

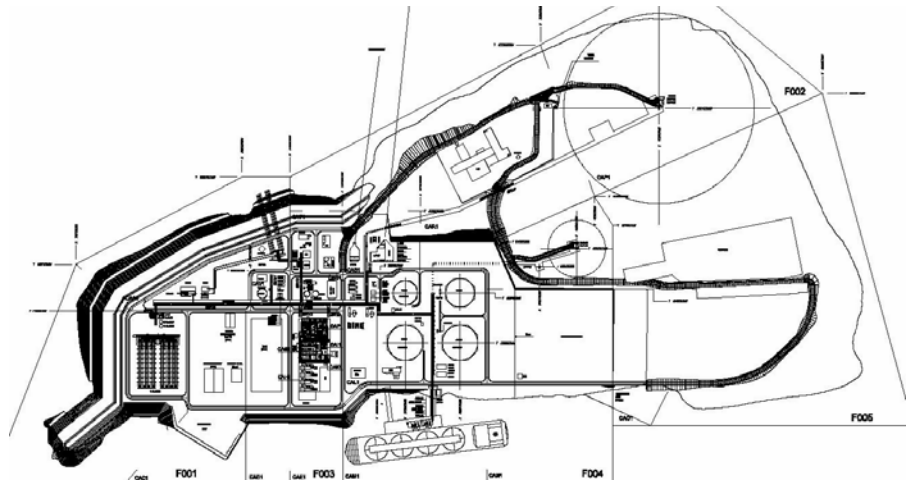
Safety Advice for Hammerfest Liquefied Natural Gas Terminal Tractebel Industry Engineering (for Statoil)

Entec was commissioned by Tractebel Industry Engineering to undertake various safety services for the design and construct contract they were undertaking for Statoil and Linde. The scope of the contract was for the storage and loading facilities for the Hammerfest liquefied natural gas (LNG) terminal to be located in northern Norway. The equipment covered in this work included 2 x 125,000m³ LNG storage tanks handling LNG at 145mbar and -168°C, 1 x 45,000m³ LPG storage tank and 1 x 75,000m³ condensate storage tank, pipelines, jetty and loading facilities.

Entec's scope of work included:

- a detailed quantified risk assessment (QRA) for the storage and loading package;
- a review and update of the design accident load for the facilities;
- analysis of the potential for escalation of incidents;
- a hazardous area classification review for the facilities;
- a fire safety analysis for the facilities; and
- an emergency plan for the storage and loading facilities.

The safety advice involved spending a number of weeks in the contractor's office



as part of the team. This included working closely with the various disciplines of the design engineers to agree the appropriate approach for the various aspects of the work that needed to be covered.

The QRA involved the use of PHAST computer software for consequence modelling, which provided input to the risk assessment model SAFETI. The risks associated with the plant were evaluated against Statoil's in-house criteria for tolerability and the design was modified to reduce the risks, where possible, to an acceptable level. For example, impoundment basins for the LNG, LPG

and jetty locations were sized large enough for containment of 'reasonably foreseeable events' but not so large that the thermal radiation levels from fires within the basins were unacceptable. For determining thermal radiation levels from elongated basins the software model BREEZE (based on the USA GRI model) was used.

In the fire safety analysis the location of fire, gas, and smoke detectors was defined as well as the location of the emergency shutdown buttons for the plant. This was done in conjunction with the requirements of the emergency plan.

The whole package of work was delivered on time (within 4 months) by a team of experienced engineers working on different aspect of the project.

The approach adopted allowed issues to be resolved promptly, provided expedient advice to the design team allowing them to keep up the momentum in the design of the plant and helped them to keep to their contractual schedules. The advice provided has allowed the risks to be reduced to tolerable levels and to meet ALARP requirements identified in Statoil's health and safety strategy. Cost savings were achieved without compromising safety; and were further boosted by demonstrating that some additional, planned precautions had no significant safety benefit.



By courtesy of Statoil

