

2016 CBC Applicable Cross-Laminated Timber (CLT) Sections

Contact: Dennis Richardson PE, CBO, CASp American Wood Council drichardson@awc.org

Structural Glued Cross-Laminated Timber. A new definition for a wood-based product identified as cross-laminated timber (CLT) has been added to **CBC Section 202**. The new manufacturing standard ANSI/APA PRG 320 is now referenced in **CBC Section 2303.1.4** and has been added to **Chapter 35**.

For reference, In addition to the new definition and product standard for CLT, there are several code sections relating to the application of CLT in the 2016 CBC including:

- Types I and II, (**CBC Section 603.1, Item 19**): Roof construction and secondary members (**footnote c in CBC Table 601**), Exterior structural members (**CBC Section 602.4.9 (misprint as 602.4.7 in CBC Section 603.1, Item 19)**), and Balconies and similar projections (**CBC Section 1406.3**).
- Type III: Interior building elements (**CBC Section 602.3**)
- Type IV HT: General (**CBC Section 602.4**), Exterior walls (**CBC Sections 602.4.2 and 602.4.8.2**), Floors (**CBC Section 602.4.6.2**), Roofs (**CBC Section 602.4.7**), Interior walls and partitions (**CBC Section 602.4.8.1**).
- Type V: all elements (**CBC Section 602.5**)
- Other specific references where Type IV HT or Heavy Timber is specified: Canopies (**CBC Section 406.7.2**), Grain processing and storage (**CBC Section 426.1**) Combustible projections (**CBC Section 705.2.3**), Interior finish (**CBC Section 803.3 and CFC 803.1**), Balconies and similar projections (**CBC Section 1406.3**), Penthouses (**CBC Section 1510.2.5**), Tank supports (**CBC Section 1510.3**), Membrane structure frames (**CBC Section 3102.3**) and Awning and canopy frames (**CBC Section 3105.3**)
- Structural fire resistance calculation for exposed CLT: Reference to 2015 NDS – Chapter 16, (**CBC Section 722.1**) Note: CBC (**Sections 703.2 and 703.3**) establishes ASTM E119 or UL263 as the method for tests and other methods to establish fire resistance rating. **CBC (Section 703.3, item 3)** refers to calculations in **CBC Section 722**. **CBC (Section 703.3, item 4)** permits engineering analysis based on a comparison of a building element, component or assemblies design determined by test (for example to utilize integrity requirements from an E 119 tested assembly for a NDS calculated CLT horizontal or fire barrier assembly).

Insight

All Decked Out¹

“If you want to save cash. . . flash”

“Don’t be a dope. . . slope”

An edited version of this Insight first appeared in the ASHRAE Journal.

By Joseph W. Lstiburek, Ph.D., P.Eng., Fellow ASHRAE

We are adding balconies to everything and people are forgetting that balconies are more than decoration but also have to function. And when we get it wrong it can be catastrophic².

We are going to be dealing with wood balconies due to their popularity and because they tend to get done wrong more often than concrete and steel balconies.

Aside from the obvious structural engineering issues dealing with water is the number one issue.

With any balcony, getting the water off of it is a big deal. You need to drain the rain. Let me repeat, you need to drain the rain. Balconies need to slope to provide drainage. How much? One-quarter inch per foot works. When you slope the balcony deck the water goes over the balcony edge and the edge needs a drip function. And where the edge meets a wall it needs to terminate in a gutter or a “kick out”. If you do not provide a drip edge water stains the surface of the balcony face. Not a very good aesthetic result. It can also allow the water to wick inward.

It gets interesting³ when the balcony “traffic surface” is a concrete topping or tile set in concrete. There are two

1 “decked out” – to be decorated with something, or dressed in something special – from the Cambridge Dictionary

2 Balcony collapse in Berkeley, CA June 16, 2015 resulting in 6 deaths and 7 serious injuries

3 As an engineer I try to avoid “interesting” details as much as possible. “May you live in interesting times” is purported to be a Chinese curse and means “may you experience much disorder and trouble in your life”. I am pretty sure a Chinese engineer coined the phrase. OK, not true, no engineer, Chinese or otherwise, had anything to do with the coining of the phrase. But all engineers get it. The phrases popularization is attributed to Bobby

fundamental approaches to “waterproofing” a balcony deck. The first is where the waterproofing layer is exposed and also is the traffic surface. The second is where the waterproofing layer is covered over by a traffic surface. Wherever the waterproofing layer is covered it is critical that a drainage layer or space is provided immediately above the waterproofing layer. I do not use the word “critical” lightly. How big/deep/thick this drainage layer of space should be is open to debate. I typically recommend 3/8-inch. Note that concrete toppings are not waterproofing layers. And coating them with sealers does not turn them into waterproofing layers.

It gets even more interesting when architects push the balconies outwards and inwards and locate them in corners. The waterproofing of the balcony deck needs to connect to the waterproofing of the walls. Remember the first principle of building enclosures? Connect the water control layer of the wall to the water control layer of the roof and to the water control layer of the foundation? Well, a balcony is a roof that you walk on. The aesthetic complexity results in construction complexity. The detailing and execution of the detailing is a big deal. It is probably the most difficult thing to get right and probably the most important thing to get right.

Two of the most common—and most problematic—balcony detailing geometries are presented in **Figure 1** and **Figure 2**. The figures are drawn with a concrete traffic surface installed over a waterproofing layer and drainage mat.

The figures are also drawn with a standard sheet water resistive barrier (WRB) such as building paper. The details remain substantially the same if a fluid applied water control layer is used or a fully adhered sheet membrane water control layer is used.

The details in **Figure 1** show the intersection of a balcony edge perpendicular to a wall.

The details in **Figure 2** show the intersection of a balcony edge proud of a wall.

Photograph 1 shows a sealant joint at the perimeter of the balcony deck where it intersects the exterior wall. Note the primer application on engineered wood deck

Kennedy from a speech in Cape Town in the mid 1960’s – a time and place that was apparently interesting.

Figure 1: Intersection of a Balcony Edge Perpendicular to a Wall—The details remain substantially the same if a fluid applied water control layer is used or a fully adhered sheet membrane water control layer is used.

Figure 1a

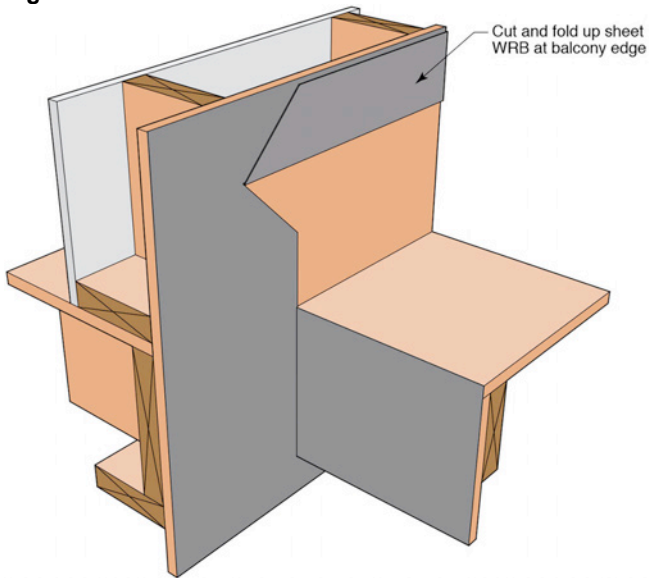


Figure 1b

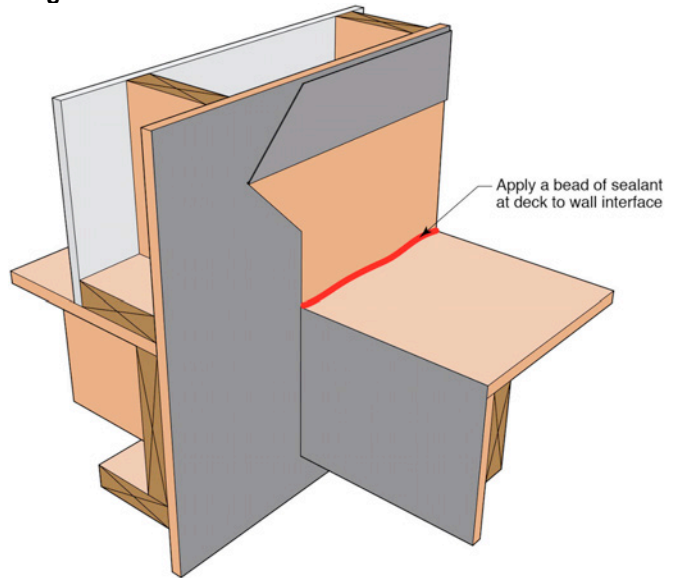


Figure 1c

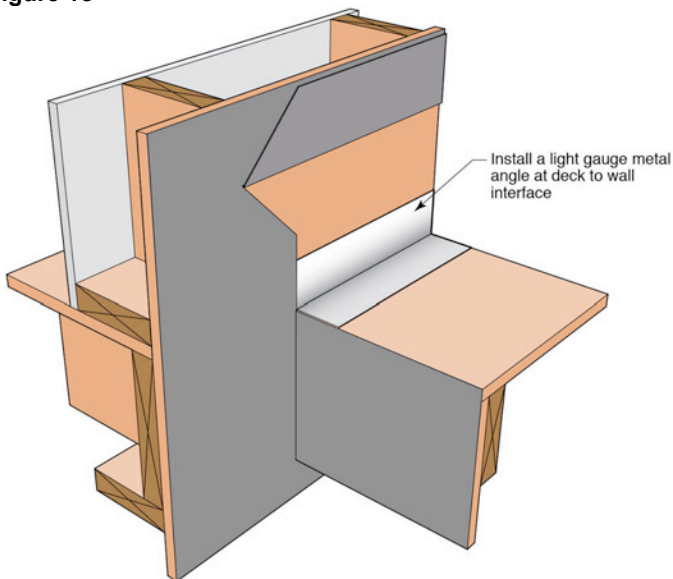


Figure 1d

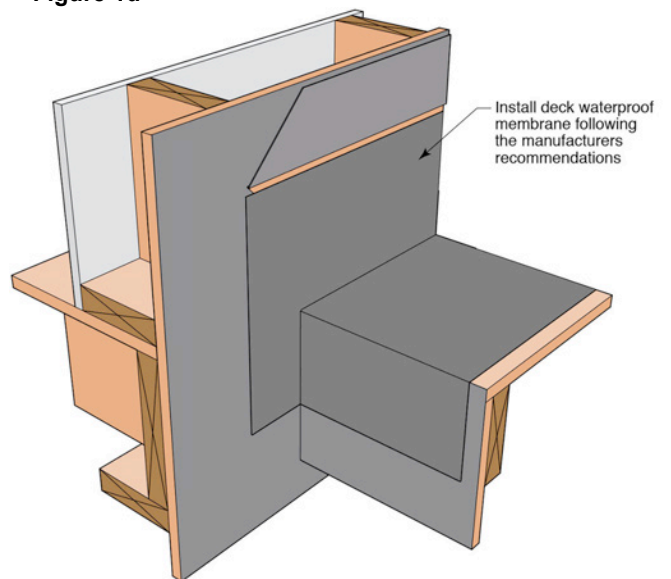


Figure 1e

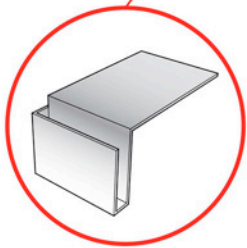
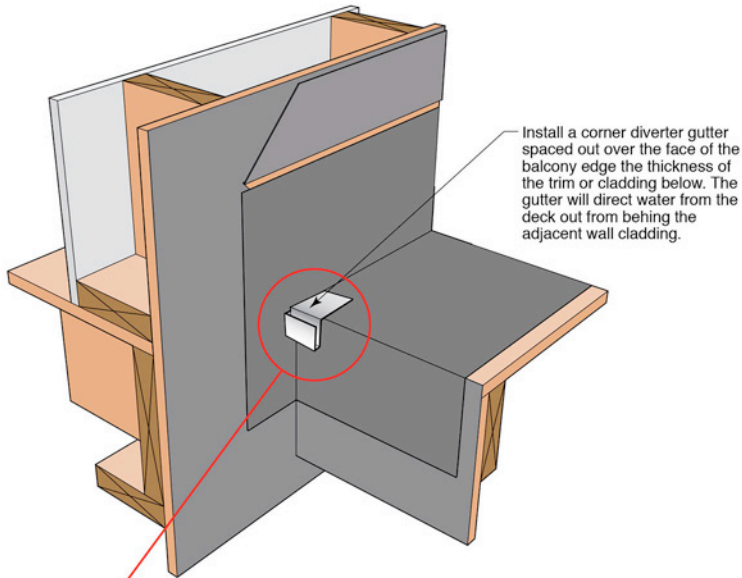


Figure 1f

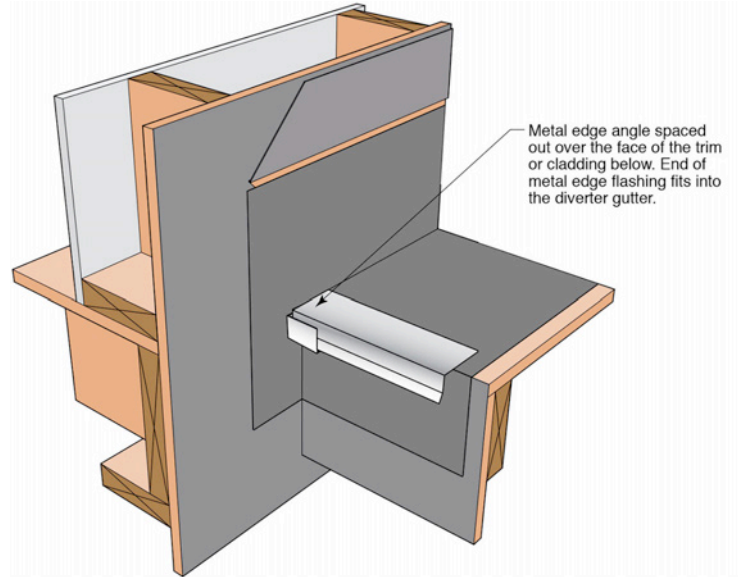


Figure 1g

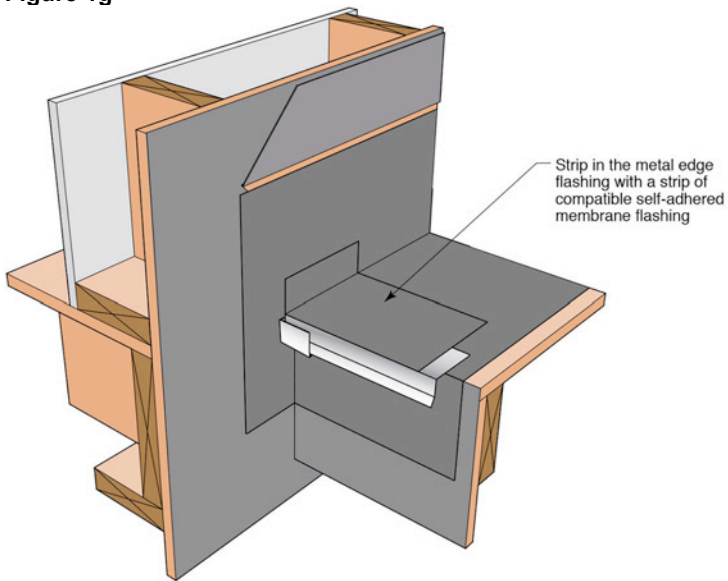


Figure 1h

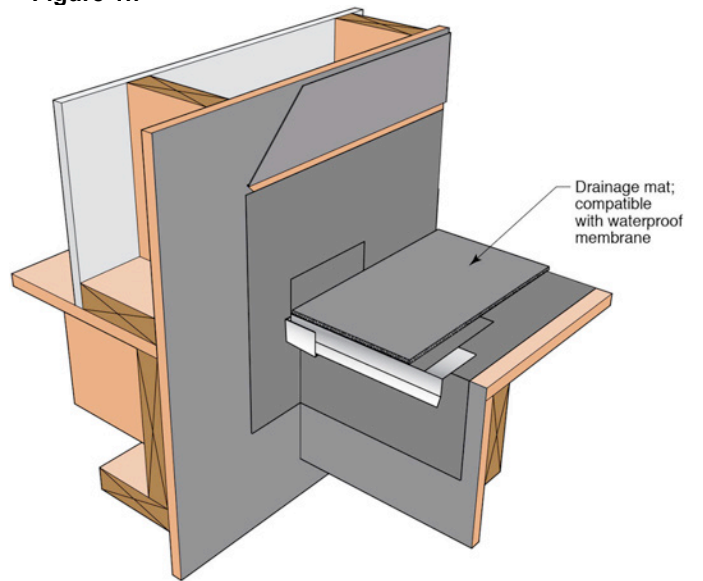


Figure 1i

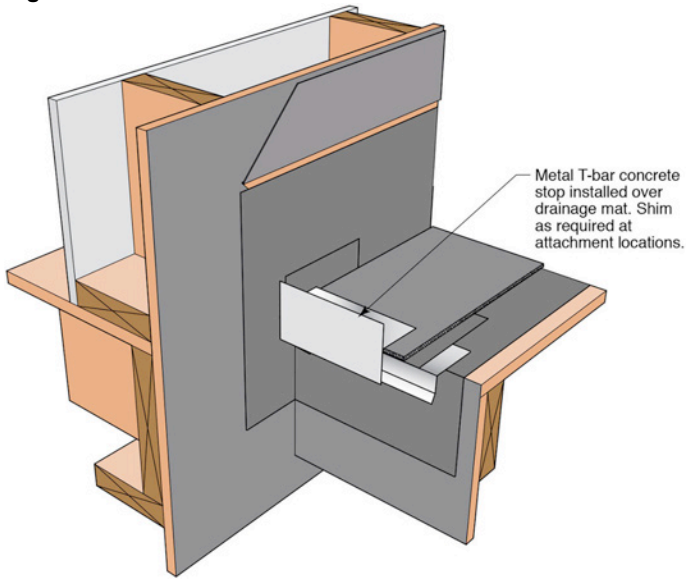


Figure 1j

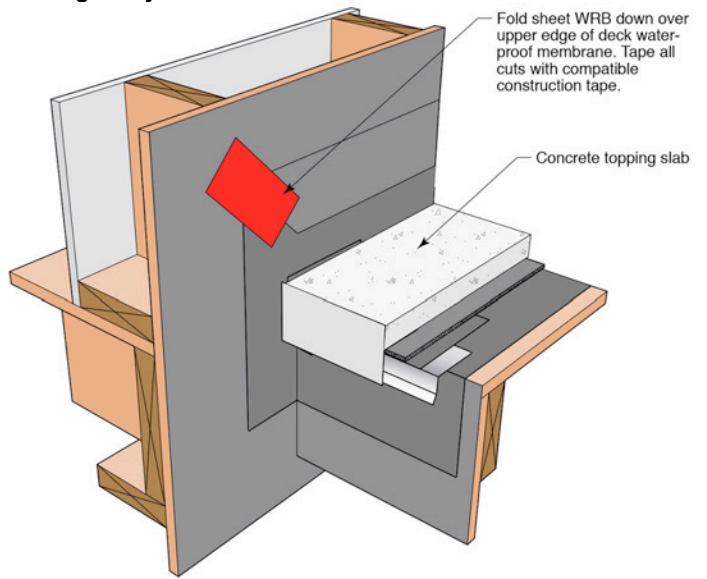


Figure 2: Intersection of a Balcony Edge Proud of a Wall—The details remain substantially the same if a fluid applied water control layer is used or a fully adhered sheet membrane water control layer is used.

Figure 2a

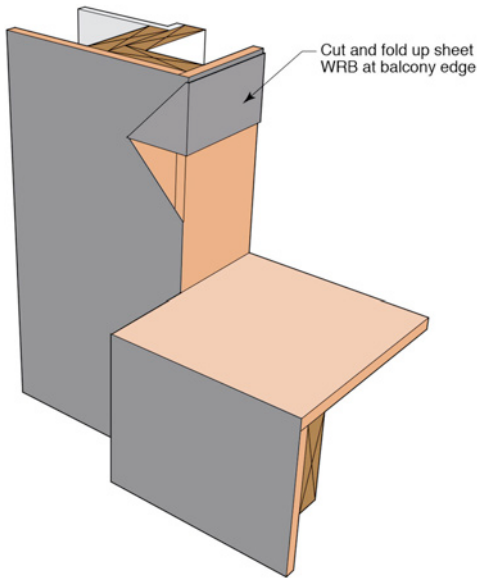


Figure 2b

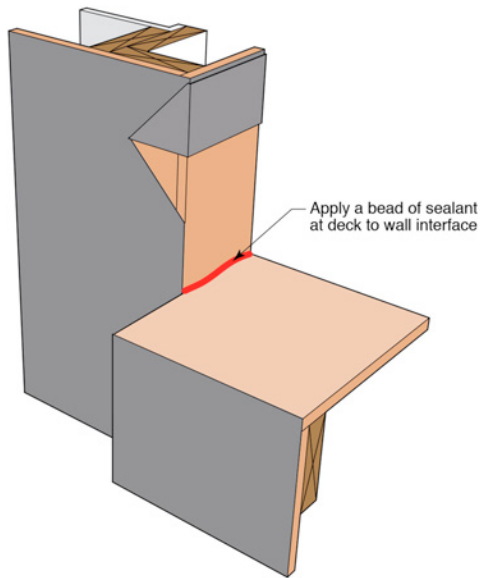


Figure 2c

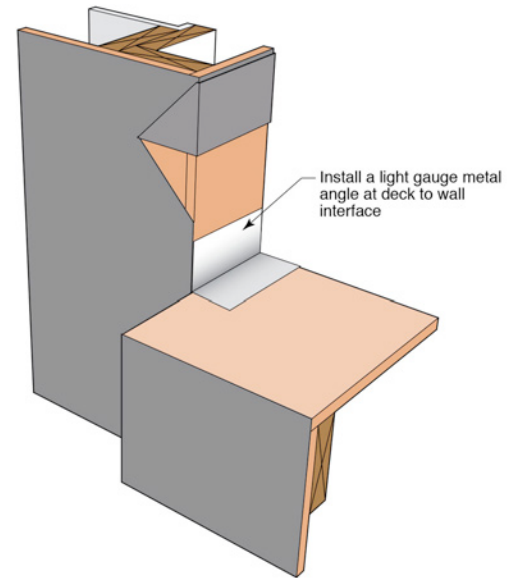


Figure 2d

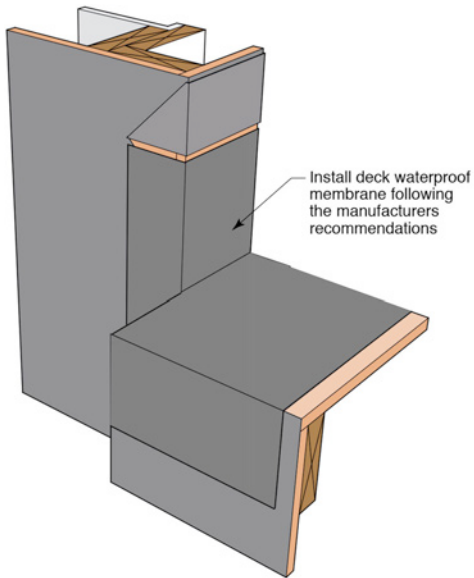


Figure 2e

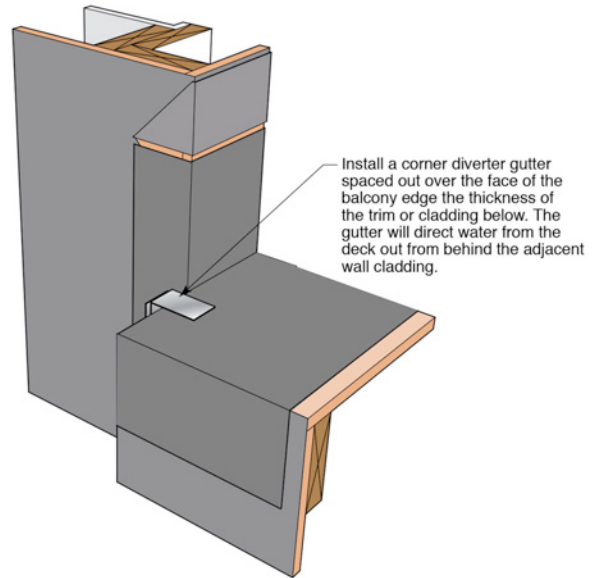


Figure 2f (reverse view)

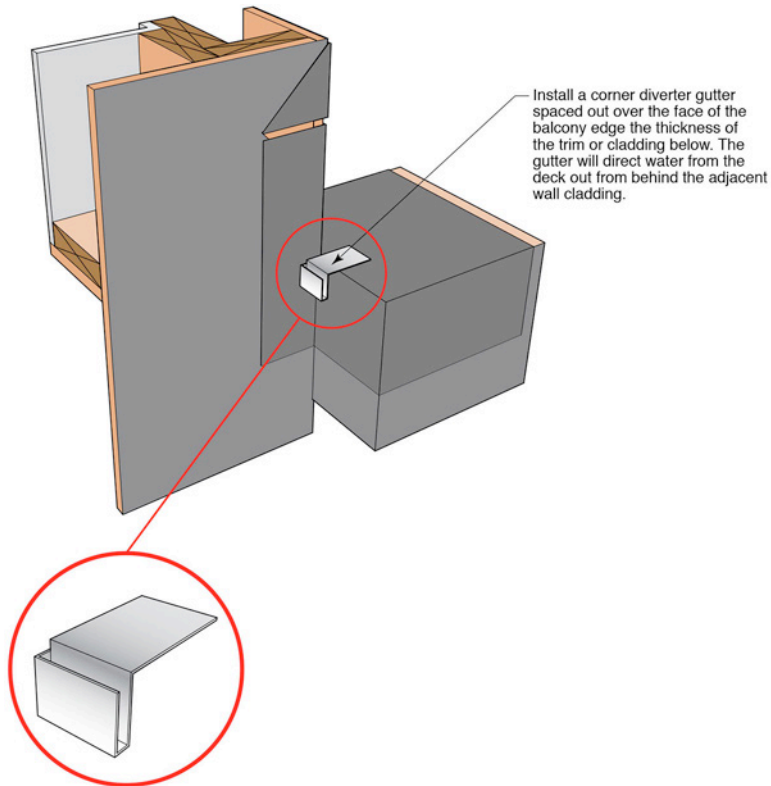


Figure 2g

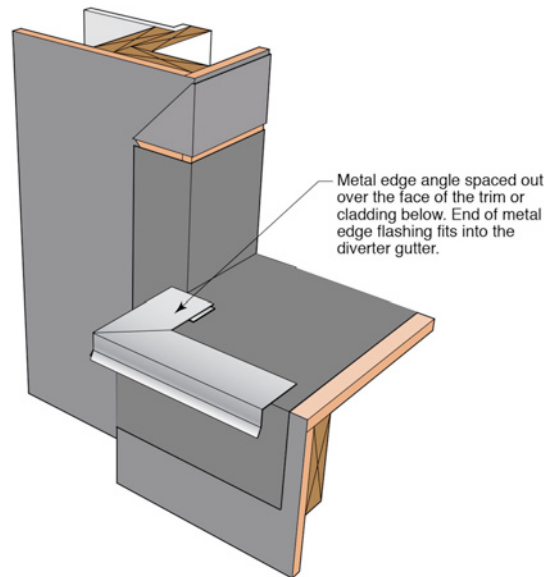


Figure 2h (reverse view)

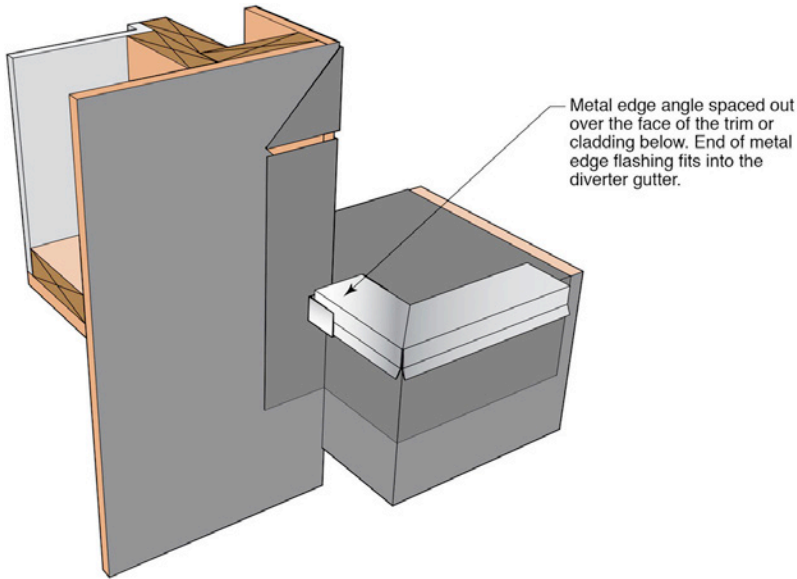


Figure 2i

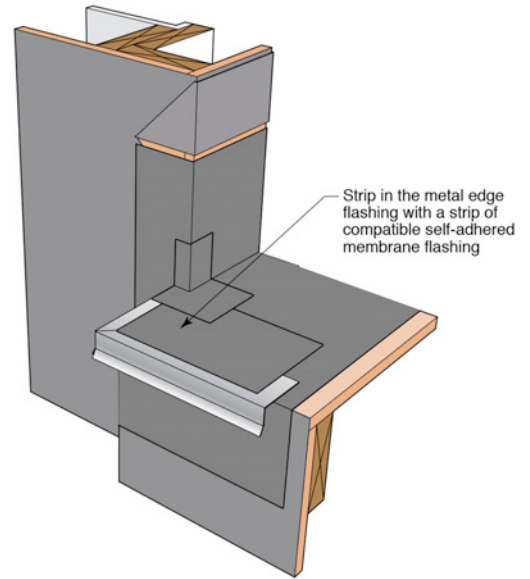


Figure 2k

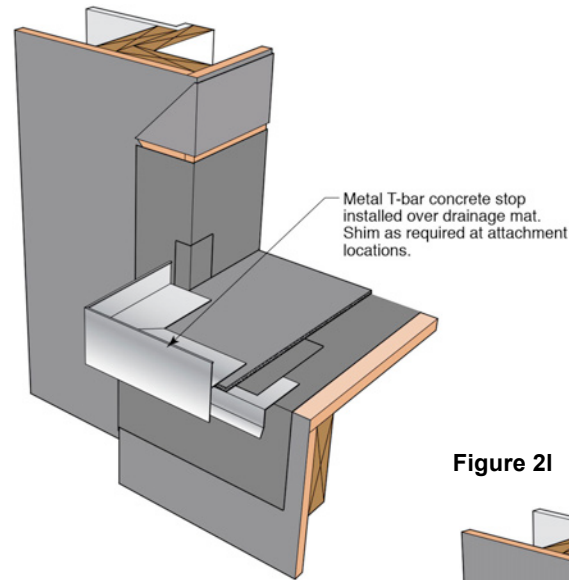


Figure 2j

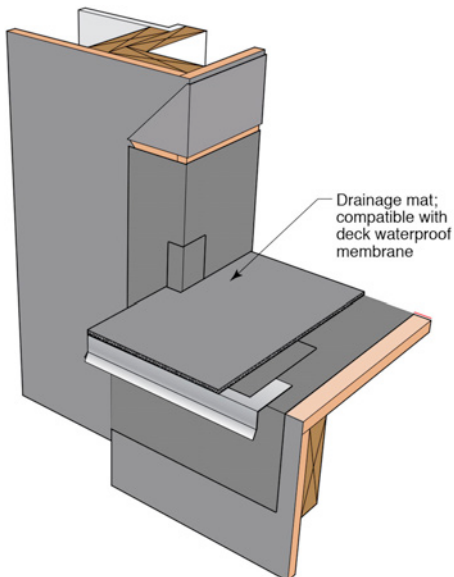
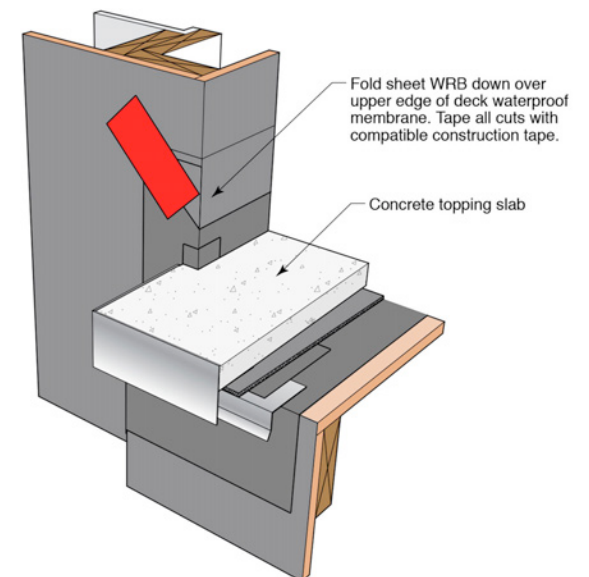


Figure 2l



sheathing and the OSB wall sheathing. The primer's function is to facilitate adhesion of the waterproofing membrane. Also note the back dam support for the yet to be installed pan flashing in the rough opening for the balcony door.



Photograph 1: Sealant Joint—A sealant joint is installed at the perimeter of the balcony deck where it intersects the exterior wall. Note the primer application on engineered wood deck sheathing and the OSB wall sheathing. The primer's function is to facilitate adhesion of the waterproofing membrane. Also note the back dam support for the yet to be installed pan flashing in the rough opening for the balcony door.

Photograph 2 shows the installation of a light gauge metal angle at the deck to wall interface. Note the use of plywood as the balcony deck surface. Plywood and engineered wood deck sheathing are typically both used interchangeably. However, adhesion of membrane waterproofing to engineered wood deck sheathing tends to be more difficult and primers become key to successful adhesion.

Photograph 3 shows the pan flashing of the rough opening of the balcony door. Note the back dam and end dam of the flashing for the balcony door. The back dam support for the pan flashing has not yet been installed. The back dam support protects the upstand of the back dam during the construction process.

Photograph 4 shows the installation of the membrane waterproofing. In this balcony installation an additional metal flashing is installed over the waterproofing that is stripped into the pan flashed balcony door opening. This additional metal flashing protects the membrane waterproofing at the door opening.



Photograph 2: Metal Angle—Note the use of plywood as the balcony deck surface. Plywood and engineered wood deck sheathing are typically both used interchangeably. However, adhesion of membrane waterproofing to engineered wood deck sheathing tends to be more difficult and primers become key to successful adhesion.



Photograph 3: Pan Flashing of Balcony Door—Note the back dam and end dam of the flashing for the balcony door. The back dam support for the pan flashing has not yet been installed. The back dam support protects the upstand of the back dam during the construction process.



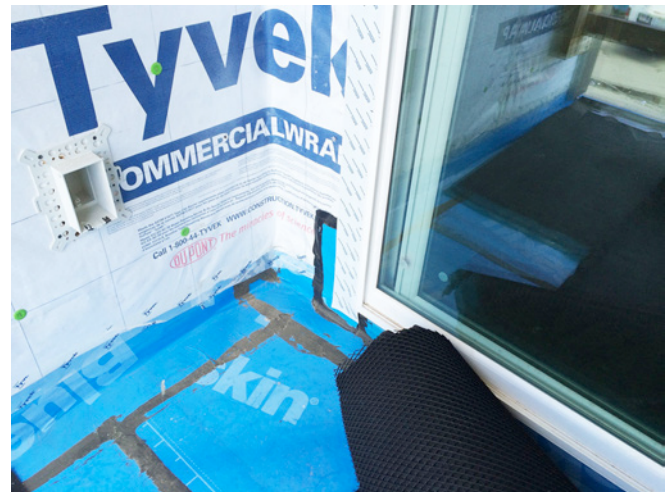
Photograph 4: Membrane Waterproofing—Additional metal flashing is installed over the waterproofing that is stripped into the pan flashed balcony door opening. This additional metal flashing protects the membrane waterproofing at the door opening.

Photograph 5 shows the installation of membrane waterproofing stripped into the pan flashed balcony door opening. Note the drainage mat installed over the top of the membrane waterproofing. Also note the mastic application sealing the waterproofing membrane to the wall sheathing.



Photograph 5: Drainage Matt—Membrane waterproofing is stripped into the pan flashed balcony door opening. Note the drainage mat installed over the top of the membrane waterproofing. Also note the mastic application sealing the vertical portion of the balcony deck waterproofing membrane to the wall sheathing.

Photograph 6 shows the lapping of the water resistive barrier (WRB) over the vertical portions of the membrane waterproofing. Also note the installation of the balcony door. A drainage mat is yet to be installed.



Photograph 6: Shingle Lapping—The water resistive barrier (WRB) is shingle lapped over the vertical portions of the membrane waterproofing. Also note the installation of the balcony door. A drainage mat is yet to be installed.

Photograph 7 also shows the lapping of the water resistive barrier (WRB) over the membrane waterproofing. A drainage mat is in place as is the drip edge at the balcony edge.



Photograph 7: Drip Edge and Drainage Matt—The water resistive barrier (WRB) is lapped over the membrane waterproofing. A drainage mat is in place as is the drip edge at the balcony edge.

Photograph 8 shows the installation of a drainage mat. The vertical top edge of the perimeter balcony deck waterproofing membrane is yet to be stripped into the exterior wall sheathing with mastic.



Photograph 8: More Drainage Matt—The vertical top edge of the perimeter balcony deck waterproofing membrane is yet to be stripped into the exterior wall sheathing with mastic.

Photograph 9 shows two drip edges at the balcony perimeter edge. The upper drip edge sheds water flowing over the edge of the concrete topping. The lower drip edge sheds water from the drainage mat gap on the top of the waterproofing membrane under the concrete topping. This two-stage drip edge approach is recommended to deal with any minerals carried in solution in drain water exiting the drainage mat gap.



Photograph 9: Two Drip Edges—The upper drip edge sheds water flowing over the edge of the concrete topping. The lower drip edge sheds water from the drainage mat gap on the top of the waterproofing membrane under the concrete topping. This two-stage drip edge approach is recommended to deal with any minerals carried in solution in drain water exiting the drainage mat gap.

2018 IBC and IEBC Group B, Successful Balcony Code Changes: (after the completion of OGCV vote, pending correlation by ICC; changes indicated are to the 2015 IBC and IEBC)

Contact: Dennis Richardson PE, CBO, CASp American Wood Council drichardson@awc.org

S 7-16 (AMPC) clarifies wood framing that is enclosed and supporting a balcony must have ventilation openings similar to that required for an attic.

IBC

2304.12.2.6 Ventilation required beneath balcony or elevated walking surfaces.

Enclosed framing in exterior balconies and elevated walking surfaces that are exposed to rain, snow, or drainage from irrigation, shall be provided with openings that provide a net free cross ventilation area not less than 1/150 of the area of each separate space.

S 85-16 (AS) incorporates the requirement from ASCE 7 for design live load of balconies and decks at 1.5 times the live load of the area served by the balcony or deck not to exceed 100 psf.

IBC

Table 1607.1

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_0 , AND MINIMUM CONCENTRATED LIVE LOADS^g

5. Balconies and decks ^h	<u>1.5 times the live load for the area served. Not required to exceed 100 psf</u> Same as occupancy served
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ADM 77-16 (AMPC) requires detailing on plans of all elements of an impervious moisture barrier system (including manufacturer's instructions when applicable) if the impervious moisture barrier option is used in IBC 2304.12.2.5 for wood framing supporting weather-exposed permeable floors, such as concrete or masonry slabs.

IBC

107.2.5 Exterior balcony and elevated walking surfaces. Where balcony or other elevated walking surfaces are exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, the construction documents shall include details for all elements of the impervious moisture barrier system. The construction documents shall include manufacturer's installation instructions.

IEBC

106.2.5 Exterior balcony and elevated walking surfaces. Where the scope of work involves a balcony or other elevated walking surfaces exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, the

construction documents shall include details for all elements of the impervious moisture barrier system. The construction documents shall include manufacturer's installation instructions.

ADM 87-16 (AMPC 1 and 2) requires inspection of all elements of the impervious moisture barrier system or special inspection can be utilized at the option of the code official if the impervious moisture barrier option is used in IBC 2304.12.2.5 for wood framing supporting weather-exposed permeable floors.

IBC

110.3.6 Weather exposed balcony and walking surface waterproofing. Where balcony or other elevated walking surfaces are exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, all elements of the impervious moisture barrier system shall be not be concealed until inspected and approved.

Exception: Where special inspections are provided in accordance with Section 1705.1.1, Item 3.

IEBC

109.3.6 Weather exposed balcony and walking surface waterproofing. Where the scope of work involves a balcony or other elevated walking surfaces exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, all elements of the impervious moisture barrier system shall be not be concealed until inspected and approved.

Exception: Where special inspections are provided in accordance with Section 1705.1.1, Item 3.

S279-16 (AMPC) requires the impervious moisture barrier system to have positive drainage of water that infiltrates the permeable floor above the impervious moisture barrier when that option is used in accordance with IBC 2304.12.2.5.

IBC

2304.12.2.5 Supporting members for permeable floors and roofs. Wood structural members that support moisture permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, shall be of naturally durable or preservative-treated wood unless separated from such floors or roofs by an impervious moisture barrier. The impervious moisture barrier system protecting the structure supporting floors shall provide positive drainage of water that infiltrates the moisture-permeable floor topping.

An article on this concept by Joseph Lstiburek, Ph.D, P.Eng., Fellow ASHRAE, is available at this link: <http://buildingscience.com/documents/building-science-insights/bsi-093-all-decked-out>

ADM77-16

IBC: 107.2.5 (New); IEBC: 106.2.5 (New)

Proposed Change as Submitted

Proponent : Dennis Richardson, American Wood Council, representing American Wood Council (drichardson@awc.org)

2015 International Building Code

Add new text as follows:

107.2.5 Exterior balcony and elevated walking surfaces. Where balcony or other elevated walking surfaces are exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, the construction documents shall include details for all elements of the impervious moisture barrier system. The construction documents shall include manufacturer's installation instructions.

2015 International Existing Building Code

Add new text as follows:

106.2.5 Exterior balconies and elevated walking surfaces. Where balcony or other elevated walking surfaces are exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, the construction documents shall include details for all elements of the impervious moisture barrier system. The construction documents shall include manufacturer's installation instructions.

Reason: Existing language in IBC Section 107.2.4 and IEBC 106.2.4 specifies requirements for the construction documents associated with the wall envelope but is silent how that extends to balcony and elevated walking surfaces where an impervious moisture barrier system protects structural elements. This new section is proposed that will add detailing requirements for exterior balcony and elevated walking surfaces.

Cost Impact: Will not increase the cost of construction

This will not increase the cost of construction as the inclusion of construction details for weather protection is a common requirement already enforced by most building departments. This clarifies existing code language to be consistent with common practice.

ADM77-16 :
107.2.5 (NEW)-
RICHARDSON12193

Public Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: With the number of failures occurring on balconies due to water infiltration and failure, this area warrants careful consideration. The construction in this area involves multiple materials and trades, so clear information is necessary. By saying 'construction documents', this could be information in the specifications, not necessarily the drawings. See also the related change in ADM87.

Assembly Action:

None

Individual Consideration Agenda

Public Comment 1:

Proponent : David Bonowitz, representing National Council of Structural Engineers Associations (dbonowitz@att.net) requests Approve as Modified by this Public Comment.

Modify as Follows:

2015 International Existing Building Code

106.2.5 Exterior balconies and elevated walking surfaces. Where the scope of work involves a balcony or other elevated walking surfaces are exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, the construction documents shall include details for all elements of the impervious moisture barrier system. The construction documents shall include manufacturer's installation instructions.

Commenter's Reason: This comment modifies the approved proposal to make it fit within the IEBC.

The IEBC works through triggers. Certain provisions only apply when those trigger conditions are met. In this case, the intent is not to require documentation of the IMB on *every* existing building project, but only on those projects where the intended scope of work would touch the balcony or exposed walking surface in question.

Proponent : Rebecca Baker, representing Jefferson County, CO / Colorado Chapter of the International Code Council requests Disapprove.

Commenter's Reason: Irrigation for landscaping is beyond the scope of the code. In addition, when construction documents are not adequate, the authority exists to require additional documentation.

ADM77-16

ADM87-16

IBC: 110.3.6 (New); IEBC: 109.3.6 (New)

Proposed Change as Submitted

Proponent : Dennis Richardson, American Wood Council, representing American Wood Council (drichardson@awc.org)

2015 International Building Code

Add new text as follows:

110.3.6 Weather exposed balcony and walking surface waterproofing. Where balcony or other elevated walking surfaces are exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, all elements of the impervious moisture barrier system shall be subject to inspection.

Exception: Where special inspections are provided in accordance with Section 1705.1.1, Item 3.

2015 International Existing Building Code

Add new text as follows:

109.3.6 Weather exposed balcony and walking surface waterproofing. Where balcony or other elevated walking surfaces are exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, all elements of the impervious moisture barrier system shall be subject to inspection.

Exception: Where special inspections are provided in accordance with Section 1705.1.1, Item 3 of the *International Building Code*.

Reason: Detailed inspections are needed to ensure the performance of the impervious moisture barrier used with exposed balconies and walking surfaces. As an exception, Section 1705.1.1 item 3 of the current code allows the building official to require special inspections of: "Materials and systems required to be installed in accordance with additional manufacturers' instructions that prescribe requirements not contained in this code or in standards referenced by this code." This would be acceptable in lieu of inspections performed by the building department staff when utilized by the building official.

Cost Impact: Will not increase the cost of construction

This will not increase the cost of construction as Section 110.3.8 currently requires "other inspections" to ascertain compliance with the code. The proposal also gives the existing option of special inspections in 1705.1.1 item 3 as an exception to this provision.

ADM87-16 :
110.3.6 (NEW)-
RICHARDSON12230

Public Hearing Results

Committee Action:

Approved as Submitted

Committee Reason: This would address inspection of the requirements referenced in what was passed in ADM77. With the number of failures occurring on balconies due to water infiltration and failure, this area warrants careful consideration. The construction in this area involves multiple materials and trades, so inspections would reduce the hazard. The proposed language would allow for special inspections.

Assembly Action:

None

Individual Consideration Agenda

Public Comment 1:

Proponent : David Bonowitz, representing National Council of Structural Engineers Associations (dbonowitz@att.net) requests Approve as Modified by this Public Comment.

Modify as Follows:

2015 International Existing Building Code

109.3.6 Weather exposed balcony and walking surface waterproofing. Where the scope of work involves a balcony or other elevated walking surfaces are exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, all elements of the impervious moisture barrier system shall be subject to inspection.

Exception: Where special inspections are provided in accordance with Section 1705.1.1, Item 3 of the *International*

Building Code.

Commenter's Reason: This comment modifies the approved proposal to make it fit within the IEBC.

The IEBC works through triggers. Certain provisions only apply when those trigger conditions are met. In this case, the intent is not to require inspection of the IMB on **every** existing building project, but only on those projects where the intended scope of work would touch the balcony or exposed walking surface in question.

Public Comment 2:

Proponent : Jonathan Siu, representing Washington Association of Building Officials Technical Code Development Committee (Jon.Siu@seattle.gov); Maureen Traxler, representing WA Assn of Bldg Officials Code Committee (maureen.traxler@seattle.gov) requests Approve as Modified by this Public Comment.

Modify as Follows:

2015 International Building Code

110.3.6 Weather exposed balcony and walking surface waterproofing. Where balcony or other elevated walking surfaces are exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, all elements of the impervious moisture barrier system shall not be subject to inspection concealed until inspected and approved.

Exception: Where special inspections are provided in accordance with Section 1705.1.1, Item 3.

2015 International Existing Building Code

109.3.6 Weather exposed balcony and walking surface waterproofing. Where balcony or other elevated walking surfaces are exposed to water from direct or blowing rain, snow, or irrigation, and the structural framing is protected by an impervious moisture barrier, all elements of the impervious moisture barrier system shall not be subject to inspection concealed until inspected and approved.

Exception: Where special inspections are provided in accordance with Section 1705.1.1, Item 3 of the *International Building Code*.

Commenter's Reason: This is an editorial change that rewrites the new inspection to read more like the other required inspections.

Proponent : Rebecca Baker, representing Jefferson County, CO / Colorado Chapter of the International Code Council (bbaker@co.jefferson.co.us) requests Disapprove.

Commenter's Reason: Irrigation for landscaping is beyond the scope of the code. In addition, the authority currently exists to make additional inspections or to require special inspections.

ADM87-16

S7-16

IBC: 1503.7 (New).

Proposed Change as Submitted

Proponent : Dennis Richardson, American Wood Council, representing American Wood Council (drichardson@awc.org)

2015 International Building Code

Add new text as follows:

1503.7 Ventilation required beneath balcony or elevated walking surfaces. Enclosed framing in exterior balconies and elevated walking surfaces that are exposed to rain, snow, or drainage from irrigation, where the structural framing is protected by an impervious moisture barrier, shall be provided with openings that provide a net free cross ventilation area not less than 1/150 of the area of each separate space. Where framing supports such surfaces over 30 inches (762 mm) above grade, the ventilation openings shall be designed to allow inspection of framing material.

Reason: This change clarifies the intent of the code when a balcony or elevated walking surface serves as a weather resistant barrier and the joist spaces below are enclosed, cross ventilation is required as for enclosed rafter spaces of roofs. When the ventilation is provided for elevated walking surfaces, the ventilation openings must be designed to accommodate routine inspection of the framing material for decay or corrosion.

Cost Impact: Will increase the cost of construction

Some vent openings may need to be modified to accommodate inspection of framing material. Many vent covers that are easily removable and re-installed with hand tools already comply with the intent of this requirement.

**S7-16 : 1503.7
(NEW)-
RICHARDSON12270**

Public Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee understands there is a problem that needs to be addressed, but believes the proposed requirement should only apply to wood and possibly light-gage steel. The fire-rating issues need to be correlated, probably in one big change, so that they allow these openings if they are small so that the inspections can be made and ventilation can be provided. As written this would be creating a conflict in the code. The committee would like to see more specificity on the inspection portals, giving some guidance to building officials. There is a concern that this is not the right location for this provision since most people would not think of walking surfaces as part of roofing. In addition it is not completely clear whether the problem that is being addressed is code-related versus something that was a construction defect.

Assembly Action:

None

Individual Consideration Agenda

Public Comment 1:

Proponent : Dennis Richardson, representing American Wood Council (drichardson@awc.org) requests Approve as Modified by this Public Comment.

Modify as Follows:

2015 International Building Code

1503.7 2304.12.2.6 Ventilation required beneath balcony or elevated walking surfaces. Enclosed framing in exterior balconies and elevated walking surfaces that are exposed to rain, snow, or drainage from irrigation, ~~where the structural framing is protected by an impervious moisture barrier,~~ shall be provided with openings that provide a net free cross ventilation area not less than 1/150 of the area of each separate space. ~~Where framing supports such surfaces over 30 inches (762 mm) above grade, the ventilation openings shall be designed to allow inspection of framing material.~~

Commenter's Reason: Section 1203.3 of the IBC is generally applied by many to require ventilation in the instance where wood supports a balcony and is enclosed. A key word is enclosed. Whenever the wood framing supporting such structures is enclosed it is more difficult for water in the assembly to dry out regardless of the source of the water (even if remaining from rain during the construction period). Even though section 1203.3 is generally applied by many, there is no specific reference to this application. It is critical to provide ventilation to these areas when enclosed and the wood supports an elevated balcony exposed to the weather.

The committee suggested this change needed to be located where it is clear it applies to wood hence the change to chapter 23.

The committee also suggested this needs to be correlated with fire-rating issues and this code change proposal could create an inconsistency. That is incorrect as Section 1406.3 of the 2015 IBC makes it clear how fire-rating issues can be resolved with the current code by extending sprinkler protection to these areas (1406.3 will be relocated in the 2018 IBC):

Section 1406.3, Exception 3: "Balconies and similar projections on buildings of Type III, IV and V construction shall be permitted to be of Type V construction, and shall not be required to have a fire resistance rating where sprinkler protection is extended to these areas."

Finally the original code change went a step further to introduce the concept of providing ventilation openings that allow the inspection for decay. This is a concept that has been introduced and is being tested by one jurisdiction where there was a balcony failure. The concept is valid but still being perfected so it has been removed from this proposal and may need to be addressed with a future code change when it is ready for prime time.

Information on this and other code change proposals by American Wood Council may be found at the following web address: www.woodcode.org (<http://www.woodcode.org>) .

S7-16

S85-16

IBC: 1607.1.

Proponent : Jennifer Goupil, AMERICAN SOCIETY OF CIVIL ENGINEERS, representing SELF (jgoupil@asce.org)

2015 International Building Code

Revise as follows:

**TABLE 1607.1
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_0 , AND MINIMUM CONCENTRATED LIVE LOADS⁹**

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (pounds)
1. Apartments (see residential)	—	—
2. Access floor systems		
Office use	50	2000
Computer use	100	2000
3. Armories and drill rooms	150 ^m	—
4. Assembly areas		—
Fixed seats (fastened to floor)	60m	
Follow spot, projections and control rooms	50	
Lobbies	100m	
Movable seats	100m	
Stage floors	150m	
Platforms (assembly)	100m	
Other assembly areas	100m	
5. Balconies and decks ^h	<u>1.5 times the live load for the area served. Not required to exceed 100 psf. Same as occupancy served</u>	—
6. Catwalks	40	300
7. Cornices	60	—
8. Corridors	100 Same as occupancy served except as indicated	—
First floor		
Other floors		
9. Dining rooms and restaurants	100 ^m	—
10. Dwellings (see residential)	—	—
11. Elevator machine room and control room grating (on area of 2 inches by 2 inches)	—	300
12. Finish light floor plate construction (on area of 1 inch by 1 inch)	—	200
13. Fire escapes	100	—
On single-family dwellings only	40	
14. Garages (passenger vehicles only)	40m	Note a
Trucks and buses	See Section 1607.7	
15. Handrails, guards and grab bars	See Section 1607.8	

16. Helipads	See Section 1607.6	
17. Hospitals		
Corridors above first floor	80	1,000
Operating rooms, laboratories	60	1,000
Patient rooms	40	1,000
18. Hotels (see residential)	—	—
19. Libraries		
Corridors above first floor	80	1,000
Reading rooms	60	1,000
Stack rooms	150 ^b , m	1,000
20. Manufacturing		
Heavy	250 ^m	3,000
Light	125 ^m	2,000
21. Marquees, except one-and two-family dwellings	75	—
22. Office buildings		
Corridors above first floor	80	2,000
File and computer rooms shall be designed for heavier loads based on anticipated occupancy	—	—
Lobbies and first-floor corridors	100	2,000
Offices	50	2,000

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm²,

1 square foot = 0.0929 m²,

1 pound per square foot = 0.0479 kN/m², 1 pound = 0.004448 kN,

1 pound per cubic foot = 16 kg/m³.

- a. Floors in garages or portions of buildings used for the storage of motor vehicles shall be designed for the uniformly distributed live loads of this Table or the following concentrated loads: (1) for garages restricted to passenger vehicles accommodating not more than nine passengers, 3,000 pounds acting on an area of 4 1/2 inches by 4 1/2 inches; (2) for mechanical parking structures without slab or deck that are used for storing passenger vehicles only, 2,250 pounds per wheel.
 - b. The loading applies to stack room floors that support nonmobile, double-faced library book stacks, subject to the following limitations:
 1. The nominal book stack unit height shall not exceed 90 inches;
 2. The nominal shelf depth shall not exceed 12 inches for each face; and
 3. Parallel rows of double-faced book stacks shall be separated by aisles not less than 36 inches wide.
 - c. Design in accordance with ICC 300.
 - d. Other uniform loads in accordance with an approved method containing provisions for truck loadings shall be considered where appropriate.
 - e. The concentrated wheel load shall be applied on an area of 4.5 inches by 4.5 inches.
 - f. The minimum concentrated load on stair treads shall be applied on an area of 2 inches by 2 inches. This load need not be assumed to act concurrently with the uniform load.
 - g. Where snow loads occur that are in excess of the design conditions, the structure shall be designed to support the loads due to the increased loads caused by drift buildup or a greater snow design determined by the building official (see Section 1608).
 - h. See Section 1604.8.3 for decks attached to exterior walls.
 - i. Uninhabitable attics without storage are those where the maximum clear height between the joists and rafters is less than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
 - j. Uninhabitable attics with storage are those where the maximum clear height between the joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses.
The live load need only be applied to those portions of the joists or truss bottom chords where both of the following conditions are met:
 - i. The attic area is accessible from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is a minimum of 30 inches; and
 - ii. The slopes of the joists or truss bottom chords are no greater than two units vertical in 12 units horizontal.
- The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.
- k. Attic spaces served by stairways other than the pull-down type shall be designed to support the minimum live load specified for habitable attics and sleeping rooms.
 - l. Areas of occupiable roofs, other than roof gardens and assembly areas, shall be designed for appropriate loads as approved by the building official. Unoccupied landscaped areas of roofs shall be designed in accordance with Section 1607.12.3.
 - m. Live load reduction is not permitted unless specific exceptions of Section 1607.10 apply.

Reason: This proposed changes to Section 1607 will harmonize the provision in the code with the 2016 edition of the referenced loading standard *ASCE 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7-16).

Table 1607.1 - Proposed modifications to Table 1607.1 modify the live loads on decks to 1.5 times the live load for the area served, but not required to exceed 100 psf. This proposed change will align the requirements of the code with the standard ASCE 7, which has included this provision in the 2010 edition. Given that balconies and decks can be places of assembly, it is reasonable that the required live load is not to exceed the specified the uniform load required for Assembly Areas.

Cost Impact: Will increase the cost of construction

The proposed changes will impact the cost of construction. This proposal coordinates the IBC with the referenced loading standard *ASCE 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures*. ASCE 7 will be updated from the 2010 edition to the 2016 edition as an Administrative Update to the 2018 I-Codes.

As of the submission date of this code change proposal, the ASCE 7 Standards Committee has completed the committee balloting on technical changes. The document is designated *ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures* is expected to be completed, published, and available for purchase prior to the ICC Public Comment Hearings for Group B in October of 2016. Any person interested in obtaining a public comment copy of ASCE 7-16 may do so by contacting James Neckel at ASCE (jnekel "at" asce. org).

S85-16 : TABLE 1607.1-GOUPIL12930

S279-16

IBC: 2304.12.2.5.

Proposed Change as Submitted

Proponent : Dennis Richardson, American Wood Council, representing American Wood Council (drichardson@awc.org)

2015 International Building Code

Revise as follows:

2304.12.2.5 Supporting members for permeable floors and roofs. Wood structural members that support moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, shall be of naturally durable or *preservative-treated wood* unless separated from such floors or roofs by an impervious moisture barrier. The impervious moisture barrier system protecting the structure supporting floors shall include elements providing positive drainage of water that infiltrates the moisture-permeable floor topping.

Reason: A key functional requirement of impervious moisture barrier systems installed under a permeable floor system exposed to water are elements that provide for drainage of any water making it's way through the permeable floor system. Without a properly functioning method to transport this water out, the floor assembly can stay saturated for very long periods of time possibly contributing to premature failure. This code proposal creates a requirement for impervious moisture barrier systems protecting the structure, supporting a floor, to provide a mechanism for the water to drain out.

Cost Impact: Will increase the cost of construction
Drainage elements between the permeable floor slab and impervious barrier are commonly called for and installed by many practitioners and will not change the cost of construction in those cases. However in cases where no method to provide positive drainage is currently provided, this proposal will increase the cost of construction.

S279-16 :
2304.12.2.5-
RICHARDSON12652

Public Hearing Results

Committee Action:

Disapproved

Committee Reason: The proposed language on impervious moisture barriers is not clear enough for the building official to enforce. The requirement for "elements providing positive drainage" should be clarified. The committee recognizes that this proposal would address a serious issue that needs to be dealt with and a public comment is encouraged to address the committee's concerns.

Assembly Motion:

As Submitted

Online Vote Results:

Failed

Support: 40.07% (107) Oppose: 59.93% (160)

Assembly Action:

None

Individual Consideration Agenda

Public Comment 1:

Proponent : Dennis Richardson, representing American Wood Council (drichardson@awc.org) requests Approve as Modified by this Public Comment.

Modify as Follows:

2015 International Building Code

2304.12.2.5 Supporting members for permeable floors and roofs. Wood structural members that support moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, shall be of naturally durable or *preservative-treated wood* unless separated from such floors or roofs by an impervious moisture barrier. The impervious moisture barrier system protecting the structure supporting floors shall ~~include elements providing~~ provide positive drainage of water that infiltrates the moisture-permeable floor topping.

Commenter's Reason: This existing code section applies when wood (that is not preservative-treated or naturally durable) supports moisture-permeable floors or roofs exposed to weather such as concrete or masonry slabs.

When such assemblies are a roof, and there is a leak in the impervious barrier, the occupants typically know about it and repairs are made. When the assembly supports a walking surface such as a balcony, there may be no early warning of a leak or decay because any leak may be located over unoccupied areas outside of the structure building envelope so the leak remains undetected.

Balcony structure performance is critical because they may see substantial loading when the balcony is occupied by several persons and balconies can be located several stories above grade. Structural failure of a balcony can result in multiple serious injuries or deaths.

In this code section, the existing requirement calls for separation by an impervious moisture barrier when the supporting wood is not preservative-treated or naturally durable. The term "impervious moisture barrier" is not defined in the code but really describes the required performance of the barrier. One bit of testimony during the Committee Action Hearing was existing language in 2304.12.2.5 may be unclear as it currently exists.

Other code changes affecting balconies were approved at the Committee Action Hearing:

ADM77-16 requires detailing on plans of all elements of the impervious moisture barrier system (including manufacturer's instructions when applicable) if the impervious moisture barrier option is used.

ADM87-16 requires inspection of all elements of the impervious moisture barrier system or special inspection can be utilized at the option of the code official.

S85-16 increased the live load for balconies to be consistent with live load requirements in ASCE-7.

S289-16 was disapproved on a close vote decided by the Chair. In their reason statement the Committee acknowledged this proposal would address a serious issue that needs to be dealt with and a public comment is encouraged to address the committee's concerns.

Early initial approaches to this code change as well as ADM77-16 and ADM87-16 were to include a comprehensive list of the various elements that might make up an impervious moisture barrier system. The proponent of these code changes received substantial feedback not to include a laundry list of possible elements that commonly make up these systems as the elements are not always the same for different systems and configurations. That logic was supported by the committee with the approval of ADM 77-16 and ADM 87-16.

Since the initial Group B code change deadline, an article by Joseph Lstiburek has been published in the ASHRAE Journal. The unedited version can be found on the author's website at the following link:

<http://buildingscience.com/documents/building-science-insights/bsi-093-all-decked-out>
(<http://buildingscience.com/documents/building-science-insights/bsi-093-all-decked-out>)

Two key concepts covered in this document is the need to provide slope, and when the traffic surface is permeable (like a concrete or masonry surface), then "it is critical that a drainage layer or space is provided immediately above the waterproofing layer." The article gives additional emphasis to the word "critical".

Without slope and a way for the water to get out, the impervious moisture barrier can be subject to constant attack by water that infiltrates the moisture permeable topping slab in a wet environment.

This concept is similar to a weep screed that provides a path for water to get out of the wood wall covered with plaster. Without an effective functioning weep screed there can be substantial water damage leading to the decay of the structural elements.

Because the overall code section is performance based, it is not possible to write a cookbook method to address this from a design standpoint. Articles such as the one linked to this reason statement do help the designer with some guidance as do manufacturer's instructions and recommendations. The key point though is just as with a weep screed, there needs to be positive drainage for moisture to get out.

There may be time to fully address concerns of the existing language found in Section 2304.12.2.5 for the 2021 IBC code cycle. That is outside of the scope of the public comment process. Since existing language will be in place for at least three more years, this public comment at least makes it clear to designers of the need to consider and provide positive drainage of water that infiltrates the moisture permeable floor topping.

As the committee said this is a serious issue in the code that needs to be dealt with.

Information on this and other code change proposals by American Wood Council may be found at the following web address: www.woodcode.org (<http://www.woodcode.org>) .