MiTek®

Using mezzanine solutions to optimise space and empower automation

WHITE PAPER: MEZZANINE APPLICATIONS

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Foreword

By enabling efficient storage and high levels of automation, steel mezzanine platforms can play a key role in the overall performance of a building.

Across a range of production, distribution and commercial environments, mezzanine floors help companies to maximise their productive space while minimising their overall footprint.

Optimising use of space is particularly important in the distribution sector, where the average warehouse size has increased dramatically in recent years, due mostly to e-commerce fulfilment demands.

The rise in omnichannel distribution, combined with labour shortages in the logistics industry, has also fuelled the demand for autonomous and intelligent warehouse technologies. Since automated intralogistics systems bring special requirements for mezzanine floors – in terms of load-bearing capacity, deflection and vibration – the design and delivery of mezzanine solutions has become more complex. When supplying mezzanines for automated warehouses, mezzanine suppliers must work closely with the system integrator from the design stage to ensure seamless integration.

As well as complying with regulations and keeping the customer's growth plans in mind, the objective for the mezzanine company is to avoid either over-engineering or under-engineering for the bespoke structure. In this way, the mezzanine will deliver the right balance of competitiveness, strength and future-proofing.

READ ON TO DISCOVER VARIOUS APPLICATIONS OF MEZZANINE SOLUTIONS IN WAREHOUSING AND DISTRIBUTION

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Storage mezzanines

A single or multi-level mezzanine floor can be used to maximise available storage space within a warehouse.

Although these linear, semi-permanent platforms can extend over the entire floor space of a facility, they usually only cover part of the footprint, freeing up other sections of the warehouse for automation, goods-in and -out areas and additional storage, for example.

→ Load capacity

It is important to discuss the intended mezzanine usage with your supplier, not only regarding your floor but also your warehouse operations. What type of storage you are planning to install and the maximum weight will determine the point loading in the mezzanine design and can influence the type of flooring solution. If required, a B-Deck structure will provide additional strength. Alternatively, heavier steelwork and/or closer joist centres can increase your load capacity. You may also have different load requirements for specific floor areas, in which case the mezzanine design can be adapted to be more robust where necessary.

YOU WILL NEED TO SELECT BOTH DECKING MATERIAL AND ANCILLARY PRODUCTS; YOUR MEZZANINE SUPPLIER CAN ADVISE ON THE BEST OPTIONS FOR YOUR REQUIREMENTS.

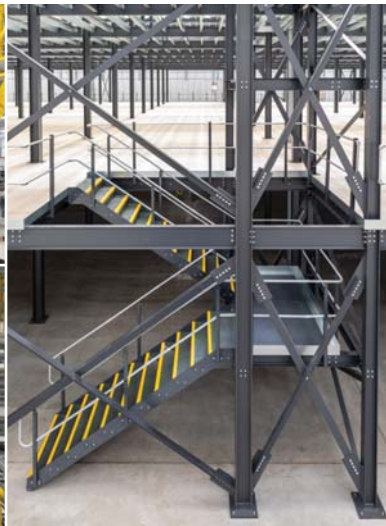
→ Multiple levels

Multi-level mezzanine solutions will need a means of transferring goods and people between levels, so they will generally feature voids for conveyors, lifts and staircases.

→ Column design

If you plan to use the ground floor for automation or goods transport, you may require specific mezzanine column spacing. With the relevant slab capacity available, the spacing can be maximised to suit roadways or other access requirements. Vertical bracings can also be positioned to accommodate access.

Even if they are used simply for storage, mezzanine floors need to be fully compliant with all building, safety and fire regulations – including any seismic requirements – that apply in the country or region where the solution is being installed. A mezzanine structure is likely to require systems for emergency lighting, fire detection, smoke alarms and sprinklers.



Case Studies

Storage mezzanines

Noatum Logistics

Noatum Logistics is a global contract logistics provider, offering omnichannel distribution throughout the UK and Europe. When building a new distribution facility in Rochester, Noatum had the foresight to involve MiTek early in the project. The 20m-tall warehouse handles fulfilment for Noatum's e-commerce clients – including fashion business, TFG London, which owns brands including Phase Eight and Hobbs. The 25,500m^2 mezzanine solution more than doubled the available storage space and involved some complex integration with automated logistics systems. Early engagement enabled MiTek to propose the installation of an additional, fourth floor that could be integrated at a later date, thereby future-proofing the facility. The mezzanine solution took only 14 weeks to construct, with the entire distribution centre completed in just 44 weeks. MiTek's solution has not only allowed Noatum to optimise space utilisation but also enabled the streamlining of its logistics processes to deliver fast, efficient and accurate order processing, even during peaks.

E-com tech giant

THG plc – which provides e-commerce services for third parties and markets its own beauty and nutrition brands – needed to create additional space quickly at its headquarters near Manchester. As MiTek had previously supplied mezzanine systems for three of the tech giant's other buildings, the team was asked to quote for the solution. The extra space was required for automated sortation and storage and the client's business plans meant that rapid delivery was essential, along with the ability to create more space in the future. MiTek designed a phased programme to deliver the 21,500m^2 mezzanine solution. Although all three levels of steelwork were installed in phase one, only one was fitted with decking and put into operation. This work was accomplished in just eight weeks. The top two levels were completed the following year, with this phase taking only six weeks. The solution provided seamless integration with the automated logistics systems and optimum space utilisation, driving cost savings.

Steel support structures

The use of steel support structures enables warehouse operators to utilise every cubic metre of available space.

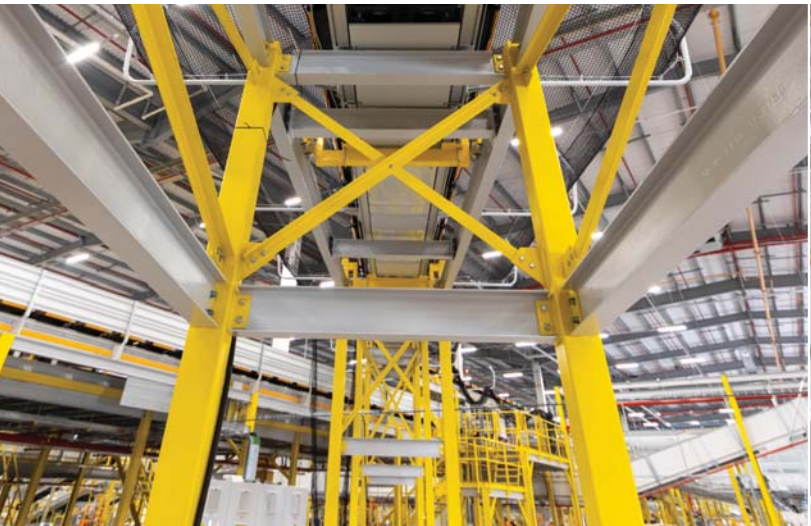
To embrace the growth in warehouse automation, suppliers of traditional mezzanine solutions have become considerably more creative. Instead of just providing additional linear floor space, today's mezzanine supplier can play a vital role by designing steel structures that support the increased use of automated technology in modern warehouses. The automated systems can be installed on top of the steel structure or suspended from it.

Such complex designs require close cooperation between the mezzanine design & engineering team and the system integrator to ensure seamless integration.

In order to support suspended equipment, such as conveyor systems, the mezzanine supplier needs to know the weight of the system that the steel structure needs to bear, along with other design criteria, including deflection and dynamic loads. The steel structure will then be designed around the requirements and layout of the automated system being installed.

Suspension will allow the area below to be kept free for a variety of activities. Any automated systems – such as conveyors, garment loops, robotics or storage and retrieval systems – require access routes and work areas for maintenance, as well as ways to cross the equipment safely. Your mezzanine supplier will help design and install these elements.

A STEEL STRUCTURE MAY ALSO BE USED TO INSTALL FIRE PROTECTION EQUIPMENT – SUCH AS SPRINKLERS – OR TO FIX CABLES, PIPES OR LIGHTING SYSTEMS.



Case Studies

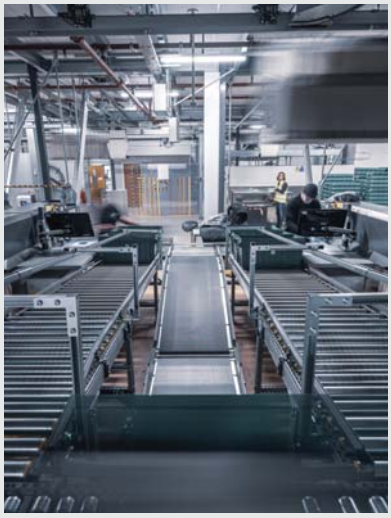
Steel support structures

High-street retailer

A UK retailer with ambitious growth plans decided to construct a huge distribution centre near Warrington. Wanting the new facility to feature state-of-the-art automation, the customer collaborated with a leading system integrator and MiTek was appointed to design and deliver the mezzanine solution. This comprised 30 steel platforms, featured five levels and extended to almost 25,000m^2. Integration of the automation – including a pallet store, both pallet and tote conveyors, transfer cars, pallet elevators and pick stations – required bespoke steel support structures. Special requirements catered for in the project included additional load-spreading beams installed on the mezzanine to support conveyor loads; extra loading on protective fencing; additional steelwork to support Davit-arm cranes; minimum clearance height below the mezzanine through the use of shallower beams; and taller columns for pit areas. With some 350 staircases planned for the new DC, MiTek also developed a new staircase design that enabled pre-assembly to make installation easier and faster.

Next plc

MiTek's largest mezzanine project to date – totalling over 100,000m^2 and reaching 24m in height – was the brand-new warehouse for UK retailer, Next, in South Elmsall. The MiTek team worked closely with automation supplier, KNAPP, to deliver this five-storey solution, which required integration with automated technologies including overhead garment conveyors, tote conveyors, spiral conveyors and elevators. To facilitate the installation of the spiral chutes into voids between the floors, MiTek engineered special supporting steelwork to help lift in and position the chutes. A key component of this mezzanine solution was a pallet transfer platform to support conveyors that move pallet loads from the automated store down to operations on the ground floor. This 1800m^2 platform alone featured 400 tonnes of steelwork, comprising 3000 beams, 6000 cold-rolled joists and 350 columns. It was designed with steelwork raised to decking level, in order to reduce construction depth and support the point loads from the conveyor feet.



AutoStore and AS/RS mezzanines

As modular solutions that can be integrated almost anywhere, automated storage and retrieval systems (AS/RS) are not only ideally suited for implementation at ground level, but also on platforms.

With sufficient warehouse height, multiple storeys can be installed. These mezzanine structures may need to be designed and built to bear the heavy loads typical in AS/RS applications and yet retain flexibility for the space below in terms of column frequency.

A current trend in automated storage is the rise of the AutoStore™ cube storage system. A steel structure not only provides the base for these systems but can support this technology by enabling:

- ➜ Tunnels underneath and above for workstations, conveyors or replenishment areas
- ➜ Intermediate platforms for workstations and maintenance
- ➜ Walkways running the whole length to facilitate inspection, maintenance and emergency escape
- ➜ Support for fire protection or lighting equipment above the systems

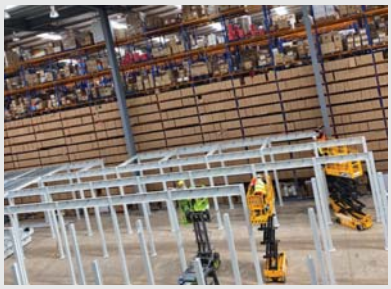
A CURRENT TREND IN AUTOMATED STORAGE IS THE RISE OF THE AUTOSTORE CUBE STORAGE SYSTEM.

Case Studies

AutoStore and AS/RS mezzanines

Direct Corporate Clothing

Direct Corporate Clothing, the largest independent workwear and personal protective equipment provider in the UK, wanted to modernise its facility in Oldbury by replacing the racking system with a fully automated warehouse solution. Central to the upgrade was an AutoStore storage system featuring almost 130,000 bins and 60 robots, which was installed in partnership with a leading integrator. MiTek was commissioned to design and install a mezzanine structure to support this technology and seamlessly integrate it with planned conveyor and intelligent picking systems. The design was facilitated by MiTek's ability to import the integrator's 3D system models directly into its own software, ensuring accuracy from the outset. MiTek's experience with AutoStore led the team to propose an innovative bracing solution for the mezzanine to ensure the required rigidity at an affordable cost. As minimising disruption to ongoing warehouse operations was paramount, MiTek devised a three-phase construction programme. Benefits of the solution include optimised space utilisation and streamlined material flows.



Major fashion retailer

Construction is underway for what will be possibly the largest AutoStore installation in mainland Europe. The system is being built in partnership with a leading system integrator in a brand-new warehouse measuring 1,000m by 200m and located in the Czech Republic. The omnichannel facility will serve a major fashion and lifestyle retailer and support its international distribution operations. The AutoStore solution – which will incorporate some 2,500 robots and 500,000 bins – will be supported by a highly engineered steel platform structure that is being constructed by the MiTek team over a period of four months. The two-tier mezzanine system will reach 9m and span three halls. The sheer scale of this project has demanded meticulous planning by MiTek to ensure delivery in line with the customer's schedule and in collaboration with other trades working on site.

Planning your mezzanine

There are a number of factors that need to be taken into account when designing your mezzanine floor solution.

→ Ground slab

The prevailing ground slab at your site will form the foundation for your mezzanine, so you will need to ensure that it can take the loads – both dynamic and static – in your planned operations. A poor base will support a lower column load, meaning your mezzanine will need more columns. As this additional steelwork adds cost – as well as limiting how you can use the space below the mezzanine – it may pay for you to invest in the quality of your slab.

→ Load capacity

When it comes to load capacity, you should consider whether you need the same strength across the whole platform, or across all floors in a multi-level solution. If not, it may be possible to use a hybrid mezzanine (constructed from hot-rolled and cold-formed steel) for the areas that have higher loading and a more cost-effective and sustainable cold-formed construction elsewhere.

→ Deflection

If you require less deflection – for example, due to sensitive equipment or if the mezzanine floor will be used for offices – you will need a more rigid structure. This means bulkier joists and beams, which will add to the cost of your steelwork. Of course, if your project is in a seismic area, more bracing (or, alternatively, moment frames) will be required.

IF YOU DO NOT NEED UNIFORM PLATFORM STRENGTH ACROSS YOUR SITE, A COMBINATION OF HYBRID AND COLD-FORMED MEZZANINES MAY BE POSSIBLE.

Benefits of early engagement

With mezzanine projects increasing in complexity, involving a reputable supplier as early as possible allows you to maximize the potential of their expertise and experience.

Early dialogue enables your mezzanine supplier to understand your business – including its growth potential – better, so that you achieve a solution that not only meets your commercial needs now but is also fit for the future.

Crucially, for new developments, engagement early in the life of your project means that your mezzanine supplier has the opportunity to influence the design of your chosen automated handling systems.

This means the provider can ensure that your mezzanine is built in the most cost-effective way, avoids common pitfalls and secures the earliest possible handover date.

In this way, early collaboration with your mezzanine partner helps to maximise the competitive advantage that your logistics solution can achieve.

MiTek®

WHO WE ARE

This White Paper has been produced by MiTek®, part of Berkshire Hathaway and a leading supplier of steel mezzanine solutions for warehouse developers, general contractors, system integrators and end users worldwide. With nearly 40 years' experience from more than 20,000 mezzanine projects, MiTek is your experienced partner when it comes to the realisation of large or complex mezzanine projects and the integration of automated technologies.

GET IN TOUCH – WE LOOK FORWARD TO HEARING FROM YOU.

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