixed offshore platforms
API RP 14 G	Appendix F. Fire protection walls
BUREAU VERITAS	Rules for the classification of offshore units (04.1997)
I.L.O	International Labour Office: Safety problems in the offshore petroleum industry (1 st ed., 1978) La sécurité et l'hygiène dans les entreprises internationales (1 st éd., 1985) (Health and safety in international businesses (1 st ed., 1985). Sécurité, hygiène du travail dans l'industrie pétrolière. Commission du Pétrole ("Health and safety at work in the petroleum industry. Petroleum Commission) (1973 session); Recommendations No. 105, 106, 142, 160, 171
ILO Convention No. 139	
ILO Convention No. 161	
MARPOL 73/78 1st ed. 1991	International Convention for the Prevention of Pollution from Ships. Convention internationale pour la prévention de la pollution par les navires, including amendments up to May 1992. Appendix IV rule 8-9, Appendix V rules 1-3-4-5-6
AISC	American Institute of Steel Construction. Manual of steel construction
W.H.O.	World Health Organization. Guidelines for drinking water quality (vol. 1-2)

Regulations

Reference	Title
DTU - FA rules (09.1982)	Méthode de prévision par le calcul du comportement au feu des structures aciers (Method of predicting by calculation the behaviour of steel structures in fire)
DTU 60-11 (10.1988)	Règles de calcul des installations de plomberie sanitaire et d'évacuations des E.P (Rules for the design of plumbing installations for sanitation and rainwater drainage)
IRCN 3.1 (24/36)	French Naval Construction Research Institute. Standards de qualité de construction des plates-formes et structures marines (1986) (Construction quality standards for marine platforms and structures (1986)
N.P.D.	Norwegian Petroleum Directorate. Acts, regulations and provisions for the petroleum activities (Vol. 1, 04.97)
SOLAS 1st ed. 1992	I.M.O (International Maritime Organization). Convention internationale pour la sauvegarde de la vie humaine en mer (International convention for the safety of human life at sea). Resolutions A124 - A270 - A414 - A515 - A649 - A564 - A754
SOLAS Res. A472	Méthode d'essais permettant le classement incombustible des matériaux de construction (Test method for classifying construction materials as non-combustible)
SOLAS Res. A471	Méthode d'essais permettant de déterminer la résistance à la flamme des textiles et voilages maintenus en position verticale (Test method for determining the flame resistance of textiles and netting held in a vertical position)
SOLAS Res. A517	Méthode d'essais au feu applicable aux cloisonnements de type ABF (Fire test method applicable to ABF type partitioning)
SOLAS Res. A652	Méthode d'essais au feu applicable aux meubles capitonnés (Fire test method applicable to quilted furniture)
SOLAS Res. A166	Evaluation des risques d'incendie présentés par les matériaux (Assessment of fire risks presented by materials)
SOLAS Res. A653	Méthode d'essais au feu pour matériaux de finition des cloisons, plafonds et ponts (Fire test method for partitions, ceiling and deck finishing materials)
SOLAS Res. A687	Méthode d'essais par inflammabilité des sous-couches de revêtements de ponts (Method of testing the non-combustibility of deck covering underlays)

Reference	Title
	Décret royaux et ministériels, arrêtés gouvernementaux applicables aux installations pétrolières (Regulations stipulated by royal decree or ministry, applicable to persons and installations in the petroleum activities) • Safety (28.06.85) • Safety zones (09.10.87) • Medical requirements for persons (12.11.90) • Health service (12.11.90) • Hygiène (17.06.91) Offshore installations Operational safety, Health and Welfare Regulations (1976)

Codes

Reference	Title
MODU (Ed. 1992)	Code for the construction and equipment of mobile offshore drilling units. Chapters 5, 9
IP 15	Institute of Petroleum. Model code of safe practise. Area classification for petroleum installations
APSAD rules	
Act No. 93-1418	Construction code. Dated 31.12.93 concerning prevention and safety on civil engineering sites
Decree No. 94-1159	Construction code. Dated 26.12.94 concerning the coordination of safety on civil engineering sites
Art. L 231-1, L 231-2	Employment code. Hygiène, sécurité et conditions de travail (locaux de travail) (Health, safety and working conditions (workplace))
Art. R 232-1 to 13	Employment code. Hygiène des locaux affectés au travail et de leurs annexes (locaux de travail) (Hygiene in work and associated premises (working areas))
Art. R 235-1 to 9, R 241-41	Employment code. Règles d'hygiène (tous locaux) (Hygiene rules (all premises))

Other documents

Reference	Title
EEC	La sécurité et l'hygiène dans les industries d'extraction du pétrole et du gaz (Health and safety in oil and gas extraction industries) International symposium (04.1983)

Total General Specifications

Reference	Title
GS EP CIV 202	Drainage and underground network
GS EP CIV 300	Reinforced and prestressed concrete
GS EP CIV 301	Design of reinforced and prestressed concrete
GS EP CIV 401	Minimum requirements for building design and construction
GS EP CIV 405	Plumbing and sanitary for onshore and offshore installations
GS EP CIV 406	Thermal and acoustic insulation
GS EP CIV 500	Special foundations For onshore Structures
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP ELE 031	Design of earthing and bonding systems
GS EP ELE 051	Design and installation of lightning protection
GS EP HVA 100	Basis of design
GS EP INS 108	Instrumentation for the design of plant rooms and control rooms
GS EP SAF 221	Safety rules for building
GS EP SAF 021	Safety Layout
GS EP SAF 228	Liquid drainage
GS EP SAF 253	Impacted area, restricted area and fire zones
GS EP SAF 341	Location and protection of onshore hydrocarbon storage
GS EP STR 102	Design of offshore topside structure
GS EP STR 901	Design rules and construction standards for ancillary structures of offshore installations
GS EP TEL 131	Marine radio links
GS EP TEL 132	Air/ground radio links
GS EP TEL 140	Public address and general alarm systems
GS EP TEL 150	Design supply and installation of satellite telecommunication systems
GS EP TEL 160	Design and installation of CCTV system
GS EP TEL 161	Design and installation of audio and video entertainment system
GS EP TEL 170	Design and installation of communication networks
GS EP TEL 180	Engineering and installation of telecommunication networks pre-cabling

3. Definition of objectives

3.1 Health, safety and the environment

3.1.1 Fire safety

All construction materials and elements shall offer fire resistance properties and reactions appropriate to the level of risk. But, in addition of requirements of the **GS EP SAF 221**, laboratory shall offer a fire résistance A120.

Compartments, fume extraction systems, gas and fire detection and alarm systems must comply with applicable regulations and standards.

Evacuation and firefighting resources must comply with all applicable regulations and standards.

3.1.2 Health and safety

The degree of toxicity of the materials used must be in accordance with the limits set by the applicable regulations.

Structures shall be executed in accordance with applicable practises in respect of protection against the risks of electrocution.

3.1.3 Environment

The provisions of **MARPOL IV** and **V** shall be applied.

3.2 Service quality and level

The OWNER wants a construction that meets the quality criteria defined below:

- Internally, the premises must be correctly dimensioned and well aired; the shell of the living quarters and the air conditioning and ventilation system must provide year-round appropriate conditions of temperature and hygiene for personnel
- Internal finishings shall be of hotel standard without being excessively luxurious
- Technical solutions implemented must be simple, rational and functional, to facilitate both construction and maintenance.

3.3 Durability

Materials shall be chosen and implemented to ensure the durability of all elements, the deterioration of which would render the structure unsuitable for its intended use.

- Cleanliness, neatness and integrity of structural elements and their coatings
- Absence of moisture inside the premises
- Absence of standing water on exposed structures
- Strength of suspended ceilings
- Strength of sealing systems
- Strength and effectiveness of seals.

4. Functional definition of structures

4.1 General requirements

The definition of the field laboratory shall depend on the nature and scale of production.

The dimensions of the laboratory shall vary according to the type, number and frequency of measurements and the complexity of the operations performed in the field.

The minimum laboratory areas specified in Appendix 1 have been calculated for a laboratory, including one workstation and dealing with the monitoring and control of output.. The equipment in Appendix 1 are design for a field of up to 50 wells and will be adapted to the field and the requirements of the plant.

4.2 Layout, links and proximity requirements

The laboratory shall always be located outside of areas of excessive vibration and production or storage areas in accordance with **GS EP SAF 221**.

The laboratory shall be located in accordance with **GS EP SAF 021**, and particularly with §5.6.3.

4.2.1 Offshore operation site

The laboratory may be located:

- In the area of the units, or
- In the accommodation area.

4.2.2 Onshore operating site

The laboratory should be located in not hazardous area.

4.3 Type of laboratory

4.3.1 Onshore base laboratory (central laboratory)

That type of laboratory gather together several rooms dedicated to oil, gas and water analyses

4.3.1.1 Laboratory room dedicated to oil analysis

Central Laboratory room dedicated to Oil and hydrocarbon analysis or on shore oil terminal laboratory.

The laboratory handles the following:

- Oil export quality measurement
- Measurements on site fluids: lubricating oil, waste water, cooling and heating loops
- Quick deposit analysis

4.3.1.2 Laboratory room dedicated to gas analysis

Central Laboratory room dedicated to gas, LNG and GPL analysis. or gas terminal laboratory.

The laboratory handles the following:

- Gas export quality measurement

- LNG and/or GPL export quality measurement

4.3.1.3 Laboratory room dedicated to Water analysis

This central laboratory room is often associated with the hydrocarbon production laboratory, from which it is separated for analytical quality and safety reasons.

The laboratory handles four main functions:

- Injected water quality
- Waste water quality
- Analysis of deposits
- Corrosion monitoring.

Depending on how the field is operated, the laboratory will be liable to change and will often require the presence of specialist operators.

The laboratory shall preferably be located near the water treatment units.

4.3.2 Integrated laboratory

This type of laboratory (generally field or off shore laboratory) gather together the all type of analysis (Oil - gas - water) using simplified procedures adapted to the site conditions

4.4 Arrangement of the space

4.4.1 General requirements

The installations shall be designed in such a way as to minimize undesirable occurrences and limit their effects on people, the environment and the installations.

4.4.2 Access

When the laboratory is located on an offshore fixed or floating production and/or storage unit, access must include an airlock.

On Onshore, the laboratory will be designed with a direct access by road in order to allow the sample and equipment supplies.

4.4.3 Working area

The laboratories must be constructed in accordance with regulations and suited to the work intended; it is preferable to avoid associating laboratories with rooms of different intended uses (offices, stores, etc.).

Laboratories in which work-involving risks of explosion is carried out shall be distanced from other rooms and kept to a single level. One side of any such room, preferably the roof, must be of lightweight construction so as to offer minimal danger in the event of explosion.

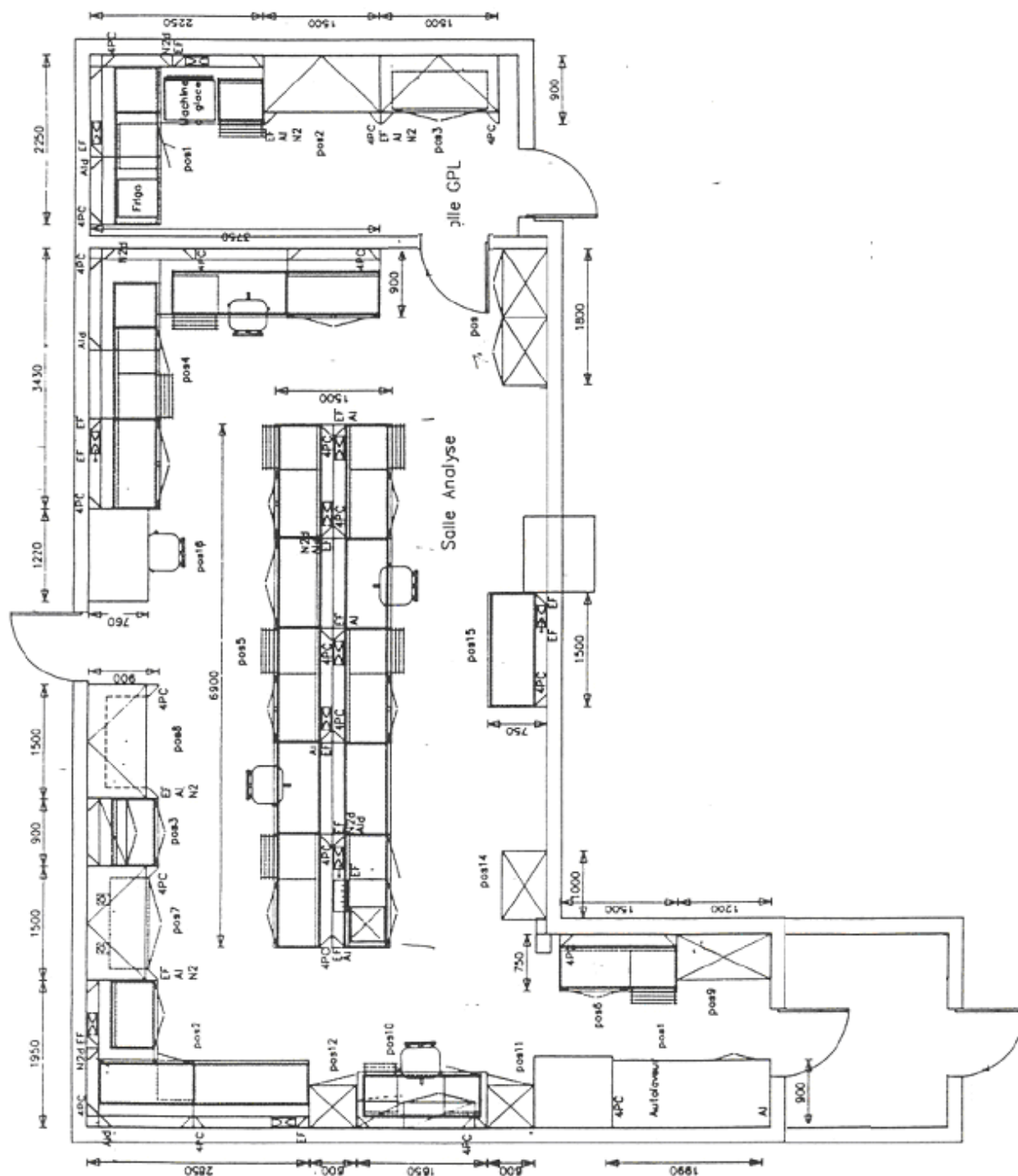
Natural room lighting must be studied to avoid shadow areas and the effects of dazzle or glare. Light should be adequate (500lux on working benches).

Room between benches shall be large enough (>0.8m).

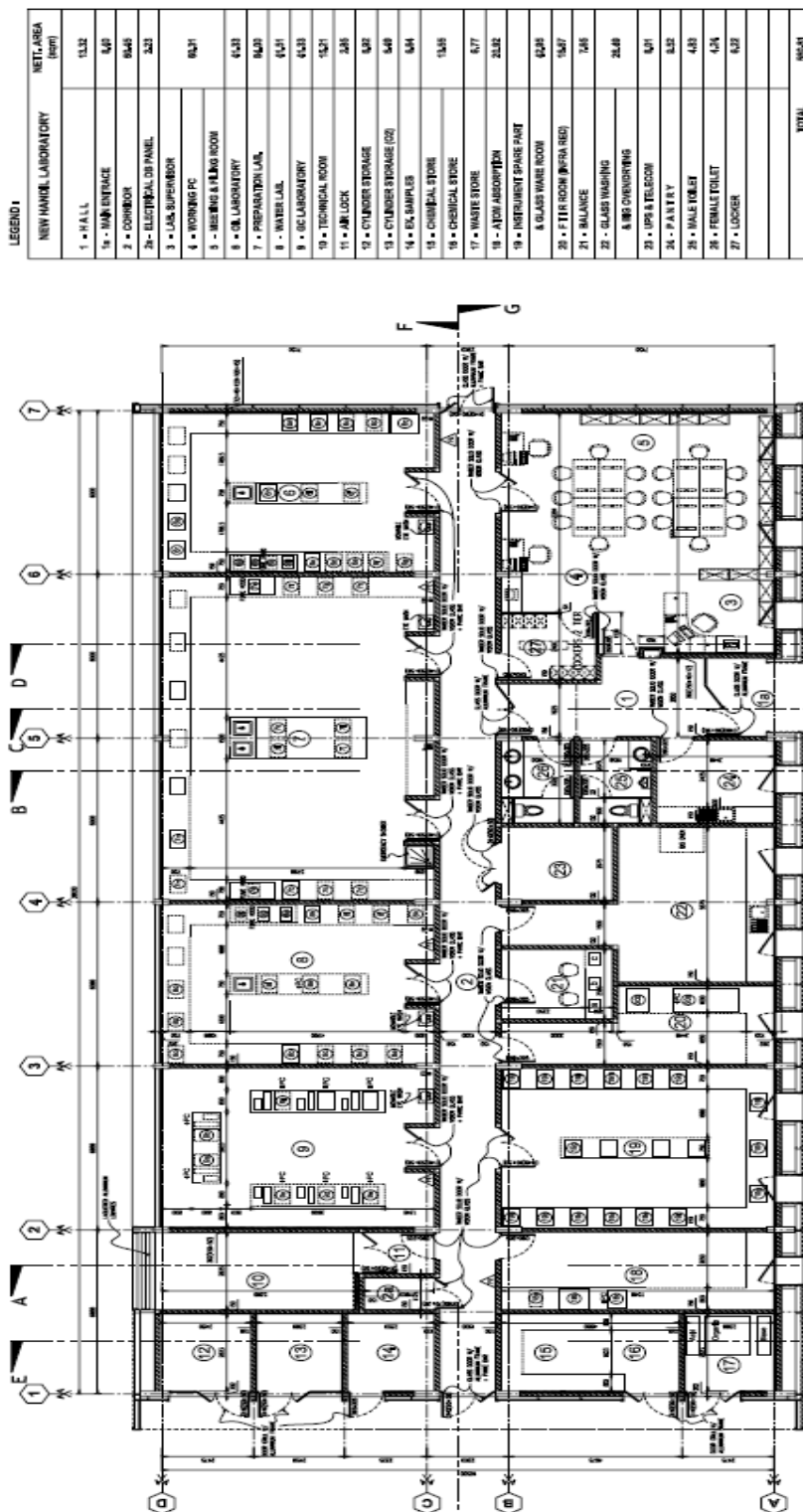
Laboratories room shall be fitted with safety shower, eye washer and fire proof blankets.

Water draining on floor or benches do not induce smell.

Gas production laboratory off shore plant



Oil /gas/water production laboratory onshore plant (Base central laboratory)



4.4.5 Storage areas

Storage must be kept in the immediate vicinity of the laboratory, outside, shaded from the sun, segregated from access ways, passages, emergency exits and working rooms.

Storage areas must be ventilated and, include holding tanks and the safety requirements shall be in accordance with the **GS EP SAF 221** and chapter 5.1.3,

The storage of products liable to release corrosive or acidic vapours must take due account of incompatibilities between certain products. Chemical must not be stored by alphabetical way but by function. It is therefore essential to avoid storing the following in close proximity to each other:

- Nitric acid and hydrochloric acid
- Acids and bases
- Oxidants and reducers
- Oxygen and hydrogen
- Chlorine and hydrogen
- Chlorine and ammonia, etc.

Highly toxic products (poisons, methyl alcohol, etc.) must be stored in a lockable cabinet.

Because of the risks of explosion, peroxides shall be kept separate and cool.

Chemical's Material Safety Data Sheet (MSDS) shall be available.

Chemical date of use must be respected.

4.5 Special requirements

Blast proof requirements:

The design shall be in accordance with the safety risk analyze regarding the blast risk from inside or outside of the laboratory (see § 5.1.1 Evaluation of risks).

Technical equipments for waste water depend of the types of effluents (see **GS EP CIV 202** and **GS EP SAF 228**). In any case, the selection of material shall be made according to the effluents chemical nature and temperature in the operating conditions (internal pressure, external loads, corrosion hazards), and to the installation, maintenance and repairing constraints. It shall be submitted to the COMPANY for approval.

The sewage system shall be In accordance with the **GS EP CIV 401**, §3.5.

5. Technical design and execution requirements

5.1 General requirements

5.1.1 Evaluation of risks

An evaluation of risks shall be drawn up according to the intended use of the laboratory and the products used (laboratory associated with the production of oil, water, gas, or all three).

5.1.1.1 External risks

External risks shall be assessed according to the location of the laboratory on the oil installation (production area, living quarters, etc.).

5.1.1.2 Internal risks

The internal risks are specific to the laboratory:

- Chemical risks (Acid, bases, solvents, gases, poisons due to all reagent used, etc.)
- High temperature and fire due to specific analysis conditions
- Pressure due to sample conditioning

5.1.2 Passive fire protection

The passive fire protection shall be in accordance with **GS EP CIV 401**.

Materials used in the construction of the laboratories shall be type approved for their intended use.

The materials used are classified according to the following criteria:

- Reaction to fire, resistance to fire according to the applicable regulations defined in the job specification
- The requirements set out in **IMO SOLAS** Chapter II-2.

5.1.3 Active fire protection

The field laboratory shall be equipped with a pressurized water system supplying fire hydrants, installed in accordance with current standards.

Extinguishers appropriate to the nature of the risks, and in numbers as defined by the safety department, shall be arranged in clearly visible and readily accessible places.

Automatic extinguishing systems may be installed together with alarm or alerting devices, or linked to heat sensors.

If the extinguishing agent (CO₂, etc.) presents some risk to personnel, triggering of the system shall be preceded by an audible evacuation alarm.

For onshore laboratory, the fire water system shall be in accordance with **GS EP CIV 401**.

5.1.4 Individual protection

The field laboratory shall, depending on workforce, be fitted with sufficient individual protection systems, comprising at least:

- Dressings for burns
- Overalls
- Gloves
- Masks
- Goggles.
- Safety shoes

5.1.5 Health and safety

Asbestos-based products shall be prohibited.

Man-Made Mineral Fibre (MMMF) based products are acceptable, provided they are accompanied by product health and safety data sheets, and:

- Present no risk to health according to convention no. 139 of the ILO
- Are clearly identified on all construction drawings, particularly on the final as-built drawing.

5.1.6 Transport conditions

For transporting the laboratory from the place of construction to the installation site, the way the internal equipment is immobilized in position shall be designed to withstand bad weather, the risks of maritime transport and all laboratory-handling operations.

The system of immobilization shall enable the fitted equipment to withstand the following minimum acceleration levels:

- Transverse acceleration (due to roll): 0.5 g
- Longitudinal acceleration (due to pitch): 0.5 g
- Vertical acceleration (due to heave): 0.2 g

These acceleration levels shall take into account the centre of gravity of the laboratory.

5.1.7 Handling and installation conditions

If the laboratory is constructed in a prefabricated cubicle separate from the general structure of the installation, the following conditions must be taken into account:

- Handling must be performed using four slings fixed by shackles in each corner of the cubicle
- Slings provisions shall be designed to enable the cubicle to be lifted vertically, taking into account an offset in the centre of gravity
- The cabin must be rigid enough to withstand all handling operations (lifting, transportation, shifting), with the internal equipment remaining in place.

5.1.8 Personal

The laboratory staff must be specified in the project requirements. The laboratory or laboratory room will be designed for this defined staff.

5.2 Function - Specific requirements

5.2.1 Structure - Coverage

The structure of the laboratory (prefabricated or otherwise) shall comply with IMO SOLAS Chapter II, Part C.

In the case of a prefabricated cubicle, it shall rest on a skid so that it can be shifted as required.

5.2.2 Seal-tightness

The walls and roof shall offer air- and water-tightness properties appropriate to the certification required; the rate of leakage at a pressure of 50 Pa must not exceed 1 m³/h.

5.2.3 Joinery

5.2.3.1 Doors

Laboratory and storage area access doors must open outwards.

They shall be fitted with compression seals designed to contain the pressurization caused by internal air conditioning and avoid the ingress of water from storms.

The thickness of the various elements, door frames and locks, shall depend on the required performance in terms of behaviour in fire.

Doors shall be fitted with anti-panic locks which can be locked by key from the outside and unlocked by the anti-panic bar from the inside.

Doors shall be fitted with "Marine" class hydraulic door closers, the power of which depends on the weight and dimensions of the doors. The effects of wind shall be compensated by the use of chains limiting door opening.

Door frames and all ironwork and fastenings must be of stainless steel. Door frames shall be bolted to the structure with resilient seals between frame and structure that are compatible with the support structure and compliant with the door fire test reports.

5.2.3.2 Windows

The frames of the windows are fixed. Unless otherwise specified in the job specification, the sill shall be of steel continuously welded to the plate. Their classification shall be the same as that of the walls in which they are fitted.

Seals shall provide total water and air tightness.

5.2.4 Windows and hardware

The equipment and materials used shall comply with **IMO SOLAS** Chapter II-2 Part B, Rule 33.

Windows shall be chosen according to the required behaviour in fire. They must be fitted in accordance with the MANUFACTURER's instructions accompanying the product, which must be covered with a classification certificate.

All fittings, hardware and anti-panic bars shall be of stainless steel or marine bronze.

All locks shall be of marine quality chrome plated brass or stainless steel. Mechanisms shall be "heavy duty" grade with standardized European barrel.

The internal and external doors shall be fitted with curve shaped stainless steel handles, the ends of which are folded back towards the door to avoid catching on clothing, etc.

The locks shall be supplied with standard keys and European barrels, according to a standard MANUFACTURER's flow diagram suited to the requirements of the OWNER.

5.2.5 Fixed and removable partitions

The behaviour in fire requirements are as follows:

- Type A partitioning (class A-60, class A-30, class A-15, class A-0) according to **IMO SOLAS** Chapter II-2, Parts A-B-C
- Type B partitioning (class B-15, class B-0) according to **IMO SOLAS**, Chapter II-2, Part C

- Type C partitioning according to **IMO SOLAS** Chapter II-2, Part C
- Type H partitioning (H-120, H-60, H-0): Resistant to hydrocarbon fire.

The chambers enclosed by suspended ceilings shall be treated according to **MODU** page 68 - 9.2.

Removable partitions shall offer the same behaviour in fire and the same sound insulation as a fixed partition.

5.2.6 Suspended ceilings

Minimum clearance under suspended ceiling: 2.60 m.

There is no need to install a suspended ceiling under upper level floors of laboratories. If one is installed, the joints of the suspended ceiling must not be sealed, to avoid any built up of gaseous products within the space inside the suspended ceiling.

Suspended ceilings shall be easy to dismantle and reassemble without damage, and shall be made of damp-proof materials. If necessary, to achieve the required acoustic performance levels, they shall include sound insulating material of an appropriate type and thickness.

Fire classifications are as follows:

- Suspended ceilings, B-0 minimum
- Continuous ceilings, B-15 minimum.

Suspended ceilings must, as a general rule, be able to incorporate lighting, HVAC outlets, fire detectors, and so on.

The suspension points shall be of non-combustible materials and offer the same fire break rating as the ceiling.

5.2.7 Acoustic insulation

The maximum sound pressure level must not exceed 55 dBA.

5.2.7.1 Impact noise

Floors must be cushioned, with a resilient underlay comprising:

- A non-vibrating resilient material
- A complex compound of floor insulating material (thickness according to classification), covered with a steel plate.

5.2.7.2 Operating noise

The transmission of noises from piping and service shafts can be avoided by the use of flexible couplings and resilient materials between plant and equipment and their supports.

Rotating machines shall be installed on non-vibrating mountings.

5.2.7.3 Air-borne noise

The job specification shall define the choice and implementation of materials according to the acoustic study carried out, designed to avoid the affects of resonance.

5.2.8 Thermal insulation

External walls and floors must have a global coefficient of thermal transmission less than or equal to $K 0.7 \text{ W/m}^2/^{\circ}\text{C}$ (including openings and thermal bridges).

5.2.9 Floor coverings

Floor coverings shall be:

- Washable
- Impermeable
- Non-slip
- Acid-resistant.

The join between floor and skirting shall be sealed and preferably rounded.

5.2.10 Paints

Wall coverings must be:

- Washable
- Acid resistant.

5.2.11 Ironwork/Metalwork

Racks shall be installed for cylinders containing liquids (compressed air, oxygen, nitrogen, etc.) outside the laboratory.

5.2.12 Internal and external signposting

Evacuation signposting must comply with [ISO TR 14564](#).

- The procedure in the event of fire must be clearly displayed inside the laboratory
- Display panels and other wall indicators shall be treated as signposting means
- External signposting shall be applied by vertical panels, designed, arranged and positioned in such a way as to allow difficulty-free access to the various rooms, common parts and levels. It must comply with the requirements set out in the general safety design specifications.

5.2.13 Electrical distribution and appliances

The type of lighting used in the storage rooms shall depend on the properties of the products stored (ADF, sealed, corrosion protection, etc.). All switches shall be located outside these rooms.

The minimum lighting requirement within the field laboratory is 300 lux, lighting provided by white fluorescent luminaires, surface mounted.

Electrical appliances and luminaires shall be flameproof or extended safety grade as appropriate (laboratory pressurized or not).

The equipment racks and metal casings of the field laboratories shall be bonded to the earth connection.

Only fixed connections shall be allowed. Temporary power supplies to removable appliances via extension leads may be permitted provided that the power supply cables include an earth conductor.

The connecting of some electrical appliances (electric water heater, for example), operation of which is not always visible, must be indicated by indicator lamps.

5.2.14 Data processing and telecommunications distribution and operations device

5.2.14.1 Distribution

Distribution in accordance with **GS EP TEL 180** - **GS EP TEL 161** - **GS EP TEL 140**, shall cover:

- The telephone link
- The fax link
- The computer link
- The intercom and emergency call network.

5.2.14.2 Operations device

- A normal telephone set
- A fax machine
- A computer terminal with 16" monitor, keyboard, printer and system unit with a link to the control room
- A loudspeaker
- An intercom set.

5.2.15 Ventilation, air conditioning, heating

In order to design the HVAC system, the following items have to be defined:

- the local conditions (wind, temperature, humidity, etc.)
- the external context (pollutants, fire and explosion hazards),
- the internal context (pollutants, chemical regents)
- the chemical storage
- the main criteria come from **GS EP HVA 100**

The global risk analyze shall be carried out by the HSE, HVAC and LABORATORY specialists. The HVAC design shall be carried out in accordance with this risk analyze.

5.2.16 Sanitary plumbing

Quite separate from the conventional waste water channels (from handbasins, etc.), drains shall be provided for polluted water or water liable to be polluted, terminating in separating or neutralizing devices. These drains may simply lead to drums located outside the laboratory, designed for periodic removal.

The drains must be made of materials resistant to the products they are likely to convey, and must be able to withstand accidental impacts and fire.

A security shower must be provided at the exit door with an activating chain.

A floor gully shall be provided at the exit, under the safety shower.

An eye bath shall be provided at the exit.

5.2.17 Industrial plumbing - Production and distribution of laboratory fluids

Cylinders must be stored outside the laboratory, easily accessed to facilitate their removal and sprinkling in the event of fire.

The installation of pressurized fluid distribution networks shall be decided according to current standards; the route of installation shall be defined in close collaboration with the safety department.

Valves and pipes shall be conventionally colour coded so that the fluids conveyed can be identified immediately.

The main feed pipes for combustible gases, nitrogen or compressed air shall include main isolating valves located outside the laboratory. This precaution does not preclude the use of valves at the ends of the distribution networks, the closed position of which can be easily checked.

Different couplings must be used universally and consistently for each category of incompatible fluids, to avoid any possible connection error.

For combustible or hazardous gases, the maximum working pressure must not exceed 16 bar inside the rooms.

Apart from points where they pass through walls, combustible gas pipes must not be clad.

Valves and taps on wet bench tops shall be made of brass and coated with an epoxy paint that is perfectly resistant to impact, abrasion, cutting, chemical agents, heat and flame.

5.2.18 Laboratory fitting-out and fixed equipment

Depending on its intended use (for oil, gas, water production, or all three), the laboratory must be fitted with:

- One or more fume cupboards with basin
- Wet bench-tops with head boards and twin sinks of enamelled stoneware, polypropylene or stainless steel with hot and cold water, and the work surface must have an acid-resistant covering
- Dry bench tops with backing boards, and the work surface must have an acid-resistant covering.

5.2.19 Special laboratory furniture

- The laboratory must have special receptacles marked "Broken glass" for temporary storage pending removal by a specialist CONTRACTOR
- Furniture units that can be wheeled under the bench-top, half drawers, half cupboards
- Key-locking storage cabinets
- Bench-top shelving

- A desk and a stool
- An armchair.

5.2.20 Laboratory-specific equipment

Gas pressure, air pressure or steam generating devices shall comply with current regulations.

Drain points shall be arranged in such a way as to be readily accessible.

Regulatory rating plates affixed to the various appliances shall be freely visible and legible at all times.

6. Maintenance, quality control procedures

6.1 Design

Before the start of the project and of construction, a Quality Plan must be drawn up, detailing all the design, study, provisioning, construction and inspection procedures. These shall be described in "detailed procedure" documents.

6.2 Construction

6.2.1 General

The permanent objective is to provide products and services that meet the defined requirements, within the times allowed.

6.2.2 Detail

Actions shall include, in particular but by no means exhaustively:

- Execution of drawings for all levels and for each trade, with details of execution, coordination plans, design notes justifying dimensioning of lifting gear, structure, floors and all details providing a clear understanding of the structure
- Drafting and following up on the detailed schedule of study, construction and progress for all trades
- Coordination of studies and execution for the various trades
- Mandatory proposal or presentation of models or samples prior to order
- Supply of copies of orders (excluding prices) with requisitions
- All of the works in the rooms 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 issued by an approved authority and detail assembly and construction drawings in accordance with these tests (walls, floors, junctions between partition/ceiling/floor, frames, doors, crossings, etc.)
- All tests for checking the correct execution and operation of the installations, including provision of the personnel, equipment and consumables needed
- Preparation for transportation, including offloading, securing and internal drying



- Updating of "As-built" drawings
- Assembly manuals and diagrams.

All of these procedures shall be supported by documentation to be included in the "end of project" file.

The Quality Plan must cover all the actions needed to construct the structure correctly, under the responsibility of the CONTRACTOR, but also of the SUB-CONTRACTORS or SUPPLIERS. It must be consistent with the construction schedule and specify the lead times allowed. The OWNER may supplement the Quality Plan with procedures that are the OWNER's responsibility (document review, inspection points, hold points).

Appendix 1 Definition of minimum equipment characteristics and levels for an laboratory

	Onshore Base Laboratory			Integrated Laboratory
	Oil production laboratory room	Gas production laboratory room	Water treatment laboratory room	Oil + gas + water laboratory
Type of measurement				
	Water and sediments (BSW) Salinity. Specific gravity	Dew point (water). Thermal value. H ₂ S content. Composition.	PH. Materials in suspension. HC, O ₂ , chlorine content.	All measurements
Dimensions				
Area	16 m ² laboratory 5 m ² storage	12 m ² (3 x 4) laboratory 4 m ² storage	24 m ² (6 x 4) laboratory 8 m ² storage	42 m ² laboratory
Bench length	5.00 ml	5.00 ml	10 ml	17.00 ml
Length of sink	1.20 ml	0.60 ml	1.20 ml	1.20 ml
Length of extractor hood	1.50 ml	1.50 ml	1.50 ml	1.50 ml
Electricity				
Current: 380 V three-phase				
Current: 220 V three-phase	yes	yes	yes	yes
Current: 24 V/48 V DC	yes	yes	yes	yes
Current: inverter supply		yes		yes
Running fluids				
Cold water	yes	yes	yes	yes
Hot water	yes	yes	yes	yes
Demineralised water		yes	yes	yes
Laboratory fluids				
Propane (C ₃ H ₈)		yes		yes
Carbon dioxide (CO ₂)				
Helium (He)		yes		yes
Oxygen (O)			yes	yes
Argon (A)				
Nitrogen (N ₂)				
Acetylene (C ₂ H ₂)				
Hydrogen (H)				
Compressed air, category 1	yes (10 bar)	yes (10 bar)	yes (10 bar)	yes (10 bar)
Compressed air, category 2				
Drains				

	Onshore Base Laboratory			Integrated Laboratory
	Oil production laboratory room	Gas production laboratory room	Water treatment laboratory room	Oil + gas + water laboratory
Waste water	yes	yes	yes	yes
Liquid hydrocarbons	yes	Possible	yes	yes
Ambient conditions				
	See GS EP HVA 100			
Products used and stored				
Mercury	no	no	no	no
Chemical reagent	yes	yes	yes	yes
Standard gas mixtures		Yes		
Chromatography		yes		
Filter papers	yes		yes	yes
Glass cleaning product			yes	yes
Universal cleaning paper	yes		yes	yes
Hydrocarbon maintenance and cleaning product	yes			
Solvents	yes	yes	yes	yes
Indications - Alarms				
In the room				
Instrument equipment remote alarm	yes	yes	yes	yes
Instrument equipment remote indication	yes	yes	yes	yes
Experiments in progress remote indication	yes	yes	yes	yes
In control room				
Instrument equipment remote alarm	yes	yes	yes	yes
Instrument equipment remote indication	yes	yes	yes	yes
Experiments in progress remote indication	yes	yes	yes	yes
Active fire protection				
Fire detection	yes	yes	yes	yes
Fire alarm	yes	yes	yes	yes
Automatic fire extinguishing	yes	yes	yes	yes
Main emergency stop	yes	yes	yes	yes
Gas detection				
Gaseous hydrocarbon detection	yes	yes		yes

	Onshore Base Laboratory			Integrated Laboratory
	Oil production laboratory room	Gas production laboratory room	Water treatment laboratory room	Oil + gas + water laboratory
H ₂ S hydrocarbon detection		Possible		
Data processing and telecommunication				
Telephone	yes	yes	Yes	yes
Microcomputer	yes	yes	Yes	yes
HVAC				
	See HVAC Design and Process			
Safety equipment and materials				
Hydrocarbon-specific fire extinguishers	2	2	2	4
Safety shower	1	1	1	1
Eye bath	1	1	1	1
Individual protection equipment				
Mask	yes	yes	yes	yes
Blanket	yes	yes	yes	yes
Goggles	yes	yes	yes	yes
Gloves	yes	yes	yes	yes
Drugs cabinet	yes	yes	yes	yes
Neutralizing agent	yes	yes	yes	yes
Laboratory-specific equipment				
Glassware				
Specific (according to standards concerning measurements to be taken)	yes		yes	yes
Standardized: for bubbling gases to measure H ₂ S content		yes		yes
Standard				
Separating funnels, various volumes	yes		yes	yes
Test tubes	yes		yes	yes
Beakers	yes	yes	yes	yes
Erlenmeyer flasks	yes	yes	yes	yes
Water blast			yes	yes
Syringe			yes	yes
Burettes			yes	yes

	Onshore Base Laboratory			Integrated Laboratory
	Oil production laboratory room	Gas production laboratory room	Water treatment laboratory room	Oil + gas + water laboratory
Funnels	yes	yes	yes	yes
Pipettes		yes	yes	yes
Vacuum flasks		yes		yes
Automatic pipettes			yes	yes
Volumetric flasks	yes		yes	yes
Drop tube			yes	yes
Miscellaneous bottles	yes		yes	yes
Disposable sterile syringes			yes	yes
1 l plastic bottles			yes	yes
1 l metal bottles for sampling	yes	yes		yes
2 l metal drums for sampling	yes			yes
Sampling equipment (probes, bottles, etc.)		yes		yes
Equipment for a field up to 50 wells				
Centrifuge (six head)	1			1
Karl fisher apparatus	1	1	1	1
Thermostatically controlled bath	1			1
Salinity meter	1			1
Hydrometers	1			1
Vibrating tube densimeters	1			1
Scales	1		1	1
Oven	1	1	1	1
Biologic oven			1	1
Thermometers	1		1	1
Chromatograph		1		1
Dew point tester		1		1
Densimeter and calorimeter		1		1
Recorder/integrator		1		1
Regulating columns		1		1
50 l refrigerator		1		1
Needle syringes		yes		yes
Katharometers and spare parts for chromatograph		yes		
Gas dryer		1		1
Vacuum pump		1		1

	Onshore Base Laboratory			Integrated Laboratory
	Oil production laboratory room	Gas production laboratory room	Water treatment laboratory room	Oil + gas + water laboratory
Barometer/gas counter		1		1
Tools	yes	yes		yes
Couplings and hoses for sampling operations	yes	yes		yes
pHmeter			1	1
"Hach" case			1	1
Test kits			1	1
Incubator			1	1
Dryer			1	1
Distilled water generator			1	1
Millepore filter or particle counters (granulometry)			yes	yes
Heating magnetic stirrers and magnetic bars	yes		yes	yes
Floor coverings				
Acid-resistant	yes	yes	yes	yes
Hydrocarbon-resistant	yes	yes	yes	yes
Wall coverings				
Washable	yes	yes	yes	yes
Acid-resistant	yes	yes	yes	yes
Hydrocarbon-resistant	yes	yes	yes	yes
Benchtop covering				
Acid-resistant	yes	yes	yes	yes
Hydrocarbon-resistant	yes	yes	yes	yes
Special furniture (for one man)				
Desk (u)	1	1	1	1
Chairs (u)	1	1	1	1
Stool (u)	1	1	1	1
Wall shelving (ml)	5.00	4.00	6.00	15
Storage under bench-drawers and shelving (ml)	5.00	4.00	6.00	15