



Safety & Risk Management Services

EER Analysis

Germanischer Lloyd – Service/Product Description



EER Analysis

Service Title: Safety & Risk Management Services

Lead Practice: GL Safety & Risk (UK)

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Service Description and Values Generated:

Prevention of Fire and Explosion, and Emergency Response (PFEER) Regulations in the UK require that duty holders ensure adequate arrangements for escape, evacuation, rescue and recovery of persons involved in an incident. In practice, for an offshore platform, this means there should be a good prospect that personnel:

- Escape from an incident to the TR (Temporary Refuge)
- Evacuate from an installation using a means readily accessible from the TR.
- Can be rescued near the platform and recovered and taken to a place of safety

Germanischer Lloyd (GL) offers a consultancy service which can identify issues of escape, evacuation and rescue (EER) of personnel from the facility. The majority of EER is performed on offshore facilities where emergency evacuation is more difficult, however EER can also be performed on onshore facilities as well.

The EER analysis will use detailed results from explosion, fire and smoke modelling for topside releases to assess the ability of personnel to reach a safe location in the event of an incident. The modelling allows the effectiveness of the escape routes to be determined and identifies circumstances where personnel cannot reach a place of safety.



DETAILED METHOD STATEMENT

a. Introduction

The general method for an evacuation, escape and rescue (EER) assessment for an offshore platform are stated. The terms evacuation, escape and rescue within the context of the assessment are defined. Typical evacuation, escape and rescue safety goals are also outlined. The methodology used to assess the effects of fires and smoke on these EER provisions is given and the results of the analysis are summarised.

b. Definitions

Escape from the Incident

Escape from the incident is the process of personnel moving along escape routes towards muster points. It is assumed that personnel will have preference for moving to the primary muster point, which in the case of most platforms is the Living Quarters.

Evacuation

Evacuation is the planned method of leaving the installation without directly entering the sea. Successful evacuation results in those on board the installation being transferred to an onshore location, or to a safe offshore location or vessel. This usually takes place by helicopter, lifeboat or life raft.

Escape to Sea

Escape to Sea is the process of leaving an installation in the event of part or all of the evacuation system failing. In these circumstances personnel make their way to the sea either by escape devices or by jumping.

Rescue

Rescue is the process by which both escapees and man overboard casualties are retrieved to a safe place where medical assistance is available.

c. Escape, Evacuation and Rescue Goals

The purposes of the escape, evacuation and rescue (EER) goals are:

- To demonstrate all reasonably practicable measures have been taken to ensure the safe and effective evacuation, escape and rescue of personnel from the installation,
- To demonstrate the adequacy of the evacuation, escape and rescue provisions in response to accident conditions,
- To provide guidance for management of emergencies.

From these high-level objectives, a series of EER goals can be developed. A typical set of EER goals are given below.

It should be noted that the UK regulations make reference to a Temporary Refuge (TR). Though a TR has specific performance criteria in the regulations, it is effectively a location that provides some protection from the effects of any incident and is also the primary location from which evacuation can be achieved. The Living Quarters may be designated as the TR for many platforms.

Emergency Philosophy

- Performance standards shall be set in place to ensure the safe and effective evacuation, escape, rescue and recovery of personnel from the installation to a place of safety.
- Appropriate organisation and arrangements shall be established which would take effect in an emergency.
- An Emergency Response Plan shall be set in place to provide guidance for all personnel.

Emergency Alarm

- Audible, and where necessary visual, alarms shall be provided to warn all persons on the installation of the occurrence of an emergency.

Escape Routes

- Safe means of escape shall be provided from all work areas, accommodation areas and process and utility areas.
- For all but the most severe of incidents, at least one escape route to the living quarters from all potentially manned areas of the installation shall remain passable for sufficient time to allow all personnel on the installation to muster in an emergency.
- At least one escape route shall remain passable within the living quarters endurance time to allow all personnel on the installation to transfer from the living quarters to a suitable means of evacuation or escape.
- Escape routes shall be readily accessible, unobstructed, well-marked and illuminated with adequate emergency lighting.

Muster/Embarkation Areas

- Primary muster areas shall be provided at the living quarters with sufficient space to accommodate the total complement of personnel on the installation.
- Embarkation areas shall be located at each means of evacuation with sufficient space for the total number of personnel to be evacuated.
- Muster areas and embarkation areas shall be readily accessible, unobstructed, well marked and illuminated with adequate emergency lighting.

Living Quarters

- The living quarters shall protect personnel during an emergency, particularly from flammable/toxic ingress, smoke ingress, heat build-up and loss of breathable atmosphere, until such time that control of the incident or evacuation can be effected.
- Sufficient control facilities shall be provided to assess an incident and to bring it under control if possible.
- Sufficient means of communication shall be provided between individuals on the installation and other installations, vessels, aircraft and onshore.

Means of Evacuation

- Sufficient means of evacuation shall be provided to ensure that all personnel on the installation can be safely evacuated in the event of an emergency.
- The means of evacuation shall be readily accessible from the living quarters.

Means of Escape to Sea

- Sufficient means of escape to sea shall be provided for all persons on the installation, who may be prevented from reaching the living quarters, or means of evacuation, or are unable to evacuate.

Personal Protection Equipment

- Each individual on board shall be issued with suitable personal survival equipment for protection in an emergency, evacuation or escape to sea.
- Sufficient personal equipment shall be provided at appropriate locations throughout the installation to assist access to the living quarters, or for use in evacuation, or escape to sea.

Means of Rescue and Recovery

- Means shall be provided for the rescue of any personnel who may enter the sea.
- Sufficient means shall be provided for the recovery of all personnel, initially on the installation, following an evacuation or escape to sea, to a place of safety.
- Suitable medical facilities shall be provided at the place of safety.

d. EER Assessment Methodology

The event frequencies calculated can be combined with the consequence assessment and used in the Transient Escape, Evacuation, and Rescue model (TEER) within ARAMAS (offshore risk assessment package) to calculate the number of fatalities on an installation from a given scenario both as a consequence of the immediate event and as result of EER. The simulation is time-dependent. A series of escape routes must be defined using the installation locations for input into TEER.

Many platforms will be fully manned at all times and provide accommodation facilities for all persons on board (POB). In addition, there may be day visitors and the possibility of further personnel, including helicopter crew, on the helideck. The EER assessment would consider all scenarios where evacuation and escape to sea is required, for example, all large and steady state fires.

The EER assessment would be carried out using manning levels provided by the client.

The hierarchy of the description is to group all releases by location, with variations as a result of the release size and fluid type then being considered. Thus all releases on a Deck are considered with appropriate flammable releases of various sizes being considered.

e. EER Assessment Results

In describing the results of the EER assessment, tables are produced which show the average outcome from the initial 'escape from the incident' phase for incidents involving a release:

- In a particular location.
- From a particular isolatable system.
- For the range of hole sizes (release rates).
- For steady state, ESD and ESD + Blowdown (where there is no difference, these categories are combined).

The tables detail the outcome for personnel at different locations from this phase of the EER in terms of whether personnel:

- Are immediate fatalities, which only occur in the module where the release occurs (called the 'event module').
- Become fatalities as they escape from the incident (transit fatalities).
- Reach the Living Quarters.
- Reach another evacuation or 'escape to sea' location, such as a jump point.

As there will be a number of scenarios in each of the categories given in the tables (accounting for changing release location, release direction and wind direction), each number given in the table is averaged over all of these scenarios.

Calculations for oil and condensate releases may be carried out for fires and smoke together as well as fires alone. The possible difference between these two sets of results allows the impact of smoke to be determined. It should be noted that for natural gas releases smoke has a negligible effect on the number of immediate, transit fatalities or muster locations of personnel. This is mainly due to the relatively low levels of smoke generated by a natural gas jet fire. In addition, the build up of the smoke that is produced is slow, and personnel surviving the initial event have reached a safe location before the smoke can impair movement.

The final outcome of the incident is dependent on the assumption that evacuation is carried out only for specific criteria (i.e. certain size etc). Additional evacuation and 'escape to sea' casualties would result if these evacuation criteria were broadened.

a. Phase 2 Drilling: Escape, Evacuation and Rescue (EER) Assessment

Date: 2007
Customer: Major Oil & Gas Company Company
Savings: Guidance on how to meet legislations

Issue:

The client planned to drill additional wells from the offshore platform in order to maintain production. This activity required that simultaneous drilling, completion and production operations be undertaken on the facility. As part of the HSSE management process, an update of the existing Safety Case to account for Simultaneous Operations (SimOps) was required. Part of the Safety Case update addresses any Escape, Evacuation and Rescue (EER) issues.

Methodology & Results:

The results of the EER study:

- Provided information to the client on issues to be addressed in the development and possible implementation of the Emergency Response procedures.
- Undertook a risk assessment to determine the appropriate type and number of evacuation systems to be installed on the facility to account for the additional personnel and other factors.
- Assessed the impact of the different SimOps hazards identified on the requirements for escape and evacuation.



Savings:

The analysis of the EER assessment concluded that there are sufficient escape routes and evacuation arrangements for the existing number of staff, however to meet legislations for the additional number of staff from the additional drilling another 75 man lifeboat is required, an additional muster area required for drilling crew, and additional escape procedures.

b. Update to Explosion, Fire and EER Analysis

Date: 2007
Customer: Major Oil & Gas Company Company
Savings: Early identification of required design changes

Issue:

The client is developing oil and gas field of the coast of West Africa and as part of this development, a platform will be located over the field. Throughout the design process of the platform, the client has considered the major hazards associated with the development and how best to engineer the platform design to mitigate the effects of these hazards. As part of this work, GL has considered both topside explosion and fires, including the escape, evacuation and rescue (EER) following fire incidents.

Methodology & Results:

These studies have been carried out at differing points in the platform design process and each has used the platform configuration and layout at the time of the study. The design evolved, partly as a result of the studies carried out, and the studies were updated in order to evaluate the effect of the changes.

The report detailed the results of a study carried out to update the explosion, fire and EER assessments using the current layout. The results of the EER study include assessment of:

- The effect of explosions following a release from a topsides process system.
- The effect of fires and smoke following a release from a topsides process system.
- The escape, evacuation and rescue of personnel for the range of fire scenarios analysed above.

Savings:

The explosion, fire and EER analysis has identified areas of the design of the new platform that would need to be changed to meet EER legislation. The study allowed the client to implement these changes at the earliest stages in the design process, thus saving the client in money and time in having to implant these changes, to meet legislation, once the platform was constructed.

Safety & Risk Management Services

Safety Case and Compliance Consultancy

Hazard Identification Studies (HAZID)

Hazard Operability Studies (HAZOP)

SIL Studies (Safety Integrity Level)

Consequence Evaluation (Fire, Release, Explosion, Dispersion), Including CFD

- **EER Analysis (Escape, Evacuation, Rescue) (GL-Aeneas)**

Quantitative Risk Analysis (QRA)

Decision Support (Risk Based Layout Studies)

Performance Standards

Large Scale Hazards Testing (Spadeadam)

Incident Investigation

Germanischer Lloyd Industrial Services GmbH

Oil and Gas

Steinhöft 9

20459 Hamburg, Germany

Phone +49 40 36149-7700

Fax +49 40 36149-1781

glis@gl-group.com

www.gl-group.com/glis

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