

FORTRESS EVOLUTION vs WOOD CASE STUDY



CHALLENGE

The purpose of this case study is to compare the costs of constructing nearly identical decks using pressure-treated wood versus Fortress Evolution steel deck framing, providing a real-world analysis of the cost differences between building with wood and steel. To maintain confidentiality and protect the builder's pricing structure, the results will be presented as percentage values. While Fortress employees were present on-site, they did not offer any verbal guidance or hands-on assistance during the construction process. To ensure the most accurate comparison, Fortress sponsored both builds, allowing for consistent specifications and parameters across both projects.

The two decks were constructed with identical railings and decking, and both were built as free-standing structures. The decision to build the decks free-standing was made to eliminate any variables related to attachment to an existing structure, which also allowed for a broader range of potential site candidates. Both decks featured Fortress Axis steel railing and MoistureShield Vision decking. The choice of fasteners, anchoring, and footings was left to the discretion of the builder, and all construction methods were similarly determined by the builder. Aside from the requirement for the decks to be free-standing, Fortress provided no additional guidance or instructions to preserve the integrity of the study. The builds were carried out in close proximity to one another, ensuring that factors such as soil conditions, local code requirements, and climate would impact both projects equally.





Figure 1: Completed wood build using Kiln Dried PT, Fortress Axis Railing and MoistureShield Vision Decking.

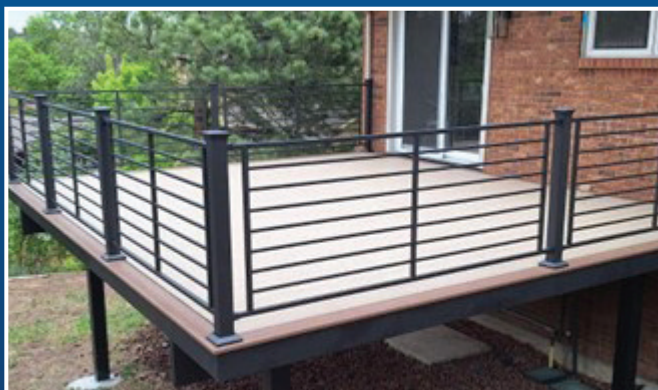


Figure 2: Completed steel build using Fortress Evolution, Fortress Axis Railing and MoistureShield Vision Decking.

Figure 1 and Figure 2 show the comparison of the two builds. Both had the same beam orientation, same number of posts and footers. The Evolution build used two single beams while the wood build used two triple beams ((3) 2x12" PT) to account for the same span. The span was 16' in the direction of the beam and 18' perpendicular to the beam. These dimensions were chosen based on what would accommodate both customers the best and allow for a real world comparison, not based on span breakpoints that would favor the steel framing. The only stipulation for sizing was to not require more footers for the wood build to get a real-world comparison. Both builds utilize a drop beam configuration with 2 posts per beam.

This section of the case study will examine the costs and challenges associated with using wood in comparison to the Fortress Evolution steel deck framing system. Several issues were observed with the wood, including cracking and warping, as illustrated in Figures 3 through 7. The warping, in particular, is a common issue with modern wood products and can be attributed to several factors, including moisture exposure, but is primarily exacerbated by the shorter growth cycles of today's timber. Shorter growth cycles result in larger light growth rings, which are weaker and more prone to warping compared to the darker, slower-growing rings found in older wood. The increased prevalence of light growth rings today contributes to the more pronounced flexing and warping of wood, a significant challenge faced by builders in the current market.

Additionally, pressure-treated wood today is far less decay-resistant than it was in the early 2000s, due to a shift away from more effective preservation treatments. As a result, modern pressure-treated wood typically has a lifespan of only 7-10 years when exposed to the elements, which is a notable reduction in durability compared to its predecessors.



FIGURE: 3



FIGURE: 4



FIGURE: 5

Figure 3: Wood showing large cracks along the board along with warping.

Figure 4: Image showing that a straight line from one side of the board doesn't match the other side. This is due to the board warping out of plane. Therefore, the square doesn't have a flat side to reference off.

Figure 5: Warping along joist that naturally occurs when building with wood.

Figure 6: Warping of joists. Will need to be straightened out using blocking.



FIGURE: 6



Figure 9: Builders planing each joist to even out the surface.



FIGURE: 7

Throughout Figures 9 and 13 we will outline how extra labor is required for the wood build to accommodate for the material used. The first and most obvious issue that needs to be resolved is the uneven surface. This is resolved with planing the joists to remove the ups and down created from the uneven material. Planing is a time consuming task that adds labor and still leaves you with an uneven surface. The builder expressed that planing will never make it perfect, just good enough for the deck boards. See Figures 8 and 9 to see the planing process. Figure 8 shows them going along carefully with a level attempting to make the joist even with its surrounding joists. Unfortunately, as you can see in Figure 9, the surface will still be uneven and you also risk taking too much off of one spot. This is a step that is completely skipped when working with Evolution steel deck framing. Additionally, another step which is skipped by selecting Evolution steel deck framing is the Butyl tape, more commonly known as "joist tape." Joist tape is costly and time consuming to install. The reason joist tape has become almost mandatory in today's current deck building market is the rot introduced from the reduced protection provided by today's pressure treatment. The joist tape helps to protect the wood from moisture that gets trapped between the deck board and the top surface of the joist.

Figure 7: Warping and crowning naturally occurring.



Figure 8: Shows that over the beam, there is still a lot of unlevel surface because of the wood warping.

Figure 10: End result of planing a board.

With the protective galvanization of the Evolution steel deck framing along with its powder coating, the joist tape is not needed which saves both the cost of the tape, and the labor installing it. On this deck at 12" OC joists, the joist tape and planing combined took 5.5 hours of labor alone. Once you factor in the material cost and tools required this becomes a large cost savings when building with Evolution steel deck framing. Another issue that was brought up during the wood build was the weight of the members relative to the Evolution. While steel is heavy, the members are hollow, and a smaller steel member takes the place of a larger wood member. Pressure treated 2x10's weigh between 5 and 5.5 lbs per linear foot whereas the Evolution 2x6 joists weigh about 3.3 lbs per linear foot. Therefore, the weight you need to carry from the pallet and lift on to the deck is 40% lighter. This translates to the builders being able to build for longer before burning out from exhaustion. Another time saver that is built into the Fortress Evolution steel deck framing is the use of the mid span blocking strap. This takes the place of the blocking seen in Figure 13. By simply screwing it to the bottom of the joists, it replaces carefully measuring out, cutting and installing blocking in each bay.

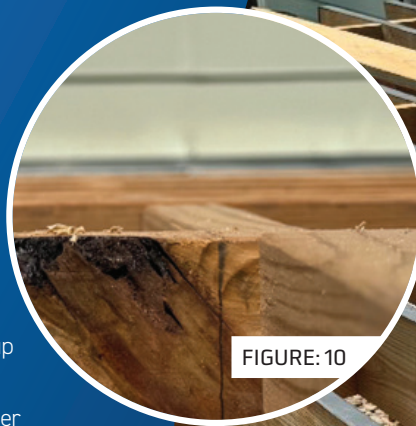


FIGURE: 10



Figure 11: Butyl Tape on the beam before the joists are added.



Figure 12: Builder installing the joist tape. Using a board to protect their knees and to make installing the tape easier.

Figure 13: The Butyl Tape fully installed.

WOOD VS STEEL COST BREAKDOWN

Labor Cost

	% of Overall Spend - Wood	% of Overall Spend - Evolution
Setup	1%	1%
Footing	6%	4%
Framing	7%	3%
Tape/Planing	2%	0%
Decking	3%	3%
Railing	3%	3%
Fascia	1%	0%
Moving Materials	2%	3%
Purchase and Transport Concrete	1%	1%
Clean up	2%	1%
Total Labor Cost	28%	17%

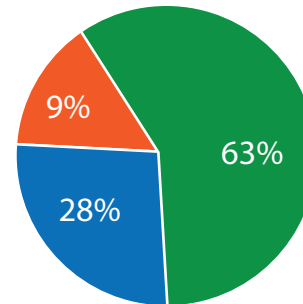
Planning and Admin Cost

Sales	1%	1%
Permitting	1%	1%
Permit Fee	4%	4%
Dumpster	2%	2%
Portable Restroom	1%	1%
Total Planning & Admin Cost	9%	9%

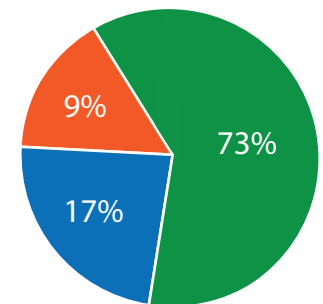
Materials

Framing	12%	31%
Decking	29%	28%
Fascia	4%	0%
Railing	14%	13%
Concrete	2%	2%
Fasteners	2%	0%
Total Material Cost	63%	73%
Overall Total Cost	100%	100%

Cost Breakdown
Wood Build



Cost Breakdown of
Steel Build



■ Total Labor Cost
■ Total Planning & Admin Cost
■ Total Material Cost

COST OF STEEL BUILD USING WOOD BUILD AS BASELINE

*Values below are shown as if "Total Material, Labor, Permits" for wood were the baseline.
Both Steel and Wood are percentages based off the total build cost of Wood before any mark up.*

Labor

	Wood Frame	Steel Frame
Setup	1%	1%
Footing	6%	4%
Framing	7%	3%
Tape/Planing	2%	0%
Decking	3%	3%
Railing	3%	3%
Fascia	1%	0%
Moving Materials	2%	3%
Purchase and Transport Concrete	1%	1%
Clean up	2%	1%
Total Labor Cost	28%	18%


Planning and Admin

Sales	1%	1%
Permitting	1%	1%
Permit Fee	4%	4%
Dumpster	2%	2%
Portable Restroom	1%	1%

Materials

Framing	12%	33%
Decking	29%	29%
Fascia	4%	0%
Railing	14%	14%
Concrete	2%	2%
Fasteners	2%	0%
Total Material Cost	63%	78%
Total Material, Labor, Permits	100%	106%
TOTAL AFTER MARKUP	136%	154%

Note: The numbers shown are estimations and are rounded to the nearest whole percentage point.



The Cost Breakdown compares all values as percentages of the “Total Material, Labor, and Permits” costs from the wood build, providing a clear illustration of how the steel components and processes compare directly to wood. The material cost for the Evolution steel deck framing is higher than that of wood, but is offset by several factors, such as the elimination of joist planing, joist tape, and the reduction in labor due to Fortress’ intuitive installation tools. Additionally, the matte black finish on the steel frame eliminates the need for fascia for aesthetic purposes, further reducing both material costs and labor. With a total cost difference to the builder of only 6%, the advantages of steel framing are clear. Using a premium product also gives the builder the opportunity to apply a premium markup. Offering a unique product and highlighting the added benefits of steel framing allows the builder to increase their markup from 35% to 54%. This pricing flexibility ensures that the builder can remain competitive while maximizing profit, leveraging the benefits of the steel system to close sales effectively. Moreover, steel framing can create additional profit opportunities when there is demand for premium products, allowing the builder to capitalize on the market when supply is limited.

IN CONCLUSION,

the Fortress Evolution steel deck framing offers significant advantages for today's deck builders. Unlike wood, the steel framing does not arrive warped or crowned, and it requires less labor to install. The steel frame system resulted in 34% fewer labor hours compared to the wood frame, meaning the same job can be completed in the same time with just two builders instead of three. Alternatively, builders can take on three jobs for every two jobs previously completed with wood, maintaining the same labor force. When factoring in labor cost savings, the price difference between the Evolution steel deck framing and traditional wood framing is quite competitive. After considering labor, materials, permitting, and other expenses, the Evolution steel deck framing is only 6% more expensive than the wood frame. This cost is associated with a premium product that not only offers a higher markup potential but also comes with a 25-year warranty. In contrast, pressure-treated wood typically lasts only 7-10 years, making steel framing a more cost-effective solution over time, as it avoids the expense and disruption of demolishing and rebuilding the deck 7-10 years. Additionally, since the steel framing will not absorb or expel moisture or rot, the steel frame will not move or warp with temp or moisture changes. This means a less volatile build resulting in less call backs when things would have shifted with wood. This labor to go rework completed builds is not compensated and therefore can eat into profits and can't be accounted for up front. The Class A fire rating of the Fortress Evolution steel deck framing also means that it can be used for building in areas where pressure treated is not an acceptable building material. This opens up access to markets that builders unwilling to build with steel are not able to compete in. Building with less competition means higher bid acceptance rates along with the ability for higher margins. The 6% cost increase is negligible compared to the pros of the Evolution steel deck framing between its longevity and numerous benefits.

