

***Fire Protection Study  
Pine Knoll Townhome Fire***



***Presented to:  
City of Raleigh***

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## EXECUTIVE SUMMARY

The format and objectives of this Fire Protection Study are to:

- A. **Document the fire** (pages 1-6)
- B. **Document the construction materials** (pages 7-15)
- C. **Define and discuss factors that contributed to the rapid fire spread** (pages 16-28)
  1. Weather (pages 16-18): High winds (ie, 35 mph) caused air-borne embers to ignite pine straw and dry grass near multiple buildings as well as dry grass on the opposite side of Capitol Blvd. Many of the buildings were ignited via this method and were destroyed before the fire department could extinguish them.
  2. Combustible construction (pages 19-25): The effect of combustible soffits was a major influence to fire spread. Vinyl siding melted and exposed fire-resistant underlayment, whereas vinyl soffits melted and exposed combustible attics. The study concludes that vinyl is suitable for siding when it has a maximum flame spread rating of 25 and it is installed over fire-resistant sheathing, but vinyl is not suitable for eaves and soffits. Fire protection objectives for soffits must be balanced with the need to release hot air and moisture from attics.
  3. Combustible landscaping (pages 26-28): Fire spread to multiple buildings when air-borne fire embers ignited dry grass and pine straw. In addition to pine needles being the probable point of origin for the Pine Knoll Townhome fire, dry grass provided a medium to transfer flames between buildings. As concluded by prominent research facilities, pine straw (ie, pine needles) should not be used close to structures. It is one of the most highly flammable landscape materials.
- D. **Recommend changes to the State Codes that may mitigate future losses** (pages 29-31).
  1. Schirmer Engineering supports the North Carolina Building Code Council Emergency Rule<sup>1</sup> to prohibit combustible soffit materials for townhomes and recommends a permanent amendment to the State Residential Building Code. The Council may also wish to consider restrictions regarding attic ventilation and siding, similar to those in the International Wildland-Urban Interface Code.
  2. Schirmer Engineering recommends that the Council consider the adoption of the International Code Council's Wildland-Urban Interface Code (IWUIC). The loss of the Pine Knoll Townhomes demonstrated the overwhelming force of a fire that attacks from the exterior, particularly one that is influenced by wind. Statistics from the North Carolina Division of Forest Resources indicate that North Carolina is:

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<sup>1</sup> Section R302.1 of the State Residential Code and its associated Emergency Rule are included in Appendix K.

- #1 in the nation regarding acreage considered to be wildland-urban interface.
  - #5 in the nation regarding the number of homes in the wildland-urban interface.
3. Schirmer Engineering recommends that the Council evaluate all Occupancies as regulated by the State Building Code to prohibit combustible soffits. The hazard of combustible construction and combustible landscaping presents the potential for a ground fire to ignite a structure. If the soffits are also combustible, fire may spread into attics and roof structures with little resistance. The report cites recent similar fires that occurred in apartments and restaurants. Major fires are inevitable as people continue to discard smoking materials near homes, apartments, motels, businesses, etc. Necessary protection includes construction materials and landscaping that are more fire resistant, and possibly even non-combustible.
  4. Although not applicable to the Pine Knoll Townhomes fire, Schirmer Engineering is advising the Council of pending legislation in Massachusetts as a result of recent major fire losses in several “sprinklered” apartment buildings. The intent is to require NFPA 13 sprinkler systems (not allow NFPA 13R sprinkler systems<sup>2</sup>) in Group R Occupancies of combustible construction. The most significant difference is that an NFPA 13 system includes attic sprinklers whereas an NFPA 13R system does not.

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<sup>2</sup> NFPA 13R is entitled Installation of Sprinkler Systems in Residential Occupancies up to and including four stories in height

## INTRODUCTION

Schirmer Engineering Corporation has been retained by the City of Raleigh to perform an independent study to recommend changes to applicable codes and ordinances to mitigate future fire losses. The study has been requested by Mayor Charles Meeker and the City Council in response to a fire on February 22, 2007 at the Pine Knoll Townhomes subdivision that destroyed 32 townhomes. This loss is an example of the current most common conflagration scenario, a wildland/urban interface fire. The classic conflagration scenario of the past century that involved narrow streets and closely spaced buildings has been replaced by a brush or forest fire that spreads to nearby buildings.<sup>3</sup>

According to the National Fire Protection Association, virtually every wildland/urban interface fire includes the combination of dry vegetation, combustible construction, and high winds.<sup>4</sup> These conditions existed at the Pine Knoll Townhomes on the day of the fire. Once an ignition source was introduced, the fire was soon uncontrollable. The cause of the fire was reported as a carelessly discarded cigarette that ignited landscaping pine straw. Fire spread up vinyl siding through vinyl soffits into attics, negating the presence of fire-rated walls between residential units. Strong winds (ie, 35 mph) caused air-borne embers to ignite pine straw and dry grass near multiple buildings as well as buildings on the opposite side of Capitol Blvd.



Photo by Lee Wilson at the Pine Knoll Townhouse fire; February 22, 2007

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<sup>3</sup> National Fire Protection Association's Fire Protection Handbook, 19<sup>th</sup> edition, Section 2-14

<sup>4</sup> National Fire Protection Association's Fire Investigation Report for the incident in Oakland/Berkeley Hills, California that occurred October 20, 1991

## DOCUMENTATION OF THE FIRE

Documentation of the fire is based on the following information obtained by Schirmer Engineering:

- Interviews with select witnesses (Todd Dryden and Paul Bailey, representatives from Beazer Homes)
- Report from Raleigh Fire Department (FDID 09213); Incident # 07-0005016; Incident report is included in Appendix E
- Log from Raleigh Emergency Communications Center; Incident # FRF070222005016
- Audio and transcript of the 911 call by Todd Dryden, site representative from Beazer Homes
- Phone interview with State Bureau of Investigation
- National Weather Service reports recorded at the Raleigh-Durham International airport, the Piedmont Triad International airport in Greensboro, the Fayetteville Regional airport, and in Chapel Hill.
- Fire photos from news station WRAL's website, included in Appendix A
- Post-fire photos obtained from City of Raleigh, included in Appendix B
- Post-fire photos taken by Schirmer Engineering on April 11, 2007; Appendix C includes photos of units with exterior damage but not destroyed; Appendix D includes photos of a typical undamaged attic
- Fire photos taken by photographer, Lee Wilson
- Fire photos taken by photographer, Mike Legeros
- Articles on the internet websites for WRAL, News & Observer, Firenews.net

### **Interview with Beazer Home's representatives:**

On April 10, 2007, Schirmer Engineering visited the site with Curt Willis of the City of Raleigh. We discussed the facts of the fire with Todd Dryden and Paul Bailey of Beazer Homes. Both men had been on site the day of the fire. Paul had left the site just prior to the fire. Upon leaving the site, he observed a resident smoking outside on the west side of Unit 32. Soon afterward, he received a phone call from Todd advising that a fire was out of control and involved three buildings. Paul returned to the site, at which time emergency vehicles were arriving.

According to Todd, the fire started outside on the west side of Unit 32. He assisted with occupant notification by knocking on doors while several men utilized bobcats to dump dirt on flaming pine straw and dry grass. However, the fire progressed rapidly beyond their ability to contain it. Almost immediately and simultaneously, Todd observed two additional buildings on fire (the west sides of Units 26 and 36). Note that the secondary fires were not adjacent to the initial fire. By all accounts, these fires had been ignited by air-borne fire embers that ignited dry grass and pine straw.

Occupants were able to evacuate, but the fire progressed so rapidly that many were not able to move their vehicles. At least six vehicles were destroyed in addition to the 32 townhomes. It was the general opinion that there would have been fatalities if the same fire conditions had occurred during the night when the homes had been occupied by sleeping residents.



Photo courtesy of City of Raleigh

## Timeline

The information below was obtained from the Raleigh Emergency Communications Center's log and the Raleigh Fire Department's incident report.

At 3:03 pm, the first 911 call was reported as a "grass fire in backyard approaching a house" on Oneonta Avenue. The incident report by the Raleigh Fire Department (RFD) also identifies that the initial alarm was received at 3:03 pm.

At 3:05 pm, the 911 log indicated "three units involved" and "multiple houses involved".

At 3:08 pm, the incident classification changed from a grass fire to a house fire, and its priority code was upgraded from a 7 to a 1.

At 3:11 pm, the first unit arrived. Their narrative states that they arrived on scene and "found several dwellings fully involved on both sides of Oneonta Avenue."

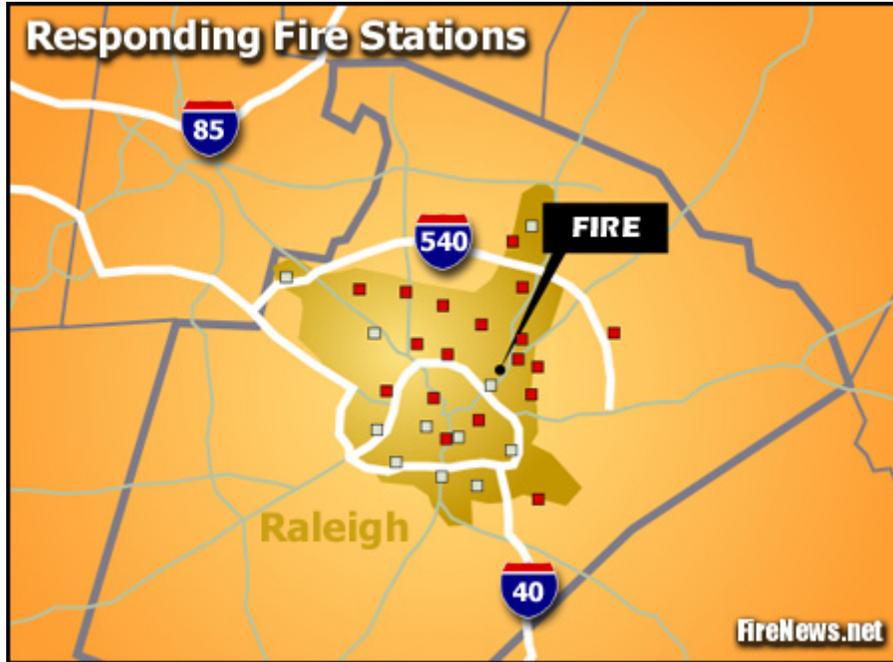
At 3:12 pm, the fire was deemed a "major working fire".

RFD's report indicates the cause of ignition to be "exposure fire".



Photo of firefighters at the Pine Knoll Townhouse fire  
Photo by Lee Wilson; February 22, 2007

According to the website, FireNews.net, more than 150 firefighters were on scene. Additionally, twelve departments from Wake County filled in at Raleigh fire stations; backup included Bay Leaf, Cary, Durham Highway, Garner, Knightdale, New Hope, Rolesville, Swift Creek, and Wake Forest.



## The site

The site is a residential community known as Pine Knolls Townhomes in Raleigh, North Carolina. The development is located west of Pine Knoll Drive and south of Old Buffalo Road. The Pine Knoll community includes the following new roads: Oneonta Avenue, Ithaca Drive, Rhinebeck Lane, Corning Drive, and Landsman Drive. A site schematic is shown below and identifies *only* those units that existed as of the date of the fire. Some units were already sold and occupied, while many others were in various stages of construction. According to Beazer Homes, 32 of the 56 existing units were completely destroyed by the fire or had damage so substantial that they were later demolished. The 32 units that were destroyed/demolished are cross-hatched in the schematic below. Note that the point of origin was on the west side of Unit 32.



## Narrative of Construction Materials and Code Requirements

The townhomes<sup>5</sup> were two-story units, some with attached single-car garages. There were four units per building as seen in the photo below. The townhomes were wood-framed with combustible vinyl siding and are considered Type V-B construction.<sup>6</sup>

Drawings by Beazer Homes refer to the typical buildings as the “Inside Garage Building” that included single-car garages with the two inner-most units and the “Outside Garage Building” that included single-car garages with the two outer-most units.

Typical units included heated areas slightly less than 1,500 sq.ft. Units with garages included an additional 250 sq.ft. of unheated area. Units without garages included an additional 35 sq.ft. of unheated area for a storage room.



Photo by Lee Wilson at the Pine Knoll Townhouse fire; February 22, 2007

The North Carolina Building Code does not apply to one and two family dwellings.<sup>7</sup> At the time the construction documents were submitted to the City of Raleigh, the applicable code was the 2002 North Carolina State Residential Code (based on the 2000 International Residential Code with state amendments).

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<sup>5</sup> The NC State Residential Code defines a townhouse as a single-family dwelling unit constructed in a row of attached units separated by property lines and with open space on at least two sides (Section R202)

<sup>6</sup> Note that Type I and II are non-combustible, Type III has a non-combustible exterior, and Type IV is Heavy-Timber. Type V is essentially a default classification for those occupancies not considered Type I, II, III, or IV. Construction classified as Type V is defined as having structural elements, exterior walls and interior walls of any materials permitted by the Building Code. (North Carolina State Building Code, Section 602)

<sup>7</sup> NCSBC Section 101, Paragraph 101.3, Exception 1

## Roof

The wood-frame roofs of the Pine Knoll townhomes had a 6:12 slope and a continuous ridge vent. The roof coverings were Class A fiberglass asphalt shingles manufactured by GAF (Sentinel, mid-weight, 3-tab, 20 yr).<sup>8</sup> The manufacturer data sheet and the International Code Council's Evaluation Service Report (ICC-ESR) are included in Appendix G. The 2002 North Carolina State Residential Code required Class A, B or C roofing materials, and this remains unchanged.<sup>9</sup>



Photo courtesy of the City of Raleigh

All materials that receive Class A, B, or C ratings are considered fire-resistant, and they must: 1) not be readily flammable, 2) afford a measurable degree of fire protection to the roof deck, 3) not slip from position, and 4) pose no firebrand hazard when there is direct impingement by one of three fire exposures. Successful exposure to *severe*, *moderate*, and *light* fire exposures, yields Class A, B, and C ratings, respectively.<sup>10</sup> Jurisdictions prone to wildfires often mandate Class A roofing materials and do not allow Class B or C.<sup>11</sup>

Ratings are obtained when manufacturers submit their products to agencies that perform testing in accordance with ASTM E108 or UL 790. Note that manufacturers may present roof coverings as Class A, with no indication of additional assembly components, installation details, etc. that were needed to achieve this rating. According to a

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<sup>8</sup> Note that a 3-tab shingle is 3 ft long by 1 ft wide and appears to be 3 shingles once the roof is complete. A 3-tab shingle can be seen lying loosely on the roof in the photo.

<sup>9</sup> Class A, B, and C ratings are discussed in the Mitigation section of this report.

<sup>10</sup> *Severe fire exposure* is a fire brand with dimensions 12 x 12 x 2 ½ inches. *Moderate fire exposure* is a fire brand with dimensions 6 x 6 x 2 ½ inches. *Light fire exposure* is a fire brand with dimensions 3 x 3 x 2 ½ inches.

<sup>11</sup> Burbank, California and Boulder, Colorado require roof coverings to have Class A ratings.

document issued by the California State Fire Marshal's Office, "*the fact that some Class A roofing passed with plywood, but failed with Oriented Strand Board (OSB), showed that the choice of sheathing material, though not specified by some roofing manufacturers, may be critical to the fire performance of the roof.*"<sup>12</sup> The intent of the referenced document was to recommend revised protocols to the ASTM E108 test to better represent conditions that roof assemblies might be exposed during a wildfire. The fact that such revisions are being considered indicates that the current testing protocol is inadequate in relation to product performance when exposed to wildfires.

Note that a fire-resistant rating does not signify a fire-proof material. The rating indicates only that the test sample resisted a specific ignition source for a specific period of time in laboratory-controlled conditions. When exposed to actual fire conditions, products with these ratings may ignite and significantly contribute to the fuel load. The presence of fire resistant shingles on the Pine Knoll Townhomes probably provided some initial fire resistance to embers, but the shingles did not, and could not, resist prolonged flame impingement. Additionally, the shingles contributed to the fuel load once the soffits melted away and allowed fire to enter and engulf the attics.



Photo by WRAL News at the Pine Knoll Townhouse fire; February 22, 2007

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<sup>12</sup> Urban Wildland Interface Building Test Standards, 12-7A-4 Fire Resistive Standards for Roof Assemblies, California State Fire Marshal

## Exterior wall coverings

The State Residential Code did not require the exterior walls to have a fire resistance rating. According to Beazer Homes<sup>13</sup>:

- The vinyl siding and soffits were manufactured by Certainteed.
- The exterior wall underlayment was Thermo Ply (Blue) Structural Grade Sheathing installed 16-inches on center; Thermo Ply was manufactured by LudLow Coated Products.<sup>14</sup> The sheathing is shown with the words “Stock Building Supply”<sup>15</sup> in the photo below.
- The exterior wall did not have a fire-resistance rating

Appendix G includes the Manufacturer Safety Data Sheets for the vinyl products and sheathing. The appendix also includes the International Code Council’s Evaluation Service Reports (ICC-ESR) for these products.<sup>16</sup>



Photo by WRAL; Pine Knoll Townhomes; February 22, 2007

<sup>13</sup> Manufacturer and product names provided by Paul Bailey, project manager with Beazer Homes

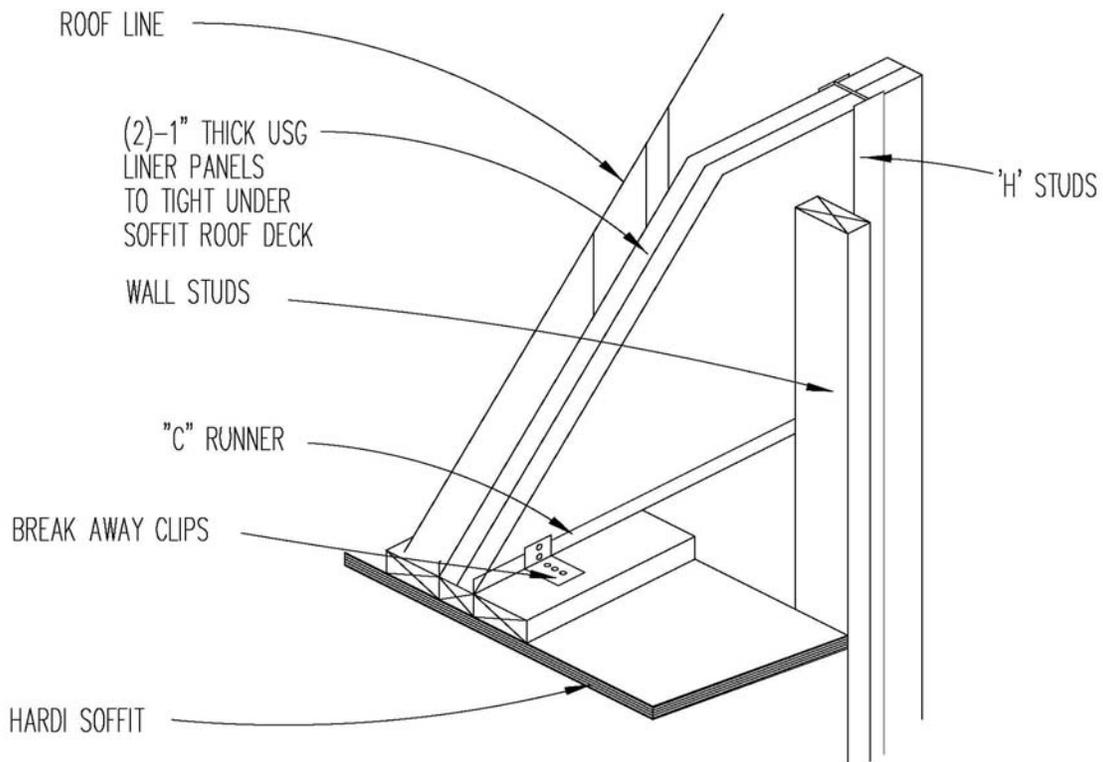
<sup>14</sup> Ludlowe Coated Products seems to have had many changes in ownership. The company is currently known as Covalence Coated Products and is merging with Berry Materials. The report holder of the ICC Evaluation Service Report ESR-1122 issued September 1, 2006 is noted as Covalence Specialty Coatings.

<sup>15</sup> According to Pat Presdorf with Covalence, their company often sprays the name of distribution companies on the sheathing while still at the Covalence facility. She recognized the name, “Stock Building Supply” as one of their distributors.

<sup>16</sup> Manufacturers may submit their products to obtain an independent determination that a product complies with specific requirements of any one of the International Codes.

The detail below appeared on the drawings submitted to the City of Raleigh. Despite the indication of “Hardi Soffit”, a trade name for non-combustible soffit material, the actual construction included combustible vinyl. According to the City of Raleigh, contractors may substitute materials (construction differing from approved drawings) provided that the substituted materials are code-compliant.

At the time of the design and construction, vinyl was a code-compliant material for soffits (also known as eave overhangs). The effect of combustible soffits, however, will be discussed in the next section and will be shown to be a significant factor in the magnitude of this fire’s loss.

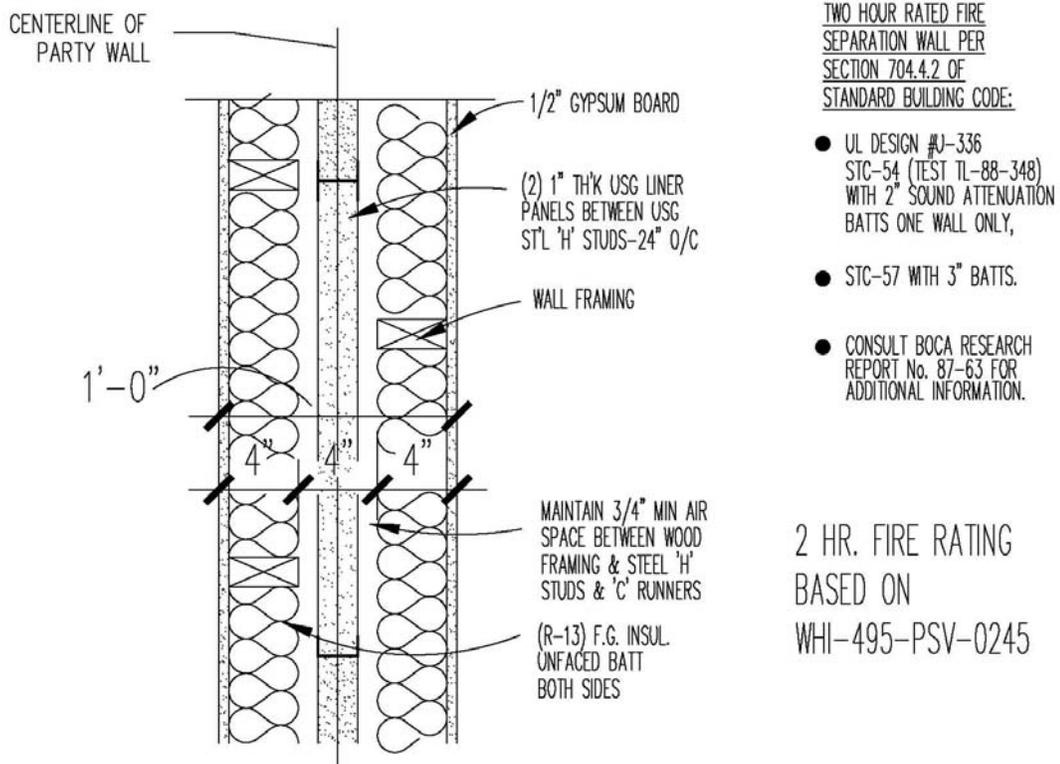


Beazer Home’s Drawing FD1, Detail 11 entitled Isometric @ Soffit  
The complete Drawing FD1 is included in Appendix H

## Dwelling Unit Separation

According to the 2002 North Carolina State Residential Code (Section R321, Dwelling Unit Separation), *each townhouse shall be considered a separate building and shall be separated by fire-resistant-rated (FRR) wall assemblies meeting the requirements of R302 for Exterior Walls. Exception: A common 2-hour FRR wall is permitted for townhouses if such walls do not contain plumbing or mechanical equipment, ducts or vents in the cavity of the common wall. Continuity: The common wall for townhouses shall be continuous from the foundation to the underside of the roof sheathing, deck or slab and shall extend the full length of the common wall.*

According to Beazer Home's Drawing FD1 (included in Appendix H), the units were separated by a 2-hour fire rating per UL Design U-336; the wall is considered a solid area (not cavity) separation system comprised of (2) 1-inch thick United States Gypsum (USG) liner panels secured with steel H-studs 24-inches on center and 2-inch by 4-inch wood studs 16-inches on center secured with aluminum break-away clips and 1/2-inch gypsum board wall finish. The design requires 3/4-inch minimum air space between wood framing and steel H-studs and C-channels.



Beazer Home's Drawing FD1, Detail 3 entitled Party Wall Detail  
 The complete Drawing FD1 is included in Appendix H.

Note that the North Carolina State Building Code defines a fire-resistance-rated wall (also known as a Firewall) as having protected openings, which restrict the spread of fire and extend continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow the collapse of construction on either side without collapse of the wall.<sup>17</sup> The photo below illustrates the successful performance of a firewall when exposed to flame from the opposite side.



Photo courtesy of City of Raleigh

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<sup>17</sup> IBC, 2003 edition, Section 702

## Fire Sprinklers

The townhomes were not equipped with fire sprinklers, and they were not required by the State Residential Code.

Note that when fire sprinkler protection is provided in Group R Occupancies, up to and including four stories in height, installations generally comply with NFPA 13R which does not require sprinklers in the attic.

Sprinkler systems are designed to control a fire in its incipient stages and to contain a fire to its room of origin. Sprinklers in a living space are generally ineffective against a raging fire that approaches from a fully engulfed attic.

Recent losses in Massachusetts have initiated action to eliminate the option of “NFPA 13R” sprinkler systems in large residential buildings of combustible construction.



Photo<sup>18</sup> provided by the Massachusetts Office of the State Fire Marshal  
Apartment units and corridors were “protected” with NFPA 13R sprinkler system  
Attic sprinklers are not required by NFPA 13R systems

When required, sprinkler protection would be in accordance with NFPA 13 that includes attic protection. Proponents for the change petition that property protection, not just life safety, is a fundamental goal of the building code. The Fire Prevention Fire Protection (FFPP) subcommittee to the Massachusetts Board of Building Regulations and Standards (BBRS) has recommended the following for the next edition of the Massachusetts State Building Code (MSBC):

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<sup>18</sup> Photo is Longview apartment fire in Georgetown, Massachusetts on January 3, 2007. The estimated damage was \$2 million. There were no fatalities, probably due part to the fire’s occurrence at 9:30 a.m. on a Wednesday.

"903.2.8 Group R. An automatic sprinkler system installed in accordance with Section 903.3 shall be provided throughout all buildings with a Group R occupancy. For Use Group R Buildings with an aggregate building area of 12,000 sq.ft. or more, the sprinkler system shall be designed and installed in accordance with NFPA 13. For the purposes of this section, the aggregate building area shall be the combined area of all stories of the building, and fire walls shall not be considered to create separate buildings."

*Commentary: The aggregate area concept for use Group R buildings is intended to require sprinkler systems designed in accordance with the criteria of NFPA 13 for larger use Group R buildings. Several recent fires in combustible construction framed use Group R buildings resulted in large property losses and posed significant challenges to firefighting efforts. This provision eliminates the option of providing an NFPA 13R sprinkler system in these large residential buildings."*

Note that Massachusetts's pending legislation applies to all Use Group R Occupancies, regardless of separation. The proposed change is the result of three recent fires with major losses in buildings equipped with NFPA 13R systems (ie, no attic sprinklers). Two fires originated on the balconies and extended into the non-sprinklered attics. The other fire originated with an explosion associated with the natural gas service entrance on the outside of the building and extended into a non-sprinklered attic.

## MAJOR FACTORS CONTRIBUTING TO THE FIRE LOSS

### Weather Influence

High winds (ie, 35 mph) caused air-borne embers to ignite pine straw and dry grass near multiple buildings as well as dry grass on the opposite side of Capitol Blvd. The photo below illustrates the result of a “spot fire” that was extinguished by the fire department before the entire building was destroyed. Many of the buildings were ignited via this method and were destroyed before the fire department could extinguish them.



Photo by Mike Legeros at the Pine Knoll Townhouse fire; February 22, 2007

The effect of weather on fire conditions and consequences is well documented in the National Fire Protection Association’s Fire Investigation report for the Oakland/Berkeley Hills Fire.<sup>19</sup> Although the California fire included wood-shingle roofs as a contributing factor that is not applicable to the Pine Knoll Townhome fire, NFPA’s report includes an excellent explanation of weather influence on wildfire. Excerpts are italicized below, and applicable conditions at Pine Knoll Townhomes are noted.

*“Weather contributes as much to the life of a wildfire as the fuels do. Temperature, lack of precipitation, and humidity provide the conditions for a fire to start, and wind nourishes the blaze, spreading it through spotting or by causing direct flame*

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<sup>19</sup> The Oakland Hills/ Berkeley Fire was a devastating conflagration that destroyed 2,449 single-family dwellings and 437 apartment/condominium units, burned over 1,600 acres, killed 25 people, injured 150 others, and did an estimated \$1.5 billion in damage.

*impingement on combustibles. The different weather characteristics work together to form a system that is either hospitable or inhospitable to wildfire.”*

**Moisture:** *“The moisture content of fuels is a critical variable. Naturally, the drier the fuel, the more susceptible it is to fire. The moisture in fuels comes from rain and relative humidity.”*

Zero precipitation was reported in Raleigh on the day of the fire. As reported by the National Weather Service at the Raleigh-Durham International airport, month-to-date precipitation was below average. Only 1.18 inches had been recorded by the 22<sup>nd</sup> day of the month when the monthly average is 2.69 inches. Actual year-to-date precipitation was recorded as 4.3 inches, when the annual average-to-date is 6.71 inches.

**Relative humidity and temperature:** *“As temperature rises, relative humidity decreases. A temperature rise of 20F can decrease the relative humidity by 50%. Relative humidity controls the moisture content of fuels, and therefore, their susceptibility to fire.”*

The temperature at the time of the fire was approximately 73F, and the humidity was approximately 14% (as reported by the National Weather Service at the Raleigh-Durham International Airport). Other reports indicate humidity as low as 8% (as reported on the Raleigh/Wake Fire Fighting blog).

**Wind:** *“Of all the weather elements affecting wildland fires, wind is the most variable and least predictable of all weather elements. Wind affects fires by carrying away moisture-laden air, hastening the drying of vegetation, adding oxygen to a fire, carrying burning embers that ignite other combustibles, and pushing flames in the direction of unburned fuels.”*

The Table below indicates wind speeds and directions at approximately the time of the fire. Complete weather reports and a map are included in Appendix F. Wind gusts of 32 mph were recorded at the Raleigh-Durham International airport. Wind gusts of nearly 50 mph and 37 mph were recorded in Greensboro and Fayetteville, respectively.

<b>WIND SPEED</b>			
<b>Airport, distance from Pine Knolls fire</b>	<b>Wind speed (mph)</b>	<b>Wind gust speed (mph)</b>	<b>Wind direction</b>
Raleigh-Durham International Airport; 20 miles west	18.4	<b>32.2</b>	west-northwestly
Piedmont Triad Inter. Airport; Greensboro; 93 miles north west	35.7	<b>49.5</b>	westerly
Fayetteville Regional Airport; 75 miles south	27.6	<b>36.8</b>	westerly
Chapel Hill, NC 32 miles west	20.7	<b>36.8</b>	westerly

Despite westerly winds being reported at local airports, witnesses at the fire reported southeasterly winds. The fire’s progression indicates an easterly direction, originating on the west side of Oneonta Avenue. Nineteen units were destroyed on the west side of Oneonta Avenue, and thirteen units were destroyed on the east side of Oneonta Avenue. Embers also ignited fires east of Pine Knolls Road and Capitol Blvd.

The direction and magnitude of the wind was effected by the fire itself. “A firestorm involves massive burning and needs an abundant amount of air in order to sustain itself. Since the fire had no natural bounds, there was plenty of air and fuel for its continued rapid, uncontrolled growth. This phenomenon creates its own “wind” to supply air to the fire. When the fire-induced winds combine with the strong prevailing winds, a turbulence results that causes the fire to be unmanageable. As the combustibles burn, buoyant forces carry burning embers upward where they eventually cool and deposit the still flaming materials on unaffected areas creating numerous additional fires (known as spotting).”

Both the Oakland Hills and Pine Knoll Townhomes were virtually out of control within only a few minutes after starting. The Oakland Hills fire consumed nearly 800 homes within the first hour. Note the similarities in the table below:

<b>Weather conditions</b>	<b>Pine Knoll Townhomes</b>	<b>Oakland/Berkeley Wildfire</b>
Wind, average speeds (mph)	<b>20</b>	<b>20</b>
Wind, gust speeds (mph)	<b>35-50</b>	<b>35-50</b>
Relative Humidity (%)	<b>14</b>	<b>16</b>
Temperature (F)	73	92

Both fires shocked communities with the realization that wildfires<sup>20</sup> can, and do, occur in urban areas not typically thought as being included in the wildland/urban interface.<sup>21</sup>

<sup>20</sup> The International Code Council defines a *wildfire* as “an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures.”

<sup>21</sup> The International Code Council defines *wildland* as “an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities”, and *wildland-urban interface* is defined as “the area where structures and other human development meets with wildland or other vegetative fuels.”

## Combustible Construction

Fire spread up vinyl siding through vinyl soffits into attics as illustrated by the photo below. While both the siding and soffits were vinyl, the effect of combustible soffits was a major influence to fire spread. When vinyl siding melted, it exposed fire-resistant underlayment which was accessible for fire fighting efforts. However, vinyl soffits melted and exposed combustible attics. Once fire entered the attics, the roof shielded fire fighting efforts, and the units were consumed.



Photo by Schirmer Engineering April 10, 2007

## Vinyl siding

- The presence of vinyl siding does not necessarily indicate a wall *without* a fire-resistant-rating. The vinyl siding's ICC-ESR, indicates that it "*may be installed over code-complying, exterior, fire-resistance-rated bearing or nonbearing walls required to be of Type V construction under the International Building Code without affecting the hourly rating of the walls*".<sup>22</sup> Most vinyl siding does not contribute to, nor detriment, a fire-resistant-rating (FRR).
- The presence of Thermo Ply does not necessarily indicate a wall *with* a fire-resistant-rating. Thermo Ply (Blue) Structural Grade Sheathing *may* be used as a component

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<sup>22</sup> Paul Bailey with Beazer Homes provided Certainteed's name as the manufacturer for the vinyl siding and soffits. ICC Evaluation Service Report ESR-1066 issued November 2006, Section 4.6.2. is included in Appendix G.

of 1-hour fire-resistive-rated exterior wall assemblies, but its ICC-ESR indicates that vinyl siding is *not* one of the approved materials.<sup>23</sup>

Despite that the exterior wall did not have a fire-resistant-rating, the sheathing offered some fire resistance for a period of time. Notice that the sheathing in the photo below had little/no damage even though the vinyl siding had melted away. Also note that the photos illustrate the following advisory issued by the manufacturer: “*Important Fire Safety Information - when rigid vinyl siding is exposed to significant heat or flame, the vinyl will soften, sag, melt or burn and may thereby expose material underneath.*”



Photo by WRAL News at the Pine Knoll Townhouse fire; February 22, 2007

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<sup>23</sup> Acceptable materials for the exterior side of the wall include: 1) non-asbestos fiber cement board, 2) brick or stone veneer exterior finish, 3) wood siding (at least 11/32 inch thick and composed of solid wood, plywood, or hardboard), or 4) steel or aluminum sidings without backing or backed by wood-fiber sheathing boards. See ICC-ESR 1122, Paragraph 4.3.1 for complete requirements.

## Vinyl soffits

The photos below illustrate fire access to the attics when the vinyl soffits melted away. The second photo is an expanded view that indicates the exterior fire was able to spread into the attics of two adjacent units, negating the presence of the fire rated separation wall.



Photo courtesy of City of Raleigh



Photo courtesy of City of Raleigh

Although a combustible material, most vinyl has a relatively low flame spread rating. Per Certainteed's Specification Sheet, their vinyl siding/soffits have the following properties:

- a Flame Spread Index of 20 per ASTM E84,
- a Smoke Development Index of 390 per ASTM E84,
- zero Fuel Contribution per ASTM E84.
- a self-ignition temperature of 813F per ASTM D 1929
- a Fire Endurance classification of 1 hour per ASTM E119.
- the material is self-extinguishing with no measurable extent of burn when tested in accordance with their specification ASTM D635.
- does not contribute to the spread of fire in a multi-story situation (multi-story flame test per UBC 26-4), and
- satisfies the conditions for the allowable use as specified in section 1406 of the IBC (Radiant Heat Test – Ignition Resistance of Exterior Walls; NFPA 268)

Certainteed's vinyl's flame spread rating of 20 yields its categorization as Class A, the most favorable class (with the least flame spread).<sup>24</sup> Note that the vinyl's Class A rating (from the ASTM E84 test) is not the same as the roof shingles' Class A rating (from the ASTM E108 test).

Soon after the fire, the North Carolina Building Code Council issued the following Emergency Rule to the Residential Code:

*"In townhouse construction (3 or more attached dwellings) non-combustible soffit material, not including aluminum, shall be used and shall be securely attached to the framing members or shall have a 1-hr fire rating as required by code. Vented non-combustible soffits shall be permitted."<sup>25</sup>*

*Current methods of townhouse constructions that are allowed by the NC Residential Code have demonstrated the potential to allow fire to spread along and through roof soffit areas and into attic spaces. In the specific instance of vinyl soffits, the material can melt away and allow an open chase for flames to rapidly spread into the attic space. Having noncombustible soffit material will reduce the spread of flames into the attic and adjacent units; thereby making the fire easier to control and manage. The recent Raleigh townhouse fire brought this issue to the attention of the council. Numerous new townhouse building permits will be issued prior to adoption and approval of the Permanent Rule."*

Section R302.1 of the State Residential Code and its associated Emergency Rule are included in Appendix K.

The Emergency Rule became effective on April 5, 2007. A public hearing was scheduled for June 11, 2007 but a formal decision (to adopt as a Permanent Rule) was deferred pending issuance of this report for the committee's consideration.

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<sup>24</sup> Class A has a flame spread of 25 or less. Class B has a flame spread of 26 - 75. Class C has a flame spread of 76-200.

<sup>25</sup> State Residential Code, Section R302.1 Exception 2, Exterior Wall Projections (070313 Item B-2)

Schirmer Engineering supports the Emergency Rule and commends the City and the Council for their immediate actions after recognizing that the combustible soffits contributed significantly to the fire loss at the Pine Knoll Townhomes.

A search was conducted of other communities to determine similar restrictions on combustible construction materials. West coast jurisdictions set the standard for wildfire fire prevention and containment. Their long dry seasons and dense population contribute to the prevalence and magnitude of wildfires that consume multitudes of homes and acres annually. Jurisdictions on the west coast proactively establish and enforce restrictions on construction materials, landscaping, human behavior, etc. to minimize the ignition and spread of fires. Accordingly, it seems reasonable to consider restrictions on construction materials imposed by west-coast jurisdictions. While their requirements may be too conservative for many parts of the country, it seems reasonable, however, that a construction material deemed acceptable in California's Mountain Fire Zone would also be acceptable in areas considered less prone to wildfires (ie, Raleigh, NC).

The following restrictions regarding soffits, attic ventilation and siding are mandated by the City of Burbank, California:

- Eaves and soffits are required to be protected on the underside as required for one-hour fire resistive rated construction.
- Vents (and all attic openings) are prohibited from being located in soffits, in eave overhangs, between rafters at eaves, or in other overhang areas.
- Attic ventilation, foundation, underfloor vents or other ventilation openings in vertical exterior walls, and vents through roofs are restricted to a maximum 144 square inches each (gable end vents are permitted provided they do not exceed 144 square inches each).
- Vents are required to be covered with noncombustible, corrosion-resistant mesh with openings not exceeding ¼-inch.
- Exterior walls are required to be of one-hour fire resistive rated construction,
- Vinyl siding and metal siding are allowed on exterior walls provided that they are installed over one-hour fire resistive rated construction; such siding shall be installed over one layer of Type X gypsum board with a minimum thickness of ½"; vinyl siding shall have a maximum flame spread of 25.
- Fiber cement siding with a Class A fire rating is allowed on exterior walls.
- Prohibited material for exterior walls includes: traditional solid wood siding, pressed wood/hardboard siding, pressure treated wood, intumescent paints, and other protective coatings.
- Roof materials shall have a Class A rating.

Boulder County (Colorado) has issued building code amendments that nearly duplicate those for the City of Burbank. Note that Boulder has been a proactive jurisdiction regarding wildland-urban interface fires since the Black Tiger Fire<sup>26</sup> occurred there in 1989.

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<sup>26</sup> The wind-driven fire raced up steep slopes in the Rocky Mountains and destroyed 44 homes and burned over 2,000 acres.

As further substantiation to prohibit combustible soffits, the following resources are cited:

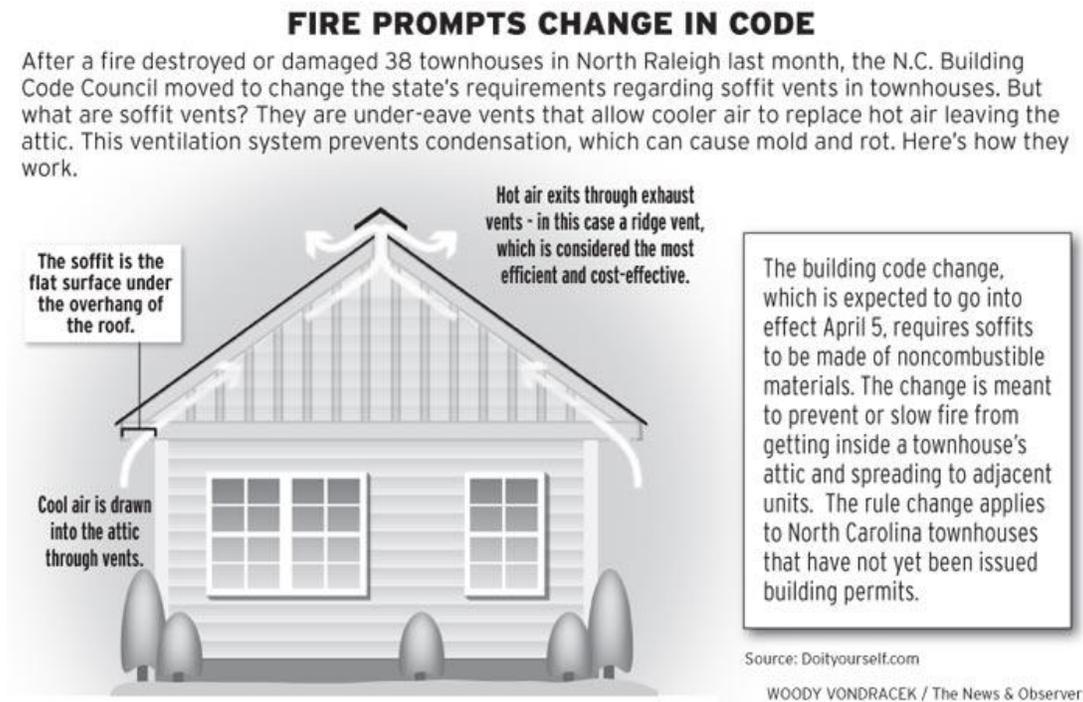
*According to the Wildfire Mitigation in Florida, “one cause for the loss of houses in Florida wildfires is the presence of vinyl or fiberglass soffit vents. Radiant heat from a wildfire can melt these materials and cause them to fall away, allowing ignition of underlying materials or allowing firebrands to be drawn into the attic, which in turn ignites the house.”*

*According to the University of California’s Homeowner’s Wildfire Mitigation Guide, Appendix B, “commonly used soffit materials are totally inadequate in preventing a fire from entering into the eaves. Soffits should either be a non-combustible material (such as a fiber cement product) or a ¾-inch plywood. The plywood should have tongue and groove connections to prevent fire entry through the joints.” The Guide warns that “soffit vents are the most vulnerable to fire but cautions that soffit vents should not be blocked, without having additional vents provided. Venting is required to reduce roof and attic temperatures and to remove excess moisture.”*

## Attic ventilation

Fire protection objectives must be balanced with the need to release hot air and moisture from attics. An analogy may be made with design conflicts that occur between security and egress; it is difficult to satisfy simultaneous objectives to limit access (in and out) while making those same passageways available for safe egress in an emergency. Similarly, it is a challenge to design vents that will allow ambient heat and moisture to escape while also restricting fire from entering.

The schematic below illustrates the necessary passageway for air that also serves as a passageway for fire.



Appeared in Raleigh's News & Observer

## Combustible landscaping

Combustible landscaping provided a medium to transfer heat and flames between buildings. As presented in the section entitled Weather Influence, conditions were dry on the day of the fire. Slightly more than an inch of rain had fallen in the prior weeks. In addition to dry and/or dead grass, landscaping included pine straw in the gardens near and directly adjacent to vinyl siding.

Pine straw (also known as pine needles) has many inherent properties that yield high ignitability, flame spread, and heat release rate. Its low surface area to mass ratio makes it easy to ignite and fast to be consumed. Its resin content produces high heat release rates when compared to other landscape mulches.

The flammability characteristics of pine straw have been documented by a joint effort of the National Institute of Standards and Technology (NIST), the Building and Fire Research Laboratory (BFRL), the University of Florida, and the United States Forest Service Southern Research Station. Testing was conducted outdoors in Gainesville, Florida during May of 2006. Indoor laboratory testing was conducted at the BFRL in October of 2006. Testing measured rate of spread, temperature, flame height, and fuel consumption (burn depth) of four common mulches: pine straw, large pine bark, small pine bark, and shredded cypress.

Outdoor test plots were approximately 13 feet (4 m) in diameter and 4.7 inches (10 -12 cm) deep. Plots were able to settle for two months prior to ignition. Plots simulated varying moisture levels. If the mulch within the test plots had not been consumed within 1-hour, the fire was manually extinguished. Wind was not measured during the outdoor testing. The photo illustrates an outdoor test plot. Results are summarized in the tables and graphs that follow.



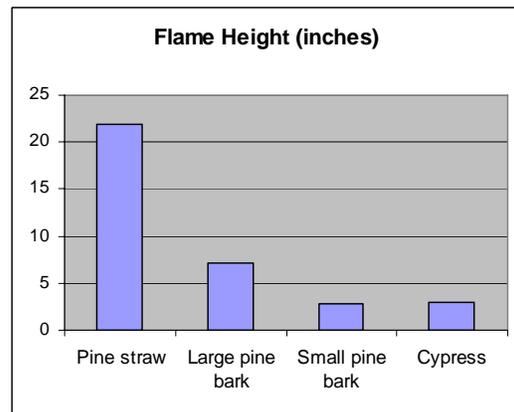
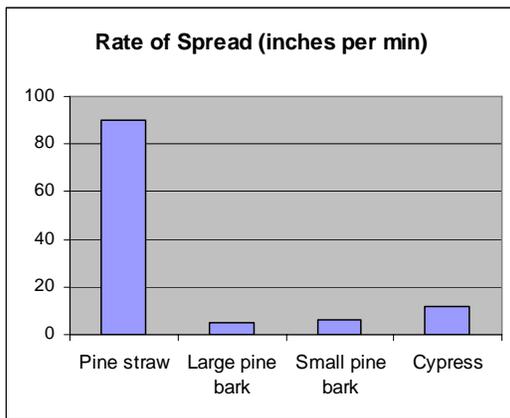
Photo by [www.Gainesville.com](http://www.Gainesville.com) May 19, 2006

The tests demonstrated pine straw to be the most hazardous, yielding the fastest rate of spread, the highest flame height, the highest temperature, and the most complete fuel consumption when compared to the other three test mulches. According to the test report, pine straw has the greatest potential of the four mulches to rapidly create an ignition source for adjacent plants and structures.

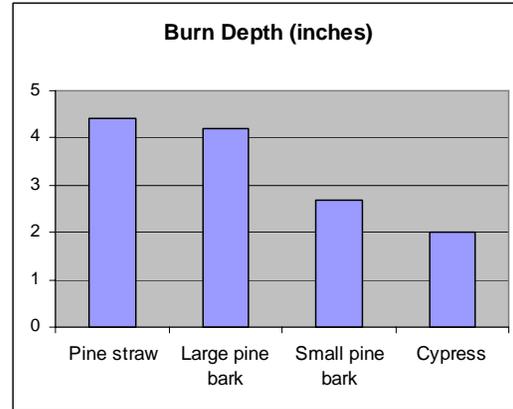
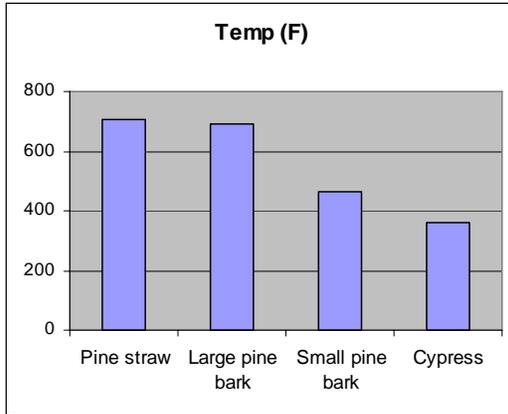
Mulch type	Rate of spread (inches per min)	Temp (F)	Flame Height (in)	Burn Depth (in)
<b>Pine straw</b>	<b>90</b>	<b>706</b>	<b>21.9</b>	<b>4.4</b>
Large pine bark	4.8	690	7.1	4.2
Small pine bark	6.3	463	2.8	2.7
Cypress	11.5	359	3.0	2.0

Test results are shown in the table above and in the charts below. The actual values are not as important as the relative magnitudes. Note that:

**Pine straw’s rate of spread was overwhelmingly faster. While the other mulches spread fire at a rate of less than 1 ft per minute, pine straw spread fire at a rate of 7.5 feet per minute.** Pine straw’s flame height was 7 times that of small pine bark and cypress and 3 times that of large pine bark.



While pine straw and large pine bark reached similar temperatures and reported similar burn depths, pine straw’s rate of spread and the flame height indicate a much more aggressive fire. In fact, the values of burn depth may be misleading since they are not reported as rates. While they both achieved nearly the same burn depth, pine straw was consumed within the first five minutes after ignition, whereas complete consumption of the large pine bark pieces required an hour of burning.



The results of these tests were recently presented at the 2007 Annual Fire Conference at NIST in Gaithersburg, Maryland. **The presenters concluded that pine straw should not be used close to structures.**

Major fires are inevitable as people continue to discard smoking materials near homes, apartments, motels, businesses, etc. Recent examples include:

- On April 30, 2007, a fire started in brush and shrubbery outside a first floor apartment in Charlotte and quickly spread into the roof and attic area, severely damaging five units.<sup>27</sup>
- On May 28, 2007, a fire swept through an apartment building in Charlotte after a fire began in pine needles near the building.<sup>28</sup>
- On July 17, 2007, a Burger King “was gutted by fire” and was likely caused by a cigarette dropped into mulch.<sup>29</sup>
- On May 10, 2007, a cigarette tossed into mulch outside a Perkins restaurant started a blaze that gutted the restaurant and led to the injury of two fire fighters.<sup>30</sup>

Necessary protection includes construction materials and landscaping that are more fire resistant, and possibly even non-combustible.

<sup>27</sup> According to WSOCTV.com

<sup>28</sup> According to WNCT.com

<sup>29</sup> According to WAVE3.com in Louisville, KY

<sup>30</sup> According to courier-journal.com in Louisville, KY

## CONCLUSIONS AND RECOMMENDATIONS

More than 32 townhomes were destroyed/damaged by a rapid exterior fire influenced by high winds, dry conditions, combustible landscaping, and combustible construction. These conditions created multiple, simultaneous fires that quickly melted vinyl soffits and engulfed attics.

As previously stated, it seems reasonable that construction materials acceptable in wildfire prone areas (ie, Burbank, CA and Boulder, CO) would be suitable in areas considered less prone to wildfires (ie, Raleigh, NC). Thus,

- o vinyl is suitable for siding when it has a maximum flame spread rating of 25 and it is installed over fire-resistant sheathing and
- o vinyl is not suitable for eaves and soffits

These restrictions regarding vinyl are not surprising when one views photos of the Pine Knoll Townhome fire and its aftermath. Although the vinyl siding melted away, it only exposed fire resistant underlayment. When the vinyl soffits melted away, however, they exposed combustible attics.

Schirmer Engineering supports the North Carolina Building Code Council Emergency Rule to prohibit combustible soffit materials for townhomes and recommends a permanent amendment to the State Residential Building Code.<sup>31</sup> The Council may also wish to consider restrictions regarding attic ventilation and siding such as those mandated by the City of Burbank, California and Boulder, Colorado.

The combination of combustible construction and combustible landscaping presents the potential for a ground fire to ignite a structure. If the soffits are also combustible, fire may spread into attics and roof structures with little resistance. Major fires are inevitable as people continue to discard smoking materials near combustible homes, apartments, motels, businesses, etc. The report cites recent similar fires that occurred in apartments and restaurants. Schirmer Engineering also recommends that the Council evaluate all Occupancies as regulated by the State Building Code to prohibit combustible soffits.

In combination with restrictions on construction material, combustible landscaping must be controlled. In addition to pine needles being the probable point of origin for the Pine Knoll Townhome fire, dry grass provided a medium to transfer flames between buildings. As concluded by prominent research facilities, pine straw (ie, pine needles) should not be used close to structures. It is one of the most highly flammable landscape materials. The Council may want to consider prohibiting combustible landscaping within a specified distance (ie, 10 ft) to certain occupancies with combustible construction (ie, apartments, hotels, motels, townhomes, restaurants, etc.).

The fire at the Pine Knoll Townhomes demonstrated the overwhelming force of a fire that attacks from the exterior, particularly one that is influenced by wind. Wildfires don't require dense forests. They can propagate via dry grass and quickly overwhelm structures and fire department response. Wildfires, of course, are particularly of concern

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<sup>31</sup> Section R302.1 of the State Residential Code and its associated Emergency Rule are included in Appendix K.

near the wildland-urban interface. According to the North Carolina Division of Forest Resources (NCDFR)<sup>32</sup>:

- North Carolina currently ranks #1 in the United States with over 5.1 million acres in the wildland-urban interface.
- North Carolina ranks #5 in the United States with over 1.7 million homes in the wildland-urban interface.

Given these statistics, the North Carolina Building Code Council may want to consider the adoption of the International Code Council's Wildland-Urban Interface Code (IWUIC).

The North Carolina Firewise organization and the North Carolina Division of Forest Resources can assist in determining boundaries for the wildland-urban interface to which the IWUIC would apply. In addition to construction materials, the IWUIC addresses access, water supply, and vegetation control. Regulations are identified for roof coverings, eaves, vents, exterior walls, gutters/ downspouts, exterior glazing, exterior doors, unenclosed underfloor protection, appendages and projections (ie, decks), and detached accessory structures. Appendices within the IWUIC include Fire Hazard Severity Form (similar to that in Appendix L) and Fire Danger Rating System.

Most wildfire mitigation strategies are those in the realm of preparation and prevention. Concepts include the creation of a Defensible Space, defined as an area around homes and other similar structures (garages, sheds, barns, outbuildings) for a) for firefighters to safely do their jobs, b) to minimize the likelihood that a wildfire will ignite the structure, and c) to minimize the likelihood that a structure fire will ignite the wildland.

Other resources for wildfire mitigation strategies are addressed in Appendix L, including

- two standards by the National Fire Protection Association, NFPA 1143 and NFPA 1144.
- a 12-page document entitled *Firewise Landscaping in North Carolina*. Eight of the 12 pages are lists of plant species native to North Carolina with Flammability Ratings of Low, Medium, High, and Extreme. Guidelines recommend the provision of fire resistant plants, trees, shrubs, etc. as well as the avoidance of highly combustible materials (ie, pine straw).
- a scoresheet, entitled *North Carolina's Wildfire Hazard & Risk Assessment*, based on the format within NFPA 1144. Factors include construction materials, access, vegetation, topography, water supply, fire department distance, and placement of gas and electric utilities.
- Federal Alliance for Safe Homes (FLASH), an educational program that provides disaster-safety building features to help families become better prepared for wildfires, windstorms, hurricanes, and floods. The website is [www.BlueprintForSafety.com](http://www.BlueprintForSafety.com)

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<sup>32</sup> Statistics were obtained from Kevin Harvell (Assistant Regional Forester – Fire Control, NCDFR Region 2) with input from Gary Wood, State Firewise Coordinator) on July 18, 2007. Schirmer Engineering contacted NCFirewise for current statistics after viewing a 2005 powerpoint presentation entitled “Firewise...Implementing a Strategy” by the NCDFR was obtained from the website, [www.ncfirewise.org](http://www.ncfirewise.org) in the WUI Specialist Toolbox

## Legislation by another state as a result of recent fire losses

Historically, large fire losses have heightened awareness and action regarding fire protection. Just as action by the North Carolina Building Code Council was initiated by the large fire loss at Pine Knoll Townhomes, recent major fire losses in several “sprinklered” apartment buildings in Massachusetts have caused the State to draft legislation to require NFPA 13 sprinkler systems (not allow NFPA 13R sprinkler systems<sup>33</sup>) in Group R Occupancies of combustible construction. The most significant difference is that an NFPA 13 system includes attic sprinklers whereas an NFPA 13R system does not. The requirement will apply to buildings with an aggregate area of 12,000 square feet or more (defined as the combined area of all stories of the building, and fire walls shall not be considered to create separate buildings). Proponents for the change petition that property protection, not just life safety, is a fundamental goal of the building code. The Massachusetts legislation is mentioned in this report since the Council may wish to take similar action.

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<sup>33</sup> NFPA 13R is entitled Installation of Sprinkler Systems in Residential Occupancies up to and including four stories in height  
Fire Protection Study  
Pine Knoll Townhome Fire



## **APPENDIX - A**



Fire photos by WRAL



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



Fire photo by WRAL; February 22, 2007



## **APPENDIX - B**

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Postfire photos by City of Raleigh



Postfire photo by City of Raleigh; March 1, 2007



Postfire photo by City of Raleigh; March 1, 2007



Postfire photo by City of Raleigh; March 1, 2007



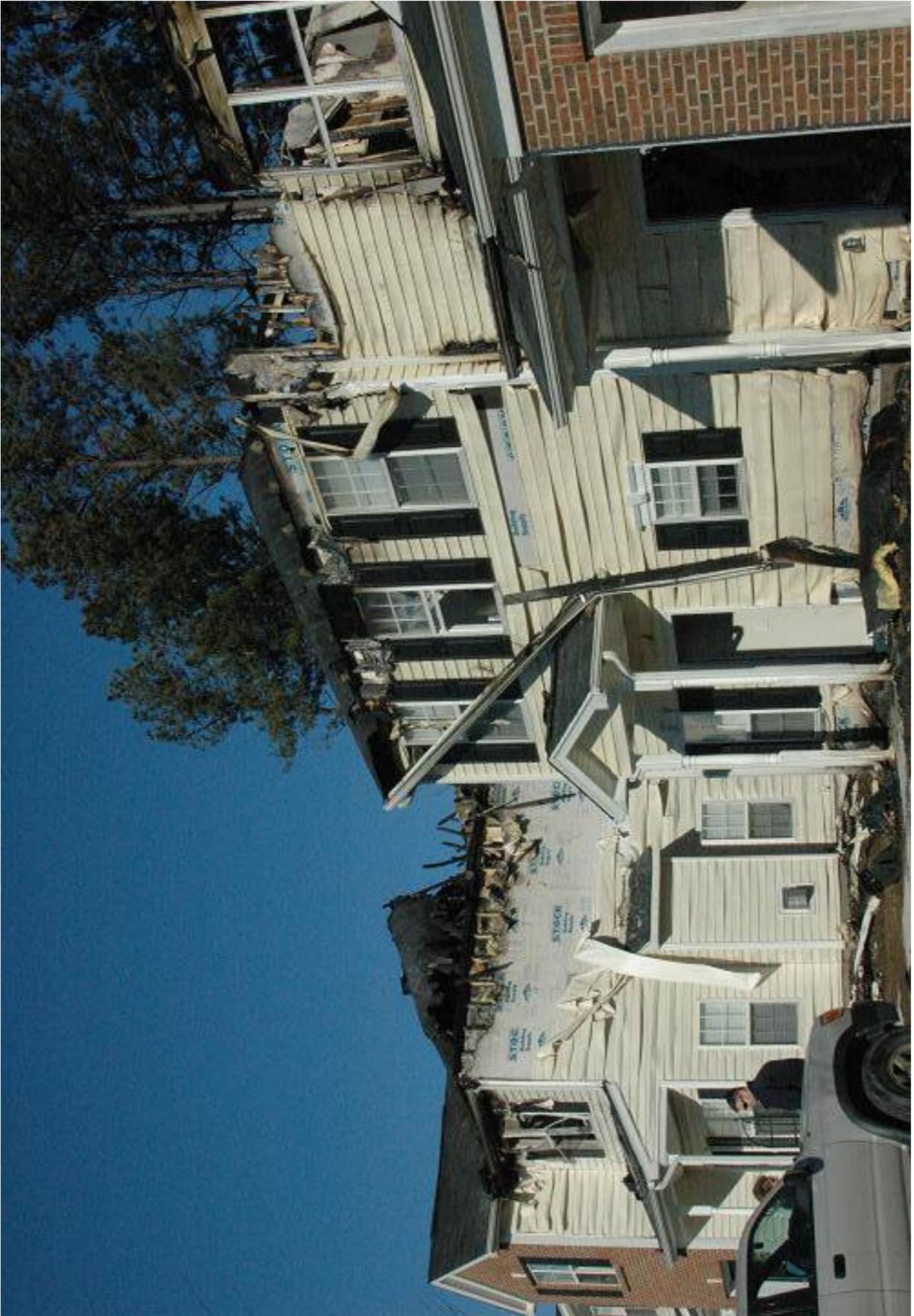
Postfire photo by City of Raleigh; March 1, 2007



Postfire photo by City of Raleigh; March 1, 2007



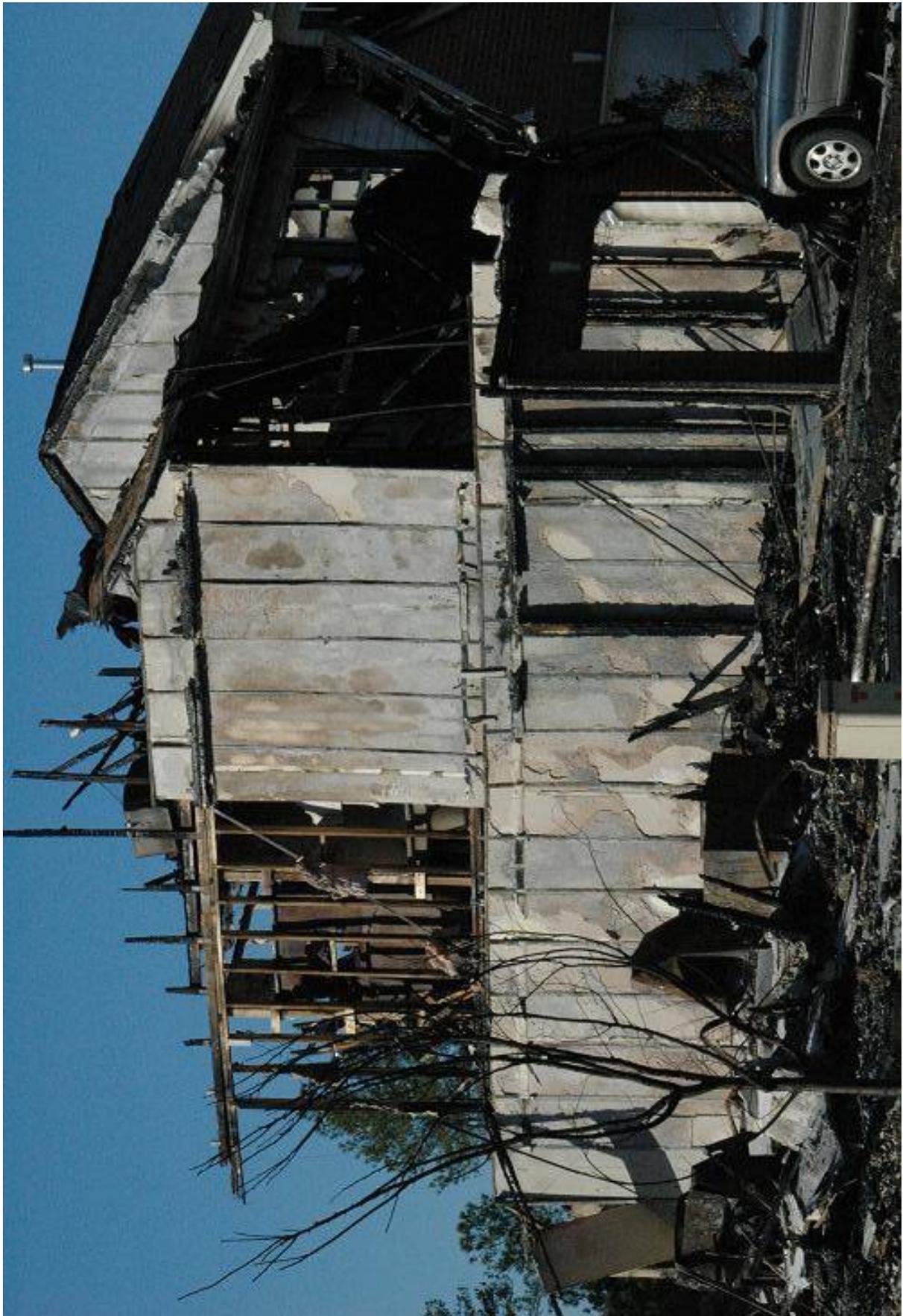
Postfire photo by City of Raleigh; March 1, 2007



Postfire photo by City of Raleigh; March 1, 2007



Postfire photo by City of Raleigh; March 1, 2007



Postfire photo by City of Raleigh; March 1, 2007



Postfire photo by City of Raleigh; March 1, 2007



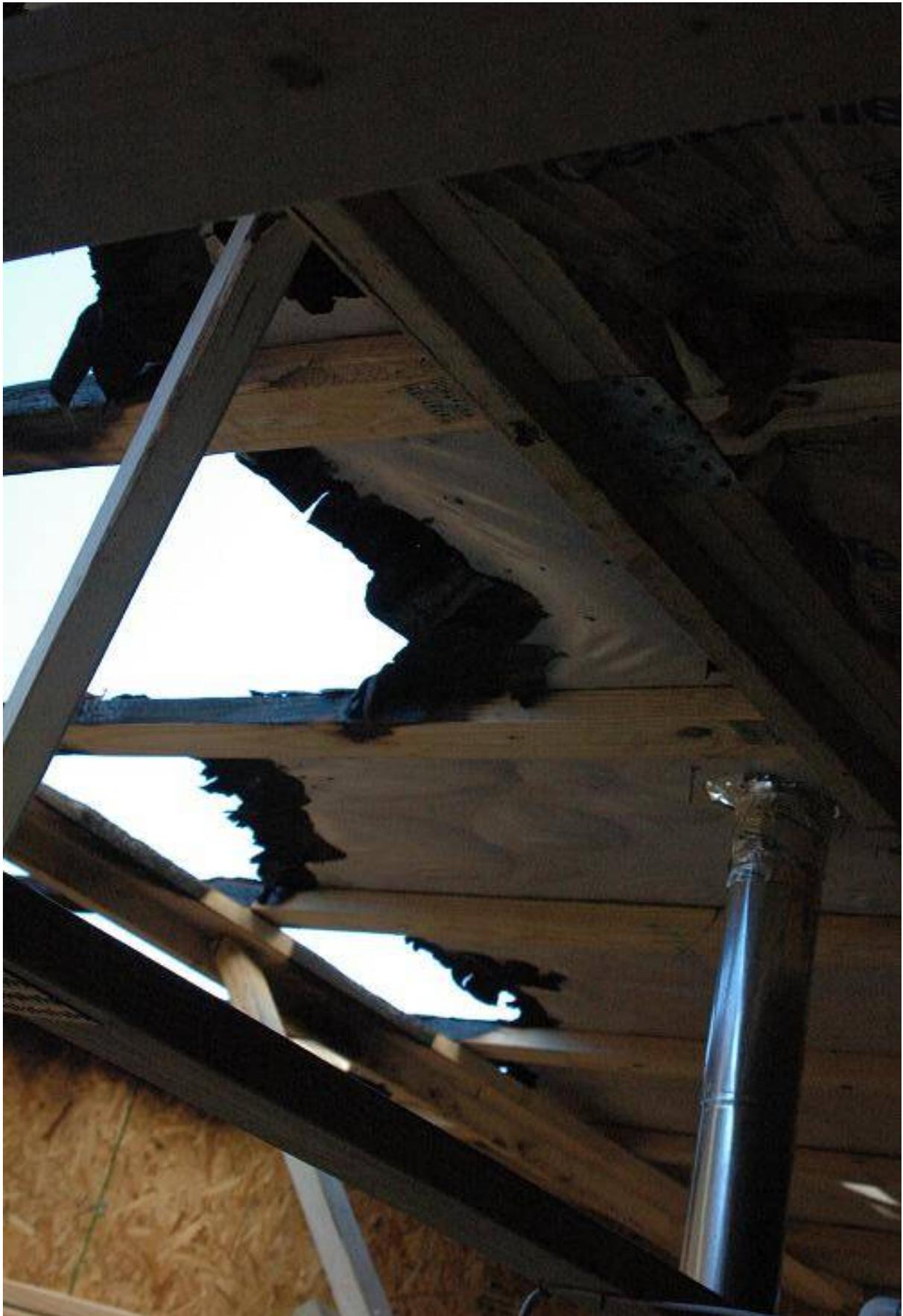
Postfire photo by City of Raleigh; March 1, 2007



Postfire photo by City of Raleigh; March 1, 2007



Postfire photo by City of Raleigh; March 1, 2007



Postfire photo by City of Raleigh; March 1, 2007



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Postfire photo by City of Raleigh; March 1, 2007



Postfire photo by City of Raleigh; March 1, 2007



Postfire photo by City of Raleigh; March 1, 2007



Postfire photo by City of Raleigh; March 1, 2007



## **APPENDIX - C**

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Postfire photos by Schirmer – Exterior Damage

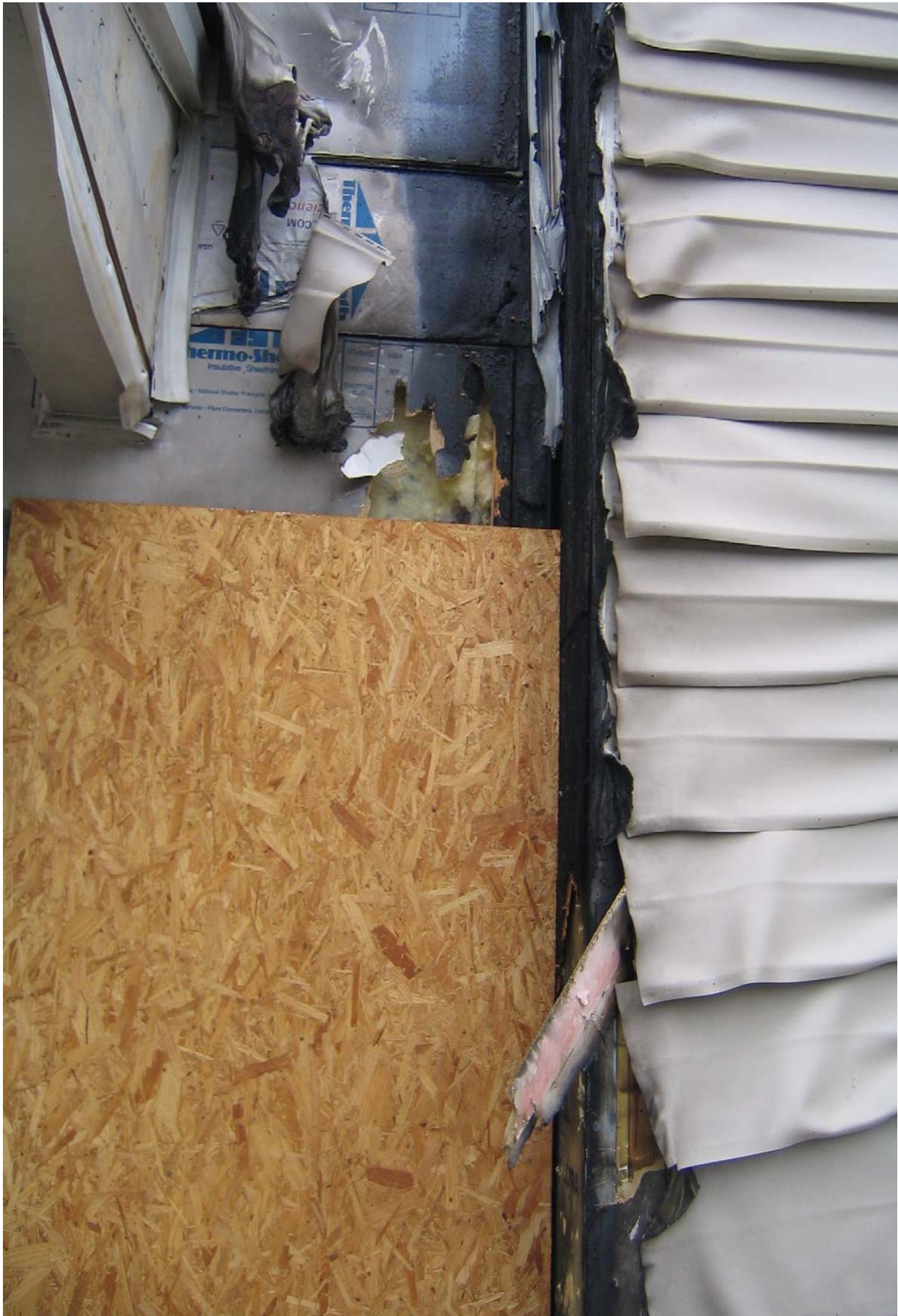


Postfire photo by Schirmer Engineering; Exterior Damage; April 10, 2007

















Postfire photo by Schirmer Engineering; Exterior Damage; April 10, 2007









Postfire photo by Schirmer Engineering; Exterior Damage; April 10, 2007





## **APPENDIX - D**

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Postfire photos by Schirmer – Undamaged Attic



Postfire photo by Schirmer Engineering; Undamaged Attic; April 11, 2007



























## **APPENDIX - E**

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Fire Department Report

<b>A</b>		MM DD YYYY 09213 NC 02 22 2007	27	07-0005016	005	<input type="checkbox"/> Delete <input type="checkbox"/> Change <input type="checkbox"/> No Activity	NFIRS -1 Basic
<b>B Location*</b>		<input type="checkbox"/> Check this box to indicate that the address for this incident is provided on the Wildland Fire Module in Section 9 "Alternative Location Specification". Use only for Wildland fires.					
<input checked="" type="checkbox"/> Street address <input type="checkbox"/> Intersection <input type="checkbox"/> In front of <input type="checkbox"/> Rear of <input type="checkbox"/> Adjacent to <input type="checkbox"/> Directions		3529 ONEONTA AVE <small>Number/Milepost Prefix Street or Highway Street Type Suffix</small>		RALEIGH NC 27601 <small>Apt./Suite/Room City State Zip Code</small>		<small>Census Tract</small>	
<b>C Incident Type *</b>		<b>E1 Date &amp; Times</b>			<b>E2 Shift &amp; Alarms</b>		
111 Building fire		Check boxes if dates are the same as Alarm Date. ALARM always required Alarm * 02 22 2007 15:03:21 ARRIVAL required, unless canceled or did not arrive <input checked="" type="checkbox"/> Arrival * 02 22 2007 15:11:00 CONTROLLED Optional, except for wildland fires <input type="checkbox"/> Controlled LAST UNIT CLEARED, required except for wildland fires <input type="checkbox"/> Last Unit <input type="checkbox"/> Cleared 02 23 2007 08:00:00			Midnight is 0000 Local Option <input type="checkbox"/> A <input type="checkbox"/> RFE27 Shift or Alarms District Platoon		
<b>D Aid Given or Received*</b>		<b>E3 Special Studies</b>					
1 <input type="checkbox"/> Mutual aid received 2 <input type="checkbox"/> Automatic aid recv. 3 <input type="checkbox"/> Mutual aid given 4 <input type="checkbox"/> Automatic aid given 5 <input type="checkbox"/> Other aid given N <input checked="" type="checkbox"/> None		Their FDID Their State Their Incident Number			Local Option Special Study ID# Special Study Value		
<b>F Actions Taken *</b>		<b>G1 Resources *</b>		<b>G2 Estimated Dollar Losses &amp; Values</b>			
10 Fire control or <small>Primary Action Taken (1)</small> 12 Salvage & overhaul <small>Additional Action Taken (2)</small> 22 Rescue, remove from <small>Additional Action Taken (3)</small>		<input checked="" type="checkbox"/> Check this box and skip this section if an Apparatus or Personnel form is used. Apparatus Personnel Suppression 0031 EMS Other <input type="checkbox"/> Check box if resource counts include aid received resources.		LOSSES: Required for all fires if known. Optional for non fires. None Property \$ , 000 , 000 <input type="checkbox"/> Contents \$ , 000 , 000 <input type="checkbox"/> PRE-INCIDENT VALUE: Optional Property \$ , 000 , 000 <input type="checkbox"/> Contents \$ , 000 , 000 <input type="checkbox"/>			
<b>Completed Modules</b>		<b>H1* Casualties</b>		<b>H3 Hazardous Materials Release</b>		<b>I Mixed Use Property</b>	
<input checked="" type="checkbox"/> Fire-2 <input checked="" type="checkbox"/> Structure-3 <input type="checkbox"/> Civil Fire Cas.-4 <input type="checkbox"/> Fire Serv. Cas.-5 <input type="checkbox"/> EMS-6 <input type="checkbox"/> HazMat-7 <input type="checkbox"/> Wildland Fire-8 <input checked="" type="checkbox"/> Apparatus-9 <input checked="" type="checkbox"/> Personnel-10 <input type="checkbox"/> Arson-11		<input type="checkbox"/> None Deaths Injuries Fire Service Civilian <b>H2 Detector</b> <small>Required for Confined Fires.</small> 1 <input type="checkbox"/> Detector alerted occupants 2 <input type="checkbox"/> Detector did not alert them U <input type="checkbox"/> Unknown		<input type="checkbox"/> None 1 <input type="checkbox"/> Natural Gas: slow leak, no evacuation or HazMat actions 2 <input type="checkbox"/> Propane gas: <21 lb. tank (as in home BBQ grill) 3 <input type="checkbox"/> Gasoline: vehicle fuel tank or portable container 4 <input type="checkbox"/> Kerosene: fuel burning equipment or portable storage 5 <input type="checkbox"/> Diesel fuel/fuel oil: vehicle fuel tank or portable 6 <input type="checkbox"/> Household solvents: home/office spill, cleanup only 7 <input type="checkbox"/> Motor oil: from engine or portable container 8 <input type="checkbox"/> Paint: from paint cans totaling < 55 gallons 0 <input type="checkbox"/> Other: Special HazMat actions required or spill > 55gal.. Please complete the HazMat form		<input type="checkbox"/> Not Mixed 10 <input type="checkbox"/> Assembly use 20 <input type="checkbox"/> Education use 33 <input type="checkbox"/> Medical use 40 <input type="checkbox"/> Residential use 51 <input type="checkbox"/> Row of stores 53 <input type="checkbox"/> Enclosed mall 58 <input type="checkbox"/> Bus. & Residential 59 <input type="checkbox"/> Office use 60 <input type="checkbox"/> Industrial use 63 <input type="checkbox"/> Military use 65 <input type="checkbox"/> Farm use 00 <input type="checkbox"/> Other mixed use	
<b>J Property Use* Structures</b>		341 <input type="checkbox"/> Clinic, clinic type infirmary		539 <input type="checkbox"/> Household goods, sales, repairs			
131 <input type="checkbox"/> Church, place of worship 161 <input type="checkbox"/> Restaurant or cafeteria 162 <input type="checkbox"/> Bar/Tavern or nightclub 213 <input type="checkbox"/> Elementary school or kindergarten 215 <input type="checkbox"/> High school or junior high 241 <input type="checkbox"/> College, adult education 311 <input type="checkbox"/> Care facility for the aged 331 <input type="checkbox"/> Hospital		342 <input type="checkbox"/> Doctor/dentist office 361 <input type="checkbox"/> Prison or jail, not juvenile 419 <input type="checkbox"/> 1-or 2-family dwelling 429 <input checked="" type="checkbox"/> Multi-family dwelling 439 <input type="checkbox"/> Rooming/boarding house 449 <input type="checkbox"/> Commercial hotel or motel 459 <input type="checkbox"/> Residential, board and care 464 <input type="checkbox"/> Dormitory/barracks 519 <input type="checkbox"/> Food and beverage sales		579 <input type="checkbox"/> Motor vehicle/boat sales/repair 571 <input type="checkbox"/> Gas or service station 599 <input type="checkbox"/> Business office 615 <input type="checkbox"/> Electric generating plant 629 <input type="checkbox"/> Laboratory/science lab 700 <input type="checkbox"/> Manufacturing plant 819 <input type="checkbox"/> Livestock/poultry storage (barn) 882 <input type="checkbox"/> Non-residential parking garage 891 <input type="checkbox"/> Warehouse			
Outside 124 <input type="checkbox"/> Playground or park 655 <input type="checkbox"/> Crops or orchard 669 <input type="checkbox"/> Forest (timberland) 807 <input type="checkbox"/> Outdoor storage area 919 <input type="checkbox"/> Dump or sanitary landfill 931 <input type="checkbox"/> Open land or field		936 <input type="checkbox"/> Vacant lot 938 <input type="checkbox"/> Graded/care for plot of land 946 <input type="checkbox"/> Lake, river, stream 951 <input type="checkbox"/> Railroad right of way 960 <input type="checkbox"/> Other street 961 <input type="checkbox"/> Highway/divided highway 962 <input type="checkbox"/> Residential street/driveway		981 <input type="checkbox"/> Construction site 984 <input type="checkbox"/> Industrial plant yard		Lookup and enter a Property Use code only if you have NOT checked a Property Use box: Property Use 429 Multifamily dwelling NFIRS-1 Revision 03/11/99	

**K1 Person/Entity Involved**  Local Option  Business name (if applicable)  -  -  Area Code Phone Number

Check This Box if same address as incident location. Then skip the three duplicate address lines.

Mr., Ms., Mrs. First Name  MI  Last Name  Suffix

Number  Prefix  Street or Highway  Street Type  Suffix

Post Office Box  Apt./Suite/Room  City

State  Zip Code  -

More people involved? Check this box and attach Supplemental Forms (NFIRS-1S) as necessary

**K2 Owner**  Same as person involved? Then check this box and skip the rest of this section.  Local Option  Business name (if Applicable)  -  -  Area Code Phone Number

Check this box if same address as incident location. Then skip the three duplicate address lines.

Mr., Ms., Mrs. First Name  MI  Last Name  Suffix

Number  Prefix  Street or Highway  Street Type  Suffix

Post Office Box  Apt./Suite/Room  City

State  Zip Code  -

**L Remarks**  Local Option

CAD NARRATIVE ( FRF070222005016 ):  
Incident Type- MAJOR WORKING FIRE

Raleigh Fire Department arrived on scene and found several multi-occupancy dwellings fully involved on both sides of Oneonta Ave. Battalion 4 performed a size-up of the incident and established command and accountability. He was later relieved of command by Car 1. Car 5 was assigned Operations. Several Engines arrived on scene and laid multiple 2 inch hand lines on the northern part of Oneonta. Subsequence units mounted an aggressive attack from Pine Knoll Drive working their way west. Engine companies utilized multiple hand lines for fire attack and exposure control. Ladder Companies were strategically placed and ladder pipe operations were initiated. Primary searches were being conducted simultaneously as fire operations ensued, and secondary searches were started as soon as physically possible. Salvage and overhaul procedures started as conditions allowed. Units remained on scene to provide continuing salvage and overhaul into the evening of February 23rd.

State and local agencies performed the investigation with the North Carolina SBI being the lead investigative agency.

**L Authorization**

F377  Warner, Henry F.  DC  RFC5  03  02  2007  
Officer in charge ID Signature Position or rank Assignment Month Day Year

Check Box if same as Officer in charge.  F934  Williams, Brandoe  CSP   03  02  2007  
Member making report ID Signature Position or rank Assignment Month Day Year



<b>I1 Structure Type *</b> If Fire was in enclosed building or a portable/mobile structure complete the rest of this form 1 <input checked="" type="checkbox"/> Enclosed Building 2 <input type="checkbox"/> Portable/mobile structure 3 <input type="checkbox"/> Open structure 4 <input type="checkbox"/> Air supported structure 5 <input type="checkbox"/> Tent 6 <input type="checkbox"/> Open platform (e.g. piers) 7 <input type="checkbox"/> Underground structure (work areas) 8 <input type="checkbox"/> Connective structure (e.g. fences) 0 <input type="checkbox"/> Other type of structure	<b>I2 Building Status *</b> 1 <input type="checkbox"/> Under construction 2 <input checked="" type="checkbox"/> Occupied & operating 3 <input type="checkbox"/> Idle, not routinely used 4 <input type="checkbox"/> Under major renovation 5 <input type="checkbox"/> Vacant and secured 6 <input type="checkbox"/> Vacant and unsecured 7 <input type="checkbox"/> Being demolished 0 <input type="checkbox"/> Other U <input type="checkbox"/> Undetermined	<b>I3 Building * Height</b> Count the ROOF as part of the highest story <u>002</u> <small>Total number of stories at or above grade</small>  <u>    </u> <small>Total number of stories below grade</small>	<b>I4 Main Floor Size*</b> <span style="float: right;">NFIRS-3 Structure Fire</span>  <u>    </u> , <u>001</u> , <u>400</u> <small>Total square feet</small>  OR <u>    </u> , <u>    </u> BY <u>    </u> , <u>    </u> <small>Length in feet                      Width in feet</small>
<b>J1 Fire Origin *</b> <u>002</u> <input type="checkbox"/> Below Grade <small>Story of fire origin</small>	<b>J3 Number of Stories Damaged By Flame</b> Count the ROOF as part of the highest story <u>    </u> Number of stories w/ minor damage (1 to 24% flame damage) <u>    </u> Number of stories w/ significant damage (25 to 49% flame damage) <u>    </u> Number of stories w/ heavy damage (50 to 74% flame damage) <u>    </u> Number of stories w/ extreme damage (75 to 100% flame damage)	<b>K Material Contributing Most To Flame Spread</b> <input type="checkbox"/> Check if no flame spread OR same as material first ignited OR unable to determine <span style="float: right;">Skip To Section L</span>  <b>K1</b> <u>    </u> <u>    </u> <small>Item contributing most to flame spread</small>  <b>K2</b> <u>    </u> <u>    </u> <small>Type of material contributing most of flame spread      Required only if item contributing code is 00 or &lt;70</small>	
<b>J2 Fire Spread *</b> 1 <input type="checkbox"/> Confined to object of origin 2 <input type="checkbox"/> Confined to room of origin 3 <input type="checkbox"/> Confined to floor of origin 4 <input type="checkbox"/> Confined to building of origin 5 <input checked="" type="checkbox"/> Beyond building of origin	<b>L1 Presence of Detectors *</b> <small>(In area of the fire)</small> N <input type="checkbox"/> None Present <span style="border: 1px solid black; padding: 2px;">Skip to section M</span> 1 <input checked="" type="checkbox"/> Present U <input type="checkbox"/> Undetermined		
<b>L2 Detector Type</b> 1 <input checked="" type="checkbox"/> Smoke 2 <input type="checkbox"/> Heat 3 <input type="checkbox"/> Combination smoke - heat 4 <input type="checkbox"/> Sprinkler, water flow detection 5 <input type="checkbox"/> More than 1 type present 0 <input type="checkbox"/> Other _____ U <input type="checkbox"/> Undetermined	<b>L3 Detector Power Supply</b> 1 <input type="checkbox"/> Battery only 2 <input checked="" type="checkbox"/> Hardwire only 3 <input type="checkbox"/> Plug in 4 <input type="checkbox"/> Hardwire with battery 5 <input type="checkbox"/> Plug in with battery 6 <input type="checkbox"/> Mechanical 7 <input type="checkbox"/> Multiple detectors & power supplies 0 <input type="checkbox"/> Other _____ U <input type="checkbox"/> Undetermined	<b>L5 Detector Effectiveness</b> Required if detector operated 1 <input checked="" type="checkbox"/> Alerted Occupants, occupants responded 2 <input type="checkbox"/> Occupants failed to respond 3 <input type="checkbox"/> There were no occupants 4 <input type="checkbox"/> Failed to alert occupants U <input type="checkbox"/> Undetermined	
<b>L4 Detector Operation</b> 1 <input type="checkbox"/> Fire too small to activate 2 <input checked="" type="checkbox"/> Operated (Complete Section L5) 3 <input type="checkbox"/> Failed to Operate (Complete Section L6) U <input type="checkbox"/> Undetermined		<b>L6 Detector Failure Reason</b> Required if detector failed to operate 1 <input type="checkbox"/> Power failure, shutoff or disconnect 2 <input type="checkbox"/> Improper installation or placement 3 <input type="checkbox"/> Defective 4 <input type="checkbox"/> Lack of maintenance, includes cleaning 5 <input type="checkbox"/> Battery missing or disconnected 6 <input type="checkbox"/> Battery discharged or dead 0 <input type="checkbox"/> Other _____ U <input type="checkbox"/> Undetermined	
<b>M1 Presence of Automatic Extinguishment System *</b> N <input checked="" type="checkbox"/> None Present 1 <input type="checkbox"/> Present <span style="border: 1px solid black; padding: 2px;">Complete rest of Section M</span>	<b>M2 Type of Automatic Extinguishment System *</b> Required if fire was within designed range of AES 1 <input type="checkbox"/> Wet pipe sprinkler 2 <input type="checkbox"/> Dry pipe sprinkler 3 <input type="checkbox"/> Other sprinkler system 4 <input type="checkbox"/> Dry chemical system 5 <input type="checkbox"/> Foam system 6 <input type="checkbox"/> Halogen type system 7 <input type="checkbox"/> Carbon dioxide (CO <sub>2</sub> ) system 0 <input type="checkbox"/> Other special hazard system U <input type="checkbox"/> Undetermined	<b>M3 Automatic Extinguishment System Operation</b> Required if fire was within designed range 1 <input type="checkbox"/> Operated & effective (Go to M4) 2 <input type="checkbox"/> Operated & not effective (M4) 3 <input type="checkbox"/> Fire too small to activate 4 <input type="checkbox"/> Failed to operate (Go to M5) 0 <input type="checkbox"/> Other U <input type="checkbox"/> Undetermined	<b>M5 Automatic Extinguishment System Failure Reason</b> Required if system failed 1 <input type="checkbox"/> System shut off 2 <input type="checkbox"/> Not enough agent discharged 3 <input type="checkbox"/> Agent discharged but did not reach fire 4 <input type="checkbox"/> Wrong type of system 5 <input type="checkbox"/> Fire not in area protected 6 <input type="checkbox"/> System components damaged 7 <input type="checkbox"/> Lack of maintenance 8 <input type="checkbox"/> Manual Intervention 0 <input type="checkbox"/> Other _____ U <input type="checkbox"/> Undetermined <small>NFIRS-3 Revision 01/19/99</small>
<b>M4 Number of Sprinkler Heads Operating</b> Required if system operated <u>    </u> <small>Number of sprinkler heads operating</small>			



## **APPENDIX - F**

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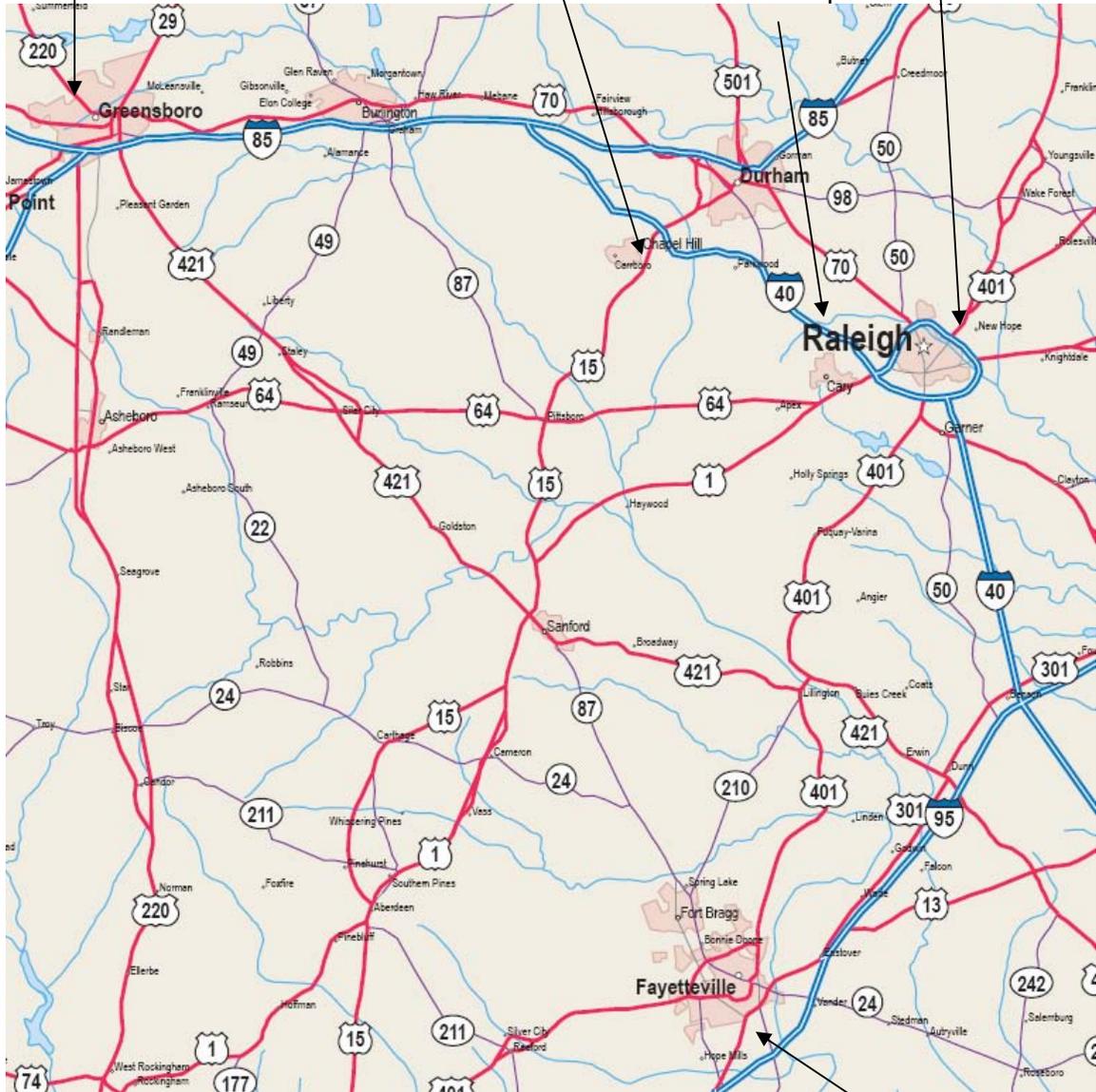
Weather Reports

Piedmont Triad International Airport,  
Greensboro, NC

Chapel Hill, NC

Pine Knoll Townhomes

Raleigh-Durham  
International Airport



Fayetteville  
Regional  
Airport

Complete weather history for these locations included in Appendix

# History for Raleigh-Durham Airport, NC

Thursday, February 22, 2007 — [View Current Conditions](#)

## Daily Summary

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Daily	<u>Weekly</u>	<u>Monthly</u>	<u>Custom</u>
<b>Temperature:</b>	Actual:	Average :	Record :
Mean Temperature	62 °F / 16 °C	45 °F / 7 °C	
Max Temperature	74 °F / 23 °C	56 °F / 13 °C	71 °F / 21 °C (1955)
Min Temperature	49 °F / 9 °C	33 °F / 0 °C	11 °F / -11 °C (1968)
<b>Degree Days:</b>			
Heating Degree Days	3	21	
Month to date heating degree days	567	507	
Since 1 July heating degree days	2287	2609	
Cooling Degree Days	0	0	
Month to date cooling degree days	0	0	
Year to date cooling degree days	1	0	
Growing Degree Days	10 (Base 50)		
<b>Moisture:</b>			
Dew Point	38 °F / 3 °C		
Average Humidity	56		
Maximum Humidity	100		
Minimum Humidity	11		
<b>Precipitation:</b>			
Precipitation	0.00 in / 0.00 cm	0.13 in / 0.33 cm	0.83 in / 2.11 cm (2003)
Month to date precipitation	1.18	2.69	
Year to date precipitation	4.30	6.71	
<b>Snow:</b>			
Snow	0.00 in / 0.00 cm	0.10 in / 0.25 cm	3.20 in / 8.13 cm (1978)
Month to date snowfall	0.6	2.4	
Since 1 July snowfall	1.6	5.4	
Snow Depth	0.00 in / 0.00 cm		
<b>Sea Level Pressure:</b>			
Sea Level Pressure	29.84 in / 1010 hPa		
<b>Wind:</b>			
Wind Speed	10 mph / 15 km/h (West)		
Max Wind Speed	28 mph / 45 km/h		
Max Gust Speed	33 mph / 53 km/h		
Visibility	6 miles / 9 kilometers		
Events	Fog		

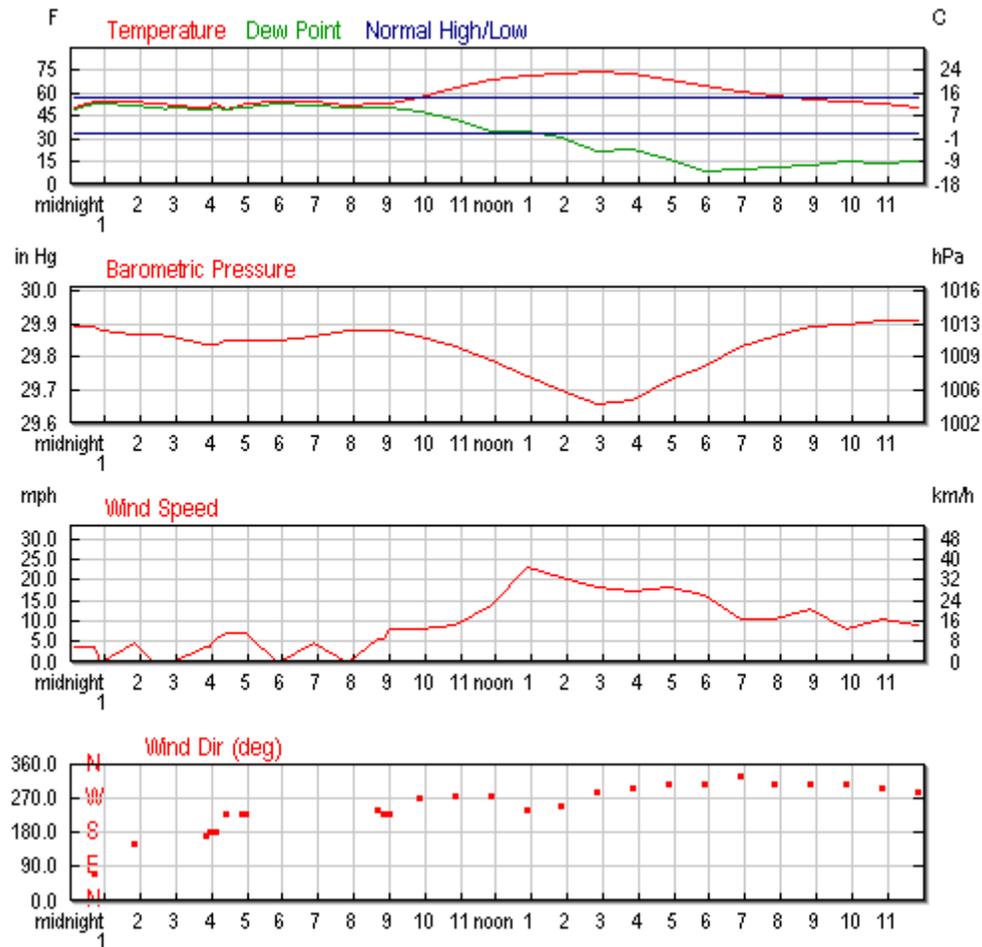
T = Trace of Precipitation, MM = Missing Value

Source: NWS Daily Summary

**Hourly Observations**

TimeEST	Temp (F)	Dew Point (F)	Humidity	Sea Level Pressure (In)	Visibility MPH	Wind Direction	Wind Speed MPH	Gust Speed MPH	Precip (In)	Conditions
12:09 AM	50	48.2	94	29.89	6	NNE	3.5	-	N/A	Patches of Fog
12:42 AM	53.6	51.8	94	29.89	6	ENE	3.5	-	N/A	Mostly Cloudy
12:51 AM	54	52	93	29.88	6	Calm	Calm	-	N/A	Overcast
1:51 AM	53.1	51.1	93	29.87	5	SSE	4.6	-	N/A	Mostly Cloudy
2:23 AM	51.8	50	94	29.87	3	Calm	Calm	-	N/A	Patches of Fog
2:37 AM	51.8	50	94	29.87	2.5	Calm	Calm	-	N/A	Patches of Fog
2:43 AM	51.8	48.2	88	29.86	1	Calm	Calm	-	N/A	Patches of Fog
2:51 AM	51.1	50	96	29.86	2	Calm	Calm	-	N/A	Patches of Fog
3:51 AM	48.9	48	97	29.84	2	South	3.5	-	N/A	Patches of Fog
3:56 AM	50	48.2	94	29.84	1	South	3.5	-	N/A	Patches of Fog
4:01 AM	51.8	48.2	88	29.84	1	South	4.6	-	N/A	Patches of Fog
4:06 AM	51.8	50	94	29.84	0.8	South	5.8	-	N/A	Patches of Fog
4:24 AM	48.2	48.2	100	29.85	0.1	SW	6.9	-	N/A	Fog
4:51 AM	51.1	50	96	29.85	0.1	SW	6.9	-	N/A	Fog
4:58 AM	51.8	50	94	29.85	0.2	SW	6.9	-	N/A	Fog
5:51 AM	53.1	52	96	29.85	0.2	Calm	Calm	-	N/A	Fog
6:51 AM	53.1	51.1	93	29.86	0.2	Variable	4.6	-	N/A	Fog
7:51 AM	51.1	50	96	29.88	0.5	Calm	Calm	-	N/A	Fog
8:41 AM	51.8	50	94	29.88	2	WSW	5.8	-	N/A	Mostly Cloudy
8:51 AM	52	50	93	29.88	2	SW	5.8	-	N/A	Scattered Clouds
8:59 AM	51.8	50	94	29.88	6	SW	8.1	-	N/A	Scattered Clouds
9:51 AM	55.9	46.9	72	29.86	9	West	8.1	-	N/A	Partly Cloudy
10:51 AM	63	42.1	46	29.83	10	West	9.2	-	N/A	Clear
11:51 AM	68	34	28	29.79	10	West	13.8	23	N/A	Partly Cloudy
12:51 PM	70	33.1	26	29.74	10	WSW	23	27.6	N/A	Partly Cloudy
1:51 PM	71.1	30	22	29.7	10	WSW	20.7	31.1	N/A	Scattered Clouds

2:51 PM	73	21	14	29.66	10	WNW	18.4	32.2	N/A	Scattered Clouds
3:51 PM	72	21.9	15	29.67	10	WNW	17.3	29.9	N/A	Partly Cloudy
4:51 PM	68	15.1	13	29.73	10	NW	18.4	28.8	N/A	Partly Cloudy
5:51 PM	64	8.1	11	29.77	10	NW	16.1	26.5	N/A	Partly Cloudy
6:51 PM	60.1	9	13	29.83	10	NNW	10.4	21.9	N/A	Clear
7:51 PM	57	10	15	29.86	10	NW	10.4	23	N/A	Clear
8:51 PM	55	12	18	29.89	10	NW	12.7	20.7	N/A	Clear
9:51 PM	53.1	14	21	29.9	10	NW	8.1	17.3	N/A	Clear
10:51 PM	52	12.9	21	29.91	10	WNW	10.4	20.7	N/A	Clear
11:51 PM	50	14	24	29.91	10	WNW	9.2	-	N/A	Clear



# History for Greensboro, NC

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## Daily Summary

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Daily	<u>Weekly</u>	<u>Monthly</u>	<u>Custom</u>
<b>Temperature:</b>	Actual:	Average :	Record :
Mean Temperature	57 °F / 13 °C	43 °F / 6 °C	
Max Temperature	71 °F / 21 °C	54 °F / 12 °C	73 °F / 22 °C (1930)
Min Temperature	42 °F / 5 °C	32 °F / 0 °C	9 °F / -12 °C (1963)
<b>Degree Days:</b>			
Heating Degree Days	8	23	
Month to date heating degree days	615	550	
Since 1 July heating degree days	2534	2888	
Cooling Degree Days	0	0	
Month to date cooling degree days	0	0	
Year to date cooling degree days	0	0	
Growing Degree Days	7 (Base 50)		
<b>Moisture:</b>			
Dew Point	31 °F / 0 °C		
Average Humidity	54		
Maximum Humidity	96		
Minimum Humidity	12		
<b>Precipitation:</b>			
Precipitation	0.00 in / 0.00 cm	0.11 in / 0.28 cm	2.14 in / 5.44 cm (2003)
Month to date precipitation	1.56	2.42	
Year to date precipitation	4.48	5.96	
<b>Snow:</b>			
Snow	0.00 in / 0.00 cm	0.20 in / 0.51 cm	2.10 in / 5.33 cm (2001)
Month to date snowfall	0.1	2.3	
Since 1 July snowfall	0.8	6.3	
Snow Depth	0.00 in / 0.00 cm		
<b>Sea Level Pressure:</b>			
Sea Level Pressure	29.83 in / 1010 hPa		
<b>Wind:</b>			
Wind Speed	14 mph / 22 km/h (West)		
Max Wind Speed	36 mph / 58 km/h		
Max Gust Speed	49 mph / 79 km/h		
Visibility	8 miles / 12 kilometers		

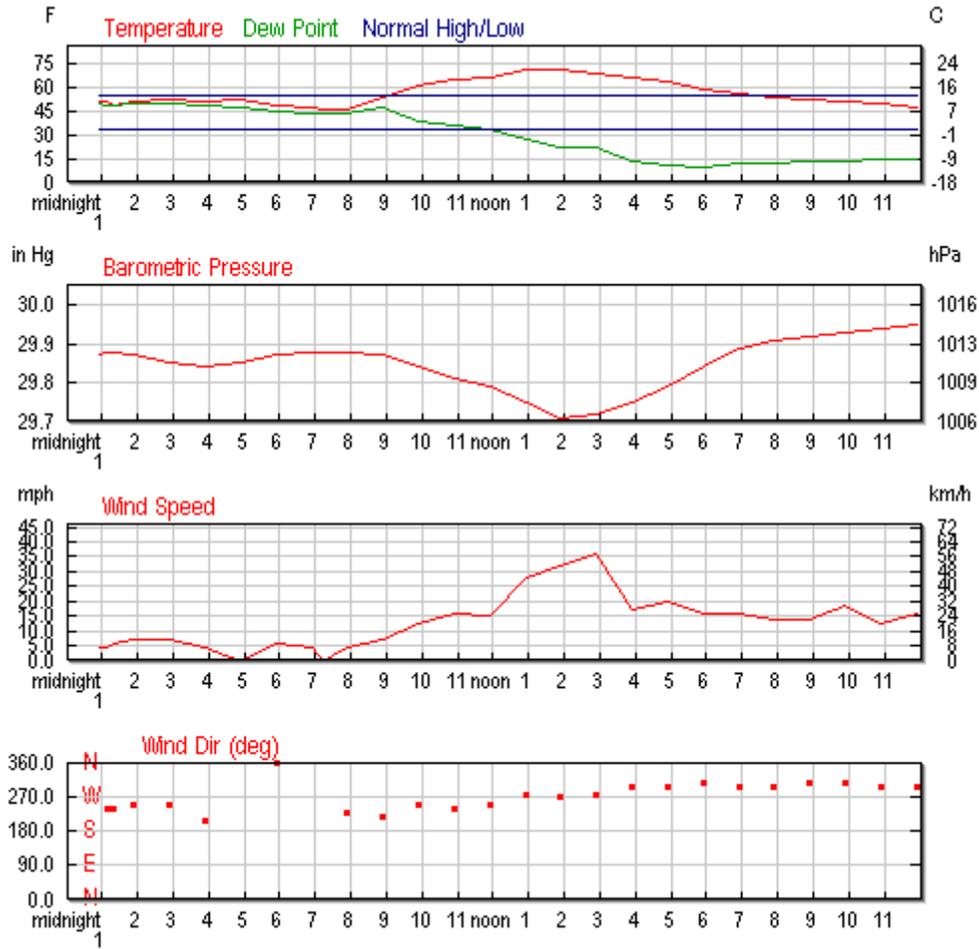
Events

T = Trace of Precipitation, MM = Missing Value

Source: NWS Daily Summary

### Hourly Observations

Time EST	Temp (F)	Dew Point (F)	Humidity	Sea Level Pressure (In)	Visibility MPH	Wind Direction	Wind Speed MPH	Gust Speed MPH	Precip (In)	Conditions
12:54 AM	50	48.9	96	29.87	4	West	4.6	-	N/A	Clear
1:08 AM	50	48.2	94	29.88	1.8	WSW	4.6	-	N/A	Clear
1:19 AM	48.2	48.2	100	29.88	3	WSW	5.8	-	N/A	Partly Cloudy
1:54 AM	50	48.9	96	29.87	5	WSW	6.9	-	N/A	Partly Cloudy
2:54 AM	52	48.9	89	29.85	6	WSW	6.9	-	N/A	Mostly Cloudy
3:54 AM	50	48	93	29.84	6	SSW	4.6	-	N/A	Mostly Cloudy
4:54 AM	51.1	46.9	86	29.85	7	Calm	Calm	-	N/A	Partly Cloudy
5:54 AM	48	44.1	86	29.87	8	North	5.8	-	N/A	Scattered Clouds
6:54 AM	46	43	89	29.88	5	Variable	4.6	-	N/A	Clear
7:13 AM	44.6	42.8	93	29.88	2.5	Calm	Calm	-	N/A	Partly Cloudy
7:54 AM	45	43	93	29.88	3	SW	4.6	-	N/A	Partly Cloudy
8:54 AM	53.1	46	77	29.87	8	SW	6.9	-	N/A	Clear
9:54 AM	60.1	37.9	44	29.84	10	WSW	12.7	-	N/A	Clear
10:54 AM	64	35.1	34	29.81	10	WSW	16.1	20.7	N/A	Clear
11:54 AM	66	33.1	29	29.79	10	WSW	15	27.6	N/A	Partly Cloudy
12:54 PM	70	26.1	19	29.75	10	West	27.6	36.8	N/A	Partly Cloudy
1:54 PM	70	21	16	29.71	10	West	32.2	46	N/A	Partly Cloudy
<b>2:54 PM</b>	<b>68</b>	<b>21</b>	<b>17</b>	<b>29.72</b>	<b>10</b>	<b>West</b>	<b>35.7</b>	<b>49.5</b>	<b>N/A</b>	<b>Clear</b>
<b>3:54 PM</b>	<b>66</b>	<b>12.9</b>	<b>13</b>	<b>29.75</b>	<b>10</b>	<b>WNW</b>	<b>17.3</b>	<b>26.5</b>	<b>N/A</b>	<b>Clear</b>
4:54 PM	63	10	13	29.79	10	WNW	19.6	29.9	N/A	Clear
5:54 PM	57.9	8.1	14	29.84	10	NW	16.1	23	N/A	Clear
6:54 PM	55	10.9	17	29.89	10	WNW	16.1	26.5	N/A	Clear
7:54 PM	53.1	10.9	19	29.91	10	WNW	13.8	26.5	N/A	Clear
8:54 PM	51.1	12	21	29.92	10	NW	13.8	20.7	N/A	Clear
9:54 PM	50	12.9	23	29.93	10	NW	18.4	26.5	N/A	Clear
10:54 PM	48.9	14	25	29.94	10	WNW	12.7	25.3	N/A	Clear
11:54 PM	46.9	14	27	29.95	10	WNW	16.1	26.5	N/A	Clear



# History for Fayetteville, NC

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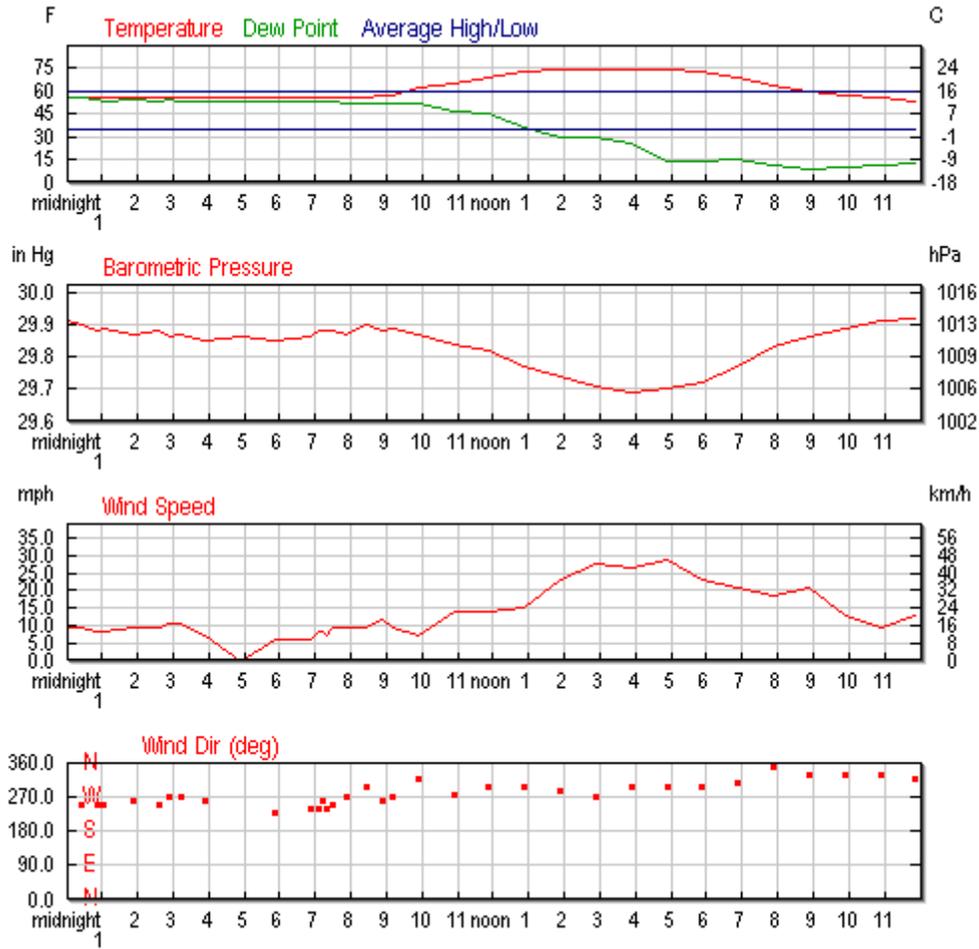
## Daily Summary

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<u>Daily</u>	<u>Weekly</u>	<u>Monthly</u>	<u>Custom</u>
	Actual:	Average :	Record :
<b>Temperature:</b>			
Mean Temperature	64 °F / 17 °C	-	
Max Temperature	75 °F / 23 °C	-	- ()
Min Temperature	53 °F / 11 °C	-	- ()
<b>Degree Days:</b>			
Heating Degree Days	1		
Month to date heating degree days	510		
Since 1 July heating degree days	1963		
Cooling Degree Days	0		
Month to date cooling degree days	0		
Year to date cooling degree days	2		
Growing Degree Days	14 (Base 50)		
<b>Moisture:</b>			
Dew Point	43 °F / 6 °C		
Average Humidity	55		
Maximum Humidity	100		
Minimum Humidity	10		
<b>Precipitation:</b>			
Precipitation	0.00 in / 0.00 cm	0.00 in / 0.00 cm	0.00 in / 0.00 cm ()
Month to date precipitation	1.60	0.00	
<b>Sea Level Pressure:</b>			
Sea Level Pressure	29.85 in / 1011 hPa		
<b>Wind:</b>			
Wind Speed	14 mph / 23 km/h (West)		
Max Wind Speed	32 mph / 52 km/h		
Max Gust Speed	41 mph / 66 km/h		
Visibility	6 miles / 9 kilometers		
Events	Fog		
T = Trace of Precipitation, MM = Missing Value		Source: NWS Daily Summary	

### Hourly Observations

Time EST	Temp (F)	Dew Point (F)	Humidity	Sea Level Pressure (In)	Visibility MPH	Wind Direction	Wind Speed MPH	Gust Speed MPH	Precip (In)	Conditions
12:02 AM	55.4	55.4	100	29.91	0.8	West	9.2	-	N/A	Overcast
12:24 AM	55.4	55.4	100	29.9	1	WSW	9.2	-	N/A	Overcast
12:53 AM	55.9	54	93	29.88	2	WSW	8.1	-	N/A	Overcast
1:03 AM	55.4	53.6	94	29.89	1.8	WSW	8.1	-	N/A	Overcast
1:53 AM	55	54	96	29.87	0.5	West	9.2	-	N/A	Fog
2:36 AM	55.4	53.6	94	29.88	1.2	WSW	9.2	-	N/A	Overcast
2:53 AM	55	54	96	29.86	2.5	West	10.4	-	N/A	Overcast
3:14 AM	55.4	53.6	94	29.87	4	West	10.4	-	N/A	Overcast
3:53 AM	55	53.1	93	29.85	4	West	6.9	-	N/A	Overcast
4:53 AM	55	53.1	93	29.86	4	Calm	Calm	-	N/A	Overcast
5:53 AM	55	53.1	93	29.85	3	SW	5.8	-	N/A	Overcast
6:53 AM	55	53.1	93	29.86	3	WSW	5.8	-	N/A	Overcast
7:04 AM	55.4	53.6	94	29.88	2	WSW	8.1	-	N/A	Overcast
7:13 AM	55.4	53.6	94	29.88	1.8	West	8.1	-	N/A	Overcast
7:20 AM	55.4	53.6	94	29.88	2	WSW	6.9	-	N/A	Overcast
7:30 AM	55.4	53.6	94	29.88	1.8	WSW	9.2	-	N/A	Overcast
7:53 AM	55	52	89	29.87	2	West	9.2	-	N/A	Overcast
8:25 AM	55.4	51.8	88	29.9	3	WNW	9.2	-	N/A	Overcast
8:53 AM	57	52	83	29.88	3	West	11.5	-	N/A	Mostly Cloudy
9:11 AM	57.2	51.8	82	29.89	4	West	9.2	-	N/A	Scattered Clouds
9:53 AM	62.1	51.1	67	29.87	5	NW	6.9	-	N/A	Clear
10:53 AM	64.9	46.9	52	29.84	9	West	13.8	-	N/A	Clear
11:53 AM	69.1	45	42	29.82	10	WNW	13.8	-	N/A	Clear
12:53 PM	73	36	26	29.77	10	WNW	15	-	N/A	Clear
1:53 PM	73.9	30	20	29.74	10	WNW	23	27.6	N/A	Clear
<b>2:53 PM</b>	<b>73.9</b>	<b>30</b>	<b>20</b>	<b>29.71</b>	<b>10</b>	<b>West</b>	<b>27.6</b>	<b>36.8</b>	<b>N/A</b>	<b>Clear</b>
<b>3:53 PM</b>	<b>73.9</b>	<b>26.1</b>	<b>17</b>	<b>29.69</b>	<b>10</b>	<b>WNW</b>	<b>26.5</b>	<b>34.5</b>	<b>N/A</b>	<b>Clear</b>
4:53 PM	73.9	14	10	29.7	10	WNW	28.8	41.4	N/A	Clear
5:53 PM	72	14	11	29.72	10	WNW	23	28.8	N/A	Clear
6:53 PM	68	15.1	13	29.77	10	NW	20.7	26.5	N/A	Clear
7:53 PM	63	10.9	13	29.83	10	North	18.4	24.2	N/A	Clear
8:53 PM	60.1	9	13	29.86	10	NNW	20.7	31.1	N/A	Clear
9:53 PM	57	10	15	29.89	10	NNW	12.7	21.9	N/A	Clear
10:53 PM	55	10.9	17	29.91	10	NNW	9.2	-	N/A	Clear
11:53 PM	53.1	12	20	29.92	10	NW	12.7	-	N/A	Clear



# History for Chapel Hill, NC

Thursday, February 22, 2007 — [View Current Conditions](#)

## Daily Summary

[« Previous Day](#)

[Next Day »](#)

February	▼	22	▼	2007	▼	Go
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	Daily	Weekly	Monthly	Custom
		Actual:	Average :	Record :
<b>Temperature:</b>				
Mean Temperature	59 °F / 15 °C	-		
Max Temperature	72 °F / 22 °C	57 °F / 13 °C	73 °F / 22 °C	(1986)
Min Temperature	46 °F / 7 °C	31 °F / 0 °C	11 °F / -11 °C	(1963)
<b>Degree Days:</b>				
Heating Degree Days	6			
Growing Degree Days	9 (Base 50)			
<b>Moisture:</b>				
Dew Point	37 °F / 2 °C			
Average Humidity	70			
Maximum Humidity	100			
Minimum Humidity	12			
<b>Precipitation:</b>				
Precipitation	0.00 in / 0.00 cm	-	-	()
<b>Sea Level Pressure:</b>				
Sea Level Pressure	29.87 in / 1011 hPa			
<b>Wind:</b>				
Wind Speed	0 mph / 0 km/h (WNW)			
Max Wind Speed	21 mph / 34 km/h			
Max Gust Speed	37 mph / 60 km/h			
Visibility	4 miles / 7 kilometers			
Events	Fog			

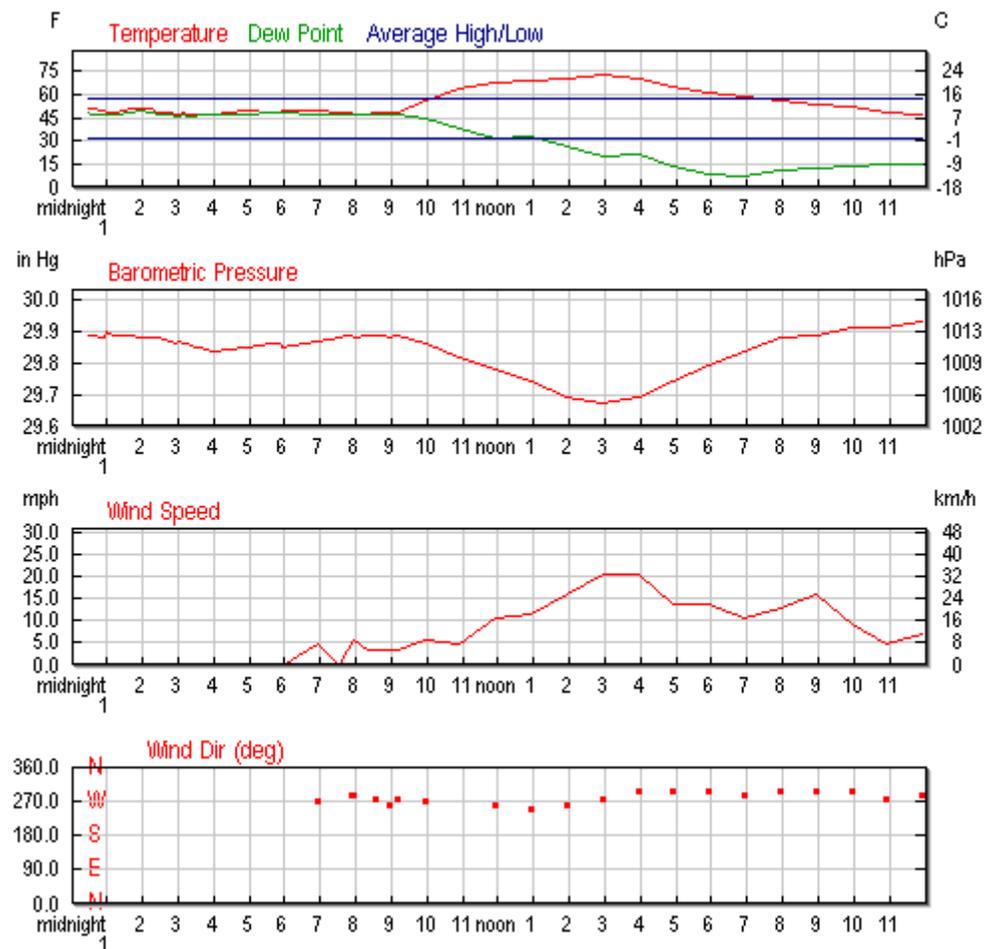
Averages and records for this station are not official NWS values.

T = Trace of Precipitation, MM = Missing Value Source: NWS Daily Summary

### Hourly Observations

Time EST	Temp (F)	Dew Point (F)	Humidity	Sea Level Pressure (In)	Visibility MPH	Wind Direction	Wind Speed MPH	Gust Speed MPH	Precipitation (In)	Conditions
12:29 AM	50	48.2	94	29.89	0.8	Calm	Calm	-	N/A	Mist
12:36 AM	50	46.4	87	29.89	0.2	Calm	Calm	-	N/A	Fog
12:56 AM	48.9	46.9	93	29.88	0.8	Calm	Calm	-	N/A	Mostly Cloudy
1:00 AM	48.2	46.4	93	29.9	2	Calm	Calm	-	N/A	Mostly Cloudy
1:11 AM	48.2	46.4	93	29.89	2.5	Calm	Calm	-	N/A	Mostly Cloudy
1:42 AM	50	48.2	94	29.89	3	Calm	Calm	-	N/A	Mostly Cloudy
1:56 AM	50	48.9	96	29.88	4	Calm	Calm	-	N/A	Overcast
2:16 AM	50	48.2	94	29.88	2.5	Calm	Calm	-	N/A	Scattered Clouds
2:20 AM	48.2	48.2	100	29.88	1	Calm	Calm	-	N/A	Mist
2:26 AM	48.2	46.4	93	29.88	0.8	Calm	Calm	-	N/A	Clear
2:47 AM	48.2	46.4	93	29.87	1.8	Calm	Calm	-	N/A	Scattered Clouds
2:56 AM	46.9	45	93	29.86	1.8	Calm	Calm	-	N/A	Partly Cloudy
3:02 AM	46.4	44.6	93	29.87	0.5	Calm	Calm	-	N/A	Fog
3:09 AM	48.2	46.4	93	29.86	0.2	Calm	Calm	-	N/A	Fog
3:17 AM	46.4	44.6	93	29.86	0.2	Calm	Calm	-	N/A	Fog
3:29 AM	46.4	44.6	93	29.85	0.2	Calm	Calm	-	N/A	Fog
3:38 AM	46.4	46.4	100	29.85	0	Calm	Calm	-	N/A	Fog
3:56 AM	46.9	46	97	29.84	0.2	Calm	Calm	-	N/A	Fog
4:56 AM	48.9	46.9	93	29.85	0.2	Calm	Calm	-	N/A	Fog
5:37 AM	48.2	48.2	100	29.86	0.8	Calm	Calm	-	N/A	Overcast
5:52 AM	48.2	48.2	100	29.86	0.5	Calm	Calm	-	N/A	Fog
5:56 AM	48.9	48	97	29.85	0.5	Calm	Calm	-	N/A	Fog
6:56 AM	48.9	46.9	93	29.87	0.5	West	4.6	-	N/A	Fog
7:33 AM	48.2	46.4	93	29.88	0.8	Calm	Calm	-	N/A	Overcast
7:45 AM	48.2	46.4	93	29.89	1.5	Variable	3.5	-	N/A	Overcast
7:54 AM	48.2	46.4	93	29.89	2	WNW	4.6	-	N/A	Overcast
7:56 AM	46.9	46	97	29.88	2.5	WNW	5.8	-	N/A	Overcast
8:21 AM	46.4	46.4	100	29.89	3	Variable	3.5	-	N/A	Overcast
8:34 AM	48.2	46.4	93	29.89	2.5	West	3.5	-	N/A	Overcast
8:45 AM	48.2	46.4	93	29.89	3	Variable	3.5	-	N/A	Overcast
8:56 AM	48	46	93	29.88	4	West	3.5	-	N/A	Mostly Cloudy
9:09 AM	48.2	46.4	93	29.89	6	West	3.5	-	N/A	Scattered Clouds
9:56 AM	55.9	44.1	64	29.86	9	West	5.8	-	N/A	Clear
10:56 AM	63	37	38	29.82	10	Variable	4.6	-	N/A	Clear
11:56 AM	66.9	30.9	26	29.78	10	West	10.4	21.9	N/A	Clear
12:56 PM	68	32	26	29.74	10	WSW	11.5	19.6	N/A	Clear

1:56 PM	70	25	18	29.69	10	West	16.1	28.8	N/A	Clear
<b>2:56 PM</b>	<b>72</b>	<b>19</b>	<b>13</b>	<b>29.67</b>	<b>10</b>	<b>West</b>	<b>20.7</b>	<b>36.8</b>	<b>N/A</b>	<b>Clear</b>
<b>3:56 PM</b>	<b>69.1</b>	<b>21</b>	<b>16</b>	<b>29.69</b>	<b>10</b>	<b>WNW</b>	<b>20.7</b>	<b>35.7</b>	<b>N/A</b>	<b>Clear</b>
4:56 PM	64.9	12.9	13	29.74	10	WNW	13.8	32.2	N/A	Clear
5:56 PM	61	8.1	12	29.79	10	WNW	13.8	25.3	N/A	Clear
6:56 PM	57.9	6.1	13	29.84	10	WNW	10.4	25.3	N/A	Clear
7:56 PM	55	10	17	29.88	10	WNW	12.7	21.9	N/A	Clear
8:56 PM	53.1	10.9	19	29.89	10	WNW	16.1	25.3	N/A	Clear
9:56 PM	51.1	12.9	22	29.91	10	WNW	9.2	18.4	N/A	Clear
10:56 PM	48	14	26	29.91	10	West	4.6	-	N/A	Clear
11:56 PM	46.9	14	27	29.93	10	WNW	6.9	-	N/A	Clear





## **APPENDIX - G**

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### Roofing and Exterior Walls



ICC Evaluation Service, Inc.  
www.icc-es.org

Business/Regional Office ■ 5360 Workman Mill Road, Whittier, California 90601 ■ (562) 699-0543  
Regional Office ■ 900 Montclair Road, Suite A, Birmingham, Alabama 35213 ■ (205) 599-9800  
Regional Office ■ 4051 West Flossmoor Road, Country Club Hills, Illinois 60478 ■ (708) 799-2305

Legacy report on the 1997 *Uniform Building Code*™

DIVISION: 07—THERMAL AND MOISTURE PROTECTION  
Section: 07310—Shingles

GAF ASPHALT SHINGLE ROOF COVERING SYSTEMS

GAF MATERIALS CORPORATION  
1361 ALPS ROAD  
WAYNE, NEW JERSEY 07470-3689

1.0 SUBJECT

Country Mansion™, Country Estates™, Grand Sequoia®, Grand Canyon™, Slateline®, TIMBERLINE Ultra® Shadow Accent™, TIMBERLINE® 25, Original TIMBERLINE, and Royal Sovereign® Asphalt Shingle Roof Covering Systems.

2.0 DESCRIPTION

2.1 General:

GAF Materials Corporation shingles are three- and five-tab, laminated asphalt shingle roof covering systems, and are Class A roof coverings when installed as described in this report. Table 1 shows manufacturing plant locations, dimensions, installed weight and maximum exposure to the weather.

2.2 Materials:

**2.2.1 General:** The shingles are fabricated from fiberglass mats, impregnated and coated with asphalt on both sides. Blends of variously colored granules are applied to the coating on the weathering surface, and a light mineral surfacing is applied to the back of the shingles to prevent sticking when bundled.

**2.2.2 Hip and Ridge Shingles:** Hip and ridge shingles are cut from three-tab Royal Sovereign shingles to 12 inches by 12 inches (English) (305 mm by 305 mm) or 13<sup>1</sup>/<sub>4</sub> inches by 13<sup>1</sup>/<sub>8</sub> inches (337 mm by 333 mm), and are compatible with any GAF shingles.

**2.2.3 Fasteners:** Fasteners must either be minimum No. 12 gage, aluminum or zinc-coated steel, barbed-, deformed- or smooth-shank roofing nails having a minimum <sup>3</sup>/<sub>8</sub>-inch (10 mm) head, or be approved minimum No. 16 gage, galvanized steel staples having a minimum crown width of <sup>15</sup>/<sub>16</sub> inch (23.8 mm).

**2.2.4 Underlayment:** Roof underlayment must comply with the code.

2.3 Installation—New Construction:

**2.3.1 General:** When installed in accordance with this section, the shingles are a Class A roof covering. The

shingles are installed in accordance with Table 15-B-1 of the code, except as noted in this report. The roof deck is minimum <sup>3</sup>/<sub>8</sub>-inch-thick (9.5 mm) exterior-grade plywood complying with UBC 23-2 or 23-3, <sup>7</sup>/<sub>16</sub>-inch-thick (11.1 mm) oriented strand board complying with UBC 23-3, or solid sheathing conforming to Sections 2312.2 and 2320.12.9 of the 1997 *Uniform Building Code*™ (UBC). Minimum roof slope shall be 2:12 (16.67% slope).

Depending upon shingle design, self-sealing thermal adhesive is embedded in either the top or the back surface of the shingle, and bonds overlapping shingles to each other, on the roof, by means of the heat of the sun. In colder climates or wind regions where it is questionable whether the thermal sealant will activate and seal the shingles, or for roof slopes greater than 21:12 (175% slope), the shingles must be hand-sealed. Hand-sealing consists of applying 1-inch-diameter (25.4 mm) spots of shingle-tab adhesive to the back of the shingle, at a manufacturer-specified distance from each side, and 1 inch (25 mm) up from the bottom of the tab. The tab must be pressed firmly into the adhesive.

Fasteners must have sufficient length to penetrate into the sheathing <sup>3</sup>/<sub>4</sub> inch (19.1 mm) or through the sheathing thickness, whichever is less. Nails must be driven flush with the surface of the shingle, and overdriving must be avoided so as to not damage the shingles. Staples must be driven straight, with the crown parallel to the bottom of the shingles. All staple legs shall be a minimum of 1 inch (25 mm) from the side of the shingle. The quantity and placement of the staples is the same as for the nails. Staples are driven with an accurately adjusted pneumatic staple gun, to ensure that the entire crown bears tightly against the shingle but does not cut the shingle surface.

Installation instructions are included as part of the identification label attached to each bundle of shingles (see Section 2.4). Nail patterns for each of the GAF products are provided in Figure 1 of this report.

**2.3.2 Underlayment:** Underlayment application shall be in accordance with Table 15-B-1 of the code and the manufacturer's instructions.

**2.3.3 Country Mansion Shingles:** A minimum of four fasteners must be installed per shingle, approximately 8 inches (203 mm) up from the bottom of the shingle. Fasteners must be installed approximately 1 inch (25 mm) and 12<sup>3</sup>/<sub>4</sub> inches (324 to 349 mm) from each side. The maximum exposure to weather is 7<sup>1</sup>/<sub>2</sub> inches (191 mm).

**2.3.4 Country Estates Shingles:** A minimum of four fasteners must be installed per shingle, approximately 8 inches (203 mm) up from the bottom of the shingle. Fasteners



must be installed approximately 1 inch (25 mm) and  $12\frac{3}{4}$  to  $13\frac{3}{4}$  inches (324 to 349 mm) from each side. The maximum exposure to the weather is  $7\frac{1}{2}$  inches (191 mm).

**2.3.5 Grand Sequoia Shingles:** Five fasteners must be installed per shingle, approximately 11 inches (279 mm) up from the bottom of the shingle. Fasteners must be installed approximately 1 inch (25 mm), 10 inches (254 mm) and 20 inches (508 mm) from each side. The maximum exposure to weather is 5 inches (127 mm), with an allowable tolerance of  $+\frac{1}{8}$  inch (3.2 mm).

**2.3.6 Grand Canyon Shingles:** A minimum of five fasteners must be installed per shingle, approximately 11 inches (279 mm) up from the bottom of the shingle. Fasteners must be installed approximately 1 inch (25 mm), 10 inches (254 mm) and 20 inches (508 mm) from each side. The maximum exposure to the weather is 5 inches (127 mm), with an allowable tolerance of  $+\frac{1}{8}$  inch (3.2 mm).

**2.3.7 Slateline Shingles:** Six fasteners must be installed per shingle, approximately  $8\frac{1}{8}$  inches (206 mm) up from the bottom of the shingle. Fasteners must be installed approximately 1 inch (25 mm), 8 inches (203 mm) and 16 inches (406 mm) from each side. The maximum exposure to weather is  $7\frac{1}{2}$  inches (191 mm).

**2.3.8 TIMBERLINE Series:** Four fasteners must be installed per shingle, approximately 6 inches (152 mm) up from the bottom of the shingle. Fasteners must be installed approximately 1 inch (25 mm) and 13 inches (330 mm) from each side. The maximum exposure to weather is  $5\frac{5}{8}$  inches (143 mm).

**2.3.9 Royal Sovereign Shingles:** Four fasteners must be installed per shingle, approximately  $5\frac{5}{8}$  inches (143 mm) up from the bottom of the shingle. Fasteners must be installed approximately 1 inch (25 mm) and 12 inches (305 mm) from each side. The maximum exposure to weather is 5 inches (127 mm).

**2.3.10 Hip and Ridge Shingles:** Hip and ridge shingles must be placed evenly over hips and ridges, and fastened to the roof deck using two fasteners, one  $5\frac{5}{8}$  inches (143 mm) from the exposed end on each side, 1 inch (25 mm) up from the bottom edge. Nails must penetrate through the double-ply area. Weather exposure shall not exceed that permitted for the field of the roof.

**2.3.11 Valley Construction:** Valleys must be flashed in accordance with Section 1508.2 of the code.

#### 2.4 Installation—Reroofing:

When installed over existing Class A or Class C asphalt shingle roofs in accordance with this section, the GAF asphalt

shingles described in this report are Class A roof coverings. The existing asphalt roof covering must be inspected in accordance with Section 1515 of UBC Appendix Chapter 15. Prior to reroofing, hip and ridge cover must be removed, and a single layer of minimum Type 30, nonperforated felt underlayment must be installed over the existing asphalt shingles. The shingles are installed in accordance with Section 2.3 of this report, except as noted in this section. Fasteners must be of sufficient length to penetrate  $\frac{3}{4}$  inch (19.1 mm) into the sheathing, or through the sheathing, whichever is less. Flashing and edging must comply with Section 1520 of UBC Appendix Chapter 15 and Section 2.3 of this report.

#### 2.5 Identification:

Each bundle of shingles bears a label with the name and address of GAF Materials Corporation; the product name; plant location identification; installation instructions; the evaluation report number (ICBO ES ER-5546); and the name of the quality control agency (Underwriters Laboratories Inc.), along with an indication of compliance with UL fire and wind requirements.

#### 3.0 EVIDENCE SUBMITTED

Data in accordance with ASTM D 3462-97 and the ICBO ES Acceptance Criteria for Roofing Systems with Asphalt Shingles Made with Glass Felt (AC127), dated July 1999.

#### 4.0 FINDINGS

**That the GAF Materials Corporation asphalt shingle roofing systems described in this report comply with the 1997 Uniform Building Code™, subject to the following conditions:**

- 4.1. The shingles are manufactured, identified and installed in accordance with the code, this report and the manufacturer's instructions.
- 4.2 The shingles are installed in areas subject to a maximum basic wind speed of 80 mph (129 km/h), on structures a maximum of 40 feet (12 192 mm) in height, in Exposure B areas.
- 4.3 The products are manufactured at locations noted in Table 1 of this report, under a quality control program with inspections by Underwriters Laboratories Inc. (AA-668).

This report is subject to re-examination in two years.

TABLE 1— PRODUCT DESCRIPTIONS AND MANUFACTURING LOCATIONS

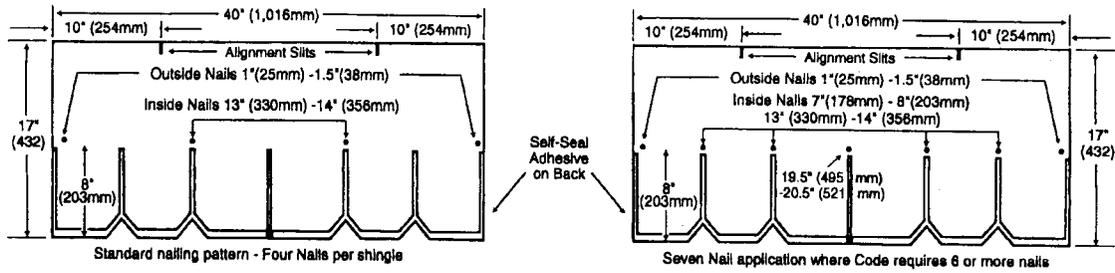
PRODUCT	SHINGLE TYPE	PLANT LOCATION	DIMENSIONS (height by width) (inches)	NOMINAL INSTALLED WEIGHT (pounds per 100 square feet)	MAXIMUM EXPOSURE TO WEATHER (inches)	LOCATION OF NAIL LINE (APPROXIMATE DISTANCE UP FROM BOTTOM OF SHINGLE) (inches) <sup>2</sup>
Country Mansion™	Laminated	Mt. Vernon, Indiana	17 × 40	360	7½	8
Country Estates™	Laminated	Mt. Vernon, Indiana	17 × 40	360	7½	8
Grand Sequoia®	Laminated	Fontana, California	17 × 40	360	5 <sup>3</sup>	11
Grand Canyon™	Laminated	Fontana, California	17 × 40	446	5 <sup>3</sup>	11
Slateline®	Five-tab	Mt. Vernon, Indiana	17 × 40	266	7½	8½
TIMBERLINE Ultra® Shadow Accent™	Laminated	Dallas, Texas; Fontana, California	13¼ × 39¾	335	5⅝	6
TIMBERLINE® 25	Laminated	Dallas, Texas; Fontana, California	13¼ × 39¾	255	5⅝	6
Original TIMBERLINE™	Laminated	Dallas, Texas; Fontana, California	13¼ × 39¾	283	5⅝	6
Royal Sovereign®	Three-tab	Fontana, California; Mt. Vernon, Indiana	13¼ × 39¾	225	5⅝	6
		Fontana, California; Vernon, Indiana; Dallas, Texas	12 × 36	225	5	5⅝
Royal Sovereign®	Hip and ridge	(field-cut)	13¼ × 13¼	—	See Footnote 1	—
			12 × 12	—	See Footnote 1	—

For SI: 1 inch = 25.4 mm, 1 pound per 100 square feet = 0.0488 kg/m<sup>2</sup>.

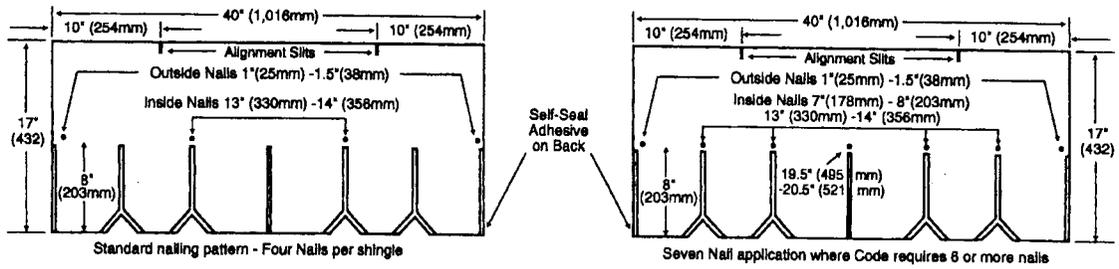
<sup>1</sup>Weather exposure shall not exceed that permitted for the field of the roof.

<sup>2</sup>Nails or staples shall be located below any face-applied self-sealing adhesive, through both laminations where applicable, but shall not be exposed to weather.

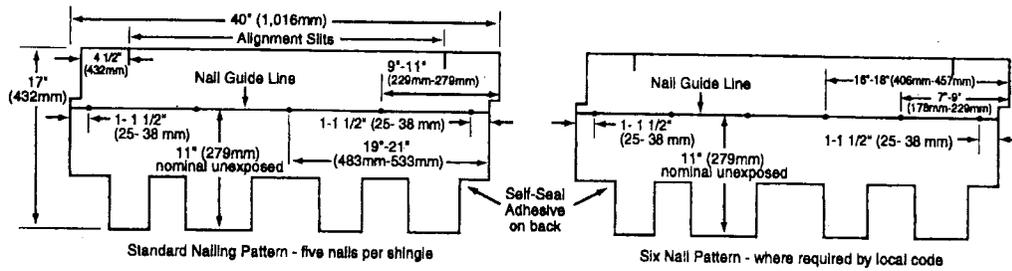
<sup>3</sup>Allowable tolerance is + ⅛ inch.



COUNTRY MANSION

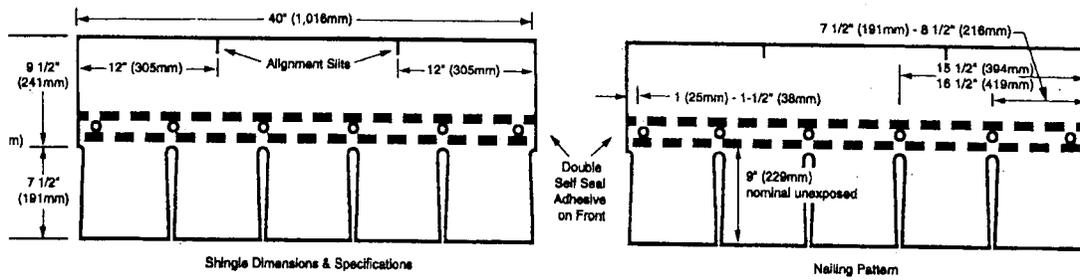


COUNTRY ESTATES

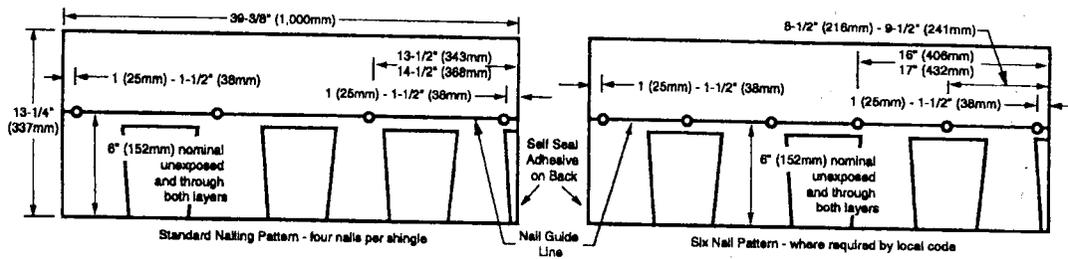


GRAND SEQUOIA/GRAND CANYON

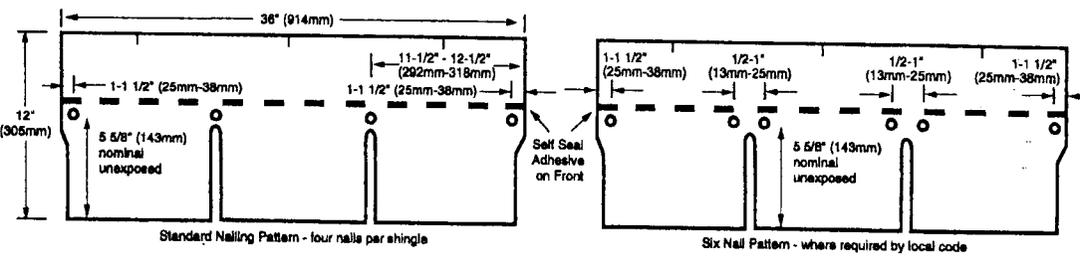
FIGURE 1 — SHINGLE NAIL PATTERNS



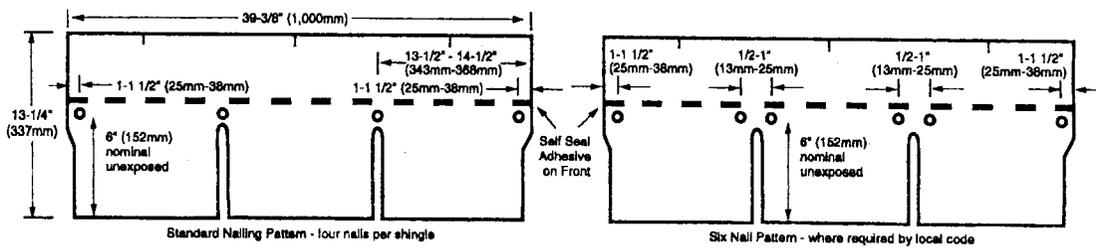
**SLATELINE**



**TIMBERLINE**



**ROYAL SOVEREIGN (ENGLISH)**



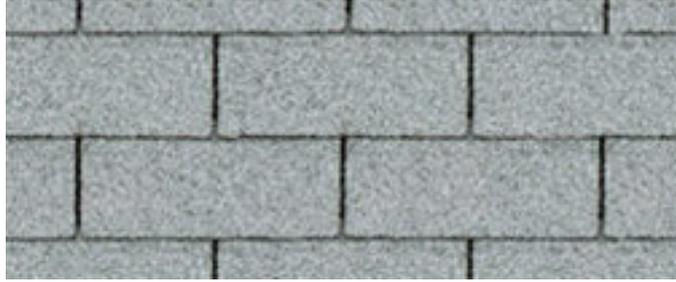
**ROYAL SOVEREIGN (METRIC)**

**FIGURE 1 — SHINGLE NAIL PATTERNS—(Continued)**

# SENTINEL®

## Shingles

*"Dependable Economy  
Grade Shingle"*



- **Basic Value...** Currently protects over one million homes nationwide
- **Quality Construction...** Strong Micro Weave® Core for long life and durability
- **Stays In Place...** Dura Grip® adhesive seals each shingle tightly and reduces the risk of shingle blow-off
- **Peace Of Mind...** 20-year ltd. transferable warranty with Smart Choice® Protection for the first three years (non-prorated material and installation labor coverage)\*  
\* See ltd. warranty for complete coverage and restrictions

### *Specifications for Sentinel*

Midweight 3-Tab Shingle  
 20-Year Ltd. Transferable Warranty  
 60 mph Ltd. Wind Warranty  
 Fiberglass Asphalt Construction  
 Class A Rating from UL  
 Passes UL 997 Wind Test  
 ASTM D3018 Type 1  
 ASTM D3161 Type 1  
 ASTM D3462 (Available from select plants)\*  
 Approx. 80 Pieces/Square (English)  
 Approx. 65 Pieces/Square (Metric)  
 3 Bundles/Square  
 Approx. 320 Nails/Square (English)  
 Approx. 260 Nails/Square (Metric)  
 5" Exposure (English)  
 5 5/8" Exposure (Metric)



*13 1/4" x 39 3/8" Metric  
12" x 36" English*



*Sentinel® shingles are available nationwide*

\*This product is manufactured to meet or exceed ASTM D3462; values from subsequent testing may vary depending on storage conditions

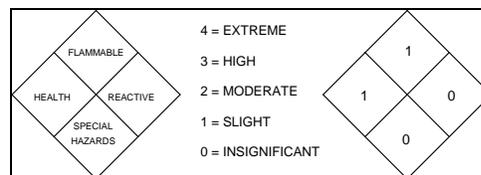


*Applies to Sentinel  
White Shingles Only.*

# MATERIAL SAFETY DATA SHEET

GAF MATERIALS CORPORATION

ROYAL SOVEREIGN®, SENTINEL®, UNIVERSALHIP & RIDGE, SLATELINE®, SLATELINE® ALGAE EATER, ROYAL SOVEREIGN® ALGAE EATER™, SENTINEL® ALGAE EATER™, MARQUIS® ALGAE EATER™, MARQUIS® WEATHERMAX, JUMBO ROYAL SOVEREIGN®, UNIVERSAL STARTER STRIP



		ROOFING SHINGLES	
Manufacturer	GAF MATERIALS CORPORATION	Identity (Trade Name As Used On Label)	
Address	1361 Alps Road Wayne, NJ 07470	MSDS Number*	1003
Phone Number (For Information)	800-766-3411	CAS Number*	None
Emergency Phone Number	(800) 424-9300	Date Prepared	11/22/88 rev. 05/03
		Prepared By*	A. A. Bondoc/P. Hennings

NOTE: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

## SECTION 1 - MATERIAL IDENTIFICATION AND INFORMATION

COMPONENTS - Chemical Name & Common Names (Hazardous Components 1% or Greater; Carcinogens 0.1% or greater)	%*	OSHA PEL	ACGIH TLV	OTHER LIMITS RECOMMENDED
SILICA, CRYSTALLINE QUARTZ CAS #14808-60-7	Approx. 4	See Table Z-3	*0.1 mg/m2	--
* Respirable Dust				
Non-Hazardous Ingredients	Approx. 96			
Total	100			

## SECTION 2 - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point	N/A	Specific Gravity (H2O = 1)	N/A
Vapor Pressure (mm Hg and Temperature)	N/A	Melting Point	N/A
Vapor Density (Air = 1)	N/A	Evaporation Rate (Butyl Acetate =1)	N/A
Solubility in Water	N/A	Water Reactive	N/A
Appearance and Odor	SHEETS, 3/16 INCH THICK, APPROX. 1 FT X 3 FT, GRANULES ON TOP, SAND ON BACK. SLIGHT ASPHALTIC ODOR.		

## SECTION 3 - FIRE AND EXPLOSION HAZARD DATA

Flash Point and Method Used	Auto-ignition Temperature	Flammability Limits in Air % by Volume	LEL	UEL
>500F, COC	N/A	N/A	N/A	N/A
Extinguisher Media CO2, FOAM, DRY CHEMICAL OR WATER				
Special Fire Fighting Procedures// WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING				
Unusual Fire and Explosion Hazards NONE				

\* Optional

OSHA 174

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MSDS

GAF

## SECTION 4 - REACTIVITY HAZARD DATA

Page G-7

STABILITY	Stable <input checked="" type="checkbox"/> _____ Unstable _____	Conditions N/A To Avoid
Incompatibility (Materials to Avoid) N/A		
Hazardous Decomposition Products THERMAL DECOMPOSITION MAY RELEASE CO, CO2, CARBON PARTICULATES, METHANE, AMMONIA, HYDROGEN CYANIDE AND HYDROGEN SULFIDE.		
HAZARDOUS POLYMERIZATION	_____ May Occur <input checked="" type="checkbox"/> Will Not Occur	Conditions To Avoid N/A

## SECTION 5 - HEALTH HAZARD DATA

PRIMARY ROUTES OF ENTRY: _X_ Inhalation _____ Skin Absorption _____ Ingestion _____ Not Haz		CARCINOGEN LISTED IN: _____ NTP <input checked="" type="checkbox"/> IARC Monograph _____ OSHA _____ Not Listed
<b>HEALTH</b>	Acute N/A	
<b>HAZARDS</b>	Chronic SILICA: LIMITATION OF EXPANSION OF THE CHEST, EMPHYSEMA.	
Signs and Symptoms of Exposure SILICA: SHORTNESS OF BREATH ON EXERTION, DRY COUGH		
Medical Conditions Generally Aggravated by Exposure SILICA: SHORTNESS OF BREATH ON EXERTION, DRY COUGH		
EMERGENCY FIRST AID PROCEDURES -		
Eye Contact N/A		
Skin Contact N/A		
Inhalation N/A		
Ingestion N/A		

## SECTION 6 - CONTROL AND PROTECTIVE MEASURES

Respiratory Protection (Specify Type) N/A		
Protective Gloves N/A	Eye Protection SAFETY GLASSES WITH SIDE SHIELDS	
<b>VENTILATION</b>	_____ Local Exhaust N/A	_____ Mechanical (General) N/A
<b>TO BE USED</b>	_____ Special N/A	_____ Other (Specify) USE SUFFICIENT NATURAL VENTILATION
Other Protective Clothing and Equipment N/A		
Hygienic Work Practices WASH HANDS AFTER APPLICATION		

## SECTION 7 - PRECAUTIONS FOR SAFE HANDLING AND USE/LEAK PROCEDURES

Steps to be Taken if Material is Spilled or Released	PICK UP PIECES AND DISPOSE PROPERLY. VACUUM DUST. USE A DUST SUPPRESSANT IF SWEEPING IS NECESSARY.
Waste Disposal Methods	DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.
Precautions to be Taken in Handling and Storage	N/A
Other Precautions and/or Special Hazards	N/A

MSDS No: 1003

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# Material Safety Data Sheet

# CertainTeed

MSDS Number: CT 10083-1  
DATE PREPARED: September 29, 2005

H M I S	Health	0
	Fire	1
	Reactivity	0
	Other	

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**Product/Trade Name:** PVC Capstock on PVC Substrate

**Chemical Name:** Not Applicable

**CAS #:** Not Applicable

**Common Name:** Vinyl Siding

**Product Use:** Construction Material. All types and grades of extruded vinyl siding and vinyl siding accessories.

### MANUFACTURER INFORMATION:

CertainTeed Corporation

P.O. Box 860

Valley Forge, PA 19482-0101

Main Telephone: (800)274-8530

Health, Safety & Environmental Affairs

(610)341-7000 (9 AM – 5 PM Eastern)

EMERGENCY TELEPHONE: CHEMTREC (800)424-9300

## 2. COMPOSITION / INFORMATION ON INGREDIENTS

CAS #	Component	Percent
9002-86-2	PVC (Chloroethylene, polymer)	60-90
Not Available	Limestone	1-10
25852-37-3	2-Propenoic acid, 2-methyl-, methyl ester, polymer with butyl 2-propenoate	1-5
8002-74-2	Paraffin and Hydrocarbon Waxes	1-5
Not Available	Titanium Dioxide	0.5-5
1592-23-0	Calcium stearate	0.5-5
Not Available	Tin Mercaptide	0.1-5
9010-88-2	2-Propenoic acid, 2-methyl-, methyl ester, polymer with ethyl 2-propenoate	0-5
68441-17-8	Ethene, homopolymer, oxidized	0-5
Not Available	Proprietary Lubricant	0-5
27136-15-8	2-Propenoic acid, 2-methyl-, methyl ester, polymer with butyl 2-propenoate and ethenylbenzene	0-5

### Component Related Regulatory Information

This product may be regulated, have exposure limits or other information identified as the following: Quartz (14808-60-7), Limestone (1317-65-3).

### Component Information/Information on Non-Hazardous Components

The products listed above are articles as so defined by the OSHA Hazard Communication Standard (29 CFR 1910.1200). Their end uses are dependant upon their manufactured shape and design, and they will not release, or otherwise result in exposure to a hazardous chemical under normal conditions of use. Exposure limits are given for reference only.

This material is not a controlled product under Canadian WHMIS regulations.

The actual weight percentage ranges for chemical components were used, rather than using the WHMIS- mandated ranges.

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### 3. HAZARD IDENTIFICATION

#### Emergency Overview

Under normal conditions of use, this product is not expected to create any unusual emergency hazards. This is a non-combustible, non-reactive solid material. Use methods suitable to fight surrounding fire. Contact with the eye may result in mechanical irritation characterized by itching or redness.

Due to the form of the product hazardous exposures are unlikely to occur. Exposure may cause slight temporary irritation to skin, eyes, nose, or throat.

Route of Exposure: Inhalation, skin, and eye contact.

#### Potential Health Effects: Eyes

This product may cause mechanical irritation of the eye from cutting, grinding or drilling of the product. Continued mechanical irritation of the eye could result in permanent corneal damage.

#### Potential Health Effects: Skin

This product may produce skin abrasions. Mechanical rubbing may increase skin irritation.

#### Potential Health Effects: Ingestion

Not a likely route of entry.

#### Potential Health Effects: Inhalation

Inhalation of dusts produced during cutting, grinding or sanding of this product may cause irritation of the respiratory tract.

#### Medical Conditions Aggravated by Exposure

None expected.

#### HMIS Ratings: Health: 0 Fire: 1 Physical Hazard: 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe \* = Chronic hazard

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### 4. FIRST AID MEASURES

#### First Aid: Eyes

Do not rub or scratch your eyes. Dust particles may cause the eye to be scratched. Flush eyes with large amounts of water for 5-15 minutes. If irritation persists, contact a physician.

#### First Aid: Skin

Wash exposed skin with soap and water. If irritation develops or persists, seek medical attention.

#### First Aid: Ingestion

Product is not intended to be ingested or eaten. If the product is ingested, do not induce vomiting. Seek medical attention.

#### First Aid: Inhalation

Move person to non-contaminated air. Call a physician if symptoms develop or persist.

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## 5. FIRE FIGHTING MEASURES

### General Fire Hazards

See Section 9 for Flammability Properties.

None expected.

### Hazardous Combustion Products

The decomposition products from this material are those that would be expected from any organic (carbon-containing) material, and are mainly derived from pyrolysis, or burning, of the polymer. These decomposition products may include carbon dioxide, carbon monoxide, carbon particles, hydrocarbons, chlorine, hydrogen, chloride, phosgene, and formaldehyde. This product should not be burned as construction waste.

### Extinguishing Media

Use any media suitable for the surrounding fires. Water, spray, fog, carbon dioxide (CO<sub>2</sub>), dry chemical, foam.

### Fire Fighting Equipment/Instructions

Firefighters should wear full-face, self contained breathing apparatus and impervious protective clothing. Firefighters should avoid inhaling any combustion products. Do not release chemically contaminated water into drains, soil or surface water.

### NFPA Ratings: Health: 0 Fire: 1 Reactivity: 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

---

## 6. ACCIDENTAL RELEASE MEASURES

### Containment Procedures

None necessary.

### Clean-Up Procedures

Sweep up or gather material and place in appropriate container for disposal. This product should not be burned as construction waste.

### Evacuation Procedures

None necessary.

### Special Procedures

Wear safety glasses with side-shields or safety goggles and gloves.

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## 7. HANDLING AND STORAGE

### Handling Procedures

Customary personal hygiene measures, such as washing hands after working with these products are recommended.

### Storage Procedures

Room temperature - normal conditions. Warehouse storage should be in accordance with package directions, if any.

**8. EXPOSURE CONTROL / PERSONAL PROTECTION**

**Component Exposure Limits**

**Limestone (Not Available)**

ACGIH: 0.05 mg/m3 TWA (respirable fraction) (related to Silica, crystalline, quartz)  
 OSHA: 0.1 mg/m3 TWA (respirable dust) (related to Silica-crystalline, quartz)  
 NIOSH: 0.05 mg/m3 TWA (respirable dust) (related to Silica, crystalline)

**Paraffin and Hydrocarbon Waxes (8002-74-2)**

ACGIH: 2 mg/m3 TWA (fume)  
 OSHA: 2 mg/m3 TWA  
 NIOSH: 2 mg/m3 TWA (fume)

**Engineering Controls**

No special protective measures are necessary for use of this product in that it is an article, and under normal conditions of use is not expected to release, or otherwise result in exposure to a hazardous chemical.

**PERSONAL PROTECTIVE EQUIPMENT**

**Personal Protective Equipment: Eyes/Face**

Safety glasses with side-shields may be worn to reduce the risk of eye injury as a result of construction activities.

**Personal Protective Equipment: Skin**

Under normal conditions of use this product is not expected to cause skin irritation. To reduce the risk of skin irritation due to construction-related activities leather or other appropriate work gloves are recommended.

**Personal Protective Equipment: Respiratory**

No special ventilation systems are required under normal conditions of use.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

<b>Appearance:</b> Various colors of vinyl siding products	<b>Odor:</b> Negligible
<b>Physical State:</b> Solid	<b>pH:</b> Not Applicable
<b>Vapor Pressure:</b> Not Applicable	<b>Vapor Density:</b> Not Applicable
<b>Boiling Point:</b> Not Applicable	<b>Melting Point:</b> Not Applicable
<b>Solubility (H2O):</b> Not Soluble	<b>Specific Gravity:</b> 1.3-1.5
<b>Flash Point:</b> Not Available	<b>Flash Point Method:</b> Not Available
<b>Lower Flammability Limit:</b> Not Available	<b>Upper Flammability Limit:</b> Not Available
<b>Auto Ignition Temp.:</b> PVC - 730°F (Applies to Rigid PVC)	<b>Burning Rate:</b> Not Available

**10. CHEMICAL STABILITY AND REACTIVITY INFORMATION**

**Chemical Stability**

Stable under normal conditions.

**Chemical Stability: Conditions to Avoid**

Keep away from heat, sparks, or open flame.

**Incompatibility**

None identified.

**Hazardous Decomposition**

The decomposition products from this material are those that would be expected from any organic (carbon-containing) material, and are mainly derived from pyrolysis, or burning, of the polymer. These decomposition products may include carbon dioxide, carbon monoxide, carbon particles, hydrocarbons, chlorine, hydrogen, chloride, phosgene, and formaldehyde.

**Possibility of Hazardous Reactions**

None expected.

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**11. TOXICOLOGICAL INFORMATION****Acute Dose Effects****General Product Information**

No information available for the product.

**Repeated Dose Effects**

No chronic health effects are expected from the normal use of this product.

**Carcinogenicity****General Product Information**

No information available for the product.

**Component Carcinogenicity****PVC (Chloroethylene, polymer) (9002-86-2)**

IARC: Supplement 7, 1987; Monograph 19, 1979 (Group 3 (not classifiable))

**Limestone (Not Available)**

ACGIH: A2 - Suspected Human Carcinogen (related to Silica, crystalline, quartz)

NIOSH: potential occupational carcinogen (related to Silica, crystalline)

IARC: Monograph 68, 1997 (Listed under Crystalline silica, inhaled in the form of quartz or cristobalite from occupational sources) (related to Silica, quartz) (Group 1 (carcinogenic to humans))

**Mutagenicity**

No information available for the product.

**Teratogenicity**

No information available for the product.

**Developmental Effects**

No information available for the product.

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**12. ECOLOGICAL INFORMATION****Ecotoxicity****General Product Information**

No information available for the product.

**Component Analysis - Ecotoxicity - Aquatic Toxicity**

No ecotoxicity data are available for this product's components.

**Environmental Fate**

No information available for the product.

**13. WASTE DISPOSAL CONSIDERATIONS**

**US EPA Waste Number & Descriptions**

**General Product Information**

This product, as supplied, is not regulated as a hazardous waste by the U.S. Environmental Protection Agency (EPA) under Resource Conservation and Recovery Act (RCRA) regulations. Comply with state and local regulations for disposal. If you are unsure of the regulations, contact your local Public Health Department, or the local office of the EPA.

**Component Waste Numbers**

No EPA Listed Waste Numbers are being shown for this product's components.

**Disposal Instructions**

Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

**14. TRANSPORTATION INFORMATION**

**US DOT Information**

**Shipping Name:** This product is not classified a hazardous material for transport.

**TDG Information**

**Shipping Name:** Not classified as a Dangerous Good for transportation.

**15. REGULATORY INFORMATION**

**US Federal Regulations**

**General Product Information**

All components are on the U.S. EPA TSCA Inventory List.

**CERCLA**

None of the components of this product are listed under CERCLA (40 CFR 302.4) and present in the material at an amount exceeding the Reportable Quantity (RQ).

**Acute Health:** No **Chronic Health:** No **Fire:** No **Pressure:** No **Reactive:** No

**State Regulations**

**General Product Information**

Other state regulations may apply. Check individual state requirements.

**Component Analysis - State**

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Limestone (¹related to Quartz) (²related to Silica-crystalline, quartz) (³related to Silica, Quartz) (⁴related to Quartz (SiO2) (⁵related to Calcium carbonate)	Not Available	No	Yes¹	Yes²	Yes³	Yes⁴	Yes⁵
Paraffin and Hydrocarbon Waxes	8002-74-2	Yes	Yes	Yes	No	Yes	Yes

**California Safe Drinking Water and Toxics Enforcement Act (Proposition 65)**

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

**Canadian WHMIS Information**

**General Product Information**

This product is not a controlled product according to the Canadian Hazardous Products Act.

**Component Analysis - WHMIS IDL**

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Limestone	Not Available	1 % (English Item 1406, French Item 1491) (related to Silica-crystalline, quartz)

**WHMIS Classification:** None.

**Additional Regulatory Information**

**General Product Information**

No additional information available.

**Component Analysis - Inventory**

Component	CAS #	TSCA	DSL	EINECS
PVC (Chloroethylene, polymer)	9002-86-2	Yes	Yes	No
2-Propenoic acid, 2-methyl-, methyl ester, polymer with butyl 2-propenoate	25852-37-3	Yes	Yes	No
Paraffin waxes and Hydrocarbon waxes	8002-74-2	Yes	Yes	Yes
Calcium stearate	1592-23-0	Yes	Yes	Yes
2-Propenoic acid, 2-methyl-, methyl ester, polymer with ethyl 2-propenoate	9010-88-2	Yes	Yes	No
Ethene, homopolymer, oxidized	68441-17-8	Yes	Yes	No
2-Propenoic acid, 2-methyl-, methyl ester, polymer with butyl 2-propenoate and ethenylbenzene	27136-15-8	Yes	Yes	No

**16. ADDITIONAL COMMENTS**

**Other Information**

Disclaimer: Supplier gives no warranty of merchantability or of fitness for a particular purpose. Any product purchased is sold on the assumption the purchaser will make his own tests to determine the quality and suitability of the product. Supplier expressly disclaims any and all liability for incidental and/or consequential property damage arising out of the use of this product. No information provided shall be deemed to be a recommendation to use any product in conflict with any existing patent rights. Read the Material Safety Data Sheet before handling product.

**Acronyms/definitions used in this MSDS:**

ACGIH	American Conference of Governmental Industrial Hygienists;
CAS No:	Chemical Abstracts Services Number;
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act;
CFR	Code of Federal Regulations;
EPA	Environmental Protection Agency;
f/cc	Fibers per cubic centimeter;
g/cm <sup>3</sup>	Grams per cubic centimeter;
HMIS	Hazardous Material Identification System;
IARC	International Agency for Research on Cancer;
LC50	Lethal concentration that produces death in 50% of the test population;
LD50	Lethal dose required to produce death in 50% of the test population;
LFL	Lower Flammable Limit;
mg/m <sup>3</sup>	Milligrams per cubic meter;
NFPA	National Fire Protection Association;
NIOSH	National Institute for Occupational Safety and Health;
NTP	National Toxicology Program;
OSHA	Occupational Safety and Health Administration;
ppm	Parts per million;
PEL	Permissible Exposure Limit;
PNOC	Particulates Not Otherwise Classified;
REL	Recommended Exposure Limit;
SARA	Superfund Amendments and Reauthorization Act;
RCRA	Resource Conservation and Recovery Act;
Title III	Emergency Planning and Community Right to Know Act; Section 302- Extremely Hazardous Substances; Section 313- Toxic Chemicals;
TLV	Threshold Limit Value;
TWA	Time Weighted Average;
UFL	Upper Flammable Limit.

**MSDS History**

MSDS Revision Summary:

<u>Date</u>	<u>MSDS No.</u>	<u>Comments</u>
09/29/2005	CT 10083-1	New MSDS

This is the end of MSDS # CT 10083-1

**ICC Evaluation Service, Inc.**[www.icc-es.org](http://www.icc-es.org)

Business/Regional Office ■ 5360 Workman Mill Road, Whittier, California 90601 ■ (562) 699-0543

Regional Office ■ 900 Montclair Road, Suite A, Birmingham, Alabama 35213 ■ (205) 599-9800

Regional Office ■ 4051 West Flossmoor Road, Country Club Hills, Illinois 60478 ■ (708) 799-2305

**DIVISION: 07—THERMAL AND MOISTURE PROTECTION**  
**Section: 07460—Siding****REPORT HOLDER:****CERTAINTEED CORPORATION**  
803 BELDEN ROAD  
JACKSON, MICHIGAN 49203  
(517) 780-3185  
[www.certainteed.com](http://www.certainteed.com)**EVALUATION SUBJECT:****CERTAINTEED VINYL SIDING AND SOFFIT****ADDITIONAL LISTEES:****ASHLAND-DAVIS**  
750 EAST SWEDSFORD ROAD  
VALLEY FORGE, PENNSYLVANIA 19482  
(610) 341-7000**VINYL CARPENTRY**  
750 EAST SWEDSFORD ROAD  
VALLEY FORGE, PENNSYLVANIA 19482  
(610) 341-7000**WOLVERINE SIDING SYSTEMS**  
750 EAST SWEDSFORD ROAD  
VALLEY FORGE, PENNSYLVANIA 19482  
(610) 341-7000**1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2003 *International Building Code*® (IBC)
- 2003 *International Residential Code*® (IRC)
- 1997 *Uniform Building Code*™ (UBC)
- BOCA® *National Building Code*/1999 (BNBC)
- 1999 *Standard Building Code*® (SBC)

**Properties evaluated:**

- Exterior veneer
- Wind load resistance—transverse
- Installation on noncombustible walls
- Fire-resistance-rated construction

**2.0 USES**

Certainteed vinyl sidings, which are also sold under the brand names Wolverine, Ashland-Davis, and Vinyl Carpentry, are

used as exterior wall coverings on buildings of all construction types over approved sheathings capable of supporting the imposed loads, including but not limited to positive transverse wind load; and as closures on the underside of exterior roof eaves (soffits).

**3.0 DESCRIPTION**

The vinyl sidings and soffits are extruded from polyvinyl chloride (PVC) resins. The siding panels are formed with an upper edge having nail slots and a lower edge that hooks into the upper edge of the lower course. The accessory items, used to detail the application of the product as an exterior wall covering, are of the same material.

All panels, except Millennium siding, are designed with receiving legs and a nailing flange with a 1<sup>1</sup>/<sub>8</sub>-inch-by-<sup>3</sup>/<sub>8</sub>-inch (28.58 mm by 9.53 mm) prepunched elongated nailing slot spaced 2 inches (50.80 mm) on center. All siding panels used in horizontal applications have weep holes prepunched at a minimum of 18 inches (457.2 mm) on center on the underside to provide ventilation and drainage. Millennium siding incorporates a <sup>1</sup>/<sub>2</sub>-inch-wide (12.7 mm), flexible, synthetic-fiber-cable nailing hem located <sup>1</sup>/<sub>2</sub> inch (12.7 mm) above the top edge of the siding panel.

The panels are available in different colors with smooth finish or embossed with a matt or wood-grain texture. The panels range in thickness from 0.036 inch to 0.060 inch.

The accessory shapes include a fascia, "F" shaped trim, "J" shaped trim, drip cap, starter strips, inside/outside corners, quarter round soffit molding, undersills, soffit cove trim, and "H" divider bar. The thicknesses of accessories range from 0.040 to 0.050 inch (1.02 to 1.27 mm).

Refer to Table 1 for panel thicknesses, lengths and profiles within the scope of this report.

**4.0 INSTALLATION****4.1 General:**

Installation of the system, including the panels, corners, starter strips, trim and other accessory items, shall be in accordance with ASTM D 4756, the manufacturer's published installation instructions, the applicable code and this report.

**4.2 Siding Installation:**

The siding is installed over solid sheathing covered with an approved water-resistive barrier as required by the applicable code.

The method of application of the siding is by first installing a starter strip horizontally, along the bottom of the building matching the lowest corner of the building. The starter strip is then nailed to the building every 8 inches (203.2 mm) to 10 inches (254 mm) in slots provided in the strip. The nails shall be located in the center of the slot, leaving a minimum <sup>1</sup>/<sub>32</sub>-inch (0.8 mm) space between the fastener head and the face of the vinyl nailing strip, to allow for expansion.

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The inside and outside corner posts are then installed on all building corners, and accessories are installed around all wall openings.

The first siding panel shall be locked into the starter strip and nailed to the building in the center of the nailing slots every 16 to 24 inches (406.4 mm to 609.6 mm). (Refer to Table 2 of this report.) The nails shall be located in the center of the slot, leaving a minimum  $\frac{1}{32}$ -inch (0.8 mm) space between the fastener head and the face of the vinyl nailing strip, to allow for expansion. Succeeding panels shall be similarly installed, locking into the panel below.

The horizontal siding panel ends shall be overlapped 1 inch (2.54 cm) at butt joints and held  $\frac{1}{4}$  inch (0.64 cm) clear of all vertical accessory members at wall ends and around openings. For vertical siding panel end joint treatment, refer to the manufacturer's installation instructions.

#### 4.3 Soffit Installation:

Siding and soffit panels may be installed as horizontal soffits at a maximum span of 24 inches (610 mm), with end joints on supports. The panels shall be retained by F-channels, J-channels or aluminum or vinyl fascia caps. The channels shall be fastened to the fascia, nailing strip or solid wood sheathing at 16 inches (406 mm) on center, with nails of sufficient length to penetrate the nailer 1 inch (25.4 mm) or to penetrate through the material thickness, whichever is less. The minimum No. 26 gage (0.019 inch) aluminum fascia cap shall be bent to form a minimum  $1\frac{1}{2}$ -inch (38 mm) receiving flange at corners; channels shall allow for  $\frac{1}{4}$  inch (6.4 mm) of expansion at each wall. To permit expansion, panels are measured to length and cut  $\frac{1}{2}$  inch (12.7 mm) less. The panels are first inserted into the wall channels and then into the fascia channels. Each panel shall be secured to the fascia or to nailing strips at a maximum of 16 inches (406 mm) on center. Adjacent panels shall be interlocked. Fascia caps shall then be installed over the panels, and a drip edge shall be placed over the cap to reduce moisture intrusion. For porch ceilings, the ceiling perimeter is framed with the J-channels or F-channels, and panel placement is as set forth for soffits.

#### 4.4 Fasteners:

Siding, soffits and accessories shall be fastened to framing with either galvanized, aluminum or stainless steel nails with a minimum length of  $1\frac{1}{2}$  inches (38 mm), a shaft diameter of 0.122 inch (3 mm), and a  $\frac{7}{16}$ -inch-diameter (11.11 mm) head. Minimum embedment into studs shall be  $\frac{3}{4}$  inch (19.05 mm). Corrosion-resistant staples may also be used, where indicated in Table 2. Staples shall be 16 gage, with a minimum length of  $1\frac{3}{4}$  inches (44.45 mm) and a crown width of  $\frac{7}{16}$  inch (11.11 mm). Minimum staple embedment into studs shall be  $\frac{3}{4}$  inch (19.05 mm).

Accessory materials such as corners, starter strips and trim shall be fastened in accordance with the manufacturer's instructions.

#### 4.5 Types I, II, III and IV Construction (IBC) and Noncombustible Construction (UBC, BNBC and SBC):

The vinyl siding may be installed on the exterior of buildings of any type of construction when installed over maximum 1-inch-thick (25.4 mm) expanded polystyrene insulation [1 pound per cubic foot (16 kg/m<sup>3</sup>)] and mechanically fastened with noncorrosive, self-tapping,  $1\frac{1}{8}$ -inch-long (29 mm) screws with minimum  $\frac{3}{8}$ -inch-diameter (9.5 mm) heads and  $\frac{1}{8}$ -inch-diameter (3 mm) shafts, and with minimum  $\frac{5}{8}$ -inch-diameter (15.88 mm) nylon washers, to the exterior of a steel stud wall constructed with  $\frac{1}{2}$ -inch-thick (12.7 mm) gypsum wall board on the exterior and  $\frac{5}{8}$ -inch-thick (15.88 mm) Type X gypsum wall board on the interior. The assembly described in this

section shall be limited to installations exposed to maximum basic wind speeds of 100 miles per hour (161 km/h) on structures a maximum of 40 feet (12 192 mm) in height under the IBC and BNBC; maximum basic wind speeds of 80 miles per hour (129 km/h) on structures a maximum of 40 feet (12 192 mm) in height in Exposure C areas under the UBC; and maximum basic wind speeds of 70 miles per hour (112 km/h) on structures a maximum of 40 feet (12 192 mm) in height in Exposure C areas under Section 1606.2 of the SBC.

#### 4.6 Fire-resistance-rated Construction:

##### 4.6.1 One-hour Fire-resistance-rated Limited Load-bearing Wood Stud Wall:

Wood studs shall be nominal 2-by-4 Douglas fir marked "STD & BTR, Doug. Fir, S-Dry," spaced 16 inches (406 mm) on center. The wall shall be constructed with a single bottom plate and double top plates. The wall is a maximum of 10 feet (3.05 m) in height with double 2-by-4 wood fire blocking located at 8 feet (2.44 m) above the bottom plate. Stud cavities shall be filled with  $3\frac{1}{2}$ -inch-thick (88.9 mm), R-11, mineral wool insulation batts. The stud wall shall be covered on the exterior with one layer of  $\frac{1}{2}$ -inch-thick (12.7 mm), exterior gypsum sheathing, and on the interior face with a single layer of  $\frac{5}{8}$ -inch-thick (15.9 mm), Type FSW, fire-resistant gypsum wall board. The exterior wall sheathing shall be covered with a water-resistive barrier. The studs are assembled with two 16d smooth box nails on each end. The wall board is installed vertically with  $1\frac{3}{4}$ -inch-long (44.5 mm), No. 6, bugle head drywall screws spaced 8 inches (203.2 mm) on center around the perimeter of the board and along the studs. Vertical joints are staggered on opposite sides of the wall. The joints shall be treated with ready-mixed joint compound and spark-perforated paper joint reinforcing tape. The siding shall be attached to the studs using  $1\frac{1}{2}$ -inch-long (38 mm) roofing nails with flat heads, spaced 8 inches (203.2 mm) on center.

The load capacity of the wall is limited to a maximum load of 1050 pounds (476.7 kg) per stud or 32 percent of maximum design load calculated under the AFPA National Design Specification for Wood Construction.

**4.6.2 Fire-resistance-rated Walls on Buildings of Type V Construction under the IBC (Type 5 under the BNBC, Type VI under the SBC, Type V under the UBC):** The vinyl siding may be installed over code-complying, exterior, fire-resistance-rated bearing or nonbearing walls required to be of Type V construction under the IBC (Type 5 under the BNBC, Type VI under the SBC, Type V under the UBC) without affecting the hourly rating of the walls.

#### 4.7 Wind Resistance:

The design wind pressures shall be determined in accordance with Chapter 16 of the IBC, UBC, BNBC, or SBC, as applicable, or Section R301.2.1.1 of the IRC, and shall not exceed the values shown in Table 2 of this report. Wind resistance of the soffit panels is outside the scope of this report.

Resistance to positive wind loads is determined by structural capacity of the substrate.

#### 5.0 CONDITIONS OF USE

The CertainTeed Vinyl Sidings and Soffits described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 Installation complies with this report, the manufacturer's published instructions and the applicable code.
- 5.2 The siding is limited to design wind pressures shown in Table 2 of this report.

- 5.3 In jurisdictions adopting the IRC, the siding shall be installed in accordance with Table R703.4 and limited to areas where the design wind pressure does not exceed the values shown in Table 2 of this report.
- 5.4 The exterior walls shall be braced or sheathed to resist racking loads with approved materials in accordance with the requirements of the applicable model building code.
- 5.5 When installation is on Types I, II, III and IV construction (IBC) and noncombustible construction (UBC, BNBC and SBC), and fire-resistance-rated construction, refer to Sections 4.5 and 4.6 of this report, respectively.
- 5.6 The siding shall be installed only on exterior walls covered by a solid sheathing capable of supporting the imposed loads, including but not limited to positive transverse wind loads.

#### 6.0 EVIDENCE SUBMITTED

- 6.1 Installation instructions.

6.2 Data in accordance with the ICC-ES Evaluation Guideline for Vinyl Siding (EG37), dated October 1, 2003 (editorially revised November 2005).

6.3 Test reports in accordance with UBC 26-4, UBC 8-1 and ASTM E 119.

6.4 A quality control manual.

#### 7.0 IDENTIFICATION

The vinyl sidings and soffits described in this report are identified by a stamp bearing the brand name (CERTAINTEED, Wolverine, Ashland-Davis, or Vinyl Carpentry), the product name and style, the statement "Conforms to ASTM Specification D 3679," the statement "Conforms to UBC Standard 14-2" and the evaluation report number (ESR-1066).

In jurisdictions enforcing the IBC or UBC, foam plastic insulation used for noncombustible construction shall be identified in accordance with IBC Section 2603.5.6 or UBC Section 2602.2.

TABLE 1—VINYL SIDING AND SOFFIT

PRODUCT NAME	PRODUCT CODE	PRODUCT STYLE	THICKNESS (inch)	LENGTH (feet-inches)
The following products are sold under the brand name CertainTeed:				
Cedar Impressions	30107	10-inch Shake	0.050	10-0
Millennium	35110	Double 4-inch	0.044	12-6
	35119	Double 4½-inch DutchLap	0.044	12-1
Monogram	33101	Double 4-inch	0.044	12-6
	33110	Double 4-inch	0.044	12-6
	33111	Double 4-inch	0.044	12-6
	33122	Double 5-inch	0.044	12-0
	33103	Double 5-inch DutchLap	0.044	12-0
	33125	Double 5-inch DutchLap	0.044	12-0
Monogram 46L	33114	Double 4-inch	0.046	16-8
	33139	Double 4-inch	0.046	20-0
	33126	Double 5-inch DutchLap	0.046	16-0
	33140	Double 5-inch DutchLap	0.046	20-0
Classic	36110	Double 4-inch	0.044	12-6
	36119	Double 4½-inch DutchLap	0.044	12-1
	36122	Double 5-inch	0.044	12-0
Mainstreet	39131	Triple 3-inch	0.042	12-1
	39111	Double 4-inch	0.042	12-6
	39110	Double 4-inch	0.042	12-6
	39122	Double 5-inch	0.042	12-0
	39113	Double 4-inch DutchLap	0.042	12-6
	39125	Double 5-inch DutchLap	0.042	12-0
	39104	Single 8-inch	0.042	12-6
	39102	6½-inch Beaded	0.042	12-4
Hamilton Park	42110	Double 4-inch	0.040	12-6
	42122	Double 5-inch	0.040	12-0
	42130	Triple 3-inch	0.040	12-1
	42119	Double 4½-inch DutchLap	0.040	12-1
Board & Batten	34137	Single 8 Vertical	0.048	12-6
	34138	Single 8 Vertical	0.048	10-0
Carolina Beaded	38102	6½-inch Beaded	0.044	12-4
Northwoods	60106	Single 7-inch	0.050	10-1

(Continued)

TABLE 1—VINYL SIDING AND SOFFIT (Continued)

PRODUCT NAME	PRODUCT CODE	PRODUCT STYLE	THICKNESS (inch)	LENGTH (feet-inches)
The following products are sold under the brand name Wolverine:				
Restoration Shapes	31106	Single 7-inch Shake	0.060	10-1
	31107	10-inch Shake	0.050	10-0
Restoration Smooth	36132	Triple 3-inch	0.044	12-1
	36118	Double 4 $\frac{1}{2}$ -inch	0.044	12-1
Classic	36132	Triple 3-inch	0.044	12-1
	36118	Double 4 $\frac{1}{2}$ -inch	0.044	12-1
	36110	Double 4 inch	0.044	12-6
	36119	Double 4 $\frac{1}{2}$ -inch DutchLap	0.044	12-1
	36122	Double 5-inch	0.044	12-0
American Legend	40131	Triple 3-inch	0.042	12-1
	40110	Double 4-inch	0.042	12-6
	40111	Double 4-inch	0.042	12-6
	40122	Double 5-inch	0.042	12-0
	40119	Double 4 $\frac{1}{2}$ -inch DutchLap	0.042	12-1
	40102	6 $\frac{1}{2}$ -inch Beaded	0.042	12-4
	40105	Single 8-inch	0.042	12-6
Encore	43130	Triple 3-inch	0.040	12-1
	43110	Double 4-inch	0.040	12-6
	43122	Double 5-inch	0.040	12-0
	43119	Double 4 $\frac{1}{2}$ -inch DutchLap	0.040	12-1
The following products are sold under the brand name Ashland-Davis:				
Pro Edition 44	37110	Double 4-inch	0.044	12-6
	37119	Double 4 $\frac{1}{2}$ -inch DutchLap	0.044	12-1
Premium Series	41110	Double 4-inch	0.042	12-6
	41122	Double 5-inch	0.042	12-0
	41119	Double 4 $\frac{1}{2}$ -inch DutchLap	0.042	12-1
	41130	Triple 3-inch	0.042	12-1
	41104	Single 8-inch	0.042	12-6
Victoria Classics	32106	Single 7-inch Shake	0.060	10-1
Easycare	44110	Double 4-inch	0.040	12-6
	44119	Double 4 $\frac{1}{2}$ -inch Dutch Lap	0.040	12-1
	44122	Double 5-inch	0.040	12-0
The following products are sold under the brand name Vinyl Carpentry:				
Triple 3 $\frac{1}{3}$ -inch InvisiVent Soffit	46228	Triple 3 $\frac{1}{3}$ -inch Vented Soffit	0.044	12-6
Triple 3 $\frac{1}{3}$ -inch Soffit / Vertical	46229	Triple 3 $\frac{1}{3}$ -inch Soffit / Vertical Siding	0.044	12-6
IronMax Soffit	47201	Double 5-inch Solid Soffit	0.046	12-0
	47205	Double 5-inch Fully Vented	0.046	12-0
Universal Soffit	48224	Triple 4-inch Fully Vented	0.040	12-0
	48216	Triple 4-inch Solid Soffit	0.040	12-0
	48220	Triple 4-inch Center Vented	0.040	12-0
Beaded Soffit	46209	Triple 2-inch Solid Soffit	0.039	12-6
	46211	Triple 2-inch Vented	0.039	12-6
Value Soffit	49224	Triple 4-inch Fully Vented	0.036	12-0
	49216	Triple 4-inch Solid Soffit	0.036	12-0
	49220	Triple 4-inch Center Vented	0.036	12-0

TABLE 2—ALLOWABLE NEGATIVE WIND LOADS

SIDING	MAXIMUM STUD <sup>1</sup> SPACING (inches)	FASTENER <sup>2</sup>	ALLOWABLE NEGATIVE WIND LOAD (psf)			
			SBC	BNBC	IBC/IRC	UBC
Monogram D5	16	Nail to studs	53	53	53	33
	16	Staple to studs	47	47	47	29
Monogram D5DL	16	Nail to studs	76	76	76	47
	16	Staple to studs	49	49	49	31
	24	Nail to studs	44	44	44	28
Monogram D4	16	Nail to studs	91	91	91	57
	16	Staple to studs	58	58	58	36
Monogram 46L D4	16	Nail to studs	87	87	87	54
Monogram 46L D5DL	16	Nail to studs	78	78	78	49
Classic D5	16	Nail to studs	67	67	67	42
	16	Staple to studs	36	36	36	22
	24	Nail to studs	49	49	49	31
Classic D4	16	Nail to studs	80	80	80	50
Mainstreet D5	16	Nail to studs	76	76	76	47
	16	Staple to studs	38	38	38	24
	24	Nail to studs	47	47	47	29
Mainstreet D5DL	16	Nail to studs	62	62	62	39
	16	Staple to studs	58	58	58	36
	24	Nail to studs	42	42	42	26
	24	Staple to studs	36	36	36	22
Mainstreet D4	16	Nail to studs	53	53	53	33
	16	Staple to studs	82	82	82	51
Hamilton Park D5	16	Nail to studs	80	80	80	50
	16	Staple to studs	76	76	76	47
	24	Nail to studs	56	56	56	35
Carolina Beaded	16	Nail to studs	67	67	67	42
	16	Staple to studs	56	56	56	35
	24	Nail to studs	36	36	36	22
	24	Staple to studs	38	38	38	24
Northwoods S7	16	Nail to studs	60	60	60	38
Millennium D4	16	Nail to studs	100	100	100	63
	16	Staple to studs	113	113	113	71
Millennium D4.5	16	Nail to studs	120	120	120	75
	16	Staple to studs	84	84	84	53
	24	Nail to studs	82	82	82	51
	24	Staple to studs	36	36	36	22
Board & Batten	12	Nail to sheathing	62	62	62	39
American Legend D5	16	Nail to studs	36	36	36	22
	16	Staple to studs	33	33	33	21
American Legend D4	16	Nail to studs	60	60	60	38
	16	Staple to studs	58	58	58	36
Encore D5	16	Nail to studs	44	44	44	28
	16	Staple to studs	69	69	69	43
	24	Nail to studs	33	33	33	21
	24	Staple to studs	44	44	44	28
Encore D4	16	Nail to studs	64	64	64	40
	16	Staple to studs	53	53	53	33
Pro Edition 44 D4.5DL	16	Nail to studs	60	60	60	38
	24	Nail to studs	38	38	38	24
Pro Edition 44 D4	16	Nail to studs	80	80	80	50
Premium Series D5	16	Nail to studs	42	42	42	26
Premium Series D4	16	Nail to studs	47	47	47	29
	16	Staple to studs	67	67	67	42

(Continued)

TABLE 2—ALLOWABLE NEGATIVE WIND LOADS (Continued)

SIDING	MAXIMUM STUD <sup>1</sup> SPACING (inches)	FASTENER <sup>2</sup>	ALLOWABLE NEGATIVE WIND LOAD (psf)			
			SBC	BNBC	IBC/IRC	UBC
EasyCare D5	16	Nail to studs	44	44	44	28
	16	Staple to studs	69	69	69	43
	24	Nail to studs	33	33	33	21
	24	Staple to studs	44	44	44	28
Cedar Impressions 10-inch Shake	16	Nail to studs	42	42	42	26
Triple 3-1/3 Soffit / Vertical	12	Nail to sheathing	56	56	56	35

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kPa.

<sup>1</sup>Studs are minimum 2-by-4 wood with a minimum specific gravity of 0.42.

<sup>2</sup>Nails and staples shall be as specified in Section 4.4.

## Monogram™ 46 Vinyl Siding

**General Description:** Monogram™ provides the look of wood siding, but does not require the upkeep common to wood. Available in a selection of profiles and finishes, Monogram offers the industry’s widest selection of colors. Monogram siding is appropriate for use in new construction for single family homes, multi-housing projects and light commercial developments. Monogram is also an ideal product for remodeling.

### Styles:

Profile	Finish	Panel Projection (Nominal)	Wall Thickness	Lock Design	Colors	Accessory Pocket
Double 4” Clapboard	Rough Cedar	¾”	.046”	CertiLock™ post-formed positive lock	31	¾”
Double 5” Clapboard	Rough Cedar	¾”	.046”	CertiLock™ post-formed positive lock	17	¾”
Double 5” Dutchlap	Rough Cedar	¾”	.046”	CertiLock™ post-formed positive lock	25	¾”

**Colors:** Monogram siding profiles are available in the industry’s widest selection of colors. All colors are Spectrophotometer controlled and utilize exclusive PermaColor™ color science.

Arbor Blend**	Cypress	Herringbone	Sable Brown*	Timber Blend**
Arctic Blend**	Desert Tan	Ivy Green*	Sandstone Beige	Weathered Blend**
Autumn Yellow	Flagstone*	Light Maple	Savannah Wicker	Woodland Mist
Barn Red*	Frontier Blend**	Meadow Blend*	Silver Ash	
Buckskin	Glacier Blend*	Natural Clay	Snow	
Canyon Blend*	Granite Gray	Oxford Blue	Sterling Gray	
Colonial White	Heritage Cream	Pacific Blue*	Summer Wheat	

\* Deluxe Color: Deluxe colors utilize CertainTeed’s exclusive SpectraGrain MVF™ (Multi-Viscosity Fusion) process to provide the unique appearance of semi-transparent and solid stained wood siding.

\*\* Premium Color: Made with an exclusive, highly durable polymer capstock combined with unique heat distortion modifiers that help ensure long-term weatherability in darker hues that would otherwise quickly fail.

**STUDfinder™:** The patented STUDfinder Installation System combines precisely engineered nail slot locations with graphics. Nails are positioned 16" and 24" on center to allow for alignment with studs. STUDfinder graphics centered directly under each slot provide a quick and easy guide to help locate studs.

**RigidForm™:** Monogram RigidForm 220 technology has a stiff, double-thick .092" nail hem for a straighter-on-the-wall appearance and wind load performance.

**Lock:** Uniquely designed for ease of installation, Monogram features the CertiLock™ locking system; a post-formed positive lock which provides for self-aligning installation. Properly installed panels will snap together with an audible “click” signaling that they are ready for nailing.

**Accessories:** CertainTeed manufactures a wide range of siding accessories which are compatible with Monogram siding styles and colors. Accessory products include installation components, soffit, window and door trim, corner lineals, corner systems and decorative moldings.

**Composition:** Monogram siding products are produced using CertaVin™ custom-formulated PVC resin. This resin is produced exclusively by CertainTeed, allowing CertainTeed to maintain the high quality of its siding products. CertainTeed’s Monogram siding is in compliance with the ASTM Specification for Rigid Polyvinyl Chloride (PVC) siding D 3679.

**Technical Data:** Monogram siding meets the weathering standard in ASTM D 3679 using ASTM D 1435 procedure. As shown in Table 1, Monogram siding is in compliance with ASTM Fire and Smoke procedures and meets or exceeds International Building Code requirements.

Table 1

ASTM E 84	Flame Spread Index 20 Fuel Contribution 0 Smoke Development Index 390
ASTM D 1929	Self-ignition temperature 813°F
ASTM E 119	Fire Endurance Classification of 1 hour rated
ASTM D 635	Material is self-extinguishing with no measurable extent of burn when tested in accordance with this specification.
UBC 26-4	Multi-Story Flame Test - indicated CertainTeed vinyl siding does not contribute to the spread of fire in a multi-story situation.
NFPA 268	Radiant Heat Test - Ignition Resistance of Exterior Walls - Conclusion that CertainTeed met the conditions for allowable use as specified in section 1406 of the International Building Code.

**Important Fire Safety Information:** When rigid vinyl siding is exposed to significant heat or flame, the vinyl will soften, sag, melt or burn, and may thereby expose material underneath. Care must be exercised when selecting underlayment materials because many underlayment materials are made from organic materials that are combustible. You should ascertain the fire properties of underlayment materials prior to installation. All materials should be installed in accordance with local, state and federal Building Code and fire regulations.

**Wind Load Testing:** CertainTeed Monogram double 4" siding has been tested per ASTM D 5206 standard test method for resistance to negative wind load pressures of 68 psf, which equates to more than 220 mph per VSI windspeed calculation guidelines, when installed with nails positioned 16" on center. Check with your local building inspector for wind load requirements in your area on the type of structure you are building.

**Documents:** CertainTeed Vinyl Siding meets the requirements of one or more of the following specifications.

- |   |  |
|---|--|
| Texas Department of Insurance Product Evaluation EC-11    | Conforms to UBC Standard 14-2  |
| New York City Approval MEA #284-93M, 285-93M              | Conforms to ASTM Specification D3679                                     |
| Miami-Dade County Product Control Approved NOA 02-0531.09 | Conforms to ASTM Specification D4477                                     |
| Florida BCIS Approval FL1573                              |  |
| ICC-ES Evaluation Report ESR-1066                         | For specific product evaluation/approval information, call 800-233-8990. |

**Installation:** Prior to commencing work, verify governing dimensions of building, examine, clean and repair, if necessary, any adjoining work on which the siding is in any way dependent for its proper installation. Sheathing materials must have an acceptable working surface. Siding, soffit and accessories shall be installed in accordance with the latest editions of CertainTeed installation manuals on siding and soffit. Installation manuals are available from CertainTeed and its distributors.

**Warranty:** CertainTeed supports Monogram siding products with a Lifetime Limited Warranty including PermaColor Lifetime Fade Protection to the original homeowner . The warranty is transferable if the home is sold.

**Technical Services:** CertainTeed maintains an Architectural Services staff to assist building professionals with questions regarding CertainTeed siding products. Call 800-233-8990 for samples and answers to technical or installation questions.

**Sample Short Form Specification:** Siding as shown on drawings or specified herein shall be Monogram Vinyl Siding as manufactured by CertainTeed Corporation, Valley Forge, PA. The siding shall have a .092" thick nail hem. Installation shall be in accordance with manufacturer's instructions.

**Three-part Format Specifications:** Long form specifications in three-part format are available from CertainTeed by calling our Architectural Services Staff at 800-233-8990. These specifications are also available on our website at [www.certainteed.com](http://www.certainteed.com).



CertainTeed Corporation  
P.O. Box 860  
Valley Forge, PA 19482  
[www.certainteed.com](http://www.certainteed.com)  
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## **APPENDIX - H**

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### Firewall Details

Appendix includes a cad drawing from Beazer Homes.

It includes details, including those duplicated in the report.

Please contact Schirmer Engineering at (704) 295-1300 if you need a copy.



## **APPENDIX - J**

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Site Schematic

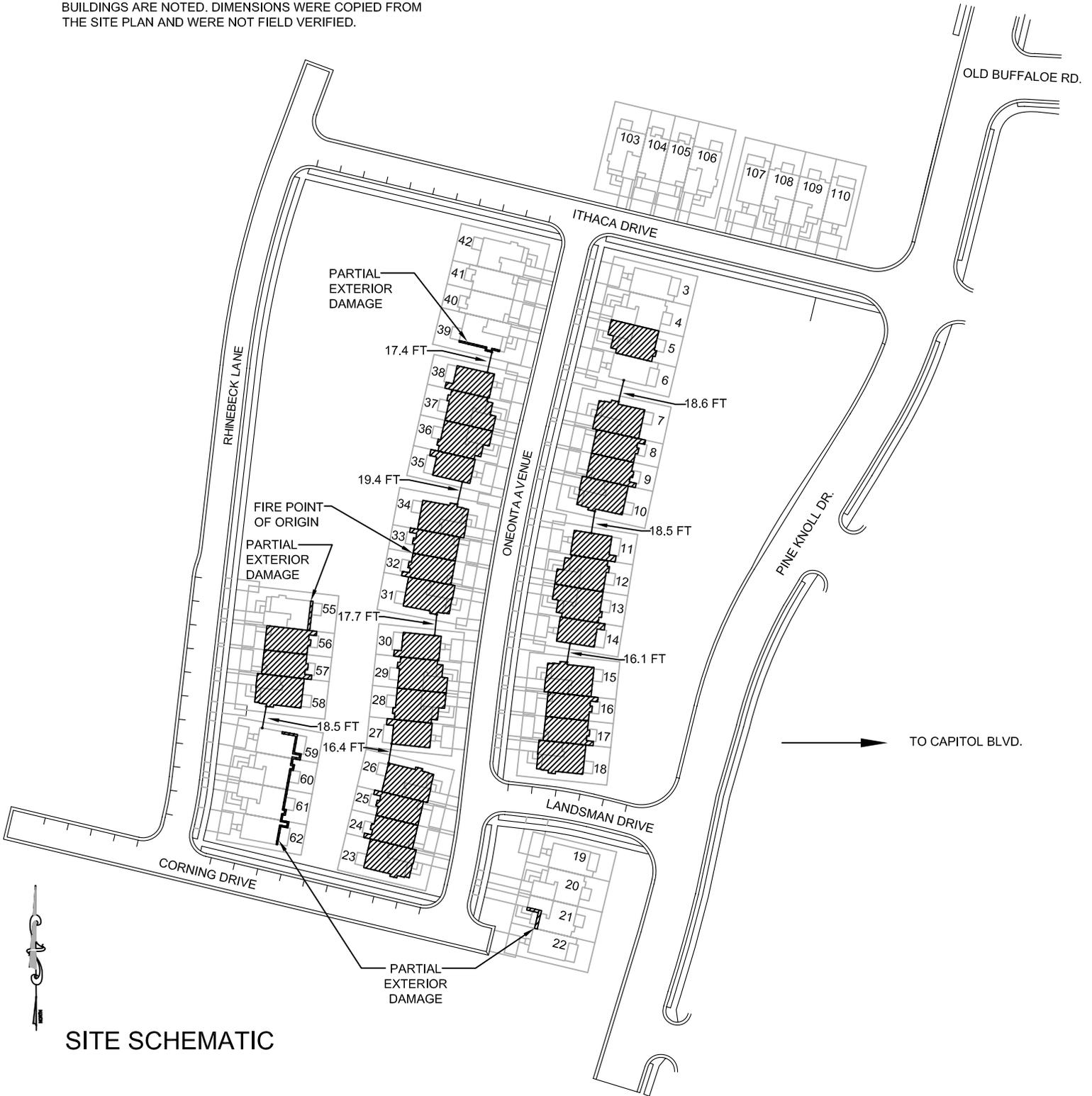
THIS SCHEMATIC ILLUSTRATES ONLY THOSE UNITS EXISTING AT THE TIME OF THE FIRE ON FEB 22, 2007.

THOSE UNITS CROSSHATCHED WERE DESTROYED DURING THE FIRE OR WERE DEMOLISHED LATER DUE TO EXTENSIVE FIRE DAMAGE.

THOSE UNITS PARTIALLY CROSSHATCHED (UNITS 21, 39, 55, 59-62) INCURRED SUBSTANTIAL EXTERIOR DAMAGE ON THE SIDE NOTED. UNITS WERE REPAIRED AS NECESSARY.

THOSE UNITS WITH NO CROSSHATCHING (UNITS 19-20, 22, 40-42, 103-110) INCURRED NO NOTEWORTHY DAMAGE FROM THE FIRE.

DIMENSIONS BETWEEN EXTERIOR WALLS OF ADJACENT BUILDINGS ARE NOTED. DIMENSIONS WERE COPIED FROM THE SITE PLAN AND WERE NOT FIELD VERIFIED.



SITE SCHEMATIC



## **APPENDIX - K**

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Emergency Rule by  
North Carolina Building Code Council

## PROPOSED TEMPORARY RULES

**Note from the Codifier:** The OAH website includes notices and the text of proposed temporary rules as required by G.S. 150B-21.1(a1). Prior to the agency adopting the temporary rule, the agency must hold a public hearing no less than five days after the rule and notice have been published and must accept comments for at least 15 business days.

For questions, you may contact either the Office of Administrative Hearings at 919.733.2678, email [oah.postmaster@ncmail.net](mailto:oah.postmaster@ncmail.net) or the Rules Review Commission at 919.733.2721.

### NC BUILDING CODE COUNCIL

**Rulemaking Agency:** Building Code Council

**Codifier of Rules** approved this rule as an emergency rule effective April 5, 2007 and received for publication the following notice and proposed temporary rule on March 27, 2007.

**Rule Citations:** Residential Code, R302.1 Exception 2, Exterior Wall Projections (070313 Item B-2)

**Public Hearing:**

**Date:** June 11, 2007

**Time:** 1:00 p.m.

**Location:** McKimmon Center, 1101 Gorman Street, Raleigh, NC

**Reason:** Current methods of townhouse construction that are allowed by the NC Residential Code have demonstrated the potential to allow fire to spread along and through roof soffit areas and into attic spaces. In the specific instance of vinyl soffits, the soffit material can melt away and allow an open chase for flames to rapidly spread into the attic space. Having noncombustible soffit material will reduce the spread of flames into the attic and adjacent units; thereby making the fire easier to control and manage.

The recent Raleigh townhouse fire brought this issue to the attention of the council. Numerous new townhouse building permits will be issued prior to adoption and approval of the Permanent Rule.

**Comment Procedures:** Comments from the public shall be directed to: Barry Gupton, PE, Dept. of Insurance, Engineering Division, 322 Chapanoke Road, Suite 200, Raleigh, NC 27603. The comment period begins April 4, 2007 and ends June 1, 2007.

NC Building Code Council

NC Residential Code

R302.1 Exception 2, Exterior Wall Projections (070313 Item B-2)

**R302.1 Exterior walls.** Exterior walls with a fire separation distance less than 3 feet (914mm) shall have not less than a one-hour fire-resistive rating with exposure from both sides. Non-rated projections shall not extend beyond the distance determined by the following two methods, whichever results in the lesser projections:

1. A point one-third the distance to the property line from an assumed vertical plane located where protected openings are required.
2. More than 12 inches (305 mm) into areas where openings are prohibited.

Projections extending beyond the distance described above into the fire separation distance shall have not less than one-hour fire-resistive construction on the underside. The above provisions shall not apply to walls which are perpendicular to the line used to determine the fire separation distance.

**Exceptions:**

1. Tool and storage sheds, playhouses and similar structures exempted from permits by Chapter 1 are not required to provide wall protection based on location on the lot. Projections beyond the exterior wall shall not extend over the lot line.
2. In townhouse construction (3 or more attached dwellings) noncombustible soffit material, not including aluminum, shall be used and shall be securely attached to framing members or shall have a 1 hour fire rating as required by code. Vented noncombustible soffit shall be permitted.

The Effective Date for this Emergency Rule is the April 5, 2007.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.



## **APPENDIX - L**

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### Tools for Assessing and Mitigating Wildfire Vulnerability

## TOOLS FOR ASSESSING AND MITIGATING WILDFIRE VULNERABILITY

There are many national organizations that have developed criteria to assess levels of wildfire vulnerability and appropriate mitigation strategies. A representative list of resources includes:

### **Firewise**

Excerpt from the [www.Firewise.org](http://www.Firewise.org) homepage: “The national Firewise Communities program is a multi-agency effort designed to reach beyond the fire service by involving homeowners, community leaders, planners, developers, and others in the effort to protect people, property, and natural resources from the risk of wildland fire - before a fire starts. The Firewise Communities approach emphasizes community responsibility for planning in the design of a safe community as well as effective emergency response, and individual responsibility for safer home construction and design, landscaping, and maintenance.”<sup>1</sup>

### **NCFirewise**

North Carolina’s website is [www.ncfirewise.org](http://www.ncfirewise.org). The 12-page document, **Firewise Landscaping in North Carolina** is attached. Eight pages include lists of plant species native to North Carolina with Flammability Ratings of Low, Medium, High, and Extreme.

NCFirewise provides **North Carolina’s Wildfire Hazard & Risk Assessment** Scoresheet that is based on the format within NFPA 1144. Scores are accumulated for the categories below and yield a final classification as low, moderate, high, and extreme hazard. Higher scores correspond to higher hazard conditions. A scoresheet is attached.

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<sup>1</sup> More excerpts from the homepage of Firewise.org: The national Firewise Communities program is intended to serve as a resource for agencies, tribes, organizations, fire departments, and communities across the U.S. who are working toward a common goal: reduce loss of lives, property, and resources to wildland fire by building and maintaining communities in a way that is compatible with our natural surroundings. Firewise Communities is part of the National Wildland/Urban Interface Fire Program, which is directed and sponsored by the Wildland/Urban Interface Working Team (WUIWT) of the National Wildfire Coordinating Group, a consortium of wildland fire organizations and federal agencies responsible for wildland fire management in the United States. The WUIWT includes: USDA Forest Service, USDI Bureau of Indian Affairs, USDI Bureau of Land Management, USDI Fish and Wildlife Service, USDI National Park Service, Federal Emergency Management Agency, US Fire Administration, International Association of Fire Chiefs, National Association of State Fire Marshals, National Association of State Foresters, National Emergency Management Association, National Fire Protection Association.”

The summary below indicates the comprehensive nature of North Carolina's Wildfire Hazard & Risk Assessment Scoresheet. Construction Materials are only one factor in a home's ability to withstand the effects of a wildfire.

a) Means of Access

- Ingress/egress (ideal is more than one road in/out)
- Road width (ideal is road wider than 24 feet)
- Road surface/grade (ideal is all-season surface w/ grade  $\leq$  to 5%)
- Road length (ideal is dead-ends less than 300 ft)
- Fire service turnaround capability (ideal is radius  $\geq$  50 ft)
- Street signs (ideal is the presence of reflective signs  $\geq$  4 inches)

b) Vegetation

- Flammability characteristics of predominate species (by Fuel Models)
- Fuel Clearance Zone (ideal is more than 100 ft from structure)

c) Topography

- within 300 ft of structure, gradual increase in points with a score of 10 for slopes greater than 41%

d) Miscellaneous

- areas that are periodically exposed to severe fire weather and strong dry winds
- areas with history of higher fire occurrence (ie, lightning, railroads, arson, debris burning)

e) Roofing Assembly

- Class A = 0, Class B = 3, Class C = 15, and non-rated combustible roof = 25

f) Building Construction

- Non-combustible vs combustible siding, eaves, and decks
- Building setback relative to slopes of 30% or more

g) Available Fire Protection

- water source availability (ideal is pressurized source included 500 gpm hydrants spaced  $\leq$  1000 ft apart)
- organized response resources (ideal is nearest fire station less than 15 minutes)
- Fixed fire protection (presence of fire sprinklers)

h) Placement of Gas and Electric Utilities

- Ideal is both underground

## **The International Code Council's International Wildland-Urban Interface Code:**

The International Code Council issues the International Wildland-Urban Interface Code to assist jurisdictions with defining appropriate regulations to protect structures from wildland fires and vice versa. In addition to construction materials, the code addresses access, water supply, and vegetation control. For several classifications of Ignition-Resistant Construction, regulations are identified for roof coverings, eaves, vents, exterior walls, gutters/ downspouts, exterior glazing, exterior doors, unenclosed underfloor protection, appendages and projections (ie, decks), and detached accessory structures. Appendices within the IWUIC include Fire Hazard Severity Form and Fire Danger Rating System.

## **The National Fire Protection Association (NFPA)**

NFPA 1143, *Standard for Wildland Fire Management*, provides regulations for incident management, community coordination/infrastructure, and fire-fighting training.

NFPA 1144, *Standard for Protection of Life and Property from Wildfire*, provides guidelines for minimum planning, construction, maintenance, education, and management for the protection of life and property from wildfire.

## **National Wildland/Urban Interface Fire Protection Initiative (NWUIFPI)**

As referenced in the report, NFPA has published several Fire Investigation Reports for landmark fires to create public awareness of the wildland/urban interface problem. The investigations and reports were sponsored by the National Wildland/Urban Interface Fire Protection Initiative (NWUIFPI), established in 1986 after record-breaking national losses of homes and natural resources occurred in 1985. The Initiative's goals were/are: a) to create public awareness, b) to encourage formation of partnerships among problem-solvers and interest groups, and c) to assist planners, local officials, fire service personnel, and homeowners in developing fire safe homes and communities in the wildland/urban interface.

To date, only four reports have been issued by the NWUIFPI since they only "review, analyze, and document selected or unusual wildland/urban interface fires that cause major home or structure loss." The reports are available through the National Fire Protection Association and include:

- The Oakland Hills/ Berkeley Fire case study documented a devastating conflagration that destroyed 2,449 single-family dwellings and 437 apartment/condominium units, burned over 1,600 acres, killed 25 people, injured 150 others, and did an estimated \$1.5 billion in damage. Nearly 800 homes were destroyed in the first hour of the fire. References from this case study were used earlier in the report to discuss the influence of weather.
- The Stephan Bridge Road Fire case study documented an even more rapid fire that spread across *flat terrain* in Michigan and destroyed 76 homes and 125 other structures.

- The *Firestorm 1991* case study documents a wind-driven fire that destroyed 114 homes in a four-county area in Washington State. Fuel included forests of Ponderosa pine that are highly flammable due to their resin and needles.

Each of these case studies involves wind-driven fires that occurred during dry conditions. Each documents the hazards of homes that include combustible vegetation and open eaves that provided ember access to roof areas.

## Federal Alliance for Safe Homes (FLASH)

FLASH is an educational program that provides disaster-safety building features to help families become better prepared for wildfires, windstorms, hurricanes, and floods. The website is [www.BlueprintForSafety.com](http://www.BlueprintForSafety.com) and it includes the following recommendations for wildfires:

### Blueprint for Safety Recommendations

- Determine wildfire risk profile using the NFPA 200 checklist or the ICC Urban Wildland Interface standard.<sup>2</sup> If risk profile is “low” to “moderate”, a minimum of 30 feet of “defensible space” should surround the home. If risk is “high” or “extreme”, defensible space should be increased up to as high as 100 feet and the use of more fire-resistive building materials should be considered.
- Homes must feature a non-combustible street number at least four inches high, on a contrasting background, visible from the road.
- Driveways must be at least 12 feet wide with at least 15 feet of vertical clearance.
- Drives longer than 150 feet must have turnarounds.
- Drives longer than 200 feet must have both turnarounds and turnouts.
- Gated driveways must open inward and have an entrance at least 2 feet wider than the driveway and be at least 30 feet from the road.
- If secured, the gate must have a key box approved by the local fire department.
- Fire-resistant plant species should be considered for use in the defensible space. Examples include dogwood, viburnum, redbud, sycamore, magnolia, beautyberry, oak, red maple, wild azalea, sweet gum and fern.
- Firewood must be stored at least 50 feet away from the home and other structures.
- **Noncombustible screening with a mesh size no greater than 1/4 inch must cover the fireplace chimney and the attic and sub-floor vents.**
- **Eaves must be made of noncombustible material.**
- Undersides of aboveground decks and balconies must be enclosed with noncombustible material.
- **Roof assembly must have a Class A fire-resistive rating — wood shakes and wood shingles are not recommended.**
- Glazed panels in exterior windows, glass doors and skylights must be multi-layered or include solid exterior shutters.
- Gutters and downspouts must be of noncombustible materials.
- LP gas containers must be located at least 30 feet away from any structure and surrounded with 10 feet of clearance.

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<sup>2</sup> NFPA 200 has been replaced by NFPA 1143