# Installing Fire Sprinklers in Residential High-Rises with Asbestos Present

The Promenade Outreach and Civic Engagement Panel

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**Residential buildings in Maryland built before 1974 were constructed with asbestos-containing materials (ACM), a known carcinogen. A** 1989 ban helped stop the use of asbestos in building construction but its presence persists, mostly sealed within building materials, such as sheet rock walls, popcorn ceilings, and concrete floors. Exact locations are not apparent to building residents until living spaces undergo renovation, when strict construction practices are enforced to ensure safety of residents and workers.[[1]](#footnote-1)1 A study published in 1990 reported that 80 percent of insulation workers with at least 20 years of experience developed asbestosis and 40 percent died of asbestos-related sickness. Globally, an estimated 90,000 people die from asbestos-related sickness annually.

**Abatement** is the process of permanently removing known hazardous material in surface areas so that it is safe for others. Abatement also includes encapsulation, which is sealing off hazardous materials so that it is safe for residents.[[2]](#footnote-2)2

## What Is Asbestos Abatement?[[3]](#footnote-3)3

After discovering asbestos, professionals remove or seal it to prevent the dust from spreading through a structure and putting people at risk. During asbestos abatement, the contaminated part of structure is sealed off to protect the rest of the building. Then, professionals wear protective equipment and remove the asbestos with hand tools and whatever methods are appropriate for the situation. Once the asbestos is gone, they use a specialized vacuum to clean the area of any lingering asbestos debris. Finally, the building must pass an inspection to determine that the asbestos is gone.

If professionals can’t remove the asbestos, they may encapsulate it by testing the seal on the encapsulation and cleaning the surrounding area. After that, it must also pass an inspection to determine that the covered asbestos is not a threat.

## What Is Asbestos Remediation?

Asbestos remediation refers to the grand plan for tackling all of the asbestos in a structure. In high-rise buildings, full remediation of asbestos could be required in areas where sprinklers are to be installed. A remediation plan begins with professional inspection, such as by an industrial hygienist, to inspect the area believed to contain asbestos.

Once the presence of asbestos is confirmed, the contaminated area is marked off with warning signs so that people know about the asbestos danger, particularly near common areas. After the demarcation, the abatement process begins. The professionals carefully remove or encapsulate the asbestos so that it no longer poses a threat to people in the building. They also clean up after themselves so the building can pass re-inspection.

1. **Staging the Construction**

Staging the construction process and coordination of all trades, occupants, and building management personnel involved are necessary in an asbestos abatement/sprinkler installation process. If asbestos is not present, installing fire sprinklers can be performed more simply.

At the Saligman House, for example, a residential apartment high-rise in Philadelphia, was successfully retrofitted with fire sprinklers in 2014.[[4]](#footnote-4)4 To do it with a minimum of inconvenience, apartments were grouped together on each floor, and each group experienced the entire installation phase in just a few days. Prior to the beginning of renovation, management assisted residents in moving furniture into areas of the individual unit not affected by the project. There was no asbestos present in the walls or ceilings, so moving furniture from room to room allowed workers to do the installation without requiring residents to move out.

Residents who didn’t leave the building for the day remained in a dayroom that featured activities and lunch. Construction crews left each unit clean at the end of a workday and residents were able to come back to their apartments and sleep in their own beds. Each group of units transitioned into different stages of demolition, installation, patching, painting, and cleaning on consecutive days over an entire cycle that took approximately four days.

In the case of the Saligman House, however, corridor sprinklers had either been installed previously or were not part of the installation plan. It turns out that the current Maryland sprinkler mandate requires sprinklers to be installed in corridors as well as in within units, necessitating the evacuation of entire floors while corridor work is underway. Therefore, it makes the most sense to empty individual apartments and corridors on the same floor simultaneously. The presence of asbestos creates long displacement intervals and higher expenses.

1. **Asbestos Removal Cost Breakdown[[5]](#footnote-5)5**

Asbestos removal involves a wide range of costs because a one-size-fits-all solution isn’t feasible. Asbestos can turn up in many parts of a building. We present the following cost data based on single family homes from the ANGI website. Note that each cost factor mentioned will also be relevant to asbestos work in high-rises. Moreover, many high-rise communities contain large common areas and non-resident spaces that must be added to costs mentioned below. While we acknowledge that high-rise projects may secure lower rates for supplies, insurance, or labor, we believe that on balance, this data captures the scope and content of tasks involved in abating asbestos in a high-rise building.

**4.1 Size of Affected Area**

The greater the square footage, the higher the cost to remove and dispose of ACMs, especially if large areas need to be sealed off, such as common rooms. Since sprinkler construction begins after asbestos work, much of the asbestos would have to be removed in order to ensure safe working conditions. Remediation is more expensive than abatement and wherever possible, encapsulation should be used to lower costs.

 The typical asbestos indoor remediation project costs anywhere from **$5 to $20 per square foot**, depending on the location. Note that this figure does not costs of displacing residents and their belongings. Nor does it include costs of sprinkler construction, a new fire pump, or associated alarm and sensor hardware and installation. Furthermore, costs for any given unit in a high-rise building has to include its share of abating common areas, such as corridors, lobbies, fitness centers, and so on. We account for each of these expenses later in the report.

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| **Interior Square Footage5** | **Average Removal Cost** |
| 100 to 200 square feet | $1,250 – $2,500 |
| 200 to 400 square feet | $2,500 – $5,000 |
| 400 to 600 square feet | $5,000 – $7,500 |
| 600 to 1,000 square feet | $7,500 – $12,500 |

**4.2** **Location of Asbestos**

Removing asbestos from accessible locations is simpler than from inaccessible locations, which may require demolition and extensive sealing. For example, to remove asbestos from a floor pipe spanning three rooms, each room will need to be sealed off, and multiple negative air fans employed before demolishing the floor. The locations of pipes and other potential ACMs in a building is challenging unless building-wide, as-built drawings are available to workers. Note that asbestos removal costs for popcorn ceilings have not been found in the open literature and we could not cost it separately.

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| **Asbestos Location5** | **Removal Cost** |
| Walls and Drywall | $8 – $13.50 per square foot |
| Flooring and Floor Tile | $5 – $15 per square foot |
| Pipe Insulation | $5 – $15 per square foot |
| HVAC Units | $35 – $55 per square foot |

**4.3 Walls and Drywall**

Sprinklers can be installed in either walls or ceilings. We present data here relevant to wall installations only, since this is the data available to us.

The following data applies to single-family homes, where popcorn ceilings are less common. Each home may encounter costs of $8 to $13.50 per square foot to remove asbestos from a wall or drywall. For example, removing asbestos from a 1,500-square-foot home will cost about $20,000, but most of the time, asbestos can be encapsulated instead of removing it at a cost of $2 to $6 per square foot. Apparently, cost differences between encapsulation and remediation are significant.

**4.4 Setup and Pre-Clean Costs**

Setting up for asbestos removal is labor-intensive and accounts for much of the overall cost, around 60 to 70 percent of the total. These efforts range from $240 to $350 per hour, depending on the complexity of the job, and can total anywhere from $1,000 to $4,000 or more.

Prep work, otherwise known as pre-cleaning, is vital and involves turning off the HVAC system, sealing off rooms or spaces to create a decontamination area, and installing negative air fans to remove contaminants via a series of filters. Some asbestos removal professionals erect warning signs and arrange disposal containers ahead of the job.

**4.5 Labor Costs**

The average single-family homeowner pays asbestos removal businesses $75 to $200 per hour for labor per crew member. The typical two-person team will take about eight hours to complete a single-family project, depending on the amount of asbestos in the space. Generally speaking, labor adds up to $1,200 to $3,200 and often includes a separate contractor fee of $800 to $1,500 to cover permits, overhead, and asbestos disposal. For large projects in high-rise buildings, labor costs may be lower.

**4.6 Materials and Equipment**

Asbestos requires a diverse array of equipment and materials to successfully remove it. These tools and items of gear add up to around $450, depending on the job. Safety gear and equipment is essential, including plenty of sealants, specialized fans, and more. Respirators cost $30 to $150 per unit, protective eyewear costs $10 to $30 per pair, and Tyvok whole bodysuits cost $25 to $50 each. Additionally, asbestos removal pros wear rubber boots and disposable gloves when working with asbestos.

**4.6** **Asbestos Disposal**

Asbestos is usually regarded as hazardous waste, and disposal must follow EPA guidelines. Costs vary from state to state, but it’s typically $10 to $50 per cubic yard and $50 to $100 for the permit.

**4.7 Asbestos Test Cost**

It may be necessary to hire an asbestos professional to test[[6]](#footnote-6)5 before and after removal. When the removal is complete, testing ensures that no asbestos has leaked into the HVAC system and there are no longer asbestos fibers in the home’s air. An asbestos test costs $250 to $850. A full air quality report costs an average of $400.

 The next sections consider other collateral costs of installing sprinklers.

1. **Fire Alarm Upgrades**

Another required element in fire sprinkler installation often ignored by industry quotes is upgrading an existing fire alarm to trigger on sprinkler or sensor events. According to Safe and Sound Security,[[7]](#footnote-7)6 complex fire alarm systems in older buildings can present unique challenges, and retrofitting an older structure can cost between $4 per square foot up to $12 per square foot. Since many buildings already possess a fire alarm, we will assume the lower cost of $4 per square foot to install new wiring or integration of a wireless system, recognizing that specific buildings may encounter higher costs. The next sections present key elements of a fire alarm system.

**5.1 Manual Fire Alarm Pull Stations**

The National Fire Protection Association 101 Life Safety Code requires at least one manual fire pull station in each commercial building. The cost of a manual fire alarm pull station is $20 to $99. Many buildings already have several pull stations.

**5.2 Smoke detectors**

Smoke detectors are typically installed on the ceiling of every room in a building. According to the National Fire Protection Association, a smoke alarm covers a radius of 21 feet. The maximum recommended distance between two smoke alarms is 30 feet. The cost of a single smoke detector ranges from $10 to $70. Many apartments have smoke or smoke and carbon monoxide detectors, but are often not wired to the current alarm system.

**5.3 Heat Detectors**

Heat detectors are an important element in protecting property in commercial buildings such as warehouses. The cost of a heat detector ranges from $11 to $150.

**5.4 Carbon Monoxide Detectors**

Carbon monoxide detectors monitor the carbon monoxide levels in the air. Carbon monoxide detectors cost from $15 to as high as $150.

**5.5 Fire Alarm Control Panel**

A fire alarm control panel serves as the brain of the fire alarm system by monitoring some or all of the detectors to respond to a fire in a variety of ways, such as by sounding evacuation alarms, initiating sprinklers, or closing fire doors. The control panel can be “addressable,” meaning that each detector is assigned an address, making it possible during an emergency to pinpoint the location of the fire. The cost of a basic addressable control panel such as Firelite ranges from $2000 to $5000.

**5.6 Audible and Visual Warning Devices**

Notification appliances play a crucial role in a commercial fire alarm system by sounding a loud noise to attract the attention of everyone in the building, such as by a bell, horn, or chime. In addition to audible devices, the Americans with Disabilities Act of 1990 requires the installation of strobes in all public areas. In the case of fire, a hearing-impaired employee or customer may not be aware of an alarm sound. Strobes must be installed in all common-use areas including cafeterias, hallways, meeting rooms, restrooms, and lobbies. The cost of these notification appliances ranges from $40 to over $200 per unit. Many buildings already employ strobes and audible warning systems.

## 5.7 Monitoring Costs

Another fire alarm system expense is the monthly monitoring fee which depends on the type of monitoring chosen, the building size, and the number of sensors installed. Generally speaking, the monthly monitoring fee will range between $50 to $100 per month.

1. **Fire Pump**

Fire pumps push water from the local water supply or a roof tank to the uppermost areas of high-rise buildings to power sprinklers. High-rise buildings, where water must be able to defy gravity and surge up to hundreds of feet to reach the top floors within seconds, are especially at risk without a fully operational pump. Pumps are also critical for buildings that supply their sprinkler systems through water storage tanks which don’t generate gravity-fed water pressure, and buildings where the municipal supply doesn’t create enough pressure on its own. Fire pump costs can range from $10,000 to $100,000. Most buildings already have a fire pump to supply water to fire trucks, but a more capable pump will be required to support a sprinkler system. In addition, tests must be performed to determine whether water pressure is sufficient to engage a sprinkler system even with a new pump. Instead of pricing a new pump directly, divide the cost range over the number of residents.

1. **Resident Displacement Costs**

Rental buildings might terminate leases during asbestos abatement and sprinkler installation, and then reopen them when the work is finished. But condo and co-op owners must vacate during construction, leaving their units and storing belongings during abatement and sprinkler retrofitting. The best plan schedules the two tasks sequentially to avoid displacing residents a second time. We estimate 28 days per floor to perform asbestos abatement and the installation of sprinklers on a single floor, a displacement that will persuade many residents to sell off their units and move elsewhere.

The table on the page 9 provides local prices of hotels, movers, and storage facilities.

##  8. Sprinkler System

In recent months, the Maryland State Fire Marshal, Brian Geraci, quoted to a large audience that sprinklers can be installed for $8 per square foot. This figure irresponsibly ignores costs for asbestos abatement and resident displacement, and likely represents installation costs for an empty building that does not have asbestos. Therefore, we estimate costs to empty the building, i.e., calculate resident displacement and asbestos remediation costs, add the price of new fire pump and fire alarm upgrades. Then we use the commercial standard of $8 per square foot to estimate totals.

1. **A Typical High Rise**

Let’s assume that a typical building comprises 1,264,000 square feet with a total of 1000 units. On average, for quick math: 1,264,000 square feet /1000 units = 1,264 square feet per unit. The ANGI estimate for asbestos remediation is $5-$20 per square foot, a variation we assume depends on the amount of asbestos present and where it is located, whether or not significant physical elements are involved, such as pipes and popcorn ceilings, and whether encapsulation is feasible in areas but not in others. In order to use sprinkler installation figures that apply to empty spaces, such as the Fire Marshal’s, we assume remediation has been accomplished so that sprinkler installs can proceed without further concerns about asbestos.

**Asbestos Remediation/Encapsulation Costs Per Average Apartment Unit**

We estimate an average cost of $12.50 per square foot at the low end of estimated costs, as in the ANGI table on page 3. We calculate asbestos remediation costs:

$12.50 per square feet x 1,264 square feet = $15,775 for asbestos remediation per unit

**Sprinkler installation Costs Per Apartment Unit**

From the State Fire Prevention Commission:

$8 per square foot x 1,264 square feet = $10,112 for sprinkler installation per unit

**Fire Alarm Upgrade Cost Per Apartment Unit**

From page 5:

$4 per square foot x 1,264 square feet = $5,056 for alarm upgrade per unit

**New Fire Pump Cost Per Apartment Unit**

From page 7:

$10,000 - $100,000 /1071 units = $9.33 – $93.33 for fire pump per unit. This number is small enough to leave out of calculations.

1. **Total Costs**

We add the above figures to displacement costs and arrive at totals of **$38k - $42k per average apartment unit at a 1,264,000 square foot complex with 1000 units**. Individual unit costs will vary, depending on exact square footage and floor, and in addition, combined units will see twice the average figures. Note that @ $24.50 per square foot. i.e., the price for asbestos abatement + fire alarm upgrade + sprinkler installation, costs for any apartment in a building configuration can be calculated. We point out that if asbestos removal is more complex than projected, costs could be even higher.

Most residents can’t afford fee or rent increases of several hundred dollars per month to pay this bill, and none will be willing to be displaced for a month or longer for this purpose. Furthermore, these numbers fundamentally depart from the Fire Marshal’s assessment by nearly 500%, suggesting that the State Fire Prevention Commission did not acquaint itself with actual figures before enacting code that forces sprinkler retrofits on older condos and co-op buildings.

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| Displacement Costs for Asbestos Abatement and Fire Sprinkler Retrofitting |
| Category | **Units with Asbestos** |  **1 BR Apt Costs** |  **2 Br Apt Costs** |
| Storage Rental Fee[[8]](#footnote-8)6 | 10'x10' unit for 1 BR apt = $206/month | 10'x15' unit for 2 BR apt = $377/month | $206  | $377  |
| Hotel stays[[9]](#footnote-9)7 | 28 nights avg. $131 per night  | $3668  | $3668  |
| Packing costs[[10]](#footnote-10)8 | Full packing  | $1000 | $1600  |
| Moving costs x 2 | $100 per hour for 2 movers and truck + difficult access, elevator and long carry | 1 BR @ 3-5 hours per local move2 BR @ 6-7 hours per local move | $900  | $1300 |
| Insurance and Items Requiring Special Handling | Full value protection: 1% of total value; released value protection: $.6 per lb. | 1 BR: 1800-3500 lbs. 2 BR: 2700-5000 lbs. or insure with homeowner's policy | $1590 (including deductible) | $3120 (including deductible) |
| Asbestos Abatement | See page 3: $12.50 per square foot | $15,775 | $15,775 |
| Fire Alarm Upgrade | See page 5: $4 per square foot | $5,056 | $5,056 |
| New Fire Pump  | See page 8: negligible | 0 | 0 |
| Sprinkler Installation | From the Maryland State Fire Marshal: $8 per square foot | $10,112 | $10,112 |
| Totals |  | Cost at avg. hotel = | $38,307 | $41,008  |
| Cost at Marriott ($192/night) =  | $40,015  | $42,716 |

1. **1** “What is the Difference Between Abatement and Remediation?” Lakeland, https://www.lakeland.com/abatement-and-remediation/ [↑](#footnote-ref-1)
2. ## 2 “What Is Asbestos Abatement?” https://cleanmanagement.com/blog/the-difference-between-asbestos-abatement-and-remediation/

 [↑](#footnote-ref-2)
3. 3 What is the Difference Between Abatement and Remediation?” Lakeland, https://www.lakeland.com/abatement-and-remediation/ [↑](#footnote-ref-3)
4. 4 “Retrofitting Fire Sprinklers: What a Large-Scale Project Needs for Success,” Quick Response Fire Supply, https://blog.qrfs.com/177-retrofitting-fire-sprinklers-what-a-large-scale-project-needs-for-success/ [↑](#footnote-ref-4)
5. 5 ANGI, “How Much Does Asbestos Removal Cost (2023 Figures)?” https://www.angi.com/articles/how-much-does-asbestos-removal-cost.htm [↑](#footnote-ref-5)
6. 5 “How to Hire a Pro for Asbestos Removal and Cleaning,” ANGI, https://www.angi.com/articles/hire-pro-asbestos-testing-and-removal.htm [↑](#footnote-ref-6)
7. 6 Pittman, Donna, “How Much Does A Commercial Fire Alarm Cost?” Safe and Sound Security, July 2022, https://getsafeandsound.com/2022/07/commercial-fire-alarm-system-cost/ [↑](#footnote-ref-7)
8. 6 “Security Public Storage, temperature controlled rental facility in Bethesda, https://www.securitypublicstorage.com/locations/bethesda [↑](#footnote-ref-8)
9. 7 “Rockville Average Hotel Costs,” https://www.budgetyourtrip.com/hotels/united-states-of-america/rockville-4367175 [↑](#footnote-ref-9)
10. 8 “How Much Does It Cost to Hire Movers for a 1 BR Apartment?” ANGI, https://www.angi.com/articles/cost-to-move-1-bedroom-apartment.htm [↑](#footnote-ref-10)