AUTODESK
Construction Cloud

General Contractor Edition

The Ultimate Guide to Design and Construction Collaboration

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Contributors

Linn Areno

Head of Construction and Engineering Solutions, Skanska Sweden
Stockholm, Sweden

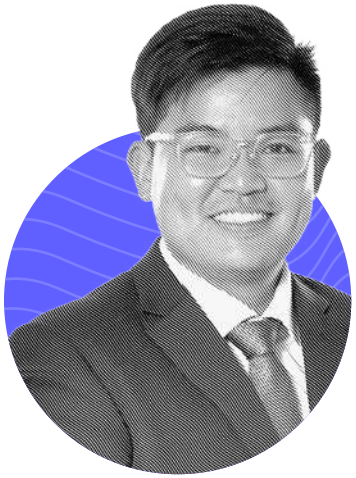
- I lead a core team in delivering construction and engineering solutions within Skanska
- I love to find new ways to solve problems, and I embrace creativity to stretch boundaries
- I focus on finding new ways to benefit from information flows, digital solutions, and communication in construction projects
- I'm all about developing solutions to make things easier, not repetitive
- After friends and family, my big loves are snow (skiing is my passion) and lush green nature! I also love sewing—today I mostly sew clothes for my son

Brant Fischer

Project Solutions Executive, Messer Construction Co.
Cincinnati, Ohio, United States

- I have worked in the construction industry for over 17 years
- I lead quality control process and projects control division
- I'm a big construction technology evangelist
- I have extensive experience in healthcare and research construction projects
- I operate a small family tree farm with my brother and love to play inline hockey

Contributors (cont.)



John Lim

Chief Digital Officer, Gamuda
Petaling Jaya, Selangor, Malaysia

- I lead innovation at a multinational construction company
- I was recognized for Technical Innovation in Tunnel Excavation from New Civil Engineer in 2019
- I was also recognized for Technical Product/Equipment Innovation of the Year by the International Tunneling Association in 2019
- I led design of the world's first autonomous tunnel boring machine (TBM) program
- I'm hooked on Taylor Swift right now and I'm a long-standing John Mayer fan—"Gravity" is my go-to song

Tony Peleska

CIO and Head of Digital Transformation, Kraus-Anderson
St. Paul, Minnesota, United States

- I have over 17 years of business-oriented technology experience in the legal, banking, and financial service industries
- Before Kraus-Anderson, I was CIO at the Minnesota Housing Finance Agency
- I served as Chairman of the Board and now serve in the Company of Fellows for the Association of Intelligent Information Management (AIIM)
- I am currently Chair of the Gartner InspireCIO Minnesota Chapter, and a member of the National Council of State Housing Agencies
- I gave up a professional soccer contract years ago to jump into the world of information technology and it was the best decision I ever made

Contributors (cont.)

Amr Raafat

Chief Innovation Officer, Windover Construction
Boston, Massachusetts, United States

- I have 20+ years of experience in architecture, engineering, and construction
- I lead Windover's VDC and IDEA™ (Innovations for Design, Engineering, and Automation) teams
- I'm a champion of pioneering construction technologies to streamline project procurement
- I received Innovator of the Year at the 2019 Autodesk AEC Excellence Awards
- I earned my black belt in karate at 16 years old

Daniel Smith

National Digital Technologies and Development Manager, Hansen Yuncken
Sydney, Australia

- I've worked in the construction sector for over 18 years, in roles ranging from BIM/VDC to technical consulting
- I'm focused on delivering a technology strategy that drives economic and efficient returns to the business
- I'm passionate about the application of emerging technologies like AI, automation, digital engineering and Design for Manufacturing and Assembly (DfMA)
- I used to love playing competitive football on the weekend

Contributors (cont.)

Greg Smith

Director of BIM/VDC, Yates Construction
Camas, Washington, United States

- I'm a construction technology leader in VDC, BIM, project management, curriculum, and design
- I serve as a trusted advisor and leader in the construction industry
- I drive the use and awareness of Autodesk Construction Cloud within Yates
- I develop relationships with industry leaders and higher education representatives
- I love to float in sensory deprivation tanks; it's therapeutic for my body and mind

Praseedha Subramanian

VDC Project Manager, DPR Construction
San Francisco, California, United States

- I have over 8 years of experience in life science, healthcare, and advanced tech construction
- I'm skilled in the use of platforms like Autodesk Revit, Navisworks, Autodesk Build, Assemble, and more
- I received Extraordinary Service Recognition from Tesla University Recruiting Team for work on Gigafactory 01 and 02
- I'm an active mentor at the ACE Mentor Program of America
- I love crafting detailed itineraries for travel of all types and playing volleyball

Introduction

There's no "me" in construction, but there is an "I".

Do I have all the information I need?

Will this software/tool do what I need it to do?

Am I done for the day?

What works for one team member—or one company—can cause friction for others. Specialty contractors can't access data after a project ends; general contractors can't see the latest architect designs; and owners can revise budgets after designs are already agreed upon.

Early stage collaboration beyond a company's walls is critical to profitability, with poor communication costing the construction industry approximately $17 billion per year. But most communication takes place within a company's (virtual) walls, with 2.5 internal collaborators working on documents for every 1 external collaborator.

Collaboration isn't just about working together. **It's about harnessing collective expertise of *each* stakeholder at *each* company**; aligning objectives; and navigating challenges as a unified front. After all, there may be tens or hundreds of stakeholders on a project, but there's only one final output.

So, how can you, as a general contractor, work better with your external partners at each stage of a project? We asked 8 construction leaders across the globe about the how they best collaborate on construction projects (and validated their insights with a specialty contractor, a designer, and an owner).

This guide is packed with their insights, expertise, and strategies meant to help you better collaborate with external and internal partners throughout the lifecycle of a project, so you can deliver high-quality work on time and on budget.

Why is collaboration important for general contractors?

Greg Smith
Communication is the number one issue in any organization. **The better we communicate, the more success we will have on any project**.

John Lim
Collaboration is important throughout the lifecycle because it ensures **the best decision making, reduced mistakes and timely completion**

Linn Areno
All the stakeholders in each project are dependent on each other. **Everyone refers to projects as "my project" and we must change that to "our project."**

Praseedha Subramanian
As a VDC manager on high-impact projects, **it is crucial to facilitate data-driven decision-making and prevent any issues**.

Brant Fischer
Construction is a people business. You can't effectively deliver a construction project or operate a building without collaborating with dozens of people. **You can't build a building solo, so collaboration is 100% necessary.**

Tony Peleska
Having a collaborative relationship from the start, like on design-build projects, is going to set you up for success. If you don't do that correctly, you're setting yourself up for failure or rework.

Daniel Smith
Collaboration **ensures better alignment and understanding of all stakeholders'** (from consultants to builders/subcontractors through to clients) expectations and requirements for the project.

Amr Raafat
Collaboration throughout design, construction, and operations **delivers essential insights, fostering collaboration and integrated decision-making**.

Benefits of collaborating throughout the project lifecycle

Connectivity

Tony

You're able to understand where your data flows from. What starts as an architect's idea goes into our hands, into the build, into the output at the very end. Being able to house that information, see it come through the platform, and integrate tools to follow the line of that data and for every job is critical.

Problem-solving

Praseedha

As a VDC manager on a cross-functional team of 80-100 members, it is crucial to streamline and facilitate data-driven decision-making processes. **A single source of truth is directly linked to increased team morale and trust**.

Skill-building

Daniel

Collaboration facilitates skills development through knowledge sharing and lessons learned among various stakeholders, pushing for better project outcomes. Plus, it fosters an environment that promotes innovation and value engineering, enhancing the overall efficiency and effectiveness of the project.

Communication

Greg

The better we communicate, the more success we will have on any project. Do we want success? Or do we want failure? We have to remember that the entire team; owners, designers, general contractor, and trade contractors; are all working on the same team. We need to all have the same goal of project success and to work towards that goal as a team. It's not about "me." It's about "us."

Benefits of collaborating throughout the project lifecycle (cont.)

Unity

John

Construction is a highly people-dependent process spanning many disciplines. As an industry, we owe it to our fellow global citizens to transform to meet the ever-growing needs of building tomorrow's infrastructure. **When we all come together, we can drive success**.

Foresight

Amr

Collaboration empowers stakeholders to achieve consistent, streamlined projects from planning through construction. Taking a proactive approach, like conducting in-wall scans during construction, provides valuable data for future maintenance, benefiting facility managers and owners.

Quality

Linn

If we don't see projects as a big team effort, it's not going to be a great product. **When we work on a "OneSkanska" project where we are vertically integrated, we can see the direct outcome of working together**. We can develop the land and design, construct, and maintain in a more holistic way. The products meet higher standards and new way of doing things is always appreciated.

Efficiency

Brant

Projects today move at such a fast pace; the risk exists to build incorrectly or make mistakes because of delayed/duplicated/incomplete communications. **Using a common tool keeps teams working together on the same platform throughout the project**.

How to collaborate better with design & engineering

Without a design, you don't have a project to start on. Seems like a simple enough fact, but getting this design data can be a fraught process. So fraught, in fact, that incorrect designs, late-issued designs, and incomplete designs are among the top five causes of capital project claims or disputes worldwide.

So if late, incorrect designs are a global problem, how can general contractors work better with design/engineering? Our experts approached the responses from different angles, but they all aligned on one common takeaway:

Share information as early and as often as possible.

Designers Agree!

"I think it's never too early for the construction team to have insight on the design. They can provide valuable feedback that's much easier to be implemented when the design is fresh & flexible. For general contractors, I think it's important to communicate early, and establish what software platforms will be used. Regular coordination meetings with clear goals for each meeting are essential."

-Ryan Gorman, BIM Manager, WJ Architects

Collaborate better with design & engineering (cont.)

Start your design on one platform

Tony

At Kraus-Anderson, it was critical to look a construction management platform's use from project inception to architects' designs to closeout. We asked ourselves, "How easy would it be for the end user to take data from one part of the project to the next, and so on?"

Setting up design models early and correctly helps drive the data throughout the lifecycle of a project. This gets you through preconstruction, construction, closeout, and handoff—it gets you through everything.

Amr

Our VDC team recently utilized AI-enabled generative design to optimize 2D MEP, structural, and architectural drawings into BIM data. This approach ensures early code compliance checks and streamlines the planning and permitting process for design teams, owners, and municipalities.

We also use model-based estimating solutions to streamline quantity takeoff early in the process. This ensures accurate estimates during the preconstruction phase, allowing the estimating team to focus their invaluable experience on critical tasks rather than on counting and measuring quantities from drawings, reducing quantity takeoff time by more than 50%.

Daniel

We emphasize transparency around work-in-progress (WIP) designs to monitor design progression. We use one construction management software platform to host, share and consume design information. With one shared tool and implementing more efficient process for sharing information in a timely manner, streamlines the coordination process, reducing rework, and enhances overall project collaboration.

This process also provides transparent access to non-technical users, enabling them to offer feedback in their areas of expertise, particularly in the area's constructability and cost control.

John

On the design side, we ensure that designs are started in 3D in one construction management software platform where everyone can tag issues and respond to comments in a transparent manner. This encourages participation across our internal and external design and engineering teams to produce a robust and clash-free design before it goes to site.

Brant

A team approach is strategy #1 when collaborating with design/engineering teams. We're all working together to deliver a project and working together collaboratively, respectfully, and efficiently are key. **Using a common tool keeps teams working together on the same platform throughout the project**.

Collaborate better with design & engineering (cont.)

Understand what designers need

Linn
We all need to understand everyone's different needs and how they collaborate. **When we work internally with our architects and structural engineers there's always room for exploring and improving**, which makes a huge difference for us in our requirement process for external teams. We want to be at the forefront of utilizing industry standards and harnessing the power of doing things uniformly within the industry—without increasing costs.

Praseedha
On a recent project, we conducted project and team health surveys every three months to study trust, accountability, and improvement. **We used a single source of truth across 30-plus sub teams to convey information, including with designers**, to enhance the efficiency with which teams performed. Spending too much time looking for answers could derail the key decision-making needed during at specific milestones.

Greg
Designers are very contemplative, wanting to explore and research. Construction teams are very time driven, needing to make decisions "on the fly." Put those two personalities in a room and there can be fireworks. But **understanding how people work, what they go through to complete their tasks**, their roles and responsibilities, helps the team to work better together.

We need to create a sense of community with teams that includes everyone. We need to treat each other with respect. Knowing a little more about others builds that sense of community. Getting rid of egos helps too, because everyone is important, and everyone has their part to play. More patience with others reduces tensions, and misunderstandings.

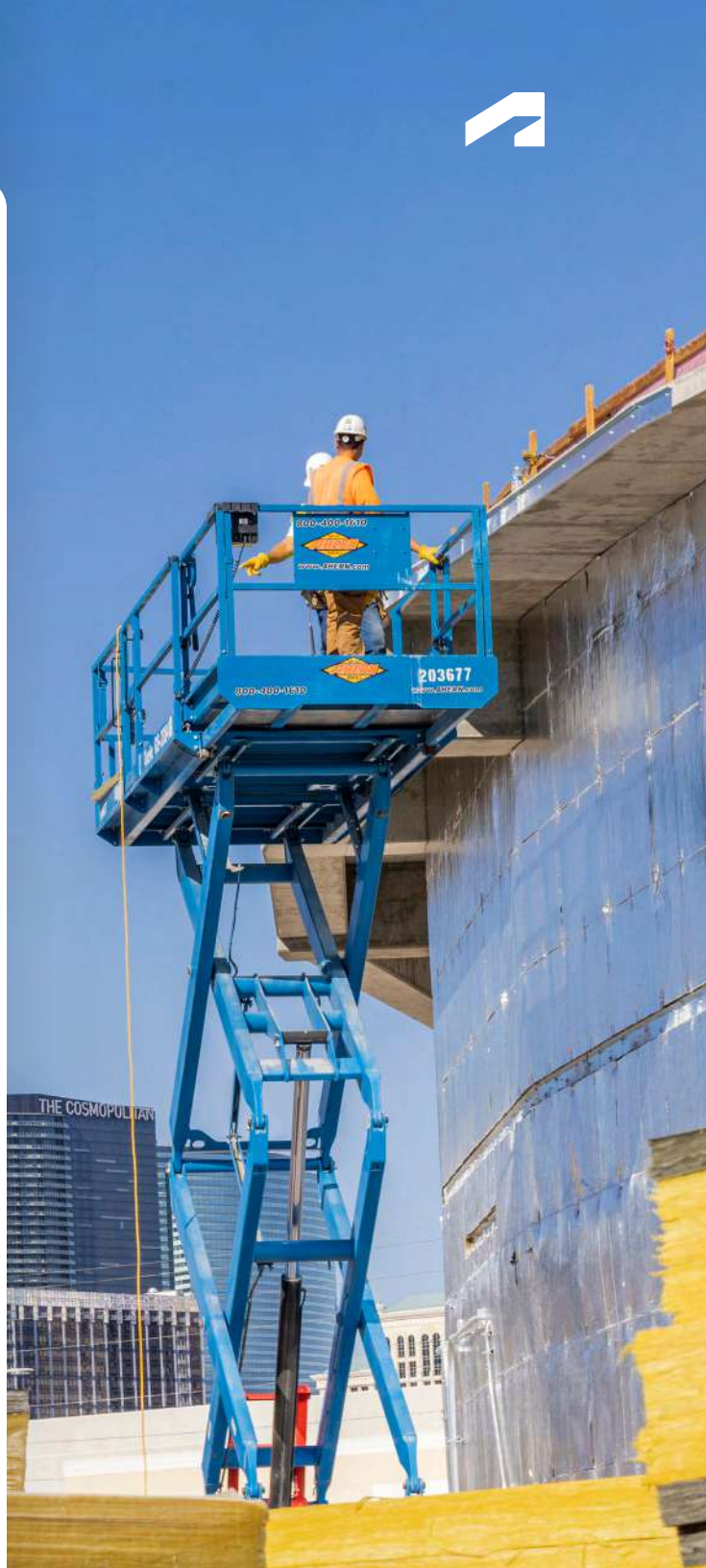
How to collaborate better with specialty contractors

The relationship between general contractors and specialty contractors can sometimes be contentious, especially as it relates to data sharing. Oftentimes, specialty contractors won't be able to reclaim the data they used on a project, meaning they have to start from scratch next time.

But general contractors and specialty contractors know there's room for improvement According to global survey data from Deloitte Access Economics and Autodesk, only 29% of general contractors and 28% of specialty contractors would rate their data sharing with external parties as strong.

So how can general contractors help bridge this data gap? Our experts all agreed that to build stronger relationships, general contractors need to:

Communicate openly so that everyone feels like they're on the same team.



Specialty Contractors Agree!

"I believe it is necessary to give all collaborating parties the same opportunity to contribute. Most importantly though is that available technology features are well known and used by all partners on the project. Therefore, it is important to check with general contractors to see which features are unknown to the teams and to organize trainings or distribute training materials accordingly before the project picks up speed. "

-Niklas Janetzky, Technology Product Manager, Pan-Pacific Mechanical

Collaborate better with specialty contractors (cont.)

Share information in mulitple ways

Tony
When you work with specialty contractors, you must use what they're working with. **You have to get information out to them using in a variety of different ways**. It can't just be an email; maybe it's an in-person meeting, where need them sign off on something, right then and there, so they can validate that the information is correct.

Greg
Make them feel like they are a part of the team. Include them as much as possible. They are the experts, after all. The old ways of working with trade contractors involved a lot of pointing fingers, yelling, demanding. That's no way to work. We are all on the same team.

Successful relationships are about helping each other do our jobs. Asking for their opinion. Involving them in decisions. Making them feel like a partner. **They really are our partners on projects**. And, again, treating each other with respect. That's a two-way street but as the general contractor we are in a leadership position. We need to model that behavior and ensure everyone is being respectful and is respected.

John
We mandate specialty contractors to onboard into our common data environment (CDE) to access the latest drawings and to also report their progress/issues through the platform. **This ensures accountability and feedback throughout their work on the jobsite**.

Collaborate better with specialty contractors (cont.)

☆ Empower teams to do their best work

Daniel

Our strategy for working with specialty contractors revolves around fostering collaboration to achieve mutual rewards. We invest in training to raise awareness for subcontractors, enhancing their efficiency and productivity. We prioritize mobile and efficient solutions to ensure timely access to relevant information. Plus, we streamline processes by reducing the number of touch points and systems that contractors need to navigate.

Linn

We see all subcontractors the same, no matter what trade they are in. **We always set the standards to have everyone included** in our chosen technical platforms, so we educate everyone needed at a project level.

Praseedha

We foster ownership of each team's respective scopes by implementing a Last Planner system in our big room environment. By co-locating work groups, regardless of organizational affiliation, **we empower teams to directly address design and field challenges** through real-time collaboration on engineering drawings and construction documents.

Brant

Bringing our trade partners into our project management (PM) platform is the key to efficient and accurate communication. Projects today move at such a fast pace; the risk exists to build incorrectly or make mistakes because of delayed/duplicated/incomplete communications. Working from one PM platform solves this problem for Messer.

Amr

Leveraging industrialized construction workflows, like prefab solutions, not only provides quality and efficiencies but also helps us tackle skilled labor shortages and attract new talent to our industry by **showcasing how fun and rewarding construction can be with robotics, machine learning, and 3D printers**.

For MEP contractors, we use BIM for spatial coordination early in construction review. It helps mitigate on-site risk. We optimize this process by conducting laser scans during construction to compare post-demolition conditions with coordination models. This ensures that all MEP and prefab elements will fit perfectly with as-built structures.

How to collaborate better with owners

According to a global survey with FMI, 76% of owners report a high level of trust with their general contractors, and 72% of general contractors report the same about owners.

Even so, owners are looking for more data than general contractors are currently providing. Per global survey data from Deloitte Access Economics and Autodesk, 61% of general contractors agree that clients are looking for greater transparency in key data points and information about a project.

So what's to be done about it? Our experts recommend that general contractors:
Keep owners in the loop by making information accessible from the start.

Owners Agree!

"General contractors need to be able to access design and engineering information in near real-time. The use of cloud-based platforms will enable them to do so. Increasingly, technologies such as 360 photos will allow them to do site reporting and supervision in a much more streamlined manner. They are also able to compare across various project timelines; this will give an overview for all the stakeholders in the projects."

-Muhammad Khalil, Senior Vice President (Group Technology Office), Boustead Singapore

Collaborate better with owners (cont.)

Share 3D models for easy review

Amr

We use 4D planning with even drone-captured 3D models early in project strategy, especially for occupied campuses and urban settings where planning is challenging. It visualizes the construction sequence synced to the project schedule, creating a living document that can be updated throughout the project to support safety planning. This approach helps clients, local authorities, and trade partners set clear expectations for upcoming onsite work, ensuring no surprises during construction.

Digital Twin models combined with IoT sensors maximize the benefits of accumulated BIM data during project planning and construction, supporting facility managers for years to come. They bridge the gap between construction as-built drawings and facility operations, ensuring seamless transition and long-term efficiency. It's also one effective step towards more energy-efficient building operations, as we can keep track of building performance in real-time.

Daniel

We provide transparent access to design information throughout the design development phases, allowing for more effective and collaborative stakeholder user group reviews. As part of this process, users are granted access to 3D data to enrich the users experience and understanding of the design, supporting better evaluations and alignment.

At project commencement and periodically throughout delivery, we also hold alignment meetings to ensure that documented requirements are in line with stakeholder expectations and make necessary adjustments.

Praseedha

Transparency is the single most important thing when it comes to owners. **Enabling the owners with access to all data and processes, including 3D coordination models**, lets them make an educated decision regarding the core group risk/opportunity logs of a project.

Collaborate better with owners (cont.)

Focus on customer experience

Tony
We have really enhanced our customer portal to create a unique customer experience for our owners. **We have focused on giving them the information that they want at their fingertips** while also creating a collaborative experience that they have requested of us.

Linn
There is a lot of work to be done to inform and educate owners and clients to make sure they can achieve what they need, and their own technologies seems to be for just one phase, like handover. **So, it's important to have them understand the aspect of design and construction, along with the best use of technology in the long run**. We prefer to always to be inclusive and open. A good project is built on a common ground—even for technology.

Work from a common data environment

Brant
Owners are brought into our construction management platform to collaborate with the rest of the project team on important workflows such as RFIs, Submittals, Meetings, or simply to take comfort in seeing our safety/quality program documented and in action with full transparency.

Greg
Making information as easy as possible to find and use. Current, relevant information. The more we can utilize one CDE, structured in a way to make information easy to find, the quicker we will have decisions. The happier the owner will be. Fewer misunderstandings and a more successful project. Like Albert Einstein says, "make everything as simple as possible, but no simpler."

John
Depending on the contract type, we might invite owners to participate in the design process through our CDE and be a part of our review process on design, as well as quality form procedures on site. **This ensures compliance and feedback from the client throughout the lifecycle of the project instead of waiting to the end of the project**.

The closeout

While it's most feasible to tackle collaboration within your own company, the biggest impact will come from improving collaboration with external parties. Here, we leave you with some actionable advice on how to improve collaboration:

Reflect on how you collaborate

1. Think about the external parties you've worked with over the past year or two. What have the interactions been like? Ask yourself questions such as:
   - Are you asking or demanding of the teams you work with?
   - Are you communicating on the channels that work best for you, or the ones that work best for the project?
   - Are you approaching meetings in a positive, curious way, or contentious from the start?
   - How often are you meeting with your external partners? Daily/weekly/monthly? Does this cadence increase or decrease during the project?
2. Take this a step further by surveying your external partners and clients on how their experience was working with you, and where you could make improvements.

Audit and standardize where you store your data

1. Construction leaders spend 11.5 hours per week searching for and analyzing the data they need for their jobs. But if it's hard for your company to do it, it's going to be even harder for external partners. Start by auditing where you're storing project data and other key information, and check off how many platforms you're using:
   - Spreadsheets
   - Data visualization tools
   - ERP
   - CRM
   - Construction project management software
   - Scheduling software
   - Bid management software
   - Building operations software
   - Asset management software
2. Next, ask yourself if external teams currently have access, and/or should have access. If they should have access, outline the benefits to help make a case to your IT team.
3. No one wants to hunt through various systems and data types to get the data they need, especially your external partners. Once you've identified the data you're tracking and how much you're using it, consider the following steps:
   - Ensure the data collected are accurate and in a standard format.
   - Choose a single, open technology solution that supports integration.
   - Establish metrics to track your performance throughout implementation.

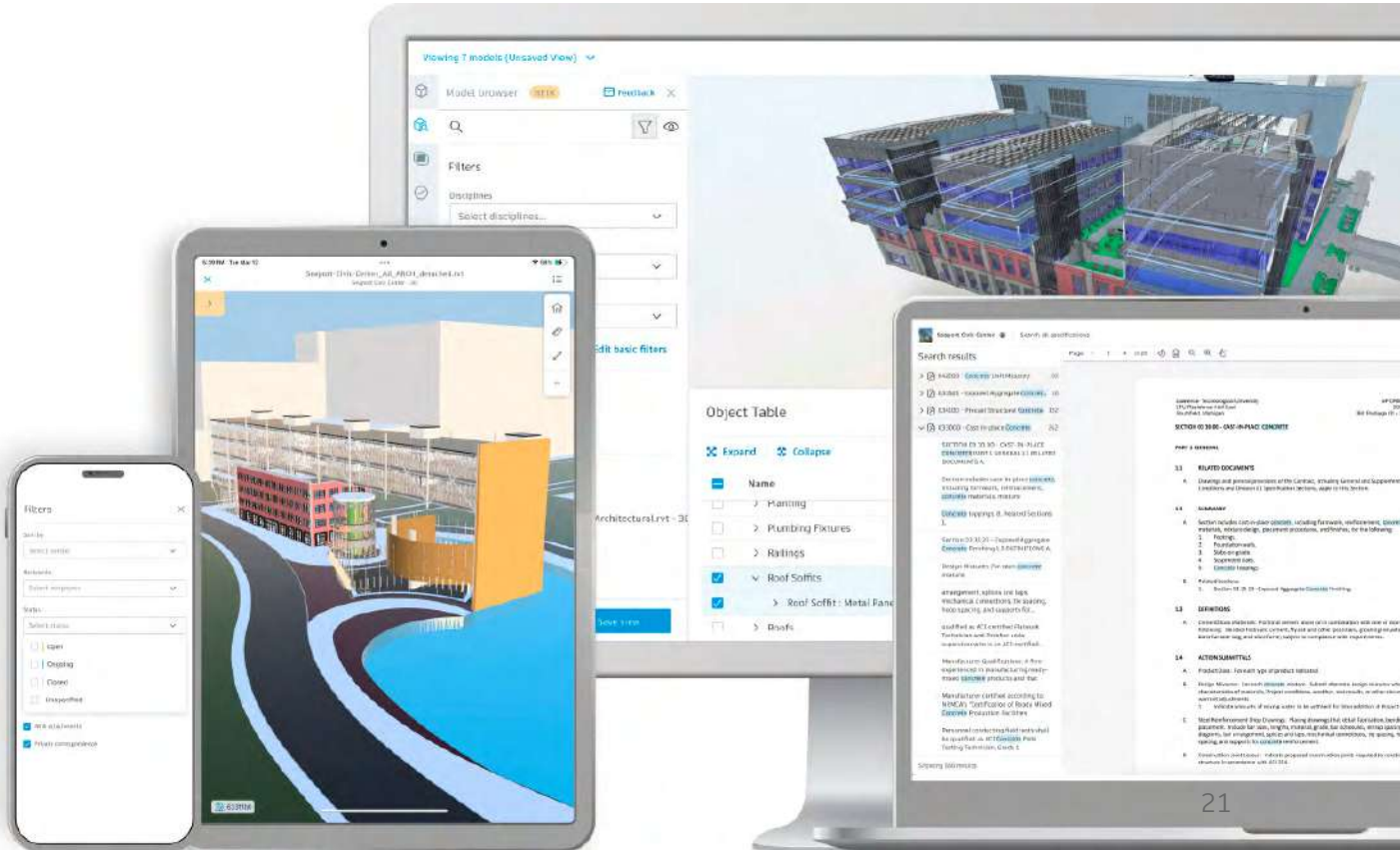
See the Future of Connected Construction

construction.autodesk.com

Our industry requires solutions that connect their information, teams, and technology —breaking down data silos and disconnected processes that hinder true transformation. As we navigate the ever-present push to do more with less, we need to uncover new ways of working, enhance connected digital workflows, and incorporate advanced analytics. To support us on this journey of transformation, we must lean into tools that connect construction – from design to plan, build, handover, and operations.

Built on a unified platform and common data environment, Autodesk Construction Cloud is a powerful and complete portfolio of construction management products that empowers general contractors, specialty trades, designers and owners to drive better business outcomes. Autodesk Construction Cloud combines advanced technology, a unique builders network and predictive insights to connect teams, workflows and data across the entire building lifecycle.

While the industry experiences unprecedented transformation, our mission remains the same: to help construction teams meet the world's rapidly expanding building and infrastructure needs while making construction more predictable, safe, and sustainable. And we've remained steadfast in our promise to deliver the industry's most compelling solutions, connecting data, teams and workflows from the field. This is our commitment to connected construction.



AUTODESK

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