



Office of the City Manager

CONSENT CALENDAR

October 12, 2021

To: Honorable Mayor and Members of the City Council

From: Dee Williams-Ridley, City Manager

Submitted by: Abe Roman, Interim Fire Chief, Department of Fire and Emergency Services

Subject: Proposed Ordinance Amending Paragraph 'NN' of Berkeley Municipal Code Section 19.48.020 ("Amendments to the California Fire Code") to Require Fire Sprinkler Installation in All New Structures and Retrofit of Existing Structures in Berkeley Fire Zones 2 and 3

RECOMMENDATION

1. Adopt the first reading of an Ordinance (Attachment 1) which modifies the language of Paragraph 'NN.' of Berkeley Municipal Code Section 19.48.020 ("Amendments to the California Fire Code) by adopting a building standard which is more restrictive than that standard currently contained in the California Fire Code and which will expand the existing local code amendment that requires the installation of fire sprinklers in new structures and the retrofit fire sprinklers into existing structures that currently exists in Fire Zone 3 to include structures located in Berkeley Fire Zone 2;
2. Adopt a Resolution (Attachment 2) setting forth findings of local conditions that require more stringent building standards than those provided by the 2019 California Fire Code and that amends Resolution number 69,178–N.S.; and
3. In compliance with state law on adopting such more restrictive building standards, hold a public hearing following the first reading and before the second reading, and schedule the public hearing for October 26, 2021.

SUMMARY

Long term fire trends and wildfire events within the past five years demonstrate that the wildfire problem in California has become progressively worse and constitutes a major threat to the City of Berkeley and it's residents. Since 2007 an existing amendment within the Berkeley Fire Code has required the installation of fire sprinklers in new and retrofit of fire sprinklers within existing single-family and duplex residences in the "Environmental Safety- Residential" land use district when certain conditions are met. This geographic land use district is now also known as Fire Zone 3 in the Berkeley Fire Code. This requirement was instituted in response to the disastrous 1991 Tunnel Fire which affected Berkeley and Oakland.

This ordinance proposes to extend this requirement for the installation and retrofit of fire sprinklers within single-family and two-family dwellings that currently exist within Fire Zone 3 to include properties within Fire Zone 2. Fire sprinkler installation and retrofit would be required whenever new space is created in a structure or when the valuation of permitted work exceeds a specified threshold, with some limited exceptions to the requirement. Fire sprinklers would limit the development of fire within a residence and prevent the spread of fire to surrounding vegetation. This requirement is a reasonable response to the increased threat of wildfires since the majority of wildfires are caused by human activity, and in predominantly residential areas most fires are related to normal activities associated with human habitation and living.

FISCAL IMPACTS OF RECOMMENDATION

The fiscal impact to the City of Berkeley will be negligible. The staff required to review additional fire sprinkler permit submittals and inspect the installation of any fire sprinkler systems initiated by the proposed amendment are already budgeted by the City. The overall workload associated with potential fire sprinkler retrofit installations of primarily residential fire sprinkler systems is not expected to exceed staff's capacity to support the added workload. Also, permit fees associated with the installation of fire sprinkler systems are designed to offset staff costs which may be incurred in the review and inspection of those installations.

CURRENT SITUATION AND ITS EFFECTS

The wildland fire problem throughout the State of California and the western region of the United States has become progressively worse over the past 30-40 years. The duration of what was once considered a 'wildfire season' has extended to the point that wildfire events occur throughout most of the calendar year. This tends to blur any distinct lines between adjacent fire seasons. As a result, wildfire activity has become more of a cycle and less of a 'season'. Recent wildfire incidents since 2017 have consistently set records for fire size, intensity and rate of spread. Scientific evidence suggests that our current extreme drought conditions that make vegetation more susceptible to ignition and the fire weather conditions which lead to extreme fire behavior and make fire control difficult are due in large part to global climate change.

Berkeley is placed at great risk by the historic trends of deteriorating wildfire conditions and increasing fire severity throughout the state, by decades of accumulated vegetation fuel loading in the hills and by the steadily increasing human population within Berkeley's vulnerable wildfire zones. We believe that the community must act now to decrease the potential for a catastrophic wildfire developing in Berkeley's wildfire zones. We are therefore recommending the expansion of the current Fire Zone 3 fire sprinkler installation and retrofit requirements to include properties and structures within Fire Zone 2.

BACKGROUND

During its adoption of the 2007 California Fire Code, the Berkeley Fire Department added a local amendment to Berkeley's code adoption. Paragraph 'NN' of Section 19.48.020 of the Berkeley Municipal Code ("Amendments to the California Fire Code") required the installation of fire sprinkler systems in any new construction having a permit valuation of \$100,000 or more in the Panoramic Hill District. The amendment also required the

retrofitting of existing structures with fire sprinklers in the same Panoramic Hill District whenever new additions to existing structures were made. This area of the City is now also known as Fire Zone 3 in the Berkeley Fire Code. The fire sprinkler installation and retrofit requirements have been in force in Fire Zone 3 since this amendment was first adopted on December 27, 2007, and went into effect as part of Berkeley Ordinance 7,003-N.S.

This ordinance provision was adopted as part of Berkeley's response to the October 20, 1991 Oakland-Berkeley firestorm (known officially as the Tunnel-Oakland Hills fire). At the time it was believed that the risk of fire and the accompanying potential for the loss of life and property represented by fires like the Oakland-Berkeley firestorm justified the additional precaution of an aggressive fire sprinkler ordinance with retrofit requirements. The goal in providing aggressive fire sprinkler requirements for structures in Fire Zone 3 was to interrupt a potential chain of events where a routine structure fire could spread to adjacent vegetation and result in the ignition of a catastrophic wildfire.

ENVIRONMENTAL SUSTAINABILITY AND CLIMATE IMPACTS

Fire protection sprinkler systems (including residential fire sprinkler systems in one- and two-family dwellings) are environmentally friendly and contribute to the sustainability of our society. A 2021 study which continued earlier work to quantify the benefits of fire protection sprinkler systems reinforced earlier findings that on a per-fire basis where fire sprinklers were involved, fire sprinklers reduced greenhouse gas emissions by 97.8%, reduced water usage to extinguish the fire by 50%-91%, and reduced water pollution and the amount of materials committed to landfills when compared to the manual extinguishment of fires. This analysis does not include the additional benefits gained in energy savings and reduced carbon dioxide emissions when a destroyed building or building materials represented by the 98% reduction in fire property losses do not need replacement.

The Factory Mutual Insurance Company (a major leading insurance company in the Highly Protected Risk insurance market) published studies which attempt to quantify the environmental impact of fire sprinklers. The latest study estimated that in the eleven years between the publication of the 2010 and 2021 studies that residential fire sprinklers in the United States (specifically sprinklers in one- and two-family dwellings) could have prevented the emission of over 1.7 billion pounds of carbon dioxide into the atmosphere if residential fire sprinklers were universally installed.

RATIONALE FOR RECOMMENDATION

Formal studies confirm that the overall severity of the wildfire problem in the state has steadily increased over the past 30-40 years and recent wildfire incidents in California since 2017 have consistently set records for fire size, intensity and rate of spread. The difficulty of controlling recent wildfires is evidenced by the number of structures being lost in wildfires despite the record expenditure of public funds on fire control efforts and in the anecdotal reports of experienced firefighters.

In 2007, the amendment requiring the installation and retrofit of fire sprinklers in Fire Zone 3 was one of the few mitigations available to help address the fire potential in that area.

Today, the same conditions that originally motivated the 2007 Panoramic Hill District fire sprinkler amendment remain in effect in Fire Zone 3. The Berkeley Fire Department believes that based on deteriorating wildfire conditions throughout the state that the wildland fire problem in Fire Zone 2 is now very similar to the wildland fire problem in Fire Zone 3.

The geographic area designated as Fire Zone 2 shares most of the wildfire characteristics present within Fire Zone 3. Both areas are recognized by the City and the Director of the California Department of Forestry and Fire Protection as Very High Fire Hazard Severity Zones (VHFHSZ) and share similar fire weather. Both areas have narrow, winding and steeply graded roads and streets. Both areas have abundant vegetation intermixed with structures. The topography of both areas is steep which creates the potential for rapidly advancing slope-driven fires. The original parcel subdivisions created narrow but deep lots in both Fire Zones. This tends to crowd adjacent structures and greatly reduces the amount of defensible space available to provide for wildfire safety. The main factor that the two areas do not share is the condition of a single means of evacuation and access by road that exists in Fire Zone 3. The majority of street segments in Fire Zone 2 have access to more than one evacuation and access route. However, given the dramatic increase in the severity of the wildfire problem it is believed that the availability of a second or additional access routes, which is typical in Fire Zone 2, cannot mitigate all of the factors previously listed that may contribute to a catastrophic wildfire.

Human activity has been a major cause of fires throughout human history. A National Fire Protection Association study which examined the causes of wildfires nationally from 2011-2015 found that approximately 54% of wildfires were due to human activity other than intentionally set fires (which accounted for another 19%). Only 4% of fires were attributed to natural causes such as lightning. In residential areas, activities associated with human habitation pose the greatest potential for ignition of a fire. In residential areas where ignitable vegetation is closely intermixed with dwellings (such as in Fire Zones 2 and 3), it is a reasonable precaution to attempt to extinguish fires related to human habitation before those fires can spread to surrounding vegetation.

In addition to preventing the transition of residential fires to surrounding vegetation, the life safety benefits of residential fire sprinklers are well established and documented. These life safety benefits are evidenced by the fact that the California Building Code has mandated fire sprinklers throughout buildings containing new residential fire areas since the 2010 edition of that code. The proposed addition of fire sprinklers to existing and new residential properties will not only reduce the risk of a catastrophic wildfire incident but will have substantial, long-term safety benefits to the occupants of these structures.

This proposed ordinance amendment will greatly expand the use of fire sprinklers in our wildfire vulnerable areas, enhance the safety of building occupants and reduce the potential for fire spread from a structure to vegetation. However, it is not a panacea for the city's wildfire problem. Additional, substantial wildfire problems exist. Major problems include an inadequate road network for evacuation and emergency access, the need for more effective notification of citizens of developing emergencies, the need to coordinate citizen evacuations, the need for more and better vegetation management and defensible

space, and the need to make fire-hardening of structures more universal. These problems have all been identified and can be addressed through other measures.

Given the potential financial impacts to property owners in the community, the subject of financial costs to the regulated community must be examined. For home owners subject to the requirement to install or retrofit fire sprinklers in their homes installation costs can vary substantially. A 2013 cost study for fire sprinkler installation in new residences by the National Fire Protection Association included multiple installations in projects in various areas of California and around the country. At that time the total cost for fire sprinkler installation in new construction (on cost-per square foot of sprinklered space) ranged from \$0.94 in Fresno to \$1.11 per square foot in Elk Grove, \$1.29 per square foot in Bakersfield and \$1.44 per square foot in Irvine, California. Nationwide, the NFPA study found an average installed cost of \$1.35 per sq. ft. and also found that in the two states having statewide installation requirements (California being one of those states) that the costs of installed systems are significantly and consistently lower. It also found that average fire sprinkler installation costs actually decreased between 2008 and 2013.

In the case of a retrofit in existing structures, the costs tend to be considerably higher and are greatly affected by the style of system installation (exposed vs. concealed pipe), the materials used and the source of water supply. A 2016 study by the City of San Francisco estimated fire sprinkler retrofit costs for exposed piping systems as approximately \$515 per installed fire sprinkler head and included costs such as water meter upgrade, backflow prevention device, and material and installation costs. The San Francisco study used a conservative assumed coverage of 80 sq. ft per sprinkler which would equate to a cost-per square foot of coverage of \$6.44. This 80 sq. ft. per sprinkler coverage estimate is considered conservative from a cost estimating standpoint because standard residential fire sprinklers are actually rated for coverage areas of 144 sq. to 440 sq. ft. of coverage. If fire sprinklers were able to consistently cover their full rated area this would drive the report's average installation costs down to \$1.17 to \$3.58 per square foot. As a practical matter the constraints of smaller home spaces such as hallways, entry foyers and smaller bedrooms tend to drive the average coverage area down and the 80 sq. ft. of coverage per installed sprinkler is realistic in many installations. In cases where piping is concealed within walls, the San Francisco report estimated that installation costs would at least double, which would equate to \$12.88 per square foot.

As constructed, the proposed revised ordinance language achieves the following goals:

1. It expands the scope and applicability of the existing fire code adoptive ordinance paragraph 'NN' from a requirement applicable only in Fire Zone 3 to a requirement applicable in both Fire Zones 2 and 3. The existing reference to "Environmental Safety- Residential District" (which is a land use planning designation) is replaced with "Fire Zones 2 and 3". These Fire Zone areas are defined in the Berkeley Fire Code as Very High Fire Hazard Severity Zones. As such, the fire sprinkler requirement would be directly linked to the wildland fire hazard present in those areas and not to a Land Use designation. This may become an important distinction as CalFire updates wildfire hazard maps. It is important that our local

wildfire mitigation provisions evolve with our technical understanding of the State's wildfire problem.

2. The amended language specifies that the provisions of paragraph 'NN' apply to "any parcel zoned for single-family or duplex dwelling use". This specific language was chosen to mirror language used in State statutes which establish the rights of property owners to develop Accessory Dwelling Units (ADUs) on these properties. ADUs are a major source of new development within Berkeley's built-out neighborhoods in Fire Zones 2 and 3. However, the language is broad enough to capture not only ADU development but a significant percentage of substantial building alterations. Given that most properties within the Fire Zone 3 are typically single-family, duplex or in some cases multiple single-family residences such a specification was previously unnecessary in earlier amendment language. The process of expanding paragraph 'NN' provisions to include all of Fire Zone 2 will necessarily capture parcels zoned for other uses. While there is utility in having structures on these other types of properties sprinkler protected in addition to the traditional dwelling units captured in the current paragraph 'NN' language, doing so creates significant obstacles in implementing and administering such a provision for larger campus-style or commercial properties having multiple buildings. In addition, larger residential properties are often captured by other fire code provisions which enhance fire safety such as our local fire alarm retrofit requirement or, in the case of larger congregate residences, an existing retrofit requirement for fire sprinklers. Also, other property types may not have the same fire hazards associated with daily residential living activities such as cooking.
3. The language of the paragraph 'NN' amendment is altered to clarify that it is intended to apply to new construction as well as to building alterations when permit valuations exceed the \$100k threshold. 'Alterations' are formally defined in the building code as construction work other than repair work or additions to existing structures or the construction of entirely new structures. The Berkeley Fire Department's historic interpretation of the current paragraph 'NN' language has always included non-repair work and additions in the application of the permit valuation threshold. The new language clarifies that the addition of new space (not just 'additions') such as the build-out of existing attic or previously unused under-floor space will trigger fire sprinkler installation.
4. The revised paragraph 'NN' language makes it clear that whenever fire sprinklers are triggered in one building by construction of a new structure or alterations to an existing structure that all structures on the property having habitable space and associated with the new work are affected by the retrofit requirement. This feature of the ordinance language is essential because:
 - a. A retrofit requirement which only applies to the specific structure that is undergoing significant alterations will result in an extended delay in sprinkler adoption as many structures may never experience a substantial remodel.

- b. As currently written, State statues addressing the construction of Accessory Dwelling Units prohibit local jurisdictions from requiring fire sprinklers in those structures unless the main structure is also equipped with fire sprinklers.
5. The \$100,000 permit valuation trigger threshold from the original paragraph 'NN' amendment is retained. This allows for reasonable building alterations without triggering fire sprinkler installation while still capturing larger alteration, renovation and construction projects.

The exceptions included in the new paragraph 'NN' language include:

'Exception 1' exempts smaller accessory structures (less than 120 sq. ft. in size) that would not normally require a building permit.

'Exception 2' exempts work classified as repairs to existing structures. There would be no permit valuation threshold associated with repair work. This will allow even extensive needed repairs such as roof, foundation, termite/pest repairs and similar work to be completed without the risk of triggering a fire sprinkler installation. This provision also exempts repair or alteration work specifically intended to bring a structure into compliance with ignition resistance construction standards for Wildland Urban Interface fire areas as recognized in the building code.

'Exception 3' allows the creation or addition of small utility or mechanical spaces to serve the needs of the structure. This is intended to allow for the incorporation of new energy generation or energy saving features into existing buildings such as 'off-grid' or solar battery power installations, newer space or water heating technologies, etc.

'Exception 4' is intended to provide some relief to sprinkler retrofit requirements in situations where multiple, free-standing primary dwellings may exist on a property and where separate households may have no control over the construction activities of others on the property.

ALTERNATIVE ACTIONS CONSIDERED

Various adjustments to the proposed ordinance language were considered, as were different permit valuation thresholds for triggering sprinkler installation. Staff's belief is that the original \$100,000 permit valuation threshold used in Fire Zone 3 will strike a balance between allowing some significant updates and upgrades of living spaces and structures while still capturing many substantial remodel projects. As a result the \$100k figure is still considered to be a valid trigger threshold for fire sprinkler installation.

CONTACT PERSON

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Attachments:

- 1: Ordinance: “AMENDMENT OF PARAGRAPH ‘NN.’ OF SECTION 19.48.020 OF THE BERKELEY MUNICIPAL CODE TO REQUIRE FIRE SPRINKLER INSTALLATION IN AND RETROFIT OF STRUCTURES IN BERKELEY FIRE ZONES 2 AND 3”
- 2: Resolution: “ADOPTING FINDINGS AS TO LOCAL CLIMATIC, GEOLOGICAL AND TOPOGRAPHICAL CONDITIONS RENDERING REASONABLY NECESSARY VARIOUS ENUMERATED LOCAL FIRE AND BUILDING STANDARDS THAT ARE MORE STRINGENT THAN THOSE MANDATED BY THE CALIFORNIA FIRE CODE AND AMENDING RESOLUTION NO. 69,178-N.S.”

ORDINANCE NO. ~~##,###~~-N.S.

AMENDMENT OF PARAGRAPH 'NN.' OF SECTION 19.48.020 OF THE BERKELEY MUNICIPAL CODE TO REQUIRE FIRE SPRINKLER INSTALLATION IN AND RETROFIT OF STRUCTURES IN BERKELEY FIRE ZONES 2 AND 3

BE IT ORDAINED by the Council of the City of Berkeley as follows:

Section 1. That Paragraph NN. of Section 19.48.020 of the Berkeley Municipal Code ("Amendments to the California Fire Code") is amended to read as follows:

NN. ~~Section 903.2.23 Environmental Safety--Residential District~~Fire Zones 2 and 3 [Additional subsection] On any parcel zoned to allow single-family or duplex dwelling residential use, Any new construction or construction alterations requiring a permit(s) determined to be \$100,000 or more in aggregate construction costs over a 36 month period, or new additions of new space to existing structures shall be required to install automatic fire sprinklers throughout the existing primary and any accessory structure(s) containing habitable space. For the purpose of this subsection "Environmental Safety--Residential District" Fire Zones 2 and 3 shall mean those areas designated as such on the Official Zoning Map of the City of in the Berkeley Fire Code, as it may be amended from time to time.

Exceptions: 1. Free standing occupancy Group 'U' structures that fall below the building permit threshold size as set forth in the Berkeley Building Code and which are accessory to an existing R3 dwelling.

2. Construction or portions of construction defined as repairs for maintenance purposes or construction alterations implemented in order to comply with ignition resistant construction requirements for wildfire exposure of the structure as set forth in the Berkeley Building Code.

3. Additions of new space that total not more than 250 square feet in area and which are used solely for mechanical or utility service of a building.

4. Where multiple, primary, free-standing dwellings exist on a given property the fire sprinkler installation requirements of this section shall be applicable to an individual primary structure and any qualified accessory structures on the property associated with affected primary dwelling structure. Other free-standing dwelling structures on the property and their accessory structures need not retrofit fire sprinklers at that time.

Section 2. This amendment shall become effective 90 days after adoption of this ordinance.

Section 3. Copies of this Ordinance shall be posted for two days prior to adoption in the display case located near the walkway in front of the Maudelle Shirek Building, 2134 Martin Luther King Jr. Way. Within 15 days of adoption, copies of this Ordinance shall be filed at each branch of the Berkeley Public Library and the title shall be published in a newspaper of general circulation.

RESOLUTION NO. ~~##,###~~-N.S.

ADOPTING FINDINGS AS TO LOCAL CLIMATIC, GEOLOGICAL AND TOPOGRAPHICAL CONDITIONS RENDERING REASONABLY NECESSARY VARIOUS ENUMERATED LOCAL FIRE AND BUILDING STANDARDS THAT ARE MORE STRINGENT THAN THOSE MANDATED BY THE CALIFORNIA FIRE CODE AND AMENDING RESOLUTION NO. 69,178-N.S.

WHEREAS, Health & Safety Code §17958 allows the City to make modifications or changes to the California Fire Code and other regulations adopted pursuant to Health & Safety Code §17921(a) which result in more stringent local requirements; and

WHEREAS, Health & Safety Code §17925, §17958.5 and §17958.7 require that such changes be supported by findings made by the governing body that such more stringent local requirements are necessary because of “local climatic, geological or topographical conditions or factors”; and

WHEREAS, such findings must be made available as a public record and a copy thereof with each such modification or change shall be filed with the California Building Standards Commission; and

WHEREAS, on November 12, 2019, the City adopted Resolution No. 69,178-N.S. which found that each of the various changes or modifications to the California Fire Code then proposed and enumerated in that document were reasonably necessary because of local climatic, geological or topographical conditions or factors and conditions in the area encompassed by the City of Berkeley; and

WHEREAS, the City is proposing to adopt additional changes and modifications to the California Fire Code, as set forth below:

NOW THEREFORE, BE IT RESOLVED by the City Council that it finds that in addition to the changes and modifications enumerated in City of Berkeley Resolution No. 69,178-N.S. that the proposed additional changes or modifications to the California Fire Code which are enumerated below are reasonably necessary because of local conditions in the area encompassed by the City of Berkeley, as set forth below:

A. LOCAL CONDITIONS

1. Climatic Conditions.

a. Discussion.

A significant portion of the City of Berkeley has been designated as a Local Agency Very High Fire Hazard Severity Zone (LAVHFHSZ) by the City in concert with the California Director of Forestry and Fire Protection. The requirement for evaluation and

designation of LAVHFHSZ on a state-wide basis was mandated by AB 337 (the "Bates Bill") in response to the Oakland/Berkeley Hills Fire of 1991. Within the City of Berkeley those areas designated as Fire Zone 2 and Fire Zone 3 in the Berkeley Fire Code are formally classified as LAVHFHSZ. A major element of this designation as a LAVHFHSZ are fire weather conditions which develop within those areas. Fire weather is an integral part of local climatic conditions. Conditions conducive to the ignition and spread of wildfires occur more frequently during certain times of the year but this does not preclude the possibility that a serious fire could occur during other months of the year. The critical climate fire conditions create a situation conducive to rapidly moving, high intensity fires. Fires starting in the wildland areas along the easterly border of the City are likely to move rapidly westward into Berkeley's urban areas. Fires starting in Berkeley structures in the LAVHFHSZ are more likely to spread to surrounding landscape and structures and adjacent wildlands.

As previously stated, the October 20, 1991, Oakland/Berkeley Hills fire motivated State legislation requiring the designation of fire hazard severity zones in areas of local jurisdiction. This fire prompted the evacuation of thousands of residents, destroyed more than 3000 dwelling units (at least 70 of which were in Berkeley) and resulted in a total of 25 confirmed deaths in the Oakland-Berkeley area. Other significant fires have occurred in Berkeley.

In September 1923, critical climatic fire conditions were in effect and Berkeley sustained one of the most devastating fires in California's history up to that point. A fire swept over the range of the hills to the northeast of Berkeley and within two hours was attacking houses within the City limits. This fire burned a total of 130 developed acres. At least 584 Berkeley buildings were destroyed and about 30 others seriously damaged. By far the greater portion were single-family dwellings, but among the number were 63 apartments, 13 fraternity, sorority and students' house clubs and 6 hotels and boarding houses.

Conditions similar to the 1923 fire were in place in 1970 when a fire destroyed 37 homes in Berkeley and Oakland. In December of 1980, a small fire that started at Berkeley's northeast limits totally destroyed five homes within minutes. In each of these instances, critical climatic fire conditions were in place and matched patterns consistent from the 1923 through the 1991 fires creating hazardous conditions for fire ignition and spread.

b. Summary.

Local climatic conditions of limited rainfall, low humidity, high temperatures and high winds along with existing building construction create extremely hazardous fire conditions that adversely affect the acceleration, intensity and size of fires in the City. The same climatic conditions may result in the concurrent occurrence of one or more fires, which may spread in the more populated areas of the City without adequate fire department personnel to protect against and control such a situation.

2. Geological Conditions.

a. Discussion.

The City of Berkeley is located in a region of high seismic activity and is traversed by the Hayward fault. It has the San Andreas earthquake fault to the west and the Calaveras earthquake fault to the east. All three faults are known to be active as evidenced by the damaging earthquakes they have produced in the last 100 years and can, therefore, be expected to do the same in the future. Of primary concern to Berkeley is the Hayward Fault, which has been estimated to be capable of earthquakes exceeding a magnitude of 7.0 on the Richter scale. It extends through many areas including Berkeley's Fire Zone 2 and 3 (both Local Agency Very High Fire Hazard Severity Zones). Intensified damage during an earthquake may be expected in the hillside areas which include Berkeley's Fire Zones 2 and 3 as they are located within or near the fault zone. Significant seismic events are commonly accompanied by ensuing fires in areas of heavy shaking. Based on the susceptibility of Berkeley's LAVHFHSZ (Fire Zone 2 and 3) to ignition and rapid uncontrollable fire spread, significant seismic activity in the Berkeley area could conceivably lead to an ensuing wildfire disaster.

b. Summary.

Local geological conditions include the potential for high seismic activity and severe shaking in the immediate areas of Fire Zones 2 and 3. The City of Berkeley is a densely populated area and has buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes. It is common for significant seismic shaking to result in ensuing fires. The modifications cited herein are necessary to better limit the potential for loss of life and property damage as a result of seismic activity.

3. Topographical Conditions.

a. Discussion.

The City of Berkeley has many homes built throughout the urban portion of the Berkeley Hills that are reached by narrow and often winding paved streets which hamper access for fire apparatus and escape routes for residents. In addition, many of the hillside homes are on the extreme eastern edge of the City and require longer response times for the total required firefighting force. Panoramic Way and other hill neighborhoods with narrow and winding streets face the problem of isolation from the rest of the City.

In addition to the problems of emergency evacuation and access created by Berkeley's topography, the steepest portions of the City also coincide roughly with Berkeley Fire Zones 2 and 3 (both Local Agency Very High Fire Hazard Severity Zones). In addition to other factors such as fuel types and fire weather conditions, a key factor in determining the boundaries of a LAVHFHSZ include the topography of the terrain. Steep terrain is often associated with intense, fast moving wildfires that are terrain driven.

Factors related to steeply sloping terrain aggravate the situation and create conditions such as the crowding of structures with limited defensible space to protect against wildfires. As a result, fires can be expected to involve large groups of buildings in these areas.

b. Summary.

Local topographical conditions include hillside housing with many narrow and winding streets in the abruptly rising Berkeley hills. These conditions create an extremely serious problem for the Fire Department when a fire or other disaster occurs. Many situations will result in the limiting or total blockage of fire department emergency vehicular traffic, overtaxed fire department personnel and a lack of resources for the suppression of fire in buildings, structures or vegetation in the City of Berkeley. These same conditions of sloping topography also contribute significantly to fire intensity and the rate of fire spread within Fire Zones 2 and 3.

B. REASONABLE NECESSITY

The proposed additional changes and modifications to the California Fire Code are reasonably necessary due to the local climatic, geological and topographical conditions set forth above. They are further justified for the reasons set forth below.

In adopting the modifications proposed below, the City proposes to make certain substantive additional modifications to building standards whose effect is to impose more stringent requirements locally than are mandated by the California Fire Code. These additional modifications are specifically listed below, but may be generally characterized as relating to the amendment of automatic sprinkler requirements within the Wildland-Urban Interface zone with the goal of improving the management of the Wildland-Urban Interface fire zone. These more stringent local requirements are reasonably necessary to address risks created by local conditions set forth above for the following reasons:

1. Section 903.2.23 affects fire sprinkler system installation requirements specifically within Fire Zones 2 and 3. The requirement to install fire sprinklers in new structures and to retrofit existing structures with fire sprinklers based on the addition of new space to or the valuation of building construction or building alteration permits already exists within Fire Zone 3.

Both Fire Zone 2 and 3 are formally recognized as a Local Agency Very High Fire Hazard Severity Zone by the City and by the Director of the California Department of Forestry and Fire Protection, and represent the “Wildland-Urban Interface” component in Berkeley. The existing Fire Zone 3 fire sprinkler requirements are being amended to include all of Fire Zone 2 due to local geological, topographical, and climatic conditions that exist within that geographic area that necessitate the imposition of requirements more restrictive than those imposed by the California Fire Code.

The affected Fire Zone 2 and Fire Zone 3 geographic areas contain risks inherent to the Wildland-Urban Interface. These risk factors include seismic (geologic) conditions, fire weather (climatic) conditions, and steep terrain (topographical) conditions within the Fire Zone 2 and Fire Zone 3 geographic areas. The factors of fire weather and steep terrain especially contribute to an enhanced likelihood of fire ignitions, enhance the intensity and rate of spread of wildfires and make containment more difficult. In recent years, the severity of fire behavior has increased notably throughout the State and region. These deteriorating factors of fire severity, increased rate of spread and the difficulty of containment are believed to be related to climate change and are a significant threat to the Berkeley community.

The impacts of Berkeley's climate on its fire weather is demonstrated by the fact that the National Weather Service uses one Fire Weather Zone classification for the majority of the city west of the hills (designated CAZ508). The National Weather Service uses a different Fire Weather Zone (known as CAZ511) for eastern portions of the Berkeley hills. A third Fire Weather Zone (CAZ510) affects wildland areas farther east of the City limits but still within an area recognized as part of Berkeley's wildfire exposure. Both the CAZ511 and CAZ510 Fire Weather Zones consistently experience more frequent and more severe Red Flag fire weather events than does Berkeley's primary CAZ508 weather zone.

Based on the specific local findings cited above and the summary of Berkeley's past history of above average death and property loss due to fires in the hillside areas, it is clear that people and structures in Fire Zone 2 and Fire Zone 3 are subject to an increased likelihood of exposure to wildfires. Also, any incidental structure fire in this geographic area poses the risk of direct transmission of fire from a structure to vegetation, which under the right conditions could cause an individual common structure fire to transition into a major, potentially catastrophic Wildland-Urban Interface wildfire event.

The fire record of automatic fire sprinklers has established that fire sprinkler systems significantly reduce the loss of life within a fire involved structure. Based on their ability to control or suppress a fire in its early stages, fire sprinklers will also slow or prevent the spread of fire from a structure into adjacent vegetation and can delay full involvement of a structure when exposed to a wildland fire where fire entry into or development through the structure occurs through sprinkler protected spaces. This amendment will maintain and expand on the standards established after the 1991 Oakland-Berkeley firestorm.

