



STEEL FRAMING INDUSTRY ASSOCIATION



## CASE STUDY

### MODERN ERECTOR SET

POLE BARN  
SUNDANCE, WYOMING

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## OVERVIEW

### PROJECT

#### Use

Commercial

#### Size

One story, 60 ft. by 140 ft.

#### Completion Date

December 2017

#### Framing Cost

\$52,019

### PEOPLE

#### Owner

Bear Lodge Mountain  
Resorts and Retro Kits,  
Sundance, WY

#### Designers

Straight Cold Rollin, LLC,  
Sundance, WY

SmartBuild Systems™ Division  
of Keymark Enterprises, LLC,  
Boulder, CO

#### Software

SmartBuild Systems and KeyTruss  
from Keymark Enterprises, LLC,  
Boulder, CO

#### Structural Engineer

Krivonen Associates,  
Billings, MT

#### Cold-Formed Steel Fabricator and Subcontractor

Straight Cold Rollin, LLC,  
Sundance, WY

#### STEEL

43 - 68 mil cold-formed  
steel framing



A 60-by-140-ft. pole barn was designed and engineered using automation software and special roll-forming machinery. It snapped together like an Erector Set.

## Design and Production Technology Enables Untrained Laborers to Build a Pole Barn

With cold-formed steel framing components, and an automated fabrication system never before used in CFS post-frame construction, Josh Kammerer supervised a crew of four untrained laborers and built a 60-by-140-ft. pole barn in two months.

“We framed our building with little measuring, marking or waste,” says Kammerer, president of Straight Cold Rollin, LLC, Sundance, Wyoming. “Assembly went together in way less time than it would have taken with concrete, wood or other materials.”

Straight Cold Rollin accomplished the feat from November to December 2017 using custom CFS wall framing software and proprietary truss design software, which integrated with Straight Cold Rollin’s production automation system. The integration allowed Kammerer to fabricate each CFS component automatically using a single, roll-forming machine. Each piece was pre-cut, pre-punched and uniquely labeled, enabling his laborers to snap and

screw together the pole barn like an Erector set.

### STRONG AND STURDY

Pole barns are common structures used to store farm implements and materials and to house small production operations. Keith Deitzen, president and CEO of Keymark Enterprises, LLC, says post-frame construction is a \$15 billion industry.

While most pole barns are framed with wood, CFS framing has the advantage of being longer-lasting. CFS studs and trusses won’t rot, warp or succumb to mold or insect infestation. And they’re fire-resistant.

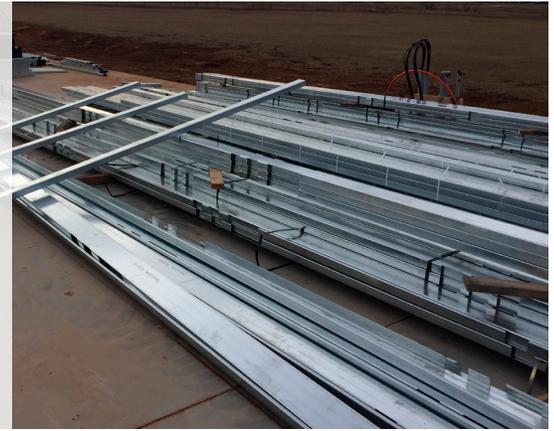
“This structure is strong,” Kammerer says. “It’s amazing how sturdy it is once it’s all locked together.”

While CFS framing has been used before to erect pole barns, what occurred in Wyoming was a first — a pole barn with parts fabricated using automation technology and erected using laborers with no formal

"It was one of the easiest buildings I have put together in my career," says Straight Cold Rollin's Josh Kammerer.



CFS materials were delivered to the job site, where a slab had been poured. The chords, girts, webs, pur-lins and bracing weighed 42,000 lbs. and fit on one truck.



Notching enabled truss webs to slide into position. No welding or re-galvanizing was needed.



Each truss was assembled with 350 self-tapping screws. All parts were ink-jet labeled to make on-site assembly easy.



carpentry training. Straight Cold Rollin designed the structure and handled its components fabrication and assembly.

### TRUSSES ASSEMBLED ON SITE

Straight Cold Rollin used wall design and truss software to create a robust structure. Independent engineering firms stamped the designs. The software generated production files, which fed Straight Cold Rollin's steel rolling machine in Marion, Kansas. Thus, the design-to-production process was automated. Straight Cold Rollin merely loaded its rolling machine with steel coil. The system fabricated and labeled each unique CFS part.

When the shipment arrived in Sundance, Kammerer and his 14-year-old son, Isaiah, unloaded the truck, unbundled the pieces and assembled the first truss in less than an hour.

"We laid out the parts, lined up the pilot holes and screwed it together," Kammerer says. "It took the two of us 45 minutes to unload and assemble the first 60-ft. clear-span truss."

Thus, automated production enabled

Straight Cold Rollin to save thousands of dollars in field labor. (See the table, Cost Comparisons.)

### EASY TO BUILD

Kammerer hired three untrained laborers and a local fireman with minimal building experience to do the work. The crew of four assembled the structure's trusses, wall panel frames and cross-bracing girts on site. They used no measuring instruments or cutting saws, only screw guns.

"We had 350 screws in each truss and 33 trusses in all to assemble," Kammerer says.

Truss chords and purlins came pre-set with alignment holes and notches. The notches made it easy to snap the 12-ft. C-shaped purlins in place, improving assembly accuracy and speed. Thus, each truss was self-jigging, and the variance between trusses was off by no more than 1/64 in., Kammerer says.

Wall panels were designed in 4 ft. widths, although Kammerer has since gone to 8-ft.-wide panels. "This way," he says, "we can put the [garage] doors

wherever we want them."

The wall panels are framed on each end with two vertical studs. One stud terminates at the top track — the load-bearing point for the truss above it. The other stud extends an additional 18 inches through the top track and serves as an attachment point for the truss — a moment-resisting connection that adds lateral strength to the building frame.

"It's a beautiful design," Kammerer says. "It was one of the easiest buildings I have put together in my career."

Kammerer has been in post-frame construction for more than 20 years.

"We're taking our future clients through the building," Wilcoxon says. "Everyone gets to experience the state of the art in headquarters office building design."

## Cost Comparisons

	Cold-Formed Steel	Wood Package 1	Wood Package 2
Wall Framing	\$9,819	\$15,800	\$9,992
Trusses	\$22,200	\$13,500	\$20,286
<b>SUBTOTAL</b>	\$32,019	\$29,300	\$30,278
Field Labor	\$20,000	\$24,650	\$22,000
<b>TOTAL COST</b>	\$52,019	\$53,950	\$52,278

The Sundance, Wy., pole barn costs were compared with wood packages submitted by two pole barn manufacturers. The result? Automation technology saved thousands of dollars in field labor.

Source: Keymark Enterprises, LLC



Purlins with notches 4 ft. o.c. acted as truss spacers and facilitated fast truss assembly.

Wall panels were fastened to the foundation using  $\frac{5}{8}$  in. x 8 in. anchors at 32 in. o.c. Hold-down devices were install at the corners.

## DETAILS

### POLE BARN

#### DESIGN

CFS framing components cut to length, pre-punched with pilot holes and dimples, and uniquely labeled for rapid field assembly.

- 60 by 140 ft., up to four commercial bays
- 16 ft. wall height
- 4:12 roof slope, no overhangs
- IBC2012 design, 30 psf ground snow load, 120 mph wind speed
- Interior shear wall

#### COLD-FORMED STEEL TRUSSES

Thirty-three, 60 ft. clear span trusses with an 18 in. heel height to connect with wall panels. labeled for rapid field assembly.

- 60 by 140 ft., up to four commercial bays
- 16 ft. wall height
- 4:12 roof slope, no overhangs
- IBC2012 design, 30 psf ground snow load, 120 mph wind speed
- Interior shear wall

#### COLD-FORMED STEEL WALLS

4-ft. panels, end columns formed from two 6 in. studs.

- 6 in. top and bottom chords: 600T150-54
- 6 in. wall studs: 600S200-68
- Plates: 600T150-54
- 6 in. girts, 24 in. o.c.: 600S200-43
- No X bracing required, sheathing used instead
- 12 ft. garage door headers: (2) 1200S300-68

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