DETAILED INFORMATION ON THE REDMOND LIVE FIRE PROJECT

BACKGROUND

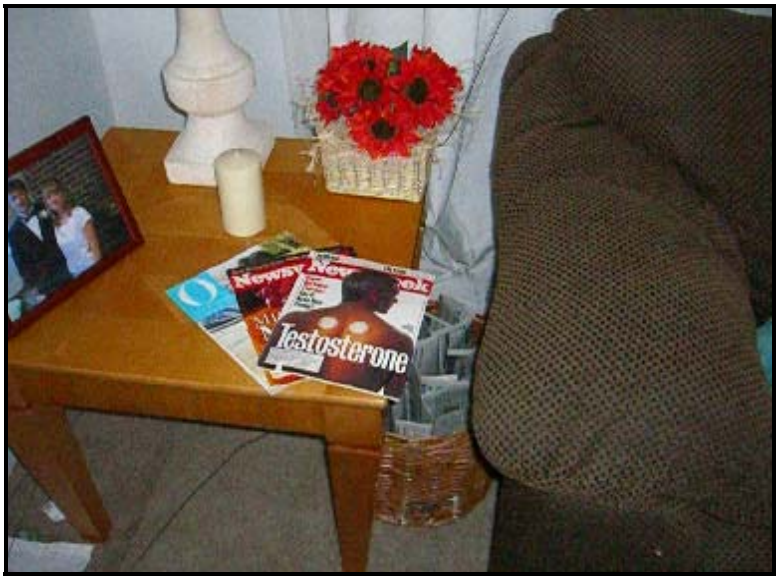
On September 9, 2006 three live fire exercises were conducted on a home scheduled for demolition in Woodinville, WA. The Redmond Fire Department and the Woodinville Fire and Life Safety District conducted these exercises cooperatively. The primary goal for this project was to gather data to support the adoption of a local ordinance requiring sprinkler systems in all new residential occupancies. The live fire exercises compared the fire development and temperature rise characteristics of an unprotected typical living room and bedroom to identical rooms that included a single UL Listed concealed residential sprinkler installed in accordance with NFPA 13D, Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes. This research consisted of a side-by-side simultaneous comparison of two living room fire scenarios, followed by two separate bedroom fire scenarios.

Underwriters Laboratories supported this effort by refining and testing the ignition scenarios in our laboratories prior to the actual fires, and reviewing the proposed sprinkler installation to ensure it was appropriate. UL staff also traveled to the burn site to setup an instrumentation package, record the actual time/temperature data, and film all of the live fire scenarios.

The sprinklers in the protected rooms were UL Listed concealed residential sprinklers with a 4.3 K-Factor and a 165° F rating; utilizing 135° F-rated cover plates. The water supply for the sprinklers was provided from a 35-psi source. Temperature measurements were taken in nine locations in the bedroom fires and ten locations in the living room fire scenarios, including 5 feet-3 inches above floor level.

IGNITION SCENARIOS

Two different ignition scenarios were used in the live fire exercises. Both of the ignition scenarios were based on fire date published by the U.S. Fire Administration (USFA). The ignition scenario used in the living room fires simulated placing burning material into a wastebasket that contained combustible material, which is a well-documented cause for residential structure fires.

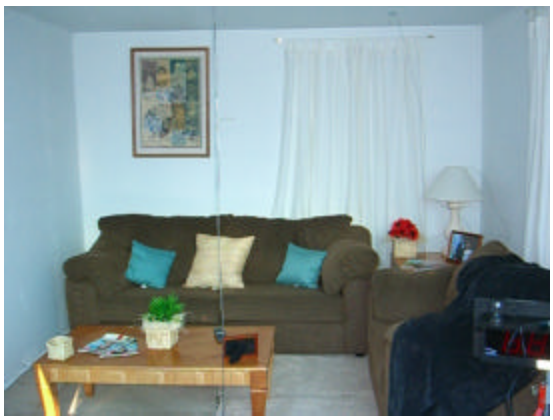


The ignition scenario used in the bedroom fires consisted of a candle placed too close to adjacent combustible material. This scenario was selected based on data published by the U.S. Fire Administration (USFA) that concluded that 50 percent of residential candle fires were caused by placing a candle too close to combustible material, and that one-third of residential candle fires originated in the bedroom.

LIVING ROOM FIRES

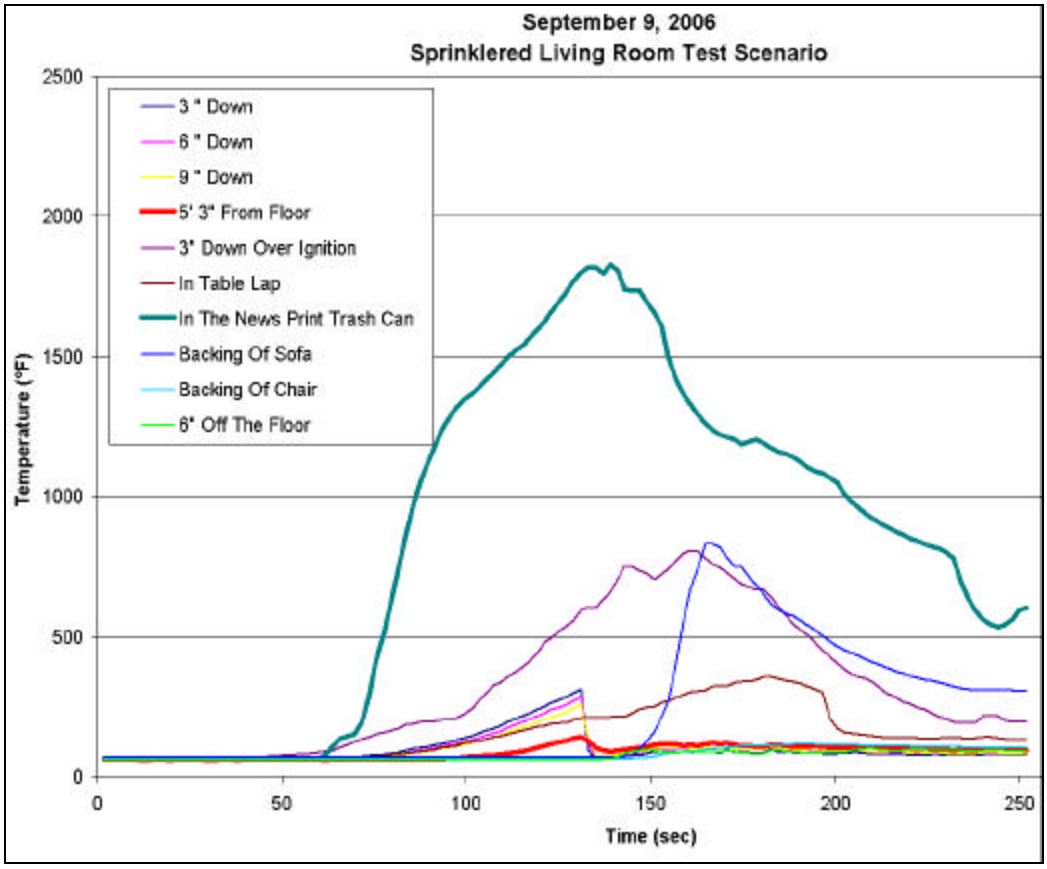
The living room fire scenarios were set up in the burn house's detached two-car garage. Two 11-foot by 14-foot rooms were constructed by local firefighters, with one side open for viewing. The living rooms were fully finished, including paint and carpeting. The furnishings in both rooms were identical, and consisted of a sofa and chair, coffee table, end table, 25-inch TV with stand, framed artwork, draperies, a table lamp, miscellaneous pictures, throw pillows, wicker wastebasket, and decorative baskets. A smoke alarm was also installed in each living room.

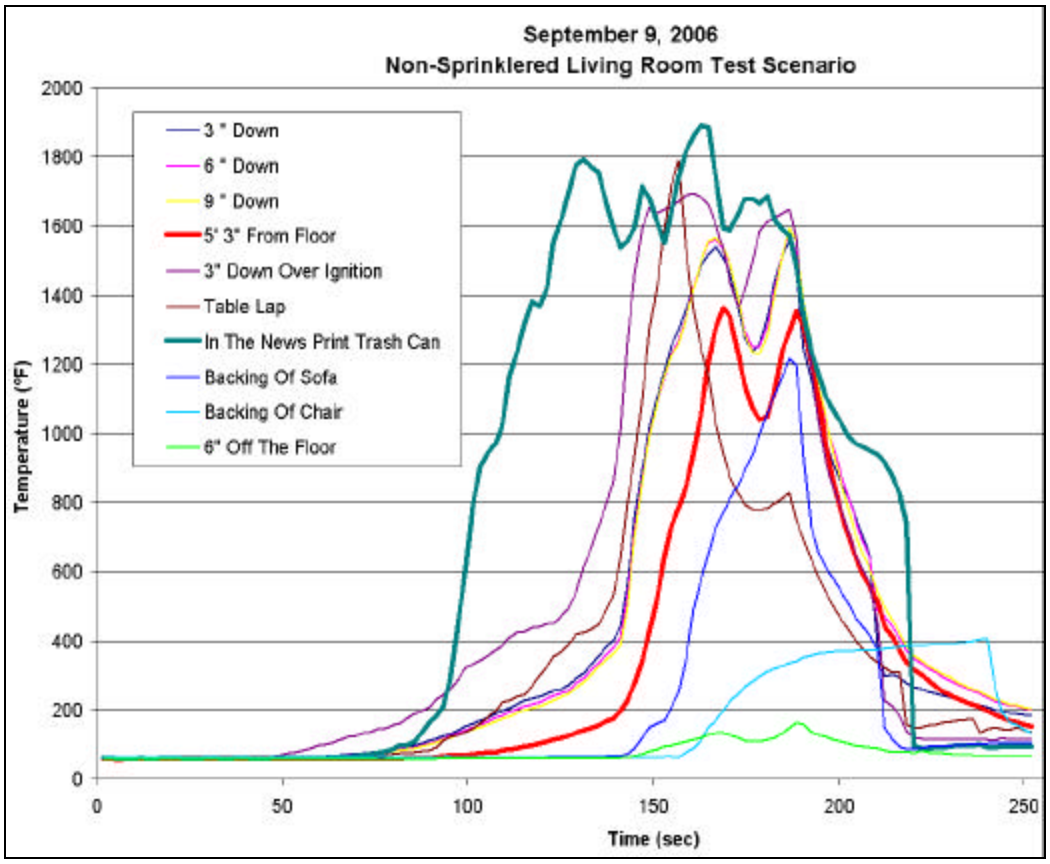
Sprinkler Protected Living Room

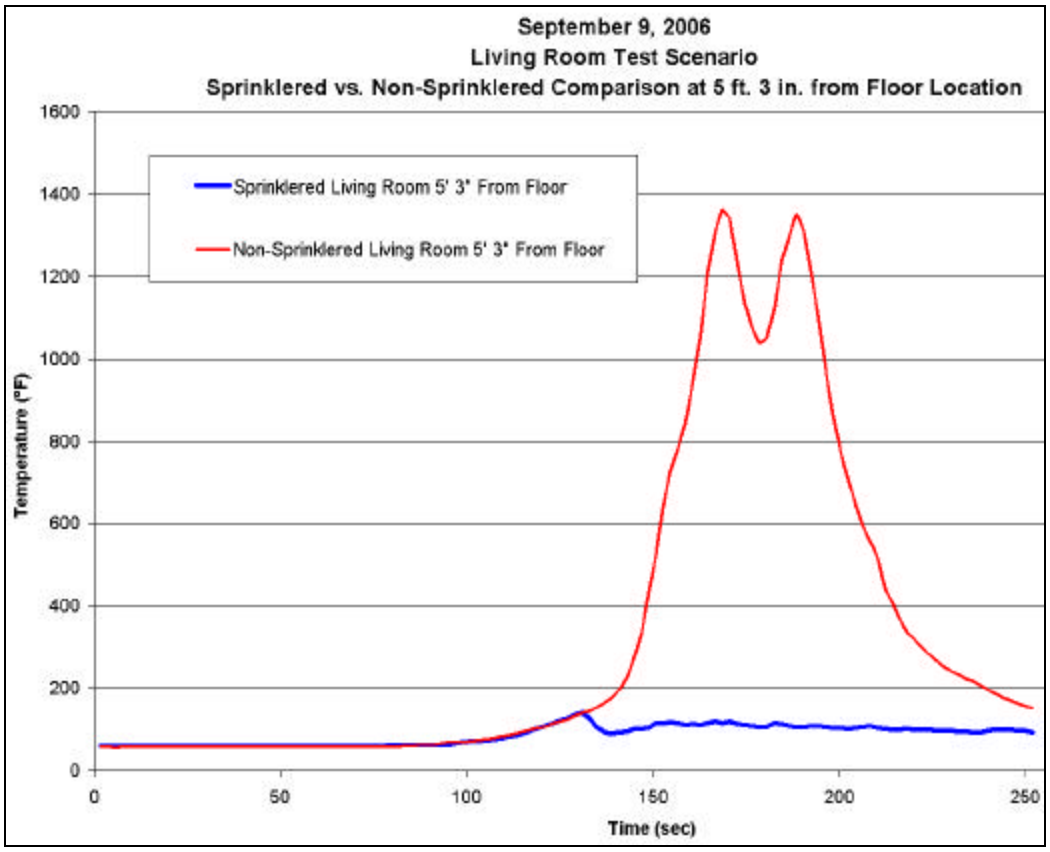


Unprotected Living Room

RESULTS OF LIVING ROOM FIRES




September 9, 2006
Non-Sprinklered Living Room Test Scenario
3 " Down
6 " Down
9 " Down
5' 3" From Floor
3" Down Over Ignition
Table Lap
In The News Print Trash Can
Backing Of Sofa
Backing Of Chair
6" Off The Floor
Temperature (°F)
Time (sec)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
50
100
150
200
250


September 9, 2006
Living Room Test Scenario
Sprinklered vs. Non-Sprinklered Comparison at 5 ft. 3 in. from Floor Location
Sprinklered Living Room 5' 3" From Floor
Non-Sprinklered Living Room 5' 3" From Floor
Temperature (°F)
Time (sec)
0
200
400
600
800
1000
1200
1400
1600
0
50
100
150
200
250

The time/temperature information from the living room fire scenarios are shown in the preceding tables. As can be seen, the living room fires were ignited simultaneously, and spread swiftly from the point of origin in the wastebasket to the draperies and sofa. The smoke alarms in both living rooms sounded quickly, which would have alerted the occupants of the danger. The fire growth in the unprotected living room developed a maximum temperature of 1,362° F at 5 feet-3 inches above the floor in three minutes and 47 seconds, compared to a maximum-recorded temperature in the living room protected with sprinklers of 120° F measured at 5 feet-3 inches above the floor. In the sprinklered living room scenario, the fire was effectively contained near the point of origin.

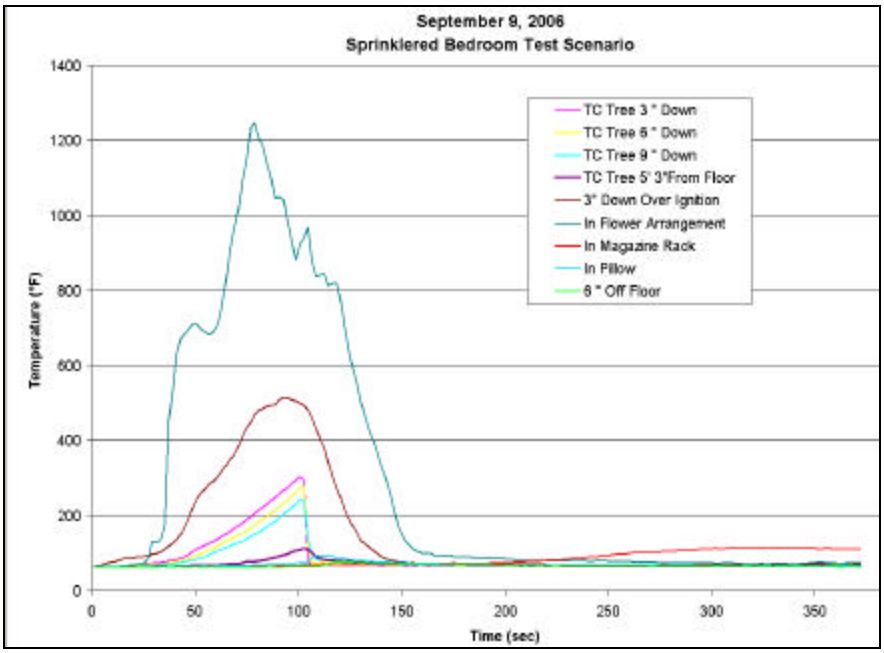
BEDROOM FIRES

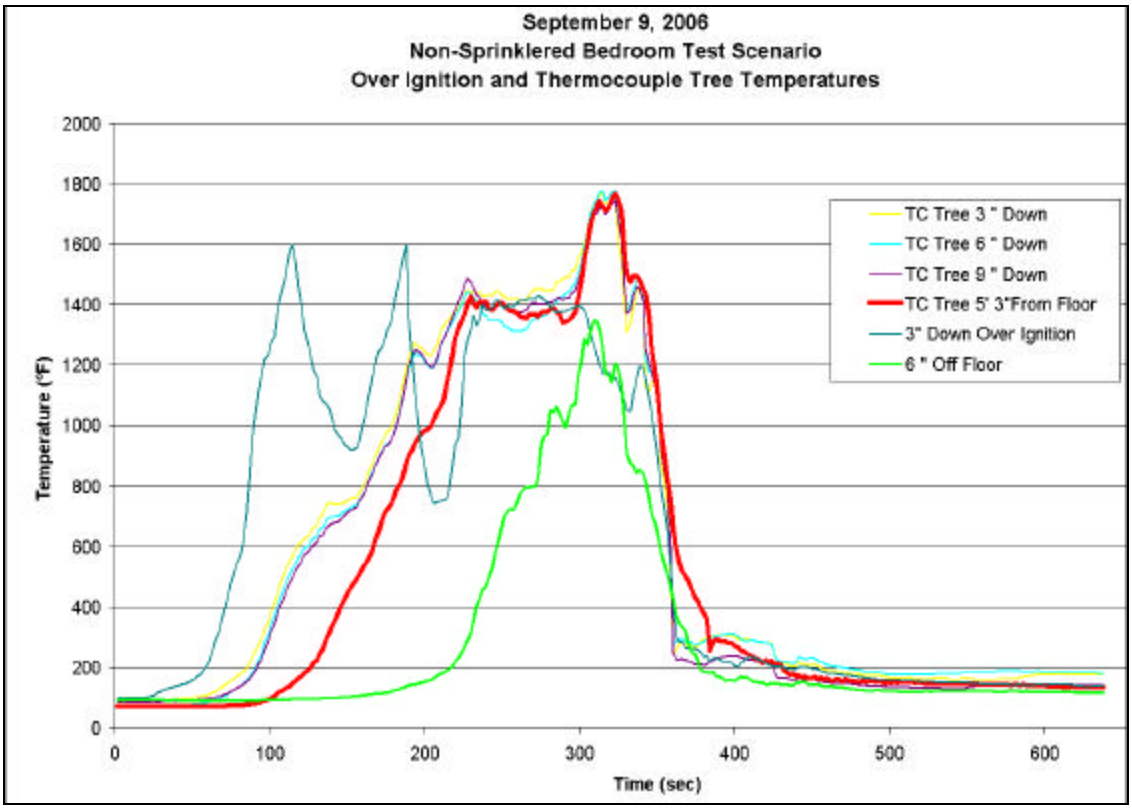
The bedroom fire scenarios were conducted in two rooms of the burn house that were modified to make them approximately equal in size (120 square feet). Typical bedroom furnishings including a dresser with mirror, nightstand, table lamp, twin bed with mattress and box spring, bedding, pillows, draperies, pictures, and miscellaneous decorative items were placed in each. Additionally, a smoke alarm was installed in each bedroom.

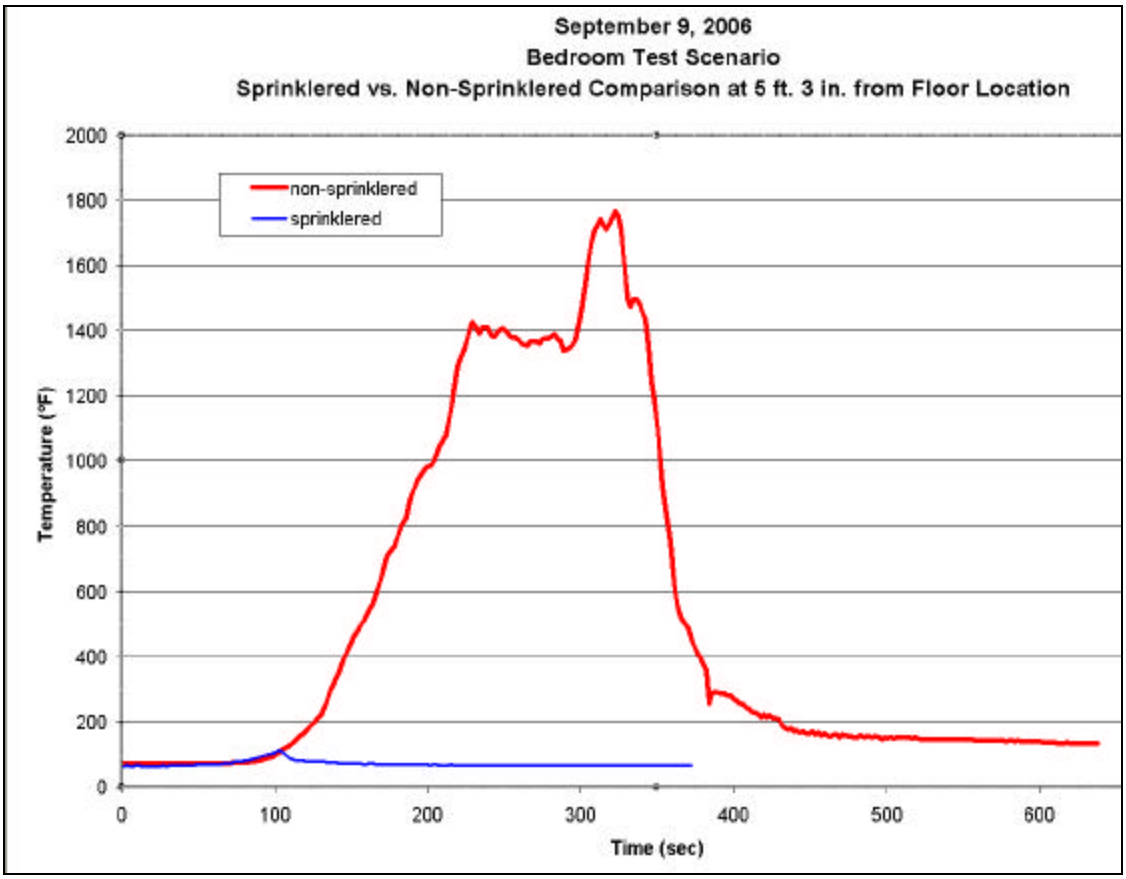
Sprinkler Protected Bedroom

Unprotected Bedroom

RESULTS OF BEDROOM FIRE SCENARIOS




September 9, 2006
Non-Sprinklered Bedroom Test Scenario
Over Ignition and Thermocouple Tree Temperatures
Temperature (°F)
Time (sec)
TC Tree 3 " Down
TC Tree 6 " Down
TC Tree 9 " Down
TC Tree 5' 3"From Floor
3" Down Over Ignition
6 " Off Floor


September 9, 2006
Bedroom Test Scenario
Sprinklered vs. Non-Sprinklered Comparison at 5 ft. 3 in. from Floor Location
Temperature (°F)
Time (sec)
non-sprinklered
sprinklered

The results of the bedroom fires are shown in this table. As can be seen, the two bedroom fires generated even more dramatic results. The fire in the unprotected bedroom raced from the point of origin to the draperies and bedding, escalating rapidly in intensity. The smoke alarm activated almost immediately, but was quickly destroyed by the fire. The temperature in the bedroom reached 1,769° F at 5 feet-3 inches above the floor, and the room flashed over in less than five minutes, well before the average local fire department response time. The fire completely consumed all of the fabric materials in the room, including the mattress and box spring.

The sprinkler-protected bedroom also saw rapid initial fire growth at the point of origin, with quick smoke-alarm activation. In stark contrast, however, the sprinkler activated quickly to contain the flames and fire damage near the point of origin. The maximum temperature recorded at 5 feet-3 inches above the floor was 110° F.

SPONSORS & PARTICIPANTS

The Fire Prevention Bureaus from Redmond and Woodinville were the driving force behind putting together this live fire exercise. The sprinkler equipment was donated and installed by a local sprinkler contractor.

Over 100 people, including local political leaders from multiple cities, observed this live fire demonstration. Everyone who viewed the fires saw an impressive display of the effectiveness of residential fire sprinklers. UL was honored to be able to support this worthwhile effort.

For additional information please contact UL's Regulatory Services by phone at, 1-800-595-9844 or by email at ulregulatoryservices@us.ul.com. The UL Regulators web site is dedicated to providing information and resources for inspection authorities; it can be accessed at, www.ul.com/regulators/index_main.cfm.