Deck Frequently Asked Questions

Deciphering DCA6 and More (BCD307)

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COURSE DESCRIPTION

Thinking about your next spring project or do you have a client that needs a wood deck designed? This course will provide an overview of common questions and challenges with design and construction of residential wood decks. Information gathered from years of frequently asked questions related to building code provisions for decks, deck construction details, and AWC’s Design for Code Acceptance 6 (DCA6) – Prescriptive Residential Wood Deck Construction Guide will be presented.
OBJECTIVES

Upon completion, participants will be better able to
2. Diagnose common challenges faced when designing and building residential wood decks and how to overcome them.
3. Discover additional resources available for wood deck design and construction.
4. Categorize code-compliant wood deck components versus those requiring approval by the authority having jurisdiction.

OUTLINE

1. DCA6 History
2. Background on 2015 IRC deck provisions
3. FAQs
POLLING QUESTION

1. What is your profession?
   a) Architect
   b) Engineer
   c) Code Official
   d) Fire Service
   e) Builder/Product Manufacturer/Other

FREE DOWNLOADS

• DCA6 Deck Guide with Commentary
  https://www.awc.org/codes-standards/publications/dca6

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WHY IS THIS IMPORTANT?

- Deck & Porch Injury Study
  - Nearly 15% of all deck-related injuries resulted from structural failure
    - 60% of structural failures are the deck connection to the house
    - 33% are the railing
  
"Except for hurricanes and tornadoes, more injuries may be connected to deck failures than all other wood building components and loading cases combined!"

Dr. Frank Woeste, P.E.

COOPERATORS

- Prescriptive Residential Wood Deck Construction Guide – Design for Code Acceptance No. 6 (DCA 6)

Primary Cooperators
- American Wood Council
- International Code Council
- Fairfax County, Virginia
COOPERATORS

Additional Cooperators

• APA-The Engineered Wood Association
• National Association of Home Builders
• Simpson Strong-Tie Company
• Southern Forest Products Association
• Southern Pine Inspection Bureau
• Stairway Manufacturers’ Association
• Virginia Polytechnic Institute and State University
• Washington State University
• NADRA – North American Deck and Railing Association
• WIJMA – Wood I-Joist Manufacturers Association

CODE BASIS

Basis and Applicability

• 2015 International Residential Code (IRC)
• Bracketed text shows reference to applicable IRC sections ex. [R317 and R318].
• Recommended prescriptive construction methods meet or exceed IRC minimum requirements
• Provisions not included in IRC are considered good practice recommendations
• Where differences exist, IRC applies
• Not intended to preclude use of other construction methods or materials
• All construction and materials approved by the authority having jurisdiction
LEDGER

- Ledger board to foundation wall
  - Concrete or solid masonry
  - ½” approved anchors

2015 DCA6

Figure 15: Attachment of Ledger Board to Foundation Wall (Concrete or Solid Masonry)

*Note: Blocks filled with grout or concrete at anchor locations for new construction

LEDGER

2015 IRC

Figure 8607.2.1(2)
PLACEMENT OF LAG SCREWS AND BOLTS IN BAND JOISTS
**POSTS**

- **Post-to-Beam**
  - Notch
    - 3x or 4x beam
    - 2-ply beam
    - Two ½” diameter bolts w/ washers
  - Post cap
    - 3-ply beams

**LATERAL SUPPORT**

**2015 IRC**

![Diagram](image)

**Figure 607.2.3**

DECK ATTACHMENT FOR LATERAL LOADS

For SI: 1 inch = 25.4 mm.
LATERAL SUPPORT

- Attachment to House
  - Lateral attachment to house floor system
  - 2012 IRC
  - 2 locations per deck
  - 1500 lb capacity
  - Always required
GUARDS

Guard requirements

- Deck height > 30”
- Guard Required

Figure 24. Example Guard Detail

GUARDS

- Adjacent Fixed Seating Requirement
  - 36” measurement from seat in DCA6

- 2015 IRC Section R312.1.2 Height
  Required guards at open-sided walking surfaces, including stairs, porches, balconies or landings, shall be not less than 36 inches (914 mm) in height as measured vertically above the adjacent walking surface of the line connecting the nosings.
GUARDS

- IBC/IRC require guard rails to resist 200 lb concentrated load [Table R301.5]
- Tests require 2.5 safety factor per IBC [1709.3.1]
- Virginia Tech Research
  - Typical ½” bolt or lag screw connections failed
  - Commercial hold-down passed

Photo courtesy of Frank Woeste and Joseph Loferski.
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POLLING QUESTION

2. DCA6 requires a 36” guard height measurement to be taken from the walking surface or any attached seating present.
   a) True
   b) False
**CONNECTING WOOD**

Tension perpendicular to grain

- Achilles heel of wood connections

**Initiators**

- notches
- large diameter fasteners
- hanging loads
- shrinkage

**CONNECTING WOOD**

- Minimum 4x4 post
- Bending design value ≥ 1,100 psi
  - All No.2 species shown in Table 2
  - $C_m = 0.85$, $C_i = 0.80$, $C_D = 1.6$

Figure 25. Guard Post to Outside Joist Example

*guard posts can be installed as shown in Figure 26 (between joists) if blocking is installed as shown below within 12" of each side of the post*

at first interior bay, provide 2x blocking at guard posts with hold-down anchors; attach blocking with 10d threaded nails top and bottom, each side

outside-joist

PLAN VIEW
CONNECTING WOOD

- Guard Post to Rim Joist
  - Hold down anchors
  - Minimum of two ½” bolts

Figure 26. Guard Post to Rim Joist Example

TENSION PERPENDICULAR-TO-GRAIN

NDS Table 11.5.1C

- Footnote 2
- Restricts loading tension zone
- Applies to ledgers if constructed with single row of fasteners
FAQ

- In DCA6 Table 2, why does the overhang span sometimes increase as joist spacing increases?
  - FAQ on AWC website
  - 2 limit states
    - 1/4 of main span
    - Deflection due to point load on cantilever
  - Under single point load, deflection @ overhang decreases as main span decreases
  - In many cases overhang spans are shorter because main spans are longer

MODIFIED JOIST TABLE IN NEXT DCA6

- Next version of DCA6 will make joist table more user-friendly
FAQ

- Why are beam spans 3” longer in IRC than in DCA6?

### 2015 IRC

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>SIZE²</th>
<th>DECK JOIST SPAN LESS THAN OR_EQUAL TO:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Southern pine</td>
<td>2 - 2 x 6</td>
<td>6-11</td>
</tr>
<tr>
<td></td>
<td>2 - 2 x 8</td>
<td>8-9</td>
</tr>
<tr>
<td></td>
<td>2 - 2 x 10</td>
<td>10-4</td>
</tr>
<tr>
<td></td>
<td>2 - 2 x 12</td>
<td>12-2</td>
</tr>
<tr>
<td></td>
<td>3 - 2 x 6</td>
<td>8-2</td>
</tr>
</tbody>
</table>

### 2015 DCA6

Table 3A. Dimension Lumber Deck Beam Spans (Lw) Supporting a Single Span of Joists with or without Overhangs.

<table>
<thead>
<tr>
<th>Species</th>
<th>Size²</th>
<th>6’</th>
<th>8’</th>
<th>10’</th>
<th>12’</th>
<th>14’</th>
<th>16’</th>
<th>18’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Pine</td>
<td>2-2x8</td>
<td>6’ - 6”</td>
<td>5’ - 6”</td>
<td>5’ - 1”</td>
<td>4’ - 7”</td>
<td>4’ - 3”</td>
<td>4’ - 0”</td>
<td>3’ - 9”</td>
</tr>
<tr>
<td></td>
<td>2-2x10</td>
<td>6’ - 6”</td>
<td>5’ - 4”</td>
<td>5’ - 1”</td>
<td>4’ - 7”</td>
<td>4’ - 3”</td>
<td>4’ - 0”</td>
<td>3’ - 9”</td>
</tr>
<tr>
<td></td>
<td>2-2x12</td>
<td>6’ - 6”</td>
<td>5’ - 4”</td>
<td>5’ - 1”</td>
<td>4’ - 7”</td>
<td>4’ - 3”</td>
<td>4’ - 0”</td>
<td>3’ - 9”</td>
</tr>
<tr>
<td></td>
<td>3-2x6</td>
<td>7’ - 11”</td>
<td>7’ - 2”</td>
<td>6’ - 5”</td>
<td>5’ - 10”</td>
<td>5’ - 5”</td>
<td>5’ - 0”</td>
<td>4’ - 9”</td>
</tr>
</tbody>
</table>

**BEAM SPANS IN IRC AND DCA6**

- 2015 IRC
- 2015 DCA6

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FAQ

- Can I use 4x4 posts based on DCA6?
  - DCA6 Commentary
  - Alternate prescriptive provisions

<table>
<thead>
<tr>
<th>Beam Span, L</th>
<th>Joist Span L</th>
<th>Post Heights¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Southern Pine</td>
<td>Douglas Fir-Red Cedar³</td>
</tr>
<tr>
<td>6'</td>
<td>&lt;10'</td>
<td>4' 2' 3' 4' 3'</td>
</tr>
<tr>
<td></td>
<td>&lt;14'</td>
<td>3' 2' 2' 3' 2'</td>
</tr>
<tr>
<td></td>
<td>&lt;18'</td>
<td>2’ 2’ 2’ 2’ 2’</td>
</tr>
<tr>
<td>8'</td>
<td>&lt;10'</td>
<td>3’ 2’ 2’ 4’ 2’</td>
</tr>
<tr>
<td></td>
<td>&lt;14’</td>
<td>2’ 2’ 2’ 3’ 2’</td>
</tr>
<tr>
<td></td>
<td>&lt;18’</td>
<td>2’ 2’ 2’ 2’ 2’</td>
</tr>
<tr>
<td>10'</td>
<td>&lt;10’</td>
<td>3’ 2’ 2’ 3’ 2’</td>
</tr>
<tr>
<td></td>
<td>&lt;14’</td>
<td>2’ 2’ 2’ 2’ 2’</td>
</tr>
<tr>
<td></td>
<td>&lt;18’</td>
<td>2’ 2’ 2’ 2’ 2’</td>
</tr>
</tbody>
</table>

POLLING QUESTION

3. The measurement of beam span is the same in DCA6 and IRC.

a) True
b) False
FAQ

• Can I notch a 4x4 guard post based on DCA6?
  • NO!

Figure 24. Example Guard Detail

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FAQ

• Does DCA6 have provisions for alternate soil conditions?
  • DCA6 Commentary

<table>
<thead>
<tr>
<th>Beam Span, L</th>
<th>Joint Span, L</th>
<th>Round Footing Diameter</th>
<th>Square Footing</th>
<th>Footing Thickness</th>
<th>Round Footing Diameter</th>
<th>Square Footing</th>
<th>Footing Thickness</th>
<th>Round Footing Diameter</th>
<th>Square Footing</th>
<th>Footing Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'</td>
<td>10'</td>
<td>15' 13x13 6'</td>
<td>14'</td>
<td>12x12 6'</td>
<td>12'</td>
<td>11x11 6'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12'</td>
<td>18'</td>
<td>18x18 7'</td>
<td>16'</td>
<td>14x14 6'</td>
<td>15'</td>
<td>13x13 6'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20'</td>
<td>22'</td>
<td>21x21 8'</td>
<td>18'</td>
<td>16x16 7'</td>
<td>17'</td>
<td>15x15 6'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24'</td>
<td>26'</td>
<td>23x23 11'</td>
<td>23'</td>
<td>21x21 9'</td>
<td>21'</td>
<td>19x19 8'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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FAQ

- How do you design a beam with joists framing in from both sides using DCA6?
  - DCA6 Commentary
    - 8'-0" joists from opposite sides
    - Use 16'-0" joist spans for equivalent tributary area
    - Need to re-evaluate posts/footers

<table>
<thead>
<tr>
<th>Species</th>
<th>Size</th>
<th>6'</th>
<th>8'</th>
<th>10'</th>
<th>12'</th>
<th>14'</th>
<th>16'</th>
<th>18'</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-2x6</td>
<td>6' - 8'</td>
<td>5' - 8'</td>
<td>5' - 11'</td>
<td>4'-7&quot;</td>
<td>4'-3&quot;</td>
<td>4'-0&quot;</td>
<td>3'-9&quot;</td>
<td></td>
</tr>
<tr>
<td>2-2x8</td>
<td>8' - 6'</td>
<td>7' - 4&quot;</td>
<td>6'-6&quot;</td>
<td>5'-11&quot;</td>
<td>5'-6&quot;</td>
<td>5'-1&quot;</td>
<td>4'-9&quot;</td>
<td></td>
</tr>
<tr>
<td>2-2x10</td>
<td>10'-1&quot;</td>
<td>8'-9&quot;</td>
<td>7'-9&quot;</td>
<td>7'-1&quot;</td>
<td>6'-6&quot;</td>
<td>6'-1&quot;</td>
<td>5'-9&quot;</td>
<td></td>
</tr>
<tr>
<td>2-2x12</td>
<td>11'-11&quot;</td>
<td>10'-4&quot;</td>
<td>9'-2&quot;</td>
<td>8'-4&quot;</td>
<td>7'-9&quot;</td>
<td>7'-3&quot;</td>
<td>6'-9&quot;</td>
<td></td>
</tr>
<tr>
<td>3-2x6</td>
<td>7'-11&quot;</td>
<td>7'-2&quot;</td>
<td>6'-5&quot;</td>
<td>5'-10&quot;</td>
<td>5'-5&quot;</td>
<td>5'-0&quot;</td>
<td>4'-9&quot;</td>
<td></td>
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<tr>
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<td>10'-7&quot;</td>
<td>9'-3&quot;</td>
<td>8'-3&quot;</td>
<td>7'-6&quot;</td>
<td>6'-11&quot;</td>
<td>6'-5&quot;</td>
<td>6'-1&quot;</td>
<td></td>
</tr>
<tr>
<td>3-2x10</td>
<td>12'-9&quot;</td>
<td>11'-0&quot;</td>
<td>9'-9&quot;</td>
<td>8'-9&quot;</td>
<td>8'-3&quot;</td>
<td>7'-8&quot;</td>
<td>7'-3&quot;</td>
<td></td>
</tr>
<tr>
<td>3-2x12</td>
<td>15'-0&quot;</td>
<td>13'-0&quot;</td>
<td>11'-7&quot;</td>
<td>10'-6&quot;</td>
<td>9'-9&quot;</td>
<td>9'-11&quot;</td>
<td>8'-7&quot;</td>
<td></td>
</tr>
</tbody>
</table>

FAQ

- If my deck has a roof, should the wet service factor, \( C_M \), be applied in design?
  - \( C_M \) required any time moisture content >19% for an extended period
  - When in doubt, assume worst case scenario and apply \( C_M \) factor
  - DCA6 assumes wet service factor for lumber properties
FAQ

• Are there resources for evaluating an existing deck?
  • https://www.awc.org/codes-standards/publications/dca6
  • Deck Evaluation Checklist - NADRA
  • Manual for the Inspection of Residential Wood Decks and Balconies - FPS

FAQ

• Why does DCA6 prohibit attachment of the ledger to an overhang or bay window?
  • Floor joist cantilever
  • Typically not designed for additional loads
  • Requires engineering or non-ledger deck
FAQ

• **What is the live load assumed in DCA6?**
  - 40 psf floor live load - residential
  - Can also be used for uniform snow load – not drift loads
  - Does not apply to concentrated loads

POLLING QUESTION

4. **DCA6 has restrictions or prohibitions on:**
   a) Heavy concentrated loads
   b) Attachment of the ledger to a bay window or overhang
   c) Drifting snow loads
   d) All of the above
FAQ

• Can a ledger be connected through a brick or stone veneer?
  • Exterior veneers
    • Brick
    • Masonry
    • Stone
  • Requires non-ledger deck
  
  Figure 17. No Attachment to or Through Exterior Veneers (Brick, Masonry, Stone)

FAQ

• Should I install knee braces on interior deck posts?
  • Knee braces only at corner posts
  • Interior posts have higher gravity loads than corner posts, additional lateral load can cause overstress

  Figure 10: Diagonal Bracing
FAQ

- **Should I install knee braces on the interior deck posts?**
  - Knee braces only at corner posts
    - Diagonal bracing contributes to the stiffness of the deck but causes additional lateral loads on posts

DCA6-12

Axial + Bending
(Bending force based on connection capacity of knee brace to post)

FAQ

- **Do I need to worry about span reductions for incised lumber?**
  - DCA6 applies incising factor (C) to refractory species
    - Douglas Fir-Larch
    - Hem Fir
    - Spruce Pine Fir
FAQ

- What about fasteners in wet conditions and preservative treated wood?
  - Corrosion Resistance IRC R317.3
    - Screws, bolts, nails
    - Hot-dipped galvanized
    - Stainless
    - Silicon bronze
    - Copper
  - Hangers and anchors
    - Galvanized
    - Stainless
  - Saltwater exposure – DCA6
    - Stainless
  - Other fasteners/hardware
    - Approved by building official
  - Flashing
    - Nominal 0.019” min.

FAQ

- How are lateral load devices provided for a deck being attached to an existing home?
  - Basement ceiling unfinished – perpendicular joists

Figure 23: Lateral Load Device with Joists Perpendicular to Deck Joists
FAQ

• How are lateral load devices provided for a deck being attached to an existing home?
  • Basement ceiling unfinished – parallel joists

FAQ

• Is there a Spanish version of DCA6?
  • Both the 2012 and 2015 versions available in Spanish
POLLING QUESTION

5. The wet service factor is applied to all lumber properties in DCA6.
   a) True
   b) False

RESOURCES

• Wood Design Focus
  • Deck Issue
  • www.forestprod.org/
  • Summer 2013
DOWNLOADS

AWC DCA6 Deck Guide
https://www.awc.org/codes-standards/publications/dca6

AWC DCA6 One-Pager to Post to Website