

DESIGN OF OFFSHORE LIVING QUARTERS

DEP 37.17.10.10-Gen.

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DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the design of offshore living quarters (LQ). This DEP covers the complete architectural and technical services for the design and construction of new LQ and for the refurbishment of existing LQ on offshore fixed and mobile installations. This DEP may also be used as an addition to new project contracting specifications as a part of a design brief. Compliance with this DEP is not intended to be a requirement for the temporary charter of drilling, accommodation or other construction activity related vessels.

This DEP states the minimum standards for design. Additional requirements are also listed which may be incorporated within the LQ and may also provide additional comfort for personnel within the accommodation spaces. LQ, control stations and ancillary spaces should conform to these requirements.

All aspects of LQ design are considered, including permanent, ancillary and temporary accommodation, extensions to existing facilities, emergency LQ and the possible use of LQ as a temporary refuge. Although the design of helidecks and of the structure and substructure of LQ are excluded from the scope of this DEP (as they are primarily addressed in other standards and DEPs), the geometrical configuration of the quarters and its location on a facility mean that the structure and the helideck design are inseparable from the content and overall layout of the LQ.

This DEP is a revision of the DEP of the same number dated December 1998: see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them.

This DEP is intended to apply to offshore installations.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are more stringent and which combination of requirements will be acceptable as regards safety, environmental, economic, and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned with the object of obtaining agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party which carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project, or operation or maintenance of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party which manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party which initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

Accommodation space	Any room used for eating, sleeping, cooking or recreation, as an office, sick bay, laundry room or locker room, any corridor giving access to any of these rooms, and any store room in the vicinity of any of these rooms.
Ancillary rooms	Those spaces which include the HVAC plant rooms, electrical switch rooms, battery rooms and suchlike which may serve both the LQ and the installation.
Clean area	A hygienic area, to be kept free from dirt or contaminating matter.
Control stations	Those spaces in which the radio, central fire detection or control, the installation's central internal communication equipment, the emergency source of power or the emergency switchboard and the overall control equipment of the facility are located.
Hazardous areas:	As defined in IP 15:
Zone 0	Areas in which an explosive gas-air mixture is continuously present, or present for long periods.
Zone 1	Areas in which an explosive gas-air mixture is likely to occur in normal operation.
Zone 2	Areas in which an explosive gas-air mixture is not likely to occur in normal operation, and if it occurs it will exist only for a short time.
Non-hazardous	By implication, an area which is not classified as Zone 0, 1 or 2 is deemed non-hazardous.
Normally manned offshore installation	An offshore installation on which persons are normally present.
Not normally manned installation	An offshore installation on which persons are not normally present. Such installations may or may not be required to include facilities for personnel whilst on board.
Mobile installation	An offshore installation, other than a floating production platform, which can be moved from place to place without major dismantling or modification, whether or not it has its own motive power.
Living quarters	Living quarters, whether permanent, temporary or emergency, are permanently enclosed spaces such as cabins, dining/galleys, recreation rooms, sick bay, offices, change rooms, wash room areas and similar spaces used for the accommodation and welfare of personnel.
Sick bay	A room for the medical treatment and care of sick and injured persons.
Welfare needs	Those essential needs of personnel on offshore installations which include private areas for sleeping and resting, personal hygiene areas for washing, showering and changing, and areas for catering, food storage, dining, laundry, recreation and medical requirements.

1.4 ABBREVIATIONS

HVAC	Heating, Ventilating and Air Conditioning
ICC	Installation Control Centre
CCR	Central Control Room
LQ	Living Quarters
MDPE	Medium Density Polyethylene
OIM	Offshore Installation Manager
PCF	Permit Control Facility
POB	Personnel on Board
TR	Temporary Refuge

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated December 1998. The changes are too extensive to summarise here.

1.6 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made within the text, the referenced section number is shown in brackets. Other documents referenced by this DEP are listed in (16).

1.7 COMMENTS ON THIS DEP

Comments on this DEP may be sent to the DEP Administrator at standards@shell.com. Shell staff may also post comments on this DEP on the Surface Global Network (SGN) under the Standards folder.

2. GOALS FOR THE DESIGN OF LQ

2.1 OVERALL GOALS

The overall goals for the design of the LQ are, as far as is reasonably practicable:

- To provide an area where the POB (Personnel On Board) shall be protected from harm, weather, noise and vibration.
- To provide a standard of accommodation commensurate with the duration and regularity with which persons are required to reside on offshore installations.
- To provide ancillary spaces to facilitate the operational requirements of the installation.
- To achieve the optimum use of space and weight in terms of living conditions and cost-effective layout through appropriate functional suitability, aesthetic appearance and coordinated interior arrangements.
- To ensure that the LQ is the safest location on the facility and that its layout and geometrical configuration assist in the achievement of the other goals.

2.2 SPECIFIC GOALS

The specific goals which contribute to the overall satisfaction of the overall goals are, as far as is reasonably practicable:

- To provide a design brief which defines the Operator's requirements and documents the basis for design.
- To provide adequate spaces, where required, to fulfil welfare needs in terms of areas for:
 - sleeping and resting;
 - personal hygiene;
 - catering and dining;
 - laundry;
 - recreation and leisure;
 - medical facilities.
- To provide adequate areas, where required, for management and control functions.
- To provide good access arrangements between all areas that personnel may require to use in both normal and emergency conditions.
- To provide adequate space for those utility services and equipment that are required to be located within the LQ.
- To select materials, equipment, components and finishes which are fit for purpose and suitable for their intended use in offshore conditions.
- To make provision in the design for utility services that make cost-effective use of space and interface efficiently with planned or existing platform utility services.
- To assist in the development of space requirements for each of the functions of the LQ.

3. PREPARATION OF A BASIS OF DESIGN

3.1 GOAL

To provide a design brief which defines the Principal's requirements and documents the basis for design.

3.2 STRATEGY

Before the design of the LQ may commence a design brief should be formulated which defines the Principal's requirements and sets out the criteria to which LQ should be designed. Sizes and spatial configurations can therefore be assessed at an early stage in the design process and thus allow for optional arrangements in the most cost-effective manner. The conclusion of this process could provide a functional specification for a new LQ.

An experienced offshore LQ Architect or Consultant should be engaged early in the process to assist in the objective development of the Principal's requirements and to contribute current best practise in the preparation of the outline proposals and identifying any local expectations arising from cultural, religious, catering, dietary or other factors.

In addition to space requirements the Design Brief should identify services requirements and expectations. It should also identify any predetermined limits to the scope of supply contained within the quarters.

3.3 GUIDANCE

Information should include, but not be limited to, the areas described in the following Sections.

3.3.1 Location

Location of the LQ relative to the installation and, in the case of fixed installations, the location relative to onshore facilities.

3.3.2 Environmental conditions

Information should include, but not be limited to, maximum and minimum temperatures, humidity and design wind speeds and direction.

3.3.3 Types of LQ

3.3.3.1 Permanent LQ

The permanent LQ may form part of an integrated deck, a self-contained module, a series of modules or a combination of all three. The LQ may be located directly on the installation or be located on its own jacket with bridge connection to the installation(s).

3.3.3.2 Permanent ancillary accommodation

Permanent ancillary accommodation may be required to augment permanent LQ facilities. This may take the form of pre-fabricated modular units. Various proprietary modular systems exist which are fully certified by the appropriate authorities and provide a variety of options and configurations from a single module to a range of interconnecting units. Whichever form is required, they should meet the requirements of this DEP.

If it is foreseen in the initial design of the permanent LQ that there may be a requirement for ancillary accommodation, then the facility should be designed to accommodate such an expansion. Utility connections should be installed to facilitate later hook-up. Also, consideration shall be given to either designing the LQ utilities to cope with the extra future demand of ancillary accommodation, or for making specific provision for the anticipated replacement or supplementing the plant and equipment.

Similarly where facilities (such as the galley) may require to cope with a possible increase in future demand, it shall be demonstrated how the future increased demand may be satisfied.

The initial layout of the LQ should also reflect the requirement to change, with spaces and circulation routes so positioned to allow for interconnection with ancillary accommodation. In all cases, safe escape routes should be retained.

3.3.3.3 Temporary reusable modules

Temporary reusable modules may be required on manned or normally unattended installations for use as additional accommodation on a specific short-term basis for a maximum period of twelve months and within legislative constraints. The requirements of this DEP (including space standards per person) shall not be relaxed for such installations.

3.3.3.4 Emergency LQ

On normally unattended installations, means shall be provided for emergency accommodation unless it can be satisfactorily demonstrated and ensured that the need will not arise.

This accommodation should be designed to cater for short maintenance visits or unscheduled overnight stays only. It should be capable of adequately and safely accommodating all persons who may be on the Installation at any one time and provide protection from the weather, and with sufficient food and water together with a suitable means of heating and lighting to last for a limited but predefined period.

Dedicated sleeping and toilet facilities that are suitable and adequate for the purpose shall be provided.

Medical facilities and storage for life jackets and/or survival suits shall be provided.

3.3.4 Facilities

The facilities required in terms of welfare needs, personal hygiene, catering, management, control and services for the LQ and its installation(s) are described below.

The requirement for flexibility and change (should the installation(s) facilities be expanded or contracted) should be considered.

3.3.4.1 Cabins

There shall be sufficient beds for the maximum number of people required to sleep on the installation, without sharing of the same bedspace by persons on successive shifts.

It is recommended that a maximum of two persons should be accommodated in each cabin, (in determining the cabin manning levels particular attention shall be paid to applicable local regulations).

The number of persons per cabin shall not exceed four people, with the following exception. In some locations short-stay construction or maintenance workers' accommodation when a maximum of eight persons per cabin may be accepted for a limited period (see 4.2).

Women shall be allocated separate sleeping accommodation.

3.3.4.2 Personal hygiene

Personal hygiene facilities should be provided comprising:

- basin, shower and water closet available to each cabin (these should be additional to public area facilities); Cabin washrooms may be shared between two adjacent cabins. Where cabins are provided for female occupancy they shall have toilet facilities that are exclusive to that cabin or are only shared with cabins allocated to other women.
- separate wash room facilities for personnel to change and to store dry working clothes before entering accommodation spaces
- washroom facilities for general use with separate facilities for male and female personnel (a wc and basin may be provided in a washroom without designating its gender usage);
- dedicated facilities for the galley staff;
- dedicated facilities as part of the medical treatment area.

3.3.4.3 Catering, food storage, dining and laundry

A galley shall be provided that is fully equipped to prepare meals for the entire POB.

There should be sufficient food and water stored for all occupants according to the frequency with which supplies can be replenished. The dining room size should be based on the seating arrangement and equipment to cater for shift patterns of the personnel. Experience has shown that a sizing basis of 35 % POB likely to be on board at any one time is required.

Laydown area should be provided external and adjacent to the galley food storage area for temporary food containers and waste storage.

A laundry and storage for linen should be provided.

Emergency bedding store (for one helicopter complement) should be provided.

A refreshment room (tea/coffee room), separated from accommodation spaces, should be provided with direct access to the installation.

An LQ store shall be provided on all large LQ's for the retention of non-food supplies.

3.3.4.4 Recreation facilities

There should be one recreation space large enough to provide seating at one time for at least 50 % of the number of personnel likely to be on board.

Additional recreational facilities may be provided, the number and size of which should be based upon the complement, the duration period of offshore residence and shift patterns.

Recreation facilities may include:

- games room;
- computer room;
- quiet lounge;
- TV lounge/cinema;
- Video /dvd room;/gymnasium;

On a small LQ recreational areas with combined functions may be acceptable where space limitations restrict LQ size and the total usage is likely to be low. On larger facilities, however, the emphasis should be placed on providing more opportunities for diverse recreational interests rather than providing one or two large rooms.

The provision of some recreational areas will allow their use for other operational functions.

3.3.4.5 Medical facilities

A first aid or medical room shall be provided with equipment, facilities and medication for rendering first aid to and treating persons who are injured or fall ill.

3.3.4.6 Management and control facilities

Facilities for management and control functions should be provided on the installation as follows:

LQ management and administration such as:

- Administration offices and crews room.
- Briefing room.
- Bonded store and camp boss office.
- Technical library.

Installation management and administration such as:

- Embarkation / disembarkation points (transit lounge).
(on some installations transfer may alternatively be by boat requiring differing provision);
- Radio and telecommunications rooms (see also DEP 32.71.00.12-Gen.).
- ICC (Installation Control Centre) and/or Emergency Control Stations.
- PCF (Permit Control Facility);
- HLO Room (On larger installations).

3.3.4.7 Utility service areas

Facilities required for utility service areas which may be located within LQ may include:

- Plant and equipment rooms for HVAC plant, potable water systems including storage tanks, purification treatment, pumps, calorifiers, compressors and condensers.
- Switch rooms for electrical switchgear, distribution boards and transformers.
- Battery rooms for batteries, chargers, inverters and UPS

The requirement for utility areas will depend upon the availability and capacity of utility services on the host installation and the extent of self-support required within the LQ.

Facilities which are more likely to be located outwith the LQ would include:

- Main switchrooms;
- Sewage treatment plant;
- Fire pumps;
- Emergency generators.

The requirement to include or exclude such facilities from the LQ should be defined at the conceptual stage.

3.3.4.8 Smoking facilities

A dedicated safe location or locations shall be provided within the LQ where personnel can smoke without affecting other personnel on board. It is recommended that a ventilated lobby is provided to restrict the leakage of smells from the room. Flameless cigarette lighters shall be provided. Only seating with hard surfaces should be provided. Fabrics should not be used. The room should be negatively pressurised relative to the surrounding rooms.

3.3.5 Hazard Identification and Assessment

Of paramount importance in the design of LQ is the aspect of safety for both personnel and the installation. This should dictate the type of construction and determine its ability to provide protection along with suitable means of both access and escape. Although the positioning of LQ on an installation, and the classification and zoning requirements relating to the entire Installation do not form part of the scope of this DEP, these elements are intrinsically linked to the internal and external layout of the LQ. The required protection of the LQ should be established as a result of a Fire and Explosion Assessment and in accordance with the fire and explosion strategy developed for the installation in accordance with ISO 13702 as amended by DEP 80.80.00.11-Gen.

The assessment shall include:

- The boundary classification and blast protection requirements.
- The means of access and escape.
- Arrangements for helicopter operations and survival craft (TEMPSC).
- Restrictions on potential positions for fresh air intakes and extracts with respect to the ingress of potential hazards such as smoke and gas.

These criteria require to be established before the LQ layout can be developed.

3.3.6 Manning levels

A considered assessment shall be made of the occupancy and fluctuations in manning levels by male and female persons throughout the life of the installation.

3.3.7 TR requirements

If all or part of the LQ is designated as the TR then reference shall be made to DEP 37.17.10.11-Gen.

(It is generally recommended that the whole LQ should be designated as the TR).

The TR should contain muster area(s) for the personnel on the installation and should be equipped with a control point for emergency communications.

The location of the designated TR, (whether it is the entire LQ, one part of the LQ or external to the LQ), should dictate escape routes. In all cases, escape routes should lead to the designated muster area(s) and once inside, doors on each escape route that lead to the muster area should open in the direction of travel. Doors from the muster areas should then lead from there to evacuation points.

If the LQ is not to be the TR, the design should include an assessment of the risk that may prevent personnel from safely reaching their designated muster point in the TR. The escape routes from the LQ to the TR should be suitably protected against the risks that have been identified.

A muster area should be identified, or separately provided, where all personnel can readily assemble in adequate clear space.

3.3.8 Construction

The objective is the provision of a structure(s) that optimises weight and space in the most cost-effective manner in terms of materials and construction.

Life cycle costs should be a determining factor in the selection of materials. Consideration should be given to the ability to fabricate using these materials, and the construction and maintenance facilities necessary to provide the specified design life.

Weight limitations and cost control are always of prime importance in the design of LQs. In this regard, consideration should be given to prefabrication and the use of lightweight materials and alternative forms of construction.

- Conventional truss construction requires the fabrication of a truss structure with deck plate and stiffeners which is then overclad with purpose made fire rated cladding panels.
- Stressed skin techniques (flat plate and stiffeners for both bulkheads and decks) such as are used extensively in ship construction can present savings in weight and schedule
- Modular construction techniques (which are a further development of stressed skin design) developed by specialist fabricators can offer advantages in quality control, fabrication schedule, fit-out and testing all of which can be carried out at ground level in specialist workshops rather than a fabrication yard environment. When interconnected the modular elements become a lightweight yet strong honeycomb structure.

Modular techniques also present the opportunity, in appropriate circumstances, to assemble an LQ offshore from smaller sections without requiring the use of a heavy lift vessel.

The method of construction and installation may require specific steelwork for sea-fastening, transportation and installation aids. These requirements may impose weight and dimensional constraints and should be developed early in the design process to minimise the extent of any additional or temporary steel.

The stresses encountered during transportation will also impose requirements, which should be in an integrated structural design.

The LQ and their associated structures and services should be designed as an integrated unit to the greatest degree practicable. The design should ensure the maximum degree of onshore assembly and the minimum amount of offshore work. Similarly, the design should optimise the possibilities for pre-commissioning and testing installations and systems onshore and minimising all offshore installation and hook-up work.

Maintenance and the replacement of component parts should be a prime consideration at all stages of the design development.

Depending on the destination of the LQ, the steelwork used may or may not be subject to low ambient temperatures (below 0 °C) requiring enhanced specification or Charpy impact testing.

For further detailed structural guidance reference is made to DEP 37.19.10.30-Gen. and DEP 37.19.00.30-Gen.

3.3.9 Noise and vibration

LQ shall in normal circumstances comply with noise and vibration limits in accordance with DEP 31.10.00.31-Gen.

Sources of possible noise and vibration are:

- Air-borne noise radiating directly from a source to its surroundings;
- Structure-borne noise resulting from vibration in the audio frequencies range transmitted via the structure from a remote source and radiated as airborne noise;
- Structure-borne noise and vibration resulting from sources within the LQ.

Noise and vibration should not exceed defined acceptance criteria and should be such that all warning signals are audible, that normal speech, telephone and radio communication is possible and that an acceptable environment is provided throughout the accommodation areas for sleep and recreation.

When modifying an existing facility a noise and vibration analysis of existing sources should be carried out as part of any concept development.

When developing a new facility, noise and vibration analyses of the proposal should be carried out in advance of the detail design stage.

Due consideration should be given to the location of mechanical and electrical equipment, both internal and external to the LQ, which may be the source of noise and vibration and require isolation, containment or replacement. This equipment may be located in plant room spaces, workshops and such like. Consideration should also be given to materials selected for construction of those spaces and to the isolation of noise sources, as the most efficient means of noise control is often at its source.

3.3.10 Utility services

The layout of utility services and distribution affects the overall LQ spatial arrangements and therefore should be considered in detail in the conceptual stage of design. Services should be selected and efficiently arranged to facilitate their installation, hook-up, operation, reliability and future maintenance. The following systems may be required:

3.3.10.1 Piped services

- hot and cold potable water distribution system;
- drainage systems ;
- seawater cooling and fire services;
- chilled water;
- refrigerant;
- compressed air (instrumentation and plant).

3.3.10.2 Heating, Ventilating and Air Conditioning (HVAC)

Refer to DEP 31.76.10.10-Gen. for general HVAC considerations.

(1) Temperature

The HVAC system should be designed to maintain a minimum temperature of 20 °C and a maximum temperature of 26 °C in all normally manned areas (cabins, offices etc.). The noise generated by the HVAC system should not exceed 40 dB(A) within occupied spaces. During periods when the outside conditions exceed design values, it is accepted that the inside temperature may not be to specification.

(2) Ventilation rates

Ventilation rates (in terms of air changes per hour) should be established with consideration of heating and cooling loads along with fresh air requirements, dedicated extraction rates and the need for pressurisation.

(3) Pressurisation

The LQ, if located in a non-hazardous area, should be pressurised to within the range of 25 Pa to 65 Pa with respect to outside atmosphere at design wind speed.

LQ located either partially or completely in a hazardous area shall be pressurised to a minimum of 50 Pa with respect to outside atmosphere at design wind speed.

Consideration shall be given to both positive and negative pressure on the LQ that can be experienced due to wind shear effects.

Air locks should not be ventilated or pressurised.

The pressurisation regime should take airflow from clean areas to dirty or contaminated and maintain the flow of air generally away from escape routes.

All enclosed corridors and staircases should be positively pressurised relative to adjacent areas to assist in maintaining smoke-free escape routes.

(4) Extract system

Extraction ventilation systems in the LQ should be separated to serve the following areas:

General extraction ventilation from cabins, office, recreation areas, dining room, locker room, and corridors should be achieved through a centralised low-velocity ducted system.

Toilet extraction should be a separate system

If the toilet extraction is not a separate system, adequate protection should be in place to prevent odours circulating through the LQ.

Dedicated extraction systems for the galley, its associated stores, the laundry, the sick bay, battery rooms and, where fitted with gaseous extinguishing system, electronic equipment and radio operator rooms.) and

(5) Air supply systems

The main air supply system should either be a fixed 100 % fresh-air system, or a fresh-air/recirculated-air plant with automatic temperature-controlled change-over for full fresh air to part recirculation. The plant should be provided with an appropriate filtration system, which should be designed to accommodate the anticipated external particulate burden. In some cases, multi stage filtration will be required to remove sand, dust particles or high levels of airborne water droplets

(6) Humidification

The relative air humidity in normally manned areas should be between 20 % and 80 %. This range may be further restricted by equipment requirements.

(7) Transfer grilles

Transfer grilles should only be provided into toilets since the objective is not to transfer air from cabins into corridors.

(8) Galley systems

Air supply ductwork to the galley shall be connected to the main supply duct outside the galley boundaries. Supply ducting to other areas shall not be taken through the galley areas.

The galley should be provided with canopies and hoods over all cooking equipment. These should be fitted with cleanable grease filters and suitable drainage. Provision should be made for fire detection and protection in the hoods, exhaust ductwork and fat fryer systems according to local regulations, NFPA-96, or similar standards.

Hoods shall be designed to ensure capture of airborne particulate by inducing a local velocity through the area under the hood of up to 0.8m/s depending on the duty and hood design.

The design of the HVAC system in the galley should, where possible, attempt to minimise the throughput of conditioned air by the use of specialised proprietary galley hoods.

Ductwork shall incorporate a number of safety features to reduce the risk of fire, including at least:

- Fire rated ductwork
- Grease traps and drains to prevent build up of combustible materials
- Access hatches to permit cleaning of the entire interior surface of the ductwork.

Extract hoods should be provided over dishwashing equipment or other appliances where high levels of steam require to be extracted directly from the galley area.

(9) Laundry systems

Warm air drying machines are a serious potential source of fire. This primarily arises due to inadequate filtration (permitting the build-up of lint), and to unsuitable duct design and materials selection. Where such drying machines are provided the following design guidance should be adopted:

- Position filters as close as possible to the drying machine outlet.
- Avoid vertical duct runs.
- Avoid concealed and inaccessible ductwork.
- Include adequate access doors for complete system cleaning and inspection. Provide specific means for quick removal and replacement of system components.
- Filters should be of a high capacity type.
- Minimise extract duct length from laundry machine to atmosphere.
- Use 'A' rated ducts, particularly where circumstances preclude application of the design principles stated above.

(10) Emergency and temporary LQ/TRs and office modules

Air supply and extraction ventilation as described above should be provided to achieve the required air change rates. Humidity control and cooling may not be provided.

Internal pressurisation should be provided as described above.

3.3.10.3 Electrical

- Power distribution;
- Lighting.

Further details are given in DEP 33.64.10.10-Gen.

3.3.10.4 Communications

- Mandatory communications in the form of a combined public address and general alarm system;
- Operational telecommunications including radios and telephones;
- Non-essential telecommunications including entertainment systems and ancillary equipment;
- If the LQ are used as the TR, then radio and phone communications are required at muster points. Refer to DEP 37.17.10.11-Gen.

3.3.10.5 Detection and protection systems

These systems should include heat, smoke, fire and gas detection and protection systems in accordance with DEP 32.30.20.11-Gen., DEP 80.80.00.11-Gen. and (if required) DEP 80.47.10.12-Gen. Reference should be made to ISO 13702.

Note: In some countries it may be a requirement to include a sprinkler system.

3.3.10.6 Co-ordination of utility services

Utility services should be co-ordinated so that all services are identified and located to allow fabrication and offshore hook-up to be completed with minimum offshore work and to allow all subsequent maintenance to be minimised. Coordination also ensures deck-to-deck heights are kept to a minimum through optimisation of ceiling void space.

Main services, (with the exception of firewater mains which should be run external to the LQ), should enter the LQ directly in the zones where internal risers are located. Appropriate consideration should be given to segregating pipes, ducts and cables. The vertical services configuration should allow for ease of horizontal distribution at each level.

All services should be clearly identified and routed together on a common support grid wherever possible and where construction, inspection and maintenance access is readily available.

Prior to hook-up, where utility services are temporarily terminated, they should be suitably blanked off to prevent ingress of dirt and moisture.

Where planned maintenance is required to concealed services, these should be carefully coordinated to ensure that this can be carried out through access panels. The number of panels must be minimised however it shall not be necessary to remove walls or ceilings to perform such planned maintenance.

3.3.10.7 Platform interface

Design of structural, architectural and service interface connections between the LQ and the installation should be developed to minimise both offshore hook-up and its eventual removal.

The structural interface should include support points and locating devices. Ease of placement and the removal of the LQ on installation abandonment should be considered.

Services interfaces may include the following:

- seawater, for HVAC cooling and fire services;
- potable water (cold), for domestic hot and cold water service;
- water/glycol mixture, heating medium for HVAC and/or domestic hot water generation;
- service and instrument air;
- electrical;
- communications;
- instrumentation;
- fire and gas connections;
- drainage piping (hazardous and non-hazardous);
- roof drainage from the helideck and LQ
- diesel fuel (lifeboats and generators) .

Common services should be grouped with a minimum of penetrations into the LQ and segregated as required by operational and maintenance considerations.

Where services are routed to interface points located within the LQ, all such routes shall be specifically planned and designated to minimise the offshore scope.

3.3.11 Materials and equipment

Materials, equipment, components and finishes selected should be fit for purpose and suitable for application in an offshore environment.

Materials should be non-combustible except where it can be demonstrated that any other required property or use of the materials precludes this. They should comply with relevant codes or standards and material selection based upon the following criteria:

- safety;
- hygiene;
- durability;
- weight;
- thermal and acoustic properties;
- assembly;
- maintenance;
- flexibility;
- finishes and aesthetic appearance.
- suitability for use in terms of physical, operational and environmental conditions;
- compatibility of materials;

Equipment within or associated with the LQ should comply with a recognised standard or specification and be suitable for its intended purpose. It should be located to ensure safe operation, be provided with a safe means of access and incorporate efficient control apparatus, guards, shields and other means of protecting personnel.

Further detailed guidance is given in section (13).

3.3.12 Preliminary sizing

The LQ structure should be designed to allow for maximum utilisation of space, flexibility of layout and ease of service routings in both horizontal and vertical locations. Preliminary sizing of the LQ should be based upon:

- Welfare needs and functional space requirements;
- Essential utility areas such as vertical and horizontal routes for ducts, cables and trunking;
- Maintenance envelopes of utility equipment including possible removal routes and means of access to regularly maintained items;• Management, control facilities and utility services areas. These may or may not be an integral part of the LQ;
- Structural considerations, transportation limits and lifting restrictions;
- Safety considerations. The ability to escape from a hazard will dictate flow patterns and the position and size of corridors and staircases. The size of rooms will dictate the number, size and position of exit points;
- Designated muster stations (TR), if within the LQ, are to accommodate all POB.

3.3.12.1 Module height

The function of a space will determine its ceiling height. The depth of the ceiling void should be based upon the arrangement and maintenance requirements of the services to be accommodated. These requirements together with the structural framework configuration will have a direct bearing on the overall height of the LQ.

3.3.12.2 Layout principles

To achieve optimal use of space and ensure related areas are positioned adjacent to one another, the following should be carefully considered:

- Efficient use of space with respect to welfare needs, utility services and minimal personnel circulation.
- Flexible (multifunctional) use of space.
- Social interaction, providing social activity facilities but ensuring privacy where required.
- Personnel circulation, which ensures ease of access of personnel into, through and out of LQ, to and from helideck, muster area(s) and survival craft.
- Efficient arrangements; similar facilities should be located on the same level for ease of communication.
- Optimisation of services, so arranged to facilitate operations, maintenance and repair.

- Segregation of services, with water and drainage services located away from electrical services, machinery or equipment rooms.
- First aid, with access to the medical facility for stretchers, facilities for emergency treatment and ease of evacuation of injured persons
- Hygiene facilities provided on each level for ease of cleaning.
- Access for personnel entering or exiting the LQ via the locker room or management and control facilities; access for services with the provision of laydown areas which are to be accessible to installation craneage and supply boat moorings for:
 - food storage and compactors adjacent to permanent food storage areas;
 - removal of bulk equipment within easy reach of plant rooms.
- Segregation (horizontal and/or vertical) of areas of dissimilar operation ie. noisy and quiet areas, dirty and clean areas and wet and dry areas. (Refer to Appendix 1.1).

3.3.12.3 Personnel circulation

Circulation within the LQ should be arranged for ease of both horizontal and vertical flow of personnel between spaces. In addition, it should allow for the separation of working areas from accommodation spaces. Consideration should be given to work and leisure pattern arrangements and safety aspects in terms of means of escape. Access to cabins should be arranged to ensure that sleeping areas are not used as 'through-routes'.

The numbers of entrances and exits into and out of the LQ should be limited. The primary 'dirty' entrance/exit should be via the locker room. An additional 'dirty' entrance/exit may be required between the ICC/PCF and the installation. A 'clean' entrance/exit should be provided between the transit lounge and the helideck, and for access between the galley/food stores and laydown area.

Airlocks should be provided to all LQ entrances and exits (except those designated only for emergency use), in order to maintain pressurisation and to limit smoke ingress.

3.3.13 Security of the Installation

In some geographical locations there may be a requirement to consider providing a higher level of personnel protection than a LQ would normally offer. Any requirement for such measures should be assessed and defined in advance of any design development.

4. WELFARE NEEDS – CABINS

4.1 GOAL

To provide adequate spaces, where required, to fulfil welfare needs in terms of areas for sleeping and resting.

4.2 STRATEGY

In order to maintain a level of comfort for individuals' needs in terms of privacy and quietness, the number of persons sharing a cabin shall not exceed 4 persons for a permanent LQ. However, it is Shell's preference that each cabin should either be double or single berth occupancy and provided with personal hygiene facilities, which may be shared between two cabins (ie four occupants maximum). All cabins should be outfitted to a similar standard on any one installation.

In cases where campaign maintenance is the primary strategy for scheduled maintenance it may be permissible to install cabins with a maximum occupancy capacity of 8 people for temporary use. These cabins should not be in use for more than two weeks at a time and should not be used more than four times a year. If such an arrangement is considered, the benefits shall be carefully assessed, giving due consideration to the fact that such an arrangement will have a detrimental effect on the comfort of the individuals.

4.3 GUIDANCE

4.3.1 Cabin sizing

Cabin sizing should be based on the facilities provided and the amount of free circulation space for the occupants. In order to cater for individual needs, the minimum floor area for single and double cabins, excluding shower and water closet compartments and lobby, should not be less than 7.6 m². The net internal cabin area (excluding lockers, bunk, desk and basin) should not be less than 4.0 m².

(Where more than two persons per cabin are permitted the minimum floor area for four-person occupancy should not be less than 12 m². For a larger temporary cabin (dormitory) the minimum floor should not be less than 3 m² per berth).

The clear internal height of the cabins should not be less than 2.4 m. The clear internal height of the shower, toilet and lobby area may be reduced to allow greater space in ceiling voids for utility services.

Where local requirements propose higher space and occupancy standards these shall be adhered to.

Examples of cabin layouts are included in (Appendix 2).

Although cabins are typically constructed with bunk beds, where cabins are required to normally provide the alternative of single beds there are proprietary beds available allowing an upper bunk to be hinged and to fold back to the bulkhead when not in use.

4.3.2 Additional berths

Where additional berths are required, for circumstances such as hook-up or maintenance, these should wherever possible be provided without requiring personnel to leave the protective envelope of the LQ. However it may be necessary to provide additional temporary accommodation modules.

4.3.3 Cabin contents

As a minimum each cabin should contain:

- bunk unit with drawers underneath, and personnel restraint (safety) rail to top bunk;
- bunk privacy curtains
- ladder with robust safety handle for access to the upper bunk;
- entertainment unit, clock and reading lamp associated with each bunk;
- provision for TV viewing from each bunk;
- desk, lamp and desk chair;
- personal storage lockers;
- life jacket and grab bag storage (if not provided at muster points);
- easy chair;
- shelf unit;
- tackboard.

5. WELFARE NEEDS - PERSONAL HYGIENE

5.1 GOAL

To provide adequate spaces, where required, to fulfil welfare needs in terms of areas for personal hygiene.

5.2 STRATEGY

Toilet and washing facilities should be provided for:

- Individuals' personal hygiene associated with the cabins.
- Public use, associated with all other facilities within the LQ, with separate toilet and washing facilities provided for male and female personnel.
- Dedicated facilities for galley staff and for the medical treatment area.

5.3 GUIDANCE

5.3.1 Cabins

Each cabin should have access to a washbasin, a lavatory (WC) and a shower. Two adjoining cabins may each have direct access to one shared wc/shower room although a combination of both such layouts may prove to offer increased occupancy permutations. Reference should be made to (Appendix 2) where a number of alternative layouts are included some of which can offer greater access for simultaneous use or for cleaning.

5.3.2 General area toilets

Sizing of washing and toilet areas for general use should be based on the POB. Facilities provided in cabins should not be included in the calculation for those required for general use. The following table is a guide to requirements:

Male personnel

- 1 WC per 25 persons (see NOTE 1 below);
- 1 urinal per 1 to 15 persons;
- 2 urinals per 16 to 30 persons;
- 3 urinals per 31 to 60 persons;
- 4 urinals per 61 to 90 persons;
- 5 urinals per 91 to 100 persons (see note 2 below);
- 1 basin per 10 persons for dirty processes; or
- 1 basin for 20 persons for clean processes.

Female personnel

- 1 WC per 10 persons (see NOTE 3 below);
- 1 basin per 10 persons for dirty processes or;
- 1 basin per 20 persons for clean processes.

- NOTES:
1. For over 100 male persons, 1 in 4 of additional WCs may be a urinal.
 2. For over 100 persons additional provision of urinals should be determined by the number of WC's (see Note 1).
 3. A minimum of 1 female WC and basin should be provided on every normally manned installation.

On installations with more than 25 POB, 2 showers may be installed in the male locker room toilet/change area and 1 shower in the female toilet area. Such showers may be only necessary in hot climates or where particularly dirty processes are likely to occur requiring the use of showers prior to operatives showering even before returning to their cabins.

Toilets in general access areas (with WC and basin only) may be provided without specifying gender usage.

In addition to the toilets in the main changing rooms, general area toilets should be located adjacent to such facilities as the Transit Lounge, CCR and Offices, Recreation Lounges and Gymnasium, the Muster Area and perhaps the mess.

5.3.3 Galley area toilets

Toilet facilities containing a WC and wash hand basin should be provided for the sole use of the galley staff. This should be integral to the galley area, but separated by a ventilated lobby from any area where food is stored or handled. On larger facilities, or where local consideration dictate, separate male and female toilets may be provided.

5.3.4 Locker room

The locker room is required for personnel to change and store their working clothes and PPE before entering the clean area of the LQ. The locker room should be located so as to act as a natural transition between the working and accommodation areas. General toilet and washing facilities should be located adjacent to the locker room and available to personnel before changing.

Lockers should be two-tier compartmentalised units and arranged in banks with adequate space between rows for personnel to change. Island bench seats and/or seats adjacent to the lockers should be provided.

The locker room should accommodate lockers for 200 % of the POB with an additional 15 % for visitors. Lockers should be not less than 750 mm high x 300 mm wide x 450 mm deep. The top of the lockers should be sloped to prevent accumulation of rubbish.

5.3.5 Sick Bay

The Medical Suite or 'Sick Bay' shall be provided with a dedicated toilet area separated from the medical examination area. It shall include a WC and basin and may also include a shower. The room shall be large enough to ensure that a patient can be assisted. It should be fitted with disabled support handles and an alarm call point.

6. WELFARE NEEDS - CATERING AND DINING

6.1 GOAL

To provide adequate spaces, where required, to fulfil welfare needs in terms of areas for catering and dining.

6.2 STRATEGY

6.2.1 General

The complex comprising laydown, food storage, preparation areas, the galley and dining room forms the largest integrated area in the LQ. It should be large enough to receive, store, process and serve perishable and non-perishable food for consumption by personnel on the installation. The facilities should be located together on the same level. Any refreshment room for use outside of the main catering complex also forms a part of the catering facilities.

Food should be received in containers via the laydown area, stored in temperature-controlled storage areas, prepared in a designated area, cooked in the galley and served to personnel in the dining room. The location of these areas should take into account logical work flows and patterns, including receipt, storage, issue, preparation, service, wash-up, waste management and disposal.

Where religious rulings so require, for instance with respect to kosher or halal food, such food should be prepared and/or served in separate areas. Any such requirement shall be established and defined at the commencement of a project.

Dry waste should be deposited in separate waste containers. Compactors shall be provided to minimise the transported volume. These should be situated in the laydown area. Perishable waste should be disposed of into waste disposal units located in the galley and discharged into the drainage system.

Lockers for the storage of galley staff's outdoor clothing or PPE should be provided in a convenient place adjacent to the galley airlock.

A separate office may be provided within the galley complex for catering management purposes, which may also be combined with the camp boss office and bonded store.

It is recognised that the specification and operation of the catering complexes benefits from specialist Contractor input. It is therefore recommended that this input be incorporated early in the design process as well as during construction.

6.2.2 Laydown areas

A dedicated laydown area should be located adjacent to the galley access, within the working radius of an installation crane and within the crane operator's view to enable containers, compactors or waste bins to be offloaded from the supply boat. Laydown areas should be arranged to allow day-to-day access to the food containers and constant visits to the waste compactors. They should be large enough to receive and accommodate the food containers and waste compactors and, in the event of equipment breakdown, to accommodate emergency deep-freeze containers.

The laydown should be equipped with a utility station to provide water to washdown the area and to provide power.

6.2.3 Food storage

Correct food storage is fundamental to any food operation to ensure good standards of hygiene. Storage conditions should reduce the rate of decomposition as much as possible to ensure that the food is maintained at the highest standard. Conditions in stores shall not expose the goods to a risk of taint or other contamination.

6.2.4 Food preparation

As a minimum, separate counters should be provided for the dedicated preparation of:

- baking and pastry;
- vegetables;
- meat, fish and poultry.

Food preparation areas should be arranged to provide direct access into each preparation area so as to minimise the risk of contamination in the food preparation chain between raw and cooked meat products, vegetables and bakery products such as bread, cakes and sweets etc. Similarly equipment for use in each preparation area should be positioned in the immediate vicinity of that preparation area.

6.2.5 Galley

The galley should include areas for:

- prime and ancillary cooking requirements;
- hot services;
- dish wash facilities;
- pan wash facilities;
- equipment storage.

The area allocated within the galley complex for these activities should relate to the capacity of the service requirements. For higher POB levels areas shall be specifically designated for each of the required functions. For POB levels below 50 spaces may be utilised for more than one function.

6.2.6 Dining

The dining room should be designed as an integral part of, and adjacent to, the galley and should include for the serving of food and beverages on a self-help basis.

The dining furniture should be arranged to provide adequate personnel circulation with ease of access to servery and beverage counters. Consideration shall be given to the flow patterns, with sufficient space being allocated for queuing adjacent to the servery. This should be located near the entry of the dining room. See (Appendix A1.5).

The siting of the waste, dirty return and wash-up area should be located near the exit routes of the dining room. The layout should provide some level of visual separation from the dining area.

All surfaces of dining area chairs should be 'wipe clean'.

6.2.7 Waste Management

There shall be provision for the receipt, handling, packaging and storage of separately categorised waste materials from the LQ for shipment to shore for disposal.

6.3 GUIDANCE

6.3.1 Laydown areas

The sizing of laydown areas may be based on the following:

- POB greater than 50
 - at least 3 food containers, each 2.5 m³ (the size of locally available containers should be confirmed);
 - 2 waste compactors, each will require an operational area of approx. 7.5 m²;
 - space to be allocated for at least one emergency refrigerated deep-freeze container;
 - 1 baler for waste paper in a weather proof enclosure.

- POB less than 50
 - at least 2 food containers;
 - 2 waste bins;
 - 1 baler (25 POB and over).

Where POB exceeds 100 a detailed plan for the laydown space requirements should be developed. The actual requirements on any facility will be directly dependent on the maximum planned frequency of restocking.

As loading of waste compactors and bins can be hazardous in windy conditions, safety side netting should be installed.

A wide external door is required providing ease of handling of the unloaded items and access into a substantial airlock. This airlock can be used in offloading containers without encouraging the external doors to be left open for a prolonged duration compromising the pressurisation of the module.

6.3.2 Food storage

The following 'walk-in' or purpose-designed temperature-controlled cabinets should be provided:

- deep freezer (3 separate compartments should be provided);
- refrigerated store;
- dry goods store;
- vegetable store;
- consumables store;
- defrost and blast chiller cabinets.

The minimum sizes of the above areas should be based on the location of the installation relative to onshore facilities and the frequency with which supplies can be replenished.

Operating temperatures for the food storage areas should be as follows:

- deep freezers -18 °C;
- cold rooms 1 °C to 4 °C;
- vegetable store +6 °C (the veg store shall be provided with air extract);
- dry goods internal ambient;
- consumables internal ambient.

Proprietary deep freeze and refrigerated walk-in stores should be complete with floor, walls and ceiling panels, doors with trace heating to frames and thresholds, pressure relief valves, controls.

Refrigeration evaporators should be mounted in or adjacent to areas served, with associated compressor/condensing units mounted externally to the LQ, or within areas from where surplus heat can be easily and conveniently discharged.

Refrigeration machines shall use zero-ozone-depletion refrigerants.

Refrigerated stores should have external controls that include warning lights, thermostats and operating temperature display. They shall be fitted with emergency alarm buttons within.

Entrances to deep freezers should be fitted with a flexible thermal curtain to prevent heat gain during prolonged periods of opening.

Cold room and freezer doors shall be openable from both sides for safety reasons.

6.3.3 Galley equipment

It is preferred that all galley equipment for an installation be supplied by a single specialist supplier for uniformity, spares and standardised quality. Their co-operation should be considered at an early stage of the design process so that a unified layout can be achieved.