OPTIMAL ECONOMICS

What is the Cost of Fires in Schools?

Final Report

February 2026

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Foreword

Since its inception in 1998 the National Fire Sprinkler Network (NFSN) has been working alongside colleagues within the fire sector to emphasise and promote the benefits of fire sprinklers. In 2017 the NFSN researched the reliability and effectiveness of fire sprinklers in the built environment concluding that the systems were both highly reliable and effective across all building types.

In recent years the NFSN have observed a decline in the number of newly built school premises being constructed with fire sprinklers as developers move away from the expectation of the primary guidance (BB100) and side step the provision of sprinklers on the grounds of perceived cost effectiveness.

This latest research explores the true cost of school fires using data from fire reports from across the England, exploring the physical impacts of fire on the building and the associated re-build costs. Going further, the report considers the wider costs such as the impacts of disruption to education, welfare and the community impact of devasting fires on schools using case studies.

The research has found that there are six school fires per week where at least one classroom is affected and one fire per week where multiple classrooms are affected. This is devasting for the pupils, staff and parents.

Government recognises the impact of disruptions to children's education and estimates the cost of the loss of future earnings to be £750 per day. When this loss is factored alongside the costs of school reconstruction, missing one day of secondary school education makes the installation of sprinklers cost effective. Missing three days of primary school education has a similar outcome.

Given that the loss of a school to fire creates more disruption and absence than one to three days, the case for sprinklers in new schools would seem self-evident.

I wish to thank everyone who contributed to the production of this document including particularly, the British Automatic Fire Suppression Association (BAFSA), the National Fire Chiefs Council (NFCC), the European Fire Sprinkler Network (EFSN), the Business Sprinkler Alliance (BSA) and the International Fire Suppression Alliance (IFSA).

I would also like to personally thank Head Teacher Lorna Blanchenot of Ravensdale Infants School in Derby, and Group Manager Adam Bleakman of Derbyshire Fire and Rescue Service for their time and effort in explaining the true impact of fire in a school.

It gives me great pleasure to commend this research document to you, my hope being that it will play an important part in shaping future amendments to building regulations involving school premises.

Terry McDermott QFSM MA

Secretary of the National Fire Sprinkler Network.

Executive Summary

Overview

1. Schools are an example of critical local infrastructure that serve our communities, providing a locally based educational hub where our children receive education and guidance to help shape future generations which in turn, support and contribute to the success of our nation as a whole. Our schools foster a sense of belonging, pride and security. Schools are also a focal point for community life offering services beyond those normally associated with education. They provide venues for local community groups which can cater for a diverse range of needs and for individuals and groups at the heart of our communities.

2. The loss of a school is devastating. There are financial, educational and more general local community impacts which create family upheaval, job insecurity and adverse effects on the well-being of children, staff and parents through the often-necessary displacement following a fire and the disruption to family and school life.

3. After considering the impact of the pandemic, the Government recognise the impact of disruptions to children's education and have concluded that the loss of one day of education equates to a figure of £750 in lost earning potential in adult life. This is an important factor when considering the overall financial cost benefit of protecting school buildings, particularly when schools are such key infrastructure in supporting children's education for the future benefit our nation.

4. This report investigates the impacts of school fires from a monetary perspective and uses case studies to highlight some of the wider impacts of school losses.

5. The research found that if the non-monetised benefits (e.g. reductions in stress, disruption to education, environmental effects) of installing sprinkler systems into new secondary school buildings are £460 per pupil per year, the costs of installing sprinkler systems are equal to the benefits. This figure is less that the lost future earnings of one pupil missing one day of school.

School Fires are a Relatively Frequent Occurrence

6. Over 2010/11 to 2023/24 there were an average of 350 school fires per annum or six to seven per week. The average area of damage per fire is equivalent to one classroom, although certain factors increase the area of damage considerably. These include, the time of day when the fire starts with fires during the evening or at night incurring much more damage.

Sprinklers are Demonstrated to be Effective when Installed

7. Over 97% of school fires over the last 14 years have been in buildings where there was no safety system present. Where sprinklers were installed and they operated, they extinguished the fire in 71% of incidents and contained/controlled the fire in a further 27% of incidents which is an overall effectiveness rate of 98%.

The Cost of School Fires

8. School fires result in both quantifiable and more qualitative costs. The costs will vary with the severity of the fire and specific circumstances of each individual school fire. Quantifiable and monetised costs include:

   - Direct costs which include the costs relating to casualties, property damage, the response of fire and rescue services and environmental effects.
   - Consequential costs associated with the continued provision of education and includes the costs of temporary accommodation and pupil transport to alternative schools.

9. In addition, there are wider effects of school fires which are less tangible and more difficult to quantify and monetise. These include stress to pupils and staff, disruption to education, the loss of exam work or materials and the well-being of vulnerable children.

10. It is estimated that the direct and consequential costs of school fires over the last 14 years is over £126 million per annum or £282,200 per school fire. This is a conservative estimate which excludes the qualitative costs of school fires. The Covid pandemic highlighted the importance of school attendance for the mental health and wellbeing of children, particularly vulnerable children. Evidence also points to the effect of low levels of absence on educational attainment and future earnings with just one day of missed school resulting in a loss of £750 in career earnings. A case study of Ravensdale School illustrates the challenges faced by pupils, staff and parents and the substantial effects of a devasting fire.

1 Introduction

1.1 Introduction

1.1.1 Optimal Economics was appointed by the National Fire Sprinkler Network to undertake an independent analysis of fire in schools in England. The number of fires in schools has declined over the last decade, but when a large fire occurs, the effects can be devastating.

1.1.2 This report examines the trends and characteristics of fires in schools in England and then seeks to establish the costs of these fires where effects can be given a monetary value. However, there can be many wider effects of school fires which are more difficult to quantify but which can have significant impacts on staff and pupils. These effects are considered through evidence on the importance of school attendance and through a case study of an infant school which was destroyed by fire in 2020.

1.1.3 Installation of automatic fire suppression systems (AFSS) can reduce the impacts of school fires and the case for sprinklers in schools is considered through cost benefit analysis.

2 School Fires in England

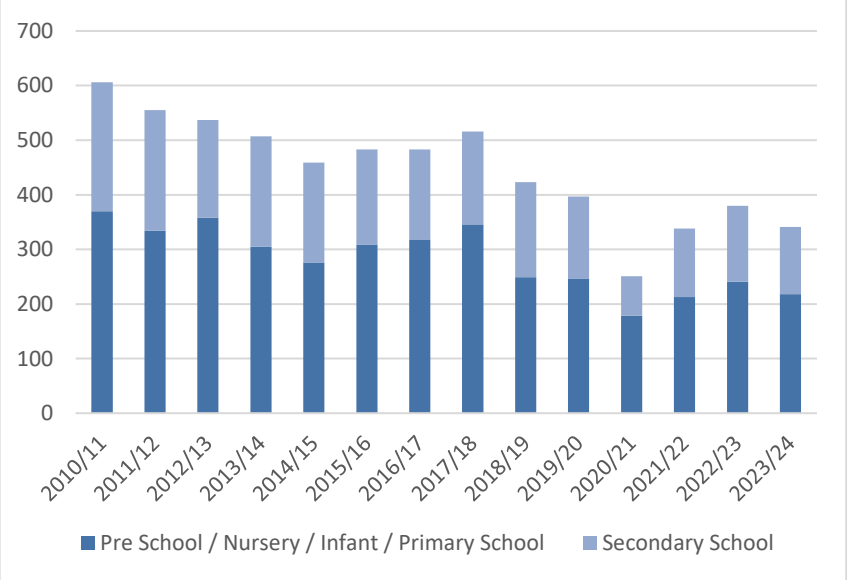
2.1 Introduction

2.1.1 This analysis considers the characteristics of school fires in England using published Ministry of Housing, Communities and Local Government (MHCLG) data. It covers the period 2010/11 to 2023/24 and includes pre-school, nursery, infant, primary and secondary school fires. For ease of presentation, reference to primary schools will include pre-school, nursery and infant school fires.

2.2 Trends in School Fires

2.2.1 There have been 6,276 fires in schools over the 14 year period between 2010/11 and 2023/24 which is an average of 448 fires per year. Details are shown in Figure 2.1.

Figure 2.1: Number of Fires in Schools, 2010/11 to 2023/24



2.2.2 Over time, there has been a reduction in the number of fires in schools from just over 600 in 2010/11 to almost 350 in 2023/24. The impact of Covid is shown in 2020/21 (when the number of fires in schools was as low as 251), but there has been a slight increase in school fires over the last few years. The majority of school fires occur in primary schools, but this is expected given that there are many more primary schools than secondary schools. This analysis is based on the total number of schools of 24,453[1].

[1] Schools, pupils and their characteristics, Academic year 2023/24 - Explore education statistics - GOV.UK

2.2.3 Across the period there were an average of 283 primary school fires and 165 secondary school fires per annum. Taking account of the stock of schools, the probability of a fire in a primary school in a year is 1.4% and 4% for secondary schools. Across the school estate as a whole, the probability of a fire in a year is 1.8%.

2.3 Characteristics of School Fires

Area of Damage

2.3.1 The distribution of fires by area of fire and total damage is shown in Table 2.1. The majority of fires are less than 20 square metres (sqm) of fire and total damage in both primary and secondary schools. The average size of a classroom is approximately 50 sqm, but a room with a fire resulting in up to 20 sqm of damage is unlikely to be available for use immediately after the fire. Where damage (either fire or total) is in excess of 50 sqm, it is expected that more than one classroom is affected by the fire.

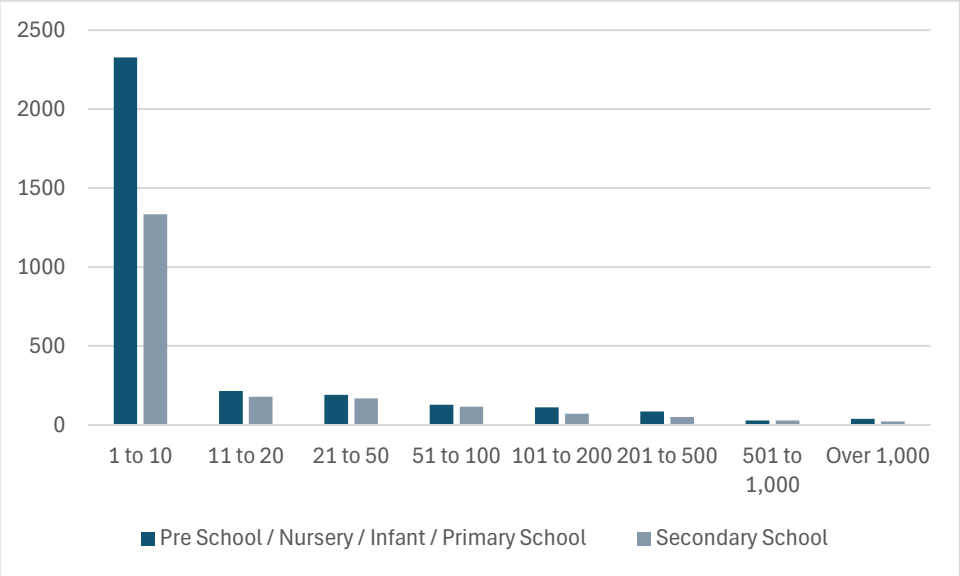
Table 2.1: Distribution of Fires by Area of Fire and Total Damage (%)

Fire Damage (sqm)	Primary	Secondary	All
< 20	93.4	92.3	92.0
21-50	2.5	2.3	2.4
50-200	2.7	3.5	3.0
> 200	1.4	1.9	1.6
Total	**100.0**	**100.0**	**100.0**
Total Damage (sqm)			
< 20	85.3	80.3	83.4
21-50	4.8	7.3	5.7
50-200	6.1	8.1	6.8
> 200	3.8	4.4	4.0
Total	**100.0**	**100.0**	**100.0**

2.3.2 Over the 14 years of the analysis, there have been 2,733 primary and 1,681 secondary school fires where the area of damage is equivalent to at least one classroom[2], that is, up to 50 sqm of total damage. This is equivalent to 6 fires per week where an area affecting at least the size of one classroom is damaged. In addition, there is almost one fire per week which has damage affecting multiple classrooms. Figure 2.2 shows the number of fires between 2010/11 and 2023/24 by school type and area of total damage.

[2] Excludes fires where the area of total damage was zero sqm.

Figure 2.2: Number of Fires by School Type and Total Area of Damage where the Area is at least 1 sqm



2.3.3 Across all school fires, the average area of fire damage is approximately 19 sqm or 38% of an average classroom. Allowing for other damage, the total area of damage across all school fires is approximately 40 sqm or 80% of an average classroom. In practice, this means that the average fire affects one classroom. For all schools the area of total damage is approximately twice the area of fire damage. Table 2.2 shows the average area of fire damage and total damage for primary, secondary and all schools by time of the fire.

Table 2.2: Average Area of Damage, Fire and Total (sqm)

Fire Damage	Primary	Secondary	All
Morning	7.1	11.5	8.5
Afternoon	15.4	13.7	14.7
Evening	41.0	41.4	41.2
Night	77.7	84.0	80.4
All	**17.6**	**21.1**	**18.9**
Total Damage			
Morning	17.5	29.5	21.4
Afternoon	33.5	34.0	33.7
Evening	89.4	86.1	88.0
Night	142.3	118.7	132.1
All	**37.9**	**44.8**	**40.4**
Ratio of Total to Fire Damage: All Fires	2.2	2.1	2.1

2.3.4 The time at which school fires occur is important in relation to the area of damage. The Table shows that across all school types the average area of both fire damage and total damage is substantially higher when the fire occurs in the evening or at night. Evening fires typically incur average areas of fire damage which are more than twice the area of fires during the afternoon with night fires incurring areas of fire damage which are approximately five to six times larger than afternoon fires. It should also be noted that the majority of primary (86%) and secondary (87%) school fires over the period of this analysis had an alarm present.

2.3.5 This is an important finding as Government has suggested that fire alarms offer sufficient fire protection for schools. However, it is understood that Fire and Rescue services are changing the way they respond to automatic fire alarms in school premises by reducing the response when it is out of school hours. If this situation was to continue, it could be expected that the extent of fire and total damage to schools would be more extensive with a greater impact on the ability to continue using the school after a fire.

2.3.6 Table 2.3 illustrates the out-of-hours response point by showing the average area of total damage for different 'alarm' scenarios. Where the alarm is present and raised the alarm, the average area of total damage is 22 sqm and 30 sqm for primary and secondary schools respectively. Where the alarm is absent, the average area of total damage is considerably higher at 91 sqm for primary schools and 123 sqm for secondary schools. The average area of damage is also high where the alarm is present but did not raise the alarm. In these circumstances (alarm absent and alarm not working), multiple classrooms would be affected by the fire.

Table 2.3: Average Area of Total Damage by Alarm Response (sqm)

Total Damage	Primary	Secondary	All
Alarm present and raised alarm	22.4	30.0	25.6
Alarm present but did not operate	16.1	21.1	17.5
Alarm present but did not raise alarm	90.3	75.8	85.5
Alarm absent	91.1	123.4	102.2
All	**37.9**	**44.8**	**40.4**

2.3.7 There were approximately 3,400 primary and 2,000 secondary school fires over the 14 years where an alarm was present with the operational reliability[3] of fire alarms at 61% and 72% for primary and secondary schools respectively.

[3] Number of fires where an alarm was present and raised the alarm as a percentage of all fires where an alarm was present.

Fire and Rescue Response

2.3.8 The area of damage also has a substantial effect on the number of vehicles attending the fire. Where the average area of fire damage is restricted to less than 50 sqm, the average number of vehicles attending the fire is 2.4 for primary schools and 3.9 for secondary schools. Fire damage greater than 50 sqm has a substantial impact on the number of vehicles attending with the number of vehicles increasing to just over 11 for both primary and secondary schools. Details are shown in Table 2.4.

Table 2.4: Number of Vehicles Attending by Size of Fire and School Type

Fire Damage	Primary	Secondary	All
<50 sqm	2.4	2.4	2.4
>50 sqm	11.3	11.4	11.3
All	**2.7**	**2.9**	**2.8**

Fatalities and Casualties

2.3.9 There have been no fatalities in fires on school premises over the 14-year period of the analysis, but there have been 148 fires where there was a casualty (89 in primary schools and 59 in secondary schools). Information requested from the Home Office[4] shows that there have been 236 non-fatal casualties (126 in primary schools and 110 in secondary schools). The average number of casualties is 17 per annum split relatively evenly between primary (9 casualties) and secondary (8 casualties) school fires.

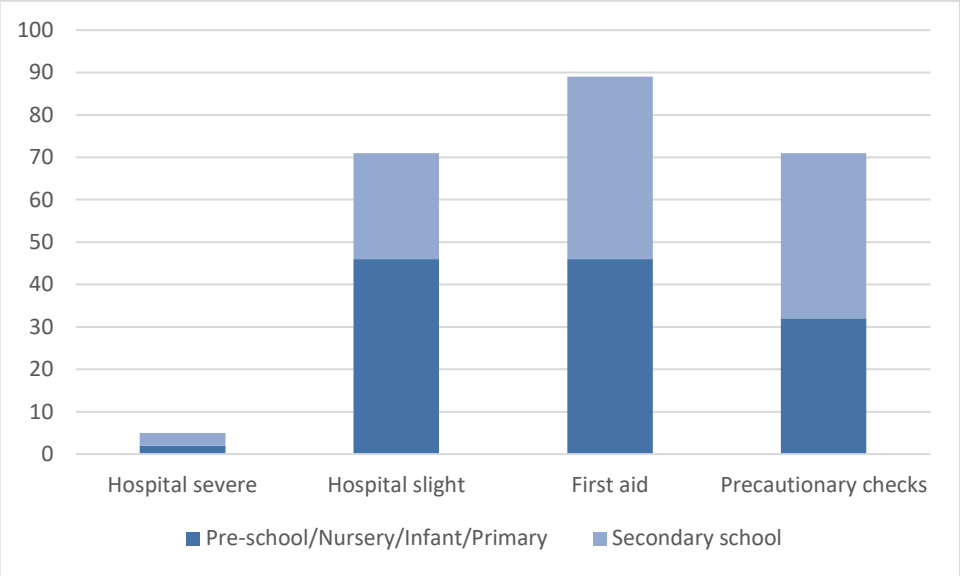
2.3.10 Fortunately, only five of the casualties (2%) were admitted to hospital with severe injuries which resulted in at least one overnight stay in hospital as an in-patient. The remaining 231 casualties were in the following categories:

- Hospital slight injury (attending hospital as an outpatient) – 71 or 5 per annum.
- First aid given at scene – 89 or 6.4 per annum.
- Precautionary check was recommended to see a doctor or attend hospital – 71 or 5 per annum.

2.3.11 The number of casualties by severity of injury and school type is shown in Figure. 2.3.

[4] Prior to April 2025, the Home Office was responsible for fire statistics

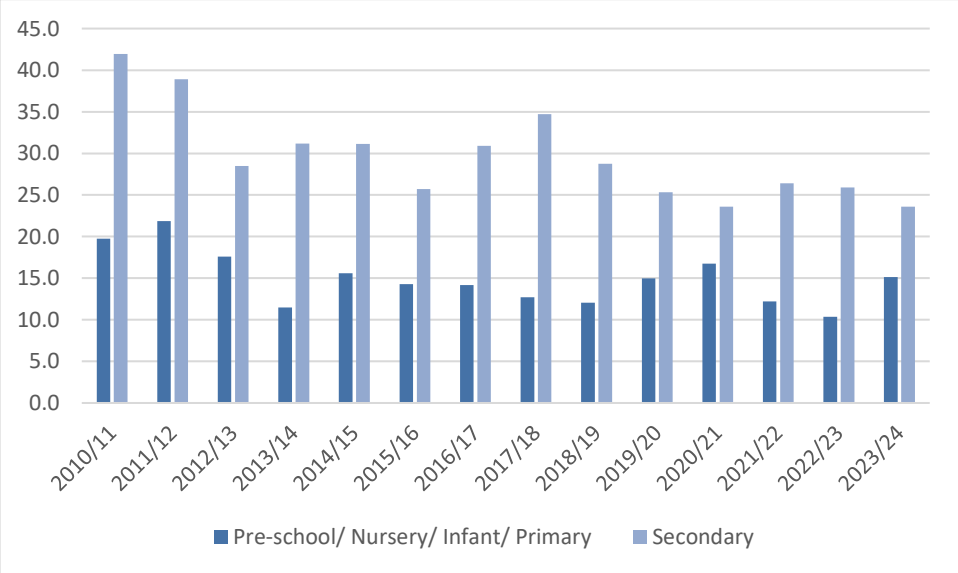
Figure 2.3: Non-Fatal Casualties by Severity of Injury by School Type, 2010/11 to 2023/24



Deliberate Fires

2.3.12 Across the 14-year period, 21% of fires were deliberate, although deliberate fires are a more frequent occurrence in secondary schools with 31% of secondary school fires being deliberate. For primary schools, deliberate fires accounted for 15% of fires since 2010/11. There has been a reduction in deliberate fires over time with deliberate fires in secondary schools being relatively stable at around 25% since 2019/20. Details are shown in Figure 2.4.

Figure 2.4: Percentage of Fires which are Deliberate in Primary and Secondary Schools, 2010/11 to 2023/24



2.4 Sprinkler System Data

2.4.1 Over 97% of the 6,276 school fires over the last 14 years have been in buildings where there was no safety system present (6,122). Of the remaining 154 fires, 119 had sprinkler systems and 35 had other systems. The majority of sprinkler systems were installed in secondary schools (71%).

2.4.2 Although sprinklers were installed in 119 schools which experienced a fire, they only operated in 57 cases. In 55 (96%) of these cases, the sprinklers either extinguished or contained/controlled the fire. Details are shown in Table 2.5.

2.4.3 For all secondary schools with fires where the sprinkler system operated, the sprinkler extinguished or contained/controlled the fire in every case. For the 13 fires in primary schools where the sprinkler system operated, the fire was extinguished or contained/controlled in 11 of the cases. For one of the fires, it was not contained or controlled and the outcome is not known for the other fire. Across this small sample of 56 fires[5], sprinklers extinguished the fire in 71% of the incidents and contained/controlled the fire in a further 27% of incidents. Hence the overall level of effectiveness was 98%.

Table 2.5: Impact of Sprinklers on Fires when Sprinkler System Operated by School Type

	Primary	Secondary	Total
Contained/controlled	5	10	15
Extinguished	6	34	40
Did not contain/control	1	-	1
Not Known	1	-	1
Total	**13**	**44**	**57**
Effectiveness Rate (%)[1]	91.7	100.0	98.2
Note: 1: Excludes the fire where the outcome is not known			

2.4.4 For the 62 fires where the system did not operate, the reason for the poor outcome is shown in Table 2.6. For 48% of incidents, the reason for the poor outcome was that the fire was in an area not covered by the system. The sprinkler system could not be expected to operate in these circumstances. A further 43% of fires described the reason for the system not operating as 'other', but no further details are available.

2.4.5 It is understood that some of the 'other' reasons for why the system does not operate as intended include:

- The fire was not big enough to set off the sprinklers.
- The temperature was not hot enough to activate the sprinklers.

[5] Excludes the fire where the outcome was not known.

2.4.6 In these situations, the sprinklers could not be expected to operate. Hence, it is expected that in the majority of cases, the reason for the poor outcome (i.e. the sprinklers not operating as intended) was that the system could not be expected to operate.

Table 2.6: Reason for the Sprinkler System not Operating by School Type

	Primary	Secondary	Total
Fire not in area covered by system	10	19	29
System damaged by fire	1	-	1
System not set up correctly	-	1	1
Other	9	17	26
Not applicable, not known, null	2	3	5
Total	**22**	**40**	**62**

2.4.7 A comparison of the average area of fire damage for the 6,122 incidents which had no safety system with the 57 incidents where the sprinkler system operated is shown in Table 2.7. The average area of fire damage in schools where there is no safety systems is approximately 3 times the area where the sprinkler system operated.

Table 2.7: Average Area of Fire Damage (sqm)

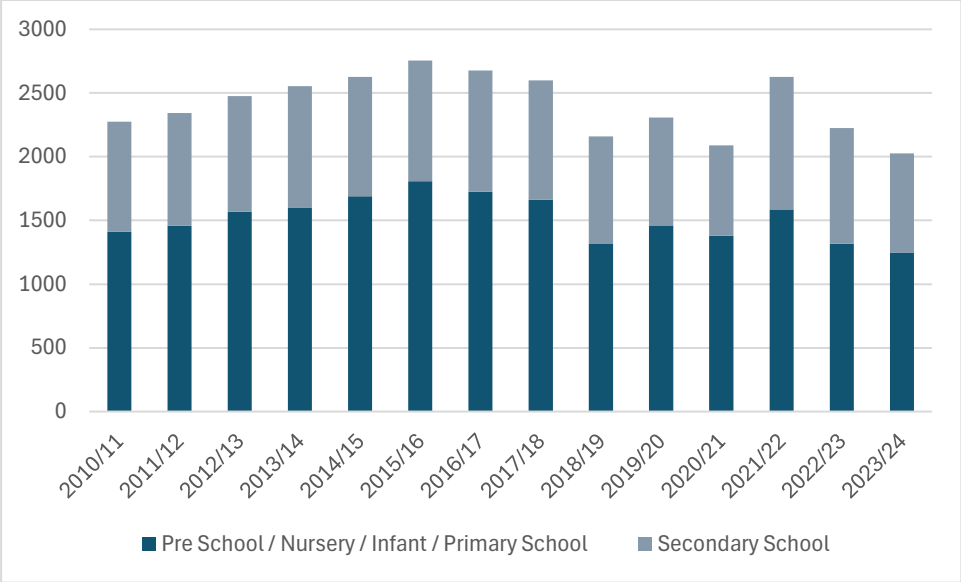
	Primary	Secondary	Total
Fires where sprinkler operated(1)	4.9	7.2	6.7
Fires without safety system	17.7	21.9	19.2
Ratio of fire damage area: - sprinkler operated: no safety	1: 3.6	1: 3.0	1: 2.9

Notes: (1): Excludes one fire from 2010/11 where the fire started in the roof and the sprinklers were located on a different floor. The system could not be expected to perform in this case.

2.5 False Alarms

2.5.1 In addition to call outs to school fires, the Fire and Rescue Services attended over 33,700 false alarms in schools over the 14-year period to 2023/24. This is an average of 2,400 false alarms per annum or 46 per week. Details are shown in Figure 2.5. This is a substantial cost as an average of 1.3 vehicles (with associated personnel) attended each incident.

Figure 2.5: Number of False Alarm Incidents in Schools, 2010/11 to 2023/24



2.6 Conclusions

2.6.1 The main conclusions to be drawn from the data are:

- The number of school fires per annum has reduced since 2010/11, but there are still almost 350 per annum or 6 to 7 fires per week.
- The probability of a fire in a primary school is 1.4% and 4% in a secondary school.
- The average area of fire damage in the average school fire is 19 sqm and 40 sqm of total damage.
- The time of day has a major effect on the area of damage with fires starting in the evening and during the night having substantially more damage.
- Fortunately, there have been no fatalities in school fires in England since 2010/11, but there are approximately 17 casualties per annum.
- Fires where there are no alarms present also have substantially more damage than fires where there is an alarm present and it raised the alarm.
- The average area of fire damage in a fire where sprinklers operate, is approximately one third of the area of fire damage in fires without a safety system.
- The effectiveness of sprinkler systems when they operate in controlling/containing or extinguishing fires is 98%.
- There are also an average of 2,400 false alarms in schools per annum, each requiring an average of 1.3 vehicles (and associated personnel) to attend.

3 The Costs of School Fires

3.1 Introduction

3.1.1 A school fire will result in a range of costs, some of which can be quantified and monetised while others are more qualitative in nature. For the purposes of this research, costs have been considered under two categories:

- Direct costs: these are costs associated with the fire and cover casualty/fatality costs, costs of property damage, the costs of the fire and rescue services responding to the fire and the environmental costs of the fire.
- Consequential costs of a school fire: these are the costs associated with the continued provision of education and will vary depending upon the severity of the fire and the particular circumstances of each individual school. The costs could include those associated with the provision of temporary accommodation, the transport of pupils to alternative schools, the provision of additional equipment etc.

3.1.2 In addition, there are wider effects of school fires which are less tangible and more difficult to quantify and monetise. These can include stress to pupils and staff, disruption to education, the loss of exam work or materials and the well-being of vulnerable children.

3.1.3 Quantification or monetisation of the direct and consequential costs of fire provide a metric for understanding the economic costs of fire and are considered in Section 3.2 and 3.3 respectively. The importance of school attendance is considered in Section 4 along with a case study of the less tangible effects of a school fire which totally destroyed an infant school.

3.2 Direct Costs of Fire

Casualty and Fatality Costs

3.2.1 Anyone caught in a fire could suffer from injuries which could affect their quality of life and general well-being. These physical and emotional harms represent a cost to the individual or their families, but there are also costs associated with healthcare provision and lost output as time off work may be required.

3.2.2 There are two different approaches to valuing the costs of injuries or fatalities. One approach adopts a quality adjusted life year (QALY) while the other adopts the value of preventing a fatality or casualty. A QALY is the value to an individual of being at full health for one year and is used in evaluation (particularly in health) although it has also been used in recent Home Office reports on the economic and social costs of crime and fire. The value of a prevented fatality or casualty is used to value small changes in risks where levels of human safety vary between options. This measure has been widely used for many years, particularly in transport and previous cost benefit studies assessing the introduction of sprinkler systems.

3.2.3 These different measures provide flexibility and the specific choice depends on the nature of the intervention being appraised. This research (in line with previous cost benefit studies) adopts the value of a prevented fatality/casualty as it is considered more appropriate for the current research.

3.2.4 The analysis in Section 2 showed that there have been no fatalities and 236 casualties in school fires in England between 2010/11 and 2023/24. The casualties were split relatively evenly between primary and secondary schools with most being hospitalised with slight injuries or receiving first aid at the scene.

3.2.5 Data available from the Department for Transport (2023 prices) for the value of preventing a fatality or casualty are:

- £2.643 million for preventing fatal casualty.
- £0.294 million for preventing a serious casualty.
- £0.023 million for preventing a slight casualty.

3.2.6 The severity of injury (Figure 2.3) shows that casualties can be taken to hospital for both serious and slight injuries or receive first aid at the scene. Over the last 14 years:

1. 2.1% of non-fatal casualties in all school fires were taken to hospital with serious injuries.
2. 30.1% of non-fatal casualties in school fires were taken to hospital with slight injuries.
3. 37.7% of non-fatal casualties in school fires received first aid at the scene.
4. 30.1% of non-fatal casualties in school fires were recommended to have a precautionary check.

3.2.7 The casualties in (1) above are classified as serious and the average value of preventing a serious casualty will be £0.294 million. Those in categories (2) and (3) are classified as slight and the average value of preventing a slight casualty is £0.023 million. Those recommended to receive a precautionary check have been excluded from the calculation of costs as the check is only recommended.

3.2.8 Table 3.1 shows the average number of casualties (by type) per annum and the estimated cost of casualties from school fires. On average, the cost of casualties in school fires is estimated to be £363,000 per annum or £810 per fire. The average cost in a primary school is just over £670 and £1,050 for a secondary school.

Table 3.1: Average Number of Casualties and Cost of Casualties by School Type, per annum			
Average Number of Casualties	**Primary**	**Secondary**	**All Schools**
Severe	0.1	0.2	0.4
Slight	3.3	1.8	5.1
First Aid	3.3	3.1	6.4
Total Casualties(1)	**6.7**	**5.1**	**11.8**
Cost of Casualties (£000)			
Severe	42.0	63.0	105.0
Slight	74.2	40.3	114.5
First Aid	74.2	69.4	143.6
Total Cost	**190.4**	**172.7**	**363.1**
Cost per fire (£)	**673**	**1,045**	**810**
Notes: (1): Excludes casualties recommended to have a precautionary check			

Property Damage

3.2.9 Fires can cause significant damage to property which can incur substantial costs in the reinstatement of the building and its contents. The cost of reinstating the damage is dependent on the scale and severity of the fire and will vary considerably across fires. Several sources of information on the damage cost of fires have been reviewed.

3.2.10 Data from insurance company Zurich[6] shows that the average cost of damage from school fires in 2023 was more than £128,000, but over the three year period to 2023, the insurer saw 115 blazes in schools which caused more than £27 million of total damage. This equates to an average cost per fire of £234,800 for the three year period to 2023.

3.2.11 The Zurich data do not distinguish between primary and secondary schools, but a recent Home Office[7] report provides a methodology which would allow damage costs to be estimated by school type. The Home Office report provides estimates of the property damage cost of fire using information on the area of property damaged (by fire and smoke and water) and the rebuild cost per sqm. The report notes that rebuild costs are relatively uncertain and will vary by property type, geographical area and the exact nature of damage.

[6] £128,000 average cost for school fires in 2023
[7] Home Office (2023) The Economic and Social Cost of Fire

3.2.12 Table 3.2 provides a summary of the property costs associated with fire damage, wider damage (including smoke and water) and total damage from the Home Office report for 'other' buildings. It should be noted that 'other' buildings is a broad category encompassing all 'non-dwelling' fires. The damage cost per primary[8] fire is £104,000 or £120,700 per primary fire with damage. These are 2020 prices which would be equivalent to £117,700 and £135,800 respectively in 2023 prices.

Table 3.2: Damage Costs[1] for 'Other Building' Fires, £

	Fire Damage	Wider Damage	Total Damage
Per Primary Fire	45,500	59,100	104,600
Per Fire with Damage	52,500	68,200	120,700

Source: Tables M15 and M17, The Economic and Social Cost of Fire

1: All costs are in 2020 prices

3.2.13 The estimates of fire damage in Table 3.2 use information on the area of fire, smoke and water damage and rebuild costs. Using the average areas of damage by school type in Table 2.2 and average rebuild costs[9] yields the estimates of fire, smoke and water damage for primary and secondary schools shown in Table 3.3.

3.2.14 In addition to the direct property damage cost, the Home Office report uses a multiplier to allow for damage to contents, disruption etc. For other buildings, the multiplier was 1.33. These wider costs are also shown in Table 3.3. In total, it is estimated that the average cost of damage from a fire was £224,600 for primary schools and £223,400 for secondary schools.

[8] Primary fires include all fires in buildings, vehicles and outdoor structures or any fire involving casualties, rescues or fires attended by five or more appliances

[9] National School Delivery Cost Benchmarking (June 2025). An average of new build and rebuild costs for primary and secondary schools for the period 2020-2025.

Table 3.3: Damage Costs by School Type		
Costs (£000s)	Primary	Secondary
Fire, smoke, water damage Wider damage	96.4 128.2	95.9 127.5
Cost per Fire (000s)	**224.6**	**223.4**
Total Damage Cost (£m)	**63.6**	**36.9**

3.2.15 Table 3.3 shows that there is a substantial cost associated with property damage resulting from a fire, but these costs will vary on a case by case basis. The costs derived from the IRS and rebuild data yield an average cost of property damage of £224,600 and £223,400 for primary and secondary school fires respectively. These are of a similar order of magnitude to the Zurich data for the three years to 2023 discussed in paragraph 3.2.11 above.

3.2.16 Using the average cost data from Table 3.3 and applying it to the average number of school fires per annum between 2010/11 and 2023/24 yields an estimate of the total damage costs of school fires of over £100 million per annum.

Response Costs

3.2.17 The cost of responding to a school fire depends on the number of firefighters attending, the number of vehicles attending, the length of time firefighters and vehicles are in attendance and the costs associated with other control and operational staff. The Home Office report estimates the direct labour, non-labour and control costs associated with responding to an incident. For 'other' buildings, this was £1,640 (2020 prices) which is equivalent to £1,846 in 2023 prices.

3.2.18 Across all fires, an average of 2.8 vehicles attended a school fire across the 14-year period. Assuming 2.8 vehicles per fire, this suggest an average cost of almost £660 (2023 prices) per vehicle to include labour, non-labour and control costs.

3.2.19 These costs have been benchmarked against the charges levied by a selection of fire and rescue services for call-outs e.g. a call-out to a fire alarm activation in an organisation which is a false alarm, requests to pump out a flooded cellar etc. The cost for the first hour of an appliance with personnel for these call-outs is in the range £440 to £680[10]. The 'other' building cost is considered appropriate for estimating the response cost of school fires.

3.2.20 Using the data in Table 2.4 for the number of vehicles attending[11] yields an estimated cost of responding to school fires in an average year of £832,600 and is shown in Table 3.4.

[10] Based on a sample of fire and rescue services including Cambridgeshire, Devon and Somerset, Hampshire, Northamptonshire and Surrey.
[11] By area of fire damage

Table 3.4: Response Costs by School Type, per annum			
	Primary	**Secondary**	**All**
Total Response Cost (£000s)	518.1	314.4	832.6
Cost per fire (£)	1,830	1,910	1,860

Environmental Costs

3.2.21 The potential environmental impacts arising from a fire are well documented and include:

- Air contamination from the fire plume.
- The contamination of groundwater and land from firefighting water run-off.
- The contamination of land from fire residues from burning materials.

3.2.22 In addition to the above effects, there can be other environmental effects arising from the reinstatement of buildings and the disposal of the fire damaged structure. For example, the cost of embodied energy in the reinstatement process.

3.2.23 Many factors will influence the environmental effects of a fire including the size of the fire, the contents of the building (affecting the type and amount of contaminants released) and whether there is a suppression system in place.

3.2.24 While there is research which identifies the qualitative environmental impacts of fires and technical studies which identify emissions and contaminants from specific sources, there are few studies which quantify all the potential environmental effects and convert them into monetary values for inclusion in economic analysis.

3.2.25 A study by BRE Global[12] sought to identify the costs and benefits associated with the installation of sprinkler systems in warehouses (of different sizes) based on a comprehensive life cycle analysis. That is, the costs and benefits associated with the installation of sprinklers were considered over their whole lifetime of 45 years.

3.2.26 The study found that for warehouses over 2,000 m^2 the whole life costs of an unsprinklered warehouse were 3.5 times that of a sprinklered warehouse. The study also found that there was an overall net benefit from installing sprinklers including a reduction in CO2 emissions from the fire, a reduced size of fire, reduced quantities of water used to fight the fire and resultant embodied CO_2 savings from contents replacement and warehouse rebuild.

3.2.27 While this demonstrates some of the potential environmental benefits of sprinkler installation, the characteristics of a school fire may be very different to a warehouse fire in terms of the building structure and contents which would burn during the fire.

[12] BRE Global (2013) An Environmental Impact and Cost Benefit Analysis for Fire Sprinklers in Warehouse Buildings

3.2.28 The subject of fire and the environment and building sustainability is potentially wide ranging and was the focus of a BRE study[13] for Communities and Local Government. The study sought to identify the potential impact of a building fire on the environment and the environmental impact of providing fire safety components and systems into buildings. The analysis also considered the scope for addressing these issues through the Building Regulations or another suitable vehicle.

3.2.29 The study concluded that "*it is far from clear that any form of fire protection that is applied to the building stock through the application of the Building Regulations can have anything other than a negative environmental impact and that this is possibly an inevitability of the necessity to protect many buildings in order to mitigate the effects of the very few fires*". This conclusion implies that the environmental costs of installing fire protection systems will usually always exceed the benefits due to the embedded environmental costs[14] associated with protecting many buildings not being offset by the environmental benefits from a relatively low number of fires.

3.2.30 However, some worldwide studies suggest that, for a few fire protection systems, this will not be the case and some systems may have a net benefit to the environment. For example, a more recent study[15] sought to develop a Fire Impact Tool for training firefighters to understand the environmental impacts which result from their actions when responding to vehicle and enclosure fires. The research examined the environmental effects of introducing sprinklers into all schools in Sweden. The research compares the environmental impact of having more frequent and severe fires in schools with the environmental impact of installing sprinkler systems in every school in Sweden. The comparison is undertaken using estimates of CO_2 equivalent for the two options.

3.2.31 The research found that if the sprinkler system can reduce the damage from fires by at least 50% and it has a lifetime of 20 years, introducing sprinkler systems into all schools in Sweden will result in savings in CO_2 equivalent emissions.

3.2.32 The only recent research which provides monetary values of the environmental cost of fires is the Home Office study[16] published in 2023 which estimates the total annual economic and social cost of fire in England. This research recognises the impact of fires on the environment and the risk emissions pose to natural resources and human health. These effects are monetised through carbon and particulate matter emissions.

[13] BRE (2010) The Impact of Fire on the Environment and Building Sustainability
[14] The cost of embedded energy and other environmental impacts from the manufacture and use of components for fire protection systems.
[15] Research Institute of Sweden (2019) Measuring the Impact of Fire on the Environment
[16] Home Office (2023) The Economic and Social Cost of Fire

3.2.33 This analysis uses the National Atmospheric Emissions Inventory (NAEI) database of carbon emission which includes total carbon emissions from wildfires and other accidental fires, the latter split into residential and other building fires. The cost of these emissions is estimated using the Department for Business, Energy and Industrial Strategy (BEIS) unit cost of carbon. This unit cost represents the value that society places on one tonne of carbon and is based on an 'abatement cost'.

3.2.34 The research also notes the air pollution impacts of fire on air quality and individual health Impacts. The effects have been monetized using the NAEI estimates of particulate matter and the DEFRA damage cost estimates for PM2.5. The damage cost looks to measure the impacts of PM2.5 on human health and other costs. As with the cost of carbon emissions, the PM2.5 emissions relate to other building fires.

3.2.35 Taking the carbon and air quality assessments together, the research finds that the environmental cost per primary fire in 'other buildings' is £490 (in 2020 prices). Changing the price base to 2023 and allowing for annual increases in the unit cost of carbon, the environmental cost of a primary fire in 'other' buildings is estimated to be £604.

3.2.36 Applying this estimate to the average number of school fires yields an estimate of the environmental cost of school fires of almost £271,000 per annum. Details are shown in Table 3.5.

Table 3.5: Environmental Costs by School Type, per annum

	Primary	Secondary	All
Environmental Cost (£000s)	171.0	99.7	270.7
Environmental Cost per Fire (£)	604	604	604

3.2.37 The figures in the Home Office report are intended for use in economic appraisal and policy evaluation, but the costs relate to all other buildings with fires in educational premises only accounting for a small percentage (less than 5%) of all other building fires. Nevertheless, it is the only estimate available of the potential environmental cost of other building fires.

3.3 Consequential Costs

3.3.1 A fire in a school which renders part of the building unusable will result in other costs to the education authority. These costs can include the provision of temporary accommodation and/or transport costs associated with moving pupils to alternative accommodation. As with property damage and response costs, these will vary depending on the severity of the fire and the specifics of each school.

3.3.2 These types of costs are most likely to arise in larger fires where more than one classroom is affected by the fire. To gauge the extent to which school fires cause so much damage that these consequential costs arise, a review of school fires over the last four years which had total damage in excess of 50 sqm was undertaken. The analysis included an internet search to identify the school where the fire occurred and a review of any press or other articles on the fire.

3.3.3 Between 2020/21 and 2023/24, there were 118 school fires where the total area of damage was greater than 50 sqm and 33 fires were identified from the review. Information on the consequential disruption caused by the fire was available for 15 fires. A summary of the disruption caused is provided below:

- Schools where the total area of damage was over 1,000 sqm:
  - St Mary's Voluntary Academy, Derby: The primary school was totally destroyed by fire and the 350 pupils were taught across three sites in the city for just over three years while their school was rebuilt. The rebuild cost was £8 million.
  - Harrington Junior School, Derbyshire: The junior school was totally destroyed and the 235 pupils were taught in the local family centre for approximately eight weeks. A temporary building was established in time for the new academic year at a cost of £500,000. This temporary building was used for two years until the new £5.5 million school was built.
  - SS Simon and Jude CE Primary School, Bolton: All school classrooms other than the modular buildings (which housed the Year 5 and 6 pupils) were destroyed by the fire. Approximately 400 pupils were taught for four months at three different sites in the city. After four months, twelve temporary classrooms and related buildings were put in place for all 550 pupils and these will be used until the school is rebuilt which will take approximately three years.
  - Rodmersham Primary School, Kent: Extensive damage resulted in pupils receiving online learning for 10 days followed by seven months in temporary accommodation.
  - Kiddi Caru Day Nursery and Pre-School: The nursery building was destroyed and children were accommodated in cabins on the original site until the building is rebuilt. Prior to the cabins being installed, the children were found temporary places at three other sites including the local community centre. The cabins are expected to be used for 12 to 18 months.
- Schools where the total area of damage was 501 to 1,000 sqm:
  - Ravensdale Infant School, Derbyshire: The fire destroyed the school and after a few weeks of remote learning, the children were split across four other local schools and then in temporary buildings on their school site for more than 18 months while the school was rebuilt. The rebuild costs were £6.9 million.

- Blatchington Mill School, Hove: The design and food rooms were badly damaged while the canteen, sports hall and library all suffered damage. The 1,600 students combined online learning with two days per week in school for around five weeks.
- Fair Ways School for Complex Needs, Swanwick: fire severely damaged a school for children with social, emotional and mental health difficulties. The 20 pupils were educated at an alternative site for a few weeks, before modular classrooms where put in place for the start of the new term.

- Schools where the total area of damage was 201 to 500 sqm:
  - Yattons Infant School, North Somerset: Half of the school (6 classrooms) was destroyed by the fire with 100 of the 300 pupils having to travel to attend two other schools for approximately 2 months until the end of the summer term. Temporary classrooms were put in place for the start of the new school year and will be in use until the new school is rebuilt in about a year.
  - London Oratory School, Fulham: The atrium and library were at the centre of the fire which resulted in home learning for pupils for much of the first half term. The school has 1,400 pupils.
- Schools where the total area of damage was 101 to 200 sqm:
  - Holywell Church of England Primary School, Barnstaple: The fire caused substantial damage and the 83 pupils were taught in spare classrooms at different local schools.
  - Asmall Primary, Ormskirk: A fire destroyed three classrooms which accommodated nursery and key stage 1 areas. A week after the fire, the pupils were able to return to education in a temporary home on the Edge Hill University campus where a building was made available and re-purposed for the primary school children who were able to stay in their class groups and have a classroom of their own.
- Schools where the total area of damage is 51 to 100 sqm:
  - Dean Trust School, Manchester: A fire in one classroom caused substantial smoke damage to the classroom and surrounding areas which resulted in all pupils receiving online education for several weeks.
  - Preston Manor High School, London: Most of the lobby and reception area were damaged by a fire which closed the school for two days. The pupils received remote learning while the school was closed.
  - Sacred Heart Primary, Ware: Although the fire was contained, there was considerable smoke damage and the whole school was left without power. Pupils were transported to another school in Bishop's Stortford for in person learning.

3.3.4 While there is no financial information available on the costs of dealing with the consequential impacts of a fire the summaries above show that there is considerable inconvenience and disruption to the children's education.

3.3.5 Due to limited financial information being publicly available on the costs of dealing with disruption to education from school fires, a review of other building failures has been undertaken in recent years which have also had disruptive effect on education. The following information was gleaned from other incidents:

- Woodmill High School Fire, Fife: A major fire engulfed the school destroying the additional support needs unit, several classrooms and the canteen. All 1,400 pupils had to be taught at six or seven other sites in Fife for four to five months. Older year groups were first to return to the school with younger pupils spending a further two to three months attending alternative premises and the pupils with additional support needs being taught elsewhere for a full school year. The cost of providing alternative accommodation and transport for 1,400 pupils, demolition of sections of the building and security costs were estimated to be £830,000[17] for the period September to Christmas. This is equivalent to approximately £40 per pupil per week.
- Sacred Heart Catholic Primary School, Barrow-in-Furness[18]: A routine inspection found that the building was rotten and at risk of collapse. This led to 200 young children meeting at the school every morning to be bussed two miles to St Bernard's Catholic high school where the primary school is temporality based. Getting the children on and off buses takes time and the headteacher has estimated that each pupil is losing around ten hours of teaching time per week. This situation has been ongoing for two years with the cost of coaches for pupil transport amounting to almost £4,900 per week. This is equivalent to approximately £25 per pupil per week.
- In response to the presence of reinforced autoclaved aerated concrete (RAAC), the Department for Education (DfE) awarded contracts to three companies worth a total of £35 million to provide temporary classrooms. It is not clear how many classrooms will be provided by these contracts, but it was suggested that 250 temporary classrooms[19] had been ordered. This would suggest a cost of approximately £140,000 per temporary classroom. It is understood that RAAC projects were estimated to around 18 months to 24 months duration which would suggest a cost of between £70,000 and £93,000 per unit per annum.

3.3.6 These examples serve to illustrate the potential disruption arising as a result of school fires. The main costs associated with this disruption include the provision of temporary buildings and transport to alternative premises. There could also be other costs related to additional staffing, adapting temporary buildings to suit needs, security costs, replacement materials, demolition and refurbishment.

[17] PressReader.com - Digital Newspaper & Magazine Subscriptions
[18] 'Our school has been homeless for two years': a rotting Cumbria school counts the cost | Schools | The Guardian
[19] Children prefer learning in temporary classrooms, Education Secretary claims | The Independent

Temporary Accommodation

3.3.7 On average over 2010/2011 to 2023/24, there were 49 school fires per annum where the total area of damage was greater than 50 sqm. This is almost one fire per week where there could be a need for temporary accommodation. The need for temporary classrooms will vary depending on the specifics of the school estate, but the potential costs of temporary accommodation can be estimated by applying some assumptions relating to the number of units required and the proportion of school fires that may require temporary accommodation. It is assumed that the need for temporary accommodation increases with the average of area damage.

3.3.8 In addition to the unit cost of the temporary building there are costs associated with the installation and removal of the units. Installation would include the need for foundations, plumbing and drains etc. while removal of the building will include the costs of disconnection of services and returning the site to its original state. There are also costs associated with other services, planning permissions and professional fees. Hence, the total cost could be in excess of £170,000 per unit.

3.3.9 The total cost of temporary accommodation for school fires is estimated to be £19.9 million per annum. Details are shown in Table 3.6 which also shows the average cost per fire per annum and the average cost per fire where the area of damage is in excess of 50 sqm.

3.3.10 For the schools where the area of total damage is in excess of 50 sqm, this equates to an average cost of £427,500 per primary school fire and £382,500 per secondary school fire.

Table 3.6: Costs of Temporary Accommodation by School Type

	Primary	Secondary	All
Total Cost (£million, p.a.)	12.0	7.9	19.9
Cost per Fire (£000)	42.3	47.8	44.3
Cost per Fire (where damage >50 sqm) (£000)	427.5	382.5	408.4

Transport to Alternative School Premises

3.3.11 The analysis of paragraph 3.3.3 shows that pupils often have to travel to an alternative site for in-person learning with the need for pupil transport also depending on the specifics of each fire. Alternative transport can often be required for a short time while temporary accommodation is arranged on site. The potential cost of school transport can be estimated by assuming a proportion of pupils in the 49 school fires per annum which incur more than 50 sqm of damage will require transport to alternative premises.

3.3.12 If it is assumed that alternative transport is required for a period of eight weeks and it costs £25 per pupil per week, the total cost of transport would be £4.7 million per annum. This equates to an average cost per primary school fire of £100,000 and £90.500 per secondary school fire (for fires where the area of damage is greater than 50 sqm). Details are shown in Table 3.7.

Table 3.7: Costs of Transport by School Type

	Primary	Secondary	All
Total Cost (£million, p.a.)	2.8	1.9	4.7
Cost per Fire (£000)	9.9	11.5	10.5
Cost per Fire (where damage >50 sqm) (£000)	100.0	90.5	96.0

Other Social and Community Costs

3.3.13 Schools are not just used during daytime for education, they are often used in the evening by local community groups and sports facilities are often available for community use outside school hours. A fire in a school which renders some or all of the building as not usable can have consequential adverse impacts on community groups and other users of the school. It has not been possible to monetise these costs.

3.4 Summary of Costs

3.4.1 Table 3.8 provides a summary of the direct and consequential costs of school fires. Using the average number of school fires per annum between 2010/11 and 2023/24, it is estimated that the total cost of school fires is over £126 million per annum. The majority of costs are direct costs (£102 million), with a further £24 million in consequential costs.

Table 3.8: Total Cost of School Fires per annum (£ million)			
	Primary	**Secondary**	**All Schools**
Direct Costs			
- Casualties	0.190	0.173	0.363
- Damage	63.554	36.857	100.411
- Response	0.518	0.314	0.833
- Environmental	0.171	0.100	0.271
Total	**64.434**	**37.444**	**101.878**
Consequential Costs			
- Temp Accomm.	11.970	7.895	19.865
- Transport	2.801	1.901	4.702
Total	**14.771**	**9.796**	**24.567**
Total All Costs	**79.205**	**47.240**	**126.445**
Average Cost per Fire (£)	279,900	286,300	282,200

3.4.2 For the direct and consequential costs which can be monetised, the average cost of a primary school fire is estimated at almost £280,000 and £286,000 for a secondary school fire. These estimates have been compared to actual claims data from the Risk Protection Arrangement (RPA). The RPA is an alternative to commercial insurance for schools and under the RPA, the UK government covers the losses instead of commercial insurance. All academies and local authority-maintained schools can join the RPA and there are currently almost 12,700[20] members.

3.4.3 Table 3.9 provides a summary of the number of RPA members who experienced a fire-related event and the average cost of the fire event. Both the number of fire events and the average cost fluctuates considerably per year. The average cost per school fire of £282,200 (Table 3.8) is slightly higher than the average cost of a fire event in 2023/24 using the RPA, but substantially less than the average costs in the RPA data in other years. For example, average cost of a fire event was highest in 2022/23 at almost £610,300 per event. Unfortunately, there is no data available from the RPA on the composition of the average costs, but as the data represents incurred losses, it would be reasonable to assume that the estimates in Table 3.8 are 'conservative' estimates.

[20] Government Actuary's Department (2025) Department for Education Risk Protection Arrangement: Summary of Estimated Claims as at 31st December 2024

Table 3.9: Average Cost of School Fires for RPA Members			
	No. Members Experiencing a Fire Related Event[1]	**Average Cost of Fire Event[1] (£)**	**Total Cost[2] (£)**
2014/15	12	14,280	171,400
2015/16	15	268,081	4,021,200
2016/17	36	80,624	2,902,600
2017/18	36	83,367	3,001,200
2018/19	47	74,802	3,515,700
2019/20	40	79,977	3,199,100
2020/21	26	444,470	11,556,200
2021/22	47	319,576	15,020,100
2022/23	52	610,276	31,734,400
2023/24	60	231,056	13,863,400
2024/25[3]	17	60,528	1,029,000

Notes: (1) Government Actuary's Department (2025) Department for Education Risk Protection Arrangement: Summary of Estimated Claims as at 31st December 2024

(2) Estimated by Optimal Economics by assuming one fire per member experiencing a fire related event

(3) Four months to 31st December 2024

4 Wider Effects of School Fires on Staff and Pupils

4.1 Introduction

4.1.1 School fires, particularly larger fires, will result in longer term effects that are more difficult to quantify. For example, there will be stress for the children from the loss of their school, work and exam materials and there will be stress to the staff delivering education in alternative premises. While these wider effects are hard to quantify and monetise, there is a substantial body of evidence on the importance of education and school attendance.

4.1.2 Education is of critical importance to individuals and society. For individuals, education has a vital role in helping to develop and equip young people with knowledge, skills and the qualifications they will need to enter the workforce. It is also the means through which individuals secure wider social, cultural and personal objectives. The benefits of education from an economic perspective include increased earning power, enhanced skill levels, a greater range of employment options and a reduced risk of unemployment and poverty. While the benefits of education are clear, there is concern about declining attendance rates and the impact that this will have on attainment.

4.1.3 This section considers the evidence on the importance of education and concludes with a summary of the 'unquantified' effects of a major school fire which destroyed an infant school in 2020.

4.2 Importance of School Attendance

4.2.1 The benefits of school attendance were highlighted in a Department for Education (DfE) blog[21] which identified that being around teachers and friends in a school or college environment is the best way for pupils to learn and reach their potential. School attendance also plays a role in keeping children safe and providing access to extra-curricular opportunities and pastoral care.

4.2.2 The importance of school attendance was also emphasised by the Chief Medical Officer who wrote to all schools[22] in September 2023 to explain why regular attendance is vital to the life chances of children and young people. The letter states that *"Being in school improves health, wellbeing and socialisation throughout the life course. The greatest benefits come from children and young people attending school regularly."*

[21] Why is school attendance so important and what are the risks of missing a day? – The Education Hub

[22] Letter to school leaders on mild illness and school attendance - GOV.UK

4.2.3 The Royal College of General Practitioners[23] (RCGP) also echoed this sentiment and stated that "Education is arguably the single most important factor in reducing trans-generational inequalities, and poor school attendance can negatively impact a child's future both socially and developmentally as well as through reduced educational achievement." As school is integral to the long-term well-being and aspirations of children, the RCGP have raised a significant concern over the levels of school absence, particularly since Covid.

4.2.4 Every moment in school counts and days missed can add up quickly. The school day is split into sessions and one session counts as either a morning or an afternoon. Evidence shows that pupils who have good attendance enjoy better wellbeing and school performance than those who do not attend.

4.2.5 The link between school attendance and attainment has been the subject of much research. A recent DfE study[24] investigated the link between different five percentage point bandings of attendance and attainment for pupils at the end of Key Stage 2 (KS2) and Key Stage 4 (KS4) in state funded mainstream schools in 2022/23. The report investigated how much more likely a pupil in each 5 percentage band of attendance is to reach a successful outcome for the key stage compared to pupils in other attendance bands. The report controlled for factors which may affect a pupil's attainment including prior attainment, eligibility for free school meals, special educational needs status, first language and deprivation.

4.2.6 The key findings from the research include:

- At both KS2 and KS4. The higher the 5 percentage attendance band a pupil is in during the assessment year, the more likely they were to achieve a successful outcome in 2022/23.
- At KS2, the pupils who attended school nearly every day in Year 6 (an attendance rate of 95-100%) were 1.3 times more likely to achieve the expected standard in reading, writing and maths compared to pupils who only attend 90-95% of the time. This means that missing just 10 days of Year 6 reduced the likelihood of reaching the expected standard by around 25%.
- At KS4, pupils who attended school nearly every day in Year 11 (an attendance rate of 95-100%) were 1.9 times more likely to achieve Grade 5 in English and Maths GCSE compared to pupils who only attended 90-95% of the time. This means that missing just 10 days of Year 11 reduced the likelihood of achieving Grade 5 in English and Maths by around 50%.

4.2.7 This research built on previous DfE studies which had found:

[23] The role of the GP in maximising school attendance – BJGP Life
[24] Link between attendance and attainment - GOV.UK

- For both KS2 and KS4, overall absence had a statistically significant negative link to attainment i.e. every extra day of school which is missed was associated with a lower attainment outcome[25].
- Pupils with higher attainment at KS2 and KS4 had lower levels of absence compared to those with lower attainment[26]. For example:
    - Pupils who did not achieve the expected standard in reading, writing and maths in 2019 had an overall absence rate of 4.7%, compared with 3.5% among pupils who achieved the expected standard and 2.7% among those who achieved the higher standard.
    - Pupils who did not achieve grade 9 to 4 in English and maths GCSEs in 2019 had an overall absence rate of 8.8%, compared with 5.2% among pupils who achieved a grade 4 and 3.7% among pupils who achieved grade 9 to 5 in both English and maths.
- Generally, the higher the percentage of sessions missed across the key stage at KS2 and KS4, the lower the level of attainment at the end of the key stage:
    - Among pupils with no missed sessions over KS2, 83.9% achieved the expected standard compared to 40.2% of pupils who were persistently absent.
    - Among pupils with no missed sessions over KS4, 83.7% achieved grades 9 to 4 in English and maths compared to 35.6% of pupils who were persistently absent

4.2.8 DfE guidance highlights that for the most vulnerable pupils, regular attendance is an important protective factor and offers the best opportunity to identify needs and provide support, but vulnerable children are more likely to be absent In the autumn term of 2023/34, the overall absence rate for pupils eligible for free school meals was almost twice the rate for non free school meal eligible children[27].

4.2.9 Following Covid, concerns have been raised over increased absence rates from school. A House of Common library research briefing[28] on 'School attendance in England' notes that in the six years before the pandemic, absence rates were around 4.5% to 4.8%. In both 2021/22 and 2022/23, the overall absence rates were in the range 7.4% to 7.6% - three percentage points higher than the pre-Covid position.

4.2.10 The Children's Commissioner for England launched the 'Big Ask' survey in 2021[29] – a national survey of England's children to capture their views on the state of the nation for them. The survey highlighted how much children had missed real classroom teaching and learning, spending time with their friends and the extra-curricular activities that brought joy and excitement to their lives during the pandemic.

[25] The-link-between-absence-and-attainment-at-KS2-and-KS4-2013-to-2014-academic-year.pdf
[26] The link between absence and attainment at KS2 and KS4, Academic year 2018/19 - Explore education statistics - GOV.UK
[27] Pupil absence in schools in England, Academic year 2023/24 - Explore education statistics - GOV.UK
[28] CBP-9710.pdf
[29] the_big_ask_the_big_answer_2021.pdf

4.2.11 These studies highlight the importance of school attendance and that missing even small amounts of school can have a substantial adverse impact on attainment. New data from the Department for Education (DfE) show that the recent policy focus of improving school attendance is starting to pay dividends with over 5 million more days in classrooms this year[30].

4.2.12 Spending more time in school boosts learning outcomes with a single day out of school costing an estimated £750 in lost earnings across the course of a career for a typical student. DfE[31] estimate that the reduction in absenteeism this year will protect over £2 billion in pupils' future earnings and build the skilled workforce needed to drive economic growth.

4.3 Other Losses related to School Closures and Covid

4.3.1 There is evidence that, in addition to learning loss, the school closures resulting from the Covid pandemic had a substantial impact on mental health and wellbeing of children including a range of emotional, behavioral and restlessness/inattention problems. Schools being closed also had implications for parents. Although the primary purpose of school is not to provide childcare, many parents rely on schools for this purpose and when children are not in school, some parents will have their ability to undertake paid work severely limited[32].

4.3.2 Research by University College London[33] found that pupils who do not attend school when it is open (uncoordinated absences) see a small decline in their academic achievement and the negative effect from each day of absence will be larger for pupils from low-income households. The research also found that pupil achievement can be harmed by term-time school closures (coordinated absences), although it is not clear whether coordinated closures are more or less damaging than uncoordinated closures. However, the research notes that coordinated absences lasting for several weeks can have small long-term negative effects on pupil achievement.

4.3.3 An IFS study[34] on learning during the Covid lockdown found that learning at home can be particularly challenging for disadvantaged pupils and students. The report found that children from better-off families spent 30% more time on home learning that those from poorer families during the first lockdown. Attendance at school is vital for the mental health and well-being of children[35], particularly for vulnerable children who are most likely to be affected due to increased risks of harm associated with isolation and financial stress.

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[30] Record attendance gains unlock over £2bn in future earnings - GOV.UK
[31] The_impact_of_school_absence_on_lifetime_earnings.pdf
[32] Balancing the Risks of Pupils Returning to Schools
[33] School absences and pupil achievement | IOE - Faculty of Education and Society

[34] Learning during the lockdown: real-time data on children's experiences during home learning | Institute for Fiscal Studies

[35] spi-b-dfe-benefits-remaining-education-s0861-041120.pdf

4.3.4 Further work by IFS[36] highlighted that loss of time in school and college has detrimental impacts on outcomes throughout a person's lifetime with estimates that each year of schooling is associated with an 8% increase in annual earnings. IFS estimated that by the time the pandemic is over, most children across the UK will have missed over half a year of normal, in person schooling. Half a year of lost learning can equate to £40,000 of lost earnings over a lifetime, which would equate to £350 billion across the UK's 8.7m school children.

4.3.5 The importance of school attendance is further emphasised in the House of Commons Research Briefing in January 2024[37] in response to safety concerns around the use of reinforced aerated autoclaved concrete (RAAC) in schools and other public buildings. In guidance issued by the Department for Education[38] for schools with confirmed RAAC in their buildings, it stated that "*Our clear priority is that children remain in face-to-face education*".

4.4 Ravensdale Infant School

4.4.1 In October 2020 the FRS was alerted to a fire at Ravensdale Infant School in Derbyshire by a member of the public. The school was fitted with a fire alarm, but this was not connected to an alarm monitoring company and did not raise the alarm. The fire took hold and it was not possible to save the infant school building. The neighbouring Junior School was ultimately saved, but it suffered from melted fascia and water damage to its floors.

4.4.2 Once the scale of the fire became clear, an emergency team, including the head teacher, City Council and FRS, was established to let parents know of the fire and to plan for how to continue delivering education. The local church provided accommodation for the emergency team to meet and the school's senior leadership team was also able to use the church as a base.

4.4.3 All 300 children had home/remote learning for three weeks until alternative arrangements could be made. Following the initial period of remote learning, in-person education resumed with the children split across four other schools:

- Nursery pupils attended a stand-alone building in Brookfield Primary School.
- Reception pupils attended Highfields Primary School.
- Year 1 pupils attended Hackwood Primary School
- Year 2 pupils were able to use the Year 10 block at Murray Park Secondary School.

[36] The crisis in lost learning calls for a massive national policy response | Institute for Fiscal Studies

[37] RAAC in the UK: Concerns and government response - House of Commons Library

[38] Guidance_for_responsible_bodies_and_education_settings_with_confirmed_RAAC_in_their_buildings_April_2024.pdf

4.4.4 Fortunately, both Highfields and Hackwood were new schools which had not long opened and therefore had quite a few empty classrooms which could be made available. This would probably not be the case if the fire occurred today.

4.4.5 While it was good to return to in-person learning, having the children split across four sites created a number of issues:

- The children had to be bussed to their alternative schools which incurred costs covering coach hire but also having members of staff travel with the children on the bus. This was usually teaching assistants who would require overtime payments. Having their children travel by bus across town was also quite stressful for parents, given the age of the children.
- Many of the Ravensdale children were entitled to free school meals but following the fire, there was difficulty finding accommodation for the kitchen team. Before the kitchen team found a suitable location, the school was buying food parcels and sending them home to children. Eventually the kitchen team were housed in Council premises and prepared meals which were transported by taxi to the four sites. This was a major logistical exercise ensuring that the temperature-controlled boxes were available and that the meals were at the correct temperature to be served following their journey from the kitchen.
- As the fire was during the covid pandemic, there were restrictions relating to multi-site visits which caused difficulties for the senior leadership team as they were limited in the schools they could visit in any one day.
- The school being used for the Year 1 pupils closed on a Wednesday afternoon so alternative accommodation had to be found for these pupils. A Forest School was used for one term but given the distance from the alternative premises, children had to be bussed to the school.
- Staff had no teaching materials. There were no screens, boards, books, pencils etc. and while consumables were replaced through the insurance claim, materials could not be ordered until alternative accommodation was sourced. Use had to be made of any tables, chairs and benches which were available, many of which were not ideal for children to work at e.g. picnic tables and benches.
- Staff had to travel to a different school base which gave rise to additional travel time, parking difficulties etc.
- It was difficult to hold in-person staff meetings as the travel time to the church (where the senior leadership team was based) from the alternative schools was prohibitive. Some staff left as a result of the fire, but the school was able to recruit. It was over one year before some new staff met their colleagues.
- Being spread across four sites meant that the school lost some of its community feel.

4.4.6 Some of the children were able to return to temporary accommodation at their own school for the summer term of 2021 (nursery and Year 2). The other years stayed at their alternative premises. As the start of the new school year in September 2021 (approximately one year after the fire), reception and nursery moved into temporary accommodation and Year 1 and 2 had temporary accommodation in Castlewood. This was a new school with classroom capacity upstairs but going up and down the stairs was a further challenge for the young children.

4.4.7 The disruption took its toll on the children and parents, particularly the need to travel by bus to another school. The stress associated with travelling was compounded by breakdowns, buses being late etc. The long days were exhausting for the children and staff were having to deal with more challenging behaviors. Some children had difficulties sleeping because they were afraid their school would burn down again and a few children left the school as a result of the fire. Fire practices at the alternative schools were particularly triggering and traumatic for some of the children.

4.4.8 As parents found it difficult to travel to the alternative schools, there was additional work for staff to keep parents informed of achievements and what was happening. This included PowerPoint presentations, photo books, newsletters etc. which could be emailed to parents and done to try and keep the community spirit of the school. Parents' evenings were a logistical challenge as family groups could be split across different schools.

4.4.9 While there were practical issues for staff (e.g. no teaching materials), there had to be much more reassurance and nurturing in lessons and a greater focus on personal, social, health and economic (PSHE) matters. The focus of teaching had to be what the children needed rather than the curriculum. Fortunately, due to Covid, there were no end of year assessments to be done.

4.4.10 After 20 months, the pupils returned to their brand new school. It was only when they returned to the school, could staff properly equip the school. The process for authorising all new materials and equipment was onerous and it took one year (once the new school was opened) to fully realise what materials and equipment were required.

4.4.11 Overall, the fire proved to be extremely challenging for the staff who were trying to teach without the necessary tools and it was a massive trauma for the children who were very young.

4.5 Conclusions

4.5.1 The Covid pandemic highlighted the importance of school attendance for the mental health and well-being of children, particularly vulnerable children. There is also considerable evidence that even low levels of absence can affect attainment with consequential effects on future earnings and careers. This has recently been estimated at £750 in lost career earnings for missing one day of school.

4.5.2 Although the circumstances of school fires are very different to the situation relating to Covid, a school fire that renders the school or part of the school unusable will have an adverse effect on the children. The Ravensdale School case study serves to illustrate the many challenges faced by pupils, staff and parents and highlights the substantial effects of a devastating fire.

4.5.3 While it would be difficult to draw conclusions about the effect of the Ravensdale School fire on education and attainment, the emotional effects on the children were clearly identified as was the need to focus on nurturing and reassurance rather than the curriculum.

4.5.4 As of 2020, two thirds of schools inspected by Zurich were rated as having 'poor' fixed fire protection systems[39]. A further 25% were judged 'poor' for fire detection measures, such as smoke detectors and fire alarms. There are six fires per week which render one classroom unusable and one further fire per week which affects multiple classrooms. All this leads to considerable stress and disruption to the affected children, parents and staff with the substantial range of effects illustrated by the Ravensdale School fire.

[39] 40 schools a month hit by fires

5 Cost Benefit Analysis

5.1 Introduction

5.1.1 Cost benefit analysis has been used to assess the cost effectiveness of installing sprinkler systems in new school buildings. Cost benefit analysis seeks to quantify in monetary terms as many of the costs and benefits of installing a sprinkler system as feasible.

5.1.2 Costs and benefits are appraised over the lifetime of the project which is assumed to be 50 years for this analysis. In line with UK Government guidance, a discount rate of 3.5% has been used for years 1 to 30 and rate of 3% has been used for years 31 to 50[40]. The costs and benefits have been discounted to take account of the fact that £1 today is worth more than £1 in future years. The discounted costs and benefits show the present value of future costs and benefits. The benefit cost ratio (BCR) has also been calculated which is the ratio of discounted benefits to discounted costs. A BCR which exceeds one means that the benefits are greater than the costs.

5.1.3 The costs and benefits have been considered for an average primary and secondary school.

5.2 Costs of Sprinkler Systems

5.2.1 The main costs required to install sprinkler systems into new school buildings include:

1. The installation costs of the system including pipework, sprinkler heads, valves etc.
2. Water supply costs including pumps and tanks.
3. Annual maintenance/ongoing costs.

5.2.2 Estimates of the costs of installing a sprinkler system into a new school building were provided by a major supplier and installer of these systems. The information was provided on the basis of a percentage of construction costs and included system costs and water supply costs (1 and 2 above). It was estimated that installation costs could be 2.5% to 3% of the construction costs of a school. An annual estimate was also provided for ongoing maintenance.

5.2.3 The model primary and secondary schools are based on average school sizes (275 pupils for a primary school and 1,050 pupils for a secondary school) with an estimated construction cost reflecting costs for new builds and re-builds from the Nation School Delivery Cost Benchmarking Study[41].

[40] The Green Book (2022) - GOV.UK

[41] Average new development costs over 2020 to 2024 of £4,400 per sqm for a primary school and £3,200 per sqm for a secondary school.

5.2.4 The following assumptions have been adopted:

- Construction cost of primary school - £8.7 million.
- Construction cost of secondary school - £26.7 million.
- Sprinkler installation costs for a primary school - £217,900 (2.5%).
- Sprinkler installation costs for a secondary school - £667,200 (2.5%)[39].

5.2.5 The ongoing maintenance costs are based on two services per annum and it is assumed that the school undertakes weekly testing. The annual maintenance cost is assumed to be £1,000.

5.3 Benefits of Sprinkler Systems

5.3.1 The benefits which are likely to arise from the installation of sprinkler systems are essentially "avoided costs" as some of the costs described in Section 3 can be reduced through the presence of a sprinkler system. While Section 3 provided estimates of costs per fire, to derive an estimate of the benefit of sprinkler systems it is necessary to make a number of assumptions relating to the probability of a fire occurring in a school and the effectiveness of sprinklers in preventing or reducing costs.

5.3.2 The probability of a fire occurring in a primary and secondary school in a year is 1.4% and 4% respectively.

5.3.3 Paragraph 2.4.3 found that for the small sample of school fires in England which had a sprinkler system, the effectiveness of the systems in containing/controlling or extinguishing the fire was 98%, but an estimate of the effectiveness of sprinklers in preventing or reducing damage is required. Previous research[42] has found that the effectiveness of sprinkler systems in reducing injuries or damages was in the following ranges:

- Injuries: 51% to 73%
- Damage: 75% - 93%

5.3.4 The following assumptions have been adopted for this analysis regarding the effectiveness of sprinklers in reducing injuries and damage.:

- Injuries – 70%.
- Damage – 90%

5.3.5 The effect of sprinklers on response costs has been calculated with reference to the average number of vehicles attending incidents where sprinklers operated. Table 2.3 shows that the number of vehicles attending a fire with damage greater than 50 sqm is approximately four times the number attending a smaller fire.

[42] BRE (2009) 'Cost Benefit Analysis for Residential Sprinkles in Scotland', BRE (20120) 'Cost Benefit Analysis of Residential Sprinklers'

5.3.6 The analysis assumes that the installation of a sprinkler system will reduce the number of fires incurring damage greater than 50 sqm by 90% and the smaller number of large fires will reduce fire response costs per fire.

5.3.7 There are no data available on the effectiveness of sprinkler systems in reducing environmental costs. However, the following effects would be expected:

- Sprinkler systems should reduce the severity of fires which, in turn, should reduce the impact of the fire on air quality.
- Sprinkler systems should use a smaller amount of water when activated which should prevent the fire growing into a major fire,
- If the sprinkler system can limit the extent of burning there should be an improvement in the quality of water which enters the water courses.

5.3.8 While there is no monetary value to attach to these benefits, they are likely to be significant.

5.4 Cost Benefit Results

5.4.1 Table 5.1 sets out the present value of costs and benefits of installing sprinkler systems into new school buildings. The analysis shows that the monetised benefits arising from the installation of sprinkler systems do not exceed the costs for either primary or secondary schools.

Table 5.1: Present Value of Costs and Benefits of Installing Sprinklers into New School Buildings

	PV Costs, £m	PV Benefits, £m	BCR
Primary	0.242	0.084	0.35
Secondary	0.691	0.240	0.35

5.4.2 The analysis of costs and benefits in Table 5.1 does not include any environmental benefits, benefits to the local community who may use the school in the evening or the benefits to pupils, staff and parents of not experiencing the disruption of a school fire. The analysis in Section 4 highlighted the importance of attendance at school for both attainment and mental well-being which was further emphasised through the Ravensdale School fire case study.

5.4.3 The question is whether the non-monetised environmental, educational and psychological effects of school fires on children, parents and staff are sufficient to outweigh the costs of installing sprinkler systems to generate a BCR of one where the present value of costs equals the present value of benefits.

5.4.4 If a fire breaks out in a school, it is likely that the school will be closed initially to all pupils while assessments and arrangements are made on how to continue with education. If it is just one classroom that is affected, there is a greater chance of the pupils whose classroom is affected being accommodated in another space in the school. When only one classroom is affected, it is expected that the children will miss one day of school. However, where more than one classroom is affected, the impact will be greater with more time required to make alternative arrangements, which could include the use of temporary accommodation. In this situation, more than one day of schooling could be missed.

5.4.5 For the non-monetised environmental, educational and psychological effects of school fires on children, parents and staff to bring the BCR to one, an annual benefit of £2,250 and £460 per primary and secondary school pupil is required.

5.4.6 The recent DfE study finds that a single day out of school costs an estimated £750 in lost earnings across the course of a career for a typical student. Hence, the lost earnings from missing one day of secondary school (£750) is greater than the annual value of non-monetised benefits (£460) required to ensure the costs of installing sprinkler systems into new secondary school buildings match the benefits. For primary school pupils, the lost earnings from three days out of school would be equivalent to the annual value of non-monetised benefits required to ensure the costs and benefits are at least equal.