Building Simple Stairs

Interior and Exterior Stairs for Utility Applications

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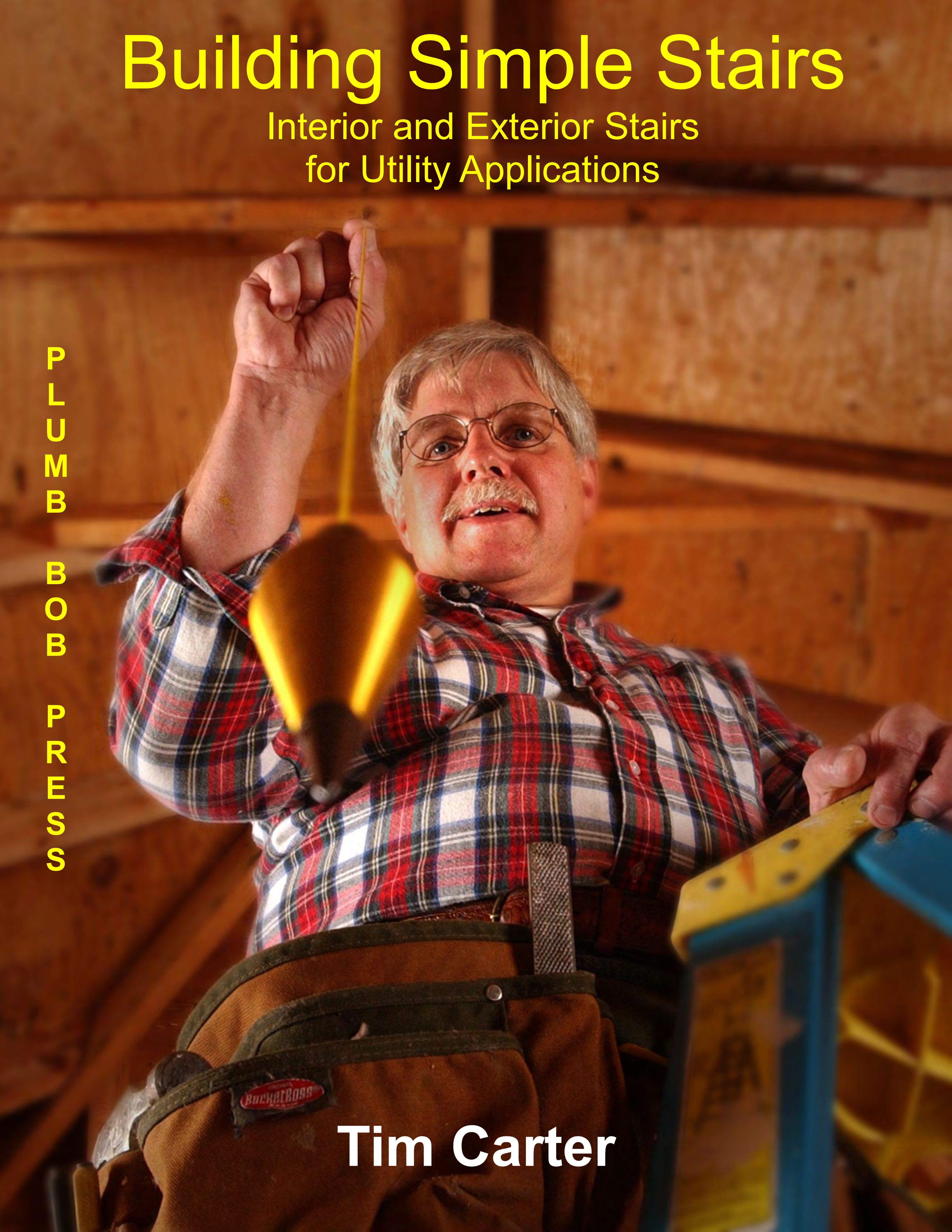
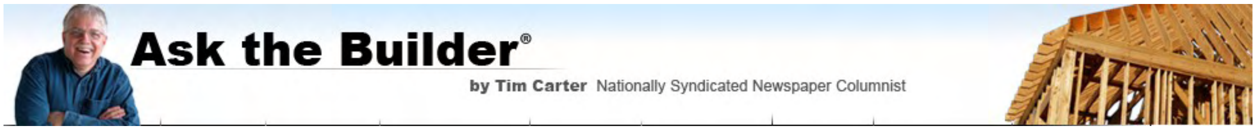


Tim Carter



Building Simple Stairs

Interior and Exterior Stairs for Utility Applications

By: Tim Carter

Table of Contents

The information in this book strives to be like a plumb bob at rest – delivering true and accurate information to those who look at it.

Introduction

Building simple stairs or steps is not simple. Not by a long shot. I will absolutely do my best to help you achieve success. There are a few obstacles you have to overcome. One of them is the mathematics that is involved. It is not that hard, but you must think things through to understand the relationship between where the stairs start and stop. You must also learn how to work with a standard framing square.

I urge you to buy the least expensive eight foot long 2x12 you can find. I want you to practice the layout and cutting of the actual stringer template on this board before you proceed to real staircase lumber. The great thing is that once you see how easy it is to produce the correct angles, the light bulb of **understanding and retaining** will burn forever in your brain. Read this entire book at least once before you start. Then perhaps read it once more. If you are patient, you will succeed!

Helpful Tips While Reading:

From time to time as you read this eBook, I will alert you when certain information requires added attention. Pay attention for the following:

When you see text that is highlighted in yellow such as this and has a piece of Caution Tape attached, be alert! The text has important information that is vital to the overall success of the project. It may also contain important safety information.

From time to time, I provide in-depth and often interesting scientific background information about the topic.

When this happens, you will see text highlighted in green with a piece of Formula Tape attached. The information in between the strips of green formula tape may help you win a round of Trivial Pursuit or Jeopardy, but don't feel the need to memorize the information!

When you see the plumb bob icon, you are at the end of a chapter and it is time to proceed to the next step.

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Acknowledgements and Credits

It didn't take me long when I was building each day to figure out that I needed to surround my-self with quality sub-contractors. These were people who helped me create the new homes, businesses and room additions that became my trademark of quality. Quality is everything and I soon discovered that consumers placed a high value on this characteristic. It should come as no surprise that I have adopted the same philosophy in my current media career. I am constantly striving to work with people who feel the same way as I do about quality.

AsktheBuilder may seem like it is just me, but there are many people who are responsible for my success. The list is large. Some I have known for years, others just in the past several months. No doubt the biggest thanks should go to my lovely wife Kathy. She has supported me since day one when I decided to jump feet first into the writing and publishing world. In fact, the idea to write the syndicated newspaper column was hers. My children, Meghan, Tristan and Kelly, also need to be thanked. When I am grumpy because of deadline pressures or tired from working too hard, they have suffered.

Who else has helped me get to this point where I can so readily share my knowledge with others? Let's start at the beginning. I owe much to:

- Roger Henthorn - for his years of computer support
- Marty Hovey - for his computer, programming and graphic support
- Richard Anderson - for his constant moral support of my new career
- Laura Bennett - for her fresh perspective of the publishing and public relations industries
- Jaclyn Easton - for her mention of me in her best-selling *StrikingitRich.com* book
- David Weiner - for selecting me to become a *Home Ranger*
- Randy Cassingham, author of This is True® - for introducing me to Hotshots
- Mary Westheimer - for connecting the dots between instant need and my content
- Michael Keating - for his photographic talents. His photos grace the website and eBooks.
- And countless others who have helped me get to this point

I wish to thank Nick Motz for allowing me to photograph this stair building project at a house he owned at the time the photos were taken. It just so happens the house was familiar to me. I grew up in it. Nick purchased the home from my mother when she moved to a nursing home.

Chapter One - Stair Basics - Risers and Treads

Several months ago, a very good friend of mine, Nick Motz, called me for help. He needed to build a simple set of steps. Nick is very industrious and had already spent lots of time on the Internet trying to find simple instructions that would allow him to complete the job. He ran into many dead ends.

Nick is a smart guy with lots of DIY construction experience, yet the thought of building steps intimidated him. I started to think back to how I taught myself to layout and cut steps. I can tell you this: Those with a good understanding of a framing square will have no problem building stairs. Think about a side view you have seen of a set of stairs. It is simply an offset stack of 90 degree angles. A framing square is a single 90 degree angle.

Stairs are a Tilted Floor

When you walk across a typical wood floor that has a room below, the floor itself probably consists of joists covered with a sub flooring and a finished floor. If the joists are sized to minimum standards, the floor might feel spongy or bounce. This can be unsettling. If a floor such as this was overloaded, it could collapse as any floor might.

A staircase is built the same as a floor. The treads you step on are the flooring and these treads are connected to stringers or the beams (think joists) that support the weight. A strong set of steps has beams that are full size.

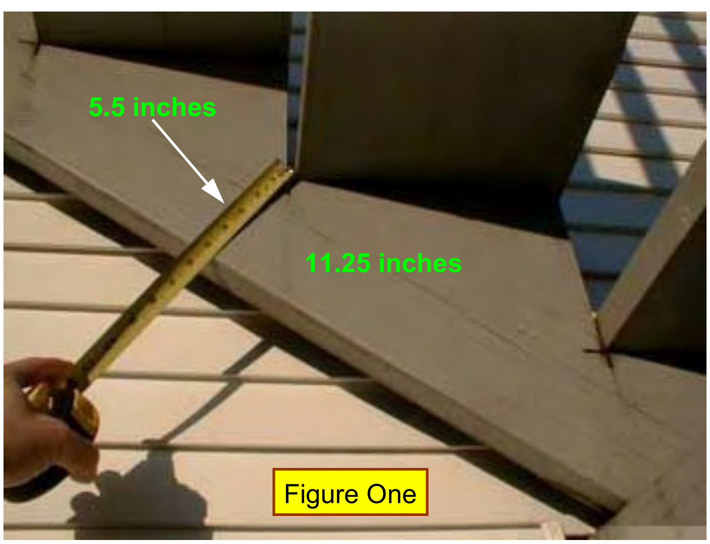

Figure One

Take a look at Figure One. It is a set of steps located not too far from my home. It is built as I see many stairs built. The carpenter laid out the risers (the vertical dis-

Building Code Issues

The Building Code is a living breathing organism. It may seem likes words on paper, but the code changes from year to year. In fact, the code has changed significantly in the 30 years that I have dealt with it, especially the section dealing with stairs.

Years ago I distinctly remember the code I used to work with talked about minimum and maximum sizes for the stair treads and risers. In fact, I remember a guideline that read: *The sum total of two risers and one tread shall be no less than 24 inches and no more than 26 inches.*

The Magic Number 25

The code reads differently today. But the older code section has a message that is carried forth in the new code. 25 inches happens to be exactly between 24 and 26 inches.

It just so happens that a staircase built with 7.5 inch risers and a 10 inch tread meets the old code. In fact, it satisfies it perfectly. Why? Two times 7.5 inches plus 10 inches happens to be 25 inches.

I learned long ago that the most comfortable set of steps to go both up and down is one that has 7.5 inch risers and 10 inch treads. **Whenever I can control the distance between floors**, a deck surface and the landing spot below, etc. you can bet the vertical distance is a multiple of 7.5 inches.

Just so you know, this combination also meets the current building code in place as I write this. But always check the code!

tance from one tread surface to another or from a tread to a floor surface) and treads (the flat part of a stair that your foot steps on) and started cutting into the stringer. He made a series of L shaped notches that you can clearly see in the photo. The trouble, is in doing so, he severely limited the amount of load the stairs can safely carry. The original width of the stringer was eleven and one-quarter inches. That is the distance between the two arrow points on the green line in the photo. If you look very carefully at the tape measure I am holding, you will see that the effective width of the stringer is about five and one quarter inches! Each stringer is less than a 2x6 not a 2x12 as it was before the carpenter made his first cut. Building a set of steps with notches as you see is fast. I have learned over the years that speed does not always equate to overall quality.

I am going to teach you a different method to create stairs. One that will take just a little more time, but one that produces maximum strength. We are not going to notch the stringers. We are going to create mortises - slots in the stringers - that will capture and hold the individual stair treads. Not only does this method create a strong set of stairs, but it also creates one that is much better looking.


Figure Two

Planning the Stairs

Look at Figure Two for a moment. It is probably not unlike the stair project you are about to tackle. It is a very interesting photo as it gives you a few clues of what used to be on the back of this home. A concrete block structure used to support a concrete pad just below the door. The wood deck structure has taken its place. Along the wall you can see the missing stucco where the concrete stairs used to be. These stairs extended from the concrete landing to the driveway. Shifting soil caused the entire structure to pull away from the house and tilt at a dangerous angle.

Don't let the new concrete pad fool you. It was poured at a precise height and horizontal distance away from the wood structure. After my friend Nick gave me the rough dimensions of the vertical distance from the wood landing to the blacktop below, I told him where and how high to build the concrete pad you see. Its proper horizontal distance away from the upper landing and its height are vital to the overall success of the job. If the landing is too far away, then the steps miss it. If it is too high or low, the stair treads will not be level.

Many people make a huge mistake when they take the vertical measurement for the total distance between their deck and the ground or from the first floor to the second floor. They simply drop a tape straight down and measure. This is wrong! It would be pure dumb luck if the distance happened to be correct – even in new construction where you think the lower floor is level.

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The actual vertical distance a set of steps traverses is the distance from the tip of the landing or upper floor **just above the highest stair tread** down to the floor or ground **immediately under the lowest tread**. Determining this measurement is not always easy to do. It requires you to calculate the spot where the bottom of the stairs will rest.

Horizontal and Vertical Distance Calculations

Figure Three shows the simple tools needed to build a set of open utility steps. You should be able to see the portable work support stand (I need two of them), level, tool belt, razor knife, tape measure, pencils, chisels, circular saw, router, two framing squares and the small brass stair gauges between the saw and the framing square. The small hands tools are all loaded in the tool belt and hidden from view. Be patient, I will explain the stair gauges in the next chapter. The two most important tools needed at this time are simply the level and the tape measure. You need these to calculate the riser height and tread length.

New Construction Applications

Imagine a project where you can control the locations of things. This means a new home, a deck, a room addition set at a different level, etc. When you are faced with this situation, you are in the driver's seat. Whenever I had this type of control on a project or its design, you can bet I made sure that the distance from one finished floor surface to another was a **multiple of 7.5 inches**. Do not get confused with sub floors and finished floors. Keep in mind the finished floor heights. For example, you often have to build and place stairs before the finished floor is installed. Just be sure you do your math right in the original layout or project design to account for this.

Risers	Treads	Finished Floor to Floor Height
1	0	7.5 inches
2	1	15
3	2	22.5
4	3	30
5	4	37.5
6	5	45
7	6	52.5
8	7	60
9	8	67.5
10	9	75
11	10	82.5
12	11	90
13	12	97.5
14	13	105
15	14	112.5
16	15	120

This table will save you some pencil lead. While we are at it you need to always keep in mind that in any given set of stairs there is always one more riser than there are treads. The table tells you that if you have just one riser that the distance between finished floors will only be 7.5 inches. In other words, there is no tread. You step up or down from one finished floor to the other.

I have a simple stair from a side porch to a brick pad. It has only one tread. There is a riser from the brick to the tread and the second riser from the tread to the porch. Do not forget this very important stair building axiom.

The set of stairs that are the focus of this EBook is another example. **I con-**

trolled the height of the risers by making Nick pour a landing pad at a precise height. It was not realistic for the blacktop to be placed that high at this house.

Pre-Existing Stair Situations

Often you do not have the luxury of building the dream set of stairs. You are forced to work with a vertical measurement that you simply can't change. If you are faced with this situation, the problem gets a bit trickier. Keep in mind that you also have to satisfy the building code. This can be a real problem the fewer risers you have to work with. For example, let's say that the vertical distance you have to work within is 26 inches. That is almost exactly the halfway point between the ideal vertical distances of 22.5 and 30 inches (multiples of 7.5).

The current building code we use in my city tells me that the maximum riser height permitted is 7 and 3/4 inches. This automatically means that you can't have just three risers and two treads for these stairs. 26 inches divided by 3 would give you a riser height of 8 and 5/8 inches or so. That is both dangerous and against code. Divide 26 inches by 4 and you arrive at 6.5 inches. That is a fairly shallow riser, but workable.

Construction Calculators

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To make the stairs comfortable, you then start to adjust the tread depth. Keep in mind the old code guidelines of 24—26 inches for two risers plus one tread. Using this formula you can hit the old code guideline with an 11 inch tread depth. Two times 6.5 plus 11 equals 24. Always try to hit this old code guideline if possible while meeting current code requirements.

I took the easy way out with that example. Imagine how difficult the math might be if the actual vertical distance between floors was 69 and 5/16ths inches! Ho hum...this is not a problem if you have in your hands a simple and inexpensive calculator that allows you to enter feet, inches and fractions of inches as you enter the measurements. Using the *Ideal 7.5 Inch Riser Table* on the previous page, you can see that this distance falls between 9 and 10 risers. You can start by dividing the vertical distance using the smaller riser number 9 to see if that will give you a riser that will meet code.

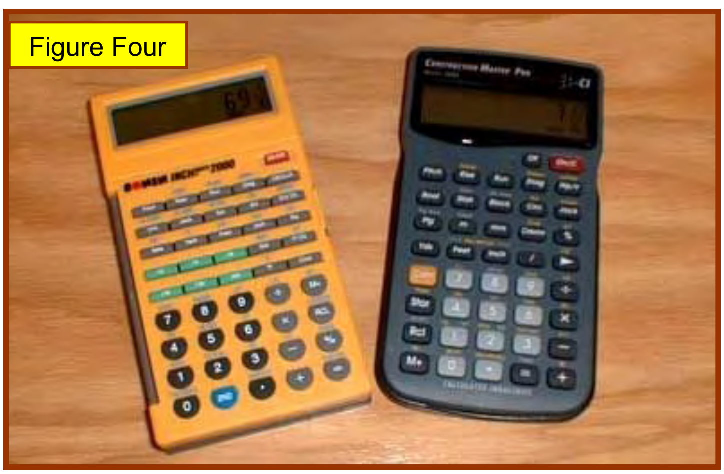

Figure Four

I happen to own two different construction calculators. One is the black **Construction Master Pro**® and the other is the yellow **Sonin Inchmate**®. Both are a breeze to use and allow me to easily enter dimensions in any format. In a matter of seconds I entered 69 and 5/16ths inches, hit the divison key, punched the number 9 for the amount of planned risers and finally hit the equals key . The instant result was 7 and 11/16ths inches. That dimension just makes it under the code requirement of a riser no higher than 7 and 3/4 inches.

These calculators are a must when you have to divide measurements that contain fractions of any type. I strongly recommend that you purchase one of these two calculators or a similar brand/model that solves ordinary construction problems using feet and inch dimensions. There are many other problems you can solve with these priceless tools. They are not limited to stair calculations by any means!

Risers Tell You Treads

In Figure Five, you can see how Nick and I arrived at the number of risers. Using the long level we established a level line out from the top of the landing. The distance from this line down to the landing pad, lower floor, etc. must be a multiple distance of whatever the risers will be. In this particular case, I determined that we could get seven risers, each of which was 7.5 inches high. Multiply seven times 7.5 inches and it totals 52.5 inches. The vertical distance from the line we are creating down to the pad is exactly 52.5 inches.


Figure Five

Do not be confused by landings in a straight set of stairs or a set of stairs that turns a 90 degree angle. The landing is simply one giant tread. Treat it this way and you will never have a problem. If the landing is indoors and will receive finished flooring, be sure to set the rough sub floor height of the landing to account for the finished flooring. It is easy to make a mistake here. I always avoided this problem by making a fairly accurate cross section drawing of the actual stairs I was building. Note the break between the subfloor and finished floor and assign an exact dimension to it from either the upper or lower subfloor. Planning is everything.

Once you know the number of risers, you automatically know the number of treads the stairs will have. You can then calculate the spot, within a few inches, of where the bottom of the steps will rest. This is done by simply adding up the number of treads and multiplying it by the tread depth. If a set of steps has seven treads and they are 10 inches deep, then the front edge of the bottom tread will end up 70 inches away from the face of the top riser. This means that the landing pad must be shifted back 6 inches or so towards the platform or floor above. In Figure Five, Nick's right foot is on the back edge of the landing pad exactly where the stairs will end. This will make perfect sense in just a few moments as we get farther into the book.

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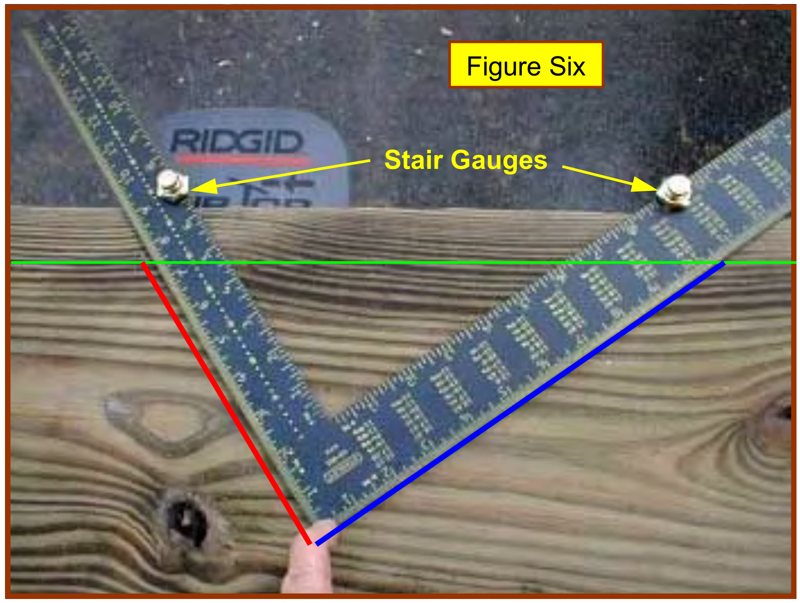
The tread depth is related to the riser height. You might be able to reckon this from the old building code 24-26 inch guideline I mentioned earlier. As the risers get shorter, the tread lengthens. But always keep in mind that riser height is critical. Stairs that have risers less than 6 and 3/4 inches high can be very uncomfortable to climb and descend.

Chapter Two - Stringer Layout - How to Use a Framing Square

It is now time to build the stairs. I have to assume that you have determined your risers and treads at this time. If you haven't, then I suggest you build a small set of stairs that has only two treads and three risers. It will be your test set. The cool thing is that you can do this with just two 8 foot long 2x12's. I always use 2x12 material to build my stairs. This material allows you to have stingers that will be very strong. Remember, the stringers are the beams that support the staircase. Do not go cheap here. Using 2x12 material for the treads gives you a perfect surface to accept footfalls. It will also provide the perfect setback - in most cases - for nosing distance if you decide to put a closed riser board between each tread.



Cool Little Tools

At this time, I want you to have your framing square, the brass stair gauges, and a pencil ready to go. Once we get through the next few steps, you are going to be a master stair builder!

Let's talk for just a moment about the bright brass stair gauges in Figure Six. These are handy thumbscrew clamps that attach to a framing square. Once you have the square in position, you slide the gauge down the framing square until it touches the wood. You then tighten the thumbscrew on top of each gauge. Once both gauges are in position, the framing square alignment is locked in position relative to the edge of the piece of wood.

The 90 Degree Axiom

I have been talking risers and treads for several pages now. But one very important thing I tend to assume is that people automatically realize that the angle between a tread and a riser is 90 degrees. If you don't already know this, you sure know it now. The framing square tongue (the narrow part usually 1.5 inches wide and 16 inches long) is always set at 90 degrees to the body of the square (the fatter part of the square usually 2 inches wide and 24 inches long). You can see this in Figure Six.

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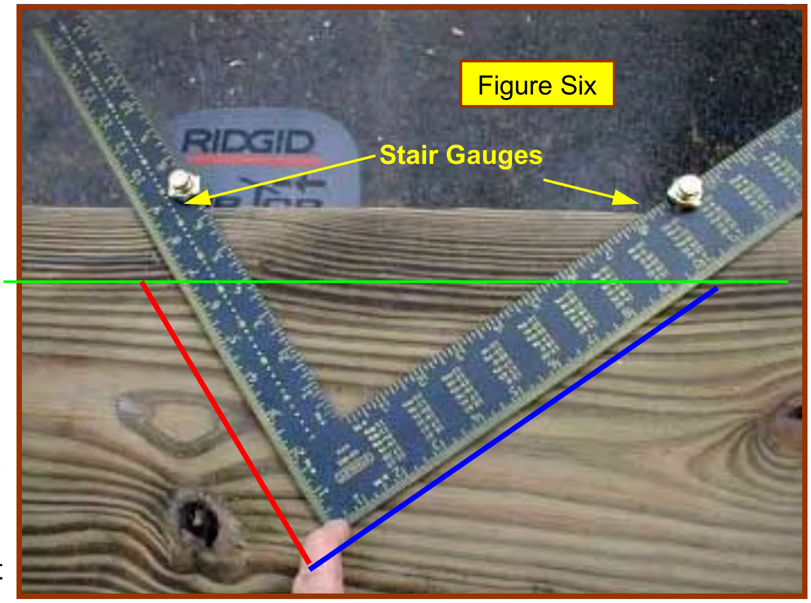
Figure Six is perhaps one of the most important photos in this EBook. Once you understand the concept of what I am trying to show, you will be able to build ANY set of stairs anyplace, anytime. I am going to reproduce the image on the next page for ease of use while describing it.



There are three colored lines in the photo that allow me to help illustrate my points. The green line is set parallel to the edge of the wood. I prefer to make this line 1.5 inches in from the edge. I draw it down the entire length of the stringer. This line represents the plane or top edge of all risers in the set of stairs.

If you build a perfect set of stairs or steps and place a straightedge on the stairs, the top corner of all treads should touch the straight-edge. No one tread should be out of line. If it is, it throws off the tread depth of the step above and/or below the one that is out of line. The red line represents a riser height. The blue line is a tread. Are you having trouble visualizing this? If so, check out the next photo.

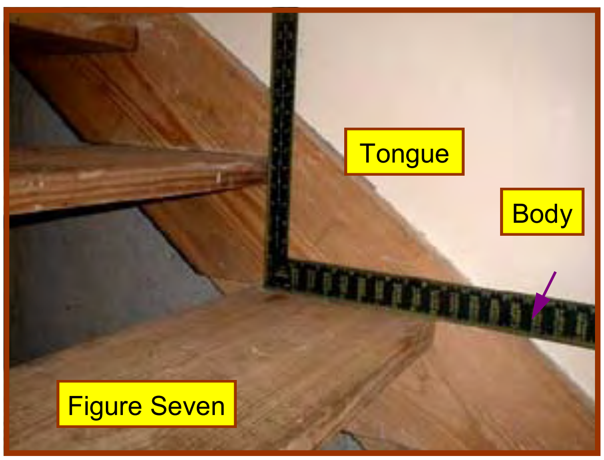


Figure Seven should put all of what I have said so far into perspective. You are looking at a small portion of the simple stairs outside of my basement office that lead up to my laundry room. If you could read the numbers on the square you would see that the top of the tread is contacting the tongue of the square right at 7.5 inches. You may be able to see that the front edge of the tread where the green line touches the tip of the blue line is right at 10 inches. **The exact same thing is happening in Figure Six above**. The green line is touching the tips of all of the treads and is parallel with the top edge of the stringer. All one has to do is make a series of these red and blue lines with the square to create the lay-out of **the top of each tread**.

Can you see how easy this is going to be? The framing square, once set at the correct riser height and tread length, allows you to make these parallel sets of lines one set at a time as you slide it along the edge of the stringer. What's more, the tongue of the square creates the final vertical plumb cut where the top of the steps rests against the deck or top landing. It also cre-ates a vertical plumb cut at the bottom of the steps. The body of the square, in turn, creates the flat seat or bottom cut where the steps sit upon the landing. I'll bet you never thought it would be this easy! Let's move on so I can show you how quickly the layout will progress.

Chapter Three - How to Build Your First Riser and Bottom Seat Cut

Figure Eight illustrates how you determine where the top of your first tread begins so that you have no waste of lumber. With the stair gauges set on the black framing square I can slide it down towards the end of the 2x12. Keep in mind that the bottom edge of the black square actually represents the **top of the treads.** Refer back to Figure Seven to confirm this.

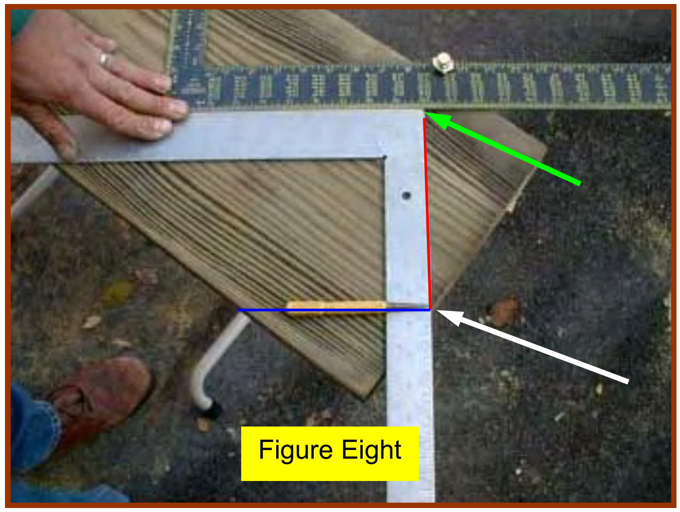


Figure Eight

Since we want 7.5 inch high risers (or whatever you determine the risers will be in your stairs), you use another framing square that is upside down. With the bottoms of the two squares touching you slide them down the stringer until the actual riser height on the tongue of the lower square matches what you need. In my case it was 7.5 inches.

But there is one other critical thing you must take into consideration to make the steps look right. Remember in Figure Six I told you to create the green setback line of 1.5 inches. A similar 1.5 inch border needs to be added to the front of the first riser. You can see a similar border added in Figure Nine. The distance of the border in Figure Nine is more than the border distance from the tips of the treads to the top edge of the stringer. I cut it this way for this set of stairs so that the vertical face would not be too terribly high. On outdoor stairs, I prefer to have the distance between the tips of the two green arrows the **same as the distance between the tips of the treads to the top edge of the stringer**. In the stairs we are building now, I will make this distance 1.5 inches.

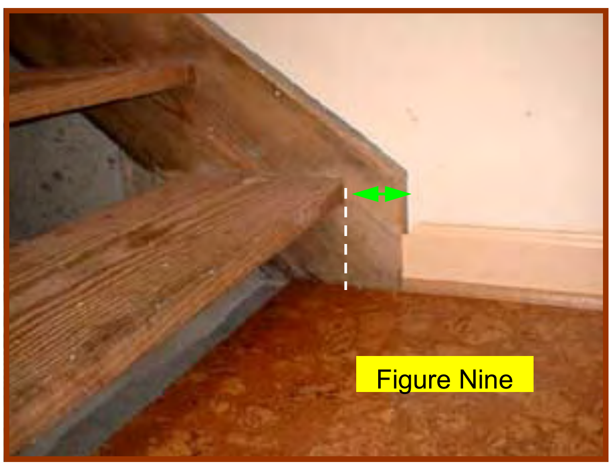


Figure Nine

The white dashed line in Figure Nine is the actual riser height. You could make your vertical plumb cut of the steps here, but I think you can see how unattractive that might be. The vertical cut would continue up until it intersected the top edge of the stringer.

Refer back to Figure Eight. To account for the 1.5 inch border, you need to slide the bottom aluminum square to the right until its corner is at the 11.5 inch mark of the black square. I say 11.5 inches because I am using a 10 inch tread (10 + 1.5 = 11.5). If your tread depth is different, you would add your tread distance plus 1.5 inches. Holding the two squares in position like this, you now slide both **at the same time** until the bottom aluminum colored square measurement on the outer edge of its tongue **equals your riser height**. In Figure Eight, the tip of the white arrow and the yellow nail set are pointing to the 7.5 inch mark on the aluminum framing square.

With the aluminum square out of the way, you can see the pencil lines. The horizontal pencil line that is parallel with the bottom of the black square was made after I drew the vertical pencil line. I simply flipped the aluminum square around and drew the horizontal line at a 90 degree angle to the vertical line.

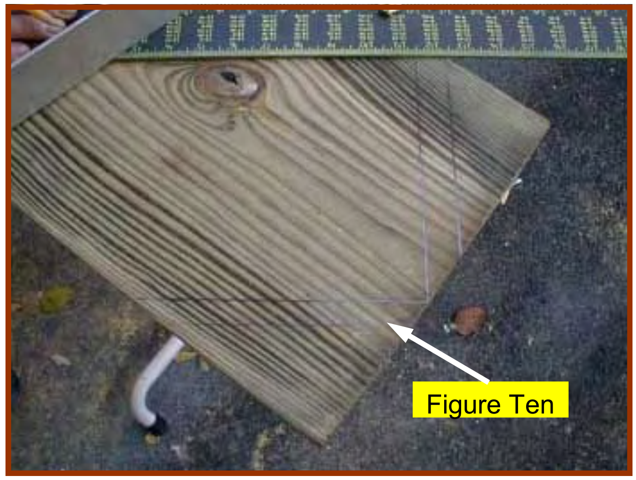


Figure Ten

The tip of the white arrow once more shows you that the two lines intersect right at the end of the 2x12 so there is no waste of lumber. I drew parallel pencil lines on either side of the actual lines just to draw attention to the actual cut lines. You do not need to do this. If you look very closely you can see the vertical pencil line touches the bottom of the black framing square just at 11.5 inches. Furthermore, if you could put a tape measure on this same pencil line, it would be 7.5 inches long from where it touches the framing square to where the tip of the white arrow is. Once again, **your riser height may be different**!

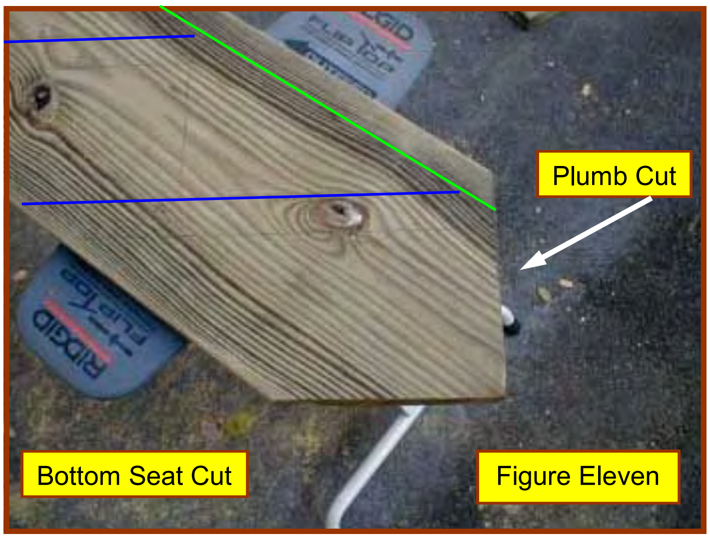


Figure Eleven

Figure Eleven shows you the bottom of the stringer once I have cut along the pencil lines. This photo is actually a little out of order as it shows the layout lines of the treads already complete. I am just about to show you how to do that. But I wanted you to see how the cuts make sense.

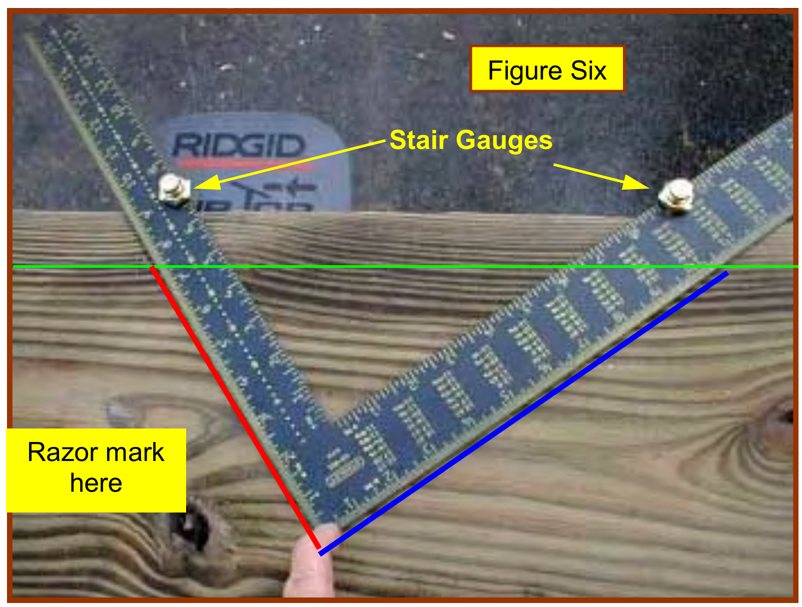
The plumb cut is parallel with any and all risers. The bottom seat cut that will rest on the concrete pad is parallel with any and all treads. I have taken the liberty to draw a blue line that overlays the pencil line indicating the top of each tread. You should be able to clearly see that the blue tread lines are parallel with the bottom seat cut. What is perhaps even more important is the first blue line above the seat cut is actually 7.5 inches up from the seat cut. The white line with two arrow points shows where I am getting this measurement. This same white arrow line represents the first riser. Don't confuse the vertical plumb cut as the first riser. The length of this plumb cut is greater than 7.5 inches since it extends up to the top edge of the stringer.

Chapter Four - Master the Layout of All Treads and Risers

Let's summarize where we are. If both of us have done our jobs you have:

- learned how to determine the right distance for risers and treads
- a good understanding of how to place the framing square on a stringer
- successfully completed the layout of the first riser and tread
- created the bottom plumb cut and seat cut of the first stringer

If you have achieved all of the above, you are over the hump. It is all downhill from now. Congratulations! Laying out the remaining risers and treads is simply a repetition of a few of the steps you have already completed. For just a moment, refer back to Figures Six and Seven. The blue lines are the treads and the red lines are the risers. Note how they both end at the green line. Pay attention to Figure Seven of the finished stairs just outside my office. See how the next blue line starts where the red line stops as the red line hits the green line?



To make it easy, I have reproduced Figure Six here. Imagine for just a moment that the blue line in the image is the first tread line that you have already drawn. Look back at Figure Eight quickly. Just after you drew the vertical line for the first riser you could have carefully removed the aluminum square **without moving the black square**, and drawn a line across the bottom of the black square until you got to the outside corner of the square. That line would be your first tread. With the black square still in place, you could then draw a line up the outside of the tongue and create your **second** riser. This is exactly what Figure Six above is showing you.

You do not have to draw the actual riser lines as you go up the board. The only lines that matter are the actual tread lines. I use a razor knife to make a crisp line right where the outer edge of the tongue crosses the green line. If you use a pencil instead, it better be sharp! If it is a fat mark and you have 16 risers and fifteen treads to mark out, you may grow your steps by as much as a half an inch. A pencil mark of say 1/8 inch in width can cause confusion. Your risers may grow by 1/16th inch each time you move the square. How you ask? Where do you place the edge of the square after it moves? On the right side of the mark? On the left side? Somewhere in the body of the fat pencil mark? This type of carpentry is very exacting. The razor mark is very precise.

The next step would be to slide the framing square to **the left** along the edge of the stringer in

Figure Six above. Stop when the bottom edge of the body of the square touches the intersection of the razor mark and the green line. You now draw a pencil line across the bottom of the square where the blue line is above and you have created your next tread. Make your second razor mark where the tongue crosses the green line and you are once again ready to move the square. See how fast this is going to go?

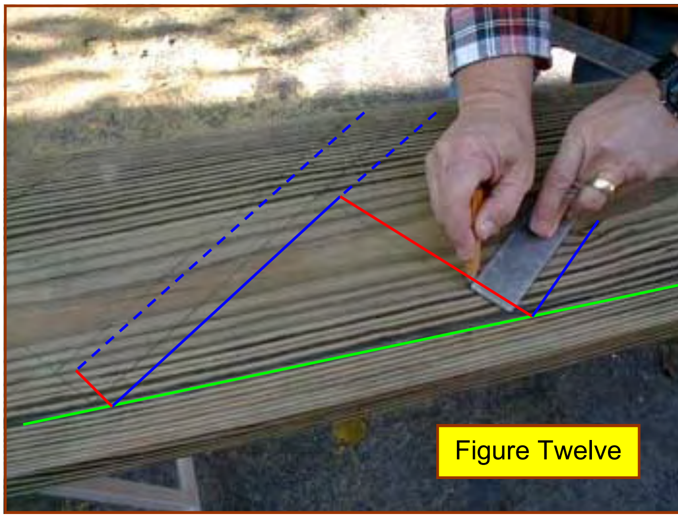


Figure Twelve is sort of upside down. Sorry! I proceeded up the stringer and marked out all of my treads. It is now time to create the outlines for the mortise slots in the stringers where the actual treads will fit. The 2x12 lumber I use for steps is just a little bit over 1.5 inches thick. The tongue on the framing square is 1.5 inches wide. This make it a handy tool to draw the small vertical line of the tread and the bottom line of the tread.

In Figure Twelve, you can see me beginning to draw the bottom line of the tread. The pencil is in my hand and I am ready to draw a line all the way to the far end of the stringer. The actual cut lines for each tread mortise are represented with solid blue, and dashed blue lines as well as the short red line in the tread to the left of where I am drawing the line.

Once you have all of the top lines of your treads drawn, you go back with the tongue of the framing square and draw the outline of the complete tread as I have done above. Just be sure you are always drawing below the top line of the tread! If you make a mistake, it should stick out like a sore thumb. It is always a good idea to make notes with your pencil as to the top tread line. You can always erase it before the job is done!

Figure Thirteen shows the stringer laid out ready for me to cut. For purposes of clarity, I drew in the vertical riser lines. I will **not** be cutting on this line, but I want you to see it. I have kept with the same color scheme meaning that blue lines are for flat or horizontal tread cuts and the small red line is a vertical cut or part of the actual riser line. Each of the tread mortises will look like this as you continue up the stringer. The area inside the boundary of the blue and red lines is going to be cut out to a depth of just one-half inch. It will make a perfect recessed area for each tread to fit into.

Chapter Five - Discover How to Cut the Top Vertical Stringer

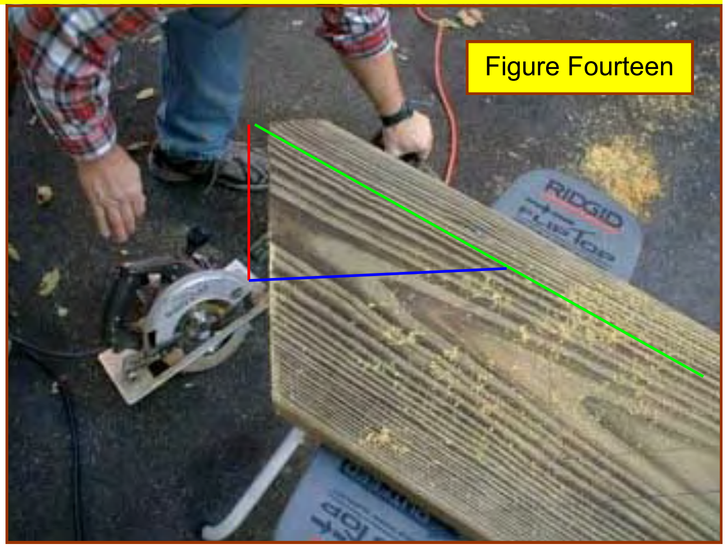


Figure Fourteen

Where are we? You have cut the bottom of the stringer off and the treads are all laid out and ready to be cut. But what about the top vertical plumb cut that sits against the landing or your deck or whatever? You can see this cut already made in Figure Fourteen. But how did I do it? Simple! It is just **the last riser**.

In this EBook, each time I draw a riser, it is red. Treads are blue. I have drawn the last ones for you on the top of the stringer in Figure Fourteen. If you just continue the red line to the bottom of the stringer, you can see how to make the top vertical cut.

I also made a secondary cut at the top of the stringer. The 1.5 inch setback indicated by the green line is the cause behind this cut. In Figure Fourteen, can you see how the top of the stringer is parallel with the blue line? The blue line represents the top of the last tread. Before I cut the top of the stringer, it came to a point. I have outlined the missing piece with magenta colored lines. If I had left this triangle of wood on the stringer, it would project up above the surface of the landing, deck or second floor or whatever the finished flooring is. Remember, the length of the **red** line in Figure Fourteen is 7.5 inches or the height of my risers. Your riser height may be different.

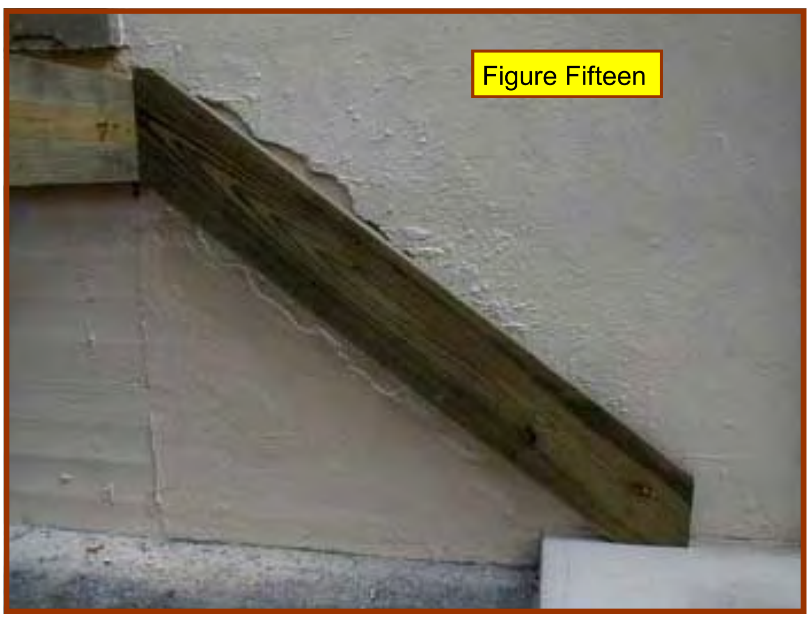


Figure Fifteen

The Test

Well, you have completed the stringer! Woo Hoo! Let's see if it works. I have done just that in Figure Fifteen. As you can see, pictures indeed do not lie. The stringer fits like a glove.

The vertical top cut fits perfectly against the face of the landing. The bottom seat cut is contacting the concrete pad along its entire length. There is no gap. **Victory!**

Chapter Six - Discover How to Cut Your Second Stringer and Determine the Tread Width

You have successfully laid out the treads and cut the bottom and top cuts for the first stringer. More importantly, it fits. You should be proud. The next step is to cut the second stringer using the exact same methods as you did for the first. But keep in mind that you do your layout on the **other side** of the next piece of lumber. If you do not pay attention to this step, you will make the mortises on the **outside** of the second stringer. That would be a real bummer!

Figure Sixteen

First things first. If you have an eagle eye, you will notice that the top of the first stringer is above surface of the deck joists in Figure Sixteen. I didn't make a mistake. Nick didn't have time to apply the decking to the landing before I showed up. I knew the decking was one inch thick so I took that into consideration when I laid out the deck and calculated my original risers. When the decking is placed, it will be perfectly flush with the top level cut of the stringer.

Look at Figure Sixteen to understand what I am talking about. You can see the first stringer I cut against the house. The pencil lines I created for the tread mortises on the face of the stringer that you see — **not the face against the foundation wall** - are too faint to see in the photo but rest assured they are there. If you were to make an exact copy of the first stringer, the lines would be on the wrong side of the duplicate stringer as they would be facing away from the house. The layout lines of the **second stringer** must face towards the house foundation wall. This will make perfect sense in a few moments when you see the following photos.

In Figure Sixteen, my friend Nick is doing preliminary measurements for the treads. We are determining the length of the tread. The second stringer will be placed against the landing in between the two yellow lines. These two lines are 1.5 inches apart from one another - the thickness of a stringer. The yellow line that is farthest away from the house (closest to the three visible bolts in the landing ledger board) is in line with the face of the 4x4 that is closest to the house foundation wall. I do it this way for several reasons. Primarily, I stay out of the way of the 4x4 landing support post. I anchor my steps to the landing with large lag bolts that pass through the landing board and into the top vertical plumb cut of each stringer. If I were to place the stringer in line with the 4x4, I would have to use a giant lag bolt that passes through the 4x4, then the deck ledger board and finally into the stringer. Secondly, placing the second stringer in this position lines it up so the hand rail that goes on the outside of the stringer connects with the 4x4 post.

Nick and I can easily calculate the length of the treads. With the first stringer in place where we want it, we simply measure from it to the yellow line that is closest to the house. This is the finished distance between the two inner faces of the stringers. Take this distance and add **one**

inch. You add an inch because each end of each tread is going to fit into the **one half inch deep** mortise that we are about to create at each tread location. We are doing this now so that both of us can keep busy as I create the second stringer. I start the process of creating the second stringer by using the first stringer as an overall template. I want both stringers to be the exact same overall size. This is simple to do as you just lay the cut stringer on top of a 2x12 that is longer than the first stringer we cut. Use a pencil to trace the top vertical cuts and the bottom seat cut. In Figure Seventeen, I am tracing the top vertical cut.


Figure Seventeen

It is very important to note that **I will not cut the stringer at this time**. Why? If you cut it off, then the framing square has nothing to hold on to as you get up to the top of the stringer. Your final tread and riser lines are nearly impossible to draw. When I am nearing completion of the tread layout lines on the second stringer, the end of the framing square with the brass stair gauge touches the 2x12 **to the right of** the cut off lines I am now drawing in Figure Seventeen.

As you have already learned, it doesn't take long to lay out and then cut the stringers. In Figure Eighteen, I have done exactly that. It fits the landing and pad just as perfectly as the first stringer. I am using my tape measure in the photo to make the two stringers parallel just so you can get an idea of how close we are to completion. All that we do now is cut out the wood at each tread location to create the mortises and then assemble the parts.


Figure Eighteen

Chapter Seven - The Final Steps - Cutting the Mortises and Assembly

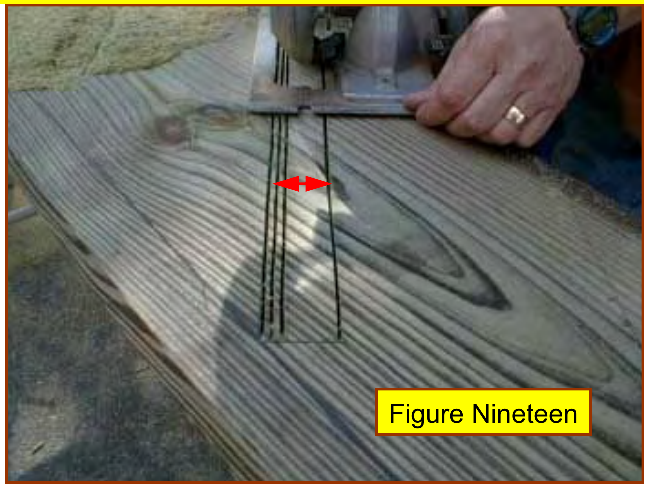


Figure Nineteen

It is time to create the mortises. This is a very easy job, but it creates lots of dust and takes a little time. Figure Nineteen shows the first secret to this process. I use my circular saw to get the task started. The first thing to do is set the blade cutting depth of the saw to one-half inch. You then start to make parallel cuts inside the two cuts that create the top and bottom of the tread. The distance between the tips of the red arrows that are pointing to outer edges of the saw cuts is just 1/16th of an inch or so greater than the thickness of the tread 2x12 material. Be sure to check the thickness of the tread material before you make the outer cuts. If the mortise is too narrow, it will be impossible to fit the tread into the mortise. If you are sloppy and cut it too big, it will look very bad once the stairs are assembled. It is easy to get it right, just check and double check measurements before you make your cuts.

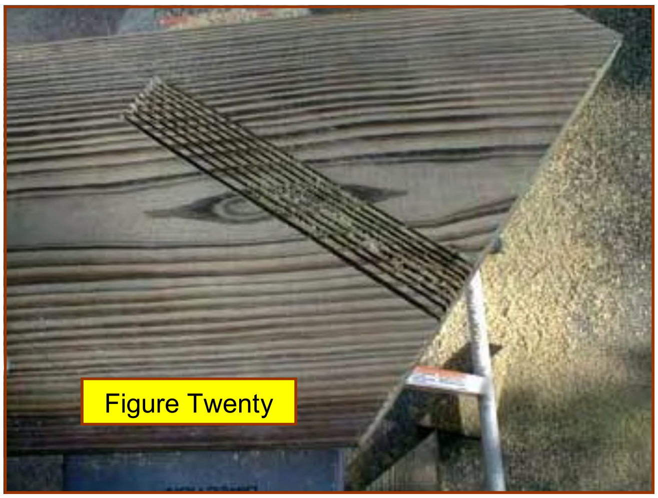


Figure Twenty

The interior saw cuts leave approximately 1/8 of wood between the cuts. You stop the saw cut at the front edge of the tread. Slow down as you approach that line. Figure Twenty shows the completed saw kerf cuts. Be sure to wear a mask if you are using treated lumber that has preservative chemicals in it. This sawing process creates vast amounts of dust.


Figure Twenty-One

Figure Twenty-One shows how I remove the narrow strips of wood that remain in the mortise cavity. A wood chisel works well to remove the wood strips. You can place the chisel vertically in between strips and lean the chisel over both directions to break them off at the base. The wood strips break easily if you made sure that the are not much wider than 1/8 inch. Wide strips of wood are very difficult to remove. Once the strips of wood are removed, there will be a large quarter circle amount

Figure Twenty-Two

of wood at the end of the mortise where the saw cuts stopped. It takes good old-fashioned carpentry skill, a hammer and the wood chisel to cut this small amount of wood down so that the mortise is a consistent depth from one end to the other. Figure Twenty-Two shows me doing just that. A sharp wood chisel makes quick work of this task.

Figure Twenty-Three shows you a stringer that is ready for assembly. Look at the sawdust on the ground under the stringer. There is even more to the right that you can't see. Note that the mortises extend out the back of the stringers. This is actually the underside of the stairs once the treads are installed in the stringers. You could create rectangular mortises that perfectly matched the shape of each tread, but that is one heck of a lot of work. If you feel you have the time and inclination, go for it.

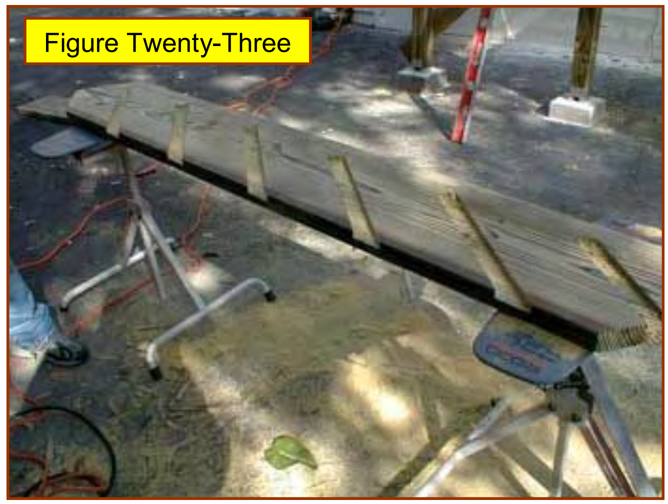


Figure Twenty-Three

Once you have created the mortises for both stringers, it is time to begin assembly of the stringers and the treads. I prefer to use gravity as an aid in this process. I lay one of the stringers on a flat surface and begin to tap the treads into place. You can make a mistake at this point if you are not careful. The 2x12 material used for the treads is not always perfectly flat. Each piece may have a small cup in it. You can minimize this when you purchase the lumber by making sure you buy lumber that is very straight and true in all dimensions. If your treads have a slight cup where the surface you walk on has a hump on one side and a dip in the other, you want the **hump side pointing to the sky**. If you do it the opposite way, rainwater can collect in the dip. This may freeze in cold climates and make for a slippery set of stairs. In warm climates, the standing water fuels algae growth.


Figure Twenty-Four

Figure Twenty-Four shows all of the treads in position. The tight mortise cuts are holding them in position. If the cuts were sloppy, they undoubtedly would fall over. They have yet to be nailed into the stringer that is on the ground. The next step is to take the remaining stringer and set it on top of the treads. It takes a little bit of fitting and tapping to get the stringer to drop down onto the treads. This is the time when you


Figure Twenty-Five

learn why it is so important to cut the mortises correctly with respect to the thickness of the treads. If you cut the mortises too tightly trying to make the stairs a piece of fine cabinetry, you will get very frustrated very fast. I try to cut my mortises perhaps just 1/16th larger than the thickness of the treads. Look at Figure Twenty-Five. See the triangular block of wood on top of the stringer? I use that to protect the outer edge of the stringer as I tap or hammer on the stringer to get the treads to sink into the mortises. The last thing you want after all of this work is a collection of hammer beauty marks where you have repeatedly hit the stringer with the hammer.

At the very least, use three inch long ring shanked hot-dipped galvanized nails to attach the treads to the stringers. In this case I used stainless steel nails that Nick had provided. Stainless steel is my weapon of choice. You can sleep at night knowing there will never be any corrosion. Take your time and be sure the nails are being driven into the center of each tread. I like to sight down the tread just as I am doing in Figure Twenty-Five.

Figure Twenty-Six shows the stairs complete, but on their side. Once the top stringer was nailed into the treads, Nick and I carefully flipped the stairs over so we could nail the remaining stringer to the treads. You have to flip the steps slowly so that the treads do not pop out of the mortises. If they do, it is no big deal, just an added step. Once again, use wood blocks as shown to tap the stringer down onto the treads.


Figure Twenty-Six

Even though this is a small set of steps, it is very heavy. I could install them by myself, but two people make the job go that much faster. Nick is using a power drill to make a pilot hole in the ends of the stringers. These holes will accept the lag bolts that will pass through the landing. Careful measurements insure that the holes match up. You can choose to drill the holes after you place the stairs in position. Nick was feeling lucky on this particular day!

We are almost finished. In fact, you may decide not to do the final small step I prefer to do, but I feel it would be a mistake to skip this step. I just told you that the steps are heavy. Imagine what type of force is pushing down on the steps if you and a friend are carrying a heavy item up or down the steps. And that is exactly what is happening. The top of the stairs wants to go down causing the bottom of the steps to kick out and slide across the landing below. If the stairs happen to be tall, people can get seriously hurt or killed.

Attaching Stairs to Landings

You lift the stairs into position they seem to hold fairly well. Gravity is holding them in place. What happens if you just drive some nails through the sides of the stringers at an angle into the deck landing and into the wood floor below if you have one? That would be a very poor connection detail indeed. The lag bolts I am going to use are one step better but not the best method. A person may drill an oversized hole for the lag bolt causing a very loose connection. Or worse yet, an over-zealous person may crank the ratchet several turns too much and actually strip the wood out as the spinning lag bolt begins to act as its own drill bit. Many people have been killed by deck collapses where deck band boards on the sides of houses have failed for this **exact reason**. The lag bolts pull away from the house and the entire deck goes with them crashing to the ground.

Figure Twenty-Seven

The best method, I feel, is to install a 2x4 ledger board that rests immediately under the top tread. The ledger board also is long enough to support both stringers. You can clearly see the 2x4 in Figure Twenty-Seven. This ledger board is invisible except for the end you see that is flush with the edge of the stringer. The blue lines indicate wear the top tread is in relation to the ledger. It is important that the stringers be notched to sit on the ledger. Remember the first things we talked about in this book? The stringers are the beams that support everything.

VICTORY!

Do your steps look like mine? They should. This set of stairs is rock solid and will support one or more persons on each tread. The process is not hard to do if you just stop and think before you cut.


Figure Twenty-Eight

The entire task from start to finish took us three hours. We could have done it a little quicker if I didn't have to stop and take photos.

If you are about to build your first set of simple stairs, I strongly urge that you build a small set that only has three risers and possibly two treads. Buy the least expensive regular 2x12's to work with. Once you feel confident, start the real set. Good luck!

AsktheBuilder Products

As you might imagine, I have all sorts of other products. Each of the items below in blue is a direct link to that product. Click them to learn more. Here is a quick list of some of my best selling items:

Stain Solver

Stain Solver®: This is a fantastic color and fabric safe oxygen bleach. It is non-toxic. You may have seen other similar products on TV such as Oxi-Clean®, and other ones sold in grocery and membership club stores. But my **Stain Solver®** beats them all. The ingredients in **Stain Solver®** are made in the USA. Virtually all of the other products, including Oxi-Clean®, have foreign-made ingredients. My stuff is more powerful and blended to achieve maximum performance. Don't be fooled by lower priced substitutes. The low price means cheaper ingredients and more low-cost filler instead of oxygen bleach!

Click any on this blue **Stain Solver®** link and you will be taken to my shopping cart where I sell my oxygen bleach, as well as other AsktheBuilder products.

New Home Checklist

New Home Construction Checklist: If you are going to be building a new home or know of someone who is, they need to know how to compare bids, make sure ALL items have been quoted, and that they are hiring the best builder. My **New Home Checklist** does all of this and more!

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