



## Fire Safety During Residential Construction

January 8, 2010



## Fire Prevention Division

Ken Carlson, Fire Marshal  
Dwight Altenburg, Assistant Fire Marshal

## Ken Carlson

- Fire Marshal: 2005 – present
- Building Official and Fire Marshal: 1998 – 2005
- Building Official: 1990 – 1998
- Building Inspector: 1984 – 1990



## Dwight Altenburg

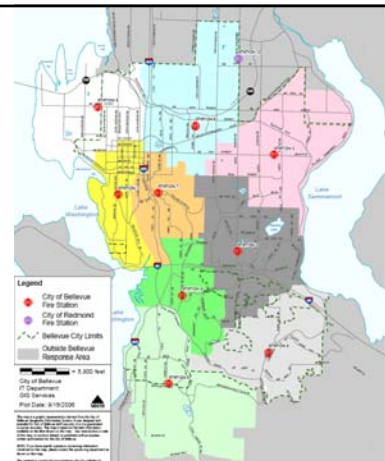
- Assistant Fire Marshal, Inspections: 2005 – Present
- Fire Prevention Officer-Investigator: 2001-2006
- Captain-Training Officer Redmond Fire Department: 1974-2001

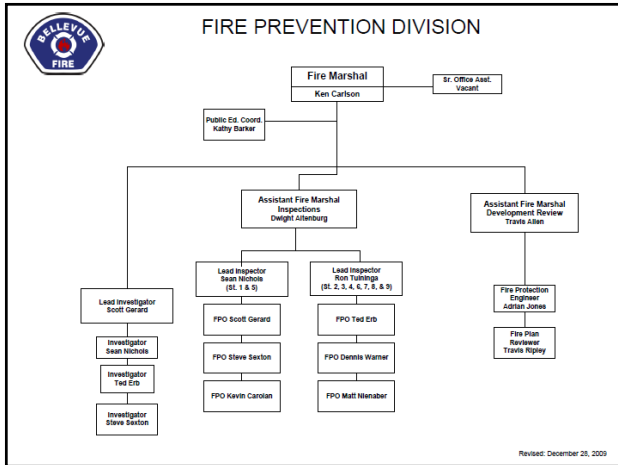


## Bellevue Fire Department

- Population Served ~ 138,000 (Fire & BLS); 250,000 (ALS)
- Response area – 35 sq. miles (Fire & BLS); 300 sq. miles (ALS)
- 9 Fire stations & 4 medic locations
- 165 firefighters, 39 medics
- Daily, on duty staffing of 49
- 17,174 incidence in 2008 79.9% EMS, 20.1% Suppression. 120 Structure fires
- ISO rating - Class 2
- Internationally Accredited Agency
- 2009 budget - \$35.7 million

## Bellevue Fire Response Area





## Mutual Aid

- All Fire Department's in King County Operate under a mutual aid agreement
- Closest unit to an emergency scene is always dispatched regardless of jurisdictional boundaries
- Minimum staffing for a fire in Bellevue is 17 firefighters (4 – 6 stations)
- 70% of the time would draw resources from neighboring agencies

## SELECTIONS FROM THE U.S. FIRE PROBLEM OVERVIEW REPORT<sup>1</sup>

Leading Causes and Other Patterns and Trends; Properties that are Vacant, Under Construction, Renovation or Demolition

**NFPA**  
Fire Analysis and Research Division  
[www.nfpa.org](http://www.nfpa.org)  
June 2003

<sup>1</sup><http://www.nfpa.org/assets/files/MbrSecurePDF/OS.Vacant.PDF>

### United States

1998 Structure Fires in Vacant or Life Properties or Properties under Construction, Demolition or Renovation

Occupancy	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Under construction	800	0	2	\$28.8
Life not routinely used	1,900	3	3	\$22.7
Under major renovation	300	0	4	\$6.6
Vacant and unsecured	7,700	18	35	\$67.1
Being demolished	300	0	0	\$3.3
<b>Total</b>	<b>1,800</b>	<b>24</b>	<b>66</b>	<b>\$41.7</b>

Structure Fires in Vacant or Life Properties or Properties under Construction, Demolition or Renovation 1994-1998 Annual Average

Occupancy	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Building under construction	400	0	0	\$17.4
Building under demolition	400	0	3	\$3.0
Construction of new building structure	0	0	0	\$0.2
Demolition of existing building structure	0	0	0	\$0.1
Vacant property	11,400	18	35	\$73.6
Contractor's shed	300	0	3	\$2.2
Life property	1,700	2	10	\$18.9
Building under renovation	400	0	4	\$3.6
Classified as unknown type construction or unoccupied property	300	0	1	\$3.9
<b>Total</b>	<b>1,800</b>	<b>13</b>	<b>66</b>	<b>\$28.7</b>

Note: These fires were reported to U.S. municipal fire departments and do not include fires reported only to Federal or state agencies or industrial fire brigades. Fires are ranked by the number of deaths, deaths and injuries to the nearest one, and direct property damage to the nearest hundred thousand dollars. Totals may not equal totals due to rounding errors. Damage has not been adjusted for inflation.  
Source: National estimates based on NFIRS and NFPA survey.

### Washington State 2001 - 2008

Building Status	Fires	Civilian Deaths	Civilian Injuries	Sum of Contents Loss	Sum of Property Loss
Under construction	197	1	4	\$ 813,750	\$ 18,106,850
Life, not routinely used	158	0	0	\$ 1,926,955	\$ 4,923,125
Under major renovation	176	1	7	\$ 1,054,052	\$ 5,404,008
Vacant and secured	520	0	6	\$ 2,619,527	\$ 23,111,302
Vacant and unsecured	414	0	4	\$ 354,263	\$ 8,482,552
Being demolished	33	1	0	\$ 306,800	\$ 675,213
Being demolished	2	0	0	\$ -	\$ -
<b>Grand Total</b>	<b>1,526</b>	<b>3</b>	<b>18</b>	<b>\$ 15,487,347</b>	<b>\$ 60,704,852</b>

#### Construction Fire Cause of Ignition 2001-2008

#### Construction Fires by Month 2001 - 2008

## U.S. Fire Administration TOPICAL FIRE RESEARCH SERIES

Volume 2, Issue 14  
November 2001 (Rev. March 2002)

### Construction Site Fires

FINDINGS

- Each year, an estimated 4,800 construction site fires cause \$35 million in property loss.
- Firefighters injured in construction fires are twice as likely to be hit or struck by debris and other objects than firefighters at other fire sites.
- Fire incidence at construction sites/complexes increases as the work-day progresses.
- The causes of 71% of construction site fires are arson and open flame.

Source: NFPA and NFIRS

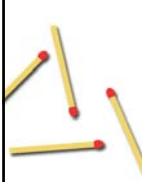
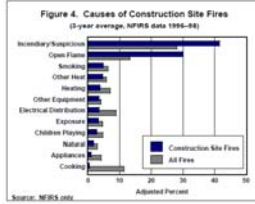
Each year between 1996 and 1998, an estimated 4,800 fires were reported at construction sites or complexes. These fires are responsible for approximately 30 injuries, 10 fatalities, and \$35.2 million in property loss.<sup>1</sup> This report addresses the causes and characteristics of these fires.

<sup>1</sup><http://www.usfa.dhs.gov/downloads/pdf/frs/v2i14-508.pdf>



**CAUSES**

Figure 4 illustrates the leading causes of construction site fires. The two dominant causes are incendiary/suspicious (arson) (41%) and open flame (30%). Arson fires are one and one-half times more frequent than all reported fires.



**SOURCES OF IGNITION**

The leading sources of heat of ignition at construction sites are listed in Figure 5. The open fire category includes rubbish fires, open incinerators, and open trash burners. The combination of open fire and cooking heat sources of ignition (15%) correspond to the high incidence of open flame fires.

**Figure 5. Sources of Heat of Ignition**  
(3-year average, NFIRS data 1996-98, adjusted percentages)

HEAT OF IGNITION	PERCENT OF FIRES
Matches	15
Relaxation	5
Cooking/Smoking	5
Open Fire	5
Cigarettes	5

Figure 6 highlights the leading factors influencing the ignition of construction site fires. The prevalence of incendiary/suspicious fires is not surprising. For the remainder of fires, about 30% involve the source of the heat of ignition (e.g., cutting/welding too close to combustibles). This underscores the importance of properly discarding ignition sources and using tools in an appropriate manner.

**Figure 6. Factors Influencing Fire Ignition**  
(3-year average, NFIRS data 1996-98, adjusted percentages)

IGNITION FACTOR	PERCENT OF FIRES
Incendiary/Suspicious	30
Cutting/Welding Too Close to Combustibles	15
Abandoned/Overlooked Materials	5
Inadequate Control of Open Fire	5



**MATERIALS IGNITED**

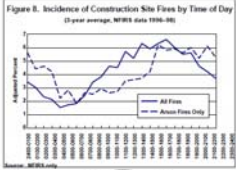
The leading materials ignited in construction site fires are rubbish bins, growing/setting forms, including grass, trees, and brush, and structural members/finishing materials. Consistent with the preponderance of arson fires, fuel—particularly gasoline—is also a common material ignited in fires on construction sites.

**WHEN FIRES OCCUR**

Construction site fires are spread somewhat uniformly throughout the year (Figure 7). March and July are peak months.



As shown in Figure 8, fire incidence at construction sites increases steadily over the course of the workday (0600-1800). The pattern for arson fires at these sites, however, is the opposite, with fire incidence more prevalent after hours. (This is consistent with national arson trends generally.)



**Greatest Potential for Fire Exist During Construction, because:**

- Little to no compartmentalization exists
- Large amounts of combustible material are present
- Sites are often unsecured and unoccupied for extended periods of time
- Significant numbers and types of ignition sources are present
- FD response can be significantly delayed because of temporary/obstructed access, poor address/street signage

**Harrington Square (Renton) Apartment Fire – June 2009**





Cause = open flame from a roofing torch  
Loss = \$12,000,000

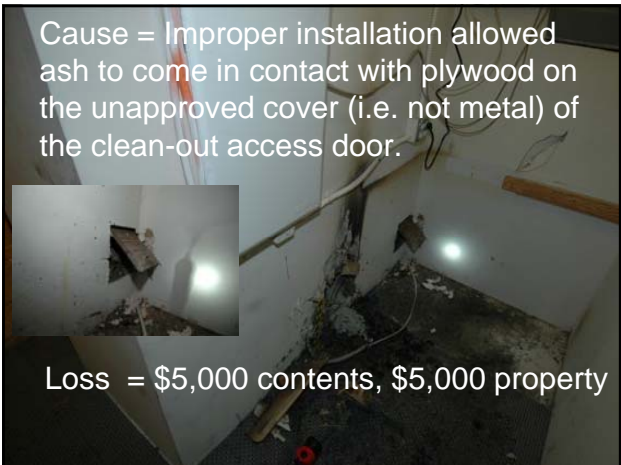
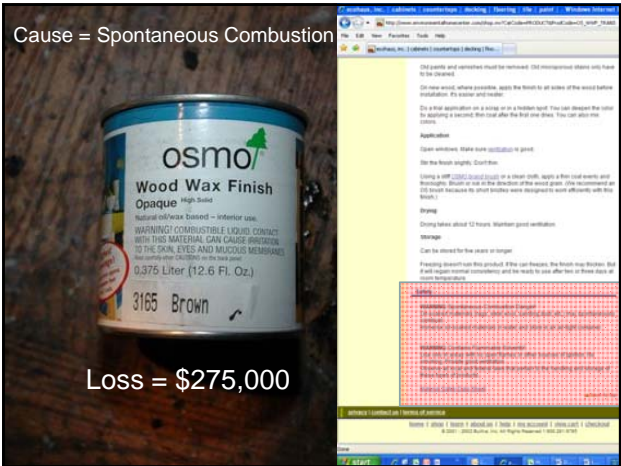


Cause = Arson  
Loss = \$7,000,000<sup>1</sup>



Cause = spontaneous combustion  
Loss = \$900,000  
Sprinklered structure, but not activated







## Advanced Planning



- ✓ Designated Fire Prevention Program Superintendent
- ✓ Fire safety plan
- ✓ Personnel Trained








## Preventing Fires

- ✓ Secure Site (fencing, security personnel, video surveillance etc.)
- ✓ Limit accumulations of combustible debris
- ✓ Smoking only in designated areas
- ✓ Materials susceptible to spontaneous ignition stored in appropriate containers
- ✓ Use only listed heated equipment

## Hot works program

Blue Origin, LLC.      CH2M HILL

**APPENDIX A. HOT WORK PERMIT**

DATE ISSUED: \_\_\_\_\_ VALID UNTIL: \_\_\_\_\_

BUILDING: \_\_\_\_\_ BUILDING #: \_\_\_\_\_ PROJECT #: \_\_\_\_\_

LOCATION OF WORK: \_\_\_\_\_

BLUE ORIGIN PROJECT MANAGER(S): \_\_\_\_\_

CONTRACTOR(S): \_\_\_\_\_

This location where this work will take place will be controlled before the start of cutting/welding operations and all the appropriate procedures (including any hot work areas) will be in place before work begins.

Signed for use of permit: \_\_\_\_\_ Date: \_\_\_\_\_

Print name: \_\_\_\_\_

**FIRE SAFETY PRECAUTIONS**


BEFORE THIS WORK, all of the following precautions shall be taken:

1. Cutting, welding or heating equipment shall be thoroughly inspected and found to be in good repair. Use of damaged or broken.
2. A valid permit (in accordance with applicable laws and regulations) shall be obtained and held in full view of the work area.
3. All hot work shall be done in a well-ventilated area. The equipment (in this instance an air plant) shall be available and accessible to personnel conducting the cutting/welding operation.
4. Hot work shall be done in a well-ventilated area. The equipment (in this instance an air plant) shall be available and accessible to personnel conducting the cutting/welding operation.
5. All equipment used for cutting/welding and hot work shall be stored at least 10 feet away from the cutting/welding operation.
6. An eye shield be placed in view of personnel before they start the hot work area. (CAUTION: HOT WORK, DO NOT TOUCH!)
7. Spillable protection shall not be done off while hot work is being done.
8. When applicable, the following precautions will also be taken before the work begins:
  - a. The material shall be properly stored, separated, secured, etc., shall cover combustible items.
  - b. Spillable protection (the material placed, removed, repaired, etc.) shall be inspected before the cutting/welding operation.


Hot Work Program      Page 7 of 8

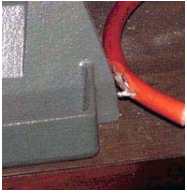
### Hot Work.

Operations including cutting, welding, Thermit welding, brazing, soldering, grinding, thermal spraying, thawing pipe, installation of torch-applied roof systems or any other similar activity



## Extension cords free from damage

## Are you ready for a fire?

- ✓ Fire Department Access
- ✓ Unobstructed access to hydrants & FD Connections
- ✓ Means to report fire
- ✓ Address posted
- ✓ Adequate water supply for firefighting
- ✓ 2A10BC portable fire extinguishers



## Additional Resources

- International Code Council – [www.iccsafe.org](http://www.iccsafe.org)
- National Fire Protection Association – [www.nfpa.org](http://www.nfpa.org)
- United States Fire Administration – [www.usfa.dhs.gov](http://www.usfa.dhs.gov)
- Bellevue Fire Department - [http://www.bellevuewa.gov/fire\\_marshall\\_message.htm](http://www.bellevuewa.gov/fire_marshall_message.htm)



### Chapter 14



**1401.1 Scope.** This chapter shall apply to structures in the course of construction, alteration, or demolition, including those in underground locations. Compliance with NFPA 241 is required for items not specifically addressed herein.

**1401.2 Purpose.** This chapter prescribes minimum safeguards for construction, alteration, and demolition operations to provide reasonable safety to life and property from fire during such operations.



### Buildings Under Construction

October 2009

Public Information Handbook 1-13

Fire during construction, alteration, or demolition are an ever-present threat. The fire potential is inherently greater during these operations than in the completed structure because of:

- Previous occupancy hazard and fire protection change conditions of construction, materials and design.
- Building design such as temporary heating, cooling, and smoking.
- The threat of debris being greater due to the possibility of construction materials on site and in open areas.

Fires can be prevented or controlled through the early planning, scheduling, and implementation of:

- Fire protection measures.
- Fire protection systems.
- On-site security.

#### Precautions to be Checked

- Verify a fire safety plan and appoint a responsible person to administer the plan. Provide a copy to the fire chief and the fire department. If the plan is not approved at the construction site adjacent to the structure.
- Provide access to the job site for fire department apparatus from the street at the nearest through connection. The emergency access roadway must extend to within 100' of all portions of the exterior walls of the building.
- Provide fire protection free access from the street to the hydrant and to complete connections for standpipes, sprinklers, or other fire fighting equipment, whether permanent or temporary.
- At each job site all of the following:
  - Verify scope of construction and
  - Verify scope of hazards exist, including but not limited to the storage and use of flammable and combustible liquids.
  - Monitor activities such as tree removal, removal of damaged equipment and cords from service and overhead cables.

□ Where a fire sprinkler system is to be installed, assure the installation is in service as soon as practicable.

□ Provide standpipes for use during construction in buildings of 4 or more stories having an average floor area greater than 10,000 sq. ft.

□ Provide at least one emergency egress stairway after construction activity to a height of 10' or more. Stairs necessary to egress, identify the exit paths, provide appropriate exit signage.

□ Do not allow private vehicles to be parked in buildings under construction and the fire sprinkler system to be placed in service changing order the notification, and the parking garage has been approved by the building department and the fire department.

□ Do not locate job offices in buildings under construction. Job offices must be separated by not less than 20' across the building under construction in buildings with fire sprinkler systems that have been placed in service and complete emergency egress and egress.

□ Obtain emergency access to roof.

□ Fire Safety During Construction and Demolition - Chapter 14, International Fire Code

□ Chapter 14 Subpart 14.01 Construction, Alteration, and Demolition Operations - CodeBook Fire Protection Association NFPA, December 2006

□ Life Safety Code - Section 4.6.10 of NFPA, 2009

For additional certification or information please contact the Fire Prevention Division of the Bellevue Fire Department at 425-452-6972

Construction Code Safety and Health Standards - Washington State Department of Labor & Industries, 1-800-547-3337 or www.dli.wa.gov



## Questions?

