

Reducing property loss due to Dryer Fires in Streamwood

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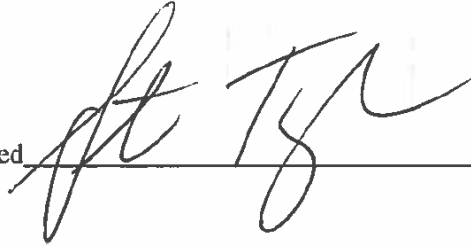
Streamwood Fire Department

Streamwood, IL

Certification Statement

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, so quotation marks so indicate, and that appropriate credit is given where I have used language, ideas, expressions, or writings of another.

Signed

A handwritten signature in black ink, appearing to be "JL Tye", is written over a horizontal line.

Abstract

The problem was dryer fires caused the second largest dollar loss to residential property in Streamwood, Illinois in the past five years. The purpose of this Applied Research Project was to identify means to reduce residential property loss due to dryer fires. Action research was utilized for this project to create a Public Education program aimed at limiting loss due to dryer fires.

The following research questions were posed: (a.) What common issues lead to dryer fires? (b.) What installation procedures and building codes are in place to help prevent dryer fires? (c.) What fire prevention programs are in place to educate the public about dryer safety?

Procedures used were a literature review, surveys sent to Fire Chiefs regarding dryer fire education programs, and interviews of a representative of the Building Department, a Fire Investigator and a Streamwood Fire Department Inspector. A demonstration recreated the flammability of dryer lint. Research found that a majority of dryer fires are due to lack of cleaning and preventative maintenance.

Action research was used to create a Public Education program. The recommendations included: a demonstration at the Streamwood Fire Department Open House, a brochure to be made available by Streamwood Community Development, a Power Point presentation for community groups, and safety messages to be included in the Village newsletter and local newspapers.

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Introduction

The Fire Investigator is called to the scene of a house fire. He tells his wife he needs to go in to investigate the cause of the fire. She responds, “The dryer probably caused it. Almost every time you’re called in, it’s a dryer.” She was right. The fire started in the laundry room. Thus began the beginning of this Applied Research Project.

In preparation for the National Fire Academy Executive Analysis of Community Risk Reduction it was found that dryer fires accounted for almost 10 percent of all fires in Streamwood for the years 2006 to 2016. This caused the second highest total dollar loss among all causes of fire. (Streamwood Fire Department, 2016)

The problem is dryer fires caused the second largest dollar loss to residential property in Streamwood, Illinois in the past ten years. The purpose of this Applied Research Project is to identify means to reduce residential property loss due to dryer fires. The following research questions will be answered: (a) What common issues lead to dryer fires? (b) What installation procedures and building codes are in place to help prevent dryer fires? and (c) What fire prevention programs are in place to educate the public about dryer safety? Action research will be used to create a Public Education program designed to reduce property loss due to dryer fires.

Background and Significance

The Streamwood Fire Department is a suburban fire department in northeastern Illinois. The Department consists of 50 full time personnel and operates out of three fire stations. The Streamwood Fire Department provides fire suppression, emergency medical services, rescue, and fire prevention. The Department serves a community of 40,746 residents.

In preparation for Executive Analysis of Community Risk Reduction (EACRR) it was discovered that over the past ten years, the Streamwood Fire Department responded to an average of four dryer fires a year. This indicates ten percent of fire responses. However, this accounts for almost \$600,000 in property loss and damage. (Streamwood Fire Department, 2016) This number represents the second largest dollar loss for this time period. The damage from dryer fires ranged from scorching of the dryer to loss of the structure. During the preparation of this project, the author responded to an additional two dryer fires.

The project hopes to satisfy goal (1) of the United States Fire Administration Strategic Plan 2014-2018: Reduce fire and life safety risk through preparedness, prevention and mitigation. The key initiatives which will be addressed are (2)- Expand fire and life safety public education and prevention initiatives, including the use of social media, to reach all segments of the population, and (4) Work with stakeholders to identify, promote, and offer programs and training to encourage “whole community” preparedness, prevention and mitigation planning. (http://www.usfa.fema.gov/strategic_plan_2014-2018.) Furthermore, the research fulfills the following goals of the EACRR course: (2) – Create a community risk reduction plan in the community, and (3) – Focus on reducing risks in the local community. (*Executive Analysis of Community Risk Reduction*, 2015, p. ix)

Literature Review

A literature review was conducted to answer the research questions. This was completed through a review of materials at the National Fire Academy's Learning Resource Center, Streamwood Fire Department, and web based resources.

What are the events that lead to dryer fires?

How a Clothes Dryer Works

In order to understand dryer fires, it is important to know how a dryer works. Woodford (2016) explains the simplest way to dry clothes is to change water into a vapor. The easiest way to produce vapor is to heat it up. He further explains the basic idea is to blow hot dry air into one side of a drum as it tumbles the clothes around and extract moist wet steam from another part of the drum at the same time.

The heart of the machine is a large metal drum with paddles around its inside. This drum rotates; in smaller machines it may rotate one way then the other. Cold air is drawn into the machine through an air intake. Often the intake is at the front of the machine. A fan powered by an electric motor sucks air in and pulls it towards a heating element. As cool air passes over the heating element, it's warmed and turned to hot air. A thermostat turns the heating element on and off periodically to stop the machine from overheating or cooking the clothes. Warm air from the heating element enters the drum, typically through large holes at the back. The drum is rotated slowly by a belt connected to an electric motor. Often one motor drives both the drum and the fan. As the drum rotates, the paddles lift and tumble the clothes until they reach the top of the drum. Then gravity makes them fall back down through the hot, dry air. The air passes through a

lint filter that catches lint and bits of fluff. Finally, the exhausted air passes through a vent hose. (Woodford, 2015)

Wet clothes placed in the drum are then dried by moving hot air. It is possible for a full load of wet clothes to contain as much as one and a half gallons of water. (FEMA, 2012)

Gas dryers require a gas line connection to function. Natural gas pulled into the unit is then combusted, creating heat that is transferred to a metal heating element. A fan blows air through small holes in the heating element, heating it up as it enters the main chamber and comes into contact with the clothing. This heat causes the water in the clothing to evaporate. (Consumer Energy Center, 2016)

Lint, consisting mostly of small fibers from the clothes and debris in or on the clothes, is created from the clothes as the clothes tumble in the drum. While much of the lint is trapped by the dryer's filter, lint is also carried through the vent system along with the moist air. (Al's Home Improvement, 2012)

Lint is a highly combustible material that can accumulate both in the dryer and the dryer vent. Accumulated lint leads to reduced airflow and can pose a potential fire hazard. In addition to the accumulation of lint, blockage in dryer exhaust vents also can occur from the nests of small birds or other animals or from damages to the venting system itself. A compromised vent will not exhaust properly to the outside. As a result, overheating may occur and a fire may ensue. (FEMA, 2012)

Causes of Dryer Fires

Reese, et al. (1998) states the most common cause of dryer fires is spontaneous combustion of accumulated lint either in the dryer or in the vent tube. This statement is based upon burn patterns in the dryers examined, where the patterns clearly indicate that the fire started in the lint filter or beyond, rather than in the drum. In fact, we have relatively few dryer fires in our files where the fire started in the drum.

FEMA (2012) states that there are an estimated 2,900 clothes dryer fires in residential buildings are reported to U.S. fire departments each year and cause an estimated 5 deaths, 100 injuries, and \$35 million in property loss. FEMA lists categories of factors contributing to ignition in clothes dryer fires. The leading category was “operational deficiency”. The leading specific factor contributing to ignition, which is part of the operational deficiency category, was failure to clean. FEMA further states proper clothes dryer maintenance to avoid a fire includes removing lint from the traps, vents, and surrounding areas of the dryer. According to FEMA, failure to clean accounted for 72 percent of the operational; deficiency contributing factors category. It also accounted for 34 percent of all clothes dryers fires in residential buildings. Dust, fiber, and lint and clothing not on a person were the leading items first ignited accounting for almost 55 percent of items.

The second leading category is mechanical failure, malfunction. This accounted for 29 percent of fires. Followed by electrical failure, malfunction at 16 percent. Other factors considered are drying improper materials such as foam-backed rugs or athletic shoes. Additionally, plastic or vinyl exhaust materials used to vent the appliance can contribute to a fire.

Flexible hoses create turbulence, which restricts efficient air flow. In some cases, the dryer may be installed in a way which pinches the hose and restricts airflow dramatically. Moisture collects on the pleats of all flexible hoses and lint can easily stick to these surfaces and cause lint to build up and create a fire hazard. (Al's Home Improvement, 2012)

Tests conducted by the Consumer Product Safety Commission (CPSC) indicated that temperatures in the exhaust outlet did not increase with zero to fifty percent blockage. Above fifty percent blockage saw increased temperatures in the exhaust outlet. In one test on the exhaust outlet with seventy five percent blockage the temperatures rose to approximately 707 degrees Fahrenheit. With complete blockage the maximum temperature in the outlet temporarily spiked at 1022 degrees Fahrenheit. (Ballanco, 2006)

New construction trends often to situate washers and dryers in nontraditional areas of the house, such as upstairs bedrooms, kitchens, and closets. These new sites require longer dryer vent ducts in order to reach an outside wall. If a dryer vent is too long or has many bends and turns, moisture in the warm air passing through it condenses on the vent surfaces. Eventually, the lint accumulates and creates resistance. (FEMA, 2012)

All manufacturers now state in the manuals not to use plastic, flexible dryer ducts between the vent and the clothes dryer. Many homes however continue to use plastic, flexible ducts. The plastic itself can provide additional fuel for a fire. Even flexible foil vents can twist, allowing lint to build up and catch on fire if it comes in contact with a sufficient amount of heat. If a fire starts beneath the dryer when the motor overheats, then the drafts from the dryer can pull the fire up into the duct, allowing a house fire to develop. (FEMA, 2012)

The Consumer Product Safety Commission (CPSC) also recommends that special care is taken when drying clothes that have been soiled with volatile chemicals such as gasoline, cooking oils, cleaning agents, or finishing oils and stains. “If possible, wash the clothing more than once to minimize the amount of volatile chemicals on the clothes and preferably, hang the clothes to dry. If using a dryer, use the lowest setting and a drying cycle that has a cool-down period at the end of the cycle. To prevent clothes from igniting after drying, do not leave dried clothes in the dryer or piled in a laundry basket.” (CPSC, 2012)

What installation procedures and building codes are in place to help prevent dryer fires?

International Residential Code

The International Residential Code, IRC (2012) Chapter 15, section M1502 regulates clothes dryer exhaust. Section M1502.1 of the IRC states that clothes dryers shall be exhausted in accordance with the manufacturer’s directions. In accordance with sections M1502.2, the dryer exhaust system shall be independent of all other systems and shall convey moisture to the outdoors. M1502.3 dictates that “exhaust ducts shall terminate on the outside of the building. Exhaust terminations shall be in accordance with the dryer manufacturer’s installation instructions. If the manufacturer’s instructions do not specify a termination location, the exhaust duct shall terminate not less than 3 feet in any direction from openings into buildings. Exhaust duct terminations shall be equipped with a backdraft damper. Screens shall not be installed at the duct termination”. M1502.4 Lists the requirements regarding material, size and installation of ducts. The ducts shall have a smooth interior finish and be constructed metal with a minimum thickness of .0157 inches. The nominal diameter shall be a minimum of 4 inches. Section M1502.4.4.1 states “The maximum length of the exhaust duct shall be 35 feet”. The section also

states the length is reduced when fittings are used. Table M1502.4.4.1 shows the reduction to be 2 feet 6 inches for each 45 degree angle, and 5 feet for each 90 degree angle.

Deziel (2010) further explains section M1502, “You must terminate your dryer vent outside the building. This also means that you can’t blow the dryer exhaust into the attic or the crawlspace. This regulation prevents lint from building up indoors and creating a fire hazard and warm, moist air from promoting rot and mold. The regulation prohibits screens at the outdoor vent termination—they collect lint which eventually blocks the vent.”

Deziel (2010) further states that “according to the International Association of Certified Home Inspectors (NACHI), the IRC defers to dryer manufacturers in specifying such details as the length of the vent and the number of bends it can contain. Some manufacturers design their machines to work with much longer vents. The IRC also leaves it up to the dryer manufacturer to specify the diameter of the vent hose to use. It allows homeowners to use one 8-foot length of flexible pipe to transition from the dryer to the exhaust pipe. This length of flexible pipe must remain visible and accessible so it can be removed and cleaned.”

International Mechanical Code

The International Mechanical Code, IMC (2012) closely matches the IRC. Section 504.4 states that screens shall not be installed at duct termination. Ducts shall not be connected with sheet metal screws or other fasteners that would obstruct exhaust flow. The IMC also states exhaust ducts shall have a smooth interior finish and shall be constructed of metal a minimum of 0.016 inch thick. The exhaust duct shall be 4 inches nominal in diameter. (IMC, 2012)

The specified length of exhaust duct shall be 35 feet. 90 and 45 degree bends subtract the same distance from the duct as stated in the IRC.

Installation Procedures

The Family Handyman Magazine (May, 2014) list a step-by step procedure for installation of a rigid metal duct. The first step is to determine where the duct will run. The article lists a few rules of thumb: The shorter the distance and fewer turns, the better. Also use no more than 25 feet of 4 inch duct. Subtract 5 feet for every 90-degree turn, and 2.5 feet for every 45-degree turn. Avoid windows and outdoor obstructions. The bottom of the vent must be 12 inches above the ground and 12 inches away from any obstructions such as decks or air conditioners. Once the shortest route to the outside has been determined, the outside location for the vent cap is prepared. During the installation of the vent cap, it is important the cap is screwed down evenly so the vent flap will seal properly. After the vent cap is installed the vent must be cut to length. Starting at the dryer the vent is attached. The crimped end fits into the duct cap section. Tape the joints with metal foil tape. The vent is anchored to the wall with pipe straps every 6 to 8 feet. It is important to loop the strap around the duct and not use screws into the duct. The final step is to run the dryer and assure the flapper on the vent cap opens.

A Consumer Product Safety Commission (CPSC) Safety alert explains how to prevent dryer fires. The CPSC also explains the importance of replacing foil accordion-type ducting: “Most manufacturers specify the use of a rigid or corrugated semi-rigid metal duct, which provides maximum airflow. The flexible plastic or foil type duct can more easily trap lint and is more susceptible to kinks or crushing, which can greatly reduce airflow.” (CPSC, 2012)

What fire prevention programs are in place to educate the public about dryer safety?

Portland (OR) Fire Department includes on their web site a list of safety tips to prevent clothes dryer fires. The site recommends:

- Have your dryer installed and serviced by a professional.
- Do not use your dryer without a lint filter.
- Keep the area around your dryer free of things that burn, like boxes, cleaning supplies and clothing.
- Do not restrict the air exhaust vent pipe and make sure that the outdoor flap is opening when the dryer is operating.
- Once a year, clean out the vent pipe or have a dryer lint removal service do it for you.
- Keep dryers in good working order. Gas dryers should be inspected by a professional to make sure that the gas line and connection are intact and free of leaks.
- Make sure the right plug and outlet are used and the machine is connected properly.
- Don't overload the dryer.
- Turn the dryer off if you leave home or go to bed.
- Clothes that have come in contact with flammable substances like gasoline, paint thinner, or similar solvents should be laid outside to dry, then can be washed and dried as usual.
- Increased drying times are one of the best indicators of a dirty or clogged vent. If it takes more than one cycle to dry a load of clothes, especially jeans and towels, cleaning is most likely in order.

CPSC includes similar topics on their website. Additional suggestions are to clean behind the dryer, where lint can build up. It is also recommended to replace flexible ducting. (CPSC, 2012)

The United States Fire Administration (USFA) offers a list of “Does” and “Don’ts” regarding installation, cleaning and maintenance of clothes dryers. Some additional tips are: clean the lint filter with a nylon brush every six months, clean out the vent pipe every three months, and check regularly for nests from birds or insects that can block the outside vent. (USFA, 2012) USFA also offers a Clothes Dryer Fire Safety handout for public distribution.

Sunrise, Florida Fire – Rescue has created a Community Risk Reduction program (CRR). Through a CRR survey, completed in 2011, it was identified that dryer fires account for 5% of fire calls. This number has risen to 13% of fire calls in the three following years. Although this can be contributed to better data collection, it was still a significant community risk. The goal of Sunrise Fire – Rescue is to reduce home clothing dryer fires by 10% over one year. The process used is a direct marketing strategy using door hangers with the dryer fire prevention message clearly stated. These door hangers are distributed in target areas and to the general public. An additional media campaign involving press releases, messages at city events, inserts in utility bills, messages in magazines, use of the city web page, and social media. Fire personnel are trained to deliver a consistent dryer fire safety message. This message is delivered at all events and engagements with the public. Lastly fire personnel are trained to report all equipment involved in dryer fires including model and serial numbers.

(<http://www.sunrisefl.gov/Modules/ShowDocument.aspx?documentID=4243>, p.19)

Summary

The most common cause of dryer fires was found to be spontaneous combustion of accumulated lint in the dryer vent or dryer itself. The clothes in the drum itself were found to not be a factor in most cases. FEMA lists categories of factors contributing to ignition in clothes dryer fires. The leading category was “operational deficiency.” The leading specific factor contributing to ignition, which is part of the operational deficiency category, was failure to clean. FEMA further states proper clothes dryer maintenance to avoid a fire includes removing lint from the traps, vents, and surrounding areas of the dryer. The second common cause was mechanical or electrical failure. Another contributing factor was the use of flexible tubing. The tubing can be pinched during installation restricting air flow. Additionally, the pleats of flexible tubing can allow lint to build up causing a reduction in ventilation. As a vent continues to fill with lint, the heating element is forced to work harder to try to compensate, creating higher temperatures.

Chapter 15 of the International Residential Code regulates the installation of dryer exhaust vents. The minimum diameter of the vent is 4 inches. The maximum length is 35 feet. Furthermore if a bend is placed in the vent, the length is reduced by 2.5 feet for a 45 degree bend, and 5 feet for a 90 degree bend. No more than 8 feet of flexible tubing is allowed, and is used to connect to rigid tubing with smooth interior finish. Flexible plastic tubing is not to be used.

Although there are resources from FEMA and CPSC, they are in the form of posters or handouts. Some Departments use their web sites or social media to get their message out. Portland OR Fire Department compiled a list of safety tips which can be downloaded from their

web page. Sunrise Fire – Rescue was found to have a comprehensive plan, involving public education through marketing and safety messages from trained fire personnel.

Procedures

While conducting research for the National Fire Academy Executive Analysis of Community Risk Reduction, it was found that the Streamwood Fire Department responds to an average of 4 dryer fires per year. The loss from these fires can range from loss of appliance to loss of the structure. This research helped the author construct a problem statement, a purpose statement and three research questions. First a literature review was completed to answer the questions: What are the events that lead to dryer fires? What installation procedures and building codes are in place to help prevent dryer fires? and, What fire prevention programs are in place to educate the public about dryer safety?

A Fire Investigator from Blaze Fire Investigation was interviewed to explain the events which lead to dryer fires. An interview was conducted with a Building Official from the Village of Streamwood Community Development to determine what codes and ordinances are in place. Finally, a Fire Inspector was interviewed from the Streamwood Fire Department Fire Prevention Bureau.

A survey was sent to recipients through three separate venues. First the International Association of Fire Chiefs sent a link through their EFO section. Secondly an e-mail blast was sent to Departments throughout Illinois. Finally, emails were sent to current second year EFO students. A survey was designed and managed through www.questionpro.com. The goal of the survey was to answer what fire prevention programs other departments have in place regarding dryer fires.

A demonstration was conducted to explain the flammability of dryer lint. “Foil type” flexible dryer vent duct was purchased from a local home repair store. The duct stated it was “fire resistant”. Dryer lint was collected from the lint trap of the fire station dryer. The lint consisted of cotton fibers from a standard load of towels. A small amount of dryer lint was placed in the duct and ignited with a barbeque lighter. Flint and steel were used to ignite another amount of dryer lint.

Lastly a fire prevention program was created to educate the citizens of Streamwood on the hazards of dryer lint and how dryer fires can easily be avoided.

Limitations

The literature review began at the National Fire Academy in February of 2016. At that time the author could not find any published ARPs regarding dryer fires. Some magazine articles were available, however no other published works could be found. Several on-line articles were found. With the exception of Sunrise Fire – Rescue, no other public education programs were detailed.

The surveys were anonymous and voluntary. The responses did not detail any specific programs. 103 individuals viewed the survey, 67 started the survey and 65 completed it. Some responses stated the use of social media. Streamwood Fire does not have any type of social media pages. The Village of Streamwood’s web site does not allow for any frequent updated messages.

The interviews conducted were from only one individual from enforcement, inspection, and investigation. This limits the amount of experience and knowledge to only one person in each type of interview. During the Fire Investigation interview, Mr. Granat mentioned Mr. Jack

Sanderson of Firefindings Investigations. Mr. Sanderson is considered an expert in dryer fires. A seminar was conducted in May 2015, and there are no other seminars scheduled in the immediate future. Unfortunately, the author was unable to neither attend nor get in contact with Mr. Sanderson at this time.

Results

What are the events that lead to dryer fires?

This research question was answered through the literature review and an interview with William Granat, a Fire Investigator for Blaze Fire Investigations. Mr. Granat estimated he has investigated over 100 dryer fires in his career. He stated the single greatest factor in causes of dryer fires was homeowner neglect and lack of maintenance. Another factor was poor venting. Mr. Granat explained a recall on dryers which poor design caused excessive buildup of lint.

Some other causes were explained. Electrical problems were rarely found. Motors can seize causing the drum belt to cause heat through friction. Spontaneous combustion can occur when clothing had flammable liquids on them. Improper products in the dryer could also cause the fabric to burn. Another rare cause was the metal from underwire bras loosened from the fabric and shorted the heating element.

Improper venting contributed to fires when it was found to be too long. Improper venting installation also was a factor. Improper venting also occurred when tenants attempted to design their own vent.

Mr. Granat explained certain dryers built by Electrolux in the mid-2000s were found to have a design flaw. Lint was allowed to build up. The telling sign was a burn pattern on the right side of the dryer. (W. Granat, personal communication October 5, 2016)

Further research found Electrolux settled a class action lawsuit in 2014. Although they admitted no wrongdoing, they stated owners need to regularly clean the dryer lint and will get free cleaning services if they have any problems within 5 years of ownership. (Asbury, 2014)

What installation procedures and building codes are in place to help prevent dryer fires?

The literature review found a step by step procedure to properly install ducting. The International Residential Code and International Mechanical Code were quoted regarding ducting requirements.

An Interview was conducted with Mr. Adam Garcia, a Building Official from Streamwood Community Development. When asked if there are any building codes regarding dryer installation, he responded that Streamwood follows the International Mechanical Code. Local Ordinance requires all rental property to be licensed. This licensing requires yearly inspection of property. Dryers and vents are checked during the inspection. Vents are not checked for lint beyond a visual check. Renters are told about dryer cleaning and maintenance. No permits are required regarding installation of dryers and dryer vents. (A. Garcia, personal communication, October 4, 2016)

Firefighter Joe Markowski, Fire Inspector, was interviewed regarding home inspections. Home inspections are made at the request of the homeowner. The Fire Prevention Bureau conducts less than 10 home inspections per year. Multi-family occupancies are inspected only in the common areas. Many inspectors have not been trained in specifics regarding dryer issues. There is a home check off sheet from the NFPA which is used on home inspections. Firefighter Markowski states that addition home inspections would not be overly burdensome. (J. Markowski, personal communication, October 5, 2016)

What fire prevention programs are in place to educate the public about dryer safety?

The literature review found several articles regarding safety tips for homeowners. A survey was sent regarding programs regarding dryer safety.

Does your Department offer home fire inspections?

Yes	<u>35</u>	53.85%	
No	<u>30</u>	46.15%	
Total	65	100	

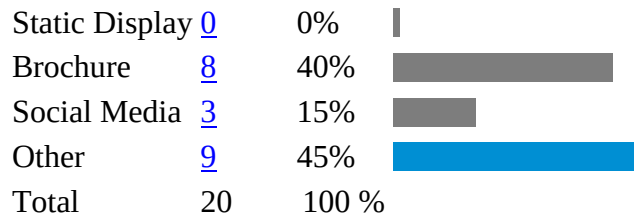
If you perform residential fire inspections, do you include clothes dryer safety?

Yes	<u>25</u>	40.98%	
No	<u>11</u>	18.03%	
We do not perform residential fire inspections	<u>25</u>	40.98%	
Total	61	100 %	

Does your Department offer any programs regarding clothes dryer safety?

Yes	<u>12</u>	18.18%	
No	<u>54</u>	81.82%	
Total	66	100 %	

If yes, how is the program delivered?



If you offer a dryer safety program, can you describe it?

- 1 - General handouts during fire prevention
- 2 - Included in general fire safety
- 3 - No official program. When we encounter an incident with a dryer, general education and safety practices are shared with the homeowner. Most issues are rooted in lack of PM on the unit relating to the clogged vent or a bad thermostat.
- 4 - Safety Brochure
- 5 - A handout is delivered during the Home Safety Visit. Dryer safety is among the topics covered for residents. Due to legalities, the FD only performs visual inspection and recommends the dryer vent is detached and inspected by an qualified/licensed HVAC technician.
- 6 - Voluntary education during a Foster Care Inspection.
- 7 - Brochure at this time only.
- 8 -Verbally whenever we are in a residence
- 9 - Following two dryer fires we posted a safety video on Facebook discussing dryer maintenance
- 10 - We cover it as part of our safety checklist - cleaning out the vent, keeping dryer in good service and removing lint between loads

A test was conducted to check the durability of flexible ducting. A 4 inch diameter aluminum foil duct was used. The goal of the test was to see if the foil duct would fail. The results of this test would be used as a live demonstration at the Streamwood Fire Department Open House. A load of cotton towels were place in a dryer and cycled to the end. The contents of the lint trap were used in the test. The lint was placed in the flexible ducting. Flame from a match

was held to the lint which immediately began to free burn. The ducting failed in less than 2 minutes. After the failure the flames were extinguished with a fire department pump can.

A second test was conducted to determine if sparks could ignite lint from a dryer. As in the first test, the contents from the lint trap were used. Flint and steel were used to create a spark. The lint ignited in the first attempt, and continued to free burn until the lint was consumed.

Discussion

This applied research project seeks to reduce property loss due to dryer fires. Based on the research, a public education program will be developed with the goal of raising public awareness, and reducing loss due to dryer fires. Three research questions were answered in order to prepare and present a Public Education program aimed at reducing the occurrence of dryer fires in Streamwood, Illinois.

Question 1

Research question 1 asked “What are the events that lead to dryer fires?” This question was answered primarily through a literature review. FEMA lists the leading causes of dryer fires. The leading category was “operational deficiency”. The leading specific factor contributing to ignition, which is part of the operational deficiency category, was failure to clean. FEMA further states proper clothes dryer maintenance to avoid a fire includes removing lint from the traps, vents, and surrounding areas of the dryer. (FEMA, 2012) The Consumer Product Safety Commission also issued a “Safety Alert” regarding overheated clothes dryers. The CPSC also recommended cleaning dryers of lint and avoiding the use of plastic or foil type ducting. (CPSC, 2012) Lastly, an interview with Fire Investigator William Granat was conducted. Mr. Granat

stated that in his experience lack of maintenance was the largest contributor to dryer fires. (W. Granat personal communication October 5, 2016)

Question 2

Research question 2 sought to find the proper installation procedures and codes regarding the installation of clothes dryers. As with research question 1, the literature review was utilized to find this answer. Two codes were found: the International Residential Code and International Mechanical Code. The codes regulate the type, diameter, and length of ducting. The codes also limit the amount of flexible ducting to 8 feet. Plastic, flexible ducting is never to be used. An interview was conducted with Mr. Adam Garcia, Building Official from the Village of Streamwood Office of Community Development. Mr. Garcia referenced the International Mechanical code as the guide followed by the Village regarding dryer venting. He further stated in order to maintain a rental license, landlords need their rental property inspected yearly. Inspectors check dryers and vents, but do not check beyond the connections. (A. Garcia personal communication October 4, 2016) Another interview was conducted with Firefighter Joe Markowski, Fire Inspector. Firefighter Markowski stated the Fire Prevention Bureau only conducts home inspections when requested by the homeowner. He stated that the inspection includes a brief look at the clothes dryer.

Question 3

Research question 3 sought to answer what fire prevention programs are in place to educate the public about dryer safety? Again, a literature review found safety tips from FEMA, CPSC and Portland, OR Fire Department. Sunrise Fire Rescue has a program in place which has

a goal of reducing dryer fires by 10% in one year. The plan utilizes various marketing techniques to educate the public. Door hangers are used in target areas, messages are presented through press releases, internet, and social media. A survey was presented to fire departments through questionpro.com. The majority of respondents (81%) did not have any type of program in place. Several departments mentioned handouts or brochures. One response mentioned posting a dryer safety video to Facebook.

As a result of answering the research questions, a plan was developed to create an education program with the goal of reducing dryer fires. The five E's of risk reduction from the National Fire Academy (NFA) were considered when selecting a strategy. Education, Engineering, and Enforcement were considered as easily attainable solutions. (*Executive Analysis of Community Risk Reduction*, 2015, p. SM 3-43) Economic Incentives and Emergency response were considered secondary solutions.

An enforcement solution was already in place regarding inspections of rental property. A brochure will be produced to suggest simple remedies to avert dryer fires. Our fire prevention bureau will also receive a brochure to hand out to residents. Our home fire inspection program will be marketed through the Village's quarterly newsletter. A Power Point presentation will be developed regarding dryer fires. The presentation will be made available to neighborhood watch meetings, safety fairs and community groups. A display will be utilized at our yearly Fire Department Open House demonstrating the flammability of dryer lint. Finally, an article will be placed in the Village's quarterly newsletter as well as the neighborhood newspaper.

Recommendations

After analyzing the research data the following recommendations are made:

First, a brochure will be produced for the Community Development Department to have for residents during rental unit inspections. The brochures will also be available to the public at the Community Development office.

Second the Fire Prevention Bureau will market their home fire inspections. The inspections will include checking dryers and venting systems. This service will be marketed through the Village web site, television channel, and newsletter.

Third, a Power Point presentation will be developed to be viewed by community groups at safety fairs, neighborhood watch meetings and other gatherings. Included in the Power Point will be the importance of cleaning vents and dryers, the proper venting, and proper maintenance.

Fourth, a display will be presented at our annual Open House. Pictures will be on hand to show the aftermath of dryer fires. A demonstration will also be included to emphasize the flammability of dryer lint. A second demonstration will show the effects of fire on foil venting. Safety check off sheets will also be available as part of the display. This display will also be utilized at our annual summer celebration event and Citizens Fire Academy.

Fifth, safety articles will be included in our Village newsletter and neighborhood newspaper. Additionally crews will deliver safety materials to the surrounding neighborhood if a dryer fire should occur.

Finally, all crews will have training in causes of dryer fires. This will enable firefighters to assist residents with any questions they might have. Additionally, when crews are on EMS or service calls, they can educate the public on any hazards they encounter.

A dryer fire can have devastating results. Most dryer fires are avoidable. The public simply needs to understand the basic maintenance necessary to keep their appliance safe. The goal of this Applied Research Project is to raise awareness in order to reduce this type of loss.

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Appendix A

Dryer Safety Power Point

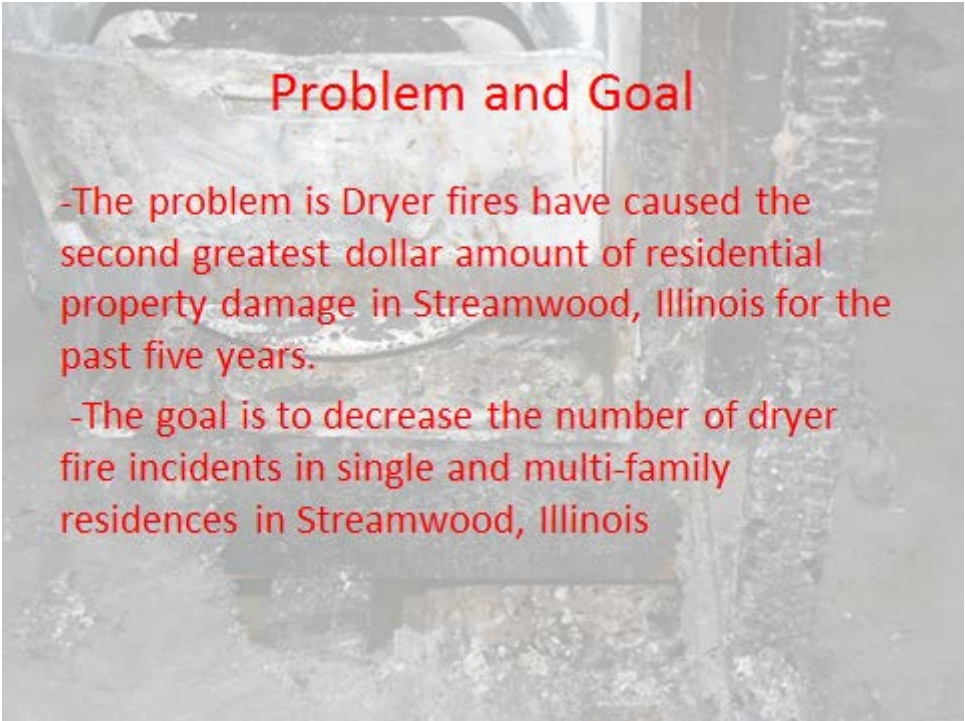




A photograph of a severely damaged, dark-colored front-loading dryer. The front panel is missing, revealing the internal drum and mechanical components. The surrounding area shows signs of fire damage and debris.

Risk Potential

- In addition to loss of property
 - Families are displaced
- Potential for death and injury due to delayed discovery of fire
- Risk is not greatly known among the community

A photograph of a severely damaged, dark-colored front-loading dryer. The front panel is missing, revealing the internal drum and mechanical components. The surrounding area shows signs of fire damage and debris.

Problem and Goal

- The problem is Dryer fires have caused the second greatest dollar amount of residential property damage in Streamwood, Illinois for the past five years.
- The goal is to decrease the number of dryer fire incidents in single and multi-family residences in Streamwood, Illinois



Factors which contribute to Dryer Fires



- Lack of Maintenance;
Failure to clean
- Mechanical
Failure/Malfunction
- Electrical
Failure/Malfunction

Failure to clean is the leading cause of dryer fires



- Lint is flammable and can burn
- Lint can build up in dryer vents and cause the dryer to work harder
- Harder working dryers cause increases in exhaust temperatures

Make sure ducting is properly installed



Foil and plastic ducts can burn



- Only 8 feet of flexible ducting should be used
- Avoid foil or plastic ducts



Tips to Avoid Dryer Fires



- Clean the lint screen before or after every load of clothes
- Clean the dryer vent at least once per year – more if used often
- Make sure the outdoor vent flap is working properly
- Clean behind the dryer where lint can build up
- Keep the area around the dryer free of things that can burn - like cardboard, plastic, etc

More Safety Tips



- Replace foil or plastic vents with rigid or flexible venting
- Don't overload the dryer
- Turn off the dryer before you leave or go to bed
- Clothes that have come in contact with flammable liquids should first be laid out to dry then washed and dried

REMEMBER!

- Increased drying times are one of the best indicators of a dirty or clogged vent. If it takes more than one cycle to dry a load of clothes, especially jeans or towels, cleaning is most likely in order.
- **The Leading cause of dryer fires is...

FAILURE to CLEAN



Appendix B

Brochure for Community Development

OUR MISSION

As a team of highly trained and dedicated professionals, it is our mission to provide the highest standard of service to all those who may seek our help.

We are a service provider and we stand ready to provide fire suppression, fire prevention and education, rescue services and emergency medical care. We will faithfully provide these important services promptly and safely to any person that resides in, works in, or visits the Village of Streamwood.

As a family of individuals committed to serving others, we will always provide for the welfare of our members through a healthy and rewarding work environment. We are dedicated to respect, integrity, compassion and leadership amongst ourselves so that we may proudly serve others.

STREAMWOOD FIRE DEPARTMENT

If you have any questions, or would like to schedule a Free home fire safety inspection, please contact us.

630-736-3650
fire@streamwood.org



Streamwood Fire Department
1095 E Schaumburg Rd
Streamwood, IL 60107

Prevent Dryer Fires

STREAMWOOD
FIRE
DEPARTMENT



The leading cause of dryer fires is failure to clean them

- Have your dryer installed and serviced by a professional
- Do not use the dryer without a lint filter
- Clean the lint filter before or after every load of clothes
- Keep the area around your dryer clear of things that can burn, like boxes, clothing, cleaning supplies, etc.
- Clothes that have come in contact with flammable liquids, like gasoline, paint thinner, or similar solvents should be laid outside to dry, then washed and dried as usual.
- Once a year, or more often if it is taking longer than normal for clothes to dry, clean out the vent pipe, or have a dryer lint removal service do it for you.
- Remember... Lint can burn, Keep your vents clear of lint



Dryer Fires are Preventable!



Use proper venting

- Replace any foil or plastic vents with rigid or flexible metal venting. Plastic and foil vents can melt or burn.
- Clean behind your dryer, and check to make sure the vent is not crushed.
- Only 8 feet of the vent should be flexible, the rest should be rigid smooth metal venting.
- Dryers should always vent to the outside.
- Make sure the vent pipe is unrestricted and the vent flap opens when the dryer is operating.

Keep dryers in good working order

- Gas dryers should be inspected by a qualified professional to make sure the gas line and connection are intact and free of leaks.
- Make sure the right plug and outlet are used and that the machine is connected properly.
- Follow the manufacturer's operating instructions and don't overload the dryer.
- Turn the dryer off before leaving home or going to bed.
- Increased drying times are one of the best indicators of a dirty or clogged vent. If it takes more than one cycle to dry a load of clothes, especially jeans or towels, cleaning is most likely in order.



Appendix C

Interview with Mr. Adam Garcia, Building Official

Community Development Department, Streamwood Illinois

October 4, 2016

1. Do we have any codes or ordinances in place regarding dryer installation?
We follow the International Mechanical Code regarding venting as far as type, diameter, maximum length, etc.
2. Do we have yearly rental property inspections?
Yes, all rental properties are inspected yearly. These are required in order to maintain a Rental License.
3. Do you inspect dryers and vents on during the inspection?
Yes, the connections and venting. We do not inspect the inside of vents, or the outside exhaust.
4. Do we inform renters about renters insurance?
No
5. Do we require a permit for dryer installation?
No
6. Is information given to owners/renters regarding cleaning and maintenance of clothes dryers?
Yes. Verbally, oftentimes the renter is present during the inspection

Appendix D

Interview with Mr. William Granat, Fire Investigator

Blaze Fire Investigations

October 5, 2016

1. How many years have you been a Fire Investigator?
18 Years
2. How many dryer fires do you estimate you've investigated over your career?
Over 100
3. Can you estimate the percentage of fires which extended beyond the appliance?
About 25%. And those which kept to the appliance created a lot of smoke damage.
4. What have you found were the events which led to clothes dryers starting on fire?
Homeowner neglect or lack of homeowner maintenance. Poor venting. Lint buildup due to poor design. (This was true in the case of Electrolux dryers.) Clothing catches fire in the drum.
5. What type of electrical problems have you found?
Problems with the power cord to the outlet. Electrical problems were found to be rare events.
6. What type of mechanical problems have you found?
The motor seizes up, and then the belt creates heat through friction.
Electrolux dryers were recalled due to mechanical issues.
7. Any other causes?
Underwire bras have caused shorting out of the heating element, when the metal worked away from the material.

Improper products put in the dryer, or clothing with flammable liquids on it.

8. Did improper venting contribute to the fire?

Yes. Vents too long, or too short. Improper installation, tenants designed their own venting system

9. What measures could have prevented the fire?

Manufacturer design flaws have caused dryer issues. In the case of Electrolux, dryers were recall. Additionally, a class action lawsuit ensued and was settled. The telltale sign of these fires was a burn pattern on the right side of the dryer. This also caused imitators to try to use the recall as a reason for the fire cause.

10. Can you provide any other comments?

Jack Sanderson from firefindings has studied many dryer fires and holds a seminar on the subject.

Appendix E

Interview with Firefighter Joe Markowski, Fire Inspector

Fire Prevention Bureau, Streamwood Illinois

October 4, 2016

1. Does the Fire Prevention Bureau conduct home fire safety inspections?
Yes, at the request of the homeowner. We conduct multi-family residential inspections, but only of the common areas.
2. How many home fire safety inspections are done each year?
Less than 10. Homeowners call when they want an inspection. Usually, those that call are very aware of fire safety. Most residents do not seem interested in an inspection.
3. Are appliances, especially dryers checked during the inspection?
No. The vents in multi-family residences are usually not checked. It is not on the inspection check off sheet. The form for home safety inspections does mention to check the dryer vent and lint trap.
4. Are there any codes which we use that require home appliances to be checked?
No. Home inspections are not required by any code. We follow the International Fire Code (IFC 2012) and also the Life Safety Code (NFPA 101) There are also ammaneded codes on the Village web site..
5. Would the Inspectors be able to handle additional residential inspections?
The average business inspection takes less than 30 minutes. Residential takes even less time. The work load should be able to be absorbed without much difficulty.
6. Do you have anything else to add?
Most Inspectors do not always understand what to look for regarding dryers. They have not been educated in this area. Rental units are inspected by Community Development

Appendix F

Pictures of Open House Display

