Committees:	Dates:
Barbican Residents Consultation Committee Barbican Residential Committee	21 May 2018 4 June 2018
Subject: Fire Safety Review	**Non-Public**
Report of: Andrew Carter Director of Community & Children's Services **Report author:** Paul Murtagh Assistant Director Barbican and Property Services	**For Decision by Barbican Residential Committee**

Summary

The purpose of this report is to inform Members of the work that has been done on potential improvement works to enhance the safety of the City of London Corporation's (CoLC's) Barbican Residential Estate and its residents in the event of fire. The report also seeks the views of, and guidance from Members on the strategic direction the CoLC should take in its future approach to fire safety.

Recommendations

The Committee is asked to:

1. Note, consider and discuss the work that has been done on potential improvement works to enhance the safety of the Barbican Residential Estate and its residents in the event of fire.

2. Note the completion of the 2018 Fire Risk Assessments for the Barbican Residential Estate and the major areas of improvement identified.

3. Provide advice and guidance to officers on the strategic direction the CoLC should take in its approach to fire safety on the Barbican Residential Estate.

4. Agree the recommendation of the Director of Community and Children's Services to consider the retro-fitting of sprinklers to the three high-rise tower blocks on the Barbican Estate subject to funding and planning approval.

Main Report

Background

1. An initial paper was presented to the Barbican Residential Committee (BRC) at its meeting on 11 September 2017, which outlined the actions we had taken in the immediate aftermath of the Grenfell Tower fire and set out our plans for further

action. Further update reports were brought back to this Committee in November 2017 and in March 2018.

2. The initial paper presented to the BRC in September 2017. and all subsequent update reports, informed Members of the CoLC's position, and the progress made, with matters such as:

    - fire risk assessments,
    - communication with residents,
    - estate management,
    - fire safety maintenance and improvement works,
    - inspections by the London Fire Brigade (LFB),
    - potential future improvement works.

3. Questions were raised about the potential use of sprinkler systems and the installation of fire alarms in high-rise blocks of flats. The CoLC's high-rise flats on the Barbican Estate do not currently have such systems. As part of the review of current processes and procedures relating to fire safety in its homes, research has been done into these, and other areas of improvements. The results are outlined in this report.

4. At its meeting on 11 May 2018, the Community and Children's Services Committee approved, in principle, to install sprinklers in its five social housing high-rise tower blocks at:

    - Great Arthur House, Golden Lane Estate,
    - Petticoat Tower, Middlesex Street,
    - West Point, Avondale Square Estate,
    - Central Point, Avondale Square Estate,
    - East Point, Avondale Square Estate.

Considerations

5. This report has been prepared following a review of the CoLC's processes and procedures relating to fire safety in its homes to ensure that they remain robust and fit for purpose and its residents remain safe.

6. The report has been prepared and produced in conjunction with the CoLC's Fire Safety Adviser and with input and guidance from other colleagues across various departments.

Automatic Water Fire Suppression Systems (Sprinklers)

7. Regulations in England mean that only buildings constructed since 2007 and which are taller than 30 metres, are required to have sprinklers fitted. This requirement was not applied retroactively. None of the CoLC's eight residential tower blocks (three on the Barbican Estate and five social housing blocks) are fitted with sprinklers.

8. It is generally well documented and accepted that a sprinkler system is one of the most effective tools available to prevent the spread of fire in high-rise blocks of flats. The installation of sprinklers in high-rise blocks of flats has significant benefits including:

    - enhancing the safety of occupants and firefighters in the event of fire in the property;
    - reducing the costs of a fire on local authorities and other property owners affected;
    - reducing the financial consequences and other burdens associated with fires;
    - reducing the demands on fire and rescue, police and ambulance/health services responding to events and the aftermath of major fires in high-rise accommodation;
    - helping address shortcomings in other fire protection measures such as compartmentation.

9. There have, historically, however been real issues and concerns with the retro-fitting of sprinkler systems, which is why they have not been installed in any great numbers in the past. These issues include:

    - the cost of retro fitting sprinkler systems is considered to be extremely expensive and intrusive,
    - the process is intrusive for residents and may require them to leave their home due to the nature of the works,
    - the retro fitting of sprinklers into existing buildings is very difficult to achieve in terms of structural problems, water storage, etc,
    - retro fitting sprinkler systems is very difficult to achieve in historic buildings or buildings with planning restrictions.

10. As part of the review of its processes and procedures, and to give Members a realistic appraisal of the potential retro-fitting of sprinkler systems, the CoLC commissioned an independent feasibility study into the fitting of sprinkler systems into its eight tower blocks. The study was carried out by Butler & Young Associates, a specialist independent firm of mechanical and electrical consulting engineers. The firm's findings are attached as Appendix 1 to this report.

11. For the purpose of this report, the focus is on the three tower blocks that form part of the Barbican Residential Estate namely:

    - Lauderdale Tower;
    - Cromwell Tower;
    - Shakespeare Tower.

12. The feasibility study concludes that from a practical point of view, the retro-fitting of a sprinkler system can be achieved without undue complications and without the need to decant residents. The one potential exception to this is the need to comply with planning restrictions, which is particularly pertinent to the Barbican Estate. At this stage, this potential complication has not been explored in any great detail.

13. The feasibility study also gives indications of the total cost for both tenant and leaseholder flats, which do not include fees, VAT and on-going maintenance costs. These are summarised in the table below:

Block	Units	Cost
Lauderdale Tower	117	£613,818
Shakespeare Tower	116	£608,764
Cromwell Tower	111	£581,694
Total:	**344**	**£1,804,276**

14. It is worth noting that the cost of installing sprinklers has already increased as a result of the response to demand from the sector. There is already a concern that even with the current demand for sprinklers, there will soon be a skills shortage in this area. This, and the increase in costs, will likely become even more significant if the anticipated changes to the current regulatory system and to the Building Regulations include the retro-fitting of sprinklers.

15. As outlined previously, there is no legal obligation on the CoLC to consider the retro-fitting of sprinklers in its tower blocks on the Barbican Estate. The recently completed fire risk assessments do not support the installation of sprinklers in the Barbican tower blocks either as a suitable fire precaution or, as part of a fire evacuation strategy.

16. The CoLC's Fire Safety Adviser has provided his views and advice on the issue of installing sprinklers and his views are attached as Appendix 2 to this report.

Fire Doors

17. As Members will be aware from previous reports on fire safety presented to this Committee, the vast majority of front entrance doors to individual flats in our residential blocks of flats are as originally installed. As such, it is expected that these doors will provide a notional 15 to 20 minutes fire resistance. While this does not comply with the current Building Regulations for new-build properties, this in itself does not mean that the doors must be changed. However, if a fire risk assessment carried out under the provisions of the Regulatory Reform (Fire Safety) Order 2005, determines that the doors require upgrading to maintain the required level of compartmentation, then the doors must be replaced.

18. As part of the work we have been doing in relation to fire safety, we identified a small number of front entrance doors from properties on the Barbican Estate to be sent away for destructive fire resistance testing. There are very few testing facilities in the country that offer this service and those that do, including the Building Research Establishment (BRE), have had serious capacity issues.

19. We had originally been advised that the doors could be submitted for testing at the beginning of March. Unfortunately, due to the capacity issues referred to above, this date was put back several times. At the time this report was written, the testing is due to take place on Saturday 2 June, which means that the results are not

available for incorporation into this report. However, if the testing goes ahead as scheduled, a verbal update will be given at this meeting.

20. It is only when we have the results of the destructive testing on the doors and screens that we can finalise decisions on the future fire safety strategy for the Barbican Estate.

Fire Alarms

21. As has been reported on several occasions previously, the LFB continues to advise against the installation of fire alarms in communal areas. However, as part of the work we have been doing on fire safety, we have considered the potential installation of fire alarms in the common parts of our tower blocks and other blocks of flats set against the specific legislation and the guidance available at the time.

22. Early warning of a fire is an essential part of ensuring that residents can evacuate safely from their flats. The success of smoke alarms in reducing the number of casualties from fires in dwellings is well documented. The provision of appropriate smoke (and sometimes heat) alarms is now considered a basic component of fire safety in flats. Through a programme of electrical testing across all of its social housing estates, the CoLC is installing hard-wired carbon monoxide, smoke and heat detectors in all its tenanted flats.

23. Although purpose-built blocks of flats are not normally provided with communal fire detection and alarm systems, there are exceptions. The most common example is a sheltered housing scheme. However, this is a 'special case' and even then, a 'stay-put' policy is normal.

24. In blocks of flats that are designed to support a 'stay-put' policy (as is the case with all our blocks), it is accepted that a fire alarm system is unnecessary and undesirable. Such a system will inevitably lead to a proliferation of false alarms, imposing a burden on fire and rescue services and, ultimately, lead to residents ignoring warnings of what could be genuine fires. In addition, the ability to effectively manage a fire alarm system is rarely possible in a block of flats, unless it is staffed at all times.

25. The very clear advice is that fire alarms should only be fitted in existing blocks of flats where there is clear justification, and only as a last resort for example, when it is impossible to upgrade other measures to enable a 'stay-put' policy.

26. Notwithstanding the above, for the purpose of completeness in terms of the Barbican tower blocks, we have received information on the cost of installing fire alarms in the communal areas as summarised below:

Block	Units	Cost
Lauderdale Tower	117	£270,000
Shakespeare Tower	116	£265,000
Cromwell Tower	111	£260,000
Total:	**344**	**£795,000**

27. It should also be noted, that if a sprinkler system was to be fitted in the tower blocks, there is even less reason or need for a full fire alarm system to be installed.

Fire Risk Assessments (FRAs)

28. As Members will be aware, Frankham Risk Management Services Limited was commissioned to carry out new FRAs for all residential blocks on the Barbican Estate. These new FRAs are very detailed and cover not only those areas previously inspected, but also any further areas of concern raised since the Grenfell Tower fire.

29. Previous FRAs carried out on the CoLC's residential blocks have been a Type 1 as required by legislation. The new FRAs are Type 3, which go beyond the requirements of the Regulatory Reform (Fire Safety) Order 2005. Type 3 FRA's cover everything required for a Type 1 FRA but also provide for an assessment of the arrangements for means of escape and fire detection (smoke alarms, heat detectors, etc.) within a sample of the flats (typically around 10%). A Type 3 FRA is non-destructive but the fire resistance of doors to rooms and compartmentation within the flat is considered.

30. Frankhams has very recently submitted the new FRAs for the Barbican Residential Estate. Officers are now working on developing detailed action plans for each of the residential blocks to ensure that the works required are completed in a timely manner in line with the FRA's recommendations. It is hoped that at the time of this meeting, we will produce for Members consideration a 'Specific Hazard Identification and Action Plan Template for Fire Risk Assessments', which lists the recommendations from all the FRA's on our Barbican residential blocks. This is intended as an overview of all the recommendations on all the residential blocks.

31. In general terms, the new FRA's have not identified any major areas of concern at this stage with the main areas of improvement or further work identified summarised as:

- further work to identify the integrity of front entrance doors and screens in terms of fire resistance;
- implementation of an appropriate programme of periodic electrical testing of fixed wiring installation;
- further work to establish levels of compartmentation/fire stopping within false ceilings between individual dwellings and communal areas;
- improved signage;
- overhaul of doors to communal areas and lobby doors to ensure they close properly to maintain compartmentation;
- periodic testing of mechanical extraction in kitchen areas;
- further work to identify integrity of vertical ducting particularly in relation to potential alterations carried out by residents that may have compromised levels of compartmentation.

32. It should be noted however, that the final action plans for each block will, possibly to a significant extent, be affected by decisions taken by this Committee as a result of this report. It is intended, subject to the approval of this Committee, that the

FRA's and resulting action plans should be available for publishing by the first week in July.

Leaseholder Recharges for Fire Safety Improvement Works

33. The issue of recharging leaseholders for fire safety improvement works is a key consideration for the CoLC particularly on the Barbican Estate. We have approximately 2030 long leaseholders in our residential blocks on the Barbican Estate. Whether or not they can be recharged for potential improvement works such as the installation of sprinklers, replacement of fire doors and so on will have a significant bearing on the affordability of such measures and the financial burden for the CoLC and the leaseholders themselves.

34. Given the importance of this matter, Counsel's opinion has been sought on the ability of the CoLC to recharge leaseholders for fire safety works. A report will be presented to this Committee in due course.

Collaborative Working

35. Since the Grenfell Tower tragedy, several opportunities have arisen for representatives of the London Councils to get together to discuss the various approaches they are taking to ensure processes and procedures relating to fire safety in their homes remain robust and fit for purpose.

36. One such opportunity is the London Housing Directors' Fire Safety Sub-Group, which the CoLC is a member of. Through its membership, the CoLC has, for example, had the opportunity to contribute to a response to the interim report on the Grenfell Tower tragedy issued by Dame Judith Hackitt. We have also been able to discuss with other London Council's topics such as ACM cladding (the type installed at Grenfell Tower), fire safety improvement measures such as fire doors and sprinklers and leaseholder recharges.

37. In general terms, most of the other London Council's face the same issues as the CoLC and are embarking on similar courses of action. Many of the other London Council's do have problems with ACM cladding on their residential blocks and are at various stages of removing and replacing it.

38. For comparison purposes, the work other London Councils are doing in relation to fire safety improvements includes:

- Hammersmith and Fulham - installing sprinklers in all its high-rise blocks with no charge to leaseholders,
- Wandsworth - installing sprinklers in 99 high-rise blocks with the intention of recharging leaseholders,
- Croydon - fitting sprinklers in 25 high-rise blocks,
- Westminster - fitting sprinklers in high-rise blocks,
- Waltham Forest - fitting sprinklers in high-rise blocks,
- Enfield - fitting sprinklers in high-rise blocks,
- Harringay – not fitting sprinklers,
- Lewisham – not fitting sprinklers.

Financial Implications

39. As outlined earlier in this report under the heading "Leaseholder Recharges for Fire Safety Improvement Works", the issue of recharging leaseholders for fire safety improvement works is a key consideration for the CoLC. With approximately 2030 long leaseholders in our residential blocks on the Barbican, whether they can be recharged for potential improvement works such as the installation of sprinklers, replacement of fire doors and so on will have a significant bearing on the affordability of such measures and the financial burden for the CoLC.

Legislation

40. All the CoLC's residential blocks on the Barbican Estate complied fully with the requirements of the Building Regulations at the time of their construction. Given that the Building Regulations are not retrospective, they remain compliant.

41. Issues do arise however where, as a result of a FRA carried out under the provisions of the Regulatory Reform (Fire Safety) Order 2005, deficiencies are highlighted in the structure of the building undermining the required level of compartmentation in relation to fire safety. In such cases, these deficiencies must be addressed and remedied, and it is no defence to argue that the building complied with the Building Regulations at the time it was built.

42. In the aftermath of the Grenfell Tower tragedy, further concerns were again raised with the adequacy of the building regulations with particular regard to fire safety. In response, Dame Judith Hackitt was asked by the Secretary of State for the Department for Communities and Local Government (DCLG) and the Home Secretary to conduct an Independent Review of Building Regulations and Fire Safety with a particular focus on their application to high-rise residential buildings.

43. Although her final report is not due until the Spring this year, in December last year, Dame Judith produced an Interim Report and presented to parliament. In the foreword to her report, she states that:

    "As the review has progressed, it has become clear that the whole system of regulation, covering what is written down and the way in which it is enacted in practice, is not fit for purpose, leaving room for those who want to take shortcuts to do so".

44. It does appear that there will be significant changes to the current regulatory system and to the Building Regulations regarding fire safety and in particular to high-rise residential buildings. Some of these changes are likely to be retrospective. The retro-fitting of sprinklers, for example, which has been debated for many years, particularly more so since the Lakanal House fire on 3 July 2009, is believed to be one such area of improvement under consideration.

45. With this in mind, Members may take the view that the CoLC, like several others are doing, should wait until the final report is published before deciding on its future strategic approach to fire safety in relation to the Barbican Estate.

Conclusions

46. Members will be aware from the several Fire Safety Update Reports presented to this, and other Committees that the CoLC has responded very positively and efficiently to the demands placed on it by the Grenfell Tower tragedy. We have done considerable work in the following areas:

- fire risk assessments,
- communication with residents,
- estate management,
- fire safety maintenance and improvement work,
- inspections by the London Fire Brigade,
- potential future improvement works.

47. This report informs Members of the work done in relation to potential improvement works to enhance the safety of the residential blocks on the Barbican Estate and its residents in the event of fire. The report also seeks Members views and guidance on the strategic direction the CoLC should take in its approach to fire safety with particular regards to our genuine high-rise residential blocks in relation to:

- retro-fitting sprinklers,
- installation of fire alarms,
- upgrading front entrance doors.

48. As outlined previously, the retro-fitting of sprinklers in CoLC tower blocks is not currently required by law and is not supported by the recently completed FRA's. However, there are clearly reasons why Members may want to positively consider retro-fitting sprinklers in the three high-rise residential tower blocks on the Barbican Estate. This includes the obvious benefits that sprinklers provide (as outlined within this report), the potential cost implications if retro-fitting does become a legal requirement, the avoidance of a divergence within the CoLC's high-rise flats and, in light of the decision to install sprinklers in the CoLC's five social housing high-rise tower blocks, the benefits and savings from 'economies of scale' in packaging the works.

49. Members will recognise the potential comparisons that may be drawn from the 'in principle' decision taken by the Community and Children's Services Committee at its meeting on 11 May 2018 to install sprinklers in its five social housing high-rise tower blocks. The Director of Community and Children's Services is therefore recommending that Members positively consider the retro-fitting of Automatic Water Suppression Systems (sprinklers) in the three high-rise residential tower blocks on the Barbican Estate. Clearly, any decision by the Committee will be subject to the appropriate funding arrangements and compliance with the relevant planning requirements.

Appendices

Appendix 1: Feasibility study into the retro-fitting of sprinklers in our high-rise residential blocks.

Appendix 2: CoLC's Fire Safety Adviser's Report

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City of London
Retrofit Sprinkler Schemes

Feasibility Study into Retrofit Sprinkler Systems at Eight Tower Blocks

Barbican – 3 Tower Blocks

Avondale – 3 Tower Blocks

BYA BUTLER & YOUNG ASSOCIATES

City of London
Retrofit Sprinkler Schemes

Middlesex Estate – 1 Tower Block

Golden Lane Estate- 1 Tower Block

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Executive Summary

City of London (CoL) have commissioned Butler & Young Associates (BYA) to prepare a feasibility study into the potential retro-fitting of water suppression systems (sprinklers) into the CoL's 8 high rise blocks, the report is to contain at least the following for each block.

- Practicalities of installing such a system (can it be done?);
- Benefits of installing such a system (compared to other potential fire safety measures such as alarms etc);
- Risks associated with installation;
- Potential costs;
- Structural problems (water storage/supply and the like);
- Limitations and restrictions etc.

CoL objective is to reduce risk of the consequences of a fire.

The blocks all comprise multi person accommodation.

The study has reviewed the following aspects: water supplies, pipework distribution, sprinkler head positions, fire escape routes and smoke/fire detection systems, it has not looked into fire compartmentation.

We have consulted with London Fire Brigade (LFB) in the preparation of this report for the Barbican Estate towers. At the time of issue we await input from the CoL Fire Officer.

This report includes adequate information to take these proposals to the next stage i.e. it provides sufficient design intent to reduce price risk of allowing an approved contractor to undertaken their design/interpretations independently without guidance.

Costs within this report include for concealing both the sprinkler heads and pipework as much as possible.
Costs within this report also cover the thermal insulation of the pipework, where necessary, to minimise the risk of freezing.

The costs do not include for the required asbestos R&D surveys, removal of asbestos or any controlled works within areas of asbestos.

The costs do not include for all or any part of a smoke/fire alarm system.

The costs do not include for any fire compartmentation other than making good following the installation of the new sprinkler system.

CoL Fire Officer

We have asked for confirmation of certain elements from the CoL Fire Officer and replies that will impact on this report.

Questions asked:-

All blocks

- Sprinkler systems for all blocks to comply with BS 9251- 2014, please confirm.

Barbican - 3 Tower blocks

- Can the supply to the new sprinkler pumps be taken from the Wet riser tank marrying pipes?
- Please confirm if just one operational alarm is required, i.e. adjacent to the sprinkler pump or would an alarm be required in each apartment? There is a fire alarm to each so therefore may not require the sprinkler alarm to each.
- External escape routes which pass other apartment windows: As each room will be protected we have assumed that the windows will not require drenching. Please could you confirm?
- Is protection required to any of the escape routes from the lift lobbies. We have allowed for lift lobbies to be protected

Avondale - 3 Tower blocks

- There are no fire alarms to this block, will separate fire alarm indication be required from each flat connected to 24/7 man security?
- We did not see a standby generator, please could you clarify whether Firemans lift has a dual supply and whether emergency lights are battery packed?

Middlesex Estate Petticoat Tower

- There are no fire alarms to this block, will separate fire alarm indication be required from each flat connected to 24/7 man security?
- We did not see a standby generator, please could you clarify whether Firemans lift has a dual supply and whether emergency lights are battery packed?
- Middlesex Street has only one means of escape stairway.

Golden Lane Estate – Great Arthur House

- There are no fire alarms to this block, will separate fire alarm indication be required from each flat connected to 24/7 man security?
- We did not see a standby generator, please could you clarify whether Firemans lift has a dual supply and whether emergency lights are battery packed?

Options/Proposed Systems

There are 2 options i.e. a fixed automatic sprinkler system or a water mist system

A fixed domestic automatic sprinkler system will comply with BS 9251- 2014, which will also include for the communal areas that impose a risk to the residents for means of escape.

A water mist system will require a pump set in each dwelling which will be a high maintenance issue and would not extend into the communal areas. We therefore consider that this type of system would not to be suitable for these blocks.

The BS does not require each flat to be alarmed to notify of sprinkler operation, only for the main pump. We have not allowed for the alarm to be connected to any 24/7 emergency care system but this can be easily undertaken to provide an alarm in the event of sprinkler operation to enable LFB to be called.

Separate flat alarms maybe a client desirable but have not been included.

There is inadequate pressure within the water main supplies to provide both the flow/pressure requirements to the highest sprinkler heads and therefore separate water storage or around 5,000 litres maximum will be required with a single pump unit sized to suit the required flow and pressures in compliance with BS 9251-2014. Alternatively, subject to confirmation with CoL Fire Officer it may be possible to use the wet riser tanks for the water source of the new sprinkler system within the Barbican Estate towers.

Due to the pressure provided at the lower levels from the booster pump and to ensure that there is adequate pressure to serve the highest heads it may be necessary to provide inline pressure reducing valves on the branch supplies. This will be confirmed during the design process and we have made an allowance for these in the cost.

We are aware that the residential sprinkler regulations allow for connections to be taken from the domestic boosted system but in our opinion this is not a preferred method as it creates excessive dead legs which will dramatically increase the risk of legionella bacteria growth with potential colonisation of the domestic water system.

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The following are our proposals for each of the blocks/sites

Barbican

This site consists of 3 tower blocks

There is communal basement car parking throughout. The car parks already have their own fully operational sprinkler system. These systems are currently being modified from a wet to an alternate system, and do not form part of this study.

There is a fire alarm system with a detector in each flat and alarm panel at reception. There are no detectors in the communal lift lobby areas.

There is a communal services tunnel that interconnects throughout the site. As this is a possible avenue for the fire to spread, sprinklers will be allowed from each of the residential blocks systems to the lobby accessing this tunnel to lower this risk.

We did not notice any Gerda boxes to provide the necessary information for the fire brigade but understand they make regular visits to the site and are familiar with all firefighting systems installed.

Lauderdale Tower

- Construction 1970
- 41 residential floors (117 flats) with 2 basement plant areas
- Basement – Wet riser plant area, Domestic water plant area, Garchey waste collection disposals area and residents' stores.
- Standby generator for emergency lighting and Firemans lift
- The block has been provided with a wet riser system having its own water storage tanks, electric & diesel pumps, wet riser outlet valve at each level (mainly in the lift lobbies) and fire brigade infill valve.
- The block has been provided with one Firemans lift for use by LFB during an emergency.
- There is asbestos throughout.
- Reception double height.
- Floors 1 to 37 – 3 flats on each
- Floors 38 & 39 – 2 flats on each
- Floors 40 & 41 - Penthouses

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Retrofit Sprinkler Schemes

Shakespeare Tower

- Construction 1970
- No service subway to this block
- 41 residential floors (116 flats) with 2 basement plant areas
- Basement – Wet riser plant area, Domestic water plant area, Garchey waste collection disposals area and residents' stores
- Standby generator for emergency lighting and Firemans lift
- The block has been provided with a wet riser system having its own water storage tanks, electric & diesel pumps, wet riser outlet valve at each level (mainly in the lift lobbies) and fire brigade infill valve
- The block has been provided with one Firemans lift for use by LFB during an emergency
- There is asbestos throughout
- Reception double height
- Floor 1 - 2 flats
- Floors 2 to 37 – 3 flats on each
- Floors 38 & 39 – 2 flats on each
- Floors 40 & 41 – Penthouses

Cromwell Tower

- Construction 1970
- 39 residential floors (111 flats) with 2 basement plant areas
- Basement – Wet riser plant area, Domestic water plant area, Garchey waste collection disposals area and residents' stores
- Standby generator for emergency lighting and Firemans lift
- The block has been provided with a wet riser system having its own water storage tanks, electric & diesel pumps, wet riser outlet valve at each level (mainly in the lift lobbies) and fire brigade infill valve
- The block has been provided with one Firemans lift for use by LFB during an emergency
- There is asbestos throughout
- Reception double height
- Floors 1 to 35 – 3 flats on each
- Floors 36 & 37 – 2 flats on each
- Floors 38 & 39 – Penthouses

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Retrofit Sprinkler Schemes

Typical proposals for each Barbican block

We propose three risers, one in each plumbing riser which are independently accessed on every floor and will provide access/entry into each flats without crossing the communal lift lobby areas.

The lift lobby communal areas can be protected by side wall sprinklers from each riser which will require drilling through and fitting to the lift lobby walls.

The means of escape area can also be protected by the same method off each riser.

All basement areas that contain fire protection plant, equipment or pipework will be protected, residential stores area will be protected together with lobby entrances to communal service tunnels.

We were able to access two flats, one in Shakespeare tower which is close to being refitted out by the leaseholder, plaster board ceilings have been added throughout and the other being flat 152 in Cromwell tower which has the original plastered/concrete ceilings.

Intent would be to run a new sprinkler main along the dwelling hallway with recessed side wall sprinklers into each / every room and recessed pendant heads along the hallway. This would require a slightly dropped plasterboard ceiling throughout the length of the hallway and all necessary modifications to ceiling lights, local tenant fitted alarms, etc.

Questions

- Practicalities of installing such a system (can it be done?)
  The answer is yes as proposals verifies

- Benefits of installing such a system (compared to other potential fire safety measures such as alarms etc)
  The fire is contained until LFB arrive
  Towers have fire alarm system therefore this comparison is irrelevant
  Sprinklers can be provided to the means of escape stairway which currently are unprotected
  There is no alternate escape stairway route from the lift lobby areas and sprinklers would assist in protecting the current route
  May reduce the requirement for preventing internal fire spread via the construction

- Risks associated with installation
  Minimum risk other than normal building construction works which would be covered by method statetments on how the works are to be installed.
  Asbestos surveys and removals if in the area of the intended works.

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Retrofit Sprinkler Schemes

- **Potential costs**
  As attached

- **Structural problems (water storage/supply and the like)**
  There are none

- **Limitations and restrictions etc.**
  Listed building approval

Estimated Cost - Barbican

Exclusive of any Asbestos works, VAT and Fees

Lauderdale Tower	**£613,818.00**
Shakespeare Tower	**£608,764.00**
Cromwell Tower	**£581,594.00**

Avondale Estate

This site consists of 3 tower blocks, West, Central and East, all of which are typical throughout.

There is no fire alarm system to these blocks, the only facility is if each tenant or leaseholder have fitted their own local detectors/alarm but this does not provide warning to other occupiers or LFB during an emergency.

Gas meters/risers are within cupboards within each flat which appear not to be ventilated or fire compartmented.

Each block has a dry riser with an outlet at every other floor adjacent to the Firemans lift.

There are two lifts which service alternate floors and one of the lift is for use by the fire brigade.

We were unable to locate a standby generator for use of both the lift and lights during emergency and assume that the lift will have a dual electrical supply and emergency lights are of the battery pack type.

There are two central risers accessed from the lift lobby and internal access stairs, one being electrical in the lift lobby the other being the dry riser in the stairway, service risers are within the demise of the flats.

There is an internal access stair and partly covered external means of escape stairs with open side.

Each Tower

- Construction 1960s.
- 19 residential floors (74 flats) no basement areas.
- Ground floor – Dry riser inlet, Domestic water plant area, Electrical intake and Waste collection disposals area.
- Residents' stores are separate and externally located. No protection required.
- Provided with a dry riser system with outlet landing valves at alternate floors.
- Each block has been provided with one Firemans lift for use by LFB during an emergency with exit on the same level as the dry riser landing valves.
- It is believed there is asbestos throughout.
- There are two stairways from each lift lobby area
- Ground floor - 2 flats.
- Floors 1 to 18 – 4 flats on each.
- Mainly consists of studio and one bedroom flats.

Typical proposals for each Avondale block

It would be difficult to install the new sprinkler riser into the same riser as the dry riser as access into this duct is restricted.

Access for sprinkler pipework into the service riser duct would mean accessing and drilling within the demise of each of the flat, the best location if this was to be considered within the flat demise would be alongside the gas riser but it would be extremely intrusive to install.

We therefore believe the best solution would be to locate the riser in the rear external, partly covered means of escape stair which would require the new main to be thermally insulated and boxed to prevent freezing, protection and concealment. We do not believe this would be a planning concern but it would need to be checked.

The new sprinkler main could branch from the riser to each flat, running at high level in each lift lobby area with insulation to prevent freezing and boxing to protect and conceal.

The lift lobby communal areas can be protected by sidewall or pendant sprinklers heads, (subject to final solution) from each main routing to the flats. The means of escape area can also be protected, if necessary, by a similar method.

All plant areas that will contain fire protection plant, equipment or pipework will be protected along with block entrance areas.

We were able to access one flat one in West Block which had just been decorated.

Intent would be to run a new sprinkler main down the dwelling hallway with recessed side wall sprinklers into each/every room and recessed pendant heads along the hallway, this would require slightly dropped plasterboard ceiling throughout the length of the hallway and all necessary modifications to ceiling lights, local tenant fitted alarms, etc.

Questions

- Practicalities of installing such a system (can it be done?)
  The answer is yes as proposals verify

- Benefits of installing such a system (compared to other potential fire safety measures such as alarms etc)
  The fire is contained until LFB arrive
  Provides LFB by indication the location of the fire
  May prevent the need to have a fire alarm system – would need Fire Officer comment
  Sprinklers can be provided to the means of escape stairways which currently are unprotected

May reduce the requirement for preventing internal fire spread via the construction

- **Risks associated with installation**
  Minimum risk other than normal building construction works which would be covered by method statetments on how the works are to be installed.
  Asbestos surveys and removals if in the area of the intended works.

- **Potential costs**
  As attached

- **Structural problems (water storage/supply and the like)**
  There are none

- **Limitations and restrictions etc.**
  Possibly planning

Estimated cost - Avondale

Exclusive of any Asbestos works, smoke/fire alarm systems VAT and Fees

West Tower	**£431,096.00**
Central Tower	**£431,096.00**
East Tower	**£431,096.00**

Middlesex Estate

This site consists of 1 tower block named Petticoat Tower.

There is no fire alarm system to this block, the only facility is if each tenant or leaseholder have fitted their own local detectors/alarm, but this does not provide warning to other occupiers.

There is communal underground car parking which is protected by a dedicated sprinkler system and has not been considered within this report.

The block has an exposed dry riser with outlets at every other floor that coincide with the Firemans lift.

There are two lifts which serve alternate floors, one is labelled as a fire-fighting lift.

We were unable to locate a standby generator for use of both the fire lift and lights during emergency, we assume that the lift will have a dual electrical supply and emergency lights will be of the battery pack type.

There is an electrical riser within the lift stair lobby. We assume that all other risers are within the flat demise.

There is only one escape stairs off the lift lobby core which exits at podium level (level 2).

The internal access stair is also the means of escape stairs which has an open side, there is no secondary means of escape.

The refuse chute runs vertically through the whole block within the access/escape stairs.

The whole block with the main walls are of concrete construction with beams.

Petticoat Tower

- Construction 1970s
- 24 floors
- Level 2 (podium) to level 23 each has 4 flats, (92 Flats)
- Level 1 – flats storage units
- Ground floor – flat storage units, plant & refuse areas with communal ground
- Ground & basement communal parking separated from the tower
- Lifts access alternate floors
- Ground floor – Dry riser inlet, Domestic water plant area, Electrical intake and waste collection disposals area

- Residents' stores are on levels ground and 1
- Provided with a dry riser system with outlet landing valves at alternative floors.
- Each block has been provided with one Firemans lift for use by LFB during an emergency, with exit on the same level as the dry riser landing valves
- It is believed there is asbestos
- Flats are an even mixture off one and two bedroom having two off each at each level (flats A& D being the two bedroom, B&C being the one bedroom)
- Concrete beams within flats that will require drilling
- Pipework to be extended from dwelling hallway to reach furthest corners within each flats.
- Only one stairway
- No secondary means of escape from each flat

Proposals for Petticoat Tower

The best location for a new sprinkler riser would be in the corner adjacent to refuse chute, as this could be installed without disturbing the tenants.

From the new risers, sprinkler pipework could be routed at high level across the access stairway lobby and into the lift lobby, drilled holes will be required. The sprinkler main could then follow the contours of the lift lobby at high level in the corners between walls/ceilings to enter each flat at high level in the dwelling hallways. The whole pipe would be boxed and the section in the stairway lobby and riser be thermally insulated to prevent freezing.

Drilling would be required through all concrete walls along the pipework route and through the floors for the riser.

Sprinkler heads would be provided within the access stairway lobby, refuse chute and the lift lobby to provide protection to these areas.

All plant areas that will contain fire protection plant, equipment or pipework will be protected along with block entrance areas.

We were able to access a one bedroom flat which had just been decorated, which revealed a down stand concrete beam that the new sprinkler pipe will have to penetrate.

Intent would be to run a new sprinkler main down the dwelling hallway with recessed side wall sprinklers into each/every room off the hallway with recessed pendant heads along the hallway, this would require a slightly dropped plasterboard ceiling throughout the length of the hallway and all necessary modifications to ceiling lights, local tenant fitted alarms, etc.

Due to the extremities of the flat in the lounge and kitchen a supply would need to be extended into these rooms located in the ceiling to the wall corner with suitable boxing to permit all areas of the flat to be covered.

City of London
Retrofit Sprinkler Schemes

Questions

- **Practicalities of installing such a system (can it be done?)**
  The answer is yes as proposals verify

- **Benefits of installing such a system (compared to other potential fire safety measures such as alarms etc)**
  The fire is contained until LFB arrive
  Provides LFB by indication the location of the fire
  May prevent the need to have a fire alarm system
  There are no secondary means of escape from each flat or an alternate escape route from the lift lobby areas
  Provides additional protection to each flat which have no secondary means of escape
  Provides protection to the one means of escape stairway
  May reduce the requirement for preventing internal fire spread via the construction

- **Risks associated with installation**
  Minimum risk other than normal building construction works which would be covered by method statetments on how the works are to be installed.
  Asbestos surveys and removals if in the area of the intended works.

- **Potential costs**
  As attached

- **Structural problems (water storage/supply and the like)**
  Downstand beam penetration to be checked

- **Limitations and restrictions etc.**
  There are none

Estimated cost

Exclusive of any Asbestos works, smoke/fire alarm systems VAT and Fees

Petticoat Tower **£537,768.00**

Golden Lane Estate

This site consists of 1 tower block named Great Arthur House.

There is no fire alarm system to this block, the only facility is if residents or leaseholders have their own local detectors/alarm but this does not provide warning to other occupiers.

The block has an exposed dry riser with an outlet at every other floor which coincides with the Firemans lift.

The dry riser rises adjacent the vertical refuse chute in one of the stairways.

There is a stairway each end of the block, both of which are partly open.

Each flat has a separate escape route from its demise into either the lift lobby or stairway subject to the location of the flat.

There are two lifts which serve alternate floors, which are located centrally on each floor, one is labelled as a fire-fighting lift.

Between the lift and end stairways there are 4 flats on each side.

We were unable to locate a standby generator for use of both the fire lift and lights during emergency, we assume that the lift will have a dual electrical supply and emergency lights are of the battery pack type.

We believe there are electrical risers outside the flats but were unable to confirm this as panels need to be unfixed to access; most other risers are within the flat demise.

The whole block with the main walls are of concrete construction with beams.

Great Arthur House

- Construction 1958 -1960
- 16 floors
- Level 1 to 15 have 8 flats each, (120 Flats)
- Ground floor – Reception, external boiler room, dry riser inlet
- Basement – Flat storage units, other plant areas & refuse collection area
- Two lifts that access alternate floors
- Provided with a dry riser system with outlet landing valves at alternative floors.

- Provided with one Firemans lift for use by LFB during an emergency, with exit on the same level as the dry riser landing valves
- There is asbestos, wall between bathroom and kitchen in each flat is asbestos
- Flats are one bedroom having 8 at each level
- Flats and lift lobbies have secondary means of escape

Typical proposals for Great Arthur House

The best location for a new sprinkler riser would be in the corner adjacent to refuse chute dry riser, as this could be installed without disturbing the tenants.

From the new risers, sprinkler pipework could be routed at high level across the full extent of each floor lobby, drilled holes will be required. The sprinkler main could then follow the contours of the lobby at high level in the corners between walls/ceilings to enter each flat at high level in the dwelling hallways. The whole pipe would be boxed in and the section in the stairway lobby and riser be thermally insulated to prevent freezing.

Drilling would be required through all concrete walls along the pipework route and through the floors for the riser.

Sprinkler heads would be provided within the stairways and lobbies to provide protection to these areas.

All plant areas that will contain fire protection plant, equipment or pipework will be protected along with block entrance areas.

We were able to access a one bedroom flat (101) which had just been decorated. There is a wall containing asbestos between the kitchen/bathroom. The extremities of two rooms will not be covered by sidewall sprinklers in the hallway due to distance.

Intent would be to run a new sprinkler main down the dwelling hallway with recessed side wall sprinklers into each/every room off the hallway with recessed pendant heads along the hallway, this would require slightly dropped plasterboard ceiling throughout the length of the hallway and all necessary modifications to ceiling lights, local tenant fitted alarms, etc.

Due to the extremities of the flat in the lounge and bedroom a supply would need to be extended into these rooms located in the ceiling to the wall corner with suitable boxing to permit all areas of the flat to be covered.

City of London
Retrofit Sprinkler Schemes

Questions

- **Practicalities of installing such a system (can it be done?)**
  The answer is yes as proposals verify

- **Benefits of installing such a system (compared to other potential fire safety measures such as alarms etc)**
  The fire is contained until LFB arrive
  Provides LFB by indication the location of the fire
  May prevent the need to have a fire alarm system
  Provides additional protection to each flat
  Provides protection to the means of escape stairways
  May reduce the requirement for preventing internal fire spread via the construction

- **Risks associated with installation**
  Minimum risk other than normal building construction works which would be covered by method statetments on how the works are to be installed.
  Asbestos surveys and removals if in the area of the intended works.

- **Potential costs**
  As attached

- **Structural problems (water storage/supply and the like)**
  There are none

- **Limitations and restrictions etc.**
  There are none

Estimated cost

Exclusive of any Asbestos works, smoke/fire alarm systems VAT and Fees

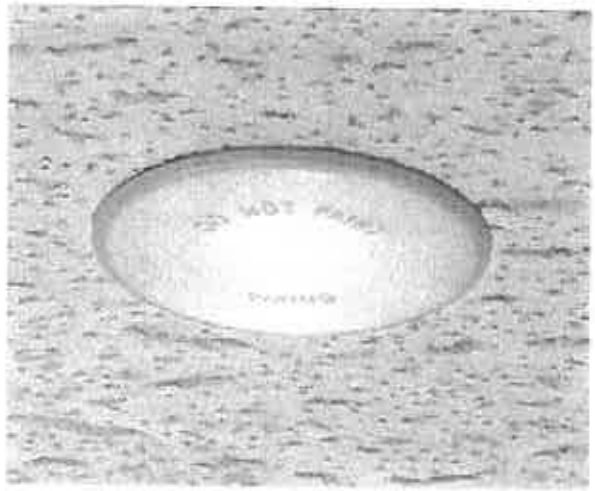
Great Arthur House **£676,880.00**

ALL SCHEMES GENERAL CONSIDERATIONS

City of London
Retrofit Sprinkler Schemes

Typical Sprinkler heads within the flats

SIDE WALL SPRINKLER PLATE



CEILING SPRINKLER PLATE

Retrofit Sprinkler Scheme – All Schemes

Connection from the water mains will be required to a sprinkler break tank located in the plant room areas (Barbican towers hopefully will be taken from the wet riser tanks) – subject to Fire Officer approval.

These will be a sprinkler pump unit feeding a new riser in each Tower serving all Tower levels, flats and stores.

Sprinkler pipework will be distributed at each floor level to the communal lobbies and extending into the apartments. (See drawings).

The sprinkler heads will be hidden and covered by a white 80mm flat plate.
In a fire scenario the plate will drop at around 50Deg C revealing the sprinkler head behind.

Statistically the risk of accidental discharge is approx. 16,000,000:1.

Disruption

There will be some noisy works whilst the risers are being installed as this will route through floors. The infill material between floors is currently unknown assumed as concrete.

There will also be noise from drilling and fixing of pipework.

There will be disruption in the lobby areas that the installer will have to control and monitor to ensure safety of the public.

We have been told by CoL that towers do contain asbestos therefore R&D surveys will be required and any asbestos located in the areas of the new sprinklers will need to be removed, which will be additional to the cost identified in this report.

Detailed Design Consideration

Retro fit sprinkler system considerations for all Tower blocks

Design based on BS9251:2014.

Flow & Pressures

Boosting required due to the lack of available pressure from the waterman to reach the upper most levels.

Flow - 4 heads operating simultaneously @ 42 l/m each = 168 l/min.

Pressure – minimum of 0.5 bar (5m) at any sprinkler.

A dedicated power supply would be required to the pump set.

All sprinkler heads are subject to malicious damage and there is little that can be done to reduce this risk. Accidental discharge risk is negligible.
The heads propose will have flat 65mm diameter white concealment covers that are soldered in position. During operation the solder covers fall off at a lower temperature exposing the sprinkler head bulb to the heat source.

We propose for the pipework to be plastic based and concealed in new ceilings and corner bulkheads.
This material permits the installation to be kept a tight as possible to the existing fabric.

Our intent is to provide new false ceilings in each dwelling as the typical section included with the drawings in this report.

The precise number and location of sprinkler heads will be subject to the designer's engineer's calculations and spray patterns of heads selected.

Tender Process

Following our design should the works proceed, it is proposed that we invite tenders from 5 No. residential sprinkler specialist installers. (depends on CoL tendering standard requirements)

NB The final design including the number of sprinklers and their positions will be determined by the contractor. (BS requirement).

City of London
Retrofit Sprinkler Schemes

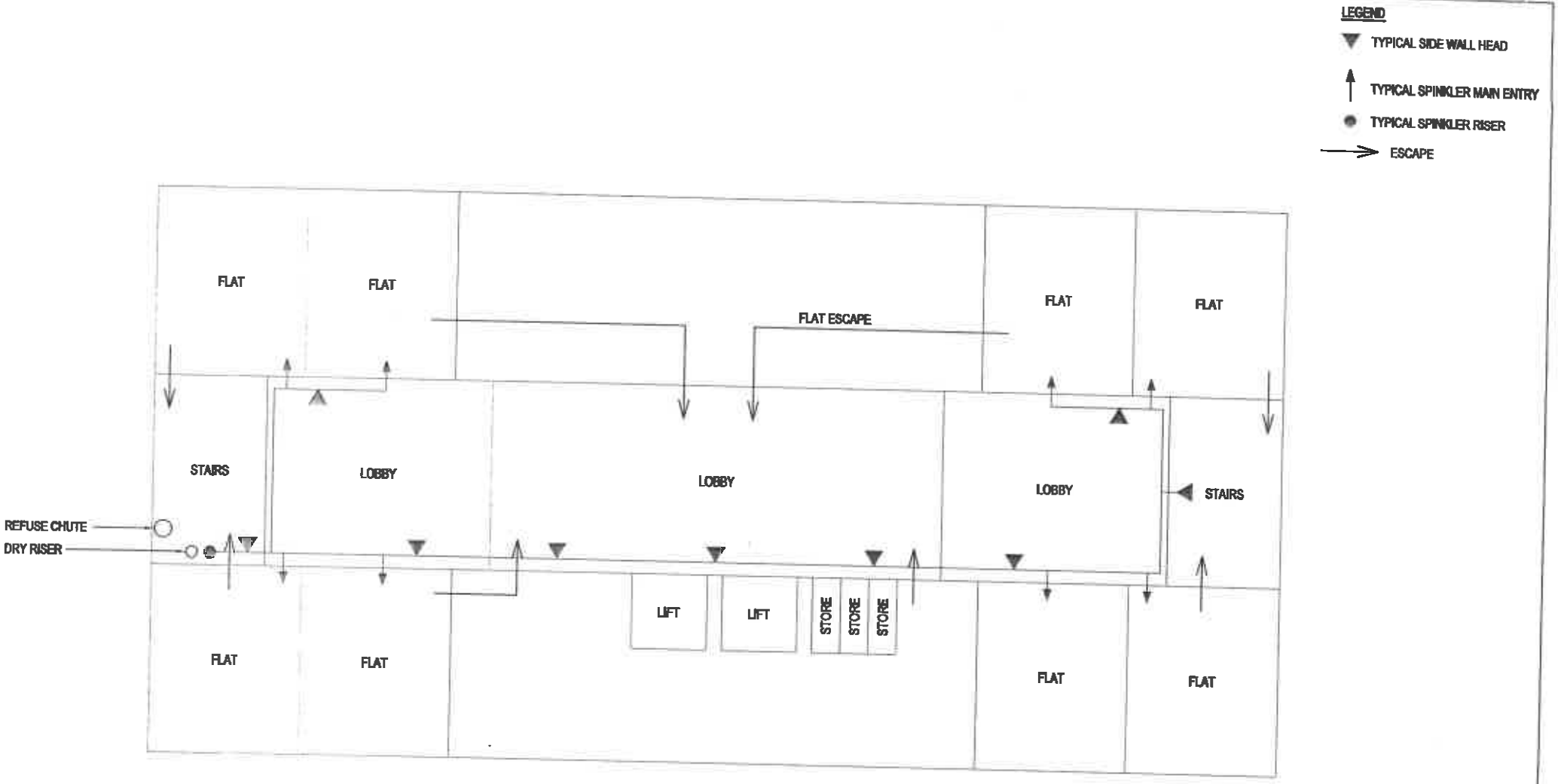
CoL sprinklers cost spread sheet

Flat cost based on the highest tender for Parkside
Chelmsford 2595

Tower block	No of flats	Cost each	Total	Fire Alarm	Standby Generator	PRV to each branch	Additional boxing	Sprinkler Alarm	TOTAL
		£5,054.00				above level 16	Thermal insulation	each flat	
						£300 each	£100 /M	£400	
Barbican									
Lauderdale Tower	117	£5,054.00	£591,318.00	Yes flats	Yes	£22,500.00	£0.00	£0.00	£613,818.00
Skakespear Tower	116	£5,054.00	£586,264.00	Yes flats	Yes	£22,500.00	£0.00	£0.00	£608,764.00
Cromwell Tower	111	£5,054.00	£560,994.00	Yes flats	Yes	£20,700.00	£0.00	£0.00	£581,694.00
Avondale Estate									
West Tower	74	£5,054.00	£373,996.00	No	No	£900.00	£26,600.00	£29,600.00	£431,096.00
Central Tower	74	£5,054.00	£373,996.00	No	No	£900.00	£26,600.00	£29,600.00	£431,096.00
East Tower	74	£5,054.00	£373,996.00	No	No	£900.00	£26,600.00	£29,600.00	£431,096.00
Middlesex Estate									
Petticoat Tower	92	£5,054.00	£464,968.00	No	No	£2,400.00	£33,600.00	£36,800.00	£537,768.00
Golden Lane Estate									
Great Arthur House	120	£5,054.00	£606,480.00	No	No	£0.00	£22,400.00	£48,000.00	£676,880.00

City of London
Retrofit Sprinkler Schemes

SKETCH DRAWINGS



THIS SKETCH DOES NOT REPRESENT A
TRUE ACCURATE LAYOUT.
ITS FOR INFORMATION ONLY

GOLDEN LANE ESTATE
GREAT ARTHUR HOUSE
TYPICAL FLOOR PLAN/PROPOSAL
SCALE (N.T.S.)

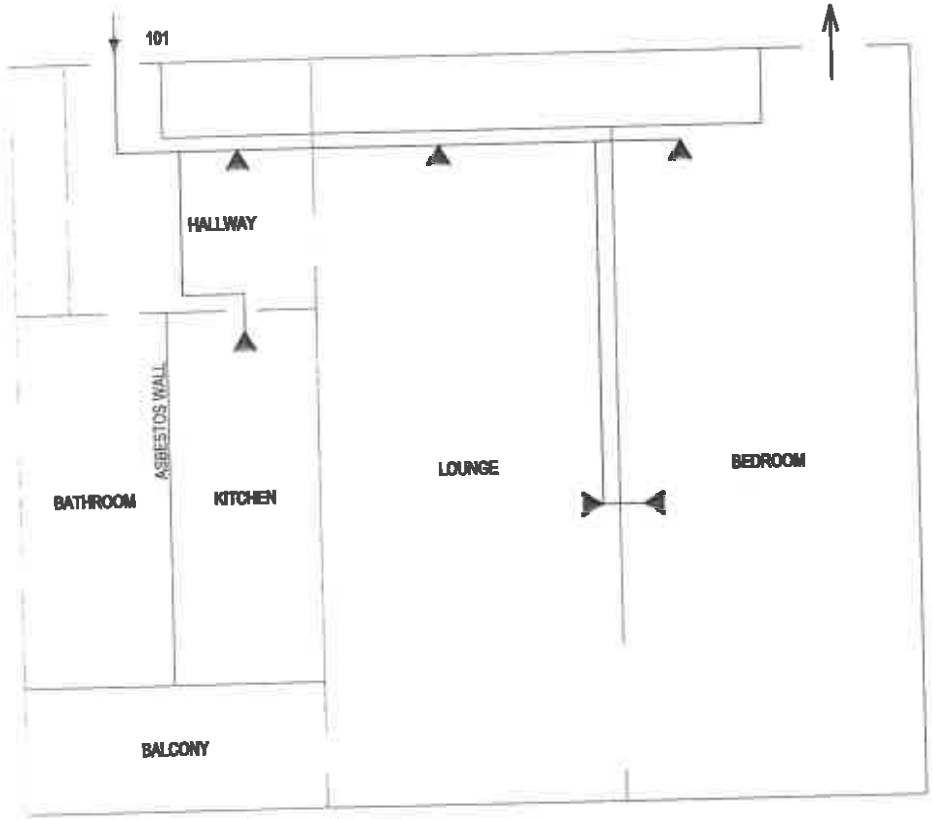
LEGEND

TYPICAL SIDE WALL HEAD

TYPICAL SPINKLER MAIN ENTRY

TYPICAL SPINKLER RISER

ESCAPE



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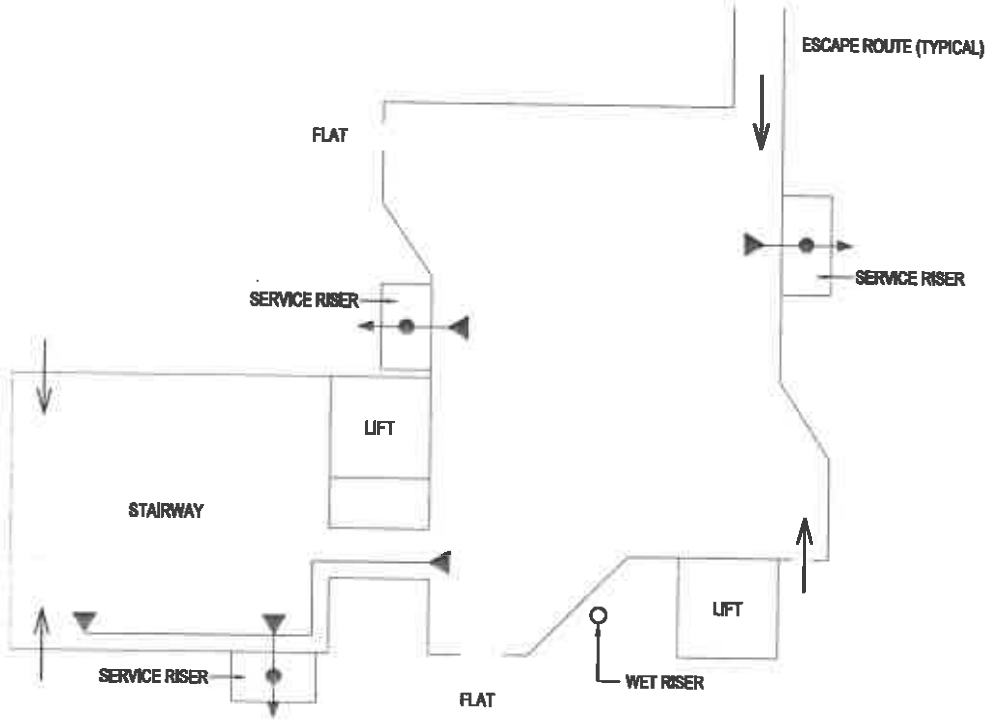
GOLDEN LANE ESTATE
GREAT ARTHUR HOUSE
TYPICAL FLAT LAYOUT/PROPOSAL
SCALE (N.T.S.)



LEGEND

- TYPICAL SIDE WALL HEAD
- TYPICAL SPINKLER MAIN ENTRY
- TYPICAL SPINKLER RISER
- ESCAPE

THIS SKETCH DOES NOT REPRESENT A
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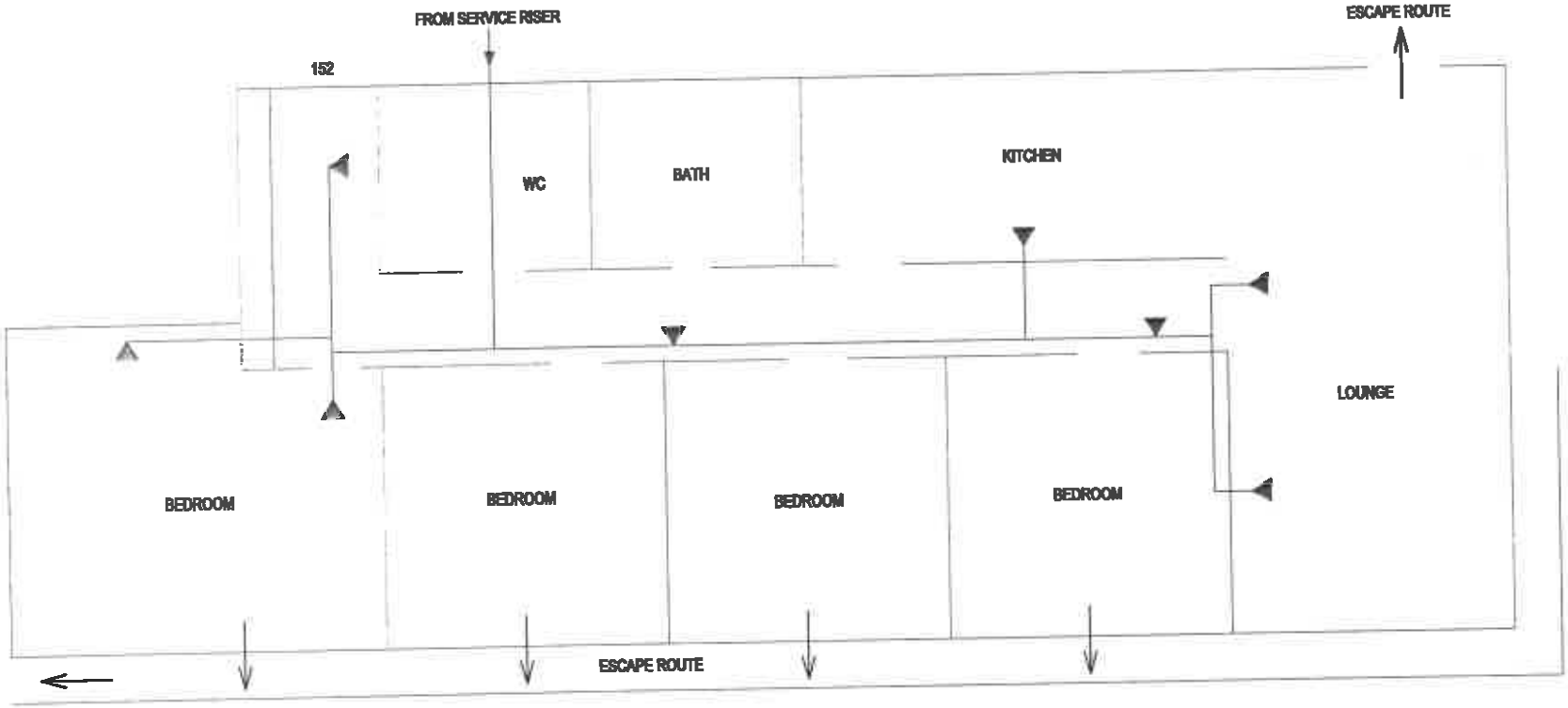
BARBICAN ESTATE
LAUDERDALE TOWER
TYPICAL FLOOR PLAN/PROPOSAL
SCALE (N.T.S.)

LEGEND

- TYPICAL SIDE WALL HEAD
- TYPICAL SPINKLER MAIN ENTRY
- TYPICAL SPINKLER RISER
- ESCAPE



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BARBICAN ESTATE
CROMWELL TOWER
TYPICAL FLAT LAYOUT/PROPOSAL
SCALE (N.T.S.)

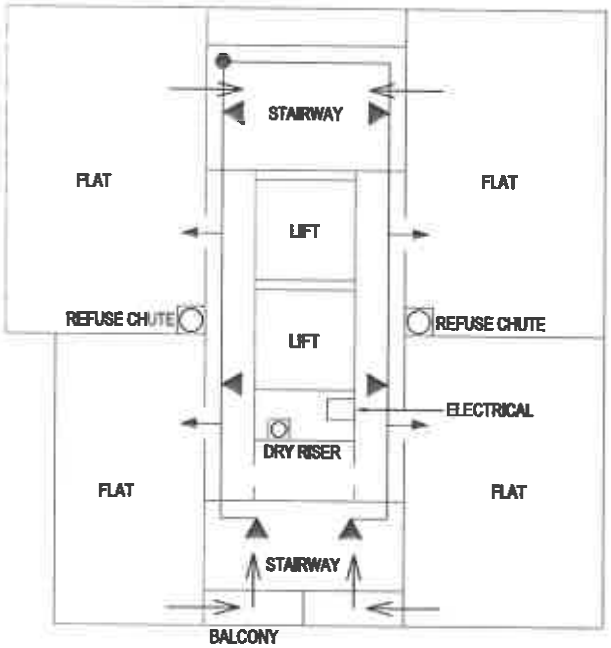
LEGEND

TYPICAL SIDE WALL HEAD

TYPICAL SPINKLER MAIN ENTRY

TYPICAL SPINKLER RISER

ESCAPE



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AVONDALE ESTATE
WEST TOWER
TYPICAL FLOOR PLAN/PROPOSAL
SCALE (N.T.S.)

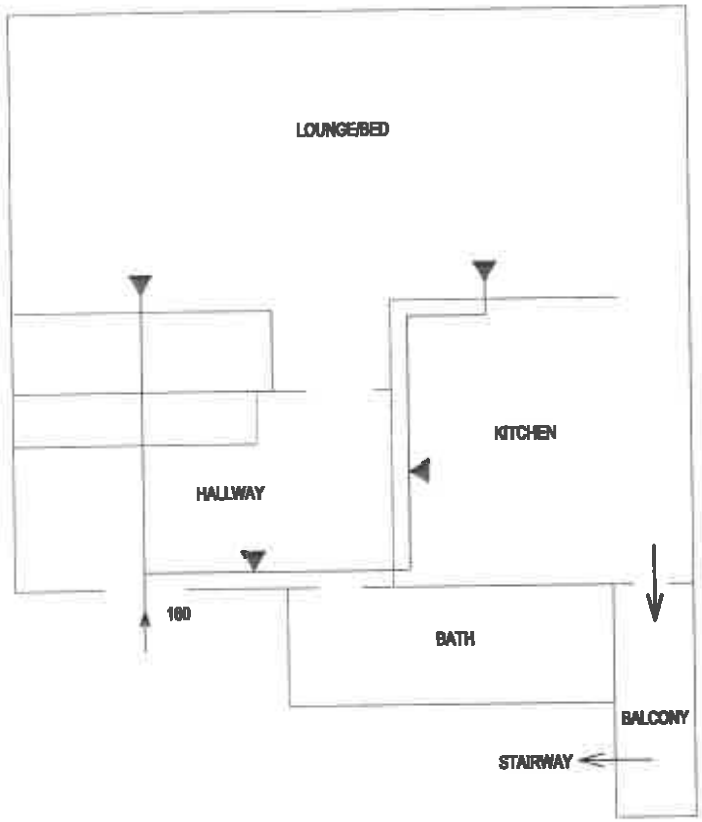
LEGEND

TYPICAL SIDE WALL HEAD

TYPICAL SPINKLER MAIN ENTRY

TYPICAL SPINKLER RISER

ESCAPE



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AVONDALE ESTATE
WEST TOWER
TYPICAL FLAT LAYOUT/PROPOSAL
SCALE (N.T.S.)

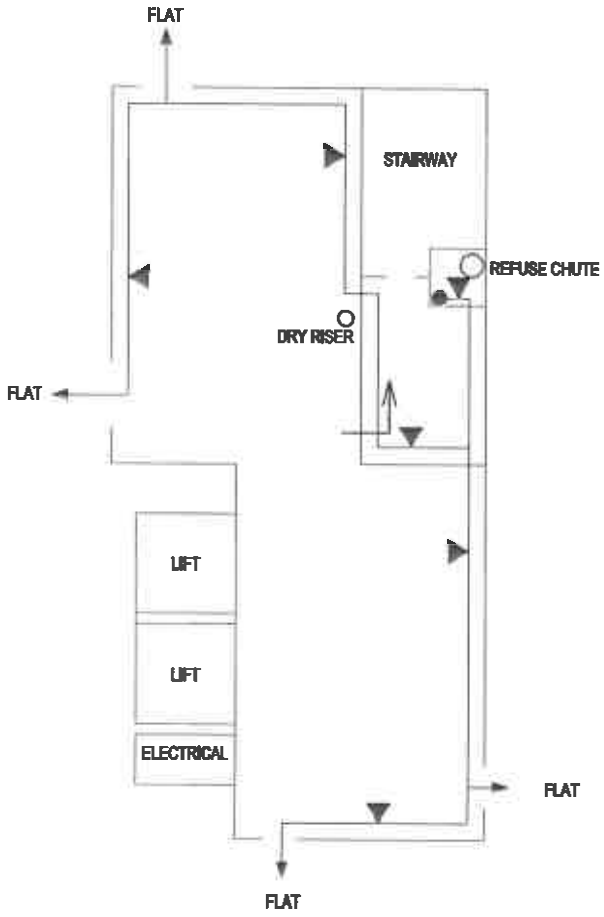
LEGEND

TYPICAL SIDE WALL HEAD

TYPICAL SPINKLER MAIN ENTRY

TYPICAL SPINKLER RISER

ESCAPE



THIS SKETCH DOES NOT REPRESENT A
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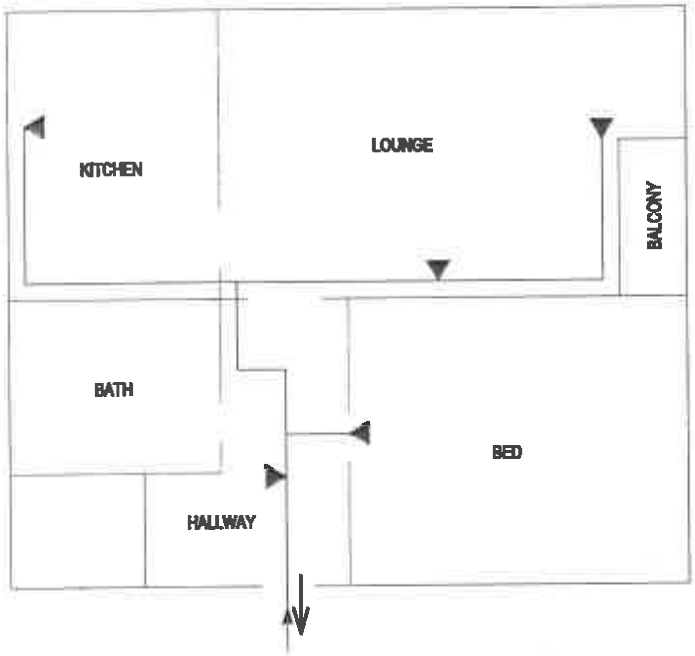
ITS FOR INFORMATION ONLY

MIDDLESEX ESTATE
PETTICOAT TOWER
TYPICAL FLOOR PLAN/PROPOSAL
SCALE (N.T.S.)

LEGEND

- TYPICAL SIDE WALL HEAD
- TYPICAL SPRINKLER MAIN ENTRY
- TYPICAL SPRINKLER RISER
- ESCAPE



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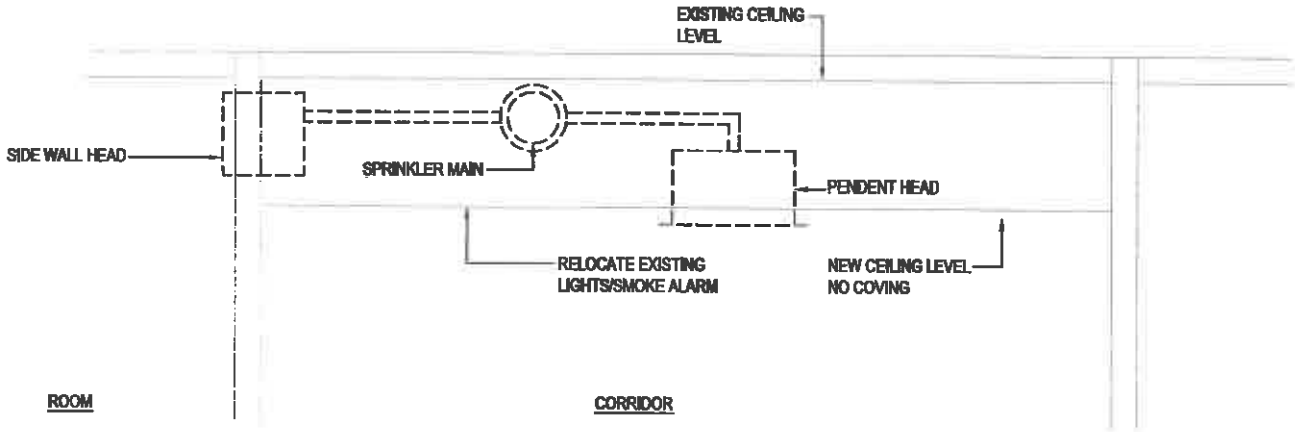
MIDDLESEX ESTATE
PETTICOAT TOWER
TYPICAL FLAT LAYOUT/PROPOSAL
SCALE (N.T.S.)



TYPICAL HIGH LEVEL SECTION
OF DWELLING CORRIDOR PROPOSAL

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ITS FOR INFORMATION ONLY

Sprinkler Systems in Residential Flats

The Corporate Fire Safety Advisor has provided the following advice to Housing:

- **All relevant health and safety legislation and Building Regulations are to be complied with.** Current regulations in England mean that only buildings constructed since 2007 and which are taller than 30 metres are required to have sprinklers fitted. This requirement was not retrospective and therefore, under the law, existing high rises in England only need to have sprinkler systems fitted if a fundamental change is made to the structure or use of the building.

- **The retrofitting of sprinkler systems in blocks of flats should be undertaken when an assessment of the structural capacity to house such a system and a fire risk assessment that considers both the fire evacuation strategy and other fire precautions supports such action.** Post Grenfell Housing have commissioned fire engineering consultants to reassess the fire risks and existing fire protection measures at all blocks of flats and sheltered accommodation with communal areas. The assessments have also challenged the fire evacuation strategy at each site. It should be noted that lessee rights, heritage/planning considerations may similarly influence any retro fitting of sprinkler systems.

- **Evidence shows that while sprinklers are primarily intended to contain or control fires, they can also be instrumental in saving the lives of people in the room of origin of a fire. However, sprinkler systems have capacity limitations and once multiple sprinkler heads have activated a water storage tank would quickly empty making the system ineffective.** Some experts are of the view that if a retro sprinkler system had been fitted at Grenfell it would have had little effect because multiple sprinkler heads would have activated emptying tanks quickly and fact that the fire's initial route between floors and adjacent flats was via cladding on the outside of the building.

- **Good fire compartmentation together with clear communication to all relevant stakeholders on the evacuation strategy should be among the top priorities for Housing in flats and sheltered accommodation. Where, so far as reasonably practicable, Housing should also strive to exceed national standards and ensure that each flat has 60 minutes compartmentation.** Housing have arranged fire standard testing a range of flat front doors to see what levels of protection they afford flat occupants.

- **Housing should keep abreast of all recommendations that emerge from the post Grenfell enquires and be prepared to evaluate the implications and where necessary act.**

- **Standalone sprinkler systems should be fitted in individual flats where it is identified as a key Personal Emergency Evacuation Plan (PEEP) control measure.**