Britannica Refined Metals Ltd

BRM Northfleet, Gravesend

Site Drainage Strategy

Wood Environment & Infrastructure Solutions UK Limited – October 2022

Report for

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Contents

1. Introduction

1.1 Background

Britannia Refined Metals (BRM) proposed to build an electronic scrap (eScrap) recycling facility at their site on the south bank of the River Thames in Northfleet, Kent. During the life cycle of this development, this fire strategy document will serve as a point of reference for designers and operators to understand and ensure the fire strategy for facility remains consistent throughout the development.

1.2 Scope

This fire strategy covers the buildings and processes that take place at the BRM eScrap site, including waste handling, process, storage and transfer of material to and from the facility.

It is acknowledged that different unique and/or bespoke solutions may be developed for specific parts of the facility over the course of individual projects and these may not adhere to the exact principles laid out in this document. Therefore, this document should not be viewed as equivalent to legislation or published guidance (e.g. British Standards, NFPA codes, etc.), but rather as a set of pre-agreed principles on which to base any future fire strategy, be it for a final stage or interim stages of construction.

It is expected that all individual projects and buildings are accompanied by a suitable fire strategy, developed by each design team or appointed contractor. In these fire strategies, the fire safety principles should be laid out clearly and concisely and any deviation from the main governing principles in this document pointed out and justified.

Following the guidance contained in this document does not replace the consultation process required with the relevant authorities and the need for an agreement with BRM.

Whilst the primary objective of the Building Regulations and British Standards is the protection of life and the prevention of fire spread beyond the site boundary, various safety measures contained in this document are over and above the minimum life safety requirements and are aimed at property protection and business continuity.

All design teams and/or appointed contractors should investigate and agree on any specific insurance requirements with BRM.

This document should not be viewed to replace any other fire safety strategy or design specification agreed between parties.

1.3 Objective

The purpose of this document is to serve as a single point of reference for fire safety across the BRM eScrap facility and to provide the basis for review of fire safety in the building. Moreover, this document is intended to serve as the main BRM fire safety policy guidance regarding fire safety.

Although the intent of this document is not as a fire risk assessment or a template for a fire risk assessment, it does provide the benchmark requirement which can be used to assess risks in the

future and to compare with general requirements and recommendations of relevant guidance documents.

The objective of this document is to provide a platform for fire strategies to be based upon and to allow contractors to tender against a requirement ensuring that buildings can be operated safely with the latest fire protection technologies when completed. The intent is that the operator of the BRM site is provided with a range of facilities and individual fire strategies that allow consistent management of the whole site and buildings and equipment, within it, in terms of fire safety.

1.4 Minimum Requirements for Fire Strategies

There is an expectation that the project is developed in line with a suitable and sufficient fire strategy document, which is to be reviewed by BRM and should be agreed with the approving authorities.

For any fire strategy put forward, the following is expected to be covered as a minimum. For all of these, guidance has been provided in the body of this document:

1. Background and project description (such as top storey height and footprint), including specific operational data such as nature of fire load and quantity.
2. Site setting and masterplan implications on site-wide infrastructure such as roads used for emergency access, location (or relocation) of assembly points and obstruction or relocation of firefighting facilities (e.g. water supplies, parking areas, access points to buildings, etc.).
3. Occupant characterisation: This includes risk profiles, occupancy loads (including expected seasonal or shift variation) and identification of potentially vulnerable members (e.g. disabled occupants and certain members of the public).
4. Detection and alarm measures: This should include the type and level of coverage as well as a basic cause & effect table and the principles for interfacing with existing or future systems.
5. Evacuation strategy: This should tie-up with the basic cause & effect principles and the reasoning behind the proposed choice.
6. Means of escape analysis: This should include travel distances, egress route widths (doors and stairs), merging flows (where applicable) and route to an assembly point. If new (or modification to existing) assembly points are required this should be stated and an indication of area and location provided. For any items that do not conform to standard guidance, suitable and sufficient justification and/or engineering analysis should be provided.
7. Internal fire spread – linings: The proposed materials of construction for walls and ceilings should be stated and compared against standard guidance. This should include ceiling and floor voids where they exist.
8. Fire resistance & compartmentation: The proposed fire resistance for loadbearing elements should be stated and compared against standard guidance. Where the proposed fire resistance differs from standard guidance, this should be adequately assessed. The compartmentation and fire separation should be laid out, including the provision of fire doors and other fire stopping such as curtains/shutters, dampers, etc.

9. External fire spread and separation: It is acknowledged that for different buildings within a site there is no statutory requirement to assess fire spread from one building to another; however. this should be done for large buildings or critical infrastructure. Any building near a site boundary should be adequately assessed for external fire spread.
10. Fire suppression: Any fire strategy should include commentary on the provision (or omission) of any active fire suppression systems, including:
    a. Automatic sprinkler system
    b. Deluge systems
    c. Water cannons/monitors
    d. Foam suppression
    e. Gas suppression
    f. Other fixed fire suppression such as automatic fire extinguishers
    g. Manual fire suppression (if any is required or proposed) such as hose reels or large capacity fire extinguishers. Whilst it is acknowledged that small fire extinguishers are not within the scope of a fire strategy or the building regulations, any design put forward that relies on manual intervention should be noted in the strategy document.

This section should include design parameters such as water demand, pumping & piping, storage of extinguishing medium and spent medium management. For any systems drawing a large electrical load, this should be stated in the fire strategy.
The proposed design guidance should be stated.

11. Fire detection systems
12. Firefighting access and facilities: This should include all basic elements for summoning the fire brigade and main facilities, including:
    a. Firefighting access (roads and routes)
    b. Firefighting shafts and stairs
    c. Water supplies and hydrant points
    d. Management of plant, including fire pumps, electrical rooms and isolating of equipment and valves
    e. Connection points
    f. Storage of hazardous goods and materials
    g. Smoke ventilation systems
13. Management measures: If the design and the success of a fire strategy depend on management measures (e.g. fire marshals, activation of measures, raising of alarms, etc.) these should be noted in the document to ensure they are review for feasibility by the operation.

1.5 Legislation

The Building Regulations

It is noted that there are no guidance documents or regulations specific to industrial sites or processing facilities in the UK for fire safety. Therefore, it is common to assess such facilities using a

combination of guidance documents and regulations, both from the UK and abroad. In the view of the Building Regulations, this approach is acceptable as long as the functional requirements for life safety are met and all requirements over and above (e.g. business continuity or insurance) are agreed upon with relevant stakeholders.

The primary legislation relevant to all projects on-site is the Building Act 1984 and its Statutory Instrument 'The Building Regulations'. The principal guidance to the Building Regulations is Approved Document B (AD B) and associated British Standards.

To comply with the Building Regulations the functional requirements must be met. It is noted that the AD B does not set out statutory requirements but provides solutions to meet the functional requirements and acknowledges that alternative solutions may be applied to achieve an acceptable level of safety.

In this case, the guidance in AD B is not considered to be best suited for the nature of the facility and the operation. Instead, it is proposed that BS 9999:2017 be used as the main guidance document, as it contains recommendations that are specific to the nature of the facility and the risk profile of occupants. If guidance other than BS 9999:2017 is to be used in the design of any building or parts of the facility, this should be agreed with BRM.

Once the construction and commissioning of any areas are completed and handed over to the client, the Regulatory Reform (Fire Safety) Order 2005 (RRO) becomes the governing legislation and it is the requirement of the responsible person, in this case the plant/building operator, to undertake a suitable and sufficient fire risk assessment.

For various areas of the plant, the requirements set in prescriptive guidance are not applicable as the design is beyond the scope of these documents. In these cases, the design should be based on the development of suitable and sufficient Hazid analysis in conjunction with the client and any other relevant stakeholders (e.g. insurers, local fire brigade, operators, etc.).

As the Building Regulations only address life safety and there is a requirement to minimise the potential for property and business losses, other national and international guidance documents may be used in the development of a fire strategy, namely:

- NFPA 850: Recommended practice for fire protection for electric generating plants and high voltage direct current converter stations
- NFPA 13: BS 14385 Standard for the installation of sprinkler systems
- NFPA 2001: Standard on clean agent fire extinguishing systems
- Other insurance guidance. Please consult BRM

BS 999:2017

BS 9999:2017 (hereafter referred to as BS 9999) is a guidance document to address life safety and it is intended to meet the functional requirements of the Building Regulations. It takes into account the nature of a building and its use as well as the characteristics of its occupants. These two elements together are then used to produce a risk-based fire safety strategy with specific measures to address each risk.

The recommendations in BS 9999 exclusively address life safety and do not consider property protection or business continuity. Therefore, the assessment of the design has to be complemented with recommendations from other guidance documents.

The Regulatory Reform (Fire Safety) Order

Under the Regulatory Reform (Fire Safety) Order 2005 every owner, occupier and operator of a premise is required to adequately manage the safety of the areas under their control. Under this legislation a 'Responsible Person or Persons' is required to be appointed so that the necessary level of safety can be implemented, with an inherent necessity for competence in the area of fire safety. The fire authority having jurisdiction has the power to inspect the premises to check that the Responsible Person(s) comply with the duties under the Order and will look for evidence that the Responsible Person(s) has carried out a suitable fire risk assessment and acted upon the significant findings of that assessment.

It is therefore important that the Responsible Person takes account of the information provided in this fire strategy when undertaking the fire risk assessment of the premises

Construction (Design and Management) Regulations

Projects undertaken within Great Britain and Northern Ireland are subject to the requirements of the Construction (Design and Management) Regulations 2015 (CDM).

The objective of CDM Regulations is to reduce the risk to health and safety during the construction and maintenance of construction sites and occupied buildings.

As described above, this report defines the overarching principles for a fire strategy to comply with Part B of the Building Regulations 2010. In order to fulfil their duties under CDM Regulation 25, any Contractor shall ensure, so far as reasonably practicable, the early installation and operation of fire protection measures contained within a fire strategy report and any others required as part of the Contractor's construction phase fire safety plan or interim fire safety strategy.

Environment Agency

The UK Environment Agency has published guidance for sites that store and manage/handle combustible waste, to limit the size of potential fires and their environmental impact, particularly with regards to smoke produced and firefighting water runoff.

Although these documents are not part of the Building Regulations, it is a BRM requirement that UK Environment Agency guidance is followed wherever possible. Any design element which deviates from EA guidance should be discussed and agreed with BRM.

2. Occupant Characterisation

2.1 Risk Profile

In BS 9999, the risk profile is comprised of two elements: the nature of the occupants and whether they are awake/asleep and if they are familiar or not with the building, this is called the occupancy characteristic, and the fire growth rate, which is related to how quickly a fire can potentially grow given the fuel load density and its nature.

As noted in BS 9999, it is acceptable to reduce the fire growth rate factor by one level when an automatic sprinkler system is provided.

According to the guidance in BS 9999, when a building has areas with different risk profiles, the most onerous should be used to define the overall risk factor and the required fire safety measures for the building.

The risk profile for each area should be classified as follows:

Area	Occupancy Characteristic	Fire Growth Factor	Risk Profile
Main plant process building	Awake and familiar	Medium	A1 Building is considered A2 but reduced to A1 due to automatic fire suppression/sprinkler installation
Unsprinklered office blocks and ancillary office areas including welfare	Awake and familiar	Medium	A2

2.2 Occupancy Loads

The site contains very different areas and therefore the method to estimate the occupancy load will be different for each part. In general, it is possible to obtain an initial estimate based on the floor areas and a suitable space factor. The actual (expected) occupancy load for each area should be verified in the development of individual fire strategies.

The occupancy load should be initially estimated based on the following figures taken from BS:9999:

Zone	Floor Factor [m^2/p]	Comments
Offices	6-10	Typically, a conservative floor factor of 6m^2 per person should be used unless there is evidence to suggest a less intensive use of space.
Operation and plant areas	>30	A very conservative figure of 30m^2 per person can be used for an initial estimate; however, this is acknowledged to potentially produce unrealistic figures. For all process areas, the expected occupancy load should be reviewed with BRM.

3. Detection and Alarm

3.1 Detection System

Although for many parts of the facility the minimum requirement in standard guidance is to provide manual detection (call points), it is proposed that all parts of the facility are afforded automatic detection to at least an L2 level of coverage, in line with BS 5839-1.

All areas should be afforded with manual call points located next to storey exits or final exits or along egress paths.

Areas in the open air (or semi-open) where the risk of smoke accumulation is low in the early stages or where detection is expected to be inefficient may be allowed to have manual call points only. This should be detailed in individual fire strategies and sufficiently assessed.

For areas where automatic detection is provided, the following is recommended:

- Point type smoke or heat detectors in the following areas:
  - Office blocks and ancillary spaces of office blocks, including any public spaces
  - Workshops and storage spaces
  - Small plant rooms such as pump rooms and compressor rooms
- Flame, video or triple IR detection in waste processing and storage areas
- Consider High Sensitivity Smoke Detection (HSSD) in high value/risk areas and areas where gaseous suppression is provided, namely:
  - Switchgear rooms and electrical rooms
- In process fire detection such as spark detection downstream of shredders and linear heat detection on conveyors will be integrated with the equipment control. Alarm signals will be relayed to the building fire system.

For every area, the automatic detection system should be complemented with manual, Type A, call points, designed and installed in accordance with BS EN 54-11:2001.

3.2 Alarm System

The alarm system will be comprised of two main elements, individual detectors and sounders and the site-wide alarm system.

Individual fire zones should go into alarm mode according to the fire strategy for each part of the facility. This will be achieved by automatically triggering the alarm sound for the affected zone.

Separately, a PA/VA system should be installed throughout the facility to allow for pre-recorded messages and/or sounds to be broadcasted. The purpose of the PA/VA system is to alert occupants of a fire but also of any other emergency that requires either to pause activities or evacuate the buildings. The facility will have a total evacuation policy where all buildings are evacuated regardless of where the fire alarm is activated.

During construction, all detection systems should be linked to a central location so that an alarm anywhere on site is visible from this location. Specific phasing requirements are noted in section 10.

Audible fire alarm devices should conform to BS EN 54-3 and visual alarm devices should conform to BS EN 54-23. Power supply to the means of warning system should comply with BS EN 54-4. Sounders should be provided throughout such that the sound pressure of the alarm signals is not less than 65 dB(A). Please note the sound pressure should be increased in areas of high background noise such that the alarm signal is not less than 75 dB (A).

Where the levels of background noise are expected to be above 60dB, the sound pressure of the alarm signal should be 5dB above the sound pressure level of the background noise.

Where the ambient noise level is expected to be above 90dB or where hearing protection is expected to be used, visual alarms (flashing beacons) should be used in addition to the audible alarm.

3.3 Cause and Effect

A suitable cause and effect matrix should be developed for each area to detail the actions arising from an alert (suspected fire) and an alarm (confirmed fire or signal to evacuate). Depending on the evacuation strategy adopted for each area, the cause and effect matrix should detail the equipment to be shut down and any other automatic actions required.

The following actions should occur automatically upon either an alert or an alarm signal (depending on the area):

- Non-critical ventilation plant to shut down
- Motorised dampers to close
- Doors on hold-open devices to release

The above effects should be zoned appropriately to limit the disruption to parts of the facility not immediately at risk or in a different building.

In all cases, a fire signal (alert or alarm) should be relayed to the main fire alarm control panel in the Security office.

4. Evacuation Strategy

The evacuation strategy should be specific to each part/building on site and intended to be the safest possible for occupants without unnecessarily compromising the continuity of the operation.

In most areas evacuation will operate on first knock basis (first signal); the alarm should be raised with the first input from any fire detection system, which can be a smoke detector, sprinkler flow switch valve or manual call point. For these areas, there should not be an investigation time.

The MCC building will operate with a suspected fire basis, where a single fire alarm does not initiate evacuation of the complete facility. The alarm should continue to be treated as a suspected fire until it is confirmed by either a second smoke detector, a sprinkler (or other suppression system) flow switch valve, a manual call point, a heat detector or from manual confirmation.

5. Means of Escape

5.1 Travel Distances

The maximum allowed travel distances are taken from BS:9999 and are dependent on the risk profile. BS:9999 allows the travel distances to be increases based on mitigating factors such as high ceiling height, enhanced detection/alarm systems and automatic extinguishing system.

All the travel distances noted are for the actual egress route.

Where foreseeable routine maintenance and repair activities may block, obstruct or change a an egress route, this should be taken into account in the measurement of the travel distance and the location of exits. The design should meet the Building Regulations requirement for both standard operation and planned maintenance mode. This is not applicable to unforeseen repair tasks or failure events that do not form part of the planned activities on site.

The PV panels on any roof represent an increase access requirement for which means of access and escape need to be considered. The fire resistance of the building need to consider the escape requirements from the roof. Sounders and if necessary beacons should be included to alert occupants in these areas.

5.2 Exit Location and Number of Exits

Exits should be clear and accessible where they are unlikely to be obstructed by plant or equipment, storage of goods and by day to day activities in the facility. Every effort should be made to ensure exits are located remotely from each other to ensure multiple exits are not affected simultaneously by the same fire event.

The minimum number of exits depends on the occupancy load for each space. Namely, the following should be considered:

- Occupancy <60: At least one exit
- Occupancy >60 & <600: At least two exits

There are no areas that are categorised as a critical part of the facility where occupants are expected to remain for an extended period in case of fire e.g. to carry out shut down and management tasks.

5.3 Exit Widths – Horizontal Escape

The egress width required depends on the risk profile and the occupancy load being served. In general, all exit doors should be at least 800mm (850 if wheelchair access is provided and to meet other parts of the Building Regulations) and corridors should be at least 1,200mm in clear width.

The configuration and design of the escape route dimension/doors/security etc. shall follow the guidance in BS 9999.

5.4 Exit Width – Vertical Escape

The facility is a single storey and the only vertical escape in the building is from infrequent maintenance access on the roof.

5.5 Disabled Evacuation

Disabled access is not expected in most areas, mainly process areas, due to the nature of the facility and the fact that operational staff are assumed to be generally able-bodied.

5.6 Evacuation Plans and Assembly Points

A set of evacuation plans should be developed for each project, which should include at least the following:

- The egress route for every floor of every building, indicating the routes to a final exit.
- The location of call points, emergency phones and fire extinguishers.
- The external routes to and the location of assembly points.
- The designated fire appliance attendance and parking points as well as water supplies and connection points to water tanks and pumps.
- The location of storage areas of hazardous materials and the storage quantity.

Sufficient assembly points should be designated in the eScrap facility to fit the entire expected occupancy load. The area requirement per person for assembly points should be between 0.5 m^2 and 1 m^2.

6. Internal Fire Spread

6.1 Linings and Material Classifications

To inhibit the spread of fire within the building, the internal linings should adequately resist the spread of flame over their surfaces; and have, if ignited, either a rate of heat release or a rate of fire growth, which is reasonable in wall and ceiling linings. The classification is defined by tests conducted in accordance with BS EN 13501-1.

The choice of materials for walls and ceiling linings can dramatically influence the rate of fire growth within a building. These surface ratings should achieve the performance indicated in below.

Location	National Class	European Class
Small rooms of not more than 30m²	3	D-s2, d2
Other rooms	1	C-s3, d2
Circulation spaces	0	B-s3, d2

Parts of walls in rooms may be of a poorer performance than specified above, but in no case worse than Class 3/D-s3, d2, provided the total area of those parts does not exceed one-half of the floor area of the room and is less than 60m2.

The surface of any glazing in the vertical plane and any part of a ceiling which slopes at an angle of more than 70° to the horizontal are considered to be walls. The following are not considered to be walls:

- Doors and door frames
- Window frames and any frames in which glazing is fitted
- Architraves, mouldings, skirtings and picture rails, and

6.2 Fire Separation and Compartmentation

BS 9999 only extends to ensuring life safety and some provisions and requirements have been made over and above these minimum measures with the purpose of property protection and to ensure business continuity.

The following fire separation and compartmentation shall be used:

- External facades – 30 minutes Resistance / 15 minute Insulation
- External wall facing firewater tank and firewater pump enclosure – 120 minutes Resistance/120 minutes Insulation.
- Walls of electrical/MCC/Switchgear room switchgear rooms, 120 minutes Resistance / 120 minutes Insulation.

The PV panels provided on the roof of various buildings are not considered to pose a significant fire risk as they are in the open air. However, any electrical control room associated with them should be considered as a place of special fire hazard and thus subject to the means of escape limitations. Moreover, they should be fire separated from any adjacent room as described above.

6.3 Structural Fire Resistance

The required structural fire resistance is dictated by the height of a building and the overall most conservative risk profile as per BS:9999.

The main building is a simple, single storey steel frame building which only supports a roof. As such no fire resistance for the structural elements of the frame are mandated. This should not however affect the fire rating of the external wall cladding.

6.4 Fire Doors

In general, all doors should have the same rating as per the wall element they sit in and be fitted with smoke seals.

Generally, doors should be fitted with self-closing mechanisms so that they return to a closed position in case of a fire. Magnetic hold-open devices can be employed to doors in common areas if such doors are expected to be rendered ineffective by occupants.

6.5 Ductwork

Where ductwork passes through fire rated construction (for example compartment walls or enclosures to protect escape routes) the integrity should be maintained. In accordance with BS 9999 Clause 32.5.2.1 there are four recommended options (it should be noted that ASFP blue book contains further information on fire-resisting ductwork).

Method 1 – Thermally Actuated Fire Dampers

- This method should not be used where ductwork passes through or serves and escape route;
- This method is not suitable for kitchen extract systems;
- Fire dampers should conform to BS EN 15650:2010 and have an E Classification equal to or greater than 60 minutes.

Method 2 – Fire Resisting Enclosures

- This method can be used in protected escape routes providing the ductwork does not serve the escape route it passes through.
- The fire-resisting enclosure should be classified EIX in accordance with BS EN 13501 Part 2 (fire exposure from the duct side). (X is the fire-resisting rating (in minutes) of the walls of the protected route)

Method 3 – Protected Using Fire Resisting Ductwork

This method can be used in protected escape routes providing the ductwork does not serve the escape route it passes through.

The fire-resisting ductwork should be classified EISX in accordance with BS EN 13501 Part 3. (X is the fire-resisting rating (in minutes) of the walls of the protected route)

Method 4 – Automatically Actuated Fire and Smoke Dampers Triggered by Smoke Detectors

- This method may be used for extract ductwork passing through protected escape routes where the ductwork does and does not serve the protected escape route.
- This method is not suitable for kitchen extract systems.

Fire and smoke dampers should conform to BS EN 15650:2010, they should have an ES classification equal to or greater than 60 minutes.

Any air transfer grilles required as part of the ventilation system should not be provided within any wall, door, floor or ceiling enclosing a protected stairway or entrance hall. Air transfer grilles located in any fire hazard rooms should be provided with both fire and smoke containment. Any transfer grilles fitted in fire doors will need to be accompanied by a test certificate provided by the door manufacturer.

6.6 Fire Dampers

The fire dampers should be sited within the thickness of the fire separating element. This will ensure the damper will not be displaced by movement or collapse of the duct. The dampers should be securely fixed in place and provided with breakaway joints in accordance with the manufacturer's instructions.

Fire dampers should be tested to BS EN 1366-2 and be classified to BS EN 13501-3. They should have an E classification equal to, or greater than, 60 minutes. Fire and smoke dampers should also be tested to BS EN 1366-2 and be classified to BS EN 13501-3. They should have an ES classification equal to, or greater than, 60 minutes.

6.7 Fire Stopping

All joints between fire-separating elements and all openings for pipes, ducts, conduits or cables to pass through any part of a fire separating element should be fire-stopped and;

- Kept as few as possible;
- Kept as small as practicable; and
- Fire stopped (which in the case of a flue or duct, should allow thermal movement).

All penetrations through a fire-rated element, vertical or horizontal, should be adequately fire stopped or protected.

Pipes that pass through a compartment wall or compartment floor (unless the pipe is in a protected shaft), or through a cavity barrier, should be in accordance with one of the following alternatives:

- For proprietary seals of any pipe diameter, a proprietary sealing system may be provided that has been shown by test to maintain the fire resistance of the wall, floor or cavity barrier;
- For pipes with a restricted diameter, where a proprietary sealing system is not used, fire-stopping may be used around the pipe sleeve or opening, keeping the opening as small as possible. The nominal interior diameter of the pipe should be not more than the relevant dimensions given in BS 9999: Table 33. The diameters given in BS 9999: Table 33 for pipes of material b) used in situation 2) assume that the pipes are part of an above-ground drainage system and are enclosed as shown in BS 9999: Figure 30. If they are not, the smaller diameter given in situation 3) should be used;
- A pipe of lead, aluminium, aluminium alloy, fibre-cement or PVC, with a maximum nominal diameter of 160 mm, may be used with pipe sleeves of non-combustible pipe as shown in BS 9999.

All elements and services penetrating fire-resisting construction are to be fire stopped with an appropriate method associated with the element penetrated and the surrounding construction.

The fire stopping should have at least the same fire resistance as the penetrated fire-rated element.

Cavity barriers are installed to close any potential pathways around fire separating elements and should be provided at the junction between any external wall and every compartment floor and compartment wall, and at the junction between an internal cavity wall and every compartment wall, compartment floor, and any other wall or door which forms part of a fire-resisting barrier.

Unprotected openings and penetrations should be identified during fire risk assessments or during daily operations by members of staff. Unprotected openings and penetrations should be reported to management immediately and should be made good (e.g. sealed, fire stopped, closed or protected) as soon as possible.

6.8 Protection of Essential Infrastructure

Any infrastructure that is essential for operating the plant should be protected against the effects of fire or mechanical damage. This should include all infrastructure and cabling that is required to perform a safe shutdown.

The period of resistance/protection should be at least as the time required to undertake a controlled shutdown, with consideration of a safety factor (recommended to be 30 minutes).

The equipment/infrastructure to be protected should be as a minimum:

- Cabling linking the CCR with the servers
- All feed cables for essential equipment to initiate and control a shutdown procedure
- Any equipment confirmed by the operator to be essential to perform a safe shutdown
- Equipment and cabling to manage a firefighting operation

Cabling should be run in metal conduit and be located away from moving parts or heat sources. Fire signal cabling should be fire rated as per the requirements in BS 5839.

7. External Fire Spread

7.1 External Wall Construction

As all buildings can be overall classed as office/industrial, the requirement in BS 9999 is for portions of external walls above 18m to be constructed using materials of limited combustibility and with a Class 0 spread of flame rate, equivalent to a Class B-s3, d2 or better (European Class), and portions under 18m with Class 1 (Class C-s3, d2 European) materials.

7.2 External Fire Spread Calculations

The building facades are relatively close to the site boundaries (>1metre) and as such external fire spread analysis is required. The main cladding on external facades is fire rated with small sections (translucent panels and roller shutter doors) that can be considered as unprotected. The external fire spread risk is to be assessed based on the recommendations of BRE report 187 to ensure the unprotected areas of the facades are not excessive and the external fire risk at the site boundary is acceptable.

7.3 Roof Construction

All roof coverings should achieve a minimum AA, AB or AC (National Class) or a B_{Roof} (t4) classification.

8. Fire Safety Systems

8.1 Fire Suppression

Minimum Requirement

BS:9999 does not require the facility to be sprinklered.

However, for the purpose of business continuity, property protection and to meet insurer guidance, the following suppression shall be provided to the following areas:

- Main Building
  - Sprinklers to NFPA 13 giving total coverage of the building including receiving area, processing area, storage areas and bagging areas.
  - NOTE – alternative automatic fire suppression systems such as water cannon can be used where they can be demonstrated to provide benefits over sprinkler systems and with agreement with BRM and the Insurers.
  - Clean agent suppression in the MCC
- Fire pump enclosure
  - Sprinkler or clean agent/water mist suppression in the fire pump enclosure.

All suppression systems should be hydraulically calculated and frost protected as required.

Hydrant System

There is no available public hydrant system with sufficient flow and pressure. Therefore, a private hydrant network is to be installed as part of the overall works.

The hydrant system should be fed from a private tank and pump package located adjacent to the building. The tank shall have sufficient capacity to feed the hydrants with a supply for two hours manual fire fighting. The volume is included in the single tank that also feeds the sprinkler system. The overall firewater system shall be hydraulically designed to ensure that operation of the hydrants does not adversely affect the sprinkler system operation.

The system should be designed to meet NFPA 24 guidance with a supply of at least 1,892 L/minute for each hydrant (two hydrants should be assumed to operate simultaneously for the design of the hydrant system and pumping capacity, not for the overall water storage).

The hydrant system should achieve an operating pressure of at least 8 barg.

Hydrants should be spaced so that there is at least one within 90m of any building on site, mainly. Hydrants should not be closer than 12m from the building. Aboveground hydrants should be protected against impact and/or damage. The firewater tank shall have connections to allow direct connection to a fire brigade pumper truck.

The design of the hydrant system should be discussed and agreed with the local fire brigade and the insurer. Hydrants should have connection points and valves that are readily

compatible with the fire brigade's typical equipment. Signage should be provided to BS 3251.

Manual Firefighting and Fire Hoses

Under the recommendations of BS 9999, handheld fire extinguishers should be provided according to BS 5306-0, 1, 3 or BS EN 671. The number and type of fire extinguishers required should be assessed and decided as part of a risk analysis exercise once the fire load, internal partitions and full details of the building are needed.

The equipment provided should be of a type appropriate for the risks and the users of the facility and placed in locations where it can be readily deployed.

The expectation is that fire extinguishers will be used for the following fire interventions:

- Response to a hotspot on a received load tipped into the receiving area.
- First response to a heat detector alarm on a conveyor or to a spark detection alarm on the outlet of the shredder. On detector alarm, the conveyor will stop to isolate the potential fire.
- First response to a hot spot or minor fire detected in the storage and bagging area.
- Minor fires in welfare area.
- Manual response with a CO_2 extinguisher to an electrical fire.

Although NFPA recommends the provision of hose reels and these are a common fire safety feature in some facilities and other countries, experience has demonstrated that unless staff is specifically trained in their use and general firefighting, they tend to place occupants at risk and in most cases fail to extinguish the fire.

The recommendation is that sufficient capacity fire extinguishers be provided as use as a first response to a small fire. In the event this does not extinguish the fire, the fire brigade are called out.

Water Supplies

Typically, the tank serving a sprinkler system should be separate from any other system. However, a combined tank can be acceptable if all of the following conditions are met:

- The proposed design is agreed with all relevant stakeholders, including the approving authorities and insurance bodies.
- The tank can hold the full combined capacity of the systems it feeds.
- The failure of one system does not prevent other systems from being used.

The capacity of a tank should be calculated using the most conservative scenario as given below:

Sprinkler System

The bulk component of the e:scrap product is PVC and fire retardant phenolic circuit board which represents a low fire risk. This is considered a Class C plastic (PVC and phenolic) in NFPA hence sprinkler design can be based on Group III commodity. Storage is solid piled type.

Firewater demand based on sprinkler demand of 8.2mm per minute/185m^2 operating area for 120minute discharge. 182m^2 total.

If water cannons/monitors are used for automatic fire suppression, demand is to be based on two monitors operating at 950LPM each for 120 minutes.

Manual hose allowance

1900LPM for 120 minutes. 228m^3 total

This approach shall be reviewed and calculations presented prior to confirming firewater pump and tank sizing.

Firewater Pumps

The facility shall be supplied with two off 100% capacity firewater pumps installed in a containerised pump enclosure. Each pump shall be rated for the full sprinkler/monitor and manual fire fighting demand. Pump and suction/discharge manifold shall meet NFPA 20 capacity/head requirements of 150% rated capacity at 65% rated head.

Pumps shall be supplied and installed as a pre-engineered package including all controls. Pumps are to be configured as one electric driven and one diesel driven pump. Pump enclosure containing the diesel engine shall be protected with sprinkler or water mist/clean agent system.

Design Standards

Water-based automatic fire suppression systems should be designed to recognised standards as follows:

- Sprinklers systems: NFPA 13 - Standard for the Installation of Sprinkler Systems
- Hydrant system:
  - Overall design, connections and valves: BS 9990 - Non automatic fire-fighting systems in buildings. This is to maintain compatibility across the site.
- Water cannons/monitors: Subject to specialist design. Cannons should be manufactured to a recognised standard.

All fire systems should be certified by a specialist fire systems contractor and all parts should be tested and certified to an approved or recognised standard (e.g. LPC or FM Global). The selection of recognised standard or means of approval shall be agreed by BRM.

8.2 Runoff Water Management

During firefighting operations, water is used to contain and control the fire. Consequently, there is normally a large amount of pooling and firefighting water runoff, which needs to be managed and considered for firefighting operations. As water comes in contact with waste and other materials it

becomes contaminated and needs to be prevented from reaching bodies of water, environmentally sensitive areas and from overflowing the drainage system.

It is a requirement from the Environment Agency to consider the environmental effects of runoff firefighting water in case of a fire, particularly one involving waste.

All parts of the facility where a fire involving waste is feasible should include a method for spent firefighting water management, which should be suitable and sufficient for the expected delivery volume and duration of a typical fire incident. This is taken to be equivalent to the volume of the firewater tank (410m^3 if sprinklers used).

Give the low fire risk of the e:scrap product, the preferred firewater retention approach is to retain any firewater on the building slab. The building perimeter will have raised edges e.g. raised threshold on doorways and ramps on vehicle access door to give sufficient retention volume. If the event of a major release of firewater, the retained water will be removed by suction truck by a specialised waste company.

The site provides tertiary containment with raised kerbs and automatic shut off to the surface water system. Full details are given in the Drainage Strategy (808678-WOD-ZZ-XX-RP-C-00002_S3_P01.1).

The designers will have to demonstrate that there is a plan in place to deal with runoff water and so it is recommended that such measures are introduced at an early stage.

8.3 Secondary Power Supplies

All power supplies, electrical wiring and control equipment should be protected against the effects of fire for an appropriate period. Power and control cables should be installed in accordance with BS 8519:2010. A secondary power supply is required for essential fire safety measures, i.e.

- Emergency lighting and signage;
- Automatic fire detection system;
- Automatic suppression systems

Note: The systems shall comply with their respective British Standards regarding alternative power supplies. The primary power source is taken from the public electricity supply, with secondary power being supplied from an alternative utility supply from; another substation, a generator, an uninterruptable power supply or batteries. The output from the secondary power supply should be enough to satisfy the maximum demands of the system. The electrical distribution system should conform to; BS 7671 and the relevant parts of BS EN 60947 and BS 7346 Part 8.

9. Firefighting Access and Facilities

9.1 General

Firefighting facilities should generally consist of the following, and should be adequately maintained and be made available due to statutory requirements at all times:

- Facilities providing access to the site and to key information by means of Fire Brigade type locks (e.g. gates, hydrants, site information box).
- Water supplies and firefighting media: Hydrants, water cannons, hose reels, water tanks, water pumps, large capacity extinguishers, etc.
- Features providing access to the buildings: corridors, fire doors, fire shutters/curtains, compartmentation elements for fire access/egress routes, etc.
- Sprinkler systems, where provided
- Emergency lighting
- Quarantine areas

9.2 Firefighting Access

Firefighting access will be via the main entrance to the south and a second access point to the north-west of the plot. This gives vehicle access to the whole of the South façade and the North West corner of the plot. From these positions manual access is considered to be adequate to the rest of the building. The access road to the Environmental Agency flood gate in the North East corner of the plot is not considered to be an emergency vehicle access route.

Any other designated access points to the site for firefighting and emergency purposes should be identified in the site plan and communicated to the emergency responders at the first instance.

All roads serving vehicle access and that are also meant for emergency services should be kept clear of obstructions at all times, except in circumstances required for maintenance or special deliveries and subject to a prior risk assessment being developed.

Any alteration to the layout of a road or any damage or defect that could affect access for vehicles and emergency services should be reported immediately to the site manager.

9.3 Quarantine Areas

Waste loads are discharged and inspected in the waste receiving area. It is possible that a load can contain hot spots, typically from damaged batteries, which become apparent when the load is tipped. This area will have fire detection and fire extinguishers available to identify a hot load and allow it to be manually quarantined and extinguished by staff.

Quarantine areas are intended for delivery and inspection of non-conforming loads and should not be used as general storage spaces. They should be kept free at all times and should be clearly and

conspicuously demarcated by either signs or floor markings to prevent staff and operators from obstructing any part of them.

A quarantine area should be provided near the site entry point to prevent a smouldering, burning or hazardous load to reach the operational areas of the facility. The quarantine area should be sufficiently large to allow a full typical load to be stored temporarily and for 360° inspection and access for firefighting. Firefighting water facilities (hydrant) should be provided within 18m of the quarantine area.

10. Management Measures and Phasing

The fire strategies developed for any part of the facility should identify specific management measures that are a requirement for fire safety.

As part of the requirements under Regulation 38, a fire strategy should highlight any specific design aspects that need to be considered by the operator or end-user, such as:

- Requirement for manual operation of equipment.
- Assumptions made in the design.
- Designation of egress routes.
- Provisions for disabled evacuation.
- Areas that are required to be kept fire sterile as part of the design.
- Location of passive fire protection, including cavity barriers, fire rated partitions, dampers and fire doors & shutters.
- Location of detector heads and sounders.
- Designated high-risk areas, such as storage of hazardous materials.
- Limitations specified by active fire protection systems, for example, storage heights used for sprinkler system design.
- Location and controls for smoke removal systems.
- Location and connections for firefighting water systems, including hydrants, fire mains & risers, hose reels and water cannons.
- Details of automatic fire suppression, namely sprinklers, deluge systems, water spray and gaseous.
- Details of specialised detection such as IR, video, thermal imaging and aspiration.

wood.