

WHITE PAPER

ELEMENTS OF A QUALITY MEZZANINE: Commonly Overlooked Factors



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The break neck pace of e-commerce and positive economic growth means that warehouses, factories, and other facilities need to make the most of the space and throughput potential they have. That includes maximizing the use of vertical space, which drives demand for mezzanines and work platforms.

Facilities have gotten taller over the years, so there may be untapped capacity at many sites. In fact, according to commercial real estate group CBRE, the average height of warehouses built in the U.S. has gone up from roughly 24 feet in the 1960s, to 33 feet in 2016.

Meanwhile, the need for more picking and small item handling is growing. According to US. Census Bureau figures, e-commerce sales reached \$394.86 billion in the U.S. market in 2016, up 15.6 percent from 2015. As of last year, 89 percent of warehouses were performing some type of value added service (VAS) like special labeling or kitting, according to an annual study of distribution center (DC) operations by Peerless Research Group on behalf of *Modern Materials Handling*.

With strong growth in e-commerce and the labor-intensive work that is often involved in fulfillment today, mezzanines are in demand. As new facilities are built or older ones are expanded to meet changing distribution requirements, companies need to make well-informed decisions about mezzanines.

However, to make the right mezzanine decision, companies should consider all the factors that can affect mezzanine strength and stability, adherence to building codes and seismic requirements—and just as importantly, the experience and material flow aspects of using the mezzanine.

However, some mezzanine providers may not give users the full range of information on everything that affects mezzanine quality, costs, and how the design impacts useable space and access. A good mezzanine manufacturer or provider should explain all factors and tradeoffs involved. A provider's quote might meet the minimum specifications asked for, but the potential buyer might not be getting the full picture on every factor that will impact costs, usability and satisfaction level with the structure.

The purpose of this white paper is to detail the full range of considerations that go into designing, deploying, and using a quality mezzanine. Elements of the design such as the thickness of the roof deck, or how the desired column spacing might add costs when it comes to concrete footings or floor modifications, should be raised early on by the mezzanine provider, according to Cubic Designs, a leading manufacturer that custom builds prefabricated custom mezzanine systems and steel platforms.

"Our approach is about giving users the right information that allows them to make a good mezzanine decision," says Ryan Agnew, Mideast regional manager for Cubic Designs. "We go over the full range of considerations for mezzanines, and as part of that process, demonstrate that we deliver the mezzanine with the characteristics they need."

The following explains key factors to keep in mind when exploring a mezzanine installation. Most mezzanine manufacturers may not mention some of these considerations, or they can get overlooked when trying to compare a narrow set of specifications on bids, yet they are important to weigh when considering a mezzanine or platform.

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—Mike Stearns, Cubic Designs’ regional manager for the Northeast region.

Column loading

While mezzanines allow companies to utilize vertical space, no one wants to give up on useable floor space and freedom of movement on the ground floor by having an excessive number of columns to provide stability for the structure. That is why, generally, mezzanine designs seek to minimize the number of columns.

What some mezzanine providers may fail to point out, however, is that minimizing the number of support columns increases the load on each column, which may necessitate the addition of footings to the

floor to handle the column loading, or the use of heavy duty base plates.

Naturally, footing or base plates add costs to a project, so this potential tradeoff should be considered, explains Mike Stearns, Cubic Designs’ regional manager for the Northeast region.

“Companies will come to a mezzanine provider looking for a design with as few columns as possible, which in terms of floor space, makes sense,” he says.

However, a mezzanine provider should explain to customers that if they insist on following a set column spacing as part of a design, that might add costs later on if the columns require reinforcement to handle the specified loads. “Customers should be informed that a floor slab has an absolute capacity for holding a maximum load before there’s a need to turn to base plates or footings to provide reinforcement,” explains Stearns. “A good mezzanine provider will educate the customer about column loads and slab capacity—and whether the design being asked for will need reinforcement of some type.”

A good mezzanine provider will also know the strength characteristics of the average slab in an industrial or commercial facility, allowing the provider to raise the issue of reinforcement costs if the customer insists on a minimal number of columns. To gain a complete answer on reinforcement, more detailed data on slab specifications would be needed. However, beware of providers who skirt the issue or simply place a small disclaimer on their quote. The need for footings or baseplates should be determined, and, ideally, sooner rather than later.

“Column loading and slab capacity is a major talking point for us,” says Stearns. “We want to make sure the design meets the customer’s loads and needs, and will work well with the building without adding unexpected costs.”

Roof deck issues

An easily overlooked factor in the overall stability and “feel” of a quality mezzanine is the thickness of the roof deck. With Cubic Designs’ mezzanines, a 20-gauge or 18-gauge corrugated deck is standard. The lower number gauge indicates a thicker and stronger material, so a 20-gauge deck is thicker and stronger than a 22-gauge deck.

While some manufacturers might bid a project with a deck sufficient to hold the intended loads, a slightly thicker roof deck is often the better choice because it will provide a more solid feel for those working on a mezzanine. The thinner gauge deck might technically be able to hold the intended load, but may impart a sense of movement or “spongy” feel for those working on the deck.

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A solid feel to the deck is especially important when the mezzanine is used for office space. No one wants a shaky feel when people are walking into an office on the mezzanine, explains Stearns. “You want the people using the mezzanine to feel they are on a very safe,

stable surface,” he says. “You don’t want a thinner deck that flexes when people walk by. It’s an important issue to consider. With thinner deck, it won’t feel as stable, and unfortunately, you won’t be able to experience that spongy feel until the mezzanine is bought and installed.”

Bracing considerations

When a mezzanine needs to hold heavy loads, such as equipment or heavy goods, some mezzanine manufacturers turn to bracing to

offer an adequate level of stability. The two most common types of bracing are knee bracing and cross bracing.

Knee bracing goes from the upper part of one column to a deck beam near the upper corner of a mezzanine, while a cross brace—or x-brace—has braces that cross each other in the center. While these bracing approaches do add stability to a structure, they limit access to the space under the mezzanine.

Cubic Designs’ mezzanines and platforms, by contrast, are held together using specialized “moment” connections. These are bolted connections that use high-strength, cold-formed steel to provide stability without the need for bracing on most projects. The name “moment” refers to the ability of the design to resist moments of instability.

The key consideration with designs that use bracing is that they hinder access to space on the ground level, explains Agnew. “Anytime you’re adding a structural element that crosses diagonally below the mezzanine, you’re impeding the site’s potential workflows—either for people moving through the space or lift trucks,” he says.

The bolted moment connection adds strength at the top joints through high-strength bolts and cold-formed steel. For very heavy-duty applications, a mezzanine might also use some bracing, but for most applications, the moment connection provides more than enough strength and stability, together with proper column spacing and load distribution.

Codes and Engineering

The saying, “the devil is in the details” certainly applies to the design, approval and installation of mezzanines and work platforms. These structures need to meet building codes and seismic requirements, and may require a design that has been reviewed and stamped by a licensed professional engineer (PE).

A project might also require permit calculations as part of a local permit process. These details can become hard to coordinate and manage the greater the number of providers who are involved. At Cubic Design, coordinating PE-stamped drawings is a non-issue, because the company has its own PEs on staff. The Cubic Designs engineering department can also provide permit calculations if these are required.

As a result, the time and cost impact of addressing these details is known upfront, and the overall process is managed by one organization. There isn’t any chasing around to get a PE-stamped design, or to obtain permit calculations. “We take care of everything under one roof, so there are no surprises and a good, predictable flow to addressing all the code and engineering details,” says Agnew.

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Mezzanine designs need to follow codes, not only local codes, but also International Building Code, as well as Occupational Health and Safety Administration (OSHA) codes. Additionally, a sign of a quality mezzanine provider is that its materials meet ASTM and AISC specifications.

Ultimately, a provider of quality mezzanines not only uses the best materials, but it also educates potential customers and raises potential tradeoffs and factors which might lead to unexpected cost upfront in the process.

When a mezzanine manufacturer's design follows these codes and specifications that eliminates potential surprises or delays down the road. Furthermore, when the mezzanine provider can do all the engineering review in-house, there's less project coordination for the customer to manage—and fewer chances of delays.

Ultimately, a provider of quality mezzanines not only uses the best materials, but it also educates potential customers and raises potential tradeoffs and factors which might lead to unexpected cost upfront in the process.

Considerations such as the benefits of thicker deck materials and proper column loading that matches the capacity of the floor should be discussed early on to avoid unexpected costs or dissatisfaction down the line. A responsible mezzanine provider should raise these issues so that the potential customer has the best information possible to make a decision and knows the tradeoffs involved in design choices. ■