## PROJECT ASSESSMENT REPORT

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**Project:**
Sludge Packaging Plant

**Site:**
Sellafield Ltd

**Title:**
Fire Safety Enforcement

**Licence Instrument No:**
Not applicable

**Nuclear Site Licence No:**
Nuclear Site Licence Number 31G

**Legislation:**
Regulatory Reform (Fire Safety) Order 2005

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¹ Acceptance of the PAR to allow release of LI  
² Approval is for publication on ONR web-site, after redaction where relevant
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Relevant Inspectors / Assessors
Files: Programme Report File
Relevant Subject Files
Sellafield, Building

Fire Safety Design Enforcement

Project Assessment Report ONR-COP-PAR-14-002
Revision 0
28 April 2014
EXECUTIVE SUMMARY

Fire Safety Design Enforcement
Sellafield, Sludge Packaging Plant, Building

The Issue

Sellafield Ltd has recently completed the construction of a Sludge Packaging Plant designed to assist in the reduction of high hazard, high risk legacy material. National guidance consisting of Approved Document B to the Building Regulations and British Standard 9999 place limits on escape distances and specifies the requirements for fire protection to staircases. Elements of the guidance relating to the staircases have not been fully implemented. Sellafield's proposed mitigation measures do not adequately reduce the existing risk gap to the expected level.

Background

The sludge packaging plant is viewed as a critical enabler in the reduction of high hazard, high risk legacy material at Sellafield. The plant was originally designed as a partially open structure but later the plan was changed without addressing the fire safety implications of enclosing the two staircases. Following ONR intervention at another building project, Sellafield issued an internal notice giving instructions to assess compliance with relevant building codes for protected staircases. Prompted by these instructions, the Sellafield fire safety team identified deficiencies in the design of . A series of reports by third party fire consultants were subsequently commissioned to assess the fire safety issues and identify mitigation measures. Currently, the fire engineering recommendations have not been implemented and the building does not meet the expected standard for fire safety.

Assessment and inspection work carried out by ONR

In March 2014 an ONR Fire Safety Inspector attended the construction site and identified issues in the arrangements for construction fire safety and an inadequate risk assessment process. These issues were mainly due to management control in areas with limited escape provisions and were addressed quickly with the cooperation of the duty holder. The inspector further requested Sellafield to produce an action plan within 28 days to indicate measures to address the fire safety design issues for the final building.

At a subsequent meeting, Sellafield presented their mitigation plan which was designed to reduce the risk gap between the design and National building standards. Sellafield were advised that further work was necessary to achieve the expected level of compliance.

Matters arising from ONR's work

It is unlikely that full compliance with relevant building standards for fire safety can be achieved without impacting upon planned timescales to commence operation; however it is possible to significantly reduce the existing risk through a combination of structural alterations and additional control measures. Several proposals were discussed with Sellafield's fire engineers including providing additional escape routes, enhancing the existing fire protective measures and measures to control fire growth.
Conclusions

The Enforcement Management Model's initial enforcement expectation indicates an Enforcement Notice. The notice would require improvement to means of escape and other fire safety provisions within a specified time period whilst allowing continued use of the building, subject to agreed additional interim control measures.

Enforcement is considered necessary for two reasons. Sellafields’ Major Project Team did not act on advice from their own in-house fire safety expertise and third party fire engineers when informed of the fire safety design issues. Secondly, the solution produced by Sellafield’s Fire Engineers on the direction from ONR, did not sufficiently reduce the risk gap.

Recommendation

It is recommended that an Enforcement Notice is served on Sellafield Ltd to reduce the risk to people from fire in building [Redacted]. The notice may allow reasonable time to close out the additional works, subject to interim control measures, to improve means of escape to an acceptable standard; whilst also allowing normal commissioning and planned operation to take place. It is believed that this course of action will comply with ONR’s Sellafield strategy, resolve the immediate issue and have a long term beneficial value for other current and future projects on site.
**LIST OF ABBREVIATIONS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ALARP</td>
<td>As low as reasonably practicable</td>
</tr>
<tr>
<td>BSL</td>
<td>Basic Safety level (in SAPs)</td>
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<tr>
<td>BSO</td>
<td>Basic Safety Objective (in SAPs)</td>
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<tr>
<td>CNS</td>
<td>Civil Nuclear Security (ONR)</td>
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<td>HOW2</td>
<td>(Office for Nuclear Regulation) Business Management System</td>
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<td>HSE</td>
<td>The Health and Safety Executive</td>
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<td>IAEA</td>
<td>The International Atomic Energy Agency</td>
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<td>NDA</td>
<td>Nuclear Decommissioning Authority</td>
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<td>ONR</td>
<td>Office for Nuclear Regulation</td>
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<td>PCER</td>
<td>Pre-construction Environment Report</td>
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<td>PCSR</td>
<td>Pre-construction Safety Report</td>
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<td>PSA</td>
<td>Probabilistic Safety Assessment</td>
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<td>PSR</td>
<td>Preliminary Safety Report</td>
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<tr>
<td>RGP</td>
<td>Relevant Good Practice</td>
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<tr>
<td>SAP</td>
<td>Safety Assessment Principle(s) (HSE)</td>
</tr>
<tr>
<td>SFAIRP</td>
<td>So far as is reasonably practicable</td>
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<tr>
<td>SSC</td>
<td>System, Structure and Component</td>
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<tr>
<td>TAG</td>
<td>(ONR) Technical Assessment Guide</td>
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OFFICIAL

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1 Enforcement Context

This assessment report summarises ONR Fire Safety inspectors’ findings in relation to compliance with the Regulatory Reform (Fire Safety) Order 2005 and, as a result of the identified shortfalls, it recommends enforcement action should be taken. The recommended action has been determined in accordance with the principles of ONR’s Enforcement Policy.

2 BACKGROUND

History of the project

The Office for Nuclear Regulation has a statutory obligation to enforce the Regulatory Reform (Fire Safety) Order 2005, on Nuclear Licensed Sites. This legislation applies to all buildings and plant at the Sellafield site and places duties on the employer (as ‘responsible person’) to make adequate provisions for fire safety. ONR Fire Safety Inspectors have identified features relating to the design of building [BLANK], Sludge Packaging Plant, which do not meet the expectations of current building codes and which could leave people at risk in the event of a fire.

The recently constructed Sludge Packing Plant [BLANK] is a project that is considered a critical enabler in the reduction of high hazard, high risk legacy material at Sellafield. The structure is a new build facility designed to collect and store sludge from the First Generation Magnox Storage Pond. Sludge is pumped to the facility via a pipe bridge from [BLANK] where it is held within three stainless steel Buffer Storage Vessels prior to being processed for long term storage by future plant.

In 2007, [BLANK] a contractor completed a fire strategy document for the planned building utilising a mixture of Approved Document B (Building Regulations) and BS 9999 along with elements of fire engineering. Sellafields’ Fire Engineering Department at Risley and Fire Safety Department jointly contested the results of report based on inappropriate selection of favourable conditions from the different guidance documents.

At some stage between 2007 and 2011, a significant design change occurred on the project. The original building had the operations floor open to the elements. Later this was changed by the introduction of an overbuilding, which effectively enclosed the operations floor and the two staircases. Serco produced a fire risk assessment in 2011 for the enclosed building which was again challenged by Sellafields’ in house Fire Safety experts who articulated their concerns to the building design team.

In February 2013 an OPEX Red was issued in relation to a similar problem that had been identified by ONR Fire Safety Inspectors on the Evaporator D project. The OPEX called for an assessment of all other construction projects to determine if any other similar problems existed and required all works to cease until a “clean bill of health” was identified. A further assessment of the fire safety design for [BLANK] was carried out in March 2013 involving an independent fire safety consultant, [BLANK]. His report identified a number of recommendations to improve fire safety, which were never implemented. A further report commissioned in November 2013 based on BS 9999, tried to justify the existing conditions but the document again failed to satisfy Sellafields’ own Fire Safety experts.

The project team were informed that a “compelling advice” notice would be issued on the building by Sellafields’ Fire Safety Department when the building was handed over for operational use. Subsequently, the project agreed to implement the findings of the independent report. However at the time of the ONR inspection in March 2014, no progress had been made against the implementation of these recommendations.
**Current Departures from Building Design Codes**

Attached to the outside of the building are a number of service modules which sit on top of each other in the following configuration; Ground floor is the 11 Kv substation and switchgear room. The first floor is the CE & I Distribution module. The second floor is the compressor module and the third floor is the ventilation module. The top floor is the operations floor where five people could be working.

The two staircases contain significant fire loading and ignition sources due to the presence of a large number of high voltage cables from an 11kv substation and switchgear. A further hazard is introduced by the presence of ventilation grills which open directly into the staircases from adjacent service modules. Unlike the expectation of Approved Document B, which requires every internal stair to be a protected stairway, neither of the two staircases serving this building meets the standard. See the extract below from Approved Document B:

> “Every internal escape stair should be a protected stairway i.e. it should be within a fire resisting enclosure” [ADB2, 4.32]
> “Protected stairways are designed to provide virtually ‘fire sterile’ areas which lead to places of safety outside the building. Once inside a protected stairway, a person can be considered to be safe from immediate danger from flame and smoke” [ADB2, B1.ix]

### 3 ASSESSMENT AND INSPECTION WORK CARRIED OUT BY ONR

**Construction Phase**

The building project for [redacted] is approximately 95% completed. All of the structural work is finished and the remaining activity is in relation to the fit out of certain elements of plant and associated instrumentation. For the purposes of the project Sellafield are considering the project to be in the construction phase. The project team anticipate a target hand over date for this building will be in May / June 2014, with active commissioning commencing in November 2014.

Prior to my initial inspection, I was provided with a copy of the Fire Risk Assessment (FRA) for the ongoing construction phase of the project which was neither suitable nor sufficient for the purpose it was designed to achieve. The document did not consider all of the risks and hazards that existed. The risk mitigation measures required enhancement and my inspection of the project site identified a number of fire safety conditions which needed attention. Due to inadequate means of escape and warning in the event of a fire for those persons working on the top of the three buffer storage vessels, I placed a requirement on the major projects team to review and amend the FRA within seven days of my inspection. This was duly achieved and appropriate control measures were implemented within the required time frame.
Final Building Design (Fire Safety)

Although build projects, such as those on Nuclear Licensed Sites, are exempt from the requirement to participate in the Building Regulation process, they are not exempt from satisfying the requirements of the Regulatory Reform (Fire Safety) Order 2005 and the Fire Scotland Act 2005. Satisfying the functional requirements of the Building Regulations by application of the guidance in Approved Document B or BS 9999 or BS 7974, will ensure adequate fire safety conditions.

The current design does not apply any of the above standards fully and, as a result, the fire safety conditions do not conform to minimum expectations. In particular, inadequate fire protection to the escape routes increases the travel distances to reach a place of safety which is in excess of the recommended maximum described in the standards.

Risley improvement plan

On the 23rd April 2014, Sellafield presented ONR with their proposed strategy to overcome the current shortfalls in the design relating to fire safety. ONR were not satisfied that the proposals adequately addressed the risk gap between the level of safety that would be expected by adopting national standards and the level of safety that would be produced by the proposed improvement plan. Also the proposals did not implement the hierarchy of measures to control risk and an ALARP justification was not provided.

4 MATTERS ARISING FROM ONR’S WORK

Construction fire safety is now considered adequate. ONR’s intervention resulted in a full review of the Fire Risk Assessment process for the construction phase by the project team. The FRA document is now of an acceptable standard and has recorded adequately the significant findings and the actions required to reduce any risk gap that exists. The project team are providing ONR with regular updates of the construction phase FRA as and when they are carried out.

Fire Safety for the final occupied use of the building remains a key focus of regulatory interest. ONR Inspectors informed the project team that they should conduct an optioneering process to consider all possible options to address the shortfalls. This piece of work is currently being carried out and the following timeframe has been provided by Sellafield:

1. Define requirements (confirm Building Regulation requirements) - Complete
2. Identify Options - Targeted to be undertaken on the 6th May.
3. Develop Options - Targeted to be complete on the 16th May.
4. Define Evaluation Criteria - Targeted to be complete on the 9th May.
5. Evaluate/Select Options - Targeted to be complete on the 23rd May.

 Enforcement Management Model

Form EMM1 has been completed to determine what, if any, enforcement action should be considered resulting from ONR’s findings in relation to the fire safety conditions for the final design in

The enforcement management model indicates an improvement notice due to the risk gap between the actual risk and the benchmark.
5 CONCLUSIONS

Between the initial concept in 2007, and the current building, a number of design changes have taken place. The primary change has been the decision to introduce an over building which had significant impact on the fire safety conditions in the building and in particular on the means of escape. The major project team were aware of the fire safety issues but did not act on this information. The issue of an OPEX Red in February 2013, again highlighted shortfalls in safety and prompted recommendations from several reports which were not implemented.

It would appear that a significant checkpoint was missed during the design and construction of this building. At the point where it was decided to erect an overbuilding, to enclose what is now the operations floor, a full review of the fire safety provision for the entire building should have taken place. If this review had been carried out it would have been clear that the means of escape from the upper areas of the building were outside acceptable limits.

6 RECOMMENDATIONS

A risk exists in that in the event of a fire, safe escape could be affected by extended distances and limited fire protection to the escape routes. It is recommended that ONR should issue an Enforcement Notice under the Regulatory Reform (Fire Safety) Order 2005 to Sellafield Ltd, requiring an adequate standard of fire safety as described in the functional guidance for Building regulations or other suitable standard.

Enforcement is considered necessary for two reasons. The Major Project Team were repeatedly informed of fire safety deficiencies by their own in-house fire safety expertise and by third party fire engineers. When ONR gave directions to provide an action plan for remediation measures, the solution from Sellafield Fire Engineers at Risley could not provide an ALARP justification and did not reduce the risk gap adequately.

The notice will allow reasonable time to close out the works, subject to interim control measures, to improve means of escape to an acceptable standard; whilst also allowing normal commissioning and planned operation to take place. It is believed that this course of action will comply with ONR’s Sellafield strategy, resolve the immediate issue and have a long term beneficial value for other current and future projects on site.
7 REFERENCES

1. Regulatory Reform (Fire safety) Order 2005

2. Approved Document B Volume 2

3. HSG 168 http://www.hse.gov.uk/pubns/books/hsg168.htm


5. British Standard 7979 – Trim Ref 2012/171909