An Bord Pleanála

FSC Report

ABP 307237-20

Appeal v Refusal or Appeal v Condition(s)	Appeal v Condition
Development Description	Proposed construction of a warehousing building with a two storey ancillary office accommodation at Unit D8, Horizon Logistics Park, Dublin Airport, Swords, Co Dublin
An Bord Pleanála appeal ref number:	ABP.307237-20
Building Control Authority Fire Safety Certificate application number:	FSC/19/4076
Appellant & Agent:	Appellant : Green REIT Horizon DAC Agent : Pro-Fire & Design Ltd
Building Control Authority:	Fingal County Council
Date of Site Inspection	NA
Inspector/ Board Consultant:	Stefan Hyde
Appendices	NA

1.0 Contents

2.0 Introduction

2.1 Subject Matter of Appeal

This report sets out my findings and recommendations on the appeal submitted by Pro-Fire & Design Ltd. [hereafter referenced as PFD] on behalf of their Client, Green REIT Horizon DAC, against Condition No. 2 attached to the Fire Safety Certificate (Reg Ref No. FSC/19/4076) granted by Fingal County Council [hereafter referenced as FCC] in respect of Proposed construction of a warehousing building with a two storey ancillary office accommodation at Unit D8, Horizon Logistics Park, Dublin Airport, Swords, Co Dublin.

It is noted that the building comprises a speculative high bay warehouse with a limited area of ancillary office accommodation.

The Applicant notes in the FSC submission that a tenant has not been confirmed for the warehouse – quoting from para 0.1 of PFD Compliance report 19014-CR-01 (Rev 1) – and therefore the racking layout indicated on the FSC drawings is of necessity speculative in nature.

The Applicant has however indicated that high bay racking may be employed in the fit-out of the warehouse and accordingly the Fire Safety Certificate application is intended to cater for this condition of use.

The Applicant has also indicated that the goods which will be stored in the warehouse will fall within the following list.

GROUP 5/3

Roofing felt in rolls (stored vertically)
Rubber goods
Wood goods
Oil and wax paper
Cardboard and paper rolls (stored vertically)
Foams and plastics (packed and unpacked) and all products packed in foam material
Cellulose
Wooden pallets, wooden battens and well aerated stacks of wood.
Celluloid

The Applicant goes onto state that in the event that the goods stored do not fall within the above list additional measures will be provided as neccessary to cater for any increase in fire severity that may arise.

The Fire Safety Certificate was granted on 20th April 2020 with 3 conditions attached.

Condition 2, which is the subject of the appeal, reads:

Condition 2
The premises is to be provided throughout with a sprinkler installation in accordance with the relevant provisions of IS EN 12845. The design of the ventilation system is to take account of the possible effects of the sprinkler system on the fire

With the stated reason for the condition being:

Reason:
To comply with Parts B1 and B5 of the Second Schedule to the Building Regulations, 1997 – 2019.

The appeal is against a single condition. De novo consideration is not warranted and the Board can rely on the provisions of Article 40(2) of the Building Control Regulations and deal with the appeal on the basis of condition only albeit Condition 3 – which deals with the fire/smoke venting of the warehouse – is a related condition in the context of outcome of Condition 2.

2.2 Documents Reviewed

1.2.1 Fire Safety Certificate Application and Supporting Documentation submitted by PFD on behalf of their Client including all additional information submission

1.2.2 Decision and grant by FCC on 20.04.2020 with 3 conditions attached

1.2.3 Appeal submission to An Bord Pleanala by PFD dated 21.05.2020

1.2.4 Appeal submission to An Bord Pleanala by FCC dated 18.06.2020

1.2.5 Appeal submission to An Bord Pleanala by PFD, in response to FCC submission referenced in 1.2.4 above, dated 22.07.2020.

3.0 Condition 2 – Consideration of Arguments by Appellant and BCA

3.1 Condition 2

Condition 2
The premises is to be provided throughout with a sprinkler installation in accordance with the relevant provisions of IS EN 12845. The design of the ventilation system is to take account of the possible effects of the sprinkler system on the fire

Reason:
To comply with Parts B1 and B5 of the Second Schedule to the Building Regulations, 1997 – 2019.

Insofar as the reason stated in the Grant of Fire Certificate for the imposition of Condition 2 is generic in nature it is considered appropriate to set out, in the first instance, the Case made by FCC as outlined in more specific detail in their appeal submission to ABP dated 18th June 2020.

Case made by FCC in respect of Condition 2

The FCC case for the imposition of Condition 2 is set out in the submission to ABP dated 18.06.2020 and the key points are summarised as follows:

I. FCC note that the basis for compliance as set out in the Applicants FSC submission is Technical Guidance Document B. However they go onto note – correctly – that travel distances being proposed are considerably in excess of the "limits" set out in Table 1.2 of TGDB for storage occupancies. In this regard they note that the Applicant has proposed travel distances of 54.5m whereas the TGDB limit is 45m for Normal Risk Storage occupancies i.e. a 21% excess. The 54.5m distance in turn has been extracted from the PFD Compliance Submissions whereas a review of the applicant's drawing 151094-DR-09 Rev 1 would indicate that the "worst case" travel distance is approximately 57m at gridline 9 which in turn yields a 27% excess of the TGDB limit.

   Furthermore it is noted that the racking layout indicated on the FSC drawings is purely speculative as no Tenant is yet on board according to the Applicant. In those circumstances TGDB, in footnote 2 to Table 1.2, advises that the design should be based on Direct Distances which are calculated at 2/3rds of the travel distance. Adopting this approach yields a code limit for Direct Distances of 30m whereas the proposed worst case Direct Distance is circa 50m. Accordingly it can be argued that the proposed warehouse has escape distances some 67% in excess of TGDB limits insofar as the actual layout of aisles/racking is not known at this stage.

   FCC go on to contend that the Applicant has not proposed any additional measures over and above those which TGDB would require had there been no excess of travel distance and no high bay rack storage.

II. FCC also dispute the appropriateness/correctness of the Design Fire which has been employed by the Applicant in addressing the excess travel distance noted in sub-para (i) above and also used by the Applicant in support of the design of the roof venting system which is being proposed to assist the fire service in undertaking fire-fighting and rescue operations as required in Clause 5.4.3.3 of TGDB.

In particular FCC contend that a Steady State Design Fire, as has been proposed by the Applicant, is not appropriate in an unsprinklered occupancy and that the design ought therefore to have been based on a growing fire with appropriate fire growth parameters. In this regard they also note that the BS9999:2017 *Fire safety in the design, management and use of buildings – Code of practice* identifies that the fire growth rate used for an unsprinklered high bay warehouse should follow the "Ultra fast" growth profile i.e. the most severe fire growth profile. FCC further note that a fire growing unchecked and following an Ultra-fast growth profile reaches the design fire size being proposed by the Applicant – 20.5MW – in only 6 minutes and reaches 270MW at 20 minutes.

III. FCC also note that the Applicant has not considered local collapse of a high bay racking system in the fire engineering analysis which they submitted in support of the case for increased travel distances i.e. which would, for instance, potentially block off access to one route of escape and force all occupants to use the other escape routes.

IV. In light of the foregoing, FCC contend that the imposition of sprinkler protection is justified in the circumstances having regard to the deviations from the TGDB limits in terms of travel distances and having regard to the lack of adequate substantiation of the venting system in terms of compliance with Clause 5.4.3.3 of TGDB or as a trade-off against the substantial increase in travel distance.

Case made by PFD in respect of Condition 2

The key points made by PFD in support of their appeal, as set out in the various documents referenced in 1.2.1, 1.2.3 and 1.2.5 above, are summarised as follows:

I. PFD contend that the excess in travel distance compared to the aforementioned "limits" in Table 1.2 of TGDB has been adequately substantiated in the fire engineering analysis prepared by B-Fluid Buildings Fluid Dynamics [hereafter referenced as BF] – i.e. the BF report dated 23.03.2020 and submitted as part of the FSC application documents. In particular PFD argue that the fire engineering report demonstrates that the Available Safe Egress Time (ASET) exceeds the Required Safe Egress Time [RSET] by a factor of 5. It is noted that the analysis prepared by BF is based on a 20.5MW Steady State Design Fire and the associated egress analysis is based on the racking configuration indicated on the FSC plan drawing 151094-DR-09 Rev 1.

II. PFD also contend that the fire engineering analysis prepared by BF confirms that the level of roof venting being provided is sufficient to satisfy the requirements of 5.4.3.3 of TGDB i.e. is sufficient to provide adequate assistance to the fire services without recourse to sprinkler protection. In this analysis a 20.5MW Steady State Design Fire is again employed. PFD contend that a 20.5MW Steady State Design Fire is appropriate in consideration of means of escape and fire service intervention and refer to the Smoke Ventilation Association document *Guidance for the Design Of Smoke Ventilation Systems For Single Storey Industrial Buildings, Including Those With Mezzanine Floors, And High Racked Storage Warehouses Rev 3* in support of this Design Fire. PFD further contend that the design is in full compliance with US NFPA 204 *Standard for Smoke and Heat Venting* being the standard referred to in 5.4.3.3 of TGDB. BF have also illustrated in Appendix 4 of their report that the venting being proposed is also capable of dealing with larger pallet fires of up to 102.5MW. It is noted that Appendix 4 of the BF report is concerned with a notional warehouse and not the subject warehouse. It is also noted

that Appendix 4 is concerned with the consideration of means of escape only and not with fire service intervention.

III. PFD take issue with FCC referring to BS9999:2017 in assessing the PFD proposals and contend that this is cherry-picking on the part of FCC as the design in this case was presented on the basis of compliance with TGDB. However it is noted that PFD also reference BS9999:2017 in Section 1.3.1 of their Compliance Report in support of their case for increasing travel distances beyond the limits in TGDB. PFD do correctly note however that BS9999:2017 does not require the provision of roof smoke/heat venting. They go onto contend that their design which incorporates automatic roof venting is an entirely different approach to BS9999 which although requiring sprinklers for High Bay Warehousing does not also require roof venting.

4.0 Assessment

B5 Smoke and Heat Venting to Assist the Fire Service

I do not concur with the Applicant that a Steady State 20.5MW Design Fire is appropriate in designing smoke and heat venting intended for the assistance of the fire service in an unsprinklered warehouse as is proposed in this instance and in particular a high bay warehouse where the flue effect between adjacent bays can result in rapid vertical and horizontal fire spread.

In this regard it is noted that PD 7974-1: 2019 suggests an Ultra-Fast fire growth rate for Cardboard and Plastic boxes in a vertical configuration as might be found in a high bay warehouse – see extract below.

Table A.2 — *Standardized fire growth rates [BS ISO/TR 13387-2]*

Growth rate	α (kW/s²)	n (-)
Slow	0.003	2
Medium	0.012	
Fast	0.047	
Ultra-fast	0.188	

Table A.3 — *Fire growth rates for some discrete fuel assemblies*

Growth rate	α (kW/s²)	n (-)	References
Cars – engine bay fire	0.01 to 0.06	2	[17]
Office reception workstation	0.003		
Wood frame chairs	0.008 to 0.017		
Stacked pallets	0.01		
Double bed	0.08		
Racked goods	0.0448 (per tier)	3	[40]
Upholstered furniture and stacked furniture near combustible linings	0.188	2	BS ISO/TR 13387-2
Office furniture — horizontally distributed	0.012		
Floor coverings	0.003		
Cardboard or plastic boxes in vertical storage arrangement	0.188		
Bedding	0.047		

This is also consistent with BS9999:2017 which in Table 3 also specifies an Ultra-Fast fire growth rate for high racked storage – refer extract below.

Table 3 **Fire growth rates**

Category	Fire growth rate [A]	Fire growth parameter [B] kJ/s³	Description	Typical examples [C]
1	Slow	0.003	Evenly distributed low level fire load, small discrete packets of fuel or material of limited combustibility [D]	Reception areas, concourses (without concession outlets) and halls with limited fire load such as sports stadia and foyers
2	Medium	0.012	Evenly distributed low to mid-level fire load comprising a mix of combustible materials	Offices, lounges, classrooms, auditoria, seating areas, galleries and car parks [E]
3	Fast	0.047	Stacked combustibles (on or off racking and shelving but excluding high rack storage), some small quantities of materials other than materials of limited combustibility [D] (or where larger quantities are stored in separate fire-resisting enclosures), process, manufacturing or storage of combustible materials	Shop sales areas [F], workshops, factories and small storage buildings
4 [G]	Ultra-fast	0.188	Medium to large quantities of materials other than materials of limited combustibility [D], high racked storage, flammable liquids and gases or where rapid uncontrolled fire growth could occur	Warehousing [H], processing plants and car parks [E] utilizing a car stacker or similar method where there is no fire separation between stacked cars

Furthermore it is noted that BF reference the structural Eurocode EN1991-1-2 in their report – however the Irish National Annex to EN1991-1-2 is also clear in noting that the fire growth rate for storage occupancies is Ultra-fast and is therefore consistent with BS9999 and PD7974.

NA to I.S. EN 1991-1-2:2002

Table NA.4 – Design fire growth rates

Building use	Fire growth rate
Picture gallery	Slow
Transport (public place)	Slow
Classroom (school)	Medium
Dwelling	Medium
Office	Medium
Hotel reception	Medium
Hotel bedroom	Medium
Hospital room	Medium
Library	Fast
Theatre (cinema)	Fast
Shop	Fast
Industrial storage or plant room	Ultra-fast

The Applicant appears to be relying upon Table 1 of the Smoke Ventilation Association Guide in arriving at the Design Fire of 20.5MW and 72sqm. However the SVA Guide is clear that Table 1 does not apply to High Bay Storage Warehouse and therefore is not applicable to the subject building.

Also in arriving at a Design Fire size the Applicant makes no calculation of the likely time to Effective Fire Service Intervention which comprises a series of time segments i.e. Alerting Time + Mobilisation Time + Travel Time + Setup Time.

The Applicant ought to have in my view considered a Growing Fire up to the time of Effective Fire Service intervention and not a Steady State fire. It is further noted that a 20.5MW fire size will occur in circa 6 minutes based on an Ultra-Fast fire growth rate and accordingly is likely to be significantly exceeded at time of Effective Fire Service Intervention which can be expected to be well in excess of 6 minutes.

B1 Means of Escape

It is clear that the scale of the warehouse is giving rise to escape distances considerably greater than the limits in Table 1.2 of TGDB. The excess based on Direct Distance calculations - being the methodology recommended in TGDB for speculative buildings where the layouts of aisles is not known – yields a 67% increase in Direct Distances which in turn yields a Design Travel Distance of 45 x 1.67 = 75m thereby catering for less favourable aisle configurations than has been shown on the indicative layout submitted in the FSC application. In my opinion the Egress Analysis which was undertaken by BF ought to have considered aisle configurations yielding this higher travel distance of 75m and not the lesser 57m distance in the more favourable Notional layout on the FSC drawings: the effect of same will be an increased RSET.

Furthermore it is noted that the BF analysis does not consider the impact of the loss of access to one of the exits as a result, for instance, of localised failure of the racking system which in turn will also result in an increase in RSET.

Finally, the smoke filling analysis has been undertaken using a Steady State 20.5MW fire whereas it ought to have been undertaken using a Growing Fire as referenced above. Given the substantial excess in travel distance over and above the TGDB limits the analysis ought also to

have considered various heat release rates as part of a sensitivity analysis since the effectiveness of the venting system is significantly dependent on the smoke layer temperatures which in turn are dependent on the heat release rate of the fire. Accordingly for means of escape a larger fire with a lower heat release rate may yield a lower ASET than would a similar size fire with higher heat release rate.

In summary the analysis as submitted does not in my opinion adequately demonstrate that the roof venting being proposed provides a sufficient trade-off to justify the significant excess travel distances arising compared to TGDB limits. It is possible that had the Applicant undertaken a more comprehensive transient fire growth/smoke production analysis combined with an appropriate sensitivity analysis to address different aisle configurations and varying heat release rates they may have been able to show compliance with B1 of the Second Schedule: however it is considered that the analysis as submitted by the Applicant does not achieve this.

5.0 Conclusion/Recommendation

In light of the foregoing I consider that the BCA are justified in the imposition of Condition 2 requiring sprinkler protection of the warehouse.

Accordingly I recommend that the appeal be refused.

6.0 Reasons and Considerations

The Applicant has not in my opinion demonstrated that the smoke venting being proposed in the roof of the warehouse adequately offsets the excess in escape distances compared to the limits in Technical Guidance Document B nor has the Applicant demonstrated that the smoke/heat venting is adequate to satisfy 5.4.3.3 of Technical Guidance Document B having regard to the speculative nature of the development, the fact that the application is intended to cater for unsprinklered high bay storage and having regard to the likely time to Effective Fire Service Intervention.

In light of the foregoing I consider that the BCA are justified in the imposition of Condition 2 requiring sprinkler protection of the warehouse.

7.0 Conditions

None

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STEFAN HYDE
Chartered Engineer I BA, BAI, PDip FSP, MA, CEng, MIEI
Consultant/Inspector

Date : _____