

APPENDIX BP

THREE- AND FOUR-FAMILY DWELLINGS

BP101 Scope. *Three and four-family dwellings* not exceeding 6,000 square feet in gross floor area and complying with this appendix shall be permitted to be constructed in accordance with this code.

BP201 Definitions

COMMON EGRESS SPACE: a portion of the means of egress that is a shared space, with or without stairs, that serves more than one dwelling unit.

THREE- AND FOUR-FAMILY DWELLING: A single structure containing three or four attached dwelling units that are not *townhouse units*.

BP301 General. Structures shall comply with all requirements of this code that are applicable to a two-family dwelling, except as modified by this appendix.

BP301.1 Engineered design. Where required by the code official, a structural design plan bearing the stamp of a licensed engineer shall be submitted with the permit application.

BP301.2 Bedroom limit. Dwelling units shall not contain more than four bedrooms.

BP401 Dwelling unit separation. Dwelling units shall be separated from each other and from *common egress spaces*, where provided, by fire-resistance-rated assemblies in accordance with the requirements in Section R302.3, except that the reduced rating for automatic sprinklers shall not be permitted.

BP501 Common egress space. *Common egress spaces* shall comply with this section.

BP501.1. Means of egress. *Common egress spaces* shall comply with Section R318, as would be required for a dwelling unit.

BP501.1.1 Discharge. *Common egress spaces* shall discharge directly to the exterior of the building.

BP501.2 Fire resistance rating. *Common egress spaces* shall be separated from the remainder of the building interior by fire-resistance-rated assemblies in accordance with the requirements in Section R302.3, as would be required for a dwelling unit, except that the reduced rating for automatic sprinklers shall not be permitted.

BP501.2.1 Smoke-resistant construction. Fire-resistance-rated vertical and horizontal assemblies separating *common egress spaces* from the

remainder of the building interior shall be constructed in a manner that also limits the transfer of smoke.

BP501.2.2 Fire-resistance-rated doors. Doors connecting a *common egress space* to dwelling units or other interior spaces shall have a fire-resistance rating of not less than 45-minutes and shall be gasketed to prevent smoke transfer. Such doors shall be provided with self-closing devices and shall be self-latching.

BP501.2.3 Air transfer openings. Ducts and air transfer openings shall not be permitted to penetrate walls, floors, or ceilings separating *common egress spaces* from dwelling units.

BP601 Habitable attics. Habitable attics shall not be permitted above the third story.

BP701 Occupiable roofs. Occupiable roofs shall not be permitted to serve more than one dwelling unit. Occupiable roofs serving one dwelling unit shall not be permitted above the third story.

BP801 Stacked dwelling units. Vertically stacked dwelling units shall comply with R302.3.5, and not more than two dwelling units shall be stacked vertically.

BP901 Use of stud wall cavities as air plenums. Stud wall cavities in walls that separate dwelling units and walls that enclose *common egress spaces* shall not be permitted to serve as air plenums.

BP1001 Automatic sprinkler system. An automatic sprinkler system shall be installed in *three- and four-family dwellings*.

BP1001.1 Design and installation. Automatic sprinkler systems shall be designed and installed in accordance with NFPA 13D, except as follows:

1. Garages and carports attached to or located beneath a dwelling unit or common egress space shall be protected by residential or quick response automatic sprinklers designed to discharge at not less than 0.05 gpm/ft² density. Where three or more sprinklers are located in the attached garage, the design shall be limited to accommodating two operating sprinklers. Garage sprinklers shall be protected from freezing, and garage doors shall not be considered obstructions with respect to placement of sprinklers.
2. Where a common egress space is provided, the automatic sprinkler system design for the building shall be based on three operating sprinklers, and sprinklers shall be provided at each floor landing and beneath the lowest landing where the space is accessible for storage.
3. Where the building is of wood construction, sprinkler protection shall be provided for exterior balconies, decks and ground floor patios located beneath a roof or deck that projects more than four feet beyond the exterior wall.

- 3.1. Sidewall sprinklers that are used to protect such areas shall be permitted to be located such that their deflectors are within 1 inch (25 mm) to 6 inches (152 mm) below the structural members and a maximum distance of 14 inches (356 mm) below the deck of the exterior balconies and decks that are constructed of open wood joist construction.

BP1101 Smoke alarms. Where a common egress space is provided, a smoke alarm shall be provided in the common egress space. In addition, smoke alarms in each dwelling unit shall connect to a notification appliance located in the common egress space. All additional requirements of R302.3.5 shall also apply where dwelling units are vertically stacked.

BP1201 Access agreement. An approved access agreement shall be required which permits access to a dwelling unit owned or occupied by others for the purposes of permitting a licensed contractor or code official to maintain or inspect fire and life safety systems. A copy of the agreement shall be submitted with the permit application.

BP1301 Fire flow. Appendix B, Section B105.1 of the International Fire Code is hereby amended to allow the required fire-flow for three- and four-family dwellings constructed in accordance with this appendix to be calculated as would be required for a two-family dwelling.

Reason:

- **BP101** expands the scope of the IRC to include three- and four-family dwellings that are not townhouses. The IRC scoping is traditionally limited to 1- and 2-family dwellings and townhouses, which stems in part from structural and fire safety provisions that are not considered as sufficient for buildings that contain additional dwelling units.

This change brings in structures commonly referred to as three-plexes and four-plexes. These structures are differentiated from townhouses by not requiring that dwelling units be divided as vertical slices, instead allowing them to be stacked vertically and to have shared egress.

Three-plexes and four-plexes present an increased fire risk associated with more families or unrelated individuals in separate units under one roof possibly exposing each other to a fire. In addition, lithium-ion and other high-energy density battery chemistries now commonly found in devices throughout homes are increasing residential fire incidents. Sufficient separation of dwelling units and protected egress routes are among essential IRC add-ons in this appendix to accommodate the increased number of dwelling units.

The appendix includes a floor area limit of 6,000 square feet as a way to reasonably restrict the size of buildings, assuming four dwelling units of 1,500 square feet each

would be reasonably consistent with affordable housing. Likewise, 6,000 square feet is a reasonable limit for the size of a multifamily building that would not be out of place in a residential neighborhood or infill housing.

- **BP201 COMMON EGRESS SPACE:** In some cases, three- and four-family dwellings will share egress spaces, and the definition of “common egress space” facilitates safety provisions in this appendix for shared egress.

THREE- AND FOUR-FAMILY DWELLING: Although townhouses can contain three or more dwelling units, they are separated in such a way that largely creates separate buildings in vertical slices. This appendix will allow three or four dwelling units in the same building with lesser separations.

- **BP301** In general, the approach of this appendix is to construct three- and four-family dwellings as would otherwise be required for a two-family dwelling, with exceptions that increase requirements as needed to offset risk associated with adding dwelling units. Two-family dwelling requirements in the IRC already prescribe fire separations and other features that represent a good starting point for three- and four-family dwellings.
- **BP301.1** The prescriptive structural design requirements in the IRC are generally considered sufficient for three or four dwelling units. A correlation commonly offered is that, because the IRC does not limit the area of a single- or two-family dwellings, having more dwelling units in the same space should not impact structural design. However, additional dwelling units that may result in shared spaces, such as common egress spaces, could increase occupant load and density in a way that challenges prescriptive structural design assumptions.

Accordingly, live load in a shared stairway and live load associated with high-occupant density spaces might warrant additional consideration of floor loading.

- **BP301.2** A four-bedroom limit per dwelling unit is included to place a limit on the possible use of these buildings as high-occupant density dormitories. Beyond possible structural design impacts, such uses sufficiently increase life-safety risk to warrant use of the International Building Code.
- **BP401** The fire separation requirements in the IRC for two-family dwellings are generally considered sufficient for three- and four-family structures. However, given the increased risk associated with more dwelling units and additional occupants exposed to a fire incident, the fire-resistance rating reduction associated with sprinkler protection is not granted for three- and four-family dwellings.

- **BP501** Historically, the IRC and its predecessor, the CABO One- and Two-family Dwelling Code, have not included provisions for shared egress since the scope of the code has precluded multifamily buildings. Multifamily buildings with shared egress have been scoped to the IBC.

Because this appendix expands the IRC to include three- and four-family dwellings, and recognizing that design options for such buildings would be severely limited if separate exits were required, requirements for common egress spaces that are considered necessary for safe egress have been included. Essentially, the common egress space is required to be constructed in a manner similar to what is required for a dwelling unit. However, additional safety provisions are added, given the importance of protecting this space for use by multiple dwelling units.

- **BP501.1** Essentially, the common egress space is required to be constructed in a manner similar to what is required for a dwelling unit. However, additional safety provisions are added, given the importance of protecting this space for use by multiple dwelling units.
- **BP501.1.1** This section makes it clear that common egress spaces are not allowed to discharge into any other interior space, such as a common-use space or through another dwelling unit.
- **BP501.2** As is the case for dwelling units, a common egress space is required to be fully separated from other interior spaces by construction with a one-hour fire-resistance rating. For two-family dwellings, the code permits the rating to be reduced from one-hour to thirty-minutes. Given the increased life risk and the fact that NFPA 13D is less robust protection than what has traditionally been required for these occupancies (normally built to the International Building Code with NFPA 13R protection...a step up from NFPA 13D), this appendix does not permit a reduction in the fire separation for three- and four-family dwellings. See also BP1001.
- **BP501.2.1** The requirement for smoke-resistant construction is consistent with current IRC provisions applicable to the upper unit exit for stacked dwelling units in Section 302.3.5. The code is not specific with respect to how this is to be accomplished, but the intent is to ensure that all openings, such as wall or ceiling penetrations or gaps around doors that would allow air movement are sealed (note that intentional air transfer openings are prohibited by BP501.2.3).
- **BP501.2.2** To protect escaping occupants and firefighters that might use the common egress space to access a dwelling unit that is on fire, it is important that doors into the common egress space withstand a fire exposure. The permitted reduction in the fire-resistance rating to forty-five minutes, as compared to one-hour for wall assemblies, recognizes that combustible materials are rarely stacked on

either side of an entrance/egress door, thereby reducing the fire exposure intensity of a door.

The requirement for gasketing to prevent smoke transfer is consistent with BP501.2.1, and the requirement for self-closing and self-latching doors is intended to prevent the possibility of a door being left open and rendering the common egress space unusable if occupants were to flee a burning dwelling unit without closing the door behind them.

- **BP501.2.3** Because of the required fire-resistance-rated enclosure of the common egress space, air transfer openings into or out of this space would require fire- and smoke-dampers. A smoke damper would have to be motorized and operated by a smoke detector and control panel...a level of complexity that is unlikely to be maintained as reliable over time in a building of this type, which would likely lack regular maintenance in common spaces. Requiring that the common egress space not have any air transfer openings avoids this problem and ensures that the common egress space, if conditioned, will have a dedicated HVAC unit.
- **BP601** Habitable attics are a relatively new allowance in the code from about 15 years ago. Their allowance essentially created a fourth story on a building that is otherwise limited to three stories in height. That potentially elevates occupants to a level that cannot be reached by fire department ground ladders, and with three or four dwelling units in a single burning building creates a significant life-safety risk that would be difficult for first responders to handle. Rescuing upper-level occupants would either require interior rescue from high floors in a building that might be charged with smoke or exterior rescue using an aerial ladder, assuming that there would be access to deploy the ladder to a rescue window.
- **BP701** Common occupiable roof areas risk becoming crowded assembly spaces, which are clearly inconsistent with the intended use of this appendix for affordable housing in dense or infill urban areas. In addition to structural overloading concerns that might be created by overcrowding in a space that is not going to be regulated, there are concerns about the possibility for a large number of people to be trapped above a fire with no way out if the common egress space is somehow compromised.

The restriction on occupiable roofs above the third story of a single dwelling unit are similar, with respect to not creating conditions where occupants might be congregating above the reach of fire department ground ladders.

- **BP801** This section carries forward the IRC's current limit to not permit more than two stacked dwelling units. That restriction is maintained because stacking of dwelling units significantly increases the risk of injury or death in a fire for upper unit occupants. The more units below, the higher the likelihood of a fire occurring below...more kitchens, more occupants, more battery-powered equipment, etc.

While it is sometimes argued that increasing the fire separation rating for floor-ceiling assemblies, perhaps from one-hour to two-hours, might be sufficient to mitigate these concerns, that ignores how fire actually behaves.

It is common knowledge that heat and smoke naturally rise in a vertical direction, creating more hazardous conditions above as compared to adjacent. A floor-ceiling assembly helps with this, but only until an exterior window breaks, which tends to happen in a matter of minutes after a fire achieves flashover (when all combustibles in the room are ignited with almost explosive flames and heat release). While sprinklers are ordinarily expected to prevent such an event, the limit on stacking of dwelling units is believed to be a reasonable redundancy to protect occupants of upper floors.

- **BP901** IRC Section M1601.1.1 prohibits air plenums in stud channels of fire-resistance-rated assemblies, and this section is intended to emphasize that requirement for three- and four-family dwellings, given that residential builders using the IRC do not typically construct fire-resistance-rated assemblies.
- **BP1001**
BP1001.1 Allowing NFPA 13D to be used for protection of three- and four-family dwellings is a significant change of direction with respect to making three- and four-family dwellings more affordable. Traditionally, these buildings have been required to be designed and constructed in accordance with the International Building Code using NFPA 13R protection. NFPA 13R is a step up from NFPA 13D with respect to the level of protection provided. For example, NFPA 13D does not require a connection for fire trucks to pump into to boost the system's water supply and performance. However, NFPA 13R's increased protection comes at increased cost, and NFPA 13R does not allow the use of multi-purpose piping systems that combine cold water domestic plumbing and fire sprinklers on the same piping network, which are sometimes installed by plumbing contractors to increase competition and possibly lower installation cost.

While it is true that allowing NFPA 13D sprinkler systems in three- and four-family buildings reduces protection, that does not address the question of whether NFPA 13D protection is generally sufficient for the level of risk associated with these buildings. Since the question of NFPA 13D performance was originally considered by national model codes over 30 years ago, a considerable number of NFPA 13D sprinkler systems have been installed throughout the U.S., and there have been a considerable number of fires in structures protected by NFPA 13D systems. The number of fires is large enough to provide meaningful data regarding the effectiveness of these systems in controlling and extinguishing dwelling fires.

An analysis of data captured by the National Fire Incident Reporting System shows

that, in more than 2,500 fire incidents in the period 2000-2022 where sprinklers operated and were effective (presumably NFPA 13D systems considering that the data is associated with one-and two-family dwelling fires), fire spread was limited to the object or room of origin in 87% of fires, and up to the story of origin in a total of 92% of fires. With this history, it is not unreasonable to extend recognition of NFPA 13D to slightly larger buildings, with the following adjustments that enhance the level of protection to offset increased risk associated with additional dwelling units in a single structure.

BP1001.1 Item 1 Garages and carports are not normally required by NFPA 13D to have sprinklers. This is not because fires in garages are not common in residential occupancies, but instead the exception exists because fires starting in garages result in fatalities less often than fires starting in occupied spaces. For three- and four-family dwellings, the increased life risk associated with more occupants in the building coupled with the additional number of vehicles that might be parked in garages and other garage activities warrants adding sprinkler protection. The prescriptive design requirements are derived from provisions that are adopted statewide in California.

BP1001.1 Item 2 NFPA 13D typically allows sprinkler systems to be designed based on an assumption that not more than two fire sprinklers will operate to control a fire. If more than two sprinklers operate, the water supply is likely to diminish, causing sprinklers to no longer discharge sufficient water to control a growing fire. Given the importance of protecting a common egress space, this appendix adds a requirement for the sprinkler system to be designed based on three operating sprinklers, rather than just two. Additionally, the appendix requires sprinklers at each common egress space landing and in storage spaces below. Both of these enhancements to the base NFPA 13D system adds a safety margin that improves the likelihood of sprinklers controlling a fire.

BP1001.1 Item 3 Exterior balconies, decks, and patios are common locations for fires to start, often associated with outdoor cooking or discarded smoking materials. Three- and four-family buildings have traditionally required sprinkler protection for these areas per NFPA 13R, and that requirement is being carried forward to this appendix. Sprinkler protection reduces the likelihood of a fire climbing the exterior of the building and entering the attic, where rapid fire spread and possible structural collapse will endanger all occupants and firefighters. The prescriptive design requirements are derived from the International Building Code Section 903.3.1.2.1 and NFPA 13R.

- **BP1101** Smoke alarms are an essential safety feature for all residential occupancies, providing early warning of incipient fires and increasing the time available for occupants to escape. Where a common egress space is provided, it is important for occupants to know about an activated smoke alarm in any unit. Hence,

a notification appliance (horn/buzzer/beeper) connected to each dwelling unit's smoke alarm circuit is required in common egress spaces, in addition to having a smoke alarm in the common egress space itself. This is an expansion of existing IRC provisions that regulate stacked duplexes, which still apply if dwelling units are stacked.

In addition to smoke alarms for early warning, requiring sprinkler waterflow alarms to notify the fire department, while desirable, was considered but deemed not feasible. There is not a simple, reliable technology for multipurpose sprinkler systems that is capable of discriminating sprinkler waterflow from other cold water uses on the same piping network. While waterflow monitoring is possible on stand-alone sprinkler systems, it would unfairly disadvantage stand-alone systems to require extra equipment and monthly alarm service fees for these systems while exempting multipurpose systems due to their technical limitations.

- **BP1201** The provisions for an approved access agreement are derived from IBC 706.1.1. It is essential to safety of multifamily occupancies that there be a means for fire- and life-safety inspections to take place and for systems in the entire building to be properly maintained. The approval should be contingent on ensuring that the proper parties are bound by the agreement and that the agreement ensures sufficient access to be available.
- **BP1301** In areas where waterflow available from water distribution systems is low or there is no system at all, fire flow requirements in IFC Appendix B can severely limit construction. The IFC requires sufficient waterflow to be available for use by a responding fire department to control or extinguish a fire.

Substantial credit, in the form of reduced flow requirements, is offered by the IFC when fire sprinklers are installed in a building. However, the provisions only recognize NFPA 13D sprinkler systems for a reduction in required fire flow for one- and two-family dwellings and townhouses, in deference to the traditional limits on permissible use of NFPA 13D systems.

This section extends that credit to three- and four-family buildings as a reasonable allowance for the modest expansion of NFPA 13D's permissible use permitted by this appendix.