



TRAINING REPS

T.R.

ATF Analysis of FF Nathan Flynn LODD

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On August 3, 2023 the ATF released a report summarizing their analysis of the 2018 Line of Duty Death of Howard County Firefighter Nathan Flynn. Just last year, Frederick County Captain Joshua Laird was killed after a similar sequence of events. The fires were attributed to a lightning induced failure of the corrugated stainless-steel tubing (CSST) used to distribute gas to appliances throughout the structures. In both cases, a fire resulted beneath the floor which eventually led to collapse of the floor and subsequent MAYDAYS/LODDs. Utilizing the Fire Dynamics Simulator (FDS), live fire testing, and electronic data, Special Agent Adam St. John and his team is able to offer us a better understanding of the flow of heat, smoke, and fire gases throughout the residence on Woodscape Drive in Howard County.

The ATF Report cites five conclusions which should be utilized to educate and train fire service members so that we can avoid repeating such tragedies. The QR code for the full report can be found under "Additional Resources".

1. **The extremely large volume of the residence allowed for a well-developed fire, despite light smoke showing on the exterior.**
2. **The elevated fire located in the basement crawl space created atypical smoke filling conditions in basement.**
3. **A ventilation flow path existed from the basement door (inlet), through the hole in the crawl space and out the first-floor mud room door (outlet). This flow patch created untenable conditions on the first floor during the MAYDAY.**
4. **The corrugated Stainless Steel Tubing (CSST) location and its relationship with the structural collapse.**
5. **An additional lightning induced CSST LODD incident (Capt. Josh Laird) occurred just three years later.**



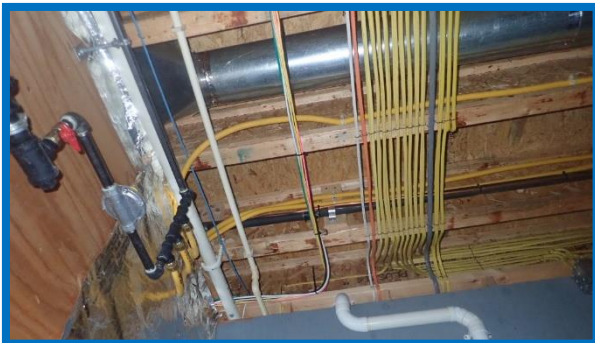
- The residence at 7005 Woodscape Dr. in Howard County consisted of 8,400 sq. ft. of open living space. Type V construction.
- The fire developed in a crawl space that was between the basement floor and first floor. A visual of the basement revealed no fire while crews entering the first floor initially determined the fire to be in the basement.
- The effects of a ventilation unidirectional flow path that existed from the basement door (inlet), through the burning crawl space and up through the living room/mud room door caused firefighters to initially see flames on the first floor and incorrectly believe the fire originated and was located in the first floor living room.
- The wood floor joists and wood sheathing that supported the flooring system burned away in the area of the CSST arc hole and resulted in structural collapse of the massive tile flooring system into the burning crawl space.

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Baltimore County is no stranger to fires involving CSST. On July 18, 2022 the cause of a dwelling fire in Cockeysville was attributed to CSST failure following a severe storm. The circumstances were eerily similar to those of the Flynn and Laird LODDs: A large “mega-mansion” style dwelling, light smoke conditions on the exterior, in a non-hydranted area, after a lightning intense storm. Luckily, the fire occurred within a wall cavity and was quickly detected by the owner.



- The residence at 4 Timerpark Ct. (Box 17-15) is in excess of 12,000 sq. ft. Type V construction.
- The fire originated within the wall space of a bedroom on the first division. Smoke traveled up the wall cavity and into an attic space, eventually showing near the peak on the exterior.
- The location of the arc hole in CSST resulted in a sustained flame within the wall cavity, causing damage to wooden wall studs and sheathing. Time and the aggressive and thorough investigation by crews contained the fire before it extended into the attic space.



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CSST

Corrugated stainless steel tubing has been used in the United States since 1990. It's flexibility, cost, and ease of installation makes it an attractive alternative to black iron gas pipe. It's estimated that over 300,000 miles of CSST is installed annually. Despite attempts to make CSST more resistant to lightning strikes, it's extremely thin wall is susceptible to the energy produced by lightning and other high heat events, such as electrical arcs. When installed, the CSST is routed through wall cavities, along floor joists, and other interstitial spaces. When attacked by lightning an arc may cause a hole in the CSST and simultaneously ignite the escaping gas, resulting in a fire that attacks wooden structural elements and sub-flooring from the start.

These high-profile incidents shed light on a not so uncommon problem and exacerbate the need for us to change the way we approach them. Smoke/burning odor calls and reported structure fires that occur following storms must be treated differently than the run of the mill room and contents fire within a ventilation-limited, compartmented dwelling.

Considerations

- ♣ Establish a reliable water source. "light" or minimal smoke in a mega-mansion is a **BIG** problem. Don't let your guard down.
- ♣ Conduct a 360, no matter the size. Note the footprint of the structure, basement access, terrain changes, etc. Be on the lookout for any damage that indicates a lightning strike.
- ♣ Mega-mansion dwellings often have a unique footprint. The I.C. must clearly identify the sides and divisions.
- ♣ Control utilities. Shutting off the gas removes the constant flow of fuel.
- ♣ Investigate the basement or lowest floor first. Rule out fire in void/concealed spaces that contain combustible structural members. Pay close attention to the interstitial space between the basement and first floor!
- ♣ Tile flooring can mask the heat from a fire consuming the sub-floor below and give the appearance that it is intact and sound. Information provided by the T.I.C. should be scrutinized carefully-it's a tool with limitations!
- ♣ Depending upon the size of the arc hole in the CSST the escaping gas may not ignite or may initially ignite and then "blow" out the flame. If the leak has developed within a finished cavity it may be challenging for crews to locate the source.

Additional Resources

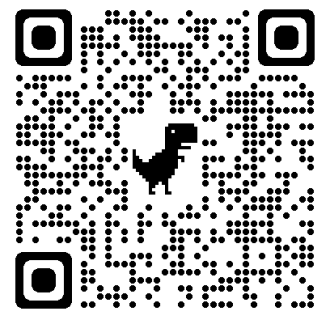
BCoFD Safety Bulletin: CSST and Lightning (June 22, 2020)

[Documenting CSST related fires in NFIRS](#)

[ATF Fire Development Analysis of the LODD of FF Nate Flynn](#)

[Internal Safety Review Board-HCDFRS LODD Report](#)

[Lightning Fire Research Project \(Document CSST related incidents here\)](#)



ATF Analysis Training Video