



BIM-DRIVEN MODULAR CONSTRUCTION

Hilti modular support system is an integrated solution that simplifies your MEP installation projects and empowers you to meet challenging demands on design and construction.



MODULAR CONSTRUCTION IS CRITICAL TODAY AND FOR THE FUTURE

Builders are feeling the crunch from multiple directions. They face rising construction costs, less reliable supply chains, a shortage of skilled labour, and more demanding requirements from customers and regulators, including environmental requirements. Meanwhile, according to McKinsey & Company, the industry has suffered from slow adoption of digitalization, an always-bespoke approach, and a high share of onsite labour.¹ The COVID pandemic has brought these issues into starker focus but has also highlighted valuable opportunities for forward-thinking builders. One such opportunity is in modular construction.

Modular construction is already widely recognized in the industry. According to Dodge Data & Analytics, 90% of practitioners of modular construction agree that it increases schedule certainty; 88% say it improves cost predictability, and a whopping 93% say it improves productivity.² It's also safer, offers improved quality and increases customer satisfaction. In other words, it helps builders meet tighter deadlines and remain profitable. The American Institute of Architects comments that modular construction “allows projects to capture the efficiencies gained by integrating the processes and technologies of design, manufacturing, and construction—without having to compromise on aesthetic intent.”³ Incorporating modular construction into your projects can be critical to satisfying your customers and distinguishing yourself from other companies.

Read on for noteworthy cases that illustrate the benefits.

¹ McKinsey & Company, “How construction can emerge stronger after coronavirus”, (May 2020): <https://www.mckinsey.com/business-functions/operations/our-insights/how-construction-can-emerge-stronger-after-coronavirus>.
² “Prefabrication and Modular Construction 2020”, Dodge Data & Analytics, 2020.
³ The National Institute of Architects, “Design for Modular Construction: An Introduction for Architects”: <https://www.aia.org/resources/6119840-modular-and-off-site-construction-guide>



COST-EFFECTIVE
FASTER
SAFER
SUSTAINABLE

Modularization provides a predictable way to lower costs and streamline installation. It lowers the demand for onsite workers, who would be at greater risk of experiencing a safety incident. Modular construction also helps to eliminate waste by reducing the number of cuts and the need for rework and by allowing engineers to optimize the design of multiple trade installations.

An example of the efficiency boost modular design and manufacturing provides is the St. Joseph Heritage Hospital in Denver, Colorado, USA.¹ By using modular design and construction, Mortenson Construction compressed its 36-month schedule by 18% to 29.5 months. For every dollar spent on prefab, Mortenson calculates that 13% of the investment was returned as a quantifiable benefit. For instance,

Mortenson used modular construction for multi-trade racks housing utilities such as hydronic piping, air ducts, cable trays, conduit, and pneumatic tubing. Assembling these racks offsite moved trades away from the critical path, with crews later piecing the system together onsite. By leveraging this strategy, the company eliminated 20 days from the construction time and saved 1.2 million US dollars. The company also estimates that this type of modular construction diverted 24,000 hours away from the construction site where accidents are more likely to occur. It estimates that it avoided 1 safety incident as a result.

Just such an example that illustrates the opportunities open to builders is that of the natural gas liquids (NGL) fractionation plant in Mont Belvieu, Texas, USA.² Burns & McDonnell performed the Engineering,

Procurement and Construction (EPC) contract for the new plant. Challenges included an aggressive deadline and very high standards for quality and safety. The company used modular construction for 92 pipe racks, which moved 2,100 linear feet of pipe rack assembly offsite. A company representative noted, “In general, bolted connections are lower cost than welded connections, with all costs increasing in the field.” The company also shaved two months off the project construction time. Selecting modular construction was certainly the smart choice.

¹ Mortenson, “Benefits & Drivers for Successful Implementation: Prefabrication,” (May 2014): <https://www.mortenson.com/-/media/project/mortenson/site/files/services/prefab/mortenson-prefab-study.pdf>
² Warnecke, Mark, “NGL Fractionation Plant on the Fast Track,” STRUCTURE magazine, November 2014.



DEPENDABLE

Using modular components also opens up greater integration into BIM tools. Each component is included in the BIM, including its actual onsite installation. This level of integration allows architects and engineers to assemble detailed and coordinated 3D models of various architectural, structural, and MEP systems. Every part, connection, and installation is a known quantity. This is a game changer for both designers, engineers, and facilities managers.

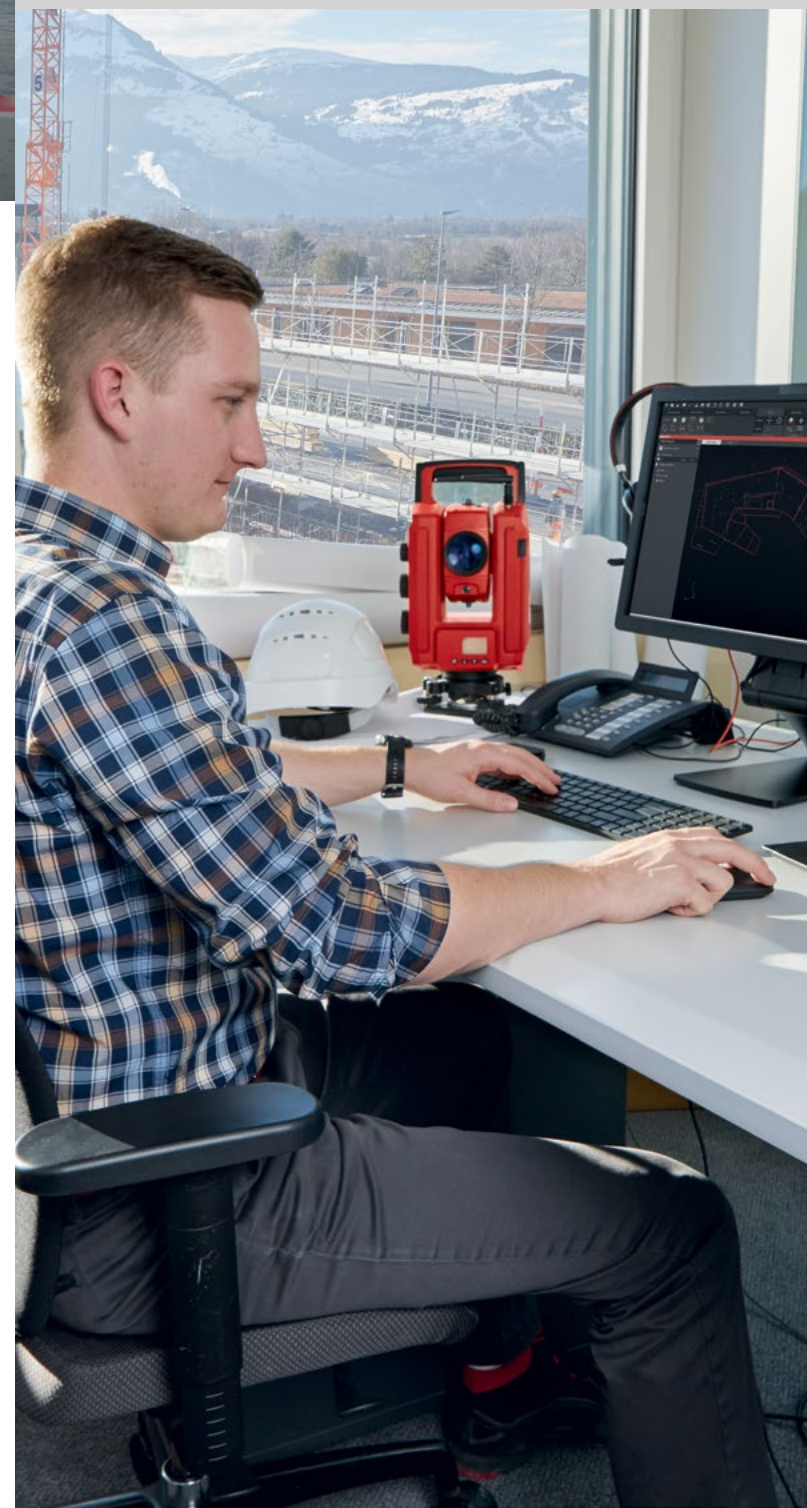
Modular components are produced in a controlled environment leveraging all the benefits of mass production, including quality assurance protocols. This means that the overall quality of modular elements surpasses traditional building materials. See the benefits of this quality improvement in corrosion resistance, facilitated regulatory compliance, and aesthetics.

Some of the most advanced and prominent builders are incorporating modular design and construction throughout their project portfolios.

Engineers at Jacobs were tasked to engineer the marine works for the Chith Export Facility at Rio Tinto's Amrun bauxite mine in North Queensland. "Using the innovative modular design approach reduced on site construction time by 12-months and removed 300,000 hours of high- risk work over water and at height activities on site."¹

Fluor has incorporated modular construction in 250 projects across the globe and has seen benefits from reduced quantities and field labour costs to increased productivity.² Bechtel also turns to modular construction to mitigate risk, especially in difficult locations.³ It sees modularization as part of the solution when facing limited availability of skilled labour, higher labour costs, and where quality considerations are very salient such as in high-density piping. Companies also choose modularization because supplies contractors can better coordinate timely delivery.

BIM-INTEGRATED BIM-EMPOWERED



Builders familiar with BIM know that it improves scheduling, budgeting and productivity. According to Dodge Data & Analytics, 59% of companies that use BIM on 50% or more of their projects report improved schedule performance from modular construction.⁴ This is due in part to the way that modular construction easily plugs into BIM and offers fuller and more detailed knowledge and control of installations.

An informative example of the way BIM and modular construction work together is the Texas Health Harris Methodist Alliance Hospital in Fort Worth, Texas, USA. Jeff Ratcliff, project manager with the Beck Group, the construction manager, said, "If it wasn't for BIM, we would not get the level of prefabrication we are doing. We are coordinating so much in such detail, [and BIM allows us] to really maximize the prefabrication and go into the detail that we need to."⁵ Multi-trade prefabricated supports were particularly important on the project. Typically, prefabrication firms have software that converts the BIM model into a bill of materials on a prefab support, streamlining the procurement process. This project combined duct work, medical gas mains, hot water supply and return for comfort heating, domestic water piping, electrical conduits, communication system pathways and low voltage systems. Benefits of this plan included reducing the peak number of trades onsite by as much as 20%. Additionally, since the multi-trade supports were prefabricated in a shop adjacent to the project site, at least 90% of the work on the supports was at waste level rather than from ladders or in other dangerous settings.

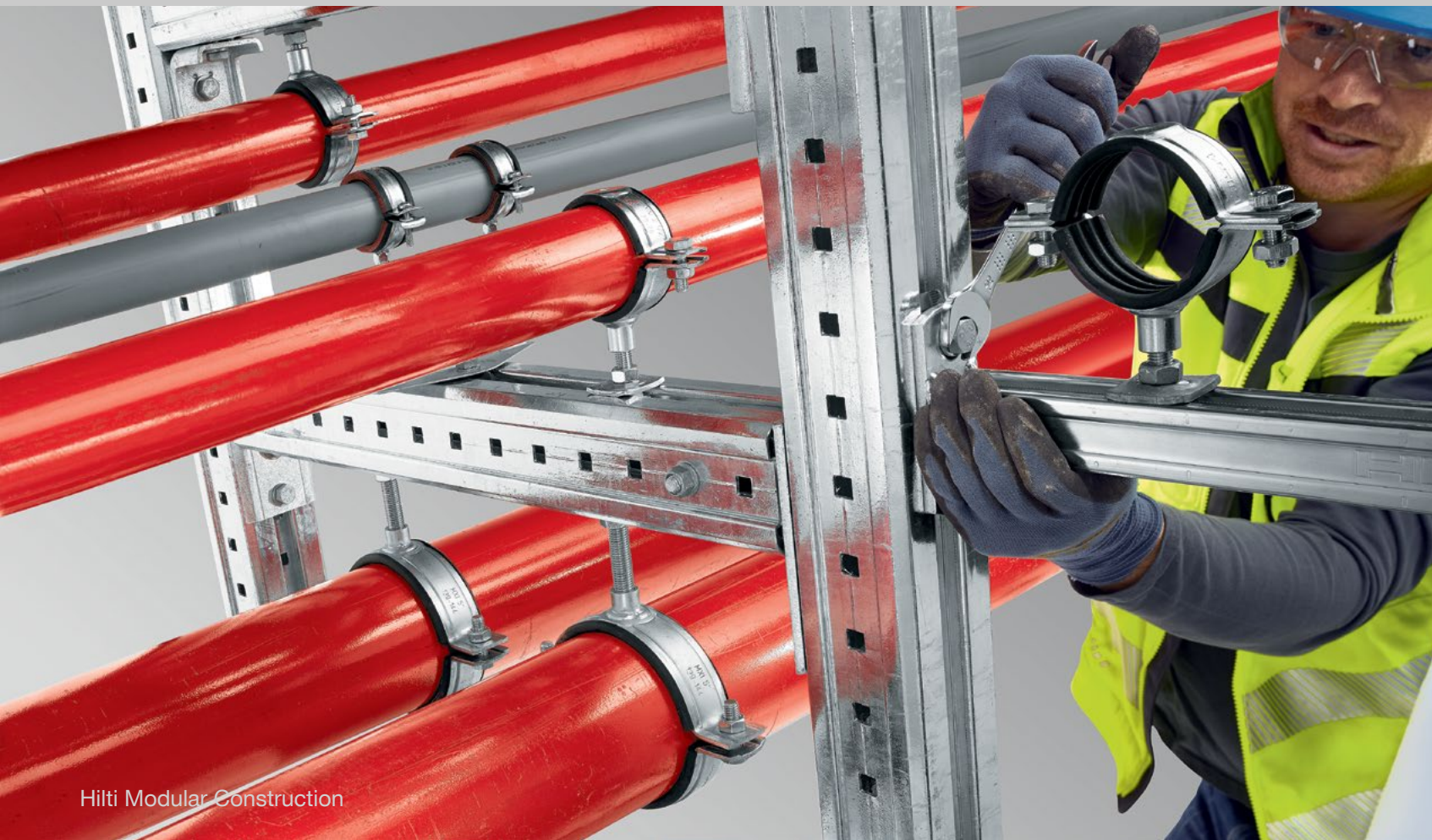
¹ Jacobs, "Unique Modular Wharf Design Secures ICE Brunel Medal for Excellence in Civil Engineering," (January 2020): <https://www.jacobs.com/newsroom/news/unique-modular-wharf-design-secures-ice-brunel-medal-excellence-civil-engineering>
² <https://www.fluor.com/services/construction/modular-construction>
³ <https://www.bechtel.com/services/modularization/>
⁴ "Prefabrication and Modular Construction 2020", Dodge Data & Analytics, 2020.
⁵ "Prefabrication and Modularization: Increasing Productivity in the Construction Industry", McGraw-Hill Construction, 2011.

SUPPORTED UP BY RIGOROUS COMPREHENSIVE RESEARCH

A study by the Construction Industry Institute highlights some of the benefits of modularized pipe supports over traditional welded supports.¹ Key findings include the following:

- Modularized pipe supports improve labour productivity by up to 66% and reduce the cost of each connection by almost as much.
- Weldless pipe tree installation likewise improves productivity by about 60% and reduces costs by 40–50%.
- Benefits accrued to builders from laser scanning and innovative scaffolding.
- Cut-lengths are eliminated.

¹ Construction Industry Institute - Innovations in Mechanical Construction Productivity Implementation, 252-2



Compare with traditional welded systems:

- Welds damage protective coatings on structural steel during installation.
- Welding diminishes flexibility because segments require additional welding, cutting or drilling in the field for adjustment.
- Future modifications are laborious and complex.
- Welded pieces can be challenging to install because of size, shape, and weight. For instance, welded trapeze components take much more effort to install than bolted systems.

A bolted system alleviates these problems. Additionally, a bolted solution is safer to assemble and install, and workers are exposed to fewer hazards associated with welding, drilling, and grinding.

MODULAR SUPPORT SYSTEM APPLICATIONS

Unlike traditional welding, Hilti modular support systems are easy to install and adjustable so that you can adapt components to your jobsite specifications and do more with less. With Hilti's wide range of Anchoring and Direct Fastening portfolio, you can fasten directly to concrete or clamp to steel without damaging the base material. Modular systems can be attached directly to existing steel structures with adjustable supports for single or multi-tier systems. Hilti's modular supports are available in different profile sizes and are corrosion resistant in different environments as defined by the ISO 9223 standard.

- Vertical pipe supports
- Rigid trapeze
- Cantilever support
- Single pipe drop
- Threaded rod trapeze
- Rooftop supports



PIPING SUPPORTS

- Raised floors
- Cantilever cable tray supports
- Electrical and instrumentation stands
- Threaded rod trapeze
- Overhead grid support



ELECTRICAL SUPPORTS

- Cantilever duct support
- Single duct fastening
- Rooftop ventilation equipment supports
- Trapeze duct supports



VENTILATION SUPPORTS

Multi-Trade Supports

Multi-trade supports are lean solutions for cramped service pathways. Such systems are generally prefabricated and integrated into your BIM. They allow for a high level of coordination, consistency and flexibility between the trades, improving schedules, quality and safety. Hilti offers an integrated approach: from design and analysis software to advanced logistics and anchoring technologies. Modular multi-trade supports:

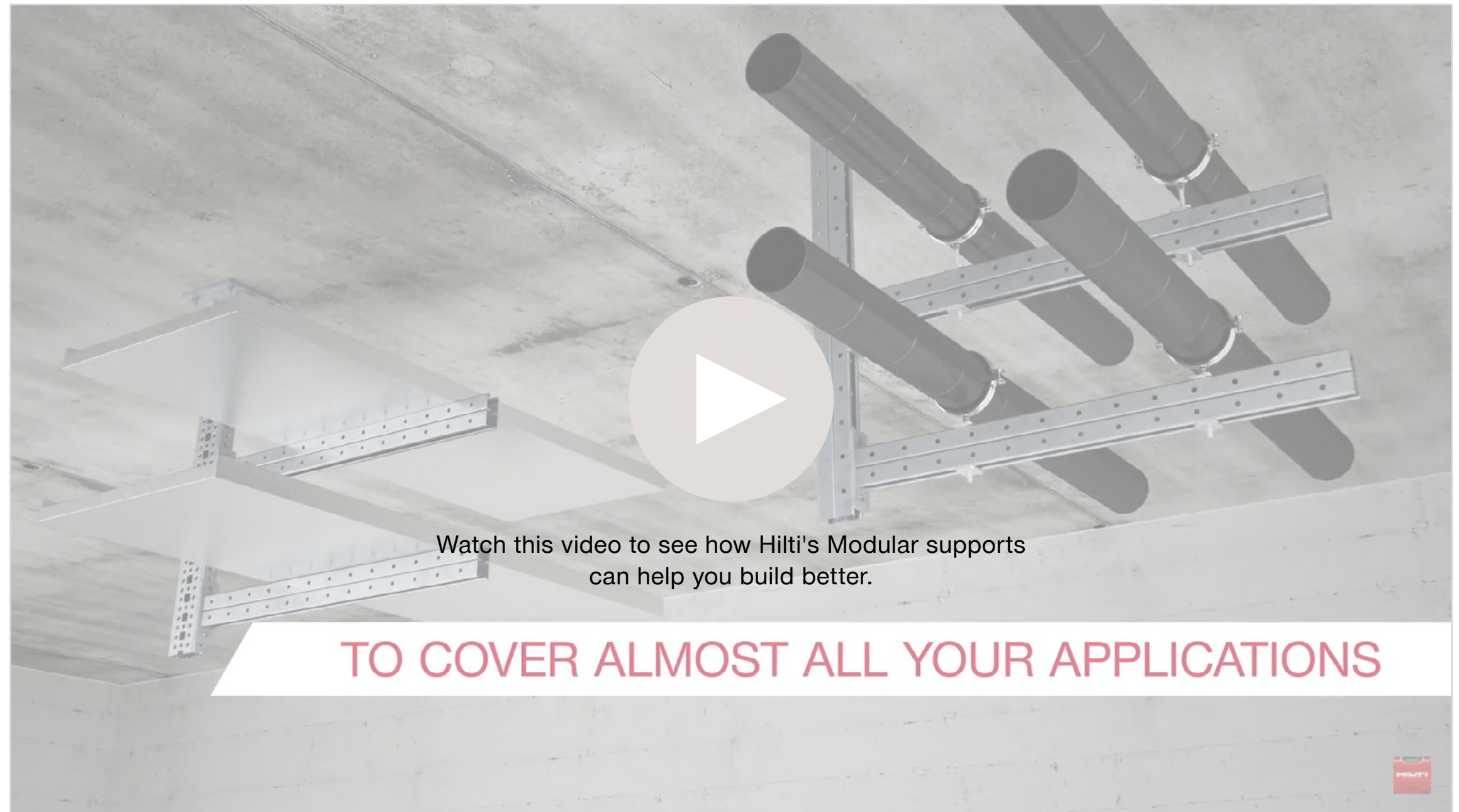
- Offer improved quality control of the assembly and system components including the opportunity to factory-test
- Ensure better handling and transport compared to prefabricated welded steel
- Provide on-site design and installation flexibility
- Reduce total installed cost when compared to the material, time and labour of prefabricating and installing welded steel supports
- Eliminate virtually all waste in the field



HILTI'S MT SYSTEM

The next generation of modular supports
for your key applications

Hilti's MT modular support system are manufactured to rigorous specifications and designed to work seamlessly together. Architects and engineers know exactly what they are using, and contractors know exactly how to assemble the systems. This eliminates time wasted on reworking, making workers more productive and satisfied. Using modular components also lowers a project's overall risk from potential delays, accidents and unforeseen maintenance.





SIMPLIFY DESIGN WITH HILTI ENGINEERING SERVICES

Experienced Hilti engineers and technical specialists will work hand in hand with your team to develop design solutions for your unique structural or non-structural application with consulting, training and education. Benefit from onsite consulting, technical support by phone and online support with Hilti Online.

SEAMLESS (WELDLESS) ASSEMBLY

Using welded steel requires skilled tradesmen onsite to assemble components and increases safety risks. In a modular system, each component is designed to be connected to other components without the need for special training or tools. Hilti's MT solution benefits from Hilti's patented twist lock adapter and thread-forming bolts. And cutting can be done easily onsite or before delivery.

Check out [this video](#) to see why choosing a modular bolted solution is the best choice for many applications.

DESIGNED TO LAST WITH CUTTING-EDGE CORROSION RESISTANCE

Corrosion is a sink that slowly drains away your investment. The internationally recognized zinc magnesium offered by Hilti provides enhanced corrosion resistance when compared to conventional zinc-coated steel, without significantly increasing the coating thickness. The thinner coating thickness also improves the forming properties of the component members, improving the mechanical properties of bends and thread deformations. This means that even hard to reach corners, like inside bends, have better corrosion protection.

BIM SOLUTIONS TO MEET YOUR DESIGN NEEDS

Enhance project management and productivity by leveraging Hilti's BIM and a library of Hilti components for Revit, AutoCAD, and many other modelling software programs. Verify that your calculations and designs meet regulatory standards. We offer customized, code-compliant structural design and analysis using our new modular supports portfolio. We make structural analysis simple. Our intuitive visual workflow renders solutions in real time. Model and analyse structural supports in a 3D static system and quickly generate reports on connector and channel utilization. Export calculations, bill of materials, shop drawings and parametric model elements to industry standard formatted for inclusion into the BIM/3D model.

HEAR WHAT OTHERS HAVE TO SAY



Gordon Nicholson, Head of Life Science Asia, Exyte, turned to Hilti MT solutions to solve problems he faced using welded H profiles. The traditional support weight was too high for his application.

“They are over-designed and lack adjustability,”** he said. He also needed all media, equipment and the ceiling frame to be preassembled with the support, and Hilti had just what he needed. This was not the first time that Mr. Nicholson had find the solution he needed at Hilti. He said, **“Hilti provided a total system solution with its heavy load products, prefabrication and 3D modelling calculation.”



Modular system solutions could be the answer to one or more challenge that you’re facing. Hilti creates such solutions for its customers and works with you to **build a better future.**

Contact us and let us show you how our products can make a difference in your work.



Want to know more? Talk to us today!

https://hilti.to/AskHilti_BIM

