REPORT TO AN BORD PLEANÁLA

ON

APPEAL AGAINST REFUSAL OF A FIRE SAFETY CERTIFICATE

ISSUED BY DUBLIN CITY COUNCIL

FOR

EXTENSION TO ARDMORE LODGE NURSING HOME, FINGLAS ROAD, TOLKA VALLEY, DUBLIN 11

Client:	An Bord Pleanála
An Bord Pleanála Ref:	FS 0551
Our Ref:	CTA 1705
Date:	Mar 2017

1.0 BACKGROUND

This Report sets out my findings and recommendations on the appeal submitted by Michael Slattery & Associates Fire Safety Consultants (MSA) against a refusal to grant a Fire Safety Certificate (Register Ref. No: FA/16/1325, Decision Order No. FSR2704/16) issued by Dublin City Council (DCC) in respect of an application for Extension to a Building: Proposed 38 bed Extension to the Ardmore Lodge Nursing Home at Finglas Road, Tolka Valley, Dublin 11.

Three reasons were stated for refusal:

Reason 1: *Non-compliance with Part B of the Second Schedule to the Building Regulations 1997-2014, section B1: Means of Escape in case of fire*.

Reason 2: *Non-compliance with Part B of the Second Schedule to the Building Regulations 1997-2014, section B3: Internal Fire Spread (Structure).*

Reason 3: *Non-compliance with Part B of the Second Schedule to the Building Regulations 1997-2014, section B4: External Fire Spread*.

1.1 SUBJECT MATTER OF THE APPEAL

- The application for a Fire Safety Certificate was lodged by MSA on 22nd June 2016, with additional information submitted on 31st August 2016.
- The Refusal to grant a Fire Safety Certificate was issued by DCC dated 21st October 2016, with 3 reasons given for the Refusal.
- An appeal against the Refusal was submitted by MSA on 18th November 2016.

1.2 DOCUMENTS REVIEWED

- Application for Fire Safety Certificate lodged by MSA, with compliance report and drawings, and additional information.
- Appeal submission by MSA to An Bord Pleanala, dated 18th November 2016
- Submission to An Bord Pleanala by DCC with fire officers report, dated 19th December 2016
- Appeal submission to An Bord Pleanala by MSA, dated 24th January 2017
- Submission from DCC to An Bord Pleanala dated 17th February 2017

- Technical information on SIPS system, submitted by DCC and by MSA
  - BRE Information Paper IP 21/10 (*Fire performance of structural insulated panels systems*)
  - BRE Information Paper 13/04 (*An introduction to building with structural insulated panels)*
  - Agrément Certificate No. 06/4312 – SIP Building System (Second Issue July 2007)
  - Agrément Certificate No. 06/4312 – SIP Building System (Amended August 2008)
  - Design Guide: Part 1: Structural Design (SIP Building Systems)
  - TFL Ltd. Structural Calculations
  - Building Test Centre fire resistance test report BTC 13687F
  - Building Test Centre fire resistance test report BTC 14254FA

2.0 FINDINGS

The case made by the building control authority is summarised as follows:

Reason 1:

- The recommendations of HTM 05-02 were used to demonstrate compliance with the building regulations.
- Sleeping accommodation should be in a separate compartment from day facilities, which is not the case at ground floor.
- The design of escape routes should be as per 2.58 of HTM 05-02-Figure 1 to facilitate bed evacuation of patients.
- The evacuation strategy has not been clearly presented on the drawings and generally presents as inadequate for the type of person who will use this building.
- HTM 05-02 recommends corridors be 2150mm wide to provide for beds/trolleys, whereas in this case the corridors scale as 1700mm, narrowing to 1400mm at the cross-corridor door.
- Figure 10 of HTM 05-02 recommends evacuation stairways at minimum 1500mm with landing widths of 1550mm x 3220mm, whereas the proposed stair is shown as 1200mm wide.
- The appeal documents note that mattress evacuation will be used, but the stairways do not comply with HBN 00-04 for mattress evacuation.
- Little/no information is given regarding (the number of) patients, level of dependency, number of staff, the level of training of staff, the level of competency needed to respond in a fire situation and carry out an evacuation.
- The evacuation strategy as presented was incomplete and not credible.
- Compliance with B1: means of escape in case of fire was not demonstrated.

Reason 2:

- Technical Document B recommends that non-combustible materials be used in the construction of an Institutional Building (Purpose Group 2(a)), whereas the proposed construction was in SIPS timber frame (justified under 5.15 of HTM 05-02).
- SIPS construction is commonly used (under BBA (UK) Agrément Certificate) in the UK for residential dwellings and light industrial buildings.
- The certification for the system is limited in scope to dwellings up to two storeys plus a room in a roof, and is not applicable to a 5-storey nursing home (no evidence for such use was presented).
- The information in BRE Information Paper IP 21/10 presents a possible risk to the structural integrity of the building in a fire situation.
- The inclusion of sprinklers may mitigate against this risk, but in the context of this type of building and occupants, the consequences of this risk are very high. The possibility of the failure of the sprinkler to act either how it should or where it should or the efficacy of it has not been analysed, the so-called 'what-if' factor.
- The strategy proposed as presented has raised concerns in DFB, and is considered to present a risk to safety for its use in this type of building and for the occupants of the building.
- From UK government sponsored studies carried out with BRE (summarised in BRE paper IP21/10), small and large scale fire tests were carried on 2-storeys structures which showed that the SIPS construction performed satisfactorily (in terms of fire resistance) but that sometime after the fire had been extinguished localised combustion was continued within the panels and on the inner surface of the polymer core.
- In other cases the test was terminated due to runaway deflection of the floor caused by rapid combustion of the engineered floor joists, and this raises concerns.
- There is a heavy reliance on the exact specification and installation of the panels (with no tolerance for variance) and on internal linings to both ceilings and the floor, which are critical to the performance in a real fire scenario.
- This information was not presented as part of the application, with little information given on the composition of the floors and on how penetrations of the wall assembly would be handled, which is intrinsic to the performance of the whole structure in a fire event.
- In other studies carried out by BRE, they note that the biggest issue in terms of inadequate protection of concealed spaces is due to poor workmanship with inappropriate materials. This is a feature that has been noted by DFB; consequently, the heavy reliance on the exact specification and installation of a SIP system is of huge concern to DFB.
- From the above-mentioned tests, the integrity of the wall will fail if the fire gets into the insulation core of the panel. The proposed sprinklers would control the size of the fire and may

extinguish it, but there is a risk that if the fire does penetrate the exterior and get to the polymer insulation core, it would be shielded from the room sprinklers and they will be ineffectual (in that regard).

- Considering that the integrity of the SIP system in a fire is very dependent on exact specification and installation, with no variance tolerable, the risk to a breach of the outer layers of the panels is high. Additional layers of plasterboard are added to the panels to provide the required fire resistance, but there is a high risk of a breach of this outer layered surface over the lifetime of the building, either at construction stage or through the lifetime of building as it changes and matures. A significant understanding of how critical it is to maintain the sealed wall surface is critical to the ongoing safety of the building. How the building is to be used and what type of people will inhabit it are intrinsic to the design.
- For a 5-storey nursing home, the level of patient dependency is not explained or analysed; the patients are expected to be in the dependent or very highly dependent categories, placing high demand on staff in a fire evacuation.
- The number, competency and training of staff is a concern, with respect to progressive horizontal evacuation demands.
- It is noted that available evacuation time is related to the level of fire protection throughout the building, and the demands on staff can result in considerable pre-movement times (in an evacuation scenario).
- In considering the type of SIPS construction, installation issues, the mode of failure of a fire affecting the floor (runaway deflection) or walls affected by fire in the core, there is a question over the time that might be available to carry out evacuation of a room or a sub-compartment.
- Analysis dealing with the above issues was not included with the application, and the proposed fire strategy has raised concerns in DFB, and is considered to present a risk to safety for its use in this type of building and for the occupants of the building.

Reason 3:

- The non-compliance with B4 was not addressed in the appeal documentation.
- The possible mode of failure of the building raises a concern for the safety of firefighters attending a fire on site.
- There is additional challenge to firefighters due to the type of firefighting operations needed in this type of building in terms of extinguishing the fire and the possible continued combustion within the panels unseen after the fire is considered extinguished whilst the building is being used for progressive horizontal escape strategies. Compliance with B4: External fire spread was not demonstrated.

DCC note that the Decision as issued was based on information submitted with the application, when the information submitted as part of the appeal was not available.

DCC also make reference to a separate recent appeal (Ref. FS 0538) relating to a nursing home in Dalkey, Co. Dublin, where the SIPS system was used, where they say that B3: Internal fire spread (Structure) was not appealed and therefore An Bord Pleanala did not consider or adjudicate on the SIPS form of construction as part of the appeal process.

It is noted that the construction in that case was for three storeys, presented by the applicant as being within the scope of the Agrément Certificate for the SIP system, and accepted by DCC (it was not included as one of the reasons for refusal of the Fire Safety Certificate in that case).

The case made by the Appellant is summarised as follows:

Reason 1:

- The proposed works have been designed on the basis of HTM 05-02, with a high level of compartmentation and sub-compartmentation, with a maximum of 6 patients per sub-compartment, sprinkler protection and each patient room enclosed in 30 minute fire resisting construction.

- There is minimal change to the existing nursing home means of escape, with the provision of additional horizontal evacuation potential to the extension from existing areas.

- Cut-off sprinklers will be provided on the existing side of the nursing home.

- The proposed extension will increase the maximum patient complement from 89 to 125, with an increase in staff from 42 (day) and 12 (night) to 55 (day) and 16 (night).

- In the extension, the maximum number of bedrooms on a floor is 8, with a maximum of 5 in any sub-compartment. With sprinklers, it is considered unlikely that any fire in this area will go beyond the room of origin, with the maximum number of patients requiring evacuation being 2, from a double room.

- Existing staff are trained and new staff will be trained, in the evacuation of patients, and more staff resources will be available to assist in the limited evacuation likely to be required. All staff receive regular training and undertake evacuation drills to familiarise with the methods of

evacuation. The same methods will be adopted in the new extension as are in place in the existing building.

- While corridors are not 2150mm wide as per HBN 00-04, it is not considered necessary as the same level of bed movements are unlikely in a nursing home. It is considered that the general minimum of 1500mm from HBN 00-04 is appropriate for the home and is in line with those in the existing approved home. The corridors in the extension will be at 1700mm wide, and the cross-corridor doors will exceed the HBN 00-04 (Figure 13) recommendation at 1300mm wide.

- The new Stair 5 is designed as per Table 1 of HBN 00-04 in respect of mattress evacuation only, and will be larger than the stairs in the existing approved, and will be in line with what staff are familiar with for existing evacuation drills and training.

- There will be a variety of levels of dependence of patients, including:

    - Independent patients capable of self-evacuation and able to understand staff directions

    - Patients suffering from dementia needing to be directed and accompanied by staff

    - Patients who are immobile and in need of assistance to get in a wheelchair

    - Patients who are immobile and will need mattress evacuation

- Given the familiarity of staff with evacuation via the existing approved stairs, the proposed new stairs is considered to be acceptable from the proposed extension.

- While it is noted that HTM 05-02 would recommend lobby protection to the stairs, the proposed design of the extension achieves the same level of protection by the provision of protected corridors in the extension and the provision of sprinklers. The level of fire separation of rooms from corridors at 60 minutes exceeds the normal 30 minutes fire rating recommended.

Reason 2:

- Principal concerns raised by DFB include detailing of the construction of the building and the fact that non-combustible materials are not used given that a 60 minute fire resistance rating is required.

- Use of the SIP system is considered acceptable with sprinklers by reference to section 5.15 of HTM 05-02, using prefabricated high performance lightweight building panels which may be used in floors, walls and roofs (with 60 minutes fire resistance).

- Framed wall construction is to be designed and detailed to BRE Guidelines for the Construction of Fire Resisting Structural Elements.

- Maximum compartment size will be 330sqm, against the permitted 2000sqm under HTM 05-02.

- Floors will be constructed using timber studding and structural OSB, with the fire resistance achieved using 12.5mm layers of plasterboard.

- BRE paper IP 21/10 summarises a number of fire resistance tests conducted on samples of SIP buildings.

- No services will be accommodated in the SIP panelling. Specifically located metal ductwork will be used to distribute the necessary services, and in no case will unprotected cabling be used (either metal tubing or flame proof cable will be used).

- All openings in fire barriers for service pipes, cables, fire dampers etc. will be sealed in accordance with the recommendations of Section 3.4 of TGDB, Section 12 of BS8313 and HTM 05-02.

- The reason for refusal is understood to be based on TGDB recommendations that the building be in non-combustible construction. The proposed SIP system is based on BBA Agrément Certificate No. 06/4312, for construction of 2.5 floors.

- The BBA Design Guide Part 1: Structural Design notes that the use of SIPS is not restricted to this height subject to an independent design being undertaken by a suitably experienced engineer. Such a design has been undertaken by TFM Ltd. (details attached).

- Regarding the use of combustible materials for the construction, it is proposed to provide sprinklers to EN 12845 as modified by HTM 05-02 as in the recently approved extension to Dalkey Lodge Nursing Home (Dun Laoghaire Rathdown Co. Council FSC 16/8045).

- HTM 05-02 does not require the building to be of non-combustible construction when it is provided with sprinkler protection as per HTM 05-02 and with sections 5.80 and 5.84 of HTM 05-02.

- In the additional submission dated 24th January 2017, reference is made to a letter from TFM Ltd. regarding the QA/QC procedures in place in the plant where the SIPS panels are manufactured. The principal issues highlighted in the letter include:

- The BBA certificate gives indicative performance levels in terms of meeting building regulations, including for 30 minute and 60 minute fire resistance of the structural elements.

- To meet the fire performance standards, there is a reliance on the specification being exact, but the proposed structure would actually have a higher than required specification with enhanced fire performance and specification based on performance, quality installations and inherent robustness.

- All procedures and systems will be Quality Controlled under BOPAS approved system.

- PODS are off site assembly allowing for a much greater degree of checking and supervision to ensure all elements are installed to ensure full compliance with the fire safety strategy.

- Each POD will be fully designed and checked with individual panel drawings for each element. The POD drawings will incorporate all electrical, plumbing and fire detection and suppression details

- Each POD will be checked at key stages to ensure all elements of design have been completely incorporated into the factory assembly process.

- Additional checks will be implemented including detailed photographic record on each POD after structural assembly, installation of fire rated plasterboard linings to walls and ceilings, installation of services, compartment floors, fire stopping and sacrificial layer of plasterboard.

- The building will generally have sacrificial plasterboard over all service zones so that walls and ceilings would have a higher than 60 minute performance from the room face in the event of a fire.

- The sacrificial layer of plasterboard will also ensure that the primary fire resisting boards are not damaged or can be accessed in any way through future maintenance.

- SIPS panels are closed at every floor level to ensure fire stopping.

- Each floor will be treated as a fire barrier with all shafts fire stopped at ceiling level or built as a protected shaft.

- Fire stopping material will be installed between all SIPS for full elevation to ensure no cavities.
- Floor coverings on compartment floors will include a screed so top of floors will also act as a fire resisting barrier, and will make the structure more robust.
- Floors will be insulated between joists.
- Vertical cavity barriers will be provided externally at every POD.

- The concerns regarding the risk of fire penetration to the core material of the panels are obviated by the provision of sprinklers and by the additional sacrificial layer of board.
- The likelihood of fire spread beyond the room of origin is greatly mitigated, addressing the concerns in relation to evacuation procedures and time to evacuate; this risk is also mitigated by the increased staffing in the extended home.

Reason 3:

- The boundary separation distances from the rear elevation are between 10m and 18m from the West elevation, as denoted on the application plans. Distances to the North and East exceed 20m.
- Given the nature of the external wall construction, the elevations are considered to more than meet the 60/15 requirements for external walls greater than 1m from the boundary (except for windows/doors).
- If it is contended that there could be catastrophic failure of the panels (resulting in more external wall exposure to the boundary), this has been refuted by virtue of the response to the QA/QC and construction detailing in the above submission.

3.0 CONSIDERATIONS:

Regulation B1: Means of Escape:

The recommendations of HTM 05-02 were used to demonstrate compliance with the building regulations (along with recommendations from TGDB). In a hospital setting, many of the patients tend to be more dependent in that, due their medical condition, they may need to be evacuated in a bed, along with medical equipment to which they may be connected and possibly with attendant staff who may need to remain with them, depending on their condition. In that regard, HTM 05-02 has recommendations that take account of necessary door and corridor widths, stairway dimensions etc.

In a care home setting, the occupant profile will normally include a majority of occupants who will be less dependent than outlined above. The majority would be classified as 'independent' or 'dependent' as per 2.19 of HTM 05-02, with fewer likely to be classified as 'very high dependency' under the same criteria (this could include dementia patients).

Under 1.1.3 of TGDB, HTM 05-02 is referenced as appropriate guidance for fire safety design of hospitals specifically and, by implication, it references TGDB as the appropriate guidance for other Purpose Group 2(a) buildings, including care homes. On that basis, compliance with the recommendations of TGDB can be taken as prima facie evidence of compliance with Part B of the building regulations.

HTM 05-02 is quoted as a reference to the requirement that day facilities should be in a separate fire compartment to sleeping accommodation, which occurs at ground floor. Under 2.52 of HTM 05-02, it appears that this recommendation applies only to facilities providing in-patient mental health services and in-patient accommodation for people with learning disabilities (and not to hospitals generally). Nonetheless, the café/day space at ground floor is separated from the bedroom corridor in 60 minutes fire resisting construction (with FD30S door), which is considered adequate (subject to the door being upgraded to FD60S).

DCC state that the design of escape routes should be as per 2.58 of HTM 05-02-Figure 1 to facilitate bed evacuation of patients (2450mm wide). There is some lack of clarity regarding the widths of corridors and stairways; relevant dimensions are not shown on the plans and 2.6 of the compliance report notes that corridors will have a minimum width of 1150mm as per 1.2.4 of TGDB, but should have a minimum width of 1200mm as per 5.47 (3.42?) of HTM 05-02 (this is the recommended width in a hospital where beds or patient trolleys will not be used for evacuation). In their further submission as part of the appeal, MSA state that the corridors will be 1700mm wide (with 1300mm wide doors).

It is stated that evacuation for a number of immobile patients will be by wheelchair or by mattress, so the widths required for bed or trolley evacuation (2450mm) are not considered necessary. In light of the minimum width recommended under TGDB (1150mm), the 1200mm recommended for non-bed evacuation under HTM 05-02 and the proposed widths of 1700mm, it is considered that the proposed corridor widths are adequate.

Regarding the proposed stairway width, this is not stated in 2.7 of the compliance report, but is noted on the plans as 1200mm wide (it is unclear if the handrail projections are included). Item 5 of the later appeal submission does not say directly what the stair width will be, but refers to Table 1 of HBN 00-04 saying that it will comply with Table 1 in respect of a stairway that can be used for mattress evacuation (at 1200mm wide), with relevant landing widths. On that basis, it is considered that adequate stairway width is provided for.

Regulation B3: internal fire spread structure:

In a building in Purpose Group 2(a) (Institutional) use, 3.2.5.1 of TGDB recommends that all compartment floors should be constructed of non-combustible materials. MSA have quoted 5.15 of HTM 05-02 in support of their proposal to use the SIPS construction, as the extension (but not the existing building) will be provided with sprinklers. It is noted that the HTM 05-02 relaxation refers to the use of materials of limited combustibility, rather than to non-combustible materials.

3.2.5.4 of TGDB also has a recommendation that walls in institutional buildings that have a fire resistance requirement of 60 minutes or more be constructed of materials of limited combustibility.

1.1.3 of TGDB refers to compartmentation recommendations for healthcare buildings being included in Section 3 of TGDB (rather than in the HTM guidance), and the TGDB guidance does not include a relaxation in respect of the provision of sprinklers. In HTM 05-02, Sections 5.6/5.7 note that partial sprinkler protection i.e. where sprinklers are not installed throughout the building, will not provide the same extent of protection for structural elements (but partial sprinkler protection can help mitigate localised fire risks in the building).

The SIPS construction system is covered by a BBA Agrément Certificate which notes that it relates to SIP loadbearing wall and roof panels, using structural insulated panels manufactured from OSB/3 and rigid polyurethane insulation. The panels are for use in domestic application up to two storeys high (plus room-in-roof) as the loadbearing inner leaf of an external cavity wall (and may also be used as part of internal

loadbearing walls). The certificate does not specify what type of flooring is used, but notes that the fire testing of components relates only to wall and roof panels.

The panels, with appropriate linings, can be used in walls required to have a fire resistance in excess of 60 minutes. All construction is subject to proper structural design by a Chartered Engineer. Intermediate floor construction in this case is in engineered or traditional timber floor joists (not covered by the Agrément Certificate), supported on the loadbearing wall panels.

The Agrément Certificate notes that the fire resistance tests (yielding the 30 or 60 minute fire resistance ratings) were carried out on the panels themselves and not on the completed assembly, nor on the floor construction, which is not specifically detailed in the Agrément Certificate. The Agrément Certificate appears to relate to the construction of the panels themselves, how they are interconnected and how they can act as vertical loadbearing structural elements. It also notes that the system is considered fit for use only when installed, used and maintained as set out in the certificate.

Item 13.7 of the certificate notes that where a greater load capacity to that given in Table 3 or where any other form of wall construction incorporating the panels (including any service penetrations) is subject to a fire resistance requirement, an appropriate assessment or test must be carried out by a UKAS approved testing laboratory. It is unclear if the load capacities on the proposed wall panels (for care home use) are greater than those (presumably for domestic use) set out in Table 3. There is no reference in the Agrément Certificate to the SIP system being applicable to higher buildings than those stated.

MSA make further reference to the SBS SIP Building Systems Design Guide: Part 1: Structural Design, in support of the use of the system for a building higher than 2 storeys (plus room-in-roof). The Guide notes that SIPs are usually used in roofs and external walls of buildings but may also be used in floors and internal walls. The current BBA certificate covers two storeys plus roof storey. However, “the system is not necessarily limited in this respect and four storeys or more are possible when independently engineered”.

While the above flexibility is allowed under the Guide in terms of structural design (stability, wind loading etc.), it does not address the issue of the fire resistance of elements of structure for buildings higher than 2.5 storeys as per the Agrément Certificate.

In summary, the Agrément Certificate appears to apply to:

- SIPS wall and roof panels used with a separately-designed floor.
- Domestic use

- Up to two storeys high (plus room-in-roof)
- Construction carried out by “approved contractors”…” who have been trained and assessed to undertake this work”.

It is relatively straightforward to design a simple fire rated timber first and attic floor to be constructed along with the Agrément Certified fire rated SIPs wall and roof panels, and be satisfied that the overall structure (in domestic use) will provide the required fire resistance. It is a considerably different matter to assert that a five storey building (in residential care use) with SIPs wall panels and a separately engineered timber floor structure will provide the required fire rating to the overall structure, in the absence of some additional attestation (separately from the pure structural design calculations).

Some ‘live fire’ testing has been done on SIPs buildings, including that set out in BRE Information Paper IP 21/10 (referenced by DCC and MSA). The buildings were of 2 storeys, with SIPs wall panels and engineered floor joists (similar to those proposed in this case). The paper notes that while individual components can be tested in a standardised test, this provides little information on how a building formed with interconnected components will perform in a real fire scenario. This led to the large -scale fire tests on two-storey SIP structures, which the paper summarises. In the tests, the two-storey construction was loaded as for a four-storey apartment building type (for the 60 minute fire resistance). The F3 test from Table 2 of the paper is considered the one most relevant to this case (60FR with PUR insulated panels).

In the 30-minute tests (F2 and F4), there was ‘runaway deflection’ of the floor due to combustion of the engineered floor joists, and this was raised as a concern by DCC. However, in this case the F3 test would apply (with 60FR) and the same deflection did not occur, so presumably would not be an issue where the floors have 60-minute fire resisting protection.

However, another concern of DCC is noted in the test results. Some time after the initial test fire had been extinguished, and no evidence of damage to the wall had been noted, it was found that there was continuing localised combustion and significant post-test damage to the wall panel (between the OSB and the insulation). The recommendations from the paper include the formation of a service void between the OSB layer and the outer plasterboard, whereas in this case the proposal (from additional information received from MSA) is to form the void outside the plasterboard and provide an additional plasterboard layer outside of that.

Regardless of the published test data, the question arises as to whether the use of combustible materials in this case is in line with the intent and reasonableness of the building regulations. The non-combustibility

recommendation in TGDB applies to all floors in (a) residential (Institutional) buildings and (b) to compartment floors above 10m high in any other building. Where floor construction is in concrete or concrete/steel, there is an inherent factor of safety as localised stability or integrity failure is less likely than with a timber floor construction, where failure can arise due to interference with the applied fire protection over time (due to mechanical damage, penetration for new services etc.), which is less likely with concrete construction. While, in theory, the fire resistance of the structure could be the same in each case, there is doubtless better protection, in general, with a non-combustible construction.

This would not be such a significant issue where a building occupancy allows for a strategy of simultaneous evacuation. Where a progressive horizontal evacuation strategy is required, then it could be considered reasonable for the relevant authority to set a higher threshold for protection than for a building where the occupants can immediately evacuate ('to an extent dependent on the use of the building'). This arises due to the continued presence of dependent occupants during a fire occurrence, and the likely extended period of presence of fire service personnel within the building (as opposed to a building with immediate evacuation).

MSA have noted that in hospitals the requirement under HTM 05-02 'materials of limited combustibility' can be omitted if sprinklers are provided. HTM 05-02 notes that where provisions of the code are being modified on the basis of the provision of sprinklers, a documented risk assessment on affected issues should be carried out. While arguments in favour of the use of the SIPs system have been made, a specific risk assessment per se has not been included. In that regard, for instance, it is not clear from the application if the new protected stairway is constructed in non-combustible materials or is part of the SIPs construction. It also has to be noted that the application of guidance for fire design of hospitals is not necessarily considered transferrable to care homes, where the overall layouts and activity dynamics can be different.

It is also noted that, at five storeys, the proposed construction is higher than the two storeys as per the BRE live fire test construction and the calculated loadings for four storeys in the test. It is also noted that in Section 19 of '*Northern Ireland HTM 84: Fire safety in residential care premises'*, no staff or resident bedrooms are permitted above four storeys. No examples of actually constructed buildings (in any type of use) using the SIP system to a height of more than 2.5 storeys have been given.

While there is undoubted benefit from the provision of sprinklers in terms of reduction in required fire resistance for elements of structure, and they are generally considered as reliable in most circumstances in terms of automatically controlling or extinguishing a fire, their proposed use in a residential care building of this height, with combustible construction, would be a departure from the current guidance in TGDB. This

applies to the provisions for floors in care homes but also to the construction of compartment floors above 10m in height.

While adherence to the recommendations of TGDB is not mandatory, it is accepted that the use of alternative strategies or methodologies must be properly supported. However, the TGDB guidance relating to the use of non-combustible materials can be reasonably considered as not just fire safety design guidance (that can be measured against alternative equivalence proposals), but (with respect to this particular provision) as a policy statement on behalf of the publishing statutory authority. Given that the life risk in this premises is at the highest end of the scale, and in the absence of updated policy/guidance from the authority, it is considered appropriate to apply the current guidance in this particular case.

With regard to the appellants case that departure from the current guidance by the use of the SIPs system is justified, the 'live fire test' information offered relates only to a two storey building (albeit with some additional information on four-storey structural loadings), and the Agrément Certificate relates only to a 2.5 storey building (in essence a two –storey domestic dwelling with an attic room). In such a building, any fire is likely to lead to immediate evacuation, probably by able-bodied occupants in most cases, and complex intervention by the fire service is not likely to be required.

In the case of a five storey care home, due to the dependent nature of the occupants and the height of the building (resulting in longer periods of evacuation/intervention), the preservation of the stability of the structure is a crucial factor that would potentially be compromised by the use of combustible materials in the structural floors and walls, and the deviation from the TGDB recommendation that non-combustible materials be used in the floors and materials of limited combustibility in walls is not adequately supported in this case.

Regulation B4: External fire spread:

DCC did not clarify in their submission what the specific reason was for refusal for non-compliance under regulation B4, except to say that the non-compliance with B4 was not addressed in the appeal documentation. In their appeal submission, DCC mention concerns regarding the possible mode of failure of the building as a matter relevant to the safety of firefighters and 'evacuation vulnerabilities', especially at night time, and potential challenges to firefighters due to continued combustion within the wall panels.

It is not considered that these issues are relevant to the requirements that arise under Regulation B4: External fire spread, which is concerned mainly with potential fire spread to/from buildings on adjacent sites.

In the application documentation, MSA tabulated the worse-case space separation requirements on the (stated) basis of the external walls having no fire rating. This assumes that each floor would be considered as a compartment floor, with the relevant enclosing rectangles being 3m high in each case, at maximum 18m long. The Table showed that for the enclosing rectangles selected, the required distance to the boundary on each relevant elevation was 1m, whereas in each case the actual distance was more than 10m.

The outputs from Table 1 of BR 187 (BRE guidance on separation distances) show different distances than shown in the application report:

- On the Eastern elevation, the enclosing rectangle of 3m x 18m (with 100% unprotected area) gives a separation distance to the relevant boundary of 4m, rather than the 1m stated.
- On the Western elevation, the enclosing rectangle of 3m x 18m (with 50% unprotected area) gives a separation distance to the relevant boundary of 2.5m, rather than the 1m stated.
- On the Northern elevation, the enclosing rectangle of 3m x 12m (with 50% unprotected area) gives a separation distance to the relevant boundary of 2m, rather than the 1m stated.

Presumably, DCC had some issue with these calculations, but have not elaborated on what they considered was deficient or required.

Nonetheless, assuming that there was total failure of the SIPS structure such that there was exposure of the complete building facades to the relevant boundaries, and individual storey compartments were not taken as the limiting factors in calculating space separation requirements, then an enclosing rectangle including the complete facades would be 30m long and 18m high. From Table 1 of the BRE guidelines for space separation, this would recommend a distance to the boundary of 15.5m (not taking into account the allowance for 50% reduction where sprinkler protection is provided).

At the Finglas Road elevation, the distance to the relevant boundary (centre of the public roadway) is around 20m, and at the North end of the site is in excess of 60m. At the rear, the distance varies from 17.8m to around 10m. Where the distance from the boundary to the building reduces to 15.5m or less, the façade of the building is only two storeys high (presenting a smaller enclosing rectangle), rather than five storeys, as the upper floors from that point are set back and have facades that are at least 15.5m from the boundary.

As the above scenario takes no account of additional internal fire spread restriction that might be facilitated by the provision of sprinklers or of any compartmentation within the extension, nor takes into account additional protection against external fire spread that might be contributed by fire resisting external walls,

and given the available distances between the relevant facades and the relevant boundaries (and taking account of the set-back of the building at upper levels where the boundary distance is reduced) it is considered that adequate provision is made in respect of external fire spread.

3.1 CONCLUSIONS:

While it is considered that the reasons given for refusal in respect of Parts B1 and B4 of the building regulations are not warranted, it is considered that the refusal of a Fire Safety Certificate (on the grounds of non-compliance with the requirements of regulation B3) was warranted, and the appeal should be refused, as set out below.

The building control authority makes reference to a previous appeal case (Ref. FS 0538) as precedent where the SIPs system was used in the construction of a nursing home extension, noting that the Board had not adjudicated on the use of that system as part of that appeal. In assessing this current case, I would note that I was restricted to reviewing the proposals and the appeal documentation having regard to the merits or otherwise of the information presented.

4.0 REASONS and CONSIDERATIONS:

Reason 1: Regulation B1: Means of Escape:

Having regard to the submissions made in connection with the Fire Safety Certificate application and the appeal, the type of use and layout of the building and having regard to the proposed widths of escape routes, exits and stairways (being similar in width to the existing stairways, with the same means of evacuation), it is considered that the functional requirements of Part B1 of the Second Schedule of the Building Regulations 1997-2014 (Means of escape) are being satisfied and that Reason 1 be omitted as a reason for refusal to grant the Fire Safety Certificate.

Regulation B3: internal fire spread structure:

Having regard to the submissions made in connection with the Fire Safety Certificate application and the appeal, the type of use and layout of the building, having regard to the dependent nature of the occupants and the required strategy of progressive horizontal evacuation and to the proposed height of the building, and with particular regard to the proposed SIPs method of construction using combustible structural floor and wall elements in the above context, it is considered that the functional requirements of Part B3 of the

Second Schedule of the Building Regulations 1997-2014 (Internal fire spread (structure)) are not being satisfied and that Reason 2 for the refusal to grant a Fire Safety Certificate be upheld.

Regulation B4: External fire spread:

Having regard to the submissions made in connection with the Fire Safety Certificate application and the appeal, the extent of unprotected areas on the facades of the building vis-à-vis their distances from the relevant boundaries, it is considered that the functional requirements of Part B4 of the Second Schedule of the Building Regulations 1997-2014 (External fire spread) are being satisfied and that Reason 3 be omitted as a reason for refusal to grant a Fire Safety Certificate.

Signed by:

COLM TRAYNOR BE FIEI Chartered Engineer

Date: **3rd March 2017**