

Companion Narrative Document to the July 1, 2009 DWR Proposed California Building Standards Code Update “Express Term” Documents

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## 1. Background & Use of This Narrative Document

This narrative document is intended to provide clarity on the Department of Water Resources (DWR) proposed California Building Standards Code update (proposed Code update) *documents* dated June 2009. The proposed Code update is divided into three documents based upon occupancy groups and the Department's intention to submit as mandatory or voluntary Code requirements. Specifically, these Code update documents are proposed to effect:

- Educational Occupancy, Group E, with Mandatory Requirements
- Residential Occupancy, Group R-3 and R-3.1, with Mandatory Requirements
- Residential Occupancy, Group R-1, R-2, and R-4, and Institutional Occupancy, Group I, with Voluntary Requirements

Illustrations of buildings that would meet the proposed Code update requirements are shown in a companion document. It is recommended that this narrative document be read in conjunction with the proposed Code update and with the illustrations for proper understanding.

For background material on how DWR arrived at evacuation locations as the proposed solution to mitigate drowning and entrapment, please refer to the April 13<sup>th</sup>/14<sup>th</sup> public workshop presentation materials. If more in-depth material is desired, please refer to "project" documents. Both the presentation materials and project documents are located on the project website found at [www.water.ca.gov/BuildingCodes](http://www.water.ca.gov/BuildingCodes).

In this document the individuals who are responsible for development of this Code proposal update package are referred to as the "Building Codes Team" (BC Team). The BC Team formed a "TAC", which is a Technical Advisory Committee composed of staff from more than five state agencies and a number of additional stakeholder groups. The package shall be submitted by the BC Team on behalf of DWR to the California Building Standards Commission (CBSC) by that agency's July 1, 2009 deadline. On that date, the CBSC begins another "annual" update cycle to the California Building Standards Code (Code).

## 2. Life Safety

The primary intent of the proposed Code updates is to improve public safety (of persons in buildings) through improved designs that promote life safety. Reducing significant structural damage of buildings is also proposed with the focus of life safety.

In brief, the proposed Code update intends to do the following for specific occupancy types (e.g., buildings used for educational purposes) in areas protected by the facilities of the Central Valley Flood Protection Plan:

- Mitigate the threat of entrapment in buildings and/or drowning of persons in buildings due to rise of flood waters.
- Reduce the likelihood of structural collapse of buildings caused by hydrostatic forces from flood waters.

- Provide a temporary safe haven or flood “evacuation location” no less than one (1) foot above surface of the predicted “200-year” flood either within or on top of buildings until rescue is made.
- Provide a reasonable path to the evacuation location and rescue accommodations from that location.

It is important to note that with the advent of these code amendments, jurisdictions should look very closely at all height limitations they have imposed within their boundaries. Such limitations can be a detriment to complying with these provisions. Since the intent of these Code amendments is improving life safety of the citizens of the jurisdiction, it is reasonable to consider exceptions to height restrictions if necessary to meet the requirements for evacuation locations.

DWR acknowledges that a small number of buildings in areas protected by the facilities of the Central Valley Flood Protection Plan are designated as historic buildings. Because the primary objective is life safety, the proposed code amendments do not exempt these buildings from the requirements for existing buildings (refer to Section 6). As with other existing buildings, the requirement to provide a historic building with an evacuation location would be triggered by a proposal to perform substantial improvements. And, as with other existing buildings, in many cases it is reasonable to assume that evacuation locations may be identified *within* historic buildings. DWR anticipates that the proposed “alternate means of protection” provision will provide local officials sufficient authority to balance the life-safety objectives with preservation of historic integrity.

### 3. Application to Specific Occupancies.

In the upcoming Code cycle, DWR is proposing mandatory requirements for Group E (Educational) and Group R-3 (one- and two-family homes) and new Group R-3.1 (licensed as 24-hour residential care facilities with 6 or fewer clients). DWR is also proposing voluntary provisions for Group I (medical and care and detention facilities) and the remainder of Group R, such as hotels, apartments, and assisted living with more than 6 clients. The table, below, provides greater detail for the proposed new construction. For DWR’s proposal to existing construction, refer to the “scope” section within applicable Code update documents.

Recommended Applicable Occupancy Group	Brief Description (See Building Standards Code Section 3 for a Complete Description)	Recommendation on Applicability	
		Mandatory	Voluntary
Group E -- Education	More than 6-person educational facilities, including daycare through 12th grade	Yes	
Group I – Institution			
- Group I-1	Assisted living facilities with 24-hour housing clients because of age, mental status, and other reasons (e.g., residential care facilities, social rehabilitation facilities)		Yes
- Group I-2	Medical facilities with more than 6-person, 24-hour nonambulatory or bedridden persons (e.g., hospitals, nursing homes)		Yes
- Group I-3	Facilities with one or more persons who are under restraint (e.g., prisons, correction facilities)		Yes
- Group I-4	Daycare facilities with more than 6 unrelated		Yes

	adults or children on a less than 24-hour basis		
Group R -- Residential			
- Group R-1	Facilities with sleeping units for transient purposes (e.g., hotels, boarding houses)		Yes
- Group R-2	Facilities with sleeping units or more than 2 dwelling units for non-transient purposes (e.g., apartments, hotels)		Yes
- Group R-3	Residential buildings other than townhouses that do not contain more than two dwelling units; townhouses not more than three stories above grade in height with a separate means of egress (e.g., single family buildings)	Yes	
- Group R-3.1	Residentially-based 24-hour care facility accommodating six or fewer clients of any age (e.g., adult care home, foster family homes, group homes)	Yes	
- Group R-4	Residential care/assisted living facilities including more than six ambulatory clients		Yes

#### 4. Placement of the Code Provisions in the CBSC.

The placement of the code provisions in the CBC has been proposed in Chapter 4, Chapter 16, or a combination of the two chapters. It was determined early on that placement in Section 1612 would not be appropriate because Section 1612 only applies to flood hazard areas (commonly referred to as “100-year floodplains”).

Sections in Chapter 4 include provisions for special uses and occupancies that add to the requirements of the Code. In that respect, it is appropriate to put the proposed provisions in Chapter 4 because they will be additional requirements. However, the sections are for specific uses (e.g., covered mall buildings; underground buildings; pet kennels; winery caves; etc.) and the code provisions apply more broadly and include structural amendments.

A suggestion was offered to create a new lettered Chapter 31G for mandatory requirements. Chapter 31 is for Special Construction, including membrane structures, temporary structures, pedestrian walkways and tunnels, awnings and canopies, marquees, signs, and towers and antennas. California state agencies have in the past created five lettered chapters for specific uses (i.e., for public swimming pools, radiation, food establishments, tents and membrane structures, and marine terminals).

Both Chapter 4 and Chapter 31 have sections specific to certain occupancies, uses, and certain structures other than buildings. The proposed Code update provisions are written to apply to select occupancies in the upcoming cycle (first cycle for DWR) in the delineated area and can be accommodated in either chapter. The benefit of a section in Chapter 4 or a new Chapter 31G is that all mandatory requirements are in one location. However, it may be appropriate to put the structural provisions in Chapter 16 (and have text in Chapter 4 or 31G to refer to it).

For the voluntary provisions, one suggestion is to create a new Appendix G31 if a new lettered Chapter G31 is used. Currently, Appendix G addresses Flood Resistant Construction and therefore appears to be a very appropriate location. The “31” notation should assist Code users in seeing the connection between the mandatory provisions in Chapter G31 and the corresponding voluntary provisions.

In another development, the California Department of Housing and Community Development (HCD) has indicated that they plan to adopt Chapters 3 through 10 of the International Residential Code (IRC) in the upcoming Code cycle. These chapters cover one and two family residential units. If this occurs as planned, the proposed modifications to the Residential one- and two-family homes (R-3) will be located within that new California Residential Code (likely “CRC”). However, it is understood that the Group R-3.1 is not truly a sub-group of R-3 occupancy and will not be located in the new CRC. Therefore changes to the R-3.1 occupancy will likely be located in the California Building Code (CBC).

## **5. Use of Principle-based Code Text.**

For this first code amendment cycle, a decision was made early on to focus on population groups that can be particularly vulnerable during a “200-year” flood event (an event with a 1/200 annual chance of occurring) or are dependent on others to assist them to safer locations. Although the entire population in a floodplain is vulnerable to flooding, the term “vulnerable” is used to refer to children, persons with disabilities, elderly, and the like. In large part this focus is due to the number of occupancy groups in the CBC and the complexity of the construction issues related to the codes. A review of the 2007 CBC was conducted to identify the occupancy groups that were most likely to include such people. This review revealed that Groups E, I and R occupancies met this criterion. For a more complete discussion of the selection of these occupancy groups, refer to Item #3 above. The guiding principle for this first code amendment then became the life safety of the vulnerable and dependent persons. It shall be noted that proposing the Code update as mandatory in the Residential occupancy group R-3 and Educational occupancy group benefits *all* persons, both vulnerable and non-vulnerable alike.

Next, existing flood regulations in the State were considered and whether the new definition of Water Surface Elevation for a 200-year floor event (WSEL200) needed to comply with only the NFIP criteria. The existing NFIP flood provisions have as their main ideal the elevation of the lowest occupied floor level to just above the 100-year flood elevation. Since the proposed flood maps for the new WSEL200 were only in draft stage, a direct comparison was not possible. However, it was known from other data that the differences between the NFIP levels and the 200-year levels varied widely from location to location. There were even areas that were not shown in the NFIP maps but had significant elevations on the potential 200-year maps. As such, it was considered that the NFIP criterion was not feasible and a new manner of protecting occupants was needed. The principle chosen allowed the BC Team and TAC to bring in new ideas and concepts. This spirit of innovation also meant that other new ideas had to be allowed as well. The use of Alternate Means of Protection is a necessary part of this criteria and it is understood that in the near future it may generate new prescriptive criteria as contemporary and innovative ideas gain wide acceptance.

## 6. Application to Existing Buildings.

This set of code amendments does not include retroactive requirements for existing buildings. Many of the at-risk areas, however, are significantly developed. DWR recognizes that compliance with the current Code is required for new construction and for existing buildings when owners propose certain types of work. Thus, many people and buildings will not benefit from the proposed entrapment mitigation measures because most existing buildings are unlikely to undergo significant renovations.

At this time, DWR is proposing to use the trigger that is in the Code for buildings in the 100-year floodplain. That trigger is based on the dollar value of work on existing buildings – when the cost of work equals or exceeds 50% of the market value of the building, compliance is required. Work might be additions, renovations, alterations, or repairs. Those familiar with the requirements for 100-year floodplains know this as “substantial improvement” and “substantial damage”. The definitions of these terms are found in Section 1612. Within the code amendment, an owner who proposes work that triggers the requirement would have to identify an evacuation location that has an acceptable route to it, and from which occupants can be easily accessed and rescued. DWR anticipates that many existing buildings will be able to provide an evacuation location without significant alterations. For example, a second floor may already be no less than one (1) foot above the predicted 200-year water surface elevation and of sufficient size given the number of occupants, so compliance would be achieved by: (1) providing an acceptable window for rescue, if one does not exist and (2) provide means for flood waters to enter the closed building to prevent the exterior hydrostatic forces from causing the building to collapse.

This trigger, however, will mean that most of the existing population currently living within areas protected by the facilities of the CVFPP will not have the added safety afforded by the proposed code amendment. DWR will continue to consider options to increase public safety. One approach that would not be accomplished through the Code might be to require owners of existing buildings to identify their vulnerability and identify evacuation options.

Another issue for existing buildings is tracking accumulated work over time on a given building. DWR’s proposal does not require this tracking; however, it would be prudent for jurisdictions to consider recording the type and amount of work done over time to see if the accumulation of such work might exceed the thresholds found in the Substantial Improvement/ Substantial Damage tests. Each jurisdiction would need to gather and maintain information documenting improvements as they are made on individual buildings and be able to quickly determine if the threshold of Substantial Improvement/Substantial Damage test has been surpassed. Most jurisdictions do not currently track this information about incremental and cumulative improvements or repairs by structure.

A small number of existing buildings may be designated as historic buildings. As explained in Section 2, DWR is not proposing to exempt historic buildings from the requirements for existing buildings.

## **7. Accessibility.**

All buildings and structures currently required to be accessible are required by the proposal to extend that accessibility to the route to the evacuation location and to an accessible evacuation location. Those uses that are not required by Chapters 11A or 11B, or other legislation, to be accessible are not required to have accessible routes to the evacuation locations or to have accessible evacuation locations. It is not the intent of this proposal to increase the application of accessibility criteria to uses that are not now required to be accessible. There are other forums that are more appropriate venues for addressing any increases in the scope of any accessibility concerns.

Another concern was the application of accessibility criteria in mixed uses or in those instances where Chapters 11A and 11B are applied. It is not the intent of this proposal to change the application of accessibility criteria. In all cases, the more restrictive requirements would apply.

One more concern for DWR is that it recognizes that where accessibility is provided to upper floor levels by elevators, service equipment essential to the operation of the elevators must be elevated no less than one (1) foot above the WSEL200. This has been included in the proposal.

## **8. Sizing the Evacuation Location.**

The proposal requires evacuation locations to have a minimum gross floor area of 7 square feet per occupant, based on the occupant load of the portions of the building that are below WSEL200.

If a populated area that is protected by the facilities of the CVFPP becomes flooded, it is likely that flood conditions will last more than a day. Given the large size of the vulnerable areas and the very large number of buildings that may have to be evacuated, it is reasonable to assume that some people may need to remain in the evacuation location for 24 hours or more. Therefore, more space than is required for standing room is appropriate. Table 1004.1.1 Maximum Floor Area Allowances per Occupant, specifies 7 square feet (net) per occupant for space that functions as assembly without fixed seats, concentrated (chairs only-not fixed). For assembly standing space, 5 square feet (net) per occupant is specified.

Also, in buildings required to be accessible, an adequate area for wheelchairs or for people who need to lie down should be provided. As such, in those uses where accessibility is required, an additional 35 square feet for every 50<sup>th</sup> occupant is proposed as the minimum requirement. Where building owners know their occupants would have greater space needs (e.g., hospital floors below the WSEL200), owners should consider appropriate adjustments from the minimum.

It is recognized that sizing the evacuation location for R-3 may take a different approach than simply applying an occupant load of 200 square feet gross per occupant called for in the CBC. However at this time, another option was not found.

## **9. Area of Refuge.**

The Code defines an Area of Refuge as “an area where persons unable to use stairways can remain temporarily to await instructions or assistance during emergency evacuation.” The draft proposal does not limit the use of the area designated as an evacuation location when it is not needed for emergencies. Therefore, evacuation locations can be areas of interior floors, decks, balconies, and even rooftops. So long as these building elements comply with the criteria for evacuation locations then they can also be used for any other purpose. In addition, the requirements for evacuation locations and areas of refuge may be satisfied concurrently, it is the responsibility of the designer to satisfy all applicable requirements and to communicate that to the enforcing agency.

## **10. Decks and Balconies that are not at the Same Level as the Level of a Floor.**

If the elevation of a floor is no less than one (1) foot above WSEL200, the evacuation location may be an area on that floor. It is expected that some designers will raise a foundation so that a floor can be the evacuation location. An alternative would be to provide a deck or balcony that is not at the same elevation as a floor, but is higher in order to be above the WSEL200 plus one foot (see illustration #2A within the companion illustration handout). For example, in areas with deep flooding where the WSEL200 is above the second floor, rather than use the rooftop or add a third story, an option would be to build a “super” deck or balcony. Because the “super” deck or balcony is not at the same elevation as a floor of the building, means must be provided for occupants to reach it by a stairway, ramp, alternating tread device, fixed ladder, lift, or other means approved by the building official. If the super deck or balcony is designed and intended for regular use, the current Code requirements apply the appropriate means of access/egress (e.g., properly designed stairs, etc.). For occupancy group R-3 (and R-3.1) a ladder would be an acceptable means of access.

## **11. Platforms on Sloped Roofs**

If the designer provides a rooftop evacuation location, the proposal requires a rooftop platform as a function of roof slope and for Group R-3 occupancies as a function of roofing materials and roof slope. The concern is that roof materials can be slippery when wet. The slopes specified in the proposal were selected for consistency with the minimum slopes for drainage or on the ability of the material to resist moisture intrusion in Group R-3, not on empirical evidence of safety. Also, a question was raised regarding the use of service platforms for rooftop equipment as evacuation locations. The code amendment does not intend to exclude the use of any type of rooftop platform that complies with these proposed code amendments.

## **12. Perimeter Protection for Rooftop Platforms and Rooftop Areas.**

For occupancies other than R-3 and R-3.1, the Code proposal requires guards when a rooftop area or platform is the evacuation location. Such protection might take the form of a guard system (railings or panels) or parapets. It is recognized that people on a rooftop evacuation location are surrounded by water, so the falling hazard is not equivalent to normal conditions. However, the distance from the roof to the water may still be considerable.

For R-3 and R-3.1 occupancies, the perimeter protection is required along the perimeter of the evacuation location. If a rooftop platform is provided (e.g., where roof slopes exceed a certain slope as a function of roofing material), the perimeter protection is the same as guards (railings or panels). For evacuation locations on sloped roofs, there is some concern about occupant fatigue. Therefore, while a full-height guard is not required, but a low profile railing (or curb) that is 12 inches in height is proposed to facilitate resting and to reduce fears of slipping when rooftops are damp.

### **13. Attics as Evacuation Locations.**

Subsequent to the distribution of the draft proposal, a question was asked regarding the use of attics as evacuation locations. As indicated earlier, the code amendment does not intend to preclude other complying areas, such as attics. In addition to all other evacuation location criteria applying, sufficient head-room shall also be provided. The proposal was amended to require minimum head-room. In addition, solidly sheathed flooring requirements are also required. The specified means for occupants to move from the evacuation location to be evacuated would still apply, such as a gable-end window that meets the minimum size requirements or a hatch to the roof.

### **14. Stand-alone Decks (Not Accessible from within the Building) or Decks/Balconies on Accessory Buildings as Evacuation Location for Occupants of Primary Structure.**

DWR does not intend to draft code amendments for these options because occupants would have to exit the primary structure and travel an unknown distance to reach an evacuation location, possibly having to move through rising floodwaters in the process. These alternatives could be considered, however, under the Alternate Means of Protection provisions, where the building official would take into consideration comments from the “applicable emergency management authority regarding plans and processes related to notification of anticipated conditions of flooding, warnings, evacuations, and other pertinent conditions.” Refer to items #18 and #19.

### **15. Identification of Evacuation Location and Route on Construction Drawings.**

In order for building officials, plan reviewers, and inspectors to know which area is to be used as an evacuation location, the area must be indicated on the plans. It is not necessary to explicitly call for this identification because it is the responsibility of the designer to demonstrate compliance. The clearest method would be similar to those used to illustrate accessibility and means of egress routes to and within buildings, which typically are shown on a separate sheet of the plans.

### **16. Signage for Some Occupancies.**

Signage is required in the code amendment to direct occupants to an evacuation location and to identify the means by which occupants are expected to escape the building. Signage can be a useful tool to notify persons in transient occupancies, as is done for fire escape plans in hotels and motels. Without such signage, after a number of years, the occupants (and perhaps building owners and managers) may forget that an evacuation location even exists. It is also recommended that a small sign be placed on the curb in front of the building identifying that building as having an evacuation location. It is understood that in the event of the design flood that that sign will be inundated. However, it will also raise the awareness in the area of the

hazard and may help to encourage people to obey evacuation orders when they do occur. This was not written into the code amendment as most such curbs are located in the public way and not subject to building code requirements.

Signage in the R-3 occupancy is proposed in inconspicuous areas with the understanding that owners will not tolerate the sign being visible within the living space. In addition to signage being required in the Group E occupancy that indicates the location and path to the flood evacuation location, a second sign is required to indicate the predicted water surface elevation for the 200-year flood event. This sign is anticipated to stimulate discussion between faculty and students as a public awareness measure.

#### **17. Voluntary Flood Emergency Supply Storage Area.**

A voluntary requirement was added for a flood emergency supply storage container or closet to be located in or immediately near the evacuation location with signage on the container or closet that clearly identifies the area. Building Codes require very few detachable devices, such as fire extinguishers. Extinguishers are typically inspected by fire departments in some uses on an annual basis. There is no current means of inspecting such supply areas on a regular basis provided in the proposal. Therefore, it was included as a recommendation.

Inflatable rafts, personal floatation devices, and flare guns could be stored in these containers among many other items. However, inflatable rafts, batteries for portable radios and similar devices cannot be expected to function properly after long-term (multiple years) storage without proper inspection and necessary repair or replacement. The container with appropriate signage could be required at a future date though. Signage would notify occupants for proper emergency response with wording similar to the following:

- DO NOT intentionally remain in a flooding region. Evacuate the region to higher ground if there is good chance you (and the occupants you are responsible for) can make it.
- Store emergency equipment and supplies for floods in this container. These may include: personal floatation devices, flare guns, blankets, rope, portable radio with batteries, inflatable rafts, non-perishable foods and devices to open/use food, toiletries, and medications. Use good judgment. Elevated temperatures (e.g., in attics) may damage items such as inflatable rafts or food and *extreme* heat may cause flammable items to combust.
- Routinely inspect emergency supplies for proper functioning. Minimum time span should be not more than one year.

#### **18. Alternate Means of Protection.**

The proposed code includes a section for consideration of alternate means of protection. It was deemed necessary because the Code's current provisions for approval of alternatives provide the building official the authority to approve alternative materials, designs and methods of construction (see below for Sec. 108.7 and Sec. 104.11). DWR anticipates that alternatives will be sought if an owner wants to justify a means of protection that is other than providing an evacuation location. For example, a condominium or apartment complex developer may propose that a single evacuation location (e.g., in a communal recreation building) is sufficient for all

occupants, especially if the community has good flood hazard monitoring and warning capabilities<sup>1</sup>. A developer may propose a “stand-alone” deck or an evacuation location in an accessory building to serve the primary building. Officials may receive requests to consider floating dock-type systems that would rise with the rising flood waters as well.

When using an alternate means of protection approach, it is important to understand the issues that a design team and jurisdiction needs to consider. Issues such as the demographics of the region and within the proposed development, and whether there are schools, day cares, theaters, hospitals, etc. that would be impacted. The distance to levees and their integrity should be evaluated and considered. Whether the local jurisdiction has an effective evacuation plan in place (e.g., updated to reflect current personnel, equipment and/or utilizing available resources, such as area auto-dialers) or other mitigating systems must be considered. Also, for the proposed project, the maximum distance from buildings to an evacuation location should be considered relative to the expected mobility of the population the project would serve. If designers and officials consider floating dock-type systems, it is recommended that access to the dock should be evaluated with consistent criteria as access to a fixed location evacuation location. It is likely that there are many more issues to consider in the evaluation of alternatives.

Two other reasons why the proposed alternate means of protection provision is necessary are (1) Sec. 108.7 pertains only to occupancies subject to the HCD requirements; and (2) Sec. 104.11 is in Appendix Chapter 1, which is voluntary.

**[Department of Housing and Community Development]**

**108.7 ALTERNATE MATERIALS, DESIGNS, TESTS AND METHODS OF CONSTRUCTION**

**108.7.1 General.**

*The provisions of this code, as adopted by the Department of Housing and community Development are not intended to prevent the use of any alternate material, appliance, installation, device, arrangement, method, design or method of construction not specifically prescribed by this code. Consideration and approval of alternates shall comply with Section 108.7.2 for local building departments and Section 108.7.3 for the Department of Housing and Community Development.*

**[Appendix Chapter 1 Administration]**

**104.11 Alternative materials, design and methods of construction and equipment.**

The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

**19. Requesting Information for Alternate Means of Protection.**

The last section of each code proposal is the criteria for Alternate Means of Protection as previously noted. Within this criterion there is a requirement that the applicant obtain information on the feasibility of the proposed alternate from agencies that have the responsibility

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<sup>1</sup> The implementation of auto-dialers by the local jurisdiction, for example, could increase the flood warning system effectiveness. These systems automatically dial the telephone number of all the citizens of the jurisdiction when an emergency is declared or an evacuation has been ordered. The City of Roseville has implemented such a system.

to protect the occupants downstream. There is also a reference to a Directory of Flood Officials that can be found on the DWR web site [www.water.ca.gov/BuildingCodes](http://www.water.ca.gov/BuildingCodes), that includes contact information for the officials/agencies responsible for the regions in which such projects can be built. These officials or their agents are required to be contacted and information received from them prior to the issuance of any building permit subject to these proposed code amendments. It is highly recommended that they be consulted early on in the design process for their input if an alternate is desired.

## **20. Requirements to Elevate for FEMA-Mapped Flood Hazard Areas.**

FEMA's National Flood Insurance Program develops maps to delineate areas that are prone to flooding by the 100-year flood (1%-annual chance flood). The NFIP regulations for the design and construction of buildings in floodplains are incorporated in the California Building Standards Code (ASCE 24 is a referenced standard in the Code). The primary requirement is elevation of the lowest floor (including basement) to or above the base flood elevation (only nonresidential buildings can be dry floodproofed).

Significant areas where the proposed code will apply are not shown on FEMA's maps as 100-year floodplains. Where an area is in both the 100-year floodplain and the area protected by the facilities of the CVFPP, a building must be designed to meet the requirements for both. Although the difference between the base flood elevation and the WSEL200 won't be known until the new maps are prepared, it is anticipated that where a building must already be elevated, a designer may determine that a reasonable solution is to add additional height to the foundation so it is elevated to the WSEL200 (the evacuation location must be no less than one foot above the WSEL200), which then makes the lowest floor its evacuation location (and occupants would move through the at-grade exit doors to be evacuated).

Where an area is subject to flooding by the 200-year flood and is not mapped as 100-year floodplain, then only the proposed code will apply (not Section 1612). Again, it is anticipated that designers will consider elevation as an option to raise the main floor to no less than one (1) foot above the WSEL200 so that it qualifies as the evacuation location. However, many of the areas that are protected by the facilities of the CVFPP will have flood depths greater than 8 feet deep (some areas will likely have flood depths in excess of 25 feet). It was determined that requiring all buildings in all areas protected by the facilities of the CVFPP to comply with all of the requirements in Section 1612 would not be reasonable.

## **21. Hydrodynamic Loads are not Explicitly Considered.**

The California Building Standards Code refers to ASCE 7, *Minimum Design Loads for Buildings and Structures* for loads, including flood loads. Flood loads include hydrostatic loads (imposed by depth of water) and hydrodynamic loads (imposed by moving water). Other flood loads are wave loads and debris impact loads. According to ASCE 7, Section 5.4.3, "[w]here water velocities do not exceed 10 feet per second, dynamic effects of moving water shall be permitted to be converted into equivalent hydrostatic loads". Using the formula provided, 10 feet per second converts to 1.9 feet of head. It is estimated that most areas where the Code requirements will apply should have low flow velocities and DWR does not anticipate designating velocities on the maps to delineate these areas. Thus, it is not necessary to explicitly consider

hydrodynamic loads. It is understood that high velocities will be experienced near where levee breaches occur, but precise locations of sudden levee failure cannot be predicted and mapped.

## **22. Required Loads on Evacuation Locations.**

The application of loads for the design of evacuation locations was thoroughly discussed. Initially, a load of 100 psf was considered to be imposed for balconies. This was determined to be overly conservative and not consistent with the CBC loads for many uses and the team revised it to be the same as the occupancy served. Another issue that was brought up was the application of this additional loading especially for rooftop platforms to the building. The intent of the BC Team was that only the supporting elements of these platforms (evacuation locations) need carry the additional loading. The entire rooftop need not be designed for the additional loading. If owners elect to design only the evacuation location and its supporting members to be structurally stable, then proof would be required by the building official to indicate how the structurally stable building portion will perform with the rest of the structure.

## **23. Calculation of Occupant Load.**

A question was raised about the occupant loads in the code amendment packages. While this is something that building officials are very familiar with, this set of code amendments went to a broader audience who was not exposed to that particular triggering mechanism. A brief explanation is needed in this narrative.

Occupant load is a trigger that the building codes have used for many years. In most cases, other than assembly types of uses, it is not a true count of the bodies that may occupy a space or building. It is a system that attempts to determine a number that can be used to size particular elements within a building or perhaps the point at which additional fire-resistive construction may be needed. In the case of assembly uses, it is the actual number of people allowed within the space or building. The fire department then enforces that figure to assure a fire-safe situation for the occupants of those assembly uses. The occupant load is determined by the square footage of the space or building in question divided by a factor from Table 1004.1.1 Maximum Floor Allowances per Occupant from the 2007 CBC. A simple example is found in dwellings. The factor for residential (dwellings) in the table is 200 square feet per occupant. Remember this is not the actual count of persons in the dwelling. So for a 2,000 square foot house with 1,400 square feet below the WSEL200, by dividing the 1,400 by 200, you have an occupant load of 7 (and the evacuation location size for this example home would be 35 square feet minimum). It becomes a little more complicated with multiple uses that have multiple factors but the procedure is the same.

## **24. Administrative Provisions.**

While these proposals do have code amendments for the administrative chapter for jurisdictions, it is known that those chapters are not sent by each jurisdiction to the CBSC for approval and can vary widely in the State. DWR does intend that the code amendment packages developed when adopted include the administrative amendments. They are a necessary element in assuring that the mitigation efforts proposed in any alternate get the necessary input from the local flood official that can assist the building official in the determination of the acceptability of alternate measures.