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Report 3696

**An Bord Pleanála Appeal regarding the attachment of
Conditions No.'s 3 & 4 by Galway City Council to grant of
Fire Safety Certificate for material alteration and extension to
existing incomplete double basement at the Crown Site, Monivea Road,
Mervue, Galway**

Client: An Bord Pleanála,
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FAO: The Secretary

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BUILDING CONTROL ACT, 1990 to 2014 – APPEAL

**FIRE SAFETY CERTIFICATE APPLICATION FOR
EXTENSION AND MATERIAL ALTERATION TO EXISTING AND INCOMPLETE
DOUBLE BASEMENT CAR PARK AT
THE CROWN SITE, MONIVEA ROAD, MERVUE, GALWAY**

**APPEAL AGAINST THE ATTACHMENT OF CONDITION'S NO. 3 and 4
TO FIRE SAFETY CERTIFICATE (REG. REF. FSC 19/052) ON 23rd APRIL 2020**

AN BORD PLEANÁLA APPEAL REFERENCE 307232-20

Local Authority: Galway City Council

Appellant: Crown Square Developments Limited c/o Maurice Johnson & Partners

RECOMMENDATION

In my opinion, the Board may rely on Article 40(2) of the Building Control Regulations to consider the subject appeal on the basis of Conditions only.

In respect of Condition No. 3, it is recommended that the appeal be rejected. The building is proposed to be designed to BS 9999:2017 and that code clearly requires the inclusion of sprinkler protection is required in this case to achieve adequate access for fire-fighters. However, so as to avoid confusion in terms of design responsibility the condition needs to be redrafted as follows:-

Condition No. 3

Both basement levels shall be protected throughout with a fixed fire-fighting automatic sprinkler system designed, installed and maintained to IS EN 12845:2015+A1:2019.

Reason:

In order to comply with B5 (Access Facilities for the Fire Service) to the Building Regulations, 1997 and subsequent amendments.

In respect of Condition No. 4, it is recommended that the appeal should be upheld and Condition No. 4 should be set aside. This is due to the fact that Condition No. 4 is superfluous given its overlap with and subsidiarity to Condition No. 9 (which has not been appealed).

The remaining 9 no. Conditions (Conditions No.'s 1, 2, 5, 6, 7, 8, 9, 10 and 11) attached to the granted Fire Safety Certificate are not subject of this appeal and should remain. The granted Fire Safety Certificate should therefore remain subject of 10 no. Conditions, i.e. Conditions No.'s 1, 2, 3 (redrafted), 5, 6, 7, 8, 9, 10 and 11).

Reasons & Considerations

Having regard to the form, use and layout of the building, to the fire safety design measures proposed by the appellant in accordance with BS 9999:2017 (which is accepted as a basis for demonstrating compliance with Part B1 of the Building Regulations), to the submissions lodged in connection with the Fire Safety Certificate application and the appeal and to the report and recommendation of the reporting Inspector, it is considered that the appeal may be determined under Section 40(2) of the Building Control Regulations 1997-2017 on the basis of Conditions only. The extent of Fire Service access to the proposed basements relies entirely on the presence of automatic sprinkler protection to achieve compliance with Part B5 of the Second Schedule of the Building Regulations, 1997-2017. For that reason Condition No. 3 shall remain. Condition No. 4 is superfluous and should be removed given the attachment of the more robust Condition No. 9.

Dr. Raymond J Connolly

BE, PhD, CEng, MIEI, MIFireE, MSFPE

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1. RELEVANT INFORMATION

- i. Application for a Fire Safety Certificate by Crown Square Developments Limited to Galway County Council dated 26th August 2019.
- ii. Compliance Report (18317 FSC R01 Issue 01) by Maurice Johnson & Partners Ltd. dated 26th August 2019 including associated drawings and *Smoke Ventilation Design Statement* by Messrs. Patrick McCaul Environmental Consulting Engineers Limited dated 30th July 2019.
- iii. Letter of additional information from Maurice Johnson & Partners Ltd. on behalf of Crown Square Developments Limited to Galway County Council dated 20th January 2020, including *Car Park Ventilation Comparison Report* by Messrs. Crossflow dated 8th January 2020.
- iv. Letter of additional information from Maurice Johnson & Partners Ltd. on behalf of Crown Square Developments Limited to Galway County Council dated 4th March 2020.
- v. Letter of additional information from Maurice Johnson & Partners Ltd. on behalf of Crown Square Developments Limited to Galway County Council dated 18th March 2020.
- vi. Letter of additional information from Maurice Johnson & Partners Ltd. on behalf of Crown Square Developments Limited to Galway County Council dated 3rd April 2020.
- vii. Fire Safety Certificate (FS 123/19) granted by Galway City Council dated 23rd April 2020 (subject of 8 no. Conditions).
- viii. Letter of appeal from Maurice Johnson & Partners Ltd. on behalf of Crown Square Developments Limited to An Bord Pleanála dated 25th May 2020. It is presumed that the failure to lodge the appeal within one month of the issue of the Fire Safety Certificate has been considered by the Board in the context of the recent public health emergency.
- ix. Letter from Galway City Council to An Bord Pleanála dated 2nd July 2020 including submission from Senior Assistant Chief Fire Officer, Galway Fire Service (dated 26th June 2020).
- x. Letter to An Bord Pleanála dated 28th July 2020 from Maurice Johnson & Partners Ltd. on behalf of Crown Square Developments Limited responding to the Galway City Council submission.

2. BACKGROUND

Maurice Johnson & Partners acting as agent for Crown Square Developments Limited made an application to Galway County Council for the extension and material alteration to the existing incomplete double basement car park at The Crown Site, Monivea Road, Mervue, Galway. The Fire Safety Certificate was granted by Galway City Council (under Reference FS 123/19) on 23rd April 2020 subject to 11 no. Conditions including *inter-alia*:-

Condition No. 3

Both basement levels shall be served with a fixed fire-fighting automatic sprinkler system designed, installed and maintained to IS EN 12845:2015+A1:2019 to an ordinary hazard group 2 classification (OH2). The enclosed loading area and service roadway shall be served with a fixed fire-fighting automatic sprinkler system designed, installed and maintained to IS EN 12845:2015+A1:2019 to a high hazard process group 2 classification (HHP2).

Reason:

In order to comply with B5 (Access Facilities for the Fire Service) to the Building Regulations, 1997 and subsequent amendments.

and

Condition No.4

The enclosed loading area and covered service roadway shall be provided with a system of smoke and heat ventilation, with the objective of clearance of smoke during the fire and after the fire has been suppressed. The system shall comply with the guidance in the Smoke Control Association publication "Design of smoke ventilation systems for loading bays and coach parks" – November 2010.

Reason:

In order to comply with B5 (Access Facilities for the Fire Service) to the Building Regulations, 1997 and subsequent amendments.

On 25th May 2020, Maurice Johnson & Partners, acting as agent for Crown Square Developments Limited, appealed to An Bord Pleanála against the attachment of these 2 no. Conditions (Conditions No.'s 3 and 4) to the Fire Safety Certificate. The residual Conditions (Conditions No.'s 1, 2, 5, 6, 7, 8, 9, 10 and 11) are not subject of the current appeal.

3. REPRISE OF APPEAL (AS PRESENTED)

The subject works are stated to comprise the material alteration and extension of a previously approved basement car park (stated by Galway City Council to reference Fire Safety Certificate Reg. Ref. FS 37/08). It is unclear what works comprise the stated extension and it is noted that the application form does not identify any floor area in respect of same.

Condition No. 3

Both basement levels shall be served with a fixed fire-fighting automatic sprinkler system designed, installed and maintained to IS EN 12845:2015+A1:2019 to an ordinary hazard group 2 classification (OH2). The enclosed loading area and service roadway shall be served with a fixed fire-fighting automatic sprinkler system designed, installed and maintained to IS EN 12845:2015+A1:2019 to a high hazard process group 2 classification (HHP2).

Reason:

In order to comply with B5 (Access Facilities for the Fire Service) to the Building Regulations, 1997 and subsequent amendments.

In their letter of appeal dated 25th May 2020, Maurice Johnson & Partners (acting as agent for Crown Square Developments Limited) outlined the basis of their appeal in respect of Condition No. 3 including:-

- (i) An Bord Pleanála case precedents from elsewhere which are predicated on the guidance in Technical Guidance Document B to the Building Regulations 2006 to the effect that “basement car parks are not normally expected to be fitted with sprinklers” or similarly that a “normal basement car park that is sufficiently mechanically ventilated does not require sprinklers”.
- (ii) It is well established that compliance with guidance in Technical Guidance Document B will “*prima facie* indicate compliance with Part B of the Second Schedule of the Building Regulations”.
- (iii) Notwithstanding recent fire events, national guidance and similar UK guidance remains unchanged in respect of car parks.
- (iv) The appellant has offered to increase the proposed rate of mechanical smoke extraction to allow for larger potential design fires (in the absence of sprinkler protection).
- (v) The appellant has commissioned a specialist report from Messrs. Crossflow that confirms the integrity of the proposed design by means of a favourable comparison of conditions predicted as

arising in the case of a sprinkler protected naturally ventilated car park and a mechanically ventilated unsprinklered car park.

- (vi) The proposed mechanical ventilation system is to be enhanced to allow for maintenance of a substantially smoke-free route through the car park to approach the seat of fire and effectively split the car park into two zones, only one of which would at any time be substantially impacted by smoke and heat.
- (vii) The proposed system would include full Fire Service controls and “training in the use of the system at commissioning stage will be provided”.
- (viii) The mechanical system is dual purpose with CO ventilation and therefore is in daily use and the provision of automatic CO detection offers ongoing system monitoring.
- (ix) The 13 no. protected staircases serving the car park offers multiple points of Fire Service access.
- (x) The fire resistance of load-bearing elements of structure at car park level is “upgraded” to 90 minutes.
- (xi) Dry rising *[sic]* mains are to be provided in all stair cores serving basement levels.
- (xii) The thermal insulation exposed in the car park soffit will comprise non-combustible materials. This is stated by the appellant to be in excess of the minimum Class O requirement.
- (xiii) Car park fire detection is to be enhanced above the minimum requirements to comprise a Type L1 automatic fire detection and alarm system throughout to IS 3218:2013+Amendments 2019.

The letter from Galway City Council to An Bord Pleanála dated 2nd July 2020 (including a submission from the Senior Assistant Chief Fire Officer of Galway Fire Service) explains the background to their attachment of Condition No. 3 and the technical basis for their requirement as follows:-

- (i) The applicant had previously agreed in 2008 to install a sprinkler system within the substantially similar double basement.
- (ii) Whilst acknowledging that Technical Guidance Document B states that basement car parks are not normally expected to be fitted with sprinklers, the subject car park is in excess of 100,000m³ in volume and is not an ordinary two level basement.
- (iii) Fire-fighting operational experience suggests that historic fire test evidence does not accurately reflect the hazards associated with modern car fires reflecting changes including inclusion of ethanol, plastic fuel tanks and fires involving multiple cars.

- (iv) The type of mechanical extraction system is not relevant to whether sprinklers should be installed or not.
- (v) The proposed design is based on the adoption of deemed-to-satisfy extraction rates (based on prescribed air change rates) instead of a quantitative design that would ensure achievement of agreed performance criteria, e.g. minimum visibility levels for fire-fighters.
- (vi) The effectiveness of the mechanical ventilation system is related to the design fire size, which in turn is impacted upon by the absence of a sprinkler protection. The Fire Authority questions whether the inevitably increased design fire size potentially arising in the absence of sprinkler protection would remain within the capacity of a fixed volume (25 air changes per hour) mechanical ventilation system to the extent necessary to achieve compliance with Part B5 to the Building Regulations. The Fire Officer speculates that the proposed 25 air changes per hour volumetric extraction system would only be capable of dealing with a maximum 10 MW fire and not a 20-30 MW design fire as stated by the appellant.
- (vii) No assessment has been offered by the appellant as to what would happen should the design fire exceed a size of 10 MW in terms of the resulting fire-fighting conditions that might arise.
- (viii) The comparative CFD analysis offered by Messrs. Crossflow is predicated on an unsubstantiated design fire size of 8 MW. The Fire Authority is of the view that no quantitative arguments, that could be substantiated by published experimental evidence or technical literature, have been offered in support of the proposed design fire size.
- (ix) The Building Regulations in Ireland differ from other neighbouring jurisdictions in regard to the requirement under Regulation B5 to afford facilities for the Fire Service to protect life and property.

The appellant in his further submission to the Board of 28th July 2020 responds to the issues raised in the Galway Fire Service Senior Assistant Chief Fire Officers report as follows:-

- (i) The previous 2008 approved Fire Safety Certificate for the scheme related to something more akin to a shopping centre and is entirely irrelevant to the current application.
- (ii) The Fire Authority's drawing of parallels with recent car park fires can be misleading.
- (iii) Plastic fuel tanks have been provided in cars for many years and are not a new phenomenon related to the recent car park fire events in Liverpool and Douglas.
- (iv) There have been no recent changes to Building Regulations guidance in respect of car parks.

- (v) An international specialist car park venting designers (Messrs. Crossflow) prepared a case study demonstrating that provision of 10 air changes per hour mechanical extraction is equivalently effective as a naturally ventilated sprinkler protected car park.
- (vi) The higher air change rate proposed (25 a.c.h. as opposed to 10 a.c.h.) will assist fire-fighting conditions even further.
- (vii) The upper-level basement (B1) is open sided and a large portion of the car park is not a true double basement.
- (viii) The appellant challenges the Fire Authority's identification of the importance of visibility for fire-fighters despite there being no specific requirements in such regard in Section 9 of BS 7346.
- (ix) The appellant suggests that the relevant guidance does not seek to identify tenability criteria for fire-fighting and postulates that this is because there are too many variables to consider and because such matters are extremely complicated.
- (x) The appellant commissioned a fire-fighting operational consultant (Mr. Iain Goodlet) to independently review the scheme. Mr. Goodlet conclusions can be summarised as being that:-
- the time of Fire Service intervention is key.
 - the proposed design exceeds Building Regulations.
 - the design supports early access for the Fire Service.
- (xi) The design code preferred by the appellant as the basis for demonstrating compliance with Part B to the Building Regulations 2006 is BS 9999 *Fire safety in the design, management and use of buildings – Code of practice* (2017) and he is clearly entitled to rely upon that document under the Department of Environment, Community and Local Government's Circular Letter dated 9th May 2011. BS 9999:2017 differs from Ireland's Technical Guidance Document B in that the BS code recommends facilities to protect fire-fighters at basements of the given depth, i.e. his chosen code is more onerous than other national guidance.
- (xii) The appellant alleges that it is unclear what the Authority considers to specifically comprise of "property protection" within Regulation B5 and asserts that no design deficiencies exist in such regard from the applicant's wider perspective.

- (xiii) The appellant highlights a contention that the proposed design includes additional enhancements outside the Fire Safety Certificate process.

- (xiv) The appellant concludes that the submitted design significantly exceeds the prescribed 10 air changes-per-hour extraction rate that is appropriate to ensure suitable conditions for fire-fighters as explored in the case study by Messrs. Crossflow.

Condition No.4

The enclosed loading area and covered service roadway shall be provided with a system of smoke and heat ventilation, with the objective of clearance of smoke during the fire and after the fire has been suppressed. The system shall comply with the guidance in the Smoke Control Association publication “Design of smoke ventilation systems for loading bays and coach parks” – November 2010.

Reason:

In order to comply with B5 (Access Facilities for the Fire Service) to the Building Regulations, 1997 and subsequent amendments.

In their letter of appeal dated 25th May 2020, Maurice Johnson & Partners (acting as agent for Crown Square Developments Limited) outlined the basis of their appeal in respect of Condition No. 4 specifically that the attachment of Condition No. 4 is seeking to impose the imposition of sprinklers by designating the subject service area space as a loading bay as opposed to reflecting its intended use as a refuse centre for sorting and collection of waste. The appellant clarifies that the smoke ventilation system within the subject area would be designed to accommodate a 20-30 MW lorry fire, as per Table 1 of the Smoke Control Association publication “*Design of smoke ventilation systems for loading bays and coach parks*” (November 2010) and that this is appropriate for the design fire scenario of a single burning bin truck without sprinklers being present.

The letter from Galway City Council to An Bord Pleanála dated 2nd July 2020 (including the submission from the Senior Assistant Chief Fire Officer, Galway Fire Service) explains that the background to the attachment of Condition No. 4 is their expectation that the service space in question could potentially accommodate 3 no. heavy goods vehicles given the size and layout of the space (noting 3 no. truck parking bays and large vehicular turning circles). The Fire Authority is of the view that the occurrence of a 20-30 MW lorry fire has the potential to lead to a “extraction capacity issue with the mechanical extraction system”. The Fire Authority also points out that as the relevant service area has an area in excess of 200 m² and is located not less than 3 metres below ground level, a mechanical smoke extraction system and associated sprinkler protection is unambiguously required under Clause 5.4.3.1 of Technical Guidance Document B.

The appellant in his further response to the Board, dated 28th July 2020, contends the Fire Authority’s referencing of Technical Guidance Document B is inappropriate given his reliance on the alternative and his preferred guidance contained in BS 9999 *Fire safety in the design, management and use of buildings – Code of practice* (2017). The appellant offers the further assertion that “at worst there may be a single bin vehicle lorry”. The appellant contends that the smoke extraction system “is designed in accordance

with” the Smoke Control Association Guide whereby the service area will be provided with a mechanical exhaust system capable of dealing with a 20-30 MW single lorry fire.

4. CONSIDERATION

The appeal is being considered as presented and no new issues arise as demand *de novo* consideration.

Condition No. 3

Both basement levels shall be served with a fixed fire-fighting automatic sprinkler system designed, installed and maintained to IS EN 12845:2015+A1:2019 to an ordinary hazard group 2 classification (OH2). The enclosed loading area and service roadway shall be served with a fixed fire-fighting automatic sprinkler system designed, installed and maintained to IS EN 12845:2015+A1:2019 to a high hazard process group 2 classification (HHP2).

Reason:

In order to comply with B5 (Access Facilities for the Fire Service) to the Building Regulations, 1997 and subsequent amendments.

The appellant refers to the precedent set by the Board's previous setting aside of Case Inspector's recommendations to require the installation of sprinklers elsewhere (ABP-305955-19). This previous appeal would appear to have rested on the Board's determination (contrary to the Inspector's Report) that compliance with the guidance contained in Technical Guidance Document B in respect of mechanical ventilation of unsprinklered basements maintains *de facto* compliance with Part B5 to the Building Regulations, in effect inferring a blanket exemption for provision of sprinklers to "car parks".

In this current case, the appellant has similarly sought to rely on the same Technical Guidance Document B guidance (Clauses 3.5.2 and 5.4.3.1) to the effect that "basement car parks are not normally expected to be fitted with sprinklers". As has happened in many previous instances, including a number of cases previously referred to the Board (exemplar reference 11.FS.0414 which the Board determined in the opposite direction to those case precedents referenced by the appellant), the Fire Authority in the current appeal is contending that the subject basement car park is not an "ordinary" car park and should not be able to avail of what is not in any event, in their view, a blanket exemption from the requirement to install sprinklers in mechanically vented basements, where used as car parks.

In this context, I must emphasise to the Board that the subject Fire Safety Certificate application is predicated on the demonstration of compliance through adoption of the design guidance contained in BS 9999:2017 *Code of practice for fire safety in the design, management and use of buildings*. This British Standard addresses the ventilation of smoke and heat from basements in Section 27.2 and more specifically for car parks in Section 27.3. At no point does BS 9999:2017 include any suggestion that basement car parks would not normally be expected to be protected with sprinklers. Given that it is

proposed to construct offices, a hotel and residential buildings above the car park, it is pertinent to note that BS 9991 *Fire safety in the design, management and use of residential buildings - Code of practice* states in Section 13 that “*where a building is otherwise provided with sprinkler protection, any enclosed car park accessed from within the building should also be provided with sprinklers in accordance with BS EN 12845*”. Given that the publication in 2019 of a new Approved Document B (Vol. 1) for dwellings in England and Wales requires provision of sprinklers throughout residential buildings having a storey in excess of 11 metres above ground level, the recent evolution of fire safety guidance in the UK has been significantly rebalanced in favour of installing sprinklers within basement car parks sitting under residential buildings of relatively modest heights. This reality differs somewhat from the picture painted by the appellant that national practice in the UK has remained unchanged in respect of the provision of sprinklers within car parks, simply because of the absence of certain specific textual changes to Approved Document B in 2019.

At face value, the appellant is seeking to simultaneously be relying upon conflicting referencing of Technical Guidance Document B in respect of the basis of his design. The appellant relies heavily on the text contained in Technical Guidance Document B, including his copying and pasting of annotated extracts from the document itself, to emphasise the inferred blanket exemption that “car parks are not normally expected to be fitted with sprinklers”. But contrarily, the appellant continually emphasises that his design is based on the “more onerous” BS 9999 code (particularly in respect of Condition No. 4 where the guidance contained in Technical Guidance Document B unambiguously undermines his argument against installation of sprinklers and mechanical smoke ventilation to the service area).

It is my opinion the appellant’s choice to have his design evaluated solely in the context of BS 9999:2017 should be respected and enforced consistently. The guidance in Technical Guidance Document B should not have been cherry picked by either the appellant or the Fire Authority when convenient to supporting their opposing arguments. Should the Board believe that a blanket exemption from sprinkler provision exists in the case of car parks, and despite my not agreeing with such, my considered view is that such a blanket exemption can only apply to car parks that are designed in full accordance with Technical Guidance Document B. There is no disputing that Technical Guidance Document B is not the applicant’s basis for design in this case and accordingly the favourable Board precedents quoted by the appellant are not applicable to this BS 9999 based appeal. In order to be consistent with the entirety of the application process in this case, the Board should determine this appeal entirely by reference to BS 9999 and is free from any precedents set on the basis of alternative design guidance.

In terms of placing the current appeal in context, it is worth re-looking at the applicant’s original Compliance Report (18317 FSC R01 Issue 01) dated 26th August 2019 including associated drawings.

In respect of compliance with Building Regulation B5, the applicant states in Section 1.5.7 of his Report that the basement car park will be provided with a mechanical smoke and heat ventilation system designed in accordance with BS 7346: *Components for heat and smoke control systems – Part 7 Code of practice on functional recommendations and calculation methods for smoke and heat control systems for covered car parks* (2013) and specifically with reference to Clause 9, i.e. mechanical cross-ventilation using jet fans. To this end, the applicant appends a third-party report *Smoke Ventilation Design Statement* by Messrs. Patrick McCaul Environmental Consulting Engineers Limited dated 30th July 2019, where it is effectively confirmed that the system proposed for the Crown Site is being designed to deliver the prescribed minimum rate of 10 air changes per hour. This equates to 288 m³/s of volumetric extraction from Level B2 with an equal replenishment volume. None of the other performance design criteria referenced in BS 7346:Part 7 are elaborated upon, e.g. ensuring maximum inlet air velocities, avoiding discharge of smoke adjacent to escape routes at ground floor (as for example arises in the case of vent shaft no. 3). The report suggests that a minimum of 84 m² of inlet air path will be available equally distributed on opposite sides of basement level B2. However, the detailed drawings submitted with the application show a substantially lesser extent of inlet air paths on the northern side of the basement and certainly nothing remotely equal to the southern side. Notwithstanding the issue of design fire size and the subsequent CFD report (which I will address subsequently), it must be recorded that the submitted design for the smoke ventilation system in a car park of this size and complexity is overly simplistic, fails to consider many key matters and is inadequate to allow delivery of compliance with Part B5 to the Building Regulations. This observation is made mindful of the combined submissions in the original application, the subsequent CFD study and the further submissions made by the applicant in the course of his appeal. It is therefore presumed that significant additional design work is expected to be undertaken.

These serious shortcomings in what has been presented as a “design” have effectively been made redundant by the attachment of Condition No. 9 to the granted Fire Safety Certificate FS 123/19 to the effect that:-

Condition No. 9

The smoke and heat extract systems in both levels of basement shall be design [sic] to the functional recommendations and calculation methods to Clause 10 of BS 7346:Part 7:2013.

Despite its onerous nature and its requiring of an entire re-design of the smoke and heat ventilation systems for the proposed building, Condition No. 9 has not been subject of appeal. This is to be welcomed as it allows for the addressing of many of the deficiencies in the design approach heretofore. Condition No. 9 allows for a more fundamental and rigorous design to be undertaken, whereby the extraction rate is to be determined by specific calculations to meet the performance criteria of ensuring

clear access for Fire Service personnel to within 10 metres of any possible fire location. There is a very substantial difference in design approach between the applicant's proposed Clause 9 system (using a "deemed to satisfy" extraction rate of 10 air changes per hour) and, as is now required by Condition No. 9, a Clause 10 system (wherein the extraction rate is to be determined by bespoke calculations predicated on a specific design fire size).

Condition No. 9 imposes such a fundamental change in the basis of design that it could in its own right quite feasibly make the installation of sprinklers a necessity to limit fire size to the extent that makes it possible to achieve the now required performance criterion. The failure to include Condition No. 9 within the subject appeal is therefore surprising. It is highlighted that the determination of smoke free access to within 10 metres of all basement locations is an absolute performance criterion and is not measured relative to conditions arising under a 10 air changes per hour regime. It is also highlighted that the extent of computational fluid dynamics modelling required to sustain the necessary conclusions of compliance is in my experience significantly more substantial than has been included in the technical submissions made to date (albeit in a different context).

In this context, it may be helpful to address the issue of design fire size. The applicant has proposed a comparison undertaken by Messrs. Crossflow based for a similarly sized mechanically vented car park in Dublin wherein conditions predicted to arise during a transient 8MW (unsprinklered) fire were compared favourably to conditions during a naturally vented steady state 4 MW (sprinklered) fire. It is noted that during the arbitrary 20 minutes fire duration examined by Messrs. Crossflow, the unsprinklered design fire size only exceeds the 4 MW sprinklered fire size for *c.*8 minutes. Furthermore, during the 12 minutes interval prior to reaching the 8 MW peak heat release rate, the unsprinklered fire remained at less than 2 MW for almost 8 minutes. The design comparison that has been made by Messrs. Crossflow is stated in their Report as being between a transient 8 MW uncontrolled fire and a 4 MW steady state sprinklered fire. This results in the ludicrous situation whereby the total heat released, i.e. the product of the heat release rate and time, from the sprinklered design fire actually exceeds that from the unsprinklered fire, i.e. 4,800 MJ compared to 4,305 MJ. In simple terms, the design fires being chosen by Messrs. Crossflow as the basis for their comparison are predicated on the inclusion of sprinkler protection actually increasing the amount of heat released into the car park from a burning car.

It is noted that the CFD contour sketch extracts show that the Dublin car park layout that was modelled by Messrs. Crossflow is physically different from the Crown Site, but this does not alter my conclusions.

The locations and specifications of impulse fans are not detailed in any of the technical submissions – presumably on the basis that detailed design would follow. No information is presented regarding the potential impact of the loss of volumetric extraction fans due to a local fire event giving rise to excessive temperatures.

The basis of Messrs. Crossflow's comparison of the natural and mechanical ventilation options is entirely qualitative. The basis for the stated benefit of maintaining tenable conditions in one half (zone) of the car park due to the configuration of impulse fans is unclear. Fire-fighters are most unlikely to attack the fire affected area within the car park from the adjacent mechanically protected "substantially smoke free" zone. The risk of the mechanical system failing and leaving them stranded in a rapidly smoke-filling open area, the loss of hose length coverage and the provision of dry falling mains to all cores, makes it almost certain that the Fire Service will seek to attack the seat of fire from the most local protected staircores. In such a context, the smoke conditions in the remote half of the car park are of little concern or benefit. A more meaningful measure of performance is local to the seat of fire and specifically along the route or routes from the adjacent protected staircores to all potential fire locations.

The onset of fires in remote areas, e.g. the triangular room plant room opening into the south west corner of the car park, represents a significant fire-fighting challenge in terms of smoke ventilation.

In their letter of appeal dated 25th May 2020, Maurice Johnson & Partners (acting as agent for Crown Square Developments Limited) outline the basis for their appeal in respect of Condition No. 3. The appellant's various arguments are individually appraised as follows:-

- (i) The case precedents from appeals to An Bord Pleanála elsewhere as quoted by the appellant are predicated on the guidance in Technical Guidance Document B to the Building Regulations, 2006. The subject development has not been designed in compliance with Technical Guidance Document B. It is inappropriate to cherry pick the clauses in the Technical Guidance Document regarding omission of sprinklers to car parks, when no equivalent relaxations are granted in the chosen design document, BS 9999.
- (ii) Equally, the point regarding Technical Guidance Document B offering "*prima facie* compliance with Part B of the Second Schedule of the Building Regulations" is irrelevant when an entirely different document has been used as the basis for design.
- (iii) Whilst the appellant is accurate in his statements regarding Approved Document B (2019), the inference that national practice in the UK regarding inclusion of sprinklers in car parks remains unchanged is misleading. Car parks attached to residential buildings having a storey in excess

of 11 metres above ground are now required to be fitted with sprinklers in England and Wales since 2019.

- (iv) The appellant has offered to increase the proposed rate of mechanical smoke extraction (from 10 ac/h to 25 ac/h) to allow for the onset of larger potential design fires (in the absence of sprinkler protection). The determination of appropriate extraction rate is not a matter for barter with the Fire Authority. As per their submission to the Board, Galway Fire Service's expectation that the capacity of any particular ventilation rate to cope with a quantified design fire size be determined through calculation is entirely reasonable. In any event, this aspect of the appeal is rendered moot by the attachment of Condition No. 9 requiring the full redesign of the smoke extraction system at both basement levels.
- (v) As outlined previously, the informative study by Messrs. Crossflow is fundamentally flawed in its choice of design fires used for comparison and does not offer any insights relevant to the current appeal.
- (vi) The appellant's proposal that the mechanical ventilation system be enhanced to allow for maintenance of a substantially smoke-free route through the car park to approach the seat of fire and effectively split the car park into two zones is now also rendered redundant by the attachment of Condition No. 9 requiring the full redesign of the smoke extraction system at both basement levels.
- (vii) As pointed out by the appellant, there are 13 no. protected staircases serving the car park offering multiple points of Fire Service access. Whilst acknowledging the advantage of multiple entry (and retreat) routes to (and from) the basement, particularly where stairs are fitted with dry falling mains, it is highlighted that most all of the stairs serving basement levels are accessible to the Fire Service only via entry into a residential, office or hotel building at ground level.
- (viii) A number of entrances to these stairways are not within 18 metres and line of sight of the Fire Service vehicular route at ground level, e.g. residential Block J. This renders these particular dry falling mains effectively redundant in the context of codified design.
- (ix) It should also be commented upon that the complexity of having access to the car park levels via stairs that sit within multiple different buildings under different management etc. seems to me to be entirely incompatible with the appellant's referenced design fire scenario, that assumes car park fires will be suppressed by Fire Service hose streams within 20 minutes of their ignition. The commentary by Mr. Iain Goodlet emphasising the importance of early Fire Service intervention is also germane in this regard.

- (x) The fire resistance of load-bearing elements of structure at car park level is proposed by the appellant to be upgraded to 90 minutes. Given that the car park slab acts as a podium deck upon which Fire Service vehicles are expected to circulate around the site and potentially park whilst fire-fighting within the basements below, there is a strong case that the fire resistance rating of the car park structure is not excessive but rather is deficient and should be not less than 120 minutes.
- (xi) The appellant suggests that the thermal insulation materials exposed within the car park will comprise non-combustible materials, i.e. in excess of the minimum Class O requirement. It is highlighted that BS 9999 requires use of non-combustible materials in the construction of open sided car parks (Clause 34.1.5(f) refers). It is also highlighted that the installation of insulation to the soffit of the car park regardless of its combustibility will give rise to extended flame lengths and to an increased risk of fire transfer between burning vehicles. There is a direct correlation between the installation of a thermal insulation material to the soffit above a car (regardless of its combustibility characteristics) and the increased propensity for fire spread between multiple vehicles. This would be a factor justifying an increased design fire size.
- (xii) The proposed enhancement of the car park's fire detection and alarm system to Type L1 to IS 3218:2013+Amendments 2019 is beneficial. However, there are significant issues in the operation of impulse (high velocity) fans within car parks whilst occupants may still be in the escape phase. It is possible that the driving of smoke plumes by impulse fans may over-run escaping occupants and for this reason BS 7346: *Components for heat and smoke control systems – Part 7 Code of practice on functional recommendations and calculation methods for smoke and heat control systems for covered car parks* (2013) requires a delay before activation of the impulse fans. It would appear that the proposed delay interval is 60 seconds, which is to my mind inadequate. This comment is offered for information in the context of the future re-design of the car park to Clause 10 of BS 7346 as required under Condition No. 9.

Many of the above arguments are reprised in the appellant's submission to the Board of 28th July 2020, albeit conveniently presented in the manner of rebuttal of the previous Fire Officer commentary. A number of the more salient points raised by the appellant in his second submission are commented upon further below so as to re-assure the appellant that the full breadth of his arguments have been given due regard in my consideration of his appeal, namely:-

- (i) The previous 2008 application is accepted as being entirely irrelevant to the current appeal.
- (ii) I am accepting of the appellant's assertion that the real-world fire experience can indeed be misleading. However, the alleged increased vulnerability of open-sided tall car parks in

Liverpool and Douglas to positive wind effects is not sustainable as a basis for the inferred suggestion that these hugely destructive car park fire events were outliers. I have attended the scenes of car park fires including Douglas, Cork and am of the firm view that the fundamental reality is that enclosed basement car park fires are more likely to be more hazardous for fire-fighting than open sided naturally ventilated car parks. This reality is reflected in the special relaxations allowed in open-sided car parks in various design codes and would in my opinion be a view shared by Fire Services throughout Ireland based on practical experience (as expressed by Galway Fire Service in this case).

- (iii) Fire Brigade response time is indeed key to a successful outcome and the wider arrangements for Fire Service access within the site are to the fore front of my considerations in this matter. In the absence of sprinkler protection, a fire within a car park must be considered to continue growing until successful Fire Service intervention occurs. The report by Mr. Iain Goodlet refers to but skirts around the specifics of the issue, i.e. the need to establish a realistic timeline for Fire Service intervention. This would typically involve allocating a design fire growth rate (agreed by the appellant to be ultra-fast) and a delay before Fire Service intervention. Such a delay would typically include time to fire detection, time to alarm, time to call of Fire Service, Fire Service response time, Fire Service travel time, Fire Service make-down to water supplies, time to water-on, time to movement to fire-fighting bridgeheads and time to movement to the seat of fire. The Crossflow Report assumes without any further justification that such Fire Service intervention will occur within 20 minutes of ignition. An ultra-fast fire would be predicted to reach a size of 270 MW after such a duration and same is clearly beyond the scope of fire-fighting intervention.
- (iv) It is accepted that plastic fuel tanks are not a new phenomenon in cars.
- (v) The appellant's reference to an "international specialist car park venting designer" in introduction to the contribution by Messrs. Crossflow may be accurate but their report, which for the avoidance of doubt is unambiguously not a design document, has become superseded by the requirement for a full quantitative system redesign imposed under Condition No. 9. The attachment of Condition No. 9 to the Fire Safety Certificate and the fact that it has not been appealed requires a complete re-design of the smoke and heat extraction systems for the basements (car park and service areas) to comply with Clause 10 of BS 7346: *Components for heat and smoke control systems – Part 7 Code of practice on functional recommendations and calculation methods for smoke and heat control systems for covered car parks* (2013).
- (vi) The appellant suggests that the relevant code guidance does not seek to identify tenability criteria for fire-fighting. The appellant postulates that this is because there are too many variables to consider and matters are extremely complicated. The appellant seems to have

entirely missed the fact that Condition No. 9 requires a re-design of the smoke management system for both car park levels in accordance with Clause 10 of BS 7346:Part 7:2013. Within Clause 10, the many complicated variables have been resolved into a performance parameter, i.e. maintenance of access via a substantially smoke-free route to within 10 metres of any potential fire location.

- (vii) The attachment of Condition No. 9 renders all arguments regarding air change rates redundant.
- (viii) The appellant summarises the findings of a review commissioned from Mr. Iain Goodlet as comprising:-
- the time of Fire Service intervention is key.
 - the proposed design exceeds Building Regulations.
 - the design supports early access for the Fire Service.

Whilst, the importance of early Fire Service intervention is not in dispute, it is unclear what additional weight should be attached to Mr. Goodlet's opinion regarding compliance with Irish Building Regulations given that this is not his obvious or stated area of expertise. In any event, it is an area unambiguously within the competence of Galway Fire Service. Whilst agreeing with Mr. Goodlet's view that the identification of the risk profile of buildings users is important, he fails to offer commentary on the applicant's design basis being that occupants will be familiar with their surroundings (Category A) despite the car park serving a hotel. Mr. Goodlet also identifies as beneficial the design's provision of quick and easy access to the basement from multiple stairs from a network of Fire Service access roads. He does not offer any comment of the fact that the basement stairways (with one single exception) are to be accessed internally from within individually occupied office, residential and hotel buildings. In the best-case scenario, such arrangements will hinder access to the basement when all buildings are completed and individually managed. In the worst-case scenario, access to various basement stairways will be via building sites whilst the ground floor construction proceeds.

Mr. Goodlet fails to identify that the dry falling mains are not in all cases located within 18 metres and a line of sight of a Fire Service hard-standing, e.g. Core J This contradicts one of the most basic of fire-fighting expectations.

Most crucially, Mr. Goodlet makes no mention of the fact that the Fire Service access roads at ground level are to a very significant extent sitting on top of the basement roof, which in effect comprises a podium. This gives rise to the scenario that Fire Service vehicles are being required to travel over the roof of the car park within which the fire is burning. In my experience, fire-fighting personnel would generally be most reluctant to drive their appliances onto a podium slab sitting over an unsprinklered burning car park and more reluctant still to park their vehicles on such a slab whilst exiting to enter down into the burning basement below. Security of a retreat route is typically to the foremost of fire-fighting concerns and the proposed design would certainly be an outlier in regard of normal practice.

Equally, it is most unusual to mount private fire hydrants on top of a podium slab with hydrant pipework running within the potentially fire affected car park, more so when the anticipated design fire scenario is a burning truck (20-30 MW) and the fire-resisting structure of the slab is only 90 minutes rated (as opposed to 120 minutes rated as would be typically necessary for fire-fighting access infrastructure).

The absence of hydrants from Phase 2 of the scheme means that the east side (future residential developments) of the site does not observe a maximum distance of 90 metres between hydrants. Whilst, expecting that the fuller details of the private fire hydrant infra-structure may follow in future Fire Safety Certificate applications, it is noted that the absence of proposals regarding fire-fighting water provisions does not help assuage fears as to the potential for a large uncontrolled fire within the car park in the absence of automatic sprinkler protection.

It casts significant doubt on the usefulness of Mr. Goodlet's common sense appraisal that "quick fire service intervention and putting water on top the fire is the surest method of a quick stop and preventing a fire escalating" when he has failed to make any comment regarding the most unusual Fire Service access arrangements being proposed in this case and the lack of detail or discussion regarding fire-fighting water supplies.

The issue of fire-fighting access to the car park is at the core of this appeal. The structure of the application is such that future details of building entry points, dry main inlet locations and vehicle hard-standings are expected to be evolved as part of future ground level applications. The drawings submitted with the current application are not consistent in respect of the general arrangement of the basement and ground floors, e.g. staircore in Block A. The information submitted is, however, sufficient to conclude that Fire Service access at ground level to a number of stair cores is not compatible with them being reliable for use as fire-fighting cores, i.e. due to excessive distance from hard-standings.

The fundamental issue in this case is the appellant's demonstration of compliance with Part B5 to the Building Regulations (Fire Service access) in Section 1.5.3 of his Fire Safety Certificate compliance report 18317 FSC1 R01 by relying upon the premise that "every part of every storey will be no more than 60 metres (measured on a route suitable for laying a hose) from the outlet located in the fire-fighting shaft as indicated on the floor plan drawings". The appellant includes circles having 60 metres radii in his general arrangement drawings of the basement levels to support this claim. There are very significant difficulties posed for the design by this summary statement of intended Fire Service access.

Firstly and most importantly, Clause 20.1.3(a) of BS 9999 limits a reliance on a 60 metres hose coverage to buildings that are "fitted throughout with an automatic sprinkler system in accordance with BS EN 12845". Buildings that are not fitted with sprinklers are required under Clause 20.1.3(b) to achieve a 45 metres maximum hose stream coverage.

Secondly, the standard requires that where exact hose distances are not known a "direct distance" should be used for design, i.e. $2/3^{\text{rd}}$ of the hose distance.

These two facts means that circles showing hose stream coverage in the unsprinklered car parks should be 30 metres in radius and not 60 metres as presented by the appellant. This reduction drastically reduces the fire-fighting provisions at basement levels to an extent no longer compliant with Part B5 to the Building Regulations. The only credible means of improving the extent of access for fire-fighters is rely on the provision of sprinklers to increase hose length coverages as per Clause 20.1.3(a) of BS 9999.

It is concluded that the provision of an automatic sprinkler system is required under BS 9999:2017 guidance (reference Table 17 and Section 20.1.3) to ensure an adequate extent of Fire Service access to the proposed building given that it contains two or more basements, each exceeding 900 m² in area.

It is highlighted that the increased extent of hose stream coverage allowed in the presence of sprinklers shall still take account of the actual routing of laid hose within the basement car parks and that additional fire mains may be required that both allow observation of the 60 metres hose length (in the presence of sprinklers) to all locations including the service (refuse collection) area and appropriate proximity of ground level dry main inlets to Fire Service vehicle hard-standings.

Notwithstanding the clear obligation under BS 9999:2017 to install sprinklers with the proposed basements, it is inappropriate for the Fire Authority to seek to act as designers of the system through determination of Hazard Group ratings. Accordingly, the wording of the attached Condition should be amended to more appropriately reflect design responsibilities.

Condition No.4

The enclosed loading area and covered service roadway shall be provided with a system of smoke and heat ventilation, with the objective of clearance of smoke during the fire and after the fire has been suppressed. The system shall comply with the guidance in the Smoke Control Association publication "Design of smoke ventilation systems for loading bays and coach parks" – November 2010.

Reason:

In order to comply with B5 (Access Facilities for the Fire Service) to the Building Regulations, 1997 and subsequent amendments.

In terms of placing the current appeal in context, it is worth re-looking at the applicant's original Compliance Report (18317 FSC R01 Issue 01) dated 26th August 2019 including associated drawings. In respect of compliance with Building Regulation B5, the applicant states in Section 1.5.7 of his Report that Clause 27.2 of BS 9999 (smoke venting of basements) does not apply because there are no proposed rooms greater than 200 m² at basement level. Clause 27.2 makes no reference to individual room sizes but rather references the floor area of a basement storey. In any event, the entire service area subject of Condition No. 4 exceeds 200 m², exceeds a depth of 3 metres below ground and therefore is requiring of smoke and heat exhaust ventilation. This is not disputed.

The appellant's reliance on his arguments regarding Condition No. 3, i.e. basement car parks not normally requiring sprinklers under Technical Guidance Document B, are now in effect reversed as he seeks to avoid the Fire Authority's simple logic based on Technical Guidance Document B that the subject service area is clearly required to be served by sprinklers and mechanical ventilation.

The Smoke Control Association Guide referenced in Condition No. 4 is not a document that offers a quantitative basis for designing smoke extraction systems (beyond adoption of deemed to comply air change rates). The appellant's assertion that his system has been designed in full compliance with the Smoke Control Association Guide is not soundly based nor is his assertion that the proposed system can accommodate a 20-30MW design fire size, i.e. presumably due to his offer of an enhanced 25 air changes per hour system. For example, the appellant has highlighted in his submission to the Board (dated 28th July 2020) that his design allows for a single vehicle fire comprising 20-30 MW ultra-fast fire. In fact, the Crossflow study (in as much as it informs the appellant's design) includes a fire growth rate that is a combination of medium and fast growth. A fast-growing fire would achieve a size of 8MW within just under 7 minutes, whereas the Crossflow fire model does not reach 8 MW until 15 minutes after ignition. An ultra-fast fire would reach the same 8 MW c.3½ minutes after ignition, i.e. almost five times faster than allowed for in the Crossflow analysis. It is also noted that an ultra-fast fire left unchecked by sprinklers would reach its full 20-30 MW fire size within about 6 minutes of

ignition, which is most likely prior to Fire Service arrival on-site and commencement of fire-fighting intervention.

Clause 27 of BS 9999 makes it clear that measures to remove smoke are required for basements, car parks, loading docks and covered roadways. The arguments as to the designation of the subject service space are irrelevant beyond the point that the space is unambiguously not a car park. The fact that the space is not a car park is only relevant in the manner that the appellant is seeking to avail of a perceived general exemption to install sprinklers in car parks and that clearly such an exemption would not extend to the service area. However, Condition No. 4 does not impose any specific requirements regarding provision of sprinklers. The requirement to meet the guidance of the Smoke Control Association's Guide is generating argument on the basis of the Guide clearly states that "in enclosed loading bays, service yards and coach parks sprinklers are likely to be needed to prevent fire spread involving the entire compartment", which obviously the appellant is seeking to avoid. However, the Guide is not a document providing a quantitative basis for sizing smoke extraction systems and to that end Condition No. 4 is effectively meaningless given its subsidiarity to the far more appropriate and robust Condition No. 9, which addresses the issue of smoke extraction system design.

It is concluded that Condition No. 4 is superfluous given the attachment of Condition No. 9 and it should be set aside.

5. CONCLUSION

In my opinion, the Board may rely on Article 40(2) of the Building Control Regulations to consider the subject appeal on the basis of Conditions only.

In respect of Condition No. 3, it is recommended that the appeal be rejected. The building is proposed to be designed to BS 9999:2017 and that code clearly requires the inclusion of sprinkler protection is required in this case to achieve adequate access for fire-fighters. However, so as to avoid confusion in terms of design responsibility the condition needs to be redrafted as follows:-

Condition No. 3

Both basement levels shall be protected throughout with a fixed fire-fighting automatic sprinkler system designed, installed and maintained to IS EN 12845:2015+A1:2019.

Reason:

In order to comply with B5 (Access Facilities for the Fire Service) to the Building Regulations, 1997 and subsequent amendments.

In respect of Condition No. 4, it is recommended that the appeal should be upheld and Condition No. 4 should be set aside. This is due to the fact that Condition No. 4 is superfluous given its overlap with and subsidiarity to Condition No. 9 (which has not been appealed).

The remaining 9 no. Conditions (Conditions No.'s 1, 2, 5, 6, 7, 8, 9, 10 and 11) attached to the granted Fire Safety Certificate are not subject of this appeal and should remain. The granted Fire Safety Certificate should therefore remain subject of 10 no. Conditions, i.e. Conditions No.'s 1, 2, 3 (redrafted), 5, 6, 7, 8, 9, 10 and 11).

Dr. Raymond J Connolly

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