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INNOVATION IN THE STRUCTURAL BUILDING COMPONENTS INDUSTRY

White Paper
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INNOVATION IN THE STRUCTURAL BUILDING COMPONENTS INDUSTRY: PAST, PRESENT, AND FUTURE

EXECUTIVE SUMMARY

The structural building components industry has operated on the precipice of technological advancements throughout its history. The manufacturers of roof trusses, floor trusses, wall panels, and offsite framing solutions (components) have sought to leverage cutting-edge technology through computer modeling software, efficient linear cutting solutions, and constantly increasing levels of mechanization and automation.

With the construction industry facing increased demand, rising labor, housing and materials costs, and a shrinking pool of skilled workers, manufacturers are turning to technology not just as a supplement to human labor, but as a strategic foundation for growth. Innovations in software, processes, automation, and integrated systems are reshaping the way components are designed, produced, and delivered.

This white paper explores the history of innovation in the structural building component manufacturing space, details the present-day technological landscape, and outlines the trends shaping the future. It documents how both incremental and disruptive innovations have advanced productivity and quality, and how the industry's growing reliance on automation, digitalization, and collaboration is helping address labor shortages and increase construction efficiency.

DEFINING INNOVATION

Innovation is the process of creating and implementing new ideas, methods, products, services, or tools that result in improvements or added values. Innovation is often associated with disruptive technologies or revolutionary inventions, but in reality, it encompasses a continuum that includes incremental, progressive, and systemic changes. In the context of structural building components, innovation can be any advancement—big or small—that improves efficiency, process, safety, quality, or cost-effectiveness.

Innovations don't have to be major breakthroughs in technology or new business models; they can be as simple as upgrades to an existing service or process or features added to an existing product, like the metal connector plate or automation, and smaller, incremental improvements, such as improved plant processes or workflows.

These practical innovations are easier (and necessary) to implement, are more approachable and adaptable, encourage a culture of continuous improvement, and are especially valuable in industries where large-scale change is difficult. Even a slight tweak can produce significant benefits across projects, helping drive the industry forward in quiet but powerful ways.

Innovation often begins with the question: *what's the obstacle, and how do we remove it?* Whether it's reducing repetitive motion, simplifying a task, or changing how materials move, the drive to solve specific problems, big or small, continues to push the industry forward.

INDUSTRY OVERVIEW BY THE NUMBERS

The component manufacturing industry in the United States consists of over 1,300 component manufacturing locations operated by approximately 988 companies. These locations vary in size, from small manufacturers with under $1 million in annual sales to large operations exceeding $50 million (data collected in 2024).

Industry Stats:

- Total U.S. Component Manufacturing Locations: 1,345
- Estimated CM Annual U.S. Sales: $9.31 billion
- Estimated SBCA CM Member Sales: $9.12 billion
- Estimated Number of Employees Across All Component Manufacturing Locations: 39,183

Industry Sales by CM Company Size:

- Small (<$1m): 33%
- Medium ($1m-$10m): 55%
- Large ($10m+): 12%

Plant Asset Averages (per location)**:**

- 3+ Semis/Trailers
- 4+ Forklifts
- 2+ Linear Saws
- 1+ Finish Roller Press
- 2+ Gantry Tables

Market Share by Component Type:

- Roof Trusses: 70%
- Floor Trusses: 11%
- Wall Panels: 8%

Market penetration of roof trusses is comprised of a majority of the country, with the exception of a few states, like Texas, that still primarily stick frame rafter roofs and have lower adoption of components.

Floor trusses are comprised of both first floor and upper floor, with upper floors holding a higher share than first floor. Of the 11% share of floor trusses, 5% are first floor and 38% are upper floors.

Builder Sentiment (Next 5 Years):

- 66% plan to continue using roof trusses; 20% anticipate an increase in use
- 12% of builders plan to increase wall panel use; 60% do not plan to use; 21% plan to use the same; 7% plan to use less
- 14% use floor trusses; 49% use I-joists; 37% use solid-sawn lumber

INDUSTRY BACKGROUND AND CHALLENGES

Traditional Practices

In the beginning, trusses were fully manual. Starting with manually drawn truss designs, trusses were cut with hand tools and assembled on plywood tables with basic jigs. The transition to mechanized saws, pen plotters, and eventually software-based design ushered in faster production cycles and tighter tolerances.

Innovation in this industry has often been driven by individual entrepreneurs and early adopters willing to invest ahead of the curve. The connector plate remains the original enabler of componentization, but waves of innovations such as digital, robotic, and AI-driven technologies continue to build on that foundation.

That innovation is all the more impressive given how fragmented this industry is. Of SBCA's over 580 component manufacturer member companies, there are over 930 locations, averaging just 1.6 locations per company. Many of the industry's non-members are even smaller, often single-location, owner-operated businesses. While fragmentation can lead to a feeling of being small and siloed, it also fosters an innovation-friendly environment. Each company tailors its processes to reflect its local market, competing on differentiation and value-added services. Innovation hasn't come from top-down mandates, it's come from the ground up, driven by companies finding ways to adapt technology to fit their unique workflows and solve real-world production challenges. That diversity creates a rich landscape of solutions and enables faster responses to market trends and customer needs. The result is a decentralized but formidable industry, one that is highly engaged, deeply skilled, and cumulatively very powerful.

Despite these advances, there are still challenges and pain points that component manufacturers encounter. One of which is material handling, a continued significant bottleneck. While advances in saws and table automation have accelerated cutting and assembly, the movement of materials between these stations is often where efficiency can break down. Repetitive motion remains another concern, particularly in handling, lifting, and staging, and continues to drive interest in solutions that reduce manual steps.

Pain Points

Plant-Side:

- Aging equipment and fragmented software
- Limited integration between design and delivery systems
- Finding and retaining trained workers/finding manufacturing labor in general
- Manual material handling (e.g. picking, sorting, moving completed trusses)
- Repetitive motion tasks that impact safety, speed, and workforce sustainability
- Economic conditions, such as recessions or labor shortages

Field-Side:

- Shortage of trained framers, specific to installing components such as roof trusses, floor trusses, and wall panels
- Delivery and sequencing issues
- Incomplete plans and miscommunication with design teams

Additional Challenges:

- Material volatility (lumber, metal plate connector costs)
- Pressure for just-in-time delivery
- Pressure for sequenced products (i.e. trusses produced and banded in a specific order for jobsite delivery and installation)
- Lack of industry-wide education on component (e.g. trusses and wall panels) benefits
- Housing affordability crises
- Inflation in materials and labor
    - In addition to the economic impact inflation has on material availability and accessibility, labor is a persistent challenge. With competition for labor amongst other industries, manual and skilled labor is less sought after, at both the school-age level heading into the workforce and the current workforce pool.
- Equipment: manual vs. automation; robotics to streamline production processes
- Software: 3D modeling, BIM, CAD, and integration with architectural and engineering platforms
- Education: training programs and educational resources to increase awareness and understanding of component benefits and capabilities

- Collaboration: cross-trade collaboration with architects, engineers, and construction professionals (and others such as building officials, code officials) to create integrated solutions that optimize entire building systems and working together in the preconstruction phase
- Resistance to and fear of change
- Sharing digital models and information without compromising intellectual property

These issues reinforce the need for integrated, scalable, and technology-driven solutions.

INNOVATION TODAY

From rudimentary manual processes to AI-assisted design and robotic assembly, each wave of innovation has increased precision, productivity, and integration across the industry. While there is typically hesitation, doubt, and fear of change and new things, the industry's general entrepreneurial spirit and willingness to embrace technology has been key to its progress.

Today, over 1,300 component manufacturing plants operate in the U.S., with more than half considered as mid- to large-scale (based on sales; see page 4). Even smaller operations continue to innovate, often customizing or integrating new technologies independently to remain competitive or finding ways to make their operations more efficient, even in smaller ways. Innovation isn't just about machinery. It's about reorganizing workflows, improving communication, and collaborating more effectively across trades. Sometimes the most innovative act is rethinking how your plant operates, not just installing a CNC machine or other expensive equipment. Many innovations have emerged not from a spirit of collaboration, with manufacturers often sharing tools, processes, and insights openly across the industry. This collective mindset has allowed ideas to spread quickly, encouraging practical experimentation and accelerating incremental progress.

One example of practical innovation can be seen in how some addressed the steep learning curve in truss layout and production, especially as newer manufacturers entered the component space without decades of in-house expertise. They leaned on tools like jet-set puck systems and simplified saw technology to make processes more accessible to new teams. Industry pioneers recognized that successful innovation means making systems easier to use, especially for teams without long-tenured crews. These incremental advances allowed manufacturers to improve efficiency without waiting years for workforce training to catch up.

Current Technologies in Use (per SBCA 2023 Innovation Survey)

- Saws: Component and linear saws
- Tables: Mix of manual jigs, lasers, automated pucks
- Lumber to Saw Transport: Forklift, manual, powered conveyors
- Cut Lumber to Tables Transport: Manual (carrying, carts)
- Post-Production: Manual banding and hand-stacking

Innovations of Today

There are innovations coming to the forefront more rapidly with today's advanced technology available. Some notable and recent innovations include:

Alpine's Plan Comparison Tool – A new AI-powered tool that analyzes two PDF versions of architectural plans, highlighting text and image differences— saving designers and estimators time while enhancing accuracy. The tool provides easier plan revision and fosters better collaboration among multi-disciplinary teams.

AnnotiQ's Smart Glasses – An innovative technology designed to streamline the work of component estimators and designers by accelerating the bidding and production phases of construction projects. They automatically convert 2D floor plans into detailed, buildable 3D models with accurate framing—while using AI to detect discrepancies in drawings, site photos, and specification sheets in real time.

Botmark's Electronic Detailing Ruler – The Botmark E-Ruler system was developed by former framing contractors to help tradespeople manage the overwhelming responsibilities of building layout. Using a total station, tablet, and the proprietary Botmark E-Ruler, it allows a single technician to perform layout faster and more accurately than a manual crew, freeing up skilled labor and improving overall jobsite productivity.

Dusty Robotics' FieldPrint Platform – A solution to ensure design integrity in the field through automated layout and a streamlined BIM-to-field process. Dusty delivers a combination of hardware, software, and services that fit seamlessly into existing construction work processes by printing digital models directly on the jobsite floor with 1/16" accuracy.

EcoSmart™ Stud—The EcoSmart™ Construction Stud is a 1-to-1 replacement for a standard construction stud. The E-Stud has gaps which reduce thermal bridging by allowing insulation to fill in the gaps. They can build a highly efficient, low complexity, low carbon, resilient, composite wall system at a low cost for all homes.

FairBuild AI – FairBuild AI helps component manufacturers assess and de-risk contracts using advanced AI and natural language processing. It identifies obligations, risks, and exposures in minutes—giving teams clarity and control before signing. Knowledge isn't just power—it's protection.

HP SitePrint – HP SitePrint is a robotic layout printer that integrates with total stations and CAD and BIM workflows, using jobsite-tested ink to print layout marks directly onto the slab. Its cloud-based platform allows users to manage and execute layout tasks digitally, enabling layout up to 10 to 12 times faster than manual methods, while promoting cross-trade coordination and helping all trades work from the same set of plans to reduce mismatches and improve jobsite communication.

Insul-Stud by Moment Innovations, LLC — These studs eliminate thermal bridging (where cold air or warm air transmits through the building envelope) and as a result are 40% more energy efficient than a solid 2x6 stud. All of this is accomplished within the wall cavity allowing builders to meet the energy code requirements without having to add foam or make the wall wider, thus allowing for conventional installation of wall sheathing, siding, and window/door jambs.

MiTek Truss Validator – The first web-based tool for verifying the suitability of wood and Posi-floor trusses for specific projects. Launched in 2024, it helps designers and engineers quickly assess truss applicability, improving efficiency and confidence in their specifications.

Oak Ridge National Laboratory's Real Time Evaluator (RTE) – The RTE was developed to provide real-time feedback to installers of prefabricated components, such as trusses and wall panels. With the RTE, a digital twin, or model, is developed based on the drawings of the house design. At the jobsite, an autonomous robotic tracker follows targets that are placed on the components and provides the actual position of the component. The RTE compares the actual position to the designed location in the digital twin and provides real-time feedback on where the component needs to go to meet the required tolerances.

Panel Straps – This is a tool that helps speed up the framing process. Initially, framers used to take rolls of seat belt material, cut them to length, make a loop out of it, and then staple or nail it into the panel to use for moving the panels. Now, there is a specific strap for this exact need, thus making it more efficient and easier to use.

Paragon D.A.N. (Design Automation Neural network) – A cloud-based SaaS (software as a service) for wood trusses, offering fast, scalable, and flexible performance directly from any web browser, without manual installations or updates. With the software being accessible from any device via a web browser, the software's performance is not limited by the device's computing power, but rather relies on Paragon's cloud servers for computationally-intensive data processing. Paragon D.A.N. automates the truss design process by using the power of the cloud to quickly find the most efficient design among the near infinite number of possible truss configurations.

Randek's ZeroLabor Robotic Sub-assembly – A cutting-edge system that automates the early-stage production of wall elements by using robotics to build sub-components such as rough openings and stud assemblies — traditionally time-consuming and labor-intensive tasks. These components are then fed directly into the main wall production line, ensuring seamless flow, no downtime, and LEAN productivity at its best.

TwinBuild LVM by CrowdBuild – An innovative estimating tool that uses advanced vision models to convert 2D floor plans into precise, whole-house quantity takeoffs. Due to the level of precision, the output not only can be used for preconstruction bids, but is able to serve as a "single source of truth" for the entire life cycle of the structure.

Vekta Automation Raking Framer – An automated linear process for optimizing the production of raking walls while minimizing waste. This automated solution caters to both parallel and raking frames. The modular design allows customers to select the most cost-effective version for their particular needs at a particular point in time.

VIRTEK VISION's Iris AI Panel Inspection System – This system leverages AI and Machine Learning to enhance component inspections to Industry 4.0. Unlike traditional methods, Iris AI adapts and learns from millions of images, identifying anomalies in real-time and notifying operators with laser-guided precision. This system improves accuracy, reduces manual oversight, and streamlines inspections, enhancing product quality and operational efficiency.

Q4US's Universal Truss Manager (UTM) – The UTM streamlines truss design file management, enabling quick uploads, organized searches, and easy sharing with authorized personnel. It offers multiple viewing options, detailed truss information, and AI tools for strategic decision-making. UTM integrates with existing systems to enhance overall truss manufacturing processes.

Equipment

Originally built of wood, early truss tables were gradually upgraded with steel tops and manual jig set-ups. A breakthrough came with the introduction of laser projection systems and automated "pucks"—software-controlled positioning jigs (laser or metal) that define the design directly on the table surface. These systems streamlined set-up and improved accuracy.

Robotic systems have further advanced table automation. Since 2008, companies like Trussmatic, House of Design[1], and Randek have introduced machines that position lumber, apply plates, and press joints with minimal human input. In some systems, completed trusses exit the table fully assembled, creating production-line efficiency.

Pre-plating systems are emerging as a major opportunity area. These systems apply metal connector plates to individual lumber members before they reach the jigging table, allowing for more accurate placement and reduced plate sizes, reducing material waste in turn. By pre-positioning plates using automated systems, manufacturers can achieve gains in both efficiency and safety, eliminating repetitive motion tasks and improving product consistency. These systems offer scalable integration with existing lines, enabling manufacturers to add various levels of automation incrementally over time rather than requiring full-system replacement at the start.

Cutting technology has progressed from component saws with four or more blades, making it possible to do two cuts on each side or more difficult cuts, to automated saws, which automatically set the length and angles using the software from the engineering program. Coming onto the scene later, linear saws revolutionized the process. With their versatility, ability to make optimized and multiple cuts, and dramatic waste reduction, these saws are commonly sold and used today.

New Processes and Methods

Automation and Mechanization in Component Manufacturing

With adapting and evolving in order to progress the industry forward, in both small and big ways, there is still a barrier to automation adoption, as there tends to be a lack of understanding of the systems and how they impact and affect processes and people.

Mechanization and automation are both critical to the advancement of modern component manufacturing, but they represent fundamentally different approaches to increasing productivity and efficiency.

[1] House of Design is now defunct; however, the technology will likely be repurposed and eventually available in a similar form.

Mechanization refers to the use of machines, equipment, or tools to assist with physical tasks. These tools are designed to reduce manual labor and speed up repetitive operations. However, they still rely heavily on human operation and oversight. Mechanization is 100% a tool or mechanical device and depends on consistent manual input for task execution and decision-making. It lightens the physical burden on workers and improves output, but humans remain central to the process.

Automation, by contrast, incorporates software and programmed communication to make independent decisions, where humans set the parameters for those decisions being made. It enables systems to respond in time to in-time production needs with minimal human intervention. In a component plant, for example, an automated saw not only cuts lumber but also determines what to cut, when to cut it, and how to sequence it based on real-time data about inventory, labor availability, and production flow. Automation is 20% mechanical and 80% software. Automation helps optimize output, balance labor, and reduce waste.

The essential difference lies in who (or what) makes the decisions. Mechanization helps people perform tasks more efficiently, while automation reduces or replaces the need for human decision-making.

This evolution is deeply connected to innovation in the structural building component manufacturing industry. As the labor market tightens and demand for faster, more accurate production grows, manufacturers are increasingly investing in intelligent systems. These systems allow companies to shift from traditional "push" manufacturing, where production is based on forecasted demand (ex. Cutting something even though it’s not needed now, but assumed it’ll be needed at some point in the future), to "pull" manufacturing, which uses real-time data to drive output decisions (ex. Basing cuts off actual needs). This leaner, more efficient approach mirrors processes from industries like automotive manufacturing and is made possible by automation. Automation enables this shift by making data-informed decisions quickly, ensuring materials and labor are used as efficiently as possible.

Mechanization laid the groundwork for mass production in component manufacturing. But today, automation is driving future progress. It empowers manufacturers to scale operations, improve quality, reduce labor dependency, and make smarter use of materials and time.

Lumber Grading

Lumber grading has evolved from skilled graders visually assessing boards for characteristics like knots, wane, and slope of grain to today’s precise, machine-based evaluations. In 1922, the American Lumber Standard Committee (ALSC) was formed to establish uniform rules for size, grading, and moisture content, leading to the first American Lumber Standard in 1924. Under this system, each piece of structural lumber bears a grade stamp showing the species or species group, mill identification, grade, and moisture designation, which is essential information for making sound design and purchasing decisions.

The introduction of machine-based grading advanced the industry by providing a more precise and technical way to rate lumber while meeting design value requirements. Two common ways structural lumber is graded today is with machine evaluated lumber (MEL) and machine stress-rated (MSR) lumber. Both methods nondestructively test each board during manufacturing to determine its physical properties, making sorting more accurate and resulting in greater consistency and reliability.

Understanding species groups has also become increasingly important, as each group's mechanical properties directly affect structural performance and must be matched to project requirements.

Other modern grading technologies incorporate advanced sensors, x-ray and optical scanning, and acoustic measurement systems to evaluate every piece at high speed. These data-driven approaches reduce variability, optimize material use, and produce consistent design values that can more easily integrate with automated manufacturing. For component manufacturers, these improvements translate into greater efficiency and higher product quality.

Communication and Collaboration

As the Internet matured, real-time collaboration between designers, builders, and trades became feasible. One of the biggest transformations in the industry has been the availability and accessibility of digital information across disciplines. The shift helps reduce errors, minimize rework, and help project teams save time, cost, and materials. It also allows those involved in the project the ability to identify conflicts earlier in the process, improving overall constructability.

Application Programming Interfaces (APIs) have allowed integration between truss software and third-party applications, including accounting, estimating, and MEP systems. As software has evolved, the focus has shifted from isolated tools to connected systems that support coordinated decision-making across teams.

Artificial intelligence is now beginning to enhance the design process, using automation to reduce material use, increase constructability, and ensure accuracy. These emerging tools, along with growing comfort with digital workflows industry-wide, are helping to break down traditional silos and support more efficient, collaborative building practices.

- Real-time communication through the internet has enhanced project collaboration.
- AI and intelligent features are being integrated to automate design checks and optimizations.
- APIs (application programming interfaces) allow seamless integration of truss software with accounting, architectural, HVAC, plumbing, and electrical systems.

Integrated Project Delivery

Integrated Project Delivery (IPD), a newer approach to project coordination and management, represents an innovation in how construction projects are executed. Unlike traditional delivery methods, IPD unites key stakeholders, such as framers, builders, architects, engineers, and trade partners, under a single multi-party agreement from the start. This approach aligns risk and reward through a shared profit pool, incentivizing collaboration, transparency, and early problem-solving.

IPD can foster innovation by breaking down silos, encouraging lean construction practices, and leveraging digital tools like 3D modeling and real-time data sharing. It closely aligns with the structural building components industry's systems-based approach, where efficiency, quality, and integration are paramount. By prioritizing shared goals and continuous improvement, IPD can drive a more agile, cost-effective, and future-ready construction process.

Digital Quality Control

As progress is made in the structural building components industry, improvements and innovative ways to excel and advance occur every day. Moving beyond vellum paper and pencil, which was the norm in the past, a digital option is available through the association: SBCA Digital QC, which came onto the scene in 2020. With Digital QC, a tablet, smartphone, or computer is used to do quality control inspections.

Digital QC gives a component manufacturer (CM) the power to run reports on their inspection data for better continuous improvement. A picture, rather than using vellum, is a great learning tool for showing crews why a joint failed the inspection. It is also more environmentally friendly and can save physical storage space by eliminating those old paper and vellum records. Digital QC provides a more efficient quality control process, allowing for more inspections of trusses which can lead to less callbacks, higher customer satisfaction, and aid in risk management.

Using SBCA's Digital QC program, the user can enter their hours worked per setup for even more detailed reports and to also ensure they are meeting the ANSI TPI-1 standard required inspection frequency of three inspections per setup per shift per week. Additionally, the Digital QC platform has a place to upload a copy of a plant's quality control manual to be sure the plant has a backup on file, should something happen to the plant's copy (such as a computer/server crash or the file gets corrupted).

DRIVERS OF INDUSTRY CHANGE AND INNOVATION

Drivers such as labor shortages, economic pressures, rising builder expectations, and the growing emphasis on sustainability are catalyzing the adoption of advanced technologies, automation, and systems-based solutions across the manufacturing and framing landscape.

Labor Shortages

The industry continues to deal with a chronic shortage of skilled labor across both manufacturing plants and framing crews. A tight labor market has resulted in:

- Scarcity of trained plant workers and framers/installers
- High turnover and rising wages
- Exploration of humanoid robotics and AI-driven solutions to help reduce dependency
- Automation and mechanization to current processes and equipment

The structural framing industry can benefit in the near term from integrating technologies such as automation and AI-driven systems into existing processes and equipment setups. Rather than overhauling entire operations, companies can enhance productivity, consistency, and quality by plugging these technologies into what's already working.

Economic Pressures

Manufacturers and builders face significant financial pressures from both upstream and downstream forces, including:

- Lumber and metal plate connector cost volatility
- Increased demand for fast, cost-effective builds
- Intensified competition from other offsite construction methods like modular, 3D printing, CLT, and alternative materials like steel and concrete

Innovation in digital design tools, automated optimization software, and manufacturing processes help mitigate these pressures. By reducing waste and material use, manufacturers can stabilize costs while delivering more competitive pricing. Systems-based framing solutions (using roof trusses, wall panels, and floor trusses as a system) are designed with structural efficiency in mind and enable faster assembly and fewer errors, helping to reduce costly callbacks and delays.

Sustainability

- Component-built systems reduce wood use (25% savings)
- 30x less jobsite waste compared to stick framing
- Energy-efficient and durable designs

Key Outcomes Driving Innovation

1. Greater Efficiency
2. Labor Shortage Solutions
3. Higher Quality Products, Services, and Solutions
4. Integrated Workflows
5. Scalability
6. Long-Term Viability

THE FUTURE OF INNOVATION

Industry progress will comprise of various factors. One key aspect that will aid in moving the industry forward is by improving digital practices, especially at the front-end of operations, to support intelligent manufacturing systems and a systems thinking approach. It's not about any one innovation, it's how they work together.

A critical part of that evolution involves better digital collaboration among project stakeholders. While component manufacturers have made significant strides in automation and data integration, challenges persist around sharing digital information without exposing sensitive intellectual property. This is particularly important as manufacturers work more closely with architects, engineers, and trades to deliver precise, high-performing structures.

Sharing models and coordinating digitally, without compromising intellectual property is needed to move forward and continue to progress. The vision would be to have a single source of truth where everyone, from engineers to installers, is working from the same, accurate information.

No matter where the industry is in the innovation timeline, systemized solutions such as roof trusses, floor trusses, and wall panels (best used as a full system) provide the best way to frame and implement innovative ideas, processes, and more. With reducing labor, bottlenecks, and increasing productivity, components in and of themselves are innovative.

To accelerate progress, greater engagement is needed from key players within the industry who have helped shape its foundation. Their involvement is essential to driving innovation forward. While some companies tend to focus on investment rather than innovation, others are emphasizing productivity—a critical aspect of innovation. Historically, machinery and equipment manufacturers have driven progress by developing new tools, such as advanced saws. As the industry advances, its challenges change, and its needs alter, continual and incremental improvements to these technologies and equipment, with focus on productivity, will play a key part in the industry's advancement and innovative progress.

As automation and robotics expand, attention is increasingly turning to material flow and material handling. Innovations are emerging to address how cut lumber moves from the saw to the assembly table, removing manual steps and redundant motion. Supporting this shift, truss manufacturers are implementing conveyors, robotic arms, and pneumatic systems to automate the entire flow from cutting to assembly to loading. Many of these solutions are designed to be adopted in stages, allowing companies to grow their automation footprint over time. This helps reduce risk for smaller, family-owned businesses that can't always make large upfront investments. Alongside physical innovations, software improvements are automating tasks like design repetition and optimization, saving time by reducing the hours and minutes required to complete routine steps. The ultimate goal is a seamless, continuous process requiring minimal manual intervention.

For many smaller, family-owned manufacturers, the ability to scale innovation gradually is essential. Large and expensive systems can be difficult to justify without a proven return on investment. These companies are often cautious not out of reluctance to innovate, but because taking on that level of financial risk can jeopardize the stability of the business. Incremental improvements offer a more accessible way forward, allowing manufacturers to test technologies, adapt over time, and build confidence before expanding further.

Another area with potential is waste recovery. While some in the industry have experimented with options like finger jointing or repurposing cut-offs, a reliable, scalable solution hasn't yet taken hold. If mastered, these systems could help reduce raw material waste and open new efficient pathways for component manufacturers.

Innovation isn't limited to investing in machinery or advanced automation—it's a mindset that must exist at every level of an organization. All sizes of companies, even smaller companies, can innovate by rethinking workflows, improving communication, and encouraging buy-in across all company roles.

It's not just about new tools; it's about how they're used, how information is shared, and how to educate and empower the people behind the processes. As the industry embraces more collaboration in the digital space, progress will depend not just on technology, but on culture, communication, and the willingness to evolve.

Future Technology Desired by Component Manufacturers
(per 2023 SBCA Innovation Survey)

- **Lumber:** Automated Carts, Conveyors
- **Saws:** Robotics, auto-feed saws, labeling
- **Cut Lumber:** Automated carts, Conveyors
- **Tables:** Automated pucks, automated routers, screens (overhead/tablets), lasers, robots
- **Post-production:** Automated banding, automated stackers

Humanoid Robotics in Component Manufacturing

AI-driven humanoid robotics potentially offers the construction sector, and specifically the component industry, a tremendous opportunity to drive monumental efficiencies through a variety of bottlenecks that currently impede home builder progress. While several on-site construction tasks can potentially be dispatched to humanoid robotics, environmental impediments and varying operating conditions will slow jobsite adoption. However, CMs operate manufacturing facilities offsite and in a controlled environment where specific tasks and processes can be mapped and replicated time after time regardless of the mass-customized nature of components, allowing for more flexibility in adopting and adapting to various advancements.

Two emerging technologies converging in a singular solution offer a unique opportunity to existing CM incumbents. It creates the possibility for an AI-powered manufacturing employee that is integrated with the existing component modeling and design software that produces individual components. This software currently replicates the desired structure in three dimensions (often from 2-D plans via human input) and produces data ranging from lot-specific engineering drawings to incredibly accurate material and labor take-offs for adjacent trades and suppliers. All of the relevant information can be seamlessly transferred to the AI-powered manufacturing employee that has been trained via every previous iteration it has seen.

Updates to the AI's model training and optimization will drive efficiencies in production and optimization making components an even better solution when framing homes. Initial iterations will likely utilize AI humanoid robots in co-bot (collaborative robot) applications alongside human employees. As production of humanoid robots ramp up and costs diminish, CMs can utilize teams of these robots to drive their manufacturing capacities as a force multiplier for their existing manufacturing capacities that are most often limited by a lack of manufacturing employees.

While CMs have led the effort to utilize advanced automation and mechanization techniques, it often comes at the cost of divesting or retooling existing manufacturing footprints or creating new from the ground up. This significantly increases the investment required to employ advanced automation in the component industry. Utilizing AI-driven humanoid robotics allows existing CMs in every corner of the country to add to their manufacturing capacities in an incremental manner consistent with increases in demand. Rarely have investment capabilities matched demand in such an incremental manner, which allows CMs to provide solutions as their needs emerge and maintain their competitive advantage.

SBCA SUPPORTS AND DRIVES INNOVATION

About SBCA

The Structural Building Components Association (SBCA) is an international trade association representing component manufacturers and industry partners such as software providers, equipment manufacturers, and suppliers.

SBCA's mission is to empower members with knowledge and tools to build successful, competitive businesses and advance the use of structural building components.

Its vision is for the building industry to prioritize high-quality components supplied by SBCA members.

SBCA promotes the safe, efficient, and widespread use of trusses, wall panels, and other structural components.

<u>The SBCA Innovation Grant</u>

The SBCA Innovation Grant, established in 2023, was formed as an effort to cultivate innovation in the structural building components and framing industry. Each year, the grant is awarded to a company or individual with an innovative product, tool, service, machine, or idea that advances the building components industry.

2023, 2024, and 2025 Recipients:

> **Alpine, an ITW Company:** *Alpine's Plan Comparison Tool* is a new AI-powered tool that analyzes two PDF versions of architectural plans, highlighting text and image differences, saving designers and estimators time while enhancing accuracy.

AnnotiQ: *AnnotiQ's Smart Glasses* are innovative technology designed to streamline the work of component estimators and designers by accelerating the bidding and production phases of construction projects.

Dusty Robotics: *Dusty Robotics' FieldPrint Platform* is a solution to ensure design integrity in the field through automated layout and a streamlined BIM-to-field process through a combination of hardware, software, and services with printing digital models directly on the jobsite floor with 1/16" accuracy.

FairBuild AI LLC: *FairBuild AI* helps component manufacturers assess and de-risk contracts using advanced AI and natural language processing by identifying obligations, risks, and exposures.

Randek: *Randek's ZeroLabor Robotic Sub-assembly* is a cutting-edge system that automates the early-stage production of wall elements by using robotics to build sub-components such as rough openings and stud assemblies. These components are then fed directly into the main wall production line, ensuring seamless flow, no downtime, and LEAN productivity at its best.

CrowdBuild: *TwinBuild LVM by CrowdBuild* is an innovative estimating tool that uses advanced vision models to convert 2D floor plans into precise, whole-house quantity takeoffs.

MiTek: *MiTek Truss Validator* is the first web-based tool for verifying the suitability of wood and Posi-floor trusses for specific projects.

Paragon D.A.N. (Design Automation Neural network) – *Paragon's cloud-based SaaS for wood trusses* offers fast, scalable, and flexible performance directly from any web browser, without installations or updates.

Q4US: *Q4US's Universal Truss Manager (UTM)* streamlines truss design file management, enabling quick uploads, organized searches, and easy sharing with authorized personnel.

VIRTEK VISION: *VIRTEK VISION's Iris AI Panel Inspection System* leverages AI and Machine Learning to enhance component inspections to Industry 4.0. This system improves accuracy, reduces manual oversight, and streamlines inspections, enhancing product quality and operational efficiency.

Vekta Automation Raking Framer: developed a prototype of an automated linear process for optimizing the production of raking walls while minimizing waste. The Vekta Raking Framer is an automated solution that caters to both parallel and raking frames.

HUD's Innovative Housing Showcase

In 2022, 2023, 2024, and 2025, SBCA and the National Framers Council (NFC) in partnership with several SBCA members, constructed a house on the National Mall in Washington, D.C. in *less than 12 hours in 2025, less than 8 hours in 2024, less than 12 hours in 2023, and less than 9 hours in 2022* for HUD's Innovative Housing Showcase on the National Mall. The event highlighted the reduced jobsite waste production and improved cycle times possible with today's offsite manufactured products, including floor truss panels, roof truss panels, and wall panels, with additional innovations used during the framing of the house and on the wall panels. This event and the build showed the innovation that components bring to the construction industry. Learn more at www.sbcacomponents.com/IHS.

INNOVATION THROUGH THE DECADES

1560-1580:

- Italian architect Ande Palladio developed three forms of the basic truss element—the rigid triangle. These forms are believed to be the earliest examples of trusses used scientifically.

1840:

- The Howe truss won a United States patent, and following Palladio's work, became the earliest form of a simple truss created for long-span bridge construction.

1844:

- Thomas W. Caleb Pratt patented another combination wood and iron bridge truss. This truss differed from the Howe with diagonal webs of iron (for tension) and verticals made of wood.

1952:

- A. Carrol Sanford invented the metal truss plate with teeth called the Gri-P-Late.

1955:

- Sanford's Gri-P-Late thrilled Miami building officials, and he was issued the first Engineered Bulletin for his product by the Architectural Standards Division of the Federal Housing Administration on July 13.
- J. Calvin Jureit, founder of Gang-Nail Systems Inc. (now MiTek Industries), created the Gang-Nail plate, the first metal connector plate for trusses that did not need supplemental nail fastening. The plates were pressed into the lumber using a concrete vertical hydraulic press and steel table precision jigs.

1956

- Joist hanger was produced and created to connect 2x4s for a roof.
- Simpson Strong-Tie published its first connector catalog, featuring the A35 framing anchor and U-series face-mount hangers.

1958:

- Klaisler Manufacturing opened its doors as one of the first truss roller manufacturers.

1959:

- CLT Continuous Lumber Tester invented at Potlatch Forests, Lewiston, ID. Patented by Harold Keller.

1960:

- After formulation began in 1959, TPI-60, "Design Specification for Light Metal Plate Connected Timber Trusses," was published by TPI.
- Walter Moehlenpah patents his version of a punch-tooth connector plate to make prefabricated trusses.

1962:

- Simpson Strong-Tie introduced the A35N and A34N connectors, incorporating a "cookie-cut" design to reduce steel usage while maintaining strength.

1964:

- The roller gantry was invented by Jim Pool, an engineer who worked for Carrol Sanford. With the help of Dick Stoddard, a Canadian fabricator, they perfected this roller gantry in 1964.

1965:

- Transverse vibration E-Computer invented at Washington State University and patented by James D. Logan and Roy F. Pellerin.

1966:

- Alpine Engineered Products was founded by William McAlpine and Charles Harnden in October of this year.

1968

- MiTek's, formerly known as Gang-Nail Systems, computer-based truss programs are written on IBM cards, and customer jobs are keypunched onto additional machine-reading card.

Late 1960s & Early 1970s:

- Robert Brooker developed the first truss engineering computer software package sold with the computer source code, based on TPI's 1974 design criteria.
- Truss plate manufacturers provided truss manufacturers with Computer Aided Design (CAD) capabilities and the option to handle truss design in-house. On-Line Data, Inc., created by truss plant owner and operator Dan Hurwitz, P.E., is one early example of this timesharing service.
- Development of Laminated Veneer Lumber and introduction of Micro-Lam product by Trus Joist.

1970:

- Jack Schmitt invented the 4x2 parallel chord truss, most commonly used as a floor truss.
- American Lumber Standards Committee voted to change lumber sizes. 2x4 changed from 1-5/8" x 3-5/8" to 1-1/2" x 3-1/2". These changes required all trusses to be re-engineered.
- In 1970, the first total truss software package-Auto Truss-was developed by Jack Palacio and Mike Tellechea for Gang-Nail Systems and in 1971 it became the first computer program offered

to customers via time-sharing. Within a few years, these programs were converted to run on IBM 1130 computers, and other truss plate manufacturers followed Gang-Nail's lead.

- Alpine started writing the first industry software – an optimizing and pricing program.

1971:

- Gang-Nail Systems and Alpine developed the plated bowstring and monopitch trusses for mobile homes based on load test results.

1972:

- Dr. Stanley K. Suddarth of Purdue University's Wood Research Laboratory introduced the Purdue Plan Structures Analyzer (PPSA I & II), a computer truss design system that he developed for truss design research and problem solving.
- Gang Nail Systems developed a new computer program, "Auto Plot," which would generate a sealed drawing greatly enhancing the engineering turn-around time for its customers.
- MiTek truss software is installed on a General Electric (GE) mainframe and accessed by customers through remote design terminals, allowing them to select from dozens of standard designs or enter custom geometries.
- Both the A35 and A34 connectors were updated with speed prongs, allowing temporary holding in place during installation.

1973:

- Carlos Rionda developed the "hinge plate" for Gang Nail Systems which solved the transportation height limitations and allowed for hi-pitch roofs for modular applications.

1974:

- Metriguard develops stress wave testing systems for locating decay in wood structural members of all types and for evaluating particleboard products during production.

1980:

- First computer generated framing plan-Auto Roof-was introduced by Gang Nail Systems and was incorporated into the time-sharing Auto truss software family.
- Alpine showcases the Sanford Roll-A-Master, Speed Roll, and Chord Splicer at BCMC. Layout truss software was launched.

1981:

- Introduction of the first fire retardant treated lumber with low corrosivity in contact with truss plates (Dricon® fire retardant treated wood).

1982:

- Gang-Nail Systems introduced the first stand alone work station for truss design (the Sun Microsystem workstation) running mainframe identical truss software.
- Simpson Strong-Tie Co. was independently approached by both Charlie Barnes and Staton Douthit. They encouraged Simpson to address truss connection concerns which led initially to the THA double shear nailed hangers and eventually to over 100 products de-signed for the truss industry.

1984:

- Later in the same year, GNS developed connector plate values and introduced, for the first time, LVL as truss chord material.
- CompuTrus Inc. was founded, focusing on the thirteen western states.

1985:

- Jerry Koskovich introduced the first automated component saw to the component industry.
- The QC Manual was finalized and sent to members.
- Alpine's layout software featured CAD-type graphics.

1986:

- Lumbermate Company, St. Louis, MO, announced the development of a system that has successfully passed the requirements for a one-hour, fire-rated, roof/floor-ceiling assembly. The new assembly FR-System 1, consists of a single layer of gypsum board installed on wood trusses, incorporating the FR-Quik Channel Set. FR Quick's self-centering and automatic-locating feature allows for quick installation.
- Gang Nail Wood Products started production of LVL and I-joists sold through component manufacturers and expanded McCausey Lumber's Master Plank LVL sales to satisfy demand.
- New and improved bearing location, lateral bracing, concentrated load and warning tags were developed by WTCA and made available to its membership.
- Alpine's Trus-Calc software (today's TrusCAD) was introduced and enabled customers to use IBM PCs as "intelligent workstations".

1987

- Alpine introduced the Automated Truss Plant, a software concept that revolutionized truss plant operations.

1988:

- Gang-Nail Systems, Inc., Miami, FL, was purchased in a joint venture agreement by MiTek Industries, St. Louis, and Bowater PLC, Great Britain.

- At the BCMC show, Alpine Engineered Products, Inc. introduced AutoSet®, the component industry's first computer-controlled and automated truss jigging system.
- At the BCMC show, The Koskovich Company introduced the AutoOmni, the industry's first fully automated computer-controlled component saw. Later in 1989, upgrading the saw to include inkjet printing.

Late 1980s:

- Apple and IBM released Personal Computers (PCs) which enabled local use of software on individual desktops.

1990:

- Rene-Paul Lemyre invented Open Joist 2000, a glued finger jointed open web floor truss with a trimmable end detail. He was the first one to use finger joints in wooden trusses and also the first one to produce a floor truss with a trimmable end detail.
- MiTek 2000 (later renamed MiTek 20/20) became the first native Microsoft Windows truss design program for component manufacturers.

1991:

- In the fall, WTCA published all of the design value changes for lumber that were being made due to in-grade testing. This work continued into the fall of 1992 when WTCA published a series of tables that took a look at the impact of the new lumber design values and the new design equations that were developed in the 1991 NDS® on truss spans. A complete package of information was provided showing the span capabilities of the old equations and old lumber design values, new equations and new lumber design values, and old equations and new lumber design values.

1993:

- The *Metal Plate Connected Wood Truss Handbook* was completed.

1994:

- The U.S. Government began requiring that metric (system international) units be used in all federal construction projects.

Mid-1990s:

- Software evolved from 2D engineering to full structure layout programs.

1995:

- The *National Design Standard for Metal Plate Connected Wood Truss Construction ANSI/TPI 1-1995* was completed to replace the TPI-85 as the basis for the design of MPC trusses.
- Framing the American Dream conducted two controlled experiments to allow for apples-to-apples framing comparisons. In 1995, the project built two identical 2600 square foot, two-story

houses. One house was entirely stick-framed, while the other home was framed using structural components, including roof trusses, wall panels and floor trusses.

- The TrusSteel cold-formed steel truss system was introduced.

1996

- Alpine introduced the AutoMill computer controlled and automated component cutter at BCMC.

1997

- Alpine launched the Wave Plate nail plate.
- Randek introduced an automated wall panel production line, which was later rebuilt in 2006 and 2010 to incorporate frequency drives and updated wiring.

1998:

- Deacom, Inc. introduces the first accounting and Enterprise Resource Planning (ERP) software designed specifically for the component industry. The software is fully compatible with the industry's leading engineering programs, allowing truss builders to easily integrate manufacturing, billing, inventory, labor tracking, and purchasing.

1999:

- The *Allowable Stress Design (ASD) Metal Plate Connected Wood Truss Guideline* was developed by WTCA with assistance from TPI.
- NAHB Fire Resolution Unites Industry Organizations: At its 1999 Spring Board meeting in May, the National Association of Home Builders (NAHB) published a document entitled NAHB Resolution on Restrictions and Bans on Wood Trusses and I-Joists. This resolution is an important step in uniting allied industry organizations to work toward greater public understanding of the economic and environmental benefits of using metal plate connected wood trusses, I-joists and other manufactured wood components, and to oppose the restriction or banning of these products due to misunderstanding of their performance characteristics under the siege of fire. Included in this joint effort are the Wood Truss Council of America (WTCA), the Wood I-Joist Manufacturers Association (WIJMA), the American Forest and Paper Association (AF&PA), APA-The Engineered Wood Association and other concerned parties.
- After a six-year distributorship with Haulin Trailers and ASI Industry, A-NU-PROSPECT begins manufacturing their own roller trailers.
- The first Turb-O-Web license was issued in the United States. Full time production of Turb-O-Web trusses commenced in Central Washington.

2000s:

- The International Codes Council (ICC) created the International Building Code (IBC) to serve as a single model building code for the entire United States.
- MiTek releases first “production ready,” automated Turb-O-Web design software in its v4.2.
- Alpine introduced FloorMaster and RAM EasyRider machines, and the VIEW 4.0 was released.

- Simpson Strong-Tie was the first connector manufacturer to develop products specifically for steel framing, expanding their offerings to include a variety of connectors, fasteners, and steel shear walls for both load-bearing and non-load-bearing applications.
- Eagle Metal developed the TrueBuild® Software Suite, offering applications for truss and wall panel design, layout, and production management. It includes modules such as TrueBuild® Layout, TrueBuild® Truss, and TrueBuild® Management, streamlining the design-to-production process for component manufacturers.

2001:

- "National Housing Quality (NHQ) Certified Contractor Program" is released as an assurance system for wood framing contractors.
- *Brace the Temporary Bracing for Safety* is released as the newest addition to the Truss Technology in Building (TTB) series.
- Advanced Design Technology (ADT) and Viking Engineering announced that they were joining forces as a strong wall panel equipment provider in October of this year.
- The Turb-O-Web system receives two US patents, #'s 6,176,060 and 6,249,972.
- Four new TTB's are released: *How to Read a Truss Design Drawing, Truss Repair, How to Read a Truss Placement Plan and Commentary for Always Diagonally Brace for Safety*.

2002:

- New TTBs are introduced: *Fire Endurance Rated Truss Assemblies* and *Sprinkler Systems & Trusses*.
- New Quality Standard in the *ANSI/TPI National Design Standard for Metal Plate Connected Wood Trusses* is adopted.
- Jobsite Safety Package was created.
- Truss Knowledge Online (TKO) was created.
- The Alpine Linear Saw debuted at BCMC.

2003:

- WTCA introduced TTW Online.
- On April 30, the Florida truss regulation 61G15-31.003, "Design of Structures Utilizing Prefabricated Wood Trusses," took effect. It clarified the previous section of Florida law, added a cover or index sheet process that reduces the time and related expenses associated with truss design process in Florida. This change to the use of a concise cover sheet makes it quick and easy for building officials to find all of the project information they need to undertake plan review.
- In-Plant WTCA QC Version 4.0 was released.
- WTCA Operation Safety Certification was released.

- The *BCSI 1-03* booklet*, Guide for Handling, Installing and Bracing of Metal Plate Connected Wood Trusses*, was released at BCMC. It replaced TPI HIB-91 booklet and several other pre-existing WTCA and TPI publications.

2004:

- WTCA's Technical Assessment Test Online (TATO) was released.
- WTCA and TPI release the Building Component Safety Information Summary Sheets (B-Series).
- TATO 2 became available.
- Pocket QC was introduced.

2005:

- A coversheet with warning language was added to the JOBSITE PACKAGE.
- Long Span Truss Installation is added to the TTB Series.
- WTCA and TPI unveil the new Jobsite Tags.
- WTCA introduced The Load Guide (TLG), v1.00 Beta, a Guide to Good Practice for Specifying & Applying Loads to Structural Building Components.
- The 2005 edition of the *National Design Specification for Wood Construction ANSI/AF&PA NDS-2005* was released.
- The free online Guide to Good Practice for Specifying & Applying Loads to Structural Building Components (The Load Guide [TLG]) became available for download.
- WTCA helped NAHB-RC develop the Certified Trade Contractor Program, the first such program to develop quality assurance standards for the framing industry.
- WTCA introduced the new Design Tools CD.

2006:

- Crane Use & Proper Truss Handling was added to the TTB series.
- WTCA Management Notes were introduced. Management Notes address critical issues that component manufacturers face in the operation of their business and are designed to help manufacturers educate regulatory groups and other outside entities in the marketplace on the industry's interpretation of regulations, laws and codes.
- WTCA launched TTT recertification online.
- The new research and testing facility broke ground in November 2006, and the 5,730 square-foot facility is scheduled to officially begin calibrating testing equipment in June of 2007. Plans are already underway for several full-scale testing projects that will mark the inauguration of the testing facility.

- WTCA and TPI introduced the 2006 edition of *Building Component Safety Information (BCSI): Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses*. A new and improved guide for jobsite safety and truss performance, the 2006 edition replaces BCSI 1-03.
- WTCA introduced The Load Guide (TLG), v1.02 Beta, a Guide to Good Practice for Specifying & Applying Loads to Structural Building Components. In addition to a large number of general improvements, TLG v1.02 added code requirements from the International Building Code (IBC) 2006 and International Residential Code (IRC) 2006, along with loading requirements from *ASCE 7-05, Minimum Design Loads for Buildings and Other Structures.*

2007:

- WTCA introduced the latest addition to its Operation Safety Program, the WTCA Forklift Certification Program. The Forklift Certification Program is a dynamic training program that is specific to the structural building components industry.
- On May 9, WTCA's Cold Formed Steel Council (CFSC) launched its first online assessment tool for the cold formed steel industry entitled Cold Formed Steel Technical Assessment Test Online (CFSTATO).
- WTCA releases the TRUCK Program- Industry Best Practices(link is external). It is a fleet management and safety program designed to train drivers about their responsibilities on the road and at the jobsite.
- WTCA's Cold-Formed Steel Council (CFSC) introduced a new product line, sticker tags for cold-formed steel structural building components.

2008:

- Interest in automated truss systems grows, with companies like TCT Automation and Randek introducing automated roof truss systems. Adoption is limited due to economic downturn.

2010s:

- Randek developed innovative systems such as the AutoFloor System, enhancing automation in floor element production, and the Butterfly Table BS20, improving efficiency in wall panel manufacturing.

2014:

- Alpine, an ITW Company, launches IntelliView 14.03, a comprehensive component manufacturing business suite.

2015:

- Framing the American Dream conducted two controlled experiments to allow for apples-to-apples framing comparisons. In 2015, two identical 2900 square foot ranch-style houses with a walk-out basements were framed side-by-side. One house was entirely stick-framed, while the other home was framed using structural components, including roof trusses, wall panels and floor trusses.

- Founded in 2015, Trussmatic emerged in automating roof truss production with its fully automated roof truss production line, which utilizes proprietary process automation and smart robotics, enabling the transformation of CAD drawings into manufactured trusses with minimal human intervention.

2016:

- MiTek developed the Wizard PDS® (Perimeter Definition System), a system that automates the placement of jigging components on truss assembly tables, significantly reducing setup times and increasing production efficiency.

2017:

- The first U.S. installation of Randek's Auto-Eye system occurs at True House in Crescent, FL.
- MiTek introduced the MatchPoint® DirectDrive™ System, enhancing roof truss manufacturing by integrating automated jigging with material handling, reducing shop floor labor by up to 40%.

2019:

- Alpine's STITCHER software was launched.
- MiTek acquired CompuTruss, expanding its reach in the western United States.

2020s:

- MiTek acquired Hornet Saw Systems, expanding its automation solutions for wall panelization by connecting structural design software directly to cutting and marking capabilities.
- House of Design entered the structural building component industry by partnering with Alpine, an ITW Company with its Automated Roof Truss System, using both manual and robotic labor.
- Randek launched the ZeroLabor Robotic System, a fully automatic robotic system performing various work processes.

2021:

- SBCA's Digital QC program is released and implemented into component manufacturing plants.
- MiTek developed the Twin-Axis™ Sheathing Saw, a specialized saw designed for cutting wall panel sheathing, featuring dual blades for ripping and cross-cuts, delivering cut panels directly to assembly stations with minimal operator involvement.

2022:

- House of Design and Alpine partnered to launch floor truss robotics, introducing robotic truss solutions utilizing ABB Robots.

2023:

- Q4US introduces IntelliTruss, a truss production optimization application utilizing advanced algorithms and machine learning to enhance manufacturing efficiency.

- SBCA Innovation Grant is formed in an effort to cultivate innovation in the structural building components and framing industry.
- Vekta was selected as the 2023 SBCA Innovation Grant recipient with their Automation Raking Framer. Vekta developed a prototype of an automated linear process for optimizing the production of raking walls while minimizing waste. The Vekta Raking Framer is an automated solution that caters to both parallel and raking frames. The modular design allows customers to select the most cost-effective version for their particular needs at a particular point in time.

2024:

- 22 robotic truss lines are operational in North America, including systems from Trussmatic, House of Design, and Randek.
- The SBCA Innovation Grant was awarded to five recipients in 2024: CrowdBuild, MiTek, Paragon, Q4US, and Virtek Vision.
- **MiTek Truss Validator** is the first web-based tool for verifying the suitability of wood and Posi-floor trusses for specific projects. Launched in 2024, it helps designers and engineers quickly assess truss applicability, improving efficiency and confidence in their specifications.

2025:

- The SBCA Innovation Grant was awarded to five recipients in 2025: Alpine, an ITW Company, AnnotiQ, Dusty Robotics, FairBuild AI LLC, and Randek.

CONCLUSION

The structural building components industry, which includes manufacturers of roof trusses, floor trusses, and wall panels, plate and other industry suppliers, framers, professionals, and more, has long been a continued source of innovation within the broader construction sector. Driven by the need to improve efficiency, address labor shortages, and respond to rising housing costs, component manufacturers have consistently embraced both incremental improvements and breakthrough technologies. From trusses and metal connector plates to early manual processes and digital software to today's AI-enhanced systems, the industry has evolved by optimizing design, production, and delivery through advancements in automation, software integration, and equipment.

Innovation is at the heart of the industry. It includes more than 1,300 U.S. component manufacturing locations, where operations big and small can customize innovations to meet local market needs. Innovations in lumber grading, digital quality control, automated cutting systems, and real-time jobsite feedback tools highlight the current wave of progress. Meanwhile, new trends like integrated project delivery, automation and mechanization, and humanoid robotics point toward a future built on collaboration and systems-based solutions and thinking.

Key forces driving innovation include ongoing labor shortages, volatile material markets, and growing pressure to reduce jobsite waste. In response, manufacturers are investing in robotics, intelligent design tools, innovative processes, and various technologies that streamline operations without requiring full-scale factory overhauls. This reflects a broader shift from mechanization, where machines assist human labor, to automation, where software and sensors make dynamic decisions to improve productivity.

Looking ahead, the industry is increasingly focused on smart, interconnected systems. Material handling automation and collaborative robotics have the ability to play a central role in helping component manufacturers scale operations incrementally. Just as important, a strong culture of shared problem-solving continues to shape innovation across the industry, where exchanging ideas, processes, and tools to support continuous improvement is paramount. This collective mindset reinforces the industry's ability to adapt, experiment, and evolve.

Innovation has driven the structural building components industry for over 70 years, from the first metal connector plate to today's robotic automation. It will continue to define our future as we seek to build faster, smarter, and more efficiently. SBCA and its members are poised to lead the charge into the next era, one where systems-based thinking, collaboration, and advanced technology shape the homes of tomorrow.

RESOURCES & LINKS

- https://alpineitw.com/about-us/achievements-and-history/
- https://alpineitw.com/wp-content/uploads/2020/09/intelliview-14-03-news-release-10-6-14.pdf#:~:text=Only%20Component,for%20SteelVIEW%20software%20customers%20is
- https://alsc.org/general-history/
- https://blog.spib.org/machine-graded-lumber-technologies-quality-and-benefits
- https://componentadvertiser.com/in-our-pages/library/automated-solutions-for-roof-truss-manufacturing
- http://digital.sbcmag.info/publication/?i=779010&p=&pn=
- https://www.fpl.fs.usda.gov/documnts/fplgtr/fpl_gtr279.pdf
- https://www.hacienda.org/news-events/hacienda-online/pulse/2018/company/simpson-strong-tie-helps-people-build-safer-stronger-structures
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- https://www.sbcacomponents.com/fad
- https://www.sbcacomponents.com/ihs
- https://www.sbcacomponents.com/media/a-bright-spot
- https://www.sbcacomponents.com/media/achieving-best-practices-in--quality-management-systems
- https://www.sbcacomponents.com/media/an-incredible-celebration
- https://www.sbcacomponents.com/media/editors-message-one-fateful-day
- https://www.sbcacomponents.com/media/how-do-you-want-your-change
- https://www.sbcacomponents.com/media/how-to-read-a-us-softwood-lumber-grade-stamp
- https://www.sbcacomponents.com/media/sbca-announces-2024-innovation-grant-finalists
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- https://www.sbcacomponents.com/media/why-its-critical-to-understand-lumber-species-groups
- https://www.sbcacomponents.com/quality-control-programs#digital-qc
- https://sbcindustry.com/industry-timeline
- https://sbcmag.info/issue/2006-august
- https://sbcmag.info/sbcextra/2013/fab-five-brief-look-metal-connector-plate-manufacturers
- https://www.sbcmag.info/sites/default/files/0604%20tqa.pdf
- https://www.sbcmag.info/sites/default/files/0805_koskovich.pdf
- https://seblog.strongtie.com/2023/12/the-twelve-days-of-christmas-a-sleigh-ride-through-the-years-with-simpson-strong-tie/
- https://www.strongtie.lv/en-LV/history
- https://trussmatic.com/about-us/
- https://www.wwpa.org/western-lumber/structural-lumber/machine-stress-rated-%28msr%29
- Interview with April Burt, Customer Insights Manager, Alpine, an ITW Company. Interview conducted by Christine Wagner, 2025.
- Interview with Barry Dixon, CEO, BeLit, Inc. and True House, Inc. Interview conducted by Christine Wagner, 2025.
- Interview with Jason Blenker, CEO, Wysocki Family Farms. Interview conducted by Christine Wagner, 2025.
- Interview with Joe Kannapell, Housing Industry Writer. Interview conducted by Christine Wagner, 2025.
- Interview with Steve Shrader, Business Development/Operations, Hans Hundegger AG. Interview conducted by Christine Wagner, 2025.