

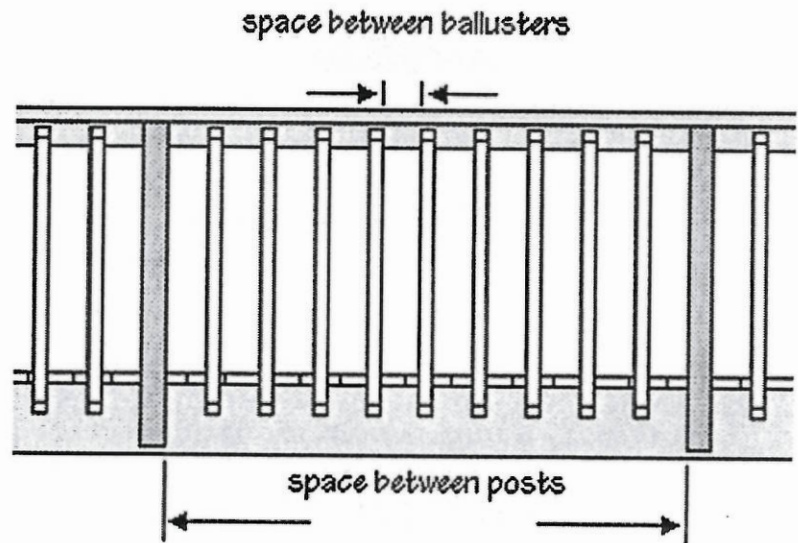
Lesson 9: Determining Spacing, Part 2

PROBLEM SITUATION 3 : Balusters

Baluster: The vertical pieces of wood or metal that are installed on a railing to prevent falling through it. They are also called spindles.

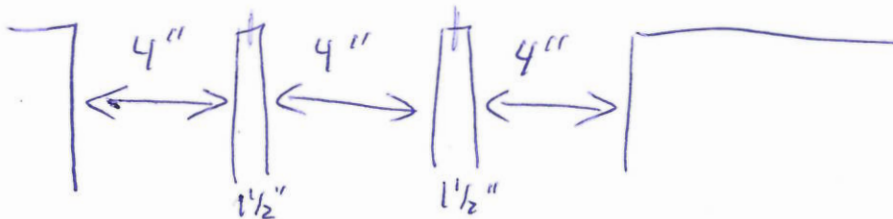
On-Center (OC) Spacing: This is the spacing between each baluster *plus* the width of one baluster.

Wisconsin Code states that there cannot be more than four inches of space between balusters.



Part 1 – In the shop

7. Space the 4x4's on top of the post-it paper so that the distance between them is 15" (Note: The post-it paper grid is 1" squares)
 - a. Now, place 2 balusters between them so they are evenly spaced
 - b. Draw a quick sketch with the measurements showing what you made (include in your measurements the space *between* each baluster)



$$15'' - 3'' = 12'' \dots \text{so } 3 \text{ spaces } 12'' \div 3 = 4''$$

- c. What is the 'On-Center spacing' for your setup?

$$4'' + \frac{3}{4}'' + \frac{3}{4}'' \xrightarrow{\frac{1}{2} \text{ a baluster}} 4'' + 1\frac{1}{2}'' = \boxed{5\frac{1}{2}''}$$

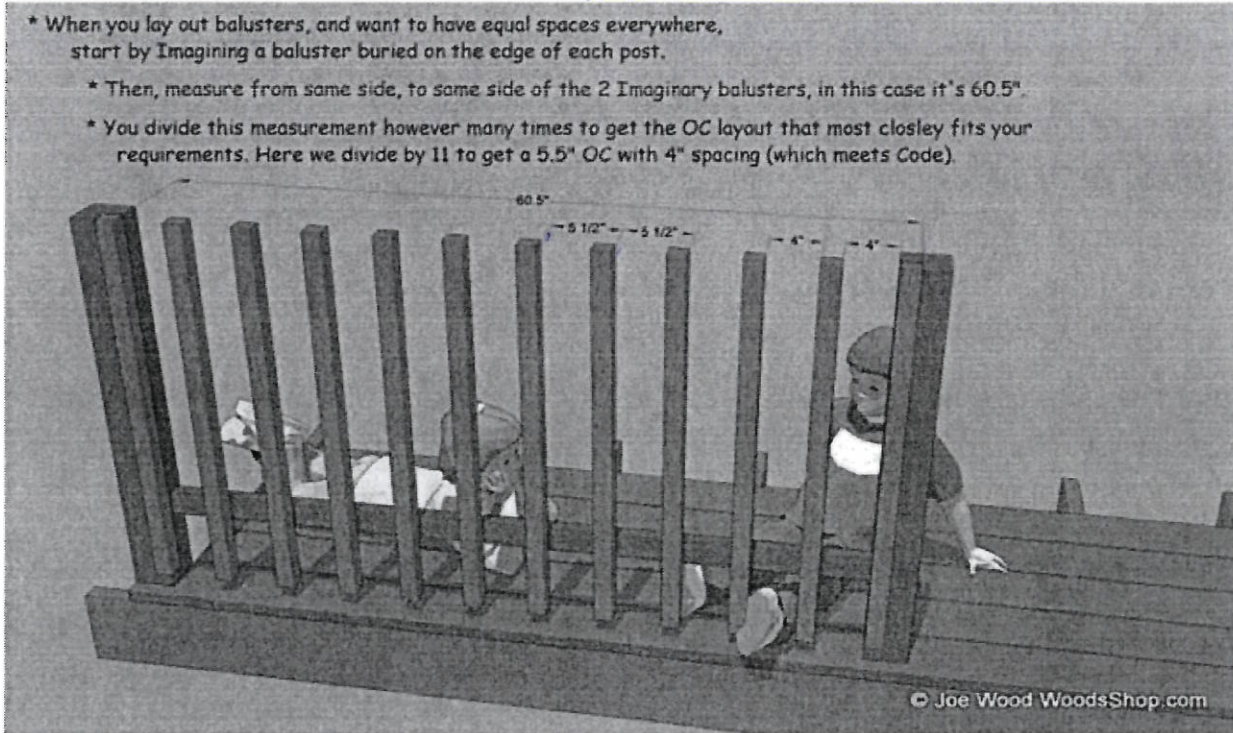
\uparrow $\frac{1}{2}$ a baluster \uparrow whole baluster

Lesson 9: Determining Spacing, Part 2

Part 3 – How it is typically done in the industry

Formula to determine the On-Center Spacing:

$$C = A \div (\text{Rounded } A \div B)$$



Variable Definitions:

- **C** = On-Center (OC) Spacing. This is the spacing between each spindle plus the width of one spindle.
- **A** = Gap between the two posts + the width of the 'imaginary baluster buried on the edge of the post'
- **B** = Width of a single baluster/spindle + maximum allowable space between

Steps for using the formulas:

- To find the number of Balusters:
Step 1: Calculate the values for A and B
Step 2: Calculate $A \div B$
Step 3: If you need to, round the answer from step 2 UP to ensure that the gap is less than code
NOTE: the answer from Step 3 is the number of *spaces* in the installation.
To determine the number of balusters, take the answer from Step 3 and subtract one.
- To find the On-Center Spacing:
Step 4: Continue with the answer from Step 3 and Divide A by the Step 3 value.
The answer to Step 4 is the On-Center spacing for the installation

Write down the example done by your instructor here:

EXAMPLE: Determine how many 2x2 balusters you would need for a rail that has 4x4 posts with a $26'' + 1\frac{1}{2}''$ space between them? $1\frac{1}{2}'' \times 1\frac{1}{2}''$

1. $A = 26'' + 1\frac{1}{2}'' = 27\frac{1}{2}''$ B. $4'' + 1\frac{1}{2}'' = 5\frac{1}{2}''$ (code baluster)

2. $27\frac{1}{2}'' \div 5\frac{1}{2}'' = 5$ ← total number of space

3. don't need to round = 5 spaces

So, $5 - 1 = 4$ balusters

4. On-Center : $27\frac{1}{2}'' \div 5 \text{ spaces} = 5\frac{1}{2}''$

5. Space between : $5\frac{1}{2}'' - 1\frac{1}{2}'' = 4''$ between

For problems 11 through 13 below you will be using posts that are 4x4, and balusters that are nominally 2x2 ($1\frac{1}{2}'' \times 1\frac{1}{2}''$). Code for balusters is that there cannot be more than four inches of space between balusters.

11. You have two posts on a deck with a distance between them of $42\frac{1}{2}''$

a. Step 1: Calculate A for the formula: $A =$ _____

Calculate B for the formula: $B =$ _____

See picture

b. Step 2: Calculate $A \div B =$ _____

c. Step 3: If you need to, round the answer from step 2 UP to ensure that the gap is less than code. Rounded $A \div B =$ _____

d. To determine the number of balusters, take the answer from Step 3 and subtract one.

Number of balusters: _____

e. Step 4: Find On-Center Spacing by Calculating $A \div$ the answer from Step 3 = _____

f. What is the space between each baluster?

g. Draw a quick sketch showing your setup based on your answers- in your sketch, draw in the values for A, B and C. You can use the example shown above to help you.

12. Now, you have two posts on a deck with a distance between them of 48". Use your own method or the formula and procedure provided to determine the following information:

a. How many 2x2 (nominal) balusters will you need? (show your work or explain)

b. What is the on-center spacing for the project? (show your work or explain)

c. What is the space between each baluster?

See picture

13. You are building a new deck for a client. You have two posts on your deck and again, you are using 2x2 (nominal) balusters. The distance between the posts is $78 \frac{3}{4}$ ". It's your job to build the rail:

a. Before taking out a calculator... *estimate* how many balusters do you think you'll need? Explain your estimation strategy

b. Now, calculate the actual number of balusters you need. (show your work or explain)

c. What is the on-center spacing for the project? (show your work or explain)

See picture

- d. What is the space between each baluster?
14. What if your balusters were $7/8$ " stock for the deck in the previous question instead of 2x2's?
- a. Now, calculate the number of balusters you need. (show your work or explain)
- b. What is the on-center spacing for the project? (show your work or explain)
- c. What is the space between each baluster?
15. What if you are doing a project where you already know the number of balusters? Can you think of other methods to determine the on-center spacing? Brainstorm with your group and try to use a DIFFERENT method to answer 14b or 14c.

MAKING CONNECTIONS

State the main idea of the lesson

