



Design Note

Project Reference: Arcadia Leisure Centre & Library Plant

Prepared by Jon Corden (MCIOB, MIFireE, FACQP FInstLM)

Date 1-10-21

Subject Plant Enclosure External Fire Spread Review

Revision 1 1-10-21

Revision 2 5-10-21

Introduction

It is proposed to provide an additional plant enclosure to the Arcadia Leisure Centre and Library, located in Levenshulme, Greater Manchester. The plant enclosure will be within a standalone external container and will comprise:

- Three air-source heat pumps and associated vessels and control equipment.
- Energy Storage System (ESS) battery.

Cabling and pipework will be run beneath ground, connecting to the plant equipment within the Leisure Centre & Library building.

The containerised plant enclosure is currently planned to be within 3m of the adjacent boundary, leading to the local Network Rail line. Typically, prescriptive guidance such as Approved Document B (1) would allow the site boundary adjacent to public highways (such as roads, rivers, railways) to be taken as the midpoint of the track, rather than the site boundary. However, in this instance, Network Rail have requested an assessment of the external fire spread risk across the site boundary.

This design note summarises the external fire spread assessment of the plant enclosure and demonstrates that, when compared to a typical building located in the same position, the risk of external fire spread across the boundary that would compromise Network Rail operations, is appreciably low.

Jon Corden Consulting Ltd

Jon@joncordenconsultingltd.co.uk

Tel: 07725200855

www.joncordenconsultingltd.co.uk

Company Reg: 09704310



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The external fire spread assessment is limited to that expected by prescriptive guidance to Part B of the Building Regulations (2). This assessment does not consider additional specific explosion risk, if necessary, should be addressed to the specialist designer of the plant equipment. This assessment also does not consider smoke production, which may be of greater impact on Network Rail however there are many other properties lining Network Rails boundary that would be a similar risk.

Basis of Assessment

Consideration of Fire Risk

The containerised plant enclosure is located external to the Arcadia Leisure Centre and Library building only due to lack of space within the building itself. In accordance with prescriptive guidance, the larger building would require assessment to consider external fire spread in regard to its occupancy type, of which the plant areas would be ancillary.

The containerised plant enclosure comprises plant equipment that is expected to be manufactured in accordance with prescriptive guidance (refer to specialist design info). Consequently, the risk of ignition is principally limited to product failure, incorrect installation, and compromise from external elements (such as weather conditions and arson) which are beyond the remit of Building Regulations consideration.

The plant equipment is constructed primarily of metal panelling and vessels and pipework with some cabling meeting appropriate guidance (refer to specialist design info). Therefore, although risk of ignition might be greater than in typical buildings, the risk of fire growth is appreciably low due to lack of combustibles within the enclosure.

The enclosure itself is typical steel container construction with expanded insulation within. Although this represents combustible construction (within the container), this would be no greater than that allowable in a typical building of less than 18m in height in accordance with prescriptive guidance.

Assessment Methodology

BR 187 (3) methodology has been adopted for the assessing the risk of external fire spread from unprotected openings across the relevant boundaries.

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In consideration of the risks associated with the plant enclosure contents and construction, it is proposed that the heat release rate associated with the enclosure is no greater than would be expected if the plant enclosure was located within the assembly building. Consequently, assessment of the external fire spread risk for an assembly building of similar size and location is considered appropriate.

External Fire Spread Assessment

Geometry

The plant enclosure has dimensions as follows:

- Heat pump enclosure = 11250mm x 3000mm (approximate height).
- Energy storage system = 3350mm x 3000mm (approximate height).

The heat pump enclosure is located 3500mm from the boundary. The energy storage system is stepped back a further 1500mm and can therefore be discounted from the assessment.

It is noted that although the boundary is 3500mm from the enclosure, the rail tracks and adjacent operating area is on a raised embankment approximately 3m above the ground level on which the enclosure is located.

Assessment

In accordance with Table A of BR187, illustrated in **Figure 1**, the enclosing rectangle of the plant enclosure is 12.0m (width) x 3m (height) and located such that the minimum boundary distance is 3.5m from the radiating panel (enclosure wall). Therefore, the maximum allowable unprotected area is 100%, i.e. the external wall would not require any additional fire protection measures.

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Figure 1: Table A of BR187 illustrating unprotected area

Table A: Enclosing rectangle 3 m high									
Distance from relevant boundary for unprotected percentage not exceeding									
Width	20%	30%	40%	50%	60%	70%	80%	90%	100%
Minimum boundary distance (m)	Figures in brackets for residential, office and assembly uses								
3.0	1.0 (1.0)	1.5 (1.0)	2.0 (1.0)	2.0 (1.5)	2.0 (1.5)	2.5 (1.5)	2.5 (2.0)	3.0 (2.0)	3.0 (2.0)
6.0	1.5 (1.0)	2.0 (1.0)	2.5 (1.5)	3.0 (1.5)	3.0 (2.0)	3.5 (2.0)	3.5 (2.5)	4.0 (2.5)	4.0 (3.0)
9.0	1.5 (1.0)	2.5 (1.0)	3.0 (1.5)	3.5 (2.0)	3.5 (2.5)	4.0 (2.5)	4.5 (3.0)	4.5 (3.0)	5.0 (3.5)
12.0	1.5 (1.0)	2.5 (1.0)	3.0 (1.5)	3.5 (2.0)	4.0 (2.5)	4.5 (3.0)	5.0 (3.0)	5.5 (3.5)	5.5 (3.5)
15.0	2.0 (1.0)	2.5 (1.5)	3.5 (2.0)	4.0 (2.0)	4.5 (2.5)	5.0 (3.0)	5.5 (3.5)	6.0 (3.5)	6.0 (4.0)
18.0	2.0 (1.0)	2.5 (1.5)	3.5 (2.0)	4.0 (2.5)	5.0 (2.5)	5.5 (3.0)	6.0 (3.5)	6.5 (4.0)	6.5 (4.0)
21.0	2.0 (1.0)	3.0 (1.5)	3.5 (2.0)	4.5 (2.5)	5.0 (3.0)	5.5 (3.0)	6.0 (3.5)	6.5 (4.0)	7.0 (4.5)

Conclusion & Recommendations

Assessment Conclusion

The following items outline the conclusions of this assessment:

- External fire spread across the boundary to the public highway is not typically expected by prescriptive guidance, but is provided in this instance to provide assurance that the risk to Network Rail operations is appreciably low.
- The assessment considers only the risk of external fire spread, appropriate to that expected by prescriptive guidance to the Building Regulations. The assessment does not consider explosion risk, which is beyond the remit of Building Regulations. The assessment does not consider smoke production, which may be of greater impact to Network Rail operations.
- The content and construction of the enclosure is such that it bears no greater risk than if it was a similarly sized assembly building in the same location. This forms the basis of the assessment.
- Assessment in accordance with BR187 demonstrates that 100% of the building façade can be unprotected and therefore no additional fire protection measures are required.
- The assessment of the enclosure in accordance with BR187 represents a conservative approach in consideration that:
 - The fire risk is contained within non-combustible materials, providing an inherent radiation shield.
 - The enclosure is external and therefore, should it be compromised, the majority of radiative heat transfer would not be directed horizontally, but vertically and thus less impact on the boundary.
 - The tracks and operating area for Network Rail is located at least a further 3m from the boundary line and therefore less affected by radiative heat transfer.

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- The tracks and operating area for Network Rail is located on an embankment elevated approximately 3m above the enclosure ground level. This embankment will form a natural shield to majority of the radiative heat transfer.
- The assessment considers a fully developed compartment fire within the enclosure, which is unlikely to occur (due to lack of combustibles) and would likely require significant time. The assessment therefore does not consider management or fire service intervention.

Recommendations

It is recommended that the Arcadia Leisure Centre and Library management consider the following:

- Ensure there is 3.5m separation (increased from 3m currently drawn) to comply with the table in BR187.
- Provide means to ensure fire or failure in the plant enclosure alerts the main building fire alarm panel or other managed location.
- Ensure that the enclosure is secured and not used for storage of combustible goods.

References

1. HM Government, The Building Regulations 2010, Approved Document B (Fire Safety), Volume 2 – Buildings other than dwellings, 2019 edition incorporating 2020 amendments (for use in England).
2. Statutory Instruments, '2018 No. 1230 Building and Buildings, England, The Building (Amendment) Regulations 2018'.
3. R. Chitty, 'External Fire Spread – Building separation and boundary distances' (BR 187), Second Edition, 2014.

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