

How to Build a Greener Industrial Mezzanine

When choosing the deck surface material for an elevated structure such as an industrial mezzanine or pick module there are generally 3 choices of materials to use for these applications:

- Bar Grate
- Concrete
- Engineered Wood Products

This article will focus on concrete and engineered wood products.

In today's world, nearly everyone is concerned about making business decisions that are environmentally responsible. That line of thinking should also be considered when choosing a decking surface for an elevated platform, such as a pick module or mezzanine.

Life Cycle Assessments can be very useful tools in making these decisions, and may help us think in a new manner about how we use our natural resources.

Life Cycle Assessment (LCA) for construction products is a systematic approach to quantify the environmental impacts associated with a product through its entire life – from initial extraction of the raw materials to manufacturing, use, and eventual disposal or recycling.

Most realize that engineered wood products are more economical and ergonomically friendlier than concrete, however a recent study by **Coldstream Consulting in British Columbia** concluded that using engineered wood products instead of concrete decking on a 50,000 square foot industrial mezzanine was an excellent choice for the environment as well. In fact, **using ResinDek® panels instead of concrete is equivalent to removing 56 vehicles from the road for a period of one year!**

Concrete is widely accepted and commonly used by most General Contractors when building elevated structures during the time of new construction.

This decision may not be deeply studied or even reviewed by the end user, who has many other concerns during this time of building a new distribution center.

So why use concrete? There may be many reasons, but one may be that concrete is the building material that General Contractors are the most familiar with and it is already being used extensively on the jobsite. In addition, concrete is noncombustible, permanent, and waterproof.

There are, however, some not-so-obvious problems with using concrete for industrial mezzanine platforms:

Weight: Concrete is much heavier than engineered wood decking products

A quick Google search shows 2.5" thick concrete slab with an estimate of 145 lbs per cubic foot. A 12" x 12" x 2.5" deep section of concrete therefore weighs about 30.2 lbs per square foot, while a 3" thick slab would weigh in at 36.3 lbs per square foot. This compares to approximately 2 to 5 lbs per square foot for wood decking, depending on thickness and product selected. To be ultra conservative, we can comfortably say that there is a **savings of 25 lbs per square foot of dead load by using an engineered wood decking panel** instead of concrete.

Therefore, using an engineered wood decking panel instead of concrete on a 50,000 square foot mezzanine platform means there is 1.25 million pounds less dead weight to be supported.

Deflection: In addition to less weight, there is the consideration of allowable deflection. The standard allowable deflection for a concrete structure is L (span between substructure supports divided by 360). This compares to the industry standard for most elevated structures of L/240, which wood decking easily withstands. If you try to build a concrete mezzanine, and allow it to deflect at L/240, you will end up with a severely cracked flooring surface that quickly becomes unsafe to work on. Less allowable deflection plus a heavier structure means that more steel is required to support the decking, and larger footings are required to support the entire structure.

Working closely with General Contractors and Mezzanine Manufacturers, Cornerstone Specialty Wood Products, LLC developed a list of building materials required to construct a 50,000 square foot industrial mezzanine platform from the ground up.

We did this using concrete decking versus engineered wood products for the decking surface.

We verified that these quantities were accurate, and then submitted the two lists of building materials to Coldstream Consulting, who performed an LCA for each list of materials. In addition to being more expensive, and less ergonomically friendly, a big problem with concrete is disposal at the end of the structure's life.

Life Cycle Assessment (LCA) Evaluations:

Listed below is a summary of materials that must be recycled at the project's end:

Concrete Mezzanine

Concrete Decking 35 trucks

Engineered Wood Products Mezzanine

Wood Products Decking 3.5 trucks

Concrete Footings 18 trucks

Concrete Footings 14 trucks

Steel Framing 8.5 trucks

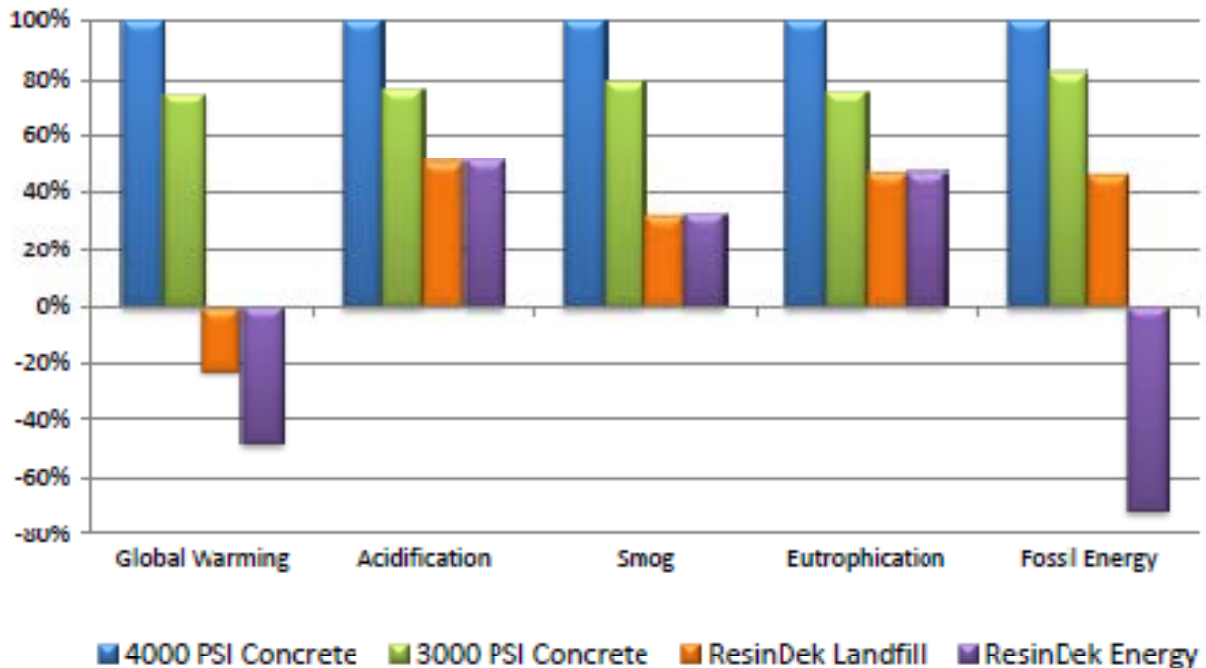
Steel Framing 7.3 trucks

Total Trucks Req'd 61.5 trucks

Total Trucks Req'd 24.8 trucks

Note: These comparisons are based on 44,000 lb tractor trailers. In actuality, given the weights and demolished nature of these structures, a disposal company would likely use dump trucks, which would make the “truckload spread” between the two choices much higher, and even more expensive from both an economic and environmental perspective.

There are more issues to consider than just extra landfill volume generated by a concrete structure. When examined in detail, the environmental case for using ResinDek® panels instead of concrete is quite compelling. The results of Coldstream Consulting’s analysis are summarized in the chart listed below:



***Life Cycle Impact Assessment Results – Normalized Against
4000 PSI Concrete Results***

The chart compares the use of a 4,000 psi mix, and a 3,000 psi concrete mix to using ResinDek panels in 5 different categories:

- CO₂ Emissions
- Acid Rain Potential

- Smog Production
- Nitrogen Contamination in Water
- Energy Consumed

A 3,000 psi concrete mix is sufficient for many applications, but concrete companies frequently recommend a stronger, more fluid mix with higher cement content (ie, a 4,000 psi mix) when pumping concrete.

After a thorough analysis of concrete decking vs. engineered wood products as a flooring surface for mezzanines, the verdict is clear, and unequivocal: **“The ResinDek (Flooring) System causes less environmental impact in every category than the two concrete systems.”** *Coldstream Consulting, February 2011 Report*

The basis for this conclusion by the Independent Consultant is detailed below:

Carbon Negative: The ResinDek panels are not just carbon neutral, but they are a **net carbon sink over their life cycle**. This means that **up to 45% more carbon is sequestered in the product than is emitted** over the rest of the life cycle.

Energy: If ResinDek is burned at the end of its life, it is a **net energy producer**. The product makes 80% more energy available at the end of its life than is consumed during the rest of the life cycle! The biggest reason for this is that ResinDek is an engineered wood product. There are very low levels of fossil fuels required to process the wood products that make up ResinDek , and trees grow with little or no amount of manmade assistance.

Other Pollution Considerations: The ResinDek panels also generated considerably less moles of hydrogen ions into the atmosphere, which have the potential to cause acid rain. In addition, there was significantly less nitrogen generated from end of life cycle disposal. Excess nitrogen in the air causes smog. Excess nitrogen that runs off into water supplies can cause “algae blooms” (a.k.a. pond scum!) that can choke off all other forms of life in a standing pool of water.

Clearly, a case can be made for the use of engineered wood products instead of concrete for the decking surface on an industrial mezzanine/elevated platform.

Whatever your personal views may be about controversial issues such as global warming, the efficient use of resources becomes a no-brainer when the needs are fulfilled equally.

If we are concerned about being good stewards of the environment, choosing a renewable resource like engineered wood products is the obvious choice to make.

Greg Doppler

President, Cornerstone Specialty Wood Products, LLC