



JENSEN HUGHES

Appeal Against Condition attached to Fire Safety Certificate (FSC/19/6117F/7D)

Project	Greenogue Industrial Estate
Local Authority	South Dublin County Council
Date	15 th June 2021

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1.0 INTRODUCTION

The project involves the construction of a new storage unit with two ancillary office blocks within it at Greenogue Industrial Estate.

A Fire Safety Certificate application for the works was granted by South Dublin County Council on the 27th May 2020 with conditions. The following conditions were attached: -

Condition 1

The proposed works shall be carried out in compliance with the particulars submitted with the fire safety certificate application, including the additional information submissions received on 12th December 2019 and 28th January 2020.

Reason: To ensure compliance with Part B of the Second Schedule to the Building Regulations 1997 to 2019.

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 a fire.

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

Condition 3

The premises is to be used for 'normal risk' storage only as defined in Appendix E of Technical Guidance Document B 2006.

Reason: To ensure compliance with Part B3 of the Second Schedule to the Building Regulations, 1997 to 2019.

Condition 4

Where the final exits from the premises lead to platforms with external stairs to accommodate the level difference between the inside and outside of the building, these platforms are to be provided with either ramped routes for dispersal from the building or else disabled refuge spaces as per Section 1.4.15 of Technical Guidance Document B 2006. These routes and any associated refuge spaces are also to be protected with fire resistant construction as per Diagram 8 of the Technical Guidance Document B 2006.

Reason: To ensure compliance with Part B3 of the Second Schedule to the Building Regulations, 1997 to 2019.

2.0 INFORMATION REVIEWED

In assessing this appeal, the following information was considered: -

- Fire safety certificate application including report and drawings received.
- CFD Analysis of smoke ventilation system.
- Additional information submission from appellant dated 10th December 2019.
- Additional information submission from the appellant dated 27th January 2019.
- Fire safety certificate grant letter (Ref: FSC/445/20) dated 28th May 2020.
- Appeal submission from FCC Fire Cert Ltd (FCC) dated 19th June 2020.
- Report on assessment of fire safety certificate application dated 7th July 2020.
- Appeal submission from FCC Fire Cert Ltd (FCC) dated 17th August 2020.
- Evacuation modelling report from appellant (report and USB) dated 26th May 2021

3.0 DISCUSSION

3.1 BCA's Case

The main concern of the BCA is that the travel distances in the main warehouse at 69m are approximately 1.5 times the maximum recommended distance of 45m. They have stated that the crux of the applicant's case for demonstrating compliance is that the smoke venting system provided to satisfy the requirements of B5, has been upgraded to a smoke control system to justify these extended travel distances.

The BCA do not seem to have a problem with the concept of using a smoke control system to justify extended travel distances. However, because in their view there is the potential for high rack storage in the warehouse, they contend that the actual design of the smoke controls system is fundamentally flawed in the absence of sprinklers to control the size of the fire. They quote two issues with high rack storage

1. Fast fire growth rates which without suppression would lead to flash over and full involvement of the building in fire.
2. Racking collapse in a fire which would cause adjacent racks to fail and further increase the rate of fire spread in the warehouse. This they contend would further limit the time available for escape and the potential for fire fighter intervention in the building.

The BCA have a fundamental concern with the design fire size used in the CFD analysis that the appellant put forward. They state that the appellant justified the fire size on the basis of the guidance in section 4.1 of the Smoke Ventilation Association document "Smoke ventilation Technical Specification - Guidance for the design of smoke ventilation systems for single storey industrial buildings, including those with mezzanine floors, and high racked storage warehouses". They state that the approach is fundamentally flawed as this document states that section 4.1 excludes high racked storage warehouses.

The BCA also question the method of adjacent pallets becoming involved in a fire. The analysis assigned adjacent pallets with a predefined auto ignition temperature, however, no additional pallets were found to become involved in the fire. Considering the nature of fire development in high rack storage the BCA do not consider it credible that no additional pallets became involved in fire during the course of the model simulation.

The BCA also quote section 9.2 of the BCA guidance which states that flashover in these types of buildings is almost certain to occur and that the smoke ventilation system designer should strenuously recommend the installation of a sprinkler system.

The BCA also quote BS 9999:2017 as being a recently published guidance document reflecting current best practice and that this would recommend a sprinkler system if used as the basis of compliance.

3.2 Appellant's Case

The appellants core case is based on the following:

1. The building has been designed in compliance with TGD B 2006.
2. The building is a normal hazard single storey storage building.
3. Under the requirements of Part B of the second schedule to the Building Regulations, and with the guidance in TGD B 2006, a sprinkler system is not required for this type of building.

They also acknowledge that the travel distances in the warehouse exceed the recommendation in TGD B, but that this is considered acceptable as they have demonstrated by use of a CFD analysis that the smoke venting system provided ensures that tenable conditions are maintained for occupants escaping. An evacuation model has also been run to estimate the required safe egress time (RSET) and they contend that this is significantly less than the available safe egress time (ASET) afforded by the smoke venting system. They state that this demonstrates compliance with B1 of the Building Regulations, which was one of the two criteria provided by the BCA as the reason for the condition.

They also contend that they have satisfied the requirements for B5, in that the minimum requirement is a smoke clearance system, yet they have provided a full smoke control system which maintains a smoke clear layer.

3.3 Discussion

High bay storage warehouses pose a particular fire safety risk. Due to the fact that goods are stacked vertically rapid fire growth can occur. The reason for this is that smoke and hot gases from a fire at the bottom of a racking, pre-heats the fuel above and raises its temperature closer to its critical ignition temperature. As a result it takes a lot less to ignite the fuel above the seat of the fire, resulting in rapid fire growth. In the event of a fire in a high bay warehouse, full involvement of the building in fire, or flashover is a very real possibility and this poses particular difficulties for fire fighters.

The travel distances in the warehouse are 69m which is an increase of 24m over the maximum recommended. Assuming a walking speed of 1m per second for an able bodied person, that is an increase in the RSET (required safe egress time) of 24 seconds.

A code compliant means of escape design, assumes that occupants will queue at exits and that it takes a period of 2.5 minutes for them to pass through these. The physical evacuation time in a code compliant building would be 45 seconds to reach the exits and a further 2.5 minutes to pass through them. The total physical escape time would therefore, be 195 seconds.

In the proposed warehouse, the physical travel time to the exits would be 68 seconds. The calculated occupancy in the warehouse was given by the appellant as being 465. In reality this would be much smaller and likely to be in the range of 20-30 people maximum. The exit capacity in the building is calculated as being 1,000. Therefore, there would be minimal queuing at the exits as there is more than double the required exit capacity based on the design occupancy. A conservative assumption would be that the queuing time would be half the code compliant 2.5 minutes. This would result in a queuing time of 75 seconds and an overall physical escape time of 144 seconds which is less than 195 seconds estimated for a code compliant building.

Using this simplistic analysis it is clear that the provision of excess exit capacity alone, compensates for an increase in travel distance of 24m. It should be noted that the pre movement time of time to detection and then the time for escape to begin has been ignored as this would essentially be the same in each case.

On the basis of the above, therefore a sprinkler system would not be necessary to meet the requirements to comply with Part B1 of the Second Schedule to the Building Regulations, 1997 to 2019. The following parts of this assessment will therefore, look at the requirement of sprinklers to comply with B5 (Fire fighting).

The BCA have quoted their concern that a fire in this building could grow rapidly and lead to flashover and result in the racking collapsing. I would not dispute this concern. I would also have concerns with the CFD modelling carried out by the appellant. It is simply not credible to state that an uncontrolled fire in a high bay warehouse would not flashover before 20 minutes and that the smoke layer would maintained at 10m above ground at a temperature of 60°C. I have not had sight of the FDS input file but in my opinion how the fire has been modelled in this situation is fundamentally flawed.

Evacuation modelling was also carried out. However, instead of comparing the proposed building with a code compliant equivalent, the appellant has chosen to estimate evacuation times for an occupancy of 40 persons and an occupancy of 452 persons, and compared these with the available safe egress time (ASET). However, as noted above, I believe the ASET analysis to be flawed.

However, the key question is does the building comply with Building Regulations guidance an unsprinklered warehouse?

The compartment area of the warehouse is approximately 13,957m² which is within maximum area for an unsprinklered warehouse of 14,000m². To comply with B3 of TGD B sprinklers would not therefore be required.

Technical Guidance Document B recommends a smoke clearance system for fire fighting in large windowless buildings > 4,000m² and 20,000m³, which is manually operated. In this case an automatically operated smoke venting system is proposed which will operate on detection of smoke and divided into smoke zones. A compliant system would not be operated until fire fighters arrive on site and by that time the fire could already be well developed. The proposed system is therefore, clearly superior to a TGD B compliant system.

3.4 Reasons and Considerations

From assessment of the file therefore, I can conclude the following:

1. The low occupancy and the large exit capacity of exits alone compensates for the extension in travel distances of 24m.
2. The smoke venting system provided by the appellant is superior to that required by the TGD B.
3. The compartment area in the warehouse is within the recommended maximum area of 14,000m² for an unsprinklered single storey storage building.

In conclusion therefore, whilst we share the BCA's concerns about the CFD modelling, in my view the extension in travel distances does not warrant the inclusion of an automatic fire suppression system and neither does the compartment size. The condition should be removed.

4.0 RECOMMENDATIONS

In arriving at its decision, the Board had regard to the Fire Safety Certificate application and details that formed part of the application, the subsequent submissions made in connection with the appeal and the reporting inspector's report and recommendation.

It is considered the removal of Condition No.2 would still ensure compliance with Part B3 of the Second Schedule of the Building Regulations 1997-2020.

Signed.....
Martin Davidson
B.Eng MSc (Fire Eng) CEng MIEI

Date: 15th June 2021

