Report of the Maryland SFPC Task Group on Protection of Existing Nonsprinklered High Rise Residential Structures

Submitted: February 7, 2019

Executive Summary

The State Fire Marshal, through the publication of a Draft Position Paper in November, 2017, challenged the State Fire Prevention Commission to develop and implement retroactive requirements to increase the level of safety in nonsprinklered high rise residential structures. The Commission had questions on some of the technical and administrative issues raised. The Chairman of the Commission appointed a Task Group to study the proposal and report on its recommendations back to the full Commission. This report is the result of the Task Group effort.

A high rise building is a building where the floor of an occupiable story is greater than 75 ft above the lowest level of fire department vehicle access. The TG focused on residential occupancies. Current Maryland and national codes and standards were referenced.

At least 120 residential high rise buildings in Maryland are nonsprinklered. This does not include Baltimore City. Baltimore County allows condominium owners in nonsprinklered buildings to opt out of their retroactive sprinkler requirement by 75% vote of the owners association. The Town of Ocean City already has retroactive residential high rise provisions that are more stringent than the State Fire Prevention Code.

The State *Fire Prevention Code* is "intended to establish minimum requirements that will provide a reasonable degree of fire prevention and control to safeguard life, property, and the public welfare". By declaring nonsprinklered high rise buildings an inimical hazard, the Commission has gone on record as declaring the current level of safety in these buildings as "unreasonable", requiring an increase in the provided level of safety. Defining what this increased level of safety should be, how it should be achieved, and the associated cost, is the challenge, and the primary objective of the Task Group effort.

A brief survey of other jurisdictions was performed. A number of large cities have retroactive fire protection requirements for high rise buildings. In many cases, there are allowances for residential occupancies which permits a degree of protection less than complete automatic sprinkler protection. These allowances include the condominium owner opt-out provision. Few jurisdictions were identified which require complete retroactive sprinkler protection in residential high rise occupancies.

The fire fatality rate per 1000 fires and the average loss per fire are generally lower in high-rise structures compared to other buildings in the same category, according to statistics from the National Fire Protection Association. NFPA attributes this lower risk to the greater use of fire protection systems and features in high-rise buildings compared to non-high-rise buildings. Nationally, both the apartment civilian fire fatality rate and the firefighter line of duty (LOD) fatalities due to fire are trending downward. Maryland does not track fire loss statistics specifically to high rise occupancies. There is no

aggressive effort by either the residential apartment industry or the State FM on preventative and preplanning approaches to high rise fire safety as advocated by NFPA.

The positive fire loss trends should not be construed to suggest that high rise structures do not pose a more-than-normal life and public safety challenge. A single, uncontrolled high rise fire might threaten a large occupant load. Combating/controlling a fire could be a significant challenge. The threat can be categorized as a "low probability, high impact" event. The "high impact" would be the potential of multiple potential civilian and firefighter casualties, and major dollar loss of a large structure.

The TG recognized these challenges, and identified specific significant threats/challenges. These can be generally described as: firefighter safety and effective firefighting operations; the risk of ignition and fire spread from cooking; and the threat from nonconforming combustible exterior insulation. Different risk/benefit approaches and data were analyzed. There is data to quantify the cost impact of retroactive sprinkler protection and its associated reliability, but it varies widely. This data is not readily available for other protection systems, particularly fire resistive construction. After deciding not to pursue a risk or performance-based approach, Task Group developed four prescriptive code protection options:

Option 1 - Provide a complete building fire suppression system:

Option 2 - Compliance with NFPA 101 for Existing High Rise Residential Occupancies (effectively requiring all dwelling units to have an exit directly to the exterior);

Option 3 - Compliance with a set of parameters developed by the TG which include provisions for: standpipes, a fire department elevator, protection of cooking equipment, smoke alarms, protection of exit access corridors, protection of vertical openings and separation of hazards, elimination or mitigation of hazards associated with combustible exterior finish material, maintenance of means of egress, maintenance of manual fire alarm systems, and standby power; or

Option 4 – Compliance with the standpipe, FD elevator, cooking protection, and combustible exterior mitigation features of Option 3. Additionally, alarms would have to sound throughout the building, and, in buildings greater than 10 stories above grade, emergency power would be provided for at least one FD elevator.

There was some differing opinions among TG members on the Option 3 corridor protection. Also, the TG was divided on Option 4, a minority position to allow a more cost-effective alternative which address key hazards and concerns.

All Options provide an increased level of safety over that which is currently permitted by the State Fire Prevention Code. The proposed levels of protection are not equivalent; the complete suppression option provides the greatest level of safety. Option 4, having a lower level of safety compared to Options 1 and 3 (but improved over the current level), is likely the least costly to implement. A full risk/cost benefit analysis was not performed.

There are a number of issues which the TG considered administrative items which should be discussed and determined by the full Fire Prevention Commission. The Task Group did not make specific recommendations on these issues, but did have some opinions. As a practical matter, retroactive

requirements would need to be phased-in. The TG considered this an implementation administrative issue and has no recommendation on this.

The TG does not endorse the idea of selectively allowing segments of the population to either opt out (condo owners) or be exempt (Baltimore City) from retroactive increases in the level building protection. The TG believes that the level of safety established by these recommendations should apply to all Maryland residents subject to the laws and regulations promulgated by the State Fire Prevention Commission and the state legislature.

Ocean City currently requires a higher level of safety in high rise buildings than the SFPC. The TG believes their requirements meet the spirit of Option 2.

1.0 History/Background

A Draft Position Paper (hereafter referred to as the FM Draft) was prepared by the State Fire Marshal (FM) and FM office. It was circulated to the Maryland State Fire Prevention Commission (SFPC, or Commission) by the Commission Chairman via email on November 6, 2017. It posited that high rise residential structures without a complete automatic fire suppression system pose an inimical hazard (§6-206 of the Public Safety Code) requiring corrections to secure an adequate and reasonable level of safety. No fire suppression essentially means no complete automatic sprinkler protection. The corrections would require retroactive improvements to existing high rise residential buildings.

The FM Draft is undated and prepared under the name of the SFPC. It remains a draft, as reiterated at the June 2018 meeting of the SFPC.

Commissioner Joseph Scheffey prepared a review of the FM Draft, “Comments to Draft Position Paper on Existing High-Rise Residential Structures” dated December 4, 2017. It was circulated on that day via email to the Commissioners, the FM office, and their respective legal counsels. It is hereafter referred to as the Scheffey Comment Paper. It questioned some of the data and assertions which were used to draw the conclusion of “inimical hazard”.

The FM Draft was discussed at the regular December, 2017 meeting of the SFPC. At that meeting, Chairman Davis asked certain members to work on a task group (TG) to resolve issues raised in the Scheffey Comments Paper. Commissioners Scheffey and Edward (Ted) Tochterman agreed to participate. They were joined by Chief Fire Protection Engineer Kenneth Bush representing the FM. After the first meeting of the TG, Mr. Ron Wineholt was invited to participate. He represents the Apartment and Office Building Association (AOBA) of Metropolitan Washington. He had apparently been involved in discussions with the FM prior to this issue being brought forward to the Commission.

The Task Group subsequently called on two fire experts to supplement the information gathered. Battalion Chief Mathew Carrigan of the Montgomery County Fire and Rescue Services provided fire department operations input and guidance. Mr. Joe Felton of the Montgomery County Department of Permitting Services provided fire suppression systems expertise.

The TG met a total of 8 times from the time period December 28, 2017 to September 12, 2018. Initial TG discussions of potential recommendations focused mainly on full fire suppression protection or complete compliance with National Fire Protection Association (NFPA) 101 existing high rise building

requirements. Commissioner Scheffey requested guidance from the full Commission at their April 26, 2018 regular meeting. Specifically, did the Commission desire that potential protection options other than complete automatic sprinkler protection be included for consideration? The Commission responded with two actions. They directed the TG to consider options other than just complete automatic sprinkler protection. Having the necessary quorum, they also formally voted to designate existing nonsprinklered high rise residential buildings as an inimical hazard. The vote was four Commissioners in favor, and one against.

To date, the SFPC has not quantified what constitutes an inimical hazard, other than to designate existing unsprinklered residential high rises as such. The TG recommended that the SFPC go on record with their actions related to the appropriate level of safety. At the June, 2018 regular meeting, the SFPC directed that the FM Draft and the Scheffey Comment Paper be attached to the June meeting minutes, so that there was a formal record on why the Commission was taking action. This TG report further quantifies this effort, particularly as it relates to the April 2018 direction that the TG develop options for nonsprinklered residential high rise buildings.

At their meeting on September 12, 2018, the TG finalized a set of four potential protection approaches. This was the last TG meeting, pending review by the full Commission. An overview of the TG effort and its recommendations was provided by Commissioner Scheffey at the December 20, 2019 Commission meeting. A hard copy of the TG technical recommendations was provided to the attending Commissioners and interested parties attending the meeting. It was also submitted to the Commission Secretary to be included for the record in the December, 2019 meeting minutes.

This report describes the history, background, findings, and recommendations of the TG. It is the detailed basis of the presentation made by Commissioner Scheffey at the December, 2019 meeting. It is intended to document the TG decision making process, serve as the basis of the recommendations, and be the formal, final output of the TG.

2.0 Approach

After the first several meetings, it was determined that the TG would focus on the technical aspects of providing the appropriate level of safety to occupants of unsprinklered residential high rise buildings. There are a number of administrative and implementation issues which the entire Commission must address. Some of these were identified in the Scheffey Comments Paper. While the TG is not making any recommendations on these, as outlined in Section 10, some opinions and considerations are given.

Commissioner Scheffey acted informally as the Chair of the TG, and Commissioner Tochterman and FPE Bush formed the core group. The TG desired to achieve consensus on challenging technical issues, and to a very large degree, did so. Disagreement mostly related to the resulting level of safety achieved from detailed recommendations. In layman's terms, this relates to "how good is good enough". Specific disagreements are noted in this commentary.

Where referenced, the documents used by the TG were the current Maryland codes and regulations [1}. The Maryland Public Safety Code (PSC) was referenced, in particular Title 6 *State Fire Prevention Commission and State Fire Marshal*, and Title 9 *Fire Protection and Prevention*. The Code of

Maryland Regulations (COMAR), in particular Title 29, Subtitle 06 *Fire Prevention Commission*, *Chapter 01, Fire Prevention Code*, was referenced. This references the 2015 Edition of NFPA 101, *The Life Safety Code.*

A high rise is defined for new construction in §9–401 of the PSC as a building for human occupancy that is: four or more stories above grade level or over 45 feet in height. It does not include a structure or building used exclusively for open air parking or a building used exclusively for agricultural purposes. Exceptions for current sprinkler mandates in §9–403 are provided for buildings less than 75 feet in height. The TG decided to use the following NFPA 101 definitions for structures for which the TG recommendations would apply:

> High rise building - a building where the floor of an occupiable story is greater than 75 ft above the lowest level of fire department vehicle access (3.3.37.3);
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> Residential Occupancy: An occupancy that provides sleeping accommodations for purposes other than health care and detention and correction (3.3.196.13); and,
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> Apartment building: a building or portion thereof containing three or more dwelling units with independent cooking and bathroom facilities (3.3.37.2).

The TG focused on residential high rise buildings, not including hotels. This includes apartments, condominiums, dormitories and public housing. It was believed that most high rise hotels in Maryland are already sprinklered. Business occupancies were not specifically addressed.

Baltimore City is generally, but not always, exempt from the PSC (§6-401). The TG did not attempt to identify Baltimore unsprinklered residential properties. Section 10.5 describes whether Baltimore should be include in the TG recommendations.

Section 10.4 describes the anomaly of exempting condominium owners from retroactive high rise fire sprinkler requirements.

The TG made a modest attempt to further quantify the risk and cost benefit aspects of retroactive protection requirements (see Section 7). Necessarily (because of time, and the voluntary nature of the TG effort), a formal risk and benefit analysis was not performed. The following specific aspects of residential high rise protection were investigated:

> The extent of unsprinklered high rise buildings in Maryland (excluding Baltimore City):
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> The establishment of an acceptable level of safety, including:
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> > That established in other major jurisdictions in the US, particularly the degree to which retroactive high rise sprinkler protection has been implemented in the US;
> >
> > Civilian and firefighter casualty and fatality data, and fire loss, in high rise residential structures;
> >
> > Performance-based and cost benefit analysis, including:
> >
> > > Example indexing method used in Chicago; and
> > >
> > > The cost of retroactive sprinkler protection; and,

Hazard analysis – identification of key fire safety issues in unsprinklered residential high rise buildings, including:

Fire department operations;

Cooking fire hazard; and

Combustible exterior insulation systems.

As the TG work progressed. It was decided not to focus on a risk/benefit analysis or an engineered, performance-based approach to establish an appropriate level of safety. Instead, specific requirements for several alternatives were developed (referred to as the prescriptive code approach). By doing this, the TG established, de facto, levels of safety it considered appropriate. To the extent possible, this quantifies the "inimical hazard" in unsprinklered residential high rise buildings (see Section 8.0).

3.0 Summary of Recommended Options

The following is a summary of the recommended protection options developed by the TG. Section 9.0 provides the specifics on these recommendations.

Option 1 - Provide a complete building fire suppression system:

Option 2 - Compliance with NFPA 101 for Existing High Rise Residential Occupancies;

Option 3 - Compliance with a set of parameters developed by the TG which include provisions for: standpipes, a fire department elevator, protection of cooking equipment, smoke alarms, protection of exit access corridors, protection of vertical openings and separation of hazards, elimination or mitigation of hazards associated with combustible exterior finish material, maintenance of means of egress, maintenance of manual fire alarm systems, and standby power; or

Option 4 – Compliance with the standpipe, FD elevator, cooking protection, and combustible exterior mitigation features of Option 3. Additionally, alarms would have to sound throughout the building, and, in buildings greater than 10 stories above grade, emergency power would be provided for at least one FD elevator.

There was some differing opinions among TG members on the Option 3 corridor protection. Also, the TG was divided on Option 4, a more cost effective alternative which address key hazards and concerns.

4.0 Extent of Unsprinklered High Rise Residential Buildings in Maryland

The TG attempted to quantify the number of nonsprinklered residential high rise buildings in Maryland, excluding Baltimore. Appendix A provides the spreadsheets of the collected data for Prince Georges (PG) and Montgomery counties.

In Prince Georges County, 25 nonsprinklered residential high rise buildings were identified by the FM and ABOA, comprised of over 5135 individual units.

Battalion Chief Carrigan of the Montgomery County Fire and Rescue Services identified 121 unsprinklered residential buildings five or more stories in height in his county. About 80 of these are estimated to be 75 feet or greater in height (note, the Appendix A spreadsheets include all 121 buildings). The total number of individual dwelling units was not identified.

Baltimore County has a requirement that high rise buildings built before July 1, 1974 be fitted with complete automatic sprinkler protection. There are a total of 199 high rise residential structures, according to Marcus Johnson of the Baltimore County Fire Marshal's office. Four of these structures are currently unsprinklered. The County allows the owners of unsprinklered condominiums to request a waiver to the sprinkler requirements provided the 75 % of unit owners agree to request such a waiver every four years. The four unsprinklered condominiums have apparently elected to take this approach.

Mr. Joe Sexauer, a code official in Ocean City, MD, provided information on their high rise fire protection requirements. Since 2005, Ocean City has had retroactive high rise requirements. The total number of high rises effected by the legislation was 45 buildings. The total number of nonsprinklered high rises, all apartment buildings, was 19. Of those 19, four of them retroactively sprinklered their building. The remaining non-sprinklered high rises were permitted to provide alternative upgrades due to having exterior exit access balconies, similar to the exception provided in the Life Safety Code (31.3.5.12.2) and as proposed by the TG as Option 2.

AOBA identified approximately 119 residential high rises in Maryland without sprinklers, based on partial data and excluding Baltimore City. This order of magnitude is consistent with the TG survey results.

The TG did not attempt to survey Anne Arundel, Howard, or Washington County, or Annapolis City.

Very tall buildings would pose a significant challenge to occupant emergency evacuation and firefighter operations. In this scenario, occupant evacuation might be staged (although the trend is to evacuate an entire structure, no matter how tall, see Section 7.3). Combating an uncontrolled fire in a very tall building is especially challenging for accessing the source, containing fire and smoke spread, and coordinating/communicating. There should be assurance that firefighters combating a fire haven't been exhausted in accessing the fire floor.

There is no absolute definition on what constitutes a tall building. However, once a building reaches 328 ft (100 m), it might be called a skyscraper [2]. By this definition, no "tall" residential buildings were identified in Maryland. The tallest apartment building identified was the Washingtonian Tower, 9701 Fields Rd, Gaithersburg, which is 25 stories. Presidential Towers in PG County is almost as high.

Baltimore City was not included in the survey. The number of existing high rise buildings in Baltimore is qualitatively judged to be material in terms of the total statewide number, perhaps on the order of 30.

5.0 Level of Safety

5.1 Establishing the Level of Safety

The current level of safety in nonsprinklered residential high rise structures was established by the codes in effect at the time these structures were built. Since 1974, Maryland has required high rise structures to be sprinklered. Each high-rise building constructed after July 1, 1974, must be protected by a complete automatic sprinkler system installed in accordance with accepted engineering practices as approved by the authority with jurisdiction (§9–403(a) of the Maryland Code). Before this time, the applicable building and life safety codes allowed two protection options for high rises: compartmentation, or complete sprinklering. In simple terms, compartmentation uses fire resistive enclosures around individual dwelling units, and between floors, to contain fire to what was deemed a manageable size. In the sprinkler option, some of the fire resistive enclosure requirements were reduced. There were many common protection features, including fire alarm, standpipe, and fire department operational features such as a fire department command/communication center.

In the early 1970s, limitations of the compartmentation option became evident, particularly in very tall buildings. Since fire was not controlled by sprinklers, fire and smoke spread could pose a threat even with the installed fire resistive barriers. This was a challenge to the vertical evacuation of potentially large numbers of building occupants, and was an associated challenge for firefighting operations. In the mid-1970s, building and fire codes recognized these limitations to the compartmentation option. Complete automatic sprinkler protection became and remains the pillar of the required protection for these structures.

The State *Fire Prevention Code (FPC)* addresses the level of safety: it is "intended to establish minimum requirements that will provide a **reasonable degree** of fire prevention and control to safeguard life, property, and the public welfare (Title 29, Subtitle 06, Chapter 01 *State Fire Prevention Code*). How is this "reasonable" degree established? The National Association of State Fire Marshals (NAFSM) provides a good description of how the level of safety is established [3]. Members of the community should determine the level of safety they are willing to accept and pay for. National codes and standards attempt to codify the level of safety for most communities in the US. This becomes the de facto "minimum" level of safety consistent with the national standard. NASFM notes that the acceptable level of safety can change with time.

By declaring nonsprinklered residential high rise buildings an inimical hazard, the Commission has gone on record as declaring the current level of safety in these buildings as "unreasonable", requiring an increase in the provided level of safety. Defining what this increased level of safety should be, and how it should be achieved and paid for, is the challenge.

5.2 Other Jurisdictions

A review of the requirements of other jurisdictions which impose retroactive requirements on high rise buildings was performed. This was mainly through an internet search and some discussions with professionals in the field. An online posting by AP described how few US cities mandate sprinklers in old residential buildings [4}. Additional information was gathered from several other jurisdictions. These findings are reported in Appendix B. The trend has been to require sprinkler retrofit in commercial structures (e.g. office towers). The trend has been for residential structures to be totally

exempt from retroactive sprinkler requirements, or to allow condominium owners to vote on whether to sprinkler or not. Where the condo opt out is allowed, the trend has been for the condominium association to vote for this opt-out. Some jurisdictions, e.g. Chicago, require a Life Safety Evaluation to determine where alternative protection to sprinklering may be provided.

Florida was the only state identified that has a state-wide sprinkler retrofit requirement. Condominiums are allowed to opt-out. There have been challenges to enforcing this requirement, for example in condominiums actually voting for the opt-out and associated administrative tracking. There is legislative movement to potentially eliminate the condo opt-out. Chicago has also had trouble tracking and enforcing the Life Safety Evaluation requirement.

Sprinklers may be required to be retroactively installed in buildings where significant renovation occurs. The definition of significant or major renovation varies among jurisdictions.

Recent initiatives for sprinkler retrofitting have been met with community/legislative resistance. After a major recent high rise fire in Honolulu involving four fatalities and significant firefighting challenges [4], there was a proposed legislative effort to invoke retroactive sprinkler requirements. This legislation has evidently been modified, based on community concerns, to allow an alternative assessment methodology, provide financial incentives for sprinklering, and also to potentially allow condominium opt-out for sprinklering individual dwelling units [5]. The legislation remains under process.

Likewise, in Pittsburgh, voting on legislation to require retroactive sprinklering of residential high rises has been postponed due to cost concerns [6].

6.0 Fire Loss History

Sections 6.1 and 6.2 summarize the high rise apartment fire loss and casualties as reported in the Draft Proposal and Comments Paper. Section 6.3 provides an update of this data during the TG study period.

6.1 High Rise Fire Incidents and Civilian Casualties

It was reported in the FM Draft Proposal that, since 2007, there have been 15,000 apartment fires in Maryland, with over 500 civilians injured, 94 civilians killed, 200 firefighters injured, and one firefighter killed. This apparently was for all apartments, both high- and low-rise, sprinklered and nonsprinklered. The entire inventory of these occupancies was apparently considered. Commissioner Scheffey cited the publically available data on high-rise multifamily structure fires in Maryland using year end summary reports. These reports do not distinguish between low- and high-rise structures. The number of civilians killed in all apartment fires appears to be trending downward; between 2002 and 2011, the average annual number of fatalities was about 11 per year; since 2012, about 8 per year. The fire fatality rate per 1000 fires and the average loss per fire are generally lower in high-rise structures compared to other buildings in the same category. High-rise buildings have lower percentages of fires with flame damage outside the room of origin. NFPA attributes this lower risk to the greater use of fire protection systems and features (including automatic detection and fire resistive construction) in high-rise buildings compared to non-high-rise buildings.

6.2 Fire Department Injuries and Casualties

As with the apartment civilian fire fatality rate, the firefighter line of duty (LOD) fatalities due to fire are trending downward as noted in the Comment Paper. According to the Maryland FM Annual Reports, there were 22 fatalities between 1997-2006. There were 5 between 2006-2016.

A similar assessment of firefighter injuries was not made since data for Maryland firefighter injuries were not readily available. National statistics were assessed. A November 2017 NFPA Research Letter headlined "Firefighter injuries are at an all-time low". The estimated firefighter injury rate in 2016 was the lowest since NFPA began reporting this data in 1981. One apartment fire incident was highlighted where a number of firefighters suffered from cyanide poisoning. This was attributed to the premature removal of their SCBA facepieces, when they thought the atmosphere was clear. There is no specific reference or categorization of injuries with respect to high-rises.

6.3 TG Update of Fire Loss Data

The AOBA representative noted that fire deaths in Maryland apartments account for less than 10% of total fire deaths. Fire deaths in high rise apartments would be an even smaller percentage of the total. An attempt was made to glean more detailed data on high rise fires from the Maryland fire incident records. This effort was not particularly helpful since the analyst had trouble filtering the report data.

Since the Comment Paper was issued, no additional high rise fire loss analysis has been produced by NFPA. Commissioner Scheffey reviewed the last three Annual Reports and Annual Fire Death Reports submitted to the SFPC by the FM. None of these reports identify apartment fires as a "clear and present danger" requiring immediate action as referenced in the FM Draft Proposal. The FM office still does not track loss data as it specifically relates to high rise buildings.

The TG updated the fire loss record based on the Maryland State Fire Marshall "Fire Deaths in Maryland", published in 2018 for calendar year 2017. Trends previously identified remain the same:

a. Fire deaths in apartments are not specifically identified as "high rise"

b. Apartment fire trends remain the same – 6% of fire deaths occur in apartments buildings (same as 2016 report of 2015 calendar year data)

c. There were no firefighter LOD deaths. This is the same as 2015 and 2016; 2018 had one LOD death, which was not related to a fireground incident.

The NFPA Standard 1710 *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* defines a high rise as "high hazard". The NIST 2013 manning and response study in high rises, cited previously in the Comments Paper, included significant high rise fires (several apartment fires were noted). The TG did not identify new, significant data/information on high rise fire losses, other than anecdotal information that firefighters had significant challenges at the July 14, 2017 Honolulu high rise condominium fire.

The TG agreed with the observations in the FM Draft and Scheffey Comment Paper that firefighting operations in a high rise can be challenging. The TG recruited DC Carrigan to provide input

and recommendations, particularly where sprinklers are not installed. Option 3 reflects these concerns, with heavy emphasis on firefighting capability, as evidenced by the recommendations related to standpipes, FD elevator service, and emergency power. Even the "cost effective" Option 4 retains these recommendations, and adds a requirement for FD elevator emergency power for taller buildings.

7.0 Risk, Benefit, and Cost

A formal risk, cost, and benefit analysis was not performed. It could be, but was beyond the scope and effort of the TG. Elements of risk benefit were investigated to the extent available to the TG.

The fire loss and incident data does not suggest an urgent need. Any further risk quantification would be hampered by the fact that Maryland does not collect fire loss and injury statistics specifically as they apply to high rise structures.

This is not to say that high rise structures do not pose a more-than-normal life and public safety challenge. The reason codes implemented the complete automatic sprinkler protection in the mid-1970s, eliminating the compartmentation option, was in recognition of these challenges. While the available data suggests that high rise incidents are not a statistically abnormal challenge, a single, uncontrolled high rise fire might threaten a large occupant load. Combating/controlling a fire could be a significant challenge. The threat can be categorized as a "low probability, high impact" event. The "high impact" would be the potential of multiple potential civilian and firefighter casualties, and major dollar loss of a large structure.

The TG recognized these challenges, and identified specific significant threats/challenges. These can be generally described as: firefighter safety and effective firefighting operations; the risk of ignition and fire spread from cooking; and the threat from nonconforming combustible exterior insulation.

An element of the benefit was further quantified by determining, to the extent possible, the cost of potential improvements.

7.1 Fire Department Operations

The input from the Montgomery County Fire and Rescue Service was valuable in identifying the strategic and tactical approaches used in high rise firefighting, and limitations associated with unsprinklered tall structures. Tactics per se don't change between a sprinklered and unsprinklered building per se, but the resources needed may significantly increase if a fire is uncontrolled. The fire department's primary concern is occupant safety; life safety is their first priority. They would prefer that the entire building be evacuated when there is a fire incident. They would use the installed standpipes for firefighting, and a standard procedure would be to supply and pressurize the standpipe from a pumper apparatus. The need for an installed standpipe is fundamental. Reliability of an installed standpipe was considered important. The TG had a number of discussions related to standpipe reliability and integrity.

They would not normally rely on an installed stair pressurization system. Their standard procedure is to use their portable fans placed to pressurize stairs (note this can be an effective tactic since they don't have very tall buildings). The fire department did not feel strongly about the need for smokeproof towers, given the stair pressurization tactics they employ.

Above ten stories, the fire department will have difficulty accessing an incident unless they have department elevator control capability. The fire department must have this capability in high rise buildings. Power to a fire department-controlled elevator must be reliable.

Montgomery County has found that code-mandated fire department command centers, with associated fire department telephones and public address systems, have limited practical use in the early stages of high rise fire (first 20-30 minutes). They establish command and communication using their own state-of-the-art equipment.

There was a proposed idea to retroactively provide an installed breathing air system standpipe for fire department use in high rises. The idea is that breathing air replenishment in a major incident would be facilitated. Both the fire department and TG members in general identified limitations of this type of system. There were concerns about the ongoing maintenance and associated air quality in such a system. The TG decided not to pursue this proposal.

In reviewing the fire department views, the AOBA noted that standpipes have been required as part of the national fire code for over 100 years. Most high rise buildings already have them. ABOA members believe most high rises would currently have fire service operable elevators. They noted that their members have faced challenges in retroactively installing emergency generator systems. In particular, finding an acceptable location and configuration to meet associated codes can be a challenge.

7.2 Cooking Hazard

Both the FM Draft and the Scheffey Comments Paper identified cooking fires as a significant threat in high rise apartment/multifamily buildings. The high rise fire statistics for these occupancies provides evidence for this concern. Three quarters of high rise fires originate in the cooking area. Three quarters of all fires originate from cooking equipment. Fire casualties in high rise apartments was not specifically assessed, but 19% of home fire deaths and 44% of home fire injuries involve cooking equipment. Similar trends likely hold true for high rise apartment fire loss.

The TG felt that retroactive sprinklering would be sufficient to contain/control most kitchen fires. It should be noted that a NIST study concluded that, even with activated sprinklers, a tenability hazard may result from a cooking fire [7], see Appendix C.

For non-sprinklered situations, the TG felt that some additional protection should be provided. Two approaches were considered. One involves traditional means of protecting cooking areas as embodied by UL Standards. The TG preferred that any protection provided meet some generally recognized approval standard. UL 300A, *Outline of Investigation for Extinguishing System Units for Residential Range Top Cooking Surfaces,* is one standard that could be used. This standard is an offshoot from commercial cooking protection standards. All currently listed units are wet chemical extinguishing systems, which generally also require power shutdown of the range.

There has been substantial research in the past 5-10 years on the development of range top ignition prevention systems. The goal is to prevent overheating at the range top, which would result food ignition. An example is overheating of cooking oil on a stovetop. UL 858 *Standard for Household Electric Ranges* was developed to address this situation (see Appendix C). The standard is for electric range tops and currently includes an ignition prevention test for open coil ranges. Gas-fired ranges are currently not included. Most vendors are proposing the use of temperature sensing and limiting devices

built into new stoves. The effective date for UL 858, Section 60A, *Abnormal Operation Oil Ignition Test*, is April 4, 2019. This means that all new open coil (not glass, not gas, not induction) range tops must prevent ignition of cooking oil in a pan for no less than 30 minutes. Only one known product was currently identified as meeting this standard, although other vendor approvals are anticipated. It is not clear that there will be a retrofit application; currently, all proposals are for installation on new stoves.

TG participant Wineholt of ABOA pointed out that many residential units in Maryland use gas for stovetop cooking. The retroactive cost of converting units with gas to electrical, in order to retrofit ignition prevention stove units, would likely be substantial and potentially cost prohibitive.

There are a number of alternative cooking protection systems as identified in Appendix C. The TG realized that some of this emerging technology is not yet listed or approved for use in the United States. An example is a localized water mist protection system, Automist®, manufactured by Plumis. It is a localized water mist system, supplied from the residential water supply. A detector is used to activate the system automatically. British Standard (BS) 8458 and 9252 are referenced by the vendor. Another technology is the Innohome Stove Guard® detection system which is designed to prevent overheating of cooktop materials. It currently has a European Union approval EU 50615 related to cooktop fire safety devices.

The TG recommends some type of additional protection of cooking areas where the building is not fully sprinklered. The exception is for Option 2, where direct exits to the exterior are available.

7.3 Exterior Combustible Insulation Materials

One hazard that seems to have been overlooked in the FM Draft is combustible exterior insulation systems. There have been a number of high profile, dramatic high-rise fires involving this material. The difference between sprinklered and nonsprinklered structures where these fires have occurred appears to be significant (e.g. Grenfell Tower in London vs. Dubai Marina Torch and Address Downtown fires in Dubai). So far, the most dramatic fires have occurred internationally.

NFPA 285 *Standard Test Method for Evaluation of Fire Propagation Characteristics of Exterior, Non-Load-Bearing Wall Assemblies Containing Combustible Components* was developed in the US to allow for exterior wall systems to include combustible insulation material. This insulation is highly desirable from an energy and aesthetic standpoint. The NFPA standard was developed so that an installed system will resist self-accelerating and self-sustaining fires. It was implemented in the United States through model building codes in the late 1980s. Maryland has adopted these requirements through adoption of the International Building Code.

Potential “noncompliant” situations might occur in Maryland where:

1. There was a gap between introduction of technology by industry and code protection adoption (this is not deemed to be a significant problem in Maryland); or,

2. Unscrupulous vendors install non-NFPA 285 compliant exterior insulation systems.

Because of the potential rapid exterior fire spread where systems are non-compliant, this hazard was deemed significant by the TG for nonsprinklered residential high rise structures. Small scale material tests can readily identify if material has a fire retardant, an attribute of most if not all NFPA 258-

compliant systems. The TG recommends that non-sprinklered residential high rise structures having combustible exterior insulation systems be evaluated to determine their compliance with NFPA 285.

Where buildings do not meet NFPA 285 requirements, a life safety evaluation should be performed. NFPA has developed a risk assessment tool which could be used for such an evaluation. The risk analysis tool EFFECT™ [8] should be used by a building owner in a nonsprinklered building identified as having noncompliant combustible exterior wall insulation. Commissioner Scheffey exercised the tool when it was first released in early 2018 (see Appendix D). He found that a tall (>50m) residential building with a code compliant combustible facade (e.g. NFPA 285 compliant system) would obtain a "tolerable" risk score, provided an "all out" emergency evacuation system/approach is provided. This is true even for a sprinklered building. It is not clear if the risk tool has since been modified, and there is a disclaimer that the tool should not be used for buildings without combustible facades. However, the "all out" attribute demonstrates the importance the developers placed on total evacuation of a high rise structure in a fire emergency.

7.4 Cost and Reliability of Mitigation Features

7.4.1 Cost of Retroactive Sprinklering

A primary factor in the retrofit cost of a sprinkler system is the availability of an adequate water supply and whether or not the building is already protected with a fire department standpipe system. AOBA members provided input to the TG on retrofit costs, which might include:

- New water lines – the large volume of water required to supply a sprinkler system may require the installation of new, larger water supply lines from the building to the nearest utility water main line. Even that may not assure adequate water supply, as some hydrants even lack adequate water supply.
- If adequate water supply lines cannot be installed, large water storage tanks on site (if zoning allows) so the newly installed fire pumps don't drain the water supply lines dry.
- Large emergency generators (sited somewhere) to power the fire pumps.
- Asbestos or silica dust abatement
- Removal of tenants from floors under construction
- Increased costs if there is no suspended ceilings in which to run piping

Additional challenges to retroactive sprinkler installation include: drilling holes in structurally important elements; working around other trades/systems (communication, power, HVAC, plumbing); potential electrical power upgrades (e.g., pump/controller demand); achieving dry pipe grade for adequate drainage; and freeze protection.

Commissioner Scheffey and AOBA representative Wineholt surveyed the large amount of information available on sprinkler retrofit costs, see Appendix E. Given the large number of variables, it is not surprising that the retrofit cost estimate varies widely. This cost is estimated to be two to eight dollars per square foot of protected area ($2-$8/sq.ft.). For a range of individual dwelling unit sizes, this is estimated to be $595 - $13,473 per unit. AOBA noted one 400-unit high rise apartment building that

cost $3.5 million to retrofit with sprinklers about 10 years ago ($8,750/unit). Using a mid-range estimates of $5/sq.ft. sprinkler cost and 900 sq.ft. per dwelling unit, and the number of individual dwelling units in PG County (5135 units, Appendix A), the cost in PG County is estimated to be on the order of $26.3 million. Directly scaling this to 119 nonsprinklered buildings estimated in Maryland, the total cost would be on the order of $125 million.

7.4.2 Reliability of Sprinkler Systems

NFPA has recently published a valuable study on sprinkler effectiveness and failure rates [9], a follow-on to an earlier study. It found that sprinklers operated and were effective in controlling a fire in 88% of fires large enough to operate them. Sprinklers should provide a high degree of occupant life safety and firefighter safety in terms of limiting/containing a fire. Complete sprinklering is considered as providing the highest level of safety.

In terms of firefighter challenges, a NIST fireground experiment report [10] notes that many high-rise buildings are not sprinklered. They caution against total reliance on sprinklers, noting that "sprinkler systems fail in about one in fourteen fires. Thus, fire departments should be prepared to manage the risks associated with unsprinklered high-rise buildings".

7.4.3 Cost and Reliability of Other Protection System Upgrades

A brief review of the cost and effectiveness of other fire protection system upgrades was made, e.g. Reference 11. These systems include: fire alarm and detection; fire resistive construction (including closure of vertical and horizontal openings, and door self-closing features); emergency power; fire department elevator control; standpipe system integrity and monitoring; and smoke control systems. AOBA identified estimated costs of kitchen fire suppression systems that ranged from $1,500-$7,000 per unit.

As with the industry at large, the TG found there were too many variables and unknowns to quantify these costs and associated effectiveness.

7.4.4 Additional Considerations

Any assessment of costs should include not only the initial capital cost as described above, but recurring costs. Sprinkler, fire alarm and detection, elevator, emergency generator, and smoke control systems all require routine inspection and maintenance. Many inspections are code mandated. The TG did not quantify these additional costs.

A change in the tax law provides potential cost savings incentives to install sprinkler systems [12]. AOBA Representative Wineholt provided an analysis of this change (see Appendix F). The new (2017) federal tax law increases depreciation of qualified property placed in service between September 27, 2017 and December 31, 2022. Mr. Wineholt concluded that the increase in annual Section 179 expensing applies to non-residential real property. He concluded that sprinklers and fire alarm and detection systems would likely be eligible for the bonus depreciation, providing a cost savings benefit for retrofitting these systems. He concluded that fire resistive enclosure improvements (stairs, openings, corridors, and residential unit doors) would likely be ineligible for the bonus depreciation.

Commissioner Scheffey also investigated current preventative and preplanning approaches to high rise fire safety as advocated by NFPA. They have published documents geared toward occupants of

residential high rise buildings [13-15]. The AOBA advised that some fire safety initiatives have been advocated by their organization to their members, but could not describe specific programs. Likewise, high rise fire prevention or action plans are not being actively advocated by the FM or Chief FPE.

8.0 Level of Safety Implementation - Performance-Based or Prescriptive Code Approach

During the spring of 2018, the TG gathered data as described above. The challenge was how to implement any proposed improvements. In the absence of a detailed risk and cost benefit analysis, the TG investigated two different approaches. One is a "performance-based" approach where a solution is engineered to achieve broadly defined goals and objectives. The prescriptive code approach relies on published mandated codes and standards to establish an inherent level of safety.

8.1 Indexing

A simplified approach to performance-based risk assessment is the indexing method. NASFM provides a good overview of this approach [3}. The desired level of safety is impacted by occupant evacuation, firefighter response and operations, and the overall economic impact to the building. Values are assigned to different layers of fire protection used to achieve the desired outcome. The individual scores of the protection levels are added or subtracted to determine an overall building score. "Pass" and "fail" values are established by fire safety experts consistent with the desired level of safety.

Two existing standards use indexing: NFPA 101A *Indexing Guide to Alternative Approaches to Life Safety*; and, The International Existing Building Code, Chapter 14, Performance Compliance Methods. Unfortunately, neither has a readily adaptable indexing scoring system to evaluate existing, unsprinklered high rise residential occupancies. NAFSM is in the process of developing such a system, but its initial effort is evidently for use in office occupancies and was not deemed usable for the TG effort.

The TG was aware of an effort by fire safety officials in Honolulu who were attempting to create a risk indexing assessment for high rise residential structures. This effort was not formalized during the TG effort and was not further considered. Commissioner Scheffey identified an existing indexing system used in Chicago to assess and improve the level of safety in nonsprinklered residential structures. He summarized the attributes and performed an example calculation of a hypothetical apartment building (Appendix G). Chicago requires that one- and two-way voice communication systems must be installed, except that residential units less than 15 stories and 60 units may have a one-way system only. One hour rated stair doors and frames and doors are required. It is assumed there is a standpipe system. The indexing factors evaluated include: height; construction type; maximum compartment size; separations; corridor wall fire resistance ; vertical openings; HVAC interconnectivity; smoke detection; communications; smoke control; means of egress capacity; dead end corridors; travel distance; elevator controls; emergency lighting; mixed occupancies; sprinklers; and, auxiliary uses.

Commissioner Scheffey concluded that, to achieve a passing score, his hypothetical nonsprinklered example building had many attributes that later evolved into Option C.

Chicago has apparently had difficulty in administrating and enforcing this indexing option.

8.2 Prescriptive Code Approach

Commissioner Scheffey was in the minority for advocating for a risk/benefit or performance approach, even as simple as an indexing approach. His rationale was that it provided more flexibility and potential cost effective trade-offs compared to a prescriptive approach. The TG subsequently adopted the prescriptive code-based approach.

It is generally agreed that sprinklers provide the greatest level of protection. Other alternatives, while they might be deemed as achieving an acceptable level of safety, would generally not be considered equivalent. It is also recognized that, while absolute assurance of both occupant and firefighter safety is desired, it cannot be achieved even with sprinklers.

It was with this in mind, and having wrestled with alternative approaches and levels of safety in the four months of the TG efforts, that Commissioner Scheffey asked for clarification from the full Commission. If the level of safety desired by the Commission was that of complete sprinkler protection, then the TG could disband and the Commission could propose this requirement. The Commission directed the TG to develop alternatives to complete sprinkler protection. By doing so, the Commission signaled that alternative levels of safety developed by the TG could ultimately be acceptable. The alternatives were developed using the prescriptive code approach.

9.0 Recommended Retroactive Requirements for Existing Nonsprinklered Residential High Rise Buildings

As noted in the Summary of Options, four prescriptive approaches were developed, including: a complete building fire suppression system: compliance with NFPA 101 for Existing High Rise Residential Occupancies; compliance with a set of parameters developed by the TG; and, compliance with key parameters of the TG-developed requirements, focusing on a less costly approach.

The TG decided to develop standalone requirements. If adopted, they do not require other revisions to the State FPC. It is the intent of the TG that application of one of the options would be in addition to any previously approved conditions that currently exist within the building. The levels of current protection could not be reduced, but would not have to be improved other than what is stated in the option which is used. It is anticipated that the exact wording and format of the proposals may have to be refined for the adoption process.

In terms of level of safety, Option 1 complete sprinkler protection, would achieve the highest level of safety. It is the level of safety established in the existing residential building requirements of NFPA 101. Option 2 essentially requires all dwelling units to have an exit to the exterior. It is also recognized in NFPA 101. It is hard to quantify the level of safety this achieves compared to sprinklers. These 2 options/levels of safety exceed that which is found in most jurisdictions as noted in Section 5.2.

The TG took the approach that, if neither of these two options is used, the hazards specifically addressed in Sections 7.1-7.3 should be addressed: provide for fire department operations; address the cooking hazard identified in residential occupancies; and, assure any noncompliant combustible exterior insulation does not contribute to reducing the level of safety. With more prescriptive requirements,

Option 3 provides a higher level of safety than Option 4, with an expected higher cost. Option 4 was a minority position within the TG.

9.1 Option 1 – Building Fire Suppression System

9.1.1 Option 1 Proposal

Compliance with one of the following:

1. Installation and continued maintenance of approved, supervised automatic sprinkler protection throughout the building in accordance with applicable standards referenced by the State Fire Prevention Code; or,

2. Installation and continued maintenance of approved, supervised water mist protection throughout the building in accordance with applicable standards referenced by the State Fire Prevention Code

9.1.2 Option 1 Discussion

Option 1.1 means complete automatic sprinkler protection in accordance with (IAW) NFPA 13. Option 1.2 means complete water mist protection IAW NFPA 750. Section 7.4.1 describes some of the challenges of retroactive sprinkler installation. It was believed that the water mist option might provide a more viable option where retrofitting of automatic sprinklers is physically challenging in a retrofit situation. A noted water mist system expert, Gerard G. Back of Jensen Hughes, provided the TG with approval and practical installation information. He agreed with Commissioner Scheffey that, generally speaking, installation of a water mist system in an existing high rise would likely cost more than retrofitting automatic sprinklers.

9.2 Option 2 – Comply with NFPA 101 Existing Residential Building Requirements

9.2.1 Option 2 Proposal - Compliance with all applicable requirements of NFPA 101 for Existing High-Rise Residential Occupancies as referenced by the State Fire Prevention Code.

9.2.2 Option 2 Discussion

This means that the building must meet Chapter 31 of NFPA 101. A building must be completely sprinklered, unless:

1. Every dwelling unit has exterior exit access (31.11.3.5.12.2); or,

2. An approved, engineered life safety system is provided (31.11.3.5.12.3). Other features must be provided, including smoke proof towers and exit door unlocking (31.2.11).

Where Option 1 above (complete building suppression) is not selected, this effectively means every dwelling unit must have exterior exit access IAW NFPA 101 Section 7.5.3, or have an approved, engineered life safety system (see NFPA 101 Section 31.3.5.12).

If an engineered life safety system is developed, it must be by an experienced professional engineer and approved by the authority having jurisdiction. It must include partial automatic sprinkler protection, smoke detection systems, smoke control systems, compartmentation, and other approved systems.

Commissioner Scheffey identified a new proposal being circulated by the NFPA 101 Technical Committee for revision to the next Edition. The proposal is to eliminate the existing high rise apartment building alternative which allows an engineered fire safety study as an alternative (31.3.5.12.3 and .4). This would effectively eliminate any performance-based approach.

9.3 Option 3 – TG-Developed Requirements

9.3.1 Option 3 Proposal

Compliance with all of the following;

1. Installation and continued maintenance of an approved Class I or Class III standpipe system in accordance with applicable standards referenced by the State Fire Prevention Code. All piping for required standpipe systems shall be supervised by water or air pressure.
2. Installation and continued maintenance of an approved fire service elevator in accordance with applicable standards referenced by the State Fire Prevention Code.
3. Protection of all fixed cooking equipment by one of the following;
    a. Installation and continued maintenance of an approved hood extinguishing system in accordance with UL 300A
    b. Installation and continued maintenance of an approved ignition prevention system in accordance with listing requirements
    c. Installation and continued maintenance of another approved automatic fire extinguishing system which provides protection to all cooking surfaces in accordance with applicable standards referenced by the State Fire Prevention Code and/or other listing or manufacturers' requirements.
4. Installation and continued maintenance of approved smoke alarms in accordance with the provisions of the Maryland Public Safety Article for existing construction apartment buildings.
5. Protection of all interior common spaces, including exit access corridors, including associated unseparated spaces, in accordance with one of the following:
    a. Installation and continued maintenance of an approved smoke detection system in accordance with applicable standards referenced by the State Fire Prevention Code and arranged to sound a general evacuation alarm throughout the building upon activation of any detector; or
    b. Installation and continued maintenance of an approved fire suppression system which is arranged to sound a general evacuation alarm throughout the building upon activation of any component of the suppression system.
6. Protection of all vertical openings in accordance with the applicable provisions of the State Fire Prevention Code for existing residential occupancies.

7. Protection of all areas in the building having a degree of hazard greater than that normal to the general occupancy of the building in accordance the applicable provisions of the State Fire Prevention Code for existing residential occupancies.

8. If a building has combustible exterior finish or insulation, the building owner shall determine, using representative test samples or a review of building as-built drawings, whether the finish meets the requirements of NFPA 285. If the materials do not meet these requirements, they shall be removed, or a risk assessment performed to determine an appropriate risk mitigation approach.

9. Means of egress designed and maintained in compliance with applicable provisions of the State Fire Prevention Code for existing residential occupancies. The provisions of Paragraph 31.2.11.1 of NFPA 101, 2015 edition for smoke proof enclosures shall not apply.

10. Installation and continued maintenance of an approved, supervised manual fire alarm system throughout the building in accordance with the applicable provisions of the State Fire Prevention Code for existing residential occupancies, and which incorporates all of the following features:

    a. Upon activation, provides approved audible and visual notification throughout the building.

    b. Upon activation, provides alarm annunciation at an approved location within the building.

    c. Upon activation, automatically transmits the alarm by an approved means for emergency services notification.

11. Installation and continued maintenance of an approved standby power system in accordance with applicable standards referenced by the State Fire Prevention Code for all of the following;

    a. Required emergency lighting.

    b. Required exit markings.

    c. Electric fire pump (if present).

    d. Pressure maintenance pump for fire protection system (if present).

    e. Air compressor serving dry-pipe or pre-action fire protection systems (if present).

    f. Emergency command center equipment and lighting (if present).

    g. Not less than one elevator serving all floors, with standby power transferable to any elevator.

    h. Mechanical equipment for smoke control (if present).

9.3.2 Option 3 Discussion

Option 3 relies to a large extent on NFPA 101 Chapter 31 recommended requirements for existing non-sprinklered low-rise buildings (NFPA 101 Chapter 31 would require sprinklers, exterior exits, or an engineered life safety system, see 9.1. and 9.2). The kitchen protection system requirement (Option 3. 3) and evaluation of exterior combustible insulation (Option 3.8) exceed the Chapter 31 requirements. It is unclear whether the elevator requirements exceed Chapter 31 requirements.

The current status of the building standpipe, elevator, and emergency power system would have to be assessed. This option also requires a thorough building walk-down inspection to determine compliance with the requirements for smoke alarms, exits, protection of vertical openings, protection of hazards, and manual fire alarm systems.

3.1 Standpipes - The TG strongly felt that a working standpipe system was necessary for fire department operations. It was felt that nearly all high rise buildings probably have a standpipe system. Originally, the TG was going to prohibit manual dry pipe systems because of reliability concerns. It was identified that there are many of these systems are installed in existing buildings. The finalized language allows for manual dry pipe systems, provided supervisory air is included.

3.2 FD Elevator Service - Again, the TG felt strongly that at least one elevator configured for fire service use be available for firefighting operations. It was unclear to the TG whether most buildings would already have this. It was noted that NFPA 101 Section 31.5.3 references NFPA 101 Section 9.4. Section 9.4.2.2 says that existing elevators shall be in accordance with the requirements of ASME A17.3 *Existing Elevator Code*. The fire service operation and emergency power criteria in A17.3 are in non-mandatory language. The intent of this Option 3.2 is that at least one elevator serving all floors has fire service operation.

3.3 Cooking Area Protection – As noted, cooking is leading cause of apartment fires and associated fire loss and casualties. Where sprinkler protection is provided, it is anticipated that it will contain the fire to the area of origin. The TG felt that there is significant potential for fire spread of an unmitigated cooking fire. The TG is recommending some type of protection for cooking areas in nonsprinklered high rise buildings.

All installed fire protection systems in all Options must be listed as defined by the FPC and the referenced NFPA Standards. It is recognized that kitchen protection system technologies are evolving. The TG believed that the authority having jurisdiction should have wide latitude in approving new technologies, for example recognizing international listing/approvals. (e.g. EU 50615 related to cooktop fire safety devices). It is intended that new localized water mist protection systems would meet Option 3.3.c.

3.4 Smoke Alarms - The PSC requires that existing apartments have single station smoke detectors outside of sleeping areas (PSC §9-104). It was noted that in new construction, not applicable under proposed Option 3.4, smoke detectors are required in each sleeping area, interconnected with one another (PSC §9-103).

3.5 Exit Access Paths - The TG felt it was important to provide some level of safety for common exit access paths. The option of smoke detection or sprinklering of these areas is proposed.

Commissioner Tochterman dissented on the inclusion of the smoke detector option. He believes that the common exit access corridors should be sprinklered.

3.6 Protection of Vertical Openings - This means IAW NFPA Chapter 31, which references NFPA 101 Section 9.1 for utilities and 9.5 for waste chutes. These chapters have specific requirements/allowances for existing buildings. Means of egress components should be IAW NFPA Section 31.2.

3.7 Protection of Hazards - This means IAW NFPA 101 Section 31.3.2, which references NFPA 101 8.7 having specific existing building requirements.

3.8 Combustible Exterior Finish Material - There have been a number of high profile, dramatic high-rise fires involving combustible exterior finish material. The difference between sprinklered and nonsprinklered structures where these fires have occurred appears to be significant. NFPA 285 *Standard Test Method for Evaluation of Fire Propagation Characteristics of Exterior, Non-Load-Bearing Wall Assemblies Containing Combustible Components* was developed and implemented in the United States through model building codes to address this situation. The Standard assures that wall systems will resist self-accelerating and self-sustaining fires. Maryland has adopted these requirements, and it is believed that most if not all buildings in Maryland comply with this Standard. Since the potential fire spread is so dramatic and significant where noncompliant systems are installed, the TG felt that nonsprinklered existing buildings should be checked for compliance with NFPA 285. The NFPA EFFECT™ risk assessment tool is anticipated to be the appropriate risk tool to be used where non-NFPA 285 compliant materials are identified.

3.9 Exits - This means IAW NFPA 101 Ch 31.2. The TG believed that the smoke proof enclosure requirements of NFPA 101 Section 31.2.11.1 were unnecessary for this Option.

3.10 Alarms – The TG felt it was important that activation of a manual alarm causes notification throughout the building.

9.4 Option 4 - Cost Effective TG-Developed Option

9.4.1 Option 4 Proposal

1. Installation and continued maintenance of an approved Class I or Class III standpipe system in accordance with applicable standards referenced by the State Fire Prevention Code. All piping for required standpipe systems shall be supervised by water or air pressure.
2. Installation and continued maintenance of an approved fire service elevator in accordance with applicable standards referenced by the State Fire Prevention Code.
3. Protection of all fixed cooking equipment by one of the following;
    a. Installation and continued maintenance of an approved hood extinguishing system in accordance with UL 300A
    b. Installation and continued maintenance of an approved ignition prevention system in accordance with listing requirements

c. Installation and continued maintenance of another approved automatic fire extinguishing system which provides protection to all cooking surfaces in accordance with applicable standards referenced by the State Fire Prevention Code or other listing; or manufacturers' requirements.

4. Installation and continued maintenance of approved smoke alarms in accordance with the provisions of the Maryland Public Safety Article for existing apartment buildings.

5. Installation of a manual fire alarm system, which, upon activation, provides approved audible notification throughout the building.

6. If a building has combustible exterior finish or insulation, the building owner shall determine, using representative test samples whether the finish meets the requirements of NFPA 285. If the materials do not meet these requirements, they shall be removed, or a risk assessment performed to determine an appropriate risk mitigation approach.

7. In buildings greater than 10 stories above grade, Installation and continued maintenance of an approved standby power system for at least one elevator which has fire department operation capabilities.

9.4.2 Option 4 Discussion

This option adopts key provisions of Option 3 (but not all the requirements) and adds emergency power for elevators in very tall buildings. This option was created to provide a more cost effective alternative to the other options, while addressing issues identified in Sections 7.1-7.3. This option presumes that buildings constructed under the previously allowed compartmentation option and associated retroactive smoke alarm requirements in the PSC provide a good baseline level of protection. This includes: building construction fire resistance; vertical and horizontal fire resistive separation; separation of hazards; exit layout (means of egress capacity, dead end corridors, travel distance, and capacity); protection of vertical openings; emergency lighting; and, emergency power. The level of protection is increased by assuring a desired level of protection for fire department operations, kitchen fires, and combustible exterior insulation. Recognizing the importance associated with total building evacuation, activation of a manual fire alarm should sound an alarm throughout the building. There could be no changes that would decrease the levels of safety previously accepted in the existing building. Retroactively inspecting the building construction features is not required except to the extent that the Option 4 requirements are applied.

Commissioner Scheffey developed this Option. His rationale was that compliance with proposed Options 2 and 3 would likely be, in many cases, so costly as to effectively require adoption of Option 1, complete sprinklering. The SFPC indicated their desire to have options to complete sprinklering. The TG was divided on whether this option should be included as a recommendation; it was the minority opinion of Commissioner Scheffey to include this option.

10. Other Considerations

10.1 Implementation of Recommendations

The TG did not take a position on how any increased level of fire safety should be implemented. By designating nonsprinklered residential high rise buildings as an inimical hazard in its April, 2018 meeting, the SFPC has vested the authority to mitigate this hazard to the FM. He could act on his own to seek mitigation; no additional action by the SFPC is necessary.

The assignment of a TG by the SFPC, and participation of the FM office (through the Chief Fire Protection Engineer), implies that retroactive improvements will at least be made administratively by the Commission. Presumably, this would be accomplished by revising regulations in Code of Maryland Regulations (COMAR) Title 29 Subtitle 06, Chapter 01, Section 02 *Prevention Fire Code*. This requires public notification and a subsequent public hearing (PS § 6-206(c)). The only legislative input would come from review by the Committee on Administrative, Executive and Legislative Review (AELR), which reviews all proposed regulations.

In his Comments Paper, Commissioner Scheffey argued that retroactive requirements for public risk reduction measures requires public and political input and judgement. The public at large, through the legislative process, should be allowed to assess the hazard and the associated costs of any subsequent risk reduction. If the hazard is great enough that both the FM and Commission deem action is necessary, a proposal to change the Annotated Code of Maryland should be developed. Commissioner Scheffey argued that this places the risk-benefit decision on the body- politic (defined here as represented by the Maryland Legislature), not in the hands of nine political (albeit expert) Commission appointees. A recent change to residential smoke detector requirements is an example of a change with far-reaching impact being made through the legislative process.

Local jurisdictions have the authority to impose greater levels of safety. The Public Safety Code establishes minimum requirements which must be followed by Maryland jurisdictions. Nothing prohibits individual jurisdictions from requiring a greater level of safety than is currently embodied by the State Code (PS § 6-206(d)(2)).

10.2 Implementation of Retroactive Requirements

There was some discussion, instigated by correspondence from the FM, that retroactive requirements be phased-in to reduce the cost impact and to take advantage of potential tax implications (see Section 7.4.4). The FM has suggested a 12 year phase-in for retroactive sprinkler protection. Some jurisdictions having retroactive implementation have, for example, used a ten-year phase-in period. The latest national tax law change allows accelerated depreciation for sprinklers and fire alarms (Section 7.4.4). It was determined that this would not likely to apply to improvements/upgrades to fire resistive construction. It is not clear if any improvements to exterior insulation cladding would be covered.

Some time period would obviously be required. For example, NFPA 1 *Fire Prevention Code*, Section A.13.3.2.26.2 identifies issues to consider when phasing-in retroactive sprinkler requirements. The TG considered this an implementation administrative issue and has no recommendation on this.

10.3 Jurisdictions Having Existing Higher Levels of Safety

Ocean City and Baltimore County have elected to require a greater level of safety. Other Maryland jurisdictions have not. Anecdotally, it was reported that there was an attempt to impose retroactive requirements in Montgomery County, but that it was rebuffed by the County Executive.

Ocean City uses a modified version of the NFPA 101 existing high rise provisions. For the exterior exit option, there is a list of additional requirements related to fire alarm and detection, standby power, FD phone system, Class I standpipe, and other features. A detailed review was not performed between their requirements and proposed Option 2.

Baltimore County has the condominium opt out provision.

The TG did not take an official position on this issue. However, it seems that the Ocean City requirements would meet the spirit of Option 2.

10.4 Condominium Owners

Baltimore County requires retroactive sprinkler protection of high rise residential structures. Condominium owners may opt out of this requirement if 75% of the owners agree (Section 5.2). The rationale is that individual owners, acting as a collective, can determine and select their desired level of safety. In other words, they can accept a higher level of risk. Florida has a similar provision, although there are indications that they are moving away from this to potentially require all residential buildings to be sprinklered.

The TG does not endorse the idea of selectively allowing building owners the choice of opting out of retroactive increases in the level building protection. The TG questioned why the PSC or SFPC would set a statewide level of safety for everyone except one particular segment of the population (condominium owners). The TG believes that the level of safety established by these recommendations should apply to all Maryland residents subject to the laws and regulations promulgated by the State Fire Prevention Commission and the state legislature.

10.5 Baltimore City

A question was raised whether retroactive high rise requirements should apply to Baltimore City. Baltimore is exempt from the SFPC, but some requirements of the PSC do apply. For example, the recent smoke detector retroactive requirement does apply to Baltimore City (PSC §9-102a). If the Commission proceeds with a change to the SFPC via a COMAR change, Baltimore City would be exempt since it is exempt from the SFPC.

The TG did not take an official position on this. But the TG reaction was similar to that for condo owners: why would the PSC or SFPC set a statewide level of safety for everyone except one particular segment of the population (Baltimore City).

11.0 Recommendations

The following recommendations are provided recognizing the following: Commissioner Tochterman disagreed with the Option 3 allowance for smoke detectors for corridor protection; and, Option 4 is a minority option developed by Commissioner Scheffey to provide a more cost-effective approach addressing important issues. Also, AOBA does not endorse all aspects of the report's recommendations. They recognize the challenges of fighting fires in high rises and the need for effective standpipes and fire service elevators to combat those fires. They question the Commission finding that unsprinklered high rises are an inimical hazard. It is AOBA's view that a policy change of this magnitude, with potentially significant impacts on housing costs, should be decided by the Maryland General Assembly and statewide in effect.

The Commission should carefully review the data and information provided in this report. The Commission should first:

1. Conclude that a greater quantification of the risk, hazards, costs and benefits is required before significant retroactive action is taken. If this is the decision, a professional consultant would be needed since a further effort is beyond the normal capabilities of the Commission and the Task Group.

Or:

2. Reconfirm their position established at their April, 2018 meeting that nonsprinklered high rise residential structures in Maryland are an inimical hazard. By doing so, they formally establish that these buildings have an inadequate level of safety consistent with assuring occupant life safety, providing for firefighter operations and safety, and limiting the economic impact from a significant fire event. The basis for this decision are the review and analysis as described in this report, including: the extent of nonsprinklered buildings in Maryland (excluding Baltimore City); the level of safety provided in other jurisdictions and embodied in national codes and standards; fire loss history; risks and hazards from high rise building fires; the impact of retroactive requirements; and the increase in the level of safety embodied in Options developed by the TG.

The TG has established the technical basis of an improved level of safety, embodied by four Options. These Options briefly summarized are: 1 - Provide a complete building fire suppression system; Option 2 - Comply with NFPA 101 for Existing High Rise Residential Occupancies (exterior exits); Option 3 - Comply with a set of parameters developed by the TG (Section 9.3.1); or, Option 4 - comply with key features of Option 3 (see Section 9.4.1).

In terms of level of safety, Option 1, complete suppression protection, would achieve the highest level of safety. It is the level of safety established in the existing residential building requirements of NFPA 101. This option/level of safety exceeds that which is found in most jurisdictions as noted in Section 5.2.

Option 2 essentially requires all dwelling units to have an exit to the exterior. It is also recognized in NFPA 101. It is hard to quantify the level of safety this achieves compared to sprinklers.

The Commission specifically directed the TG to develop alternatives to complete sprinkler protection. By doing so, the Commission signaled that alternative levels of safety developed by the TG

could ultimately be acceptable. The TG took the approach that, if neither Option 1 nor 2 is used, the hazards specifically addressed in Sections 7.1-7.3 should be addressed: provide for fire department operations; address the cooking hazard identified in residential occupancies; and, assure any noncompliant combustible exterior insulation does not contribute to reducing the level of safety. With more prescriptive requirements, Option 3 provides a higher level of safety than Option 4, with an expected higher cost. Option 4 was a minority position within the TG.

Assuming the Commission decides to move forward, they should revise these options as needed based on the technical judgement and input from all Commission members. This would establish the technical basis for retroactive improvements which would then be moved forward administratively.

The Commission could move forward by changing the COMAR or the Public Safety Code. Pros and cons of this approach are identified. The Commission should identify the appropriate approach.

Likewise, the Commission should decide on the following administrative items, which were discussed in Section 10:

Exempt or include condominium owners;

Exempt or include Baltimore City;

Establish a phase-in period;

Recognize the potential equivalent protection provided by Ocean City.

11.0 Acknowledgements

Thanks are extended to special experts Gerrard G. (Jerry) Back, Dan Gottuk, and Josh Dinaburg of Jensen Hughes who provided expert information on water mist and cooking equipment. Thanks are also extended to Jensen Hughes for the use of their conference room for most of the Task Group meetings.

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Respectfully Submitted:

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Apartment and Office Building	Montgomery County Fire	Montgomery County Department of
Association of Metropolitan	and Rescue Service	Permitting Services
Washington		

Appendix A

Nonsprinklered Residential Units in Prince Georges and Montgomery Counties

Montgomery County

Last FH entry	Inspector	Building Name	Street	Address	Full Address
10/13/2016	Jones	Alexander House	8560	2nd Ave	8560 2nd Ave
10/6/2016	Jones	Glen Lane Apts	4949	Battery La	4949 Battery La
7/20/2016	Jones	Sussex House	4970	Battery La	4970 Battery La
2/21/2017	Jones	Glen Dorra Apts	4998	Battery La	4998 Battery La
7/28/2016	Jones	Seasons Bldg	4710	Bethesda Ave	4710 Bethesda Ave
10/27/2016	Jones	Colesville Towers	8811	Colesville Rd	8811 Colesville Rd
12/1/2016	Jones	Lenox Park Apts	1400	East West Hwy	1400 East West Hwy
9/16/2016	Jones	Westlake Towers	7420	Westlake Ter	7420 Westlake Ter
7/21/2016	Jones	Highland House	5480	Wisconsin Ave	5480 Wisconsin Ave
7/21/2016	Loveless	Topaz House	4400	East West Hwy	4400 East West Hwy
2/15/2017	Loveless	Hermitage Woods Condos	3301	Hewitt Ave	3301 Hewitt Ave
12/15/2016	Loveless	Claridge House	2445	Lyttonsville Rd	2445 Lyttonsville Rd
6/6/2016	Loveless	Park Ritchie	7600	Maple Ave	7600 Maple Ave
7/14/2016	Loveless	Park View Apts	7667	Maple Ave	7667 Maple Ave
7/22/2016	Loveless	Maple Towers	7610	Maple Ave	7610 Maple Ave
7/20/2016	Loveless	North Park Apts	4620	N Park Ave	4620 N Park Ave
7/14/2016	Loveless	Parkside Plaza	9039	Sligo Creek Pkw	9039 Sligo Creek Pkw
8/16/2016	McSwain	Windsor Tower	13920	Castle Blv	13920 Castle Blv
10/3/2016	McSwain	Triangle Towers	4853	Cordell Ave	4853 Cordell Ave
9/1/2016	McSwain	Washingtonian Tower	9701	Fields Rd	9701 Fields Rd
11/1/2016	McSwain	Flower Oaks Apts	8308	Flower Ave	8308 Flower Ave
8/16/2016	McSwain	Franklin Apts	7620	Maple Ave	7620 Maple Ave

8/23/2016	McSwain	Forest Park Apts	9300	Piney Branch Rd	9300 Piney Branch Rd
8/23/2016	McSwain	Forest Park Apts	9302	Piney Branch Rd	9302 Piney Branch Rd
8/23/2016	McSwain	Forest Park Apts	9304	Piney Branch Rd	9304 Piney Branch Rd
8/23/2016	McSwain	Forest Park Apts	9306	Piney Branch Rd	9306 Piney Branch Rd
8/23/2016	McSwain	Forest Park Apts	9312	Piney Branch Rd	9312 Piney Branch Rd
8/23/2016	McSwain	Forest Park Apts	9314	Piney Branch Rd	9314 Piney Branch Rd
8/25/2016	McSwain	Forest Park Apts	9316	Piney Branch Rd	9316 Piney Branch Rd
11/4/2016	McSwain	University Towers I	1111	University Blvd W	1111 University Blvd W
11/4/2016	McSwain	University Towers II	1121	University Blvd W	1121 University Blvd W
8/24/2016	Schrader	The Point at Silver Spring	8715	1st Ave	8715 First Ave
6/21/2016	Schrader	Blair Plaza Apts	1401	Blair Mill Rd	1401 Blair Mill Rd
8/4/2016	Schrader	Springwood Apts	1220	Blair Mill Rd	1220 Blair Mill Rd
6/15/2016	Schrader	Kenwood House	5100	Dorset Ave	5100 Dorset Ave
6/23/2016	Schrader	Twin Towers	1110	Fidler La	1110 Fidler La
6/23/2016	Schrader	Deauville Apts	7520	Maple Ave	7520 Maple Ave
8/2/2016	Schrader	Hampshire Towers	7333	New Hampshire Ave	7333 New Hampshire Ave
8/30/2016	Schrader	Hampshire Towers	7401	New Hampshire Ave	7401 New Hampshire Ave
6/13/2016	Schrader	Irene Apts	4701	Willard Ave	4701 Willard Ave
8/15/2016	Barnes	Takoma Towers	7051	Carroll Ave	7051 Carroll Ave
8/19/2016	Barnes	Kensington House	10225	Frederick Ave	10225 Frederick Ave
12/6/2016	Barnes	Americana Finmark	9900	Georgia Ave	9900 Georgia Ave
3/1/2017	Barnes	North Park Apts	4615	N Park Ave	4615 N Park Ave
4/3/2017	Barnes	Elizabeth Apts	4601	N Park Ave	4601 N Park Ave
6/27/2016	Cole	Suburban Towers	8600	16th St	8600 16th St

9/8/2016	Cole	Middlebrook Apts	5015	Battery La	5015 Battery La
8/1/2016	Cole	Miramont Villas	6060	California Cir	6060 California Cir
8/1/2016	Cole	Miramont Villas	6050	California Cir	6050 California Cir
12/5/2016	Cole	Halpine View Apts	12907	Crookston La	12907 Crookston La
12/5/2016	Cole	Halpine View Apts	13001	Crookston La	13001 Crookston La
12/5/2016	Cole	Kenwood House	95	E Wayne Ave	95 E Wayne Ave
2/14/2017	Cole	Silver Spring Towers	816	Easley St	816 Easley St
6/7/2016	Cole	Grosvenor Park III	10401	Grosvenor Pl	10401 Grosvenor Pl
7/15/2016	Cole	Grosvenor Park Condos	10201	Grosvenor Pl	10201 Grosvenor Pl
12/14/2016	Cole	White Oak Towers	11700	Old Columbia Pik	11700 Old Columbia Pik
6/8/2016	Cole	Montgomery Towers	415	Silver Spring Ave	415 Silver Spring Ave
3/10/2016	Cole	Montgomery White Oak	11550	Stewart La	11550 Stewart La
8/18/2016	Marchesani	Willoughby	5500	Friendship Blv	5500 Friendship Blv
8/25/2016	Marchesani	Garland Towers	8221	Garland Ave	8221 Garland Ave
4/14/2017	Marchesani	Columbia Towers	12001	Old Columbia Pik	12001 Old Columbia Pik
2/17/2017	Marchesani	Kenwood House	5101	River Rd	5101 River Rd
4/13/2017	Marchesani	Thayer Towers	575	Thayer Ave	575 Thayer Ave
2/21/2017	Marchesani	Thayer Terrace	525	Thayer Ave	525 Thayer Ave
10/27/2016	Marchesani	Hillbrook Towers	515	Thayer Ave	515 Thayer Ave
3/30/2017	Marchesani	Willoughby	4515	Willard Ave	4515 Willard Ave
7/12/2016	Schrader	The Point at Silver Spring	8750	Georgia Ave	8750 Georgia Ave
10/7/2016	Schrader	Edinburgh House	7513	Maple Ave	7513 Maple Ave
9/8/2016	Sudik	White Hall Condos	4977	Battery La	4977 Battery La
10/25/2016	Sudik	Renesaince Plaza	14000	Castle Blv	14000 Castle Blv

7/25/2016	Sudik	Park Sutton	1900	Layttonsville Rd	1900 Layttonsville Rd
8/10/2016	Sudik	Park Bradford Apts	8601	Manchester Rd	8601 Manchester Rd
8/17/2016	Sudik	White Hall West Apts	8315	N Brook La	8315 N Brook La
12/7/2016	Sudik	Grosvenor Park II	10500	Rockville Pik	10500 Rockville Pik
10/24/2016	Sudik	Parkside East Apts	710	Roeder Rd	710 Roeder Rd
6/1/2016	Sudik	Silver Spring House	555	Thayer Ave	555 Thayer Ave
12/1/2016	Sudik	Sudbury House	2100	Washington Ave	2100 Washington Ave
6/9/2015	Williams	Warwick Towers	1131	University Blvd W	1131 University Blvd W
3/1/2017	Williams	Arcola Towers	1135	University Blvd W	1135 University Blvd W
3/16/2017	Barnes	Ambassador Apts	2715	University Blv W	2715 University Blv W
2/23/2017	Donahue	Mapleview Apts	7710	Maple Ave	7710 Maple Ave
8/2/2016	Donahue	Chateau Apts	9737	Mt Pisgah Rd	9737 Mt Pisgah Rd
8/2/2016	Donahue	Chateau Apts	9727	Mt Pisgah Rd	9727 Mt Pisgah Rd
5/31/2016	Donahue	Promenade	5225	Pooks Hill Rd	5225 Pooks Hill Rd
8/24/2016	Patterson	Georgia West Apts	8708	1st Ave	8708 1st Ave
11/23/2016	Patterson	Montgomery Arms Apts	8712	Colesville Rd	8712 Colesville Rd
6/10/2016	Patterson	Rebecca House	10920	Connecticut Ave	10920 Connecticut Ave
6/13/2016	Patterson	Manchester House	25	E Wayne Ave	25 E Wayne Ave
11/7/2016	Patterson	Summit Hills Apts	1705	East West Hwy	1705 East West Hwy
10/28/2016	Patterson	Summit Hills Apts	1703	East West Hwy	1703 East West Hwy
10/28/2016	Patterson	Summit Hills Apts	1701	East West Hwy	1701 East West Hwy
5/4/2016	Patterson	Ken Mil Apts	9119	Manchester Rd	9119 Manchester Rd
6/6/2016	Patterson	Monterey Apts	5901	Montrose Rd	5901 Montrose Rd

9/8/2016	Patterson	Park Montgomery	8860	Piney Branch Rd	8860 Piney Branch Rd
9/9/2016	Patterson	Carolyn Condos	614	Sligo Ave	614 Sligo Ave
10/26/2016	Patterson	Corona Apts	714	Sligo Ave	714 Sligo Ave
6/9/2016	Patterson	Sligo House	603	Sligo Ave	603 Sligo Ave
9/14/2016	Patterson	Waterford Apts	3333	University Blv W	3333 University Blv W
10/24/2016	Sudik	Silver Spring Towers	815	Thayer Ave	815 Thayer Ave
7/19/2016	Thorn	Blair House	8201	16th St	8201 16th St
8/23/2016	Thorn	Connceticut Ave. Condos	8101	Connecticut Ave	8101 Connecticut Ave
10/4/2016	Thorn	Elizabeth House	1400	Fenwick La	1400 Fenwick La
9/15/2016	Thorn	Winexburg Manor Apts	2301	Glenallan Ave	2301 Glenallan Ave
9/1/2016	Thorn	Takoma Phoenix	7611	Maple Ave	7611 Maple Ave
7/6/2016	Thorn	Essex House	7777	Maple Ave	7777 Maple Ave
1/19/2017	Thorn	Sligo Ave Apts	700	Sligo Ave	700 Sligo Ave
8/22/2016	Thorn	Aldon Towers	8200	Wisconsin Ave	8200 Wisconsin Ave
12/29/2016	Williams	Summit Hills Apts	8484	16th St	8484 16th St
7/29/2016	Williams	Summit Hills Apts	8504	16th St	8504 16th St
10/3/2016	Williams	Summit Hills Apts	8510	16th St	8510 16th St
2/15/2017	Williams	Summit Hills Apts	8508	16th St	8508 16th St
10/28/2016	Williams	Summit Hills Apts	8500	16th St	8500 16th St
10/28/2016	Williams	Summit Hills Apts	8502	16th St	8502 16th St
7/6/2016	Williams	Blair East Apts	1220	East West Hwy	1220 East West Hwy
1/27/2017	Williams	Berkshire Towers Apts	11200	Lockwood Dr	11200 Lockwood Dr
2/3/2017	Williams	Berkshire Towers Apts	11215	Oak Leaf Dr	11215 Oak Leaf Dr
1/27/2017	Williams	Berkshire Towers Apts	11235	Oak Leaf Dr	11235 Oak Leaf Dr
8/29/2016	Williams	Forum Condos	11801	Rockville Pik	11801 Rockville Pik
3/15/2017	Williams	Dalton Apts	733	Sligo Ave	733 Sligo Ave
3/15/2017	Williams	Barbizon Apts	735	Sligo Ave	735 Sligo Ave

			4450	S Park Ave	4450 S Park Ave

Prince Georges County

A	3901 Suitland Rd	Suitland	20746	AJO Realty	1	283	3-17	1970
A	9014 Rhode Island Ave	College Park	20740	College Prk Hous. Auth.	1	108	6-11	1971
A	2400 Queens Chapel Rd	Hyattsville	20782	Kettler	1	247	4-55	1965
A	4915 Eastern Ave	Hyattsville	20782	Habitat America	1	88	4-55	
A	6731,33,35 New Hampshire	Chillum	20912	Elisa Frankert	3	467	4-44	1968
A	2600 Queen Chapel Rd	Hyattsville	20782	Morgan Properties	1	96	4-1	1960
A	3001 Branch Ave	Temple Hills	20748	Kay	1	334	3-29	
C	4410 Oglethorpe St	Hyattsville	20781		1	143	4-7	
A	5309 Riverdale Road	Riverdale	20737	WC Smith Co.	1	180	4-7	1964
A	6700 Belcrest Road	Hyattsville	20782	Donaldson Group	1	288	4-1	1964
A	1836 Metzerott Road	Adelphi	20783	Mr. Bhola	1	510	4-34	1971
C	3450 Toledo Terrace	Hyattsville	20782	Linwood Taylor	1	176	4-1	1962
A	4105 Southern Ave	Capitol Heights	20743	Southern	1	69	3-17	
C	6200 Westchester Park Dr	College Park	20740	OP Management	1	301	6-14	1972
A	6100 Westchester Park Dr	College Park	20740		1	301	6-14	
						3591		
		Total buildings 17+8 = 25		Total units 3591 + 1544 (Oakcrest Towers, Brooks Drive) = 5135				

Appendix B

Review of Retroactive Requirements in Other Jurisdictions

Jurisdiction	Auto. Sprk. Required?	Ref
Chicago	Commercial yes, residential no, Life Safety Evaluation for non-sprinklered	Dept. of Buildings
Houston	yes, except privately owned condos	WTOP/AP
NYC	Commercial > 70 ft., residential when significantly renovated	WTOP/AP
LA	All except residential, some partial AS required	WTOP/AP
Phila	Commercial, not residential	WTOP/AP
San Antonio	All, except residential condos, where common area sprinklering is required	WTOP/AP
San Diego	No for residential	WTOP/AP
Dallas	No for residential	WTOP/AP
San Jose	Yes	WTOP/AP
San Francisco	Commercial buildings and tourist hotels only, other residential no	WTOP/AP
Florida	Yes, unless condo board votes to opt out; trend towards sprinklering?	SRHL,FFSA
Baltimore County	yes, condo owners may opt out	web link

https://wtop.com/national/2017/07/few-us-cities-mandate-sprinklers-in-old-residential-towers/
https://www.baltimorecountymd.gov/Agencies/fire/firemarshal/protectionsystems.html
http://www.floridafiresprinkler.com/files/4714/7122/2210/Hi_Rise_Retrofit_-_FAQ_Final.pdf

Appendix C

Supplemental Information on Cooking Area Protection

C.1 UL 858

The following information was provided by Mr. Josh Dinaburg, Senior Fire Protection Engineer with JensenHughes. In November, 2017, he reported that UL 858 is the standard for electric range tops and was updated to include an ignition prevention test for open coil ranges. The test is heating of oil in a pan with no ignition for 30 minutes. Most existing stoves would ignite now in about 8 minutes. There are no requirements on how to achieve this, but most are vendors will likely propose to use temperature sensing and limiting devices built into the stoves. The manufacturers have agreed and believe they are capable of meeting this. There is at least one existing product on the market which meets the requirements, manufactured by Brown Stoves.

In May, 2018, Mr. Dinaburg provided an update to the TG. The effective date for UL 858 Section 60A, *Abnormal Operation Oil Ignition Test*, is April 4, 2019. This means that all new open coil (not glass, not gas, not induction) range tops must prevent ignition of cooking oil in a pan for no less than 30 minutes. Mr. Dinaburg was still only aware of one product that is available, but believes other products are in development and testing. I have heard through the STP that manufacturers have been testing. Products from mainstream vendors should be appearing soon, but nothing is being marketed or placed in stores yet. The Association of Home Appliance Manufacturers has indicated that they are close to submitting a proposal for a ceramic glass top test that is basically the same as for the electric coil.

C.2 NIST Study on Residential Kitchen Fire Suppression

The National Institute of Standards and Technology published a study of residential cooking fire suppression technologies (see main reference list). The abstract to the paper describes a wide range of cooking fire experiments conducted to examine the effectiveness of retrofit residential kitchen fire suppression systems. A series of experiments provided data on the hazard associated with cooking oil fires. Then, a series of real-scale fire suppression experiments followed using scenarios outlined in the UL 300A draft standard testing various fire suppression systems. Experiments were conducted in a full-scale residential kitchen with dimensions 3.6 m x 3.4 m x 2.4 m high. Both gas and electric ranges were used. Several types of cooking vessel and oil types were tested. The suppression systems tested included automatic and manual suppression technologies. The manual devices included wet and dry chemical type extinguishers. The automatic systems included room-wide and range hood-installed systems. The room wide systems included water mist and residential sprinkler systems. The hood-installed systems included water mist and wet and dry chemical systems. Manual extinguishers consistently suppressed the oil fires while maintaining tenable conditions in the mock-up kitchen. One hood-installed wet chemical system tested demonstrated success in extinguishing the oil fires in all experiments, and maintained tenability in the mock-up kitchen throughout most of the experiments. The hood-installed dry chemical system tested failed to extinguish the oil fire in all experiments, and introduced tenability hazards not present prior to the system activation. All other system types tested provided mixed results, they either could not reliably suppress the fire, or they consistently generated tenability hazards in the test kitchen.

The results of these experiments point the need to develop other approaches to kitchen fire safety such as ignition prevention technologies and reliable early nuisance-free warning through smoke alarms.

C.3 Ignition Prevention - New Stoves

Brown Stoves

See unit introduced in 2014, http://www.marketwired.com/press-release/brown-stove-works-launches-industrys-first-heat-sensing-range-that-reduces-risk-cooking-1956255.htm See Coil Logic™ from Brown, designed to meet UL 858. http://www.brownstoveworksinc.com/new-features.html .This is apparently for new stoves, electric only.

C.4 Retrofit Devices - Ignition Prevention and Suppression

From Pioneering Technology

website http://www.marketwired.com/press-release/pioneerings-smartburner-first-meet-new-industry-standard-electric-coiled-cooktops-ranges-2216567.htm : "The new UL858 (60A) standard published by Underwriters Laboratories includes a new test requirement for cooking oil ignition. To be listed for sale anywhere in the United States, all new household electric coiled cooktops/ranges must meet the new test requirement by April 2019.

In its simplest form this new test requires that an electric coil stovetop be turned to its maximum heat setting with a pan of oil on the element and allowed to operate for 30 minutes or until the cooking oil ignites, whichever comes first. If there is ignition, then the product fails and cannot be listed for sale in North America."

Pioneering's SmartBurner® has passed this new testing requirement and is now listed as meeting the new industry standard for sale in the United States.

This newly published UL858 standard and test procedure will, for now, apply only to electric coil cooktops/ranges. Going forward AHAM has committed to working together with industry, the U.S. Consumer Product Safety Commission, Health Canada, as well as UL and CSA, to determine how similar tests and requirements can be applied to radiant glass ceramic, induction, and gas cooktops and ranges in future."

Note this is a retrofit ("aftermarket") device, and may also be applicable to new stoves.

Innohome

https://www.innohome.com/ Retrofit heat sensor. "Exceeds the requirements of the new BS EN 50615:2015 *Household and similar electrical appliances*. Several other devices are marketed.

IGaurd Stoves

https://iguardfire.com/?gclid=EAIaIQobChMI8PeV85Cr2wIVjVmGCh2gFg6HEAAYAiAAEgIx2PD_BwE "Automatically shuts off the stove after 5 minutes of no one being in the kitchen". Retrofit Timer device, kits for gas and electric stoves. Electric stove model has automatic sensor-based restart, gas model has manual restart. Marketed for aged population and others more likely to leave stove on unattended.

DFP Denlar

https://www.denlarhoods.com/ Residential suppression (residential hood using potassium acetate). "ICC approved". Also timer shut off device similar to IGaurd.

Restaurant Technologies, Inc.

https://www.rti-inc.com/solutions/automist Automist™, commercial duct and fan cleaning system. RTI is geared toward the commercial market

Stovetop Firerstop

https://stovetopfirestop.com/product/plus/ "Plus" unit is a powder suppressant.

https://stovetopfirestop.com/stovetop-firestop-redefines-residential-cooking-fire-suppression-with-new-sensor-based-product/

https://stovetopfirestop.com/wp-content/uploads/2017/10/Is-StoveTop-FireStop-UL-Listed-1.pdf

https://stovetopfirestop.com/products/

https://www.youtube.com/watch?v=EwkvMFTdo9Y

Plumis

https://plumis.com/taphead.html Automist, connects to faucet. Reportedly meets BS 8458:2015 *Fixed fire protection systems. Residential and domestic watermist systems. Code of practice for design and installation*

Hydramist

http://www.watermist.com/en/products/15-ampu/

Appendix D

Comments to NFPA EFFCT RISK Assessment Tool

Commissioner Scheffey exercised an early release version of the tool and reported the following to the Task Group on February 23, 2018.

The report on high rise buildings with combustible exterior walls was published by the Fire Protection Research Foundation. The link to the tool, called EFFECT, is: https://www.nfpaeffect.com/signup . Commissioner Scheffey noted that the risk assessment tool, while specifically applicable to combustible exterior walls, provides a good overall risk assessment model/framework. He exercised the tool and found the following:

i. At the first level of general, overall assessment, if the building has combustible exterior materials (code compliant or not), it must be assessed even if it has sprinkler protection.
ii. There is heavy emphasis on evacuating the entire building ("all out" strategy). A tall (>50m) residential building with code compliant combustible facade (e.g. NFPA 285 Exterior Insulation and Finish System) would obtain a "tolerable" risk score, provided an "all out" emergency evacuation system/approach is provided. An "intolerable" risk score would result in the same building if evacuation is "stay in place". For example, if local residential unit detection is provided, but alarms are not transmitted to the building, or transmitted alarms only sound in common corridors, the default would be to categorize the building as "stay in place". Code compliant insulation material would still be designated an intolerable risk in this scenario. Surprisingly, this also true if the building has no combustible façade.
iii. More surprising, intolerable risk would even occur in a sprinklered, noncombustible clad building (if each unit didn't have an individual audible device)! Commissioner Scheffey identified the stated model limitations: the tool is for use in assessing buildings with possible combustible façade systems. The tool should not be used for a risk assessment of fire safety provisions for a building without combustible facades. The focus of the tool is on rapid exterior fire spread to multiple floors. It is not focused on the limitation of interior fire spread though compartmentation. Presumably, this is why a building with code compliant combustible materials must be fully evacuated when using this tool, even if sprinklered. This might be considered a conservative approach.

Appendix E

Sprinkler Retrofit Costs

Sprinkler retrofit costs vary widely. It is very difficult to generalize about the cost of retrofitting sprinklers in an existing building, other than that it is very expensive and will vary based on the size, structure and layout of the building.

The National Fire Sprinkler Association (NFSA) uses the following estimate: $1.25 – 3.00/sq. ft. new construction cost of complete sprinklering, plus a cost plus 25-50% additional for retrofit. This equates to $1.90 – 4.50/sq. ft.

AOBA representative Wineholt provided the following information:

- Cost – As reflected in the following sources, costs for retrofitting an existing high rise vary wildly:
  - http://highriselifesafety.com/retrofitting/ - $4 - $8 / sq. ft.
  - http://www.hawaiinewsnow.com/story/36801033/fewer-older-residential-high-rises-to-be-required-to-have-fire-sprinklers-but-cost-still-an-issue - $4,305 - $13,473/unit
  - http://www.myfloridalicense.com/dbpr/lsc/documents/CondominiumSprinklerRetrofitReportOctober2009.pdf - $595 - $8,633/unit
  - https://www.greenbaumlaw.com/media/publication/126_FireSprinklers_Sirot.proof_1.pdf $5 - $7 / sq. ft.
  - http://www.nreionline.com/news/high-costs-hamper-fire-sprinkler-retrofits $2 - $3 / sq. ft.

References and Bibliography

National Fire Sprinkler Association, “Fire sprinkler Retrofit Guide. Making Your Community Safe from Fire”, 2nd Edition, NFSA, Linthicum, MD, May 2017

https://www.google.com/search?source=hp&ei=JJJEXI_MFeKn5wLDtaHICw&q=Retrofitting+of+Sprinkler+Issues&btnK=Google+Search&oq=Retrofitting+of+Sprinkler+Issues&gs_l=psy-ab.3...2768.10491..10973...0.0..0.88.1856.32.....0....1..gws-wiz.....0..0j0i131j0i22i30j33i22i29i30j33i160.It81DkKz90c

Butry, D.T., Brown, M.H., and Fuller, S.K., “Benefit-Cost Analysis of Residential Fire Sprinkler Systems, “ National Institute of Standards and Technology, NISTIR 7451, Gaithersburg, MD, September, 2007

Appendix F

Tax Reform Impact on Fire Protection Systems

March 21, 2018

TO: Joe Scheffey

FROM: Ron Wineholt, AOBA

RE: Tax Implications for Fire Safety Improvements

You requested that I provide the Task Group what information I could find regarding tax benefits available to property owners under the new federal tax law for fire safety improvements such as sprinklers, alarm and detection equipment, and fire resistive enclosure improvements (stairs, openings, corridors, and residential unit doors).

In evaluating this issue, I reviewed the flyer from the National Fire Sprinkler Association (NFSA), the Congressional Report on the federal tax bill, and exchanged emails with a CPA that I trust, who is experienced with business taxes. As you can appreciate by reviewing the language of the Congressional Report, nothing is simple when trying to understand the federal tax law. As I am not a CPA, the following is solely my opinion.

As summarized in the NFSA flyer, the new federal tax law conveys two primary types of benefits for property owners making fire safety improvements: (1) Section 179 expensing of depreciable business assets; and (2) Bonus depreciation of qualified property. Each is discussed below.

Section 179 Expensing

Section 179 expensing is generally limited to depreciable personal property, with limited exceptions for qualified real property. Although the new federal tax law increased the amount of annual Section 179 expensing to $1 million, the provision that allows fire protection and alarm systems as a qualifying expense is only for nonresidential real property.

Cost Recovery – Bonus Depreciation

The new federal tax law increases bonus depreciation to 100% of the cost of qualified property placed in service after September 27, 2017 through December 31, 2022. To qualify, such property must have an applicable recovery period of 20 years or less under IRS guidelines.

Depreciation is applied against business income to reduce taxable income. To the extent that the depreciation exceeds business income for a year, the excess depreciation may be carried forward as a net operating loss. Therefore, if a property owner makes $1 million in improvements, they must at some point have $1 million in taxable business income against which to apply the depreciation expense.

To know what fire safety improvements qualify for the bonus depreciation requires comparison to the IRS depreciation schedule for that type of improvement (see below IRS depreciation chart). The NFSA states that sprinklers will qualify for the bonus depreciation, so presumably they must have concluded that they have a depreciable life of 20 years or less under IRS regulations. Alarm and detection equipment seems comparable, and would likely also be depreciated at 20 years or less.

However, fire resistive enclosure improvements (stairs, openings, corridors, and residential unit doors) seem to fall under structural components of the property, with depreciation lives of over 20 years, and thus not eligible for the bonus depreciation.

Table 2-1. MACRS Recovery Periods for Property Used in Rental Activities

	MACRS Recovery Period	
Type of Property	**General Depreciation System**	**Alternative Depreciation System**
Computers and their peripheral equipment	5 years	5 years
Office machinery, such as:		
• Typewriters		
• Calculators		
• Copiers	5 years	6 years
Automobiles	5 years	5 years
Light trucks	5 years	5 years
Appliances, such as:		
• Stoves		
• Refrigerators	5 years	9 years
Carpets	5 years	9 years
Furniture used in rental property	5 years	9 years

Office furniture and equipment, such as: • Desks • Files	7 years	10 years
Any property that doesn't have a class life and that hasn't been designated by law as being in any other class	7 years	12 years
Roads	15 years	20 years
Shrubbery	15 years	20 years
Fences	15 years	20 years
Residential rental property (buildings or structures) and structural components such as furnaces, waterpipes, venting, etc.	27.5 years	40 years
Additions and improvements, such as a new roof	The same recovery period as that of the property to which the addition or improvement is made, determined as if the property were placed in service at the same time as the addition or improvement.	

Appendix G

Chicago Fire Risk Indexing

The Chicago Life Safety Evaluation (LSE) approach emphasizes residential occupancies. The Chicago Ordnance which established the LSE has certain baseline conditions. Commercial occupancies greater than 80 ft must be retroactively sprinklered. Residential occupancies with non-transient occupants are exempt from this requirement. Residential units (apartments and condos) must pass the LSE unless they are fully sprinklered. A building that passes the LSE is deemed to achieve a reasonable level of safety. Specific details, including the scoring system, was circulated in a file titled "LSE Rules scoring system included" in March 2018 by Commissioner Scheffey.

There are certain baseline conditions which must be met. One- and two-way voice communication systems must be installed (exception: residential units less than 15 stories and 60 units may have a one-way system only). They must have 1 hr rated stair doors and frames. The LSE assumes there is a standpipe system.

The LSE uses fifteen attributes, scored as they effect Fire Safety, Means of Egress, and General Safety. These are:

1. Building height (under 100 ft is discounted);

2. Building construction (there is a modest penalty for curtain walls which are judged to promote floor-to-floor fire spread);

3. Compartmentation (fire areas greater than 10,000 sq. ft are penalized;

4. tenant/dwelling unit separation (doors without ratings or closers are penalized);

5. Vertica openings;

6. HVAC (positive credit if HVAC serves only 1 floor);

7. Smoke detection (positive credit for dwelling unit detectors, more for total building detection (audible alarm requirements not clear to me));

8. Communications (emphasized - lots of credit for combined 1-and 2-way voice coms);

9. Smoke control (penalty for none, max credit for sandwich pressurization);

10. Means of egress capacity (significant max penalty for one route or noncompliant stair doors);

11. Dead end corridors (max penalty >100ft);

12. Travel distance (max penalty > 200 ft);

13. Elevator controls;

14. Emergency power for egress lighting (penalty for none);

15. mixed occupancy separation;

16. Sprinklers (credit given for partial sprinklers); and,

17. Auxiliary uses.

Commissioner Scheffey performed an example calculation of a hypothetical apartment building, greater than 100 ft and in good condition. For the scoring system. I assumed:

1. Type 1A construction with curtain walls;

2. Floor compartment size of 10, 000 sq. ft, corridors 1 hr with self-closing 1 hr doors, no unprotected vertical openings;

3. HVAC serving a max of 5 floors, the only smoke control being operable windows;

4. Tenant unit smoke detectors, no voice communications;

5. Egress – 2 stairs without locks, dead end of 75 ft, travel distance of 150 ft;

6. FD manual elevator control, egress lighting provided with emergency power, no mixed occupancy, no sprinklers, and no auxiliary use separation problems.

The hypothetical building did not pass, but the addition of a one- and two- way communication system nearly achieved a passing grade. This is evidently required in any event. Total area smoke detection would add substantial credit. A single stair or inadequately protected stair would result in a severe penalty.

Commissioner Scheffey conclude that, if the building separation integrity is good and there are no serious egress deficiencies, residential high rise buildings with unit smoke detection would pass provided voice communications are provided. They are required in any event. Good building separation means no unprotected vertical openings, rated corridor walls with rated, self-closing doors, and rated stair doors with closures. Egress deficiencies are long dead end corridors or single exit configurations. Rated stair doors and standpipes are also required.

Commissioner Scheffey concluded that this “acceptable” configuration has many similarities to the proposed required list of desired fire safety attributes initially prepared by Task Group member Ted Tochterman which formed the basis of Option 3.