Our Ref GG/1213/mc/39dcc

Date 25th July 2024

Kevin Kinneally
Fire Prevention Section
Dublin Fire Brigade HQ
165-169 Townsend Street
Dublin 2

Dear Kevin

DUBLIN CITY COUNCIL FRUIT MARKET, ST MICHANS STREET, SMITHFIELD, DUBLIN 7.

Fire Safety Certificate Additional Information (Ref: FSC 3018655)

Further to our recent conversation, please find enclosed a package of additional information for the above Fire Safety Certificate application (Ref: FS 3018655). The following revised documentation are enclosed as part of this Additional Information Submission: -

- Revised FSC Compliance Report (Ref. GG/1213/R1 Issue 2).
- Revised drawings listed in the table below.

Drawing Number	Drawing Title	Scale
GG/1213/01/04 - Rev A	Proposed Ground Floor Plan	1:200 @ A1

Revisions to the previously submitted FSC documents have been highlighted in blue within the FSC Compliance Report (R1 Issue 2) and red revision clouds on drawings.

We would like to clarify the following with regards to the above Fire Safety Certificate application: -

1. ***A B2 Risk Profile (i.e. medium fire growth rate) has been chosen for the proposed building. The building is a large open-plan retail space with restaurant facilities and kiosks cooking and serving food throughout. Table 3 of BS 9999 recommends a B3 Risk Profile (i.e. fast fire growth rate) for "Shop sales areas" including "shopping complexes and department stores as well as high street shops and premises for personal services". The proposed market could easily be compared to a large department store, albeit with the addition on cooking and assembly & recreation levels of occupancy.***

   We confirm that the building will be used as a food market only, with some additional restaurant and cooking facilities. Therefore, it will not be similar to a typical large Department Store or high street retail unit, where the type and extent of goods on display and their orientation (display, racking, etc.) would constitute a significantly higher fire load than expected within the Food Market.

- As per the recommendations of Table 3 of BS 9999:2017, where the fire load consists of a mix of combustible materials '*evenly distributed low to mid-level'*, a **medium fire growth rate** would be considered applicable. The market building is expected to have a similar fire growth rate i.e. low to mid-level storage of food produce for display purposes.

- As per Table 3 of BS 9999:2017, a fast fire growth rate is considered applicable where there are stacked combustibles (on or off racking but excluding high racking), which would be more relevant to a Department Store or Retail sales area, where a higher level of combustible materials may be displayed/stacked to ceiling level i.e. Hardware shops, clothes shops, toy shops, furniture store etc.

- As further noted in Table 3 of BS9999:2017 (for Shop sales areas) *"Combustibility, quantity and how goods are displayed should be taken into account and the risk category amended accordingly*".

The provisions set out in Table 3 of BS 9999: 2017 recognise that all shop sales areas are not similar, and the level of risk varies depending on the combustibility of the materials, the amount of goods present and how they are displayed.

Therefore, the comparison of the Food Market to a typical Department Store or large High Street retail unit is considered inaccurate. Based on the limited fire load associated with the display and sale of food, a **medium fire growth rate** is considered applicable to the market building.

2. ***Following on from the above Point 1, the calculations of Appendix 3 assess a fire in an individual kiosk, in terms of fire-load and area. It then takes this result to determine the distance between the Market Spaces, which are concentrated pods of up to 6 individual kiosks. A kiosk fire is calculated to result in a 4.2 MW fire, based on only 14.4m^2 of a 36m^2 kiosk containing a fire load and a, as previously discussed, liberal HRR of 290KW/m^2. The report states, "any materials within 3.3m of the fire origin may become involved in the fire". This suggests that a fire within an individual kiosk will spread to surrounding kiosks due to their proximity within each "Market Space". This makes the 4.3m (3.3m + 1m factor of safety) distance redundant as it is based on a fire that does not spread from the initial kiosk. Please review the kiosk/Market Space arrangements so that each layouts are in line with the calculated distances.***

As detailed in Appendix 3 of the enclosed updated FSC Compliance Report (Ref. GG/1213/R1 Issue 2), both a deterministic analysis and comparative analysis have been carried out, using CFAST modelling, to demonstrate that the proposed compartmentation within the Market building will provide the level of fire safety required to satisfy the requirements of Part B of the Second Schedule to the Building Regulations. As part of this analysis: -

- A general retail heat release rate of 550kw/m^2 was utilised which is considered extremely onerous for the type and orientation of the fire load expected within the food market.
- The size of the fire modelled, based on the above heat release rate (of 550kw/m^2) was calculated to be 82.5MW. To simulate a fire enveloping an entire market bay/zone, the design fire was located in 4 different locations within the bay/zone, each with a fire size of 20.6MW.
- A radiation target was set up 4m away from the fire location to simulate the distance across circulation routes between the zone of fire origin and the adjacent bay/zone.

The CFAST analysis demonstrated that the radiant heat flux to the target (i.e. the adjacent market zone at 4m distance) did not exceed the threshold of 20KW/m^2 for non-piloted ignition (i.e. 16.3KW/m^2) above which fire spread between market bays/zones may occur.

As noted above, the analysis was based on a HRR of 550kw/m^2 and considered an entire market zone to be fully enveloped in fire at the same time – both assumptions are extremely onerous and therefore provide a significant margin of safety to the results of the analysis.

The deterministic and comparative analysis demonstrates the benefits associated with the orientation of the market fire loads, the provision of wide circulation routes between market zones/bays and the existing high roof complete with permanent open vents in ensuring that a fire within a single market zone/bay will not spread beyond the zone of fire origin to adjacent market zones.

The results also demonstrate that both the actual area of the fire load and the maximum fire size within a TGD B compliant retail compartment would be multiples of that within the Food market compartment.

Therefore, if compliance with the guidance in Technical Guidance Document B (TGD B) will, *prima facie*, indicate compliance with Part B of the Second Schedule to the Building, then the deterministic and comparative analysis have demonstrated that the proposed compartmentation will provide a greater level of fire safety than that provided by TGD B guidance, therefore satisfying the requirements of Part B of the Second Schedule to the Building Regulations

3. ***Appendix 3 makes a point that the ceiling of each kiosk is perforated, allowing smoke and hot gases to rise to roof level, reducing the risk of heat feedback. Please provide more detail on the materials and construction of the kiosks so it can be determined if they may contribute to a growing fire or not. Please outline their compliance with Table A8 of TGD B and the nature of the perforations in the kiosk ceilings.***

We confirm the walls separating each stall/kiosk will be of non-perforate construction and surface linings will achieve a Class B s3-d2 surface spread of flame.

Where the ceilings of kiosks are required to be 'enclosed' for security purposes, these ceilings will comprise of 'mesh type' perforate construction involving non-combustible materials. In the event of a fire within a kiosk, the hot smoke and gases produced will dissipate through the perforate ceiling of the kiosk and into the large roof of the market building, which is provided with permanent venting.

4. ***As mentioned at the start of this FI request, in order to comply with the guidance of the Department's circular, BS 9999 can be used as a basis of design as long as the level of fire safety achieved is adequate to satisfy the requirements of the Irish Building Regulations. Considering this, the proposed compartment size of the market space (5,792m^2) significantly exceeds the 4,000m^2 recommended in Table 3.1 of TGD B (if the space is considered as Retail). It is unclear whether or not the maximum compartment volume is exceeded or not. Table 3.1 of TGD B allows for compartment sizes to be doubled if an appropriate automatic sprinkler system is provided. Therefore, in order to comply with B3 of the Irish Building Regulations, it is recommended to provide sprinklers to I.S. EN 12845: 2015. (See Point 5 below).***

As stated above the DECLG, in their 2011 circular, confirmed their satisfaction for Local Authority Building Control Authorities to consider fire safety strategy designs based on British Standard BS 9999 code guidance, as alternative solutions, as provided for in Section 0.1.4 of TGD B, and stated that designs based on this Code may in general be regarded as acceptable, provided the level of fire safety achieved is adequate to satisfy the requirements of Part B of the Second Schedule to the Building Regulations.

As noted in the DECLG circular, BS9999 provides a more flexible approach to fire safety design than that provided by the more generic guidance of TGD B, through the use of a risk-based approach to fire safety design, taking account of physical factors of the building and human factors of its occupants. It also provides '*an alternative approach to fire safety and can be the only practical way to achieve a satisfactory standard of fire safety in some large and complex buildings….*'.

The market building, which opened in 1892 and is a listed building of significant historical importance, was constructed 100 years before the introduction of the Building Regulations. It is a large, open plan building with a high roof.

Under the requirements of Section B3 of the Building Regulations, the objective of the provision of compartmentation within a building is to prevent rapid fire spread and to *'reduce the chances of a fire becoming large, on the basis that large fires are more dangerous'.*

As noted in item 1, a risk-based approach was utilized to assess the building. As part of this Risk based approach the building was deemed to have a B2 Risk profile where there is no limit on compartment sizes.

Although compliance with the recommendations of BS9999:2017 vis-à-vis the provision of fire compartmentation is achieved, in order to demonstrate that the proposed compartmentation will provide the level of fire safety required to satisfy the requirements of Part B of the Second Schedule to the Building Regulations, both a deterministic analysis and comparative analysis have been carried

out, as detailed in Appendix 3 of the enclosed updated FSC Compliance Report (Ref. GG/1213/R1 Issue 2).

Deterministic approach
The deterministic approach, using CFAST modelling, demonstrated the benefits associated with the orientation of the market fire loads, the provision of wide circulation routes between market zones/bays and the existing high roof complete with permanent open vents in ensuring that a fire within a single market zone/bay will not spread beyond the zone of fire origin to adjacent market zones, and therefore satisfying the requirements of Section B3 of the Building Regulations by preventing rapid fire spread and reducing the chances of a fire becoming large.

The analysis incorporated some onerous assumptions regarding fire sizing which ensured that a significant margin of safety is incorporated into the results.

Comparative analysis
Similarly, the comparative analysis further demonstrated that both the actual area of the fire load and the maximum fire size within a TGD B compliant retail compartment are multiples of that within the Food market compartment.

Therefore, if compliance with the guidance in Technical Guidance Document B (TGD B) will, *prima facie*, indicate compliance with Part B of the Second Schedule to the Building, then the deterministic and comparative analysis have demonstrated that the proposed compartmentation will provide a greater level of fire safety than that provided by TGD B guidance, therefore satisfying the requirements of Part B of the Second Schedule to the Building Regulations

The deterministic and comparative analysis also validate the recommendations of Section 31.2 and Table 28 of BS 9999:2017, which permit a single fire compartment within the Food market building.

On this basis, the provision of sprinkler within the market building are not deemed necessary to demonstrate compliance with Part B of the Building Regulations.

5. Following on from Point 4 above, 212m^2 of permanent roof ventilation is to be provided (approximately 3.6% of the floor area). Considering compliance with Section 5.4.3.3 of TGD B, why has this area of ventilation been chosen? It is noted that inlet air can be provided by the doors around the perimeter of the building. Does the area of inlet air provided equal the area of outlet ventilation? In addition, it is noted in the compliance report that this permanent ventilation may assist in fire brigade access and fire-fighting. Where the provision of sprinklers is not possible, what impact would this roof level ventilation have on means of escape? Should sprinklers not be considered a possible solution, please demonstrate numerically that the roof level ventilation (and any other factors) would be sufficient to maintain tenable evacuation conditions for the full occupancy of the building, taking worst case scenario fire size and locations and ASET/REST analysis.

In response to Item 5, we confirm as follows: -

- The 212m^2 of permanently open roof vents already exist. They are provided at the apex of each roof bay and run along the length of each bay, as highlighted on the roof plan drawing.
- Inlet air is available via the doors to the perimeter of the building which can be opened on fire brigade arrival to the building.
- For the purposes of the CFAST modelling, inlet air was not provided i.e. which is the worst case scenario of a fire in the market building when unoccupied, and when all external doors are locked closed. Once the external doors are opened i.e. on arrival of the fire brigade, the introduction of inlet/replacement air via the open doors will increase the efficiency of the natural smoke venting system, resulting in a significant reduction in smoke layer temperatures while maintaining the smoke layer at a greater height above the market floor.
- It has been demonstrated that means of escape provisions comply with BS9999:2017 recommendations. Although there are undoubted benefits associated with the provision of smoke vents vis-a-vis means of escape, smoke venting is not required as a compensatory measure for any shortfall in Means of Escape provisions.
- An ASET/RSET analysis would only be required to justify a ‘fire engineered approach’ to Means of Escape provisions, where full compliance with code guidance is not demonstrated. As detailed above, means of escape from the Market building complies with BS9999:2017 recommendations.

6. **Please note that all doors on escape routes should be hung to open not less than 90°. Sliding doors are not acceptable due to the likelihood of them being difficult to open in an emergency or becoming blocked by rubbish/items, either accidentally or maliciously. Similarly, BS 9999 nor TGD B recommend doors on escape routes to open on actuators (not equivalent to fail-safe). Exit doors providing escape for 50 or more persons should be provided with panic bolts complying with I.S. EN 1125: 2008. Doors on escape routes should either open in the direction of escape or be held in the open position while the building is occupied (non-fire doors). Please amend the compliance report accordingly and ensure that the opening directions of all doors are clearly shown on plans. Please note that this also relates to external doors/gates such as Exit 18.**

   The existing sliding doors at the entrances/exits from the Market will be held in the open position during the market's hours of trading. In order to provide weather protection, draft lobbies will be constructed inside the existing sliding doors, with each lobby including a new set of swing doors.
   These doors will be activated by push bars in accordance with EN 1125 to open in the direction of escape. The ground floor plan drawing (Dwg. Ref. GG/1213/01/04 Rev A) has been updated to show the doors opening in the direction of escape.

   Gate Exit 19 will be maintained in the open position during occupied hours, to serve as a final external exit to street from Exit 9.

   It is proposed to maintain Exit 18 as opening inwards and against the direction of escape. This is considered reasonable based on the following: -

   - Opening the gate in the direction of escape will encroach on the existing public footpath and would pose a health and safety risk.
   - The number of people escaping via this route would be low i.e. from the conservatory restaurant and kitchen areas.
   - Evacuees approach to this final exit will be in the open air, having evacuated from the kitchen and restaurant areas. The yard will act as an external mustering point and is considered a place of safety i.e. outside.
   - The gate will be provided with a thumb turn for means of escape purposes. Unlike a final exit from within the building itself, as the exit gate is located externally along the escape route, where a large mustering/assembly area is located within the external yard, occupants can wait within this place of safety before exiting orderly through the final exit gate.

7. **Please note that where travel distances/escape widths are to be increased, as per the guidance of BS 9999, Dublin Fire Brigade requires the provision of an L1 fire detection and alarm system installed in accordance with I.S. 3218: 2013 + A1: 2019. Please amend accordingly.**

   We confirm that the Fire Detection and alarm system will achieve an L1 standard level of coverage in accordance with I.S. 3218: 2013 + A1: 2019.

8. **In order to comply with the Irish Building Regulations, elements of structure should be in accordance with Tables A1 & A2 of TGD B. Please amend accordingly.**

   We confirm that any new elements of structure will be constructed to achieve 60 minutes fire resistance for load bearing capacity.

9. **Considering an occupancy of almost 6,000, it is felt that there is an over-dependency on disabled refuges. According to the Healthy Ireland Survey 2023, approximately 12% of the population has some form of mobility issue meaning up to 695 persons may have difficulty evacuating from a fully occupied market. Please review disabled egress routes, particularly Exits 7, 16, 17 where TGD K ramps can be provided.**

   As highlighted on the enclosed updated Ground Floor Plan (Dwg. Ref. GG/1213/01/04 Rev A), there is a ramped escape route provided onto Chancery Street, between Exits 16 and 17. The ramp is provided with a gradient of 1:30 and is therefore suitable for escape purposes.

External steps are currently provided along the escape route from Exit 7, leading into the external yard. Due to site constraints it is not feasible to incorporate a compliant escape ramp in this location, based on a rise of 880mm from access level to the conservatory room. Therefore, a disabled refuge area has been provided adjacent the exit. The number of occupants in the conservatory and dining room that may utilise this exit is relatively low i.e. 121 persons. Currently 1 no. refuge area is highlighted at this exit. However, there is sufficient space to incorporate further wheelchair refuges at this location but maintaining the one call point.

We note the Health Ireland Survey (2023) finding that 12% of the population may have difficulties in walking or climbing stairs, but it does not state that they are unable to self-evacuate in an emergency.

In order to aid the escape of mobility challenged occupants, the stepped route at Exit 7 will comprise of an ambulant disabled stairs to comply with the requirements M2 of the TGD M 2010 for existing buildings i.e. the rise of the steps will be provided between 150 and 180mm with a going at a minimum of 250mm complete with handrails on both sides of the stepped approach.

10. **The Proposed Ground Floor plan suggests that the escape route from Exit 9 leads through the delivery yard towards Exit 18. There is an existing gate leading to Arran St East immediately opposite Exit 9. Would it be possible to utilise this route and avoid additional traffic through the delivery yard?**

    We have updated the Ground Floor Plan layout (Dwg. Ref. GG/1213/01/04 Rev A) to highlight the gate onto Arran Street (immediately opposite Exit 9) as an Exit (i.e. Exit 19). Exit 19 will be maintained in the open position during occupied/trading hours.

11. **An escape route is shown in yellow through the delivery yard. How is it proposed to maintain this route is kept clear from obstruction i.e. stored goods, delivery vans, forklifts etc?**

    The route will be used as an alternative means of escape from the kitchen areas and the conservatory dining area which will have relatively low occupancies. The route from these exits through the delivery yard will be demarcated as “Fire Escape Route Keep Clear”, as highlighted on the enclosed updated Ground Floor Plan (Dwg. Ref. GG/1213/01/04 Rev A).

    There will be no forklifts in operation at the market and delivery vans will be provided with 4 dedicated unloading areas/spaces for the collection and delivery of goods.

    As part of the Management strategy, periodic checks of the route through the delivery yard will need to be carried out to ensure they are always maintained clear during occupied hours of the market.

12. **Please confirm that access to refuse storage chambers are not adjacent to escape routes or final exits. Please confirm that refuse storage chambers are to be sited and constructed in accordance with BS 5906: 1980.**

    The Refuse storage areas will be open to air, therefore any heat from a fire within one the bins will be dissipated to atmosphere. A railing will be provided 1,500mm from the base of the step serving the alternative means of escape from the kitchen to stop bins encroaching onto the route for means of escape. The requirements of BS 5906 deals with storage chambers that form part of the building and therefore are not appliable to external refuse areas.

13. **In regards to the kiosks provided with cooking facilities, please provide more detail on the proposed nature of these units and how compliance is to be maintained.**

    a. **How many cooking kiosks are to be provided? Is this number to be capped?**

       The overall operator of the Market building has yet to be appointed. The number of cooking kiosks will be capped but it cannot be confirmed until such time an operator is appointed.

    b. **Are they to be located within certain Market Spaces or distributed throughout the market area? It is understood that the lack of permanent ducting to the atmosphere allows for a certain flexibility of location but it may prove prudent to provide dedicated cooking zones that are remote from primary escape routes, principally the west elevation which contains 8 final exits.**

As noted above, the overall operator of the Market building has yet to be appointed. The location of the cooking kiosks will be confirmed following their appointment.

It is likely that the cooking stalls/kiosks will be distributed throughout the market areas. In the event of a fire in the cooking stall, as part of the means of escape/exit capacity calculations, we have allowed for 2 no. exits along the west elevation to be discounted simultaneously. Based on 2 no. exits discounted simultaneously there is still sufficient exit capacity to cater for the calculated occupancy of the building.

c. To what codes to the recirculation units comply?

The Units will be manufactured to DW172 Specification for kitchen ventilation systems

d. Who is responsible for the maintenance of these units, central management or the individual tenants? Similarly, who is responsible to maintenance of the wet chemical suppression systems?

It will be the responsibility of the owner/operator of the Kiosk to ensure maintenance is carried out at manufacturer's specified timelines of both the extraction unit and the wet chemical system. This will be enforced by the Market's Management Company.

e. How is the level of flammable material (grease particles) in emissions measured? What levels are accepted by the regulations/manufacturers?

The amount of grease produced would depend on what cooking operations are taking place (food type, quantity etc.). As the current operator has not been appointed for the market, we do not have specific details on the proposed food items to be cooked. However, when this is confirmed by the operator the maintenance of the system would be tailored to suit.

f. Confirm that removal of filters, activation of the fire detection and alarm system, activation of the wet chemical suppression system, manual slam-shut button would shut off the electrical supply and/or render the system inoperable by default.

The installation will include an I/O for the Fire Detection and Alarm system, to turn off the power supply in the event of fire.

g. Confirm that the system is interlocked with the electric cooking equipment such that cooking is only enabled when airflow is established and proved.

The electrical system will be an interlocked system, the canopy specialist will provide a monitor within the canopies to allow for the same.

h. Does the space into which emissions are released, i.e. the market area, require a certain level of ventilation in order to maintain safe air quality levels? If so, how is this achieved?

All air is filtered as it passes through the recirculation canopy. This is a 4-stage process as follows: -

- **Stage 1:** G4 grade panel filters – these act as a pre filter in the unit to remove more coarse particles. This also protects the more sensitive filters located behind it.
- **Stage 2:** F7 rigid bag filters – these filter finer particles than the G4 filters and act as pre filters for the HEPA and carbon filters that are located behind them.
- **Stage 3:** HEPA filters – these will remove 99.9% of particles down to 0.3 µm. They also act as protection for the carbon filters.
- **Stage 4:** Carbon filters – activated carbon filters can remove 95% of particles down to micron level however their primary use in our unit is to filter any remaining residual odours as the previous 3 levels of filtration will have removed nearly all particles from the airstream.

The main market area will remain a naturally ventilated space with 212m^2 of permanently open roof vents

14. It is proposed that surface linings of walls and ceilings achieve a minimum classification of Class C – s3, d2 (Class 1) as the market is considered as a retail space. Considering the extent of cooking/dining to be provided (as per Point 13), the market area, or at least sections of which, could be considered akin to Assembly and Recreation. Following the guidance of Section 2.1 (e) of TGD B, surface linings should achieve Class B – s3, d2 (Class 0) in restaurant/assembly areas. Please amend accordingly.

Stall areas and places of special fire risk will be provided with wall linings achieving a minimum of Class B – s3-d2 (Class 0) surface spread of flame/fire performance classification. All other areas within the Market building will achieve a Class C– s3-d2 (Class 1) surface spread of flame in accordance with Table 33 of BS 9999 2017.

15. **Are the Catering & Restaurant Kitchens provided with permanent ventilation to the atmosphere and wet chemical suppression systems?**

    The operator of the market is currently unknown. However, we can confirm the installation of kitchen extract system will be in accordance with DW 172 and any open cooking appliances will be provided with Localised (e.g. Ansul) suppression.

16. **Mechanical ventilation is referenced in the compliance report. Is any mechanical ventilation proposed?**

    Mechanical ventilation will be provided in WC's and washrooms.

17. **Please confirm that fire safety signs shall be provided to indicate escape routes, including any doorways or exits which provide access to the means of escape, to meet the requirements of S.I. 299 of 2007 Safety, Health and welfare at work (General application) regulations 2007.**

    We can confirm fire safety signs will be provided to indicate escape routes, including any doors or exits which provide access to the means of escape will meet the requirements of S.I. 299 2007 Safety, Health and Welfare at work (General application) Regulations 2007.

18. **Please confirm the location of hose-reels conforming to I.S. EN 671: Part 1: 2012.**

    Clause 10.4.5 of BS9999:2017 states that hose reels should be installed where the Fire Risk Assessment shows it to be necessary. As the building will be predominantly occupied by members of the public the provision of hose reels would be considered unnecessary based on the following: -

    - The provision of hose reels encourages occupants who may not be trained in fighting a fire to do so by providing an unlimited water supply.
    - Laying out of hoses may cause a trip hazard to people trying to escape.

    Based on the above we would consider it reasonable to omit hose reels as a means of controlling a fire and propose to install Fire extinguishers in accordance with IS EN 3-7 and IS 291:2015 + A1 2022.

I trust that you find the above in order. However, if you have any queries on the above, please give me a call.

Yours Sincerely

Michael Carroll

Michael Carroll
Principal Fire Engineer

Enc.