Assessing risk in occupied buildings

ABB helps a major gas-fired power station to reduce the risks of injury to personnel on site.

The client’s power station was commissioned in 1999 as a 400 MW gas-fired station. As part of a wider initiative within their company, there was a requirement for a better understanding of the risks to the occupants of buildings on the site and practical options to reduce these to tolerable levels.

The client engaged ABB to carry out an occupied buildings risk assessment on the site to identify the risk to the occupants of buildings on the site from hazards associated with the site’s operations.

**Solution**
ABB carried out a risk assessment and produced a set of specific recommendations that would reduce the risk exposure in the occupied buildings to an acceptable level.

The assessment followed the guidance published by the Chemical Industries Association (CIA) in relation to occupied buildings on sites handling hazardous materials.

The methodology comprised the following steps:

1. Identifying the buildings where people could be present and confirming that they are ‘occupied’ within the terms of the CIA guidance:
   - 7 buildings were identified as being occupied; an office building, security gatehouse, control room, workshop store room, boiler laboratory, contractor cabin(s) and a scaffolders’ cabin.

2. Identifying the hazardous events to which the occupants of the buildings may be exposed, and assessing the severity of these events:
   - Hazardous events with the potential to cause explosion overpressure, thermal radiation or toxic gas effects on the occupied buildings were identified by examination of the site’s own hazard identification studies, an examination of the major accident hazard map constructed by the site and a site inspection. In addition, the potential for electrical exposure from HV equipment impacting on occupied buildings was identified.
- Potential hazardous events that were identified included:
  - Explosion in a gas compressor house
  - Fire or explosion on high pressure natural gas lines
  - Fire in diesel storage tank
  - Explosion following gas release in the turbine hall
  - High pressure steam release in the turbine hall

3. Assessing the effects of these hazardous events.
   - All potentially hazardous events were modelled, using DNV’s Phast software, which is one of the most widely-used consequence assessment tools. For electrical explosions, hazard radii were estimated based on published sources. The modelling work ‘mapped’ the potential exposure across the site to over pressure, fire and toxic releases.

4. Carrying out consequence screening.
   - The consequence maps for each hazardous event were used to find which occupied buildings could be subject to unacceptable consequences if the event occurred. The remaining occupied buildings were screened out and no further action was taken.

5. For those occupied buildings not screened out, a more detailed assessment was carried out.
   - This involved a building inspection and, where necessary, the calculation of event likelihoods to gain a more detailed understanding of the risks and thereby determine whether they are ALARP.

6. Drawing up a list of remedial actions to improve the building performance or reduce the hazard level to ALARP levels.
   - For those buildings for which the risks were determined not to be ALARP, a range of building and process improvement options were identified. These included:
     - Extending the blast wall around a generator transformer
     - Removing the windows from a control room
     - Installing anti-shatter film on the widows and glass doors of an office building
     - Relocation of an accommodation cabin
     - Ensuring that an inspection regime is in place to demonstrate the integrity of the fuel gas line underneath a culvert

Benefits
The benefits that ABB’s work provided to client included:

- An understanding of where risk levels could be further reduced
- An understanding of the specific actions that could be taken to reduce risk
- Compliance with recognised good practice
- Meeting the expectations of the competent authority
- Demonstrating that employees are exposed only to risks that are as low as reasonably practical (ALARP)
- Focussed risk reduction and allocation of resources