

Why did the university's barn collapse?

The collapse created embarrassing publicity for the university and gave a black eye to a construction method that didn't deserve the blame. ■ By John Oncken

December 30, 2001, was a snowy, windy night, but the weather wasn't the culprit in the collapse of the new dairy research barn at the University of Wisconsin (UW)-Madison's Arlington Research & Training Center near De Forest.

Actually, only the south half of the post-frame building fell down — a collapse attributed to design flaws — but that was enough to make the barn uninhabitable for the 54 cows it housed.

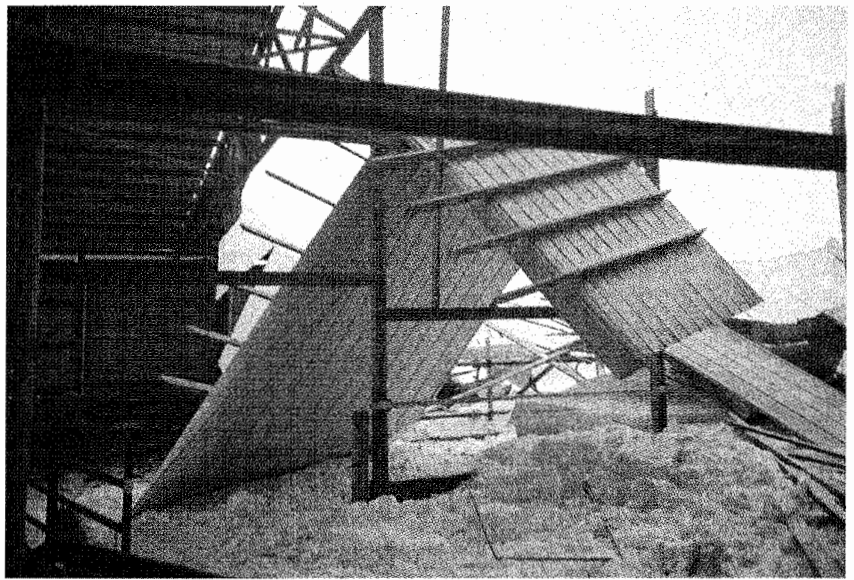
After employee Nate Paiser discovered the collapse around 6:30 a.m., he, herdsman Tim Patchin and other employees worked for several hours to free the cows trapped under the rafters and roof. None of the cows were injured.

More than a year later, reconstruction of the facility continues at a sluggish pace, and everyone involved is trying to make sure that something like this never occurs again.

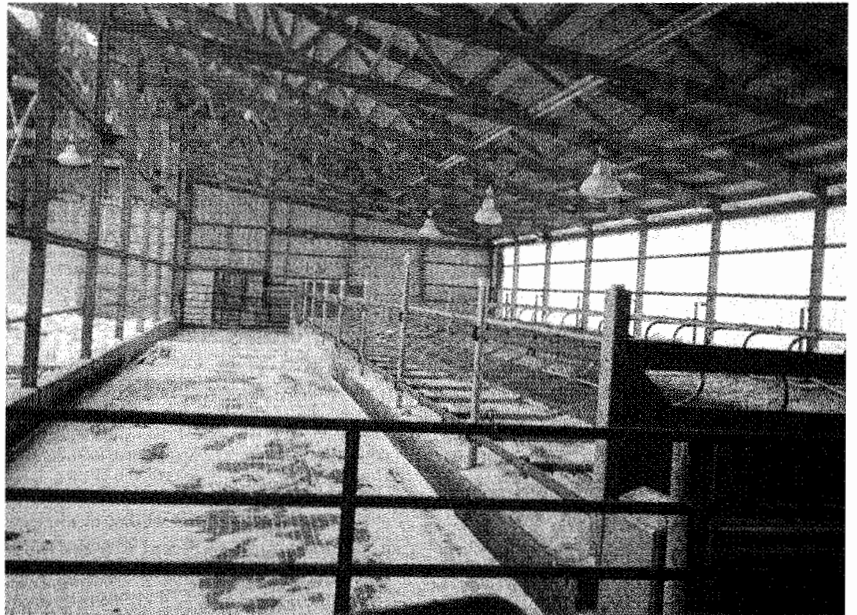
The collapse was an embarrassing turn of events. The new facility was a part of the UW-Madison's College of Agriculture and Life Science \$10 million upgrade of dairy facilities at Arlington, Marshfield and Madison.

Hundreds of thousands of these buildings are found on farms across the United States since the 1940s when pole building construction became popular. The building systems are economical, easily and quickly constructed and durable. Few ever collapse.

The research barn was designed to hold 100 cows in freestalls. Research



The university's dairy barn immediately after it collapsed (top) and after it had been partially repaired.



underway in the building involved trying out various types of animal bedding and tests of a Bou-Matic robotic milking system in a small addition at the east end of the barn, where several hundred dairy nutritionists and farmers had attended an open house two weeks before.

DESIGN FLAWS

So what happened to the university's new \$240,000 freestall barn?

The design flaws were apparent to some observers before the collapse.

"It's going to fall down," said a farmer, who had toured the facility. "The rafters aren't built right. There isn't any bracing."

The farmer was right.

It "was not an experimental building," says Lou Armentano, chairman of the UW-Madison Dairy Science Department who oversees the center, nor was construction controlled or supervised by the department, college or university.

When farmers decide to build, the process usually involves an exchange of ideas before arriving at an engineering design. Most engineering details are seldom discussed unless it affects the final price. Farmers assume the contractor will do things right.

It's a much more complex process with any state building costing more than \$100,000.

In this case, faculty members and extension specialists outlined the basic design, which was sent to the UW-Madison Campus Facilities and Planning Management (FPM) to develop an initial request for bids. Bids were based on basic building size and layout. There were also minimum specifications for some components, such as ability to handle the weight of snow.

The project was then turned over to the Wisconsin Department of Administration, Division of Facilities Development (DFD). Dairy scientists had little involvement at this stage of the process.

None of the 15 post-frame design-build firms contacted by the UW-Madison FPM were interested in the project and there were only two responses to a formal request for bids.

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The reconstructed barn after installation of the proper rafters.

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The lack of interest surprised DFD project manager Jon Jenson. He admitted that “we were bewildered by this [lack of response],” which probably reflected the booming economy and the reluctance of firms to get involved with state projects that generally involve more red tape. The low bidder was Hardy Geo-Tech, Omro.

WHOSE FAULT WAS IT?

Exactly what happened and who is responsible for the barn’s collapse?

UW faculty members and extension specialists say they aren’t because they simply provided a general outline of their needs. And campus FMD simply drafted a request for a proposal. Jenson was concerned from the inception of the project about the department’s unfamiliarity with the design-build methods. Almost all of their projects involve “traditional” buildings.

An architect’s review of the project (at a cost of \$4,800) apparently did not include a review of the plans.

“The architect’s role was to assist in

development of schematic plans and performance specifications,” says Jenson. “The ultimate responsibility for design, materials selected and their installation was with the contractor.”

According to Jenson, the DFD provided little or no oversight of the plan or the actual building construction because it was a design-build project.

In an e-mail, Jenson wrote that “DFD typically has not checked structural engineer calculations on design/build projects... this is partially due to the reason that design/build is used by an owner ... [who is] seeking single source responsibility as well as cost effectiveness, schedule compression etc.”

NO VISITING

Jenson says a department representative visited the building site every two weeks for “paperwork.” Jenson did not visit the barn until after it was built.

Apparently, no one at the university or DOA with post-frame construction experience or expertise reviewed the plans or visited the site during construction.

According to David Bohnhoff, a

registered professional engineer with the UW Biological Systems Engineering Department who is nationally known for his post-frame building research, the failure to install critical truss bracing resulted in a collapse under heavy snow drifts, even though the bracing was shown on a drawing prior to construction.

“Unfortunately for all involved, the subsequent investigation revealed additional construction errors and a lack of routine structural calculations,” says Bohnhoff. The building wasn’t designed to withstand the wind and snow load prescribed in the original contract documents and no structural engineer was involved during the design, he says.

For legal reasons, the university can’t re-engineer the facility or supervise its reconstruction, Bohnhoff says.

“In my opinion, the reinforcing and other repairs that have occurred to date, as well as those proposed for the future, are as embarrassing to the post-frame building industry as the original construction. To stand on

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the sidelines and watch this all occur when you have the ability to provide the most comprehensive, efficient and economical post-frame building design in the world is a frustration that's difficult to put into words," he says.

There is a lot more at stake here than people realize, he says. The design-build process — when the same contractor designs and builds the structure — is an efficient process that reduces costs.

PROFIT BEFORE SAFETY?

"When you understand construction and purchase building materials on a daily basis, you know how to design a building to save money. Virtually all farm builders are design-build firms — a fact that is largely responsible for keeping farm building costs down. When the state uses quality design-build firms, the taxpayers ultimately win. Unfortunately, the Arlington fiasco is likely to reduce the use of design-build on state jobs," Bohnhoff says.

The state usually prefers the more

conventional approach of hiring an independent architect/engineering (A/E) firm to complete the design prior to bidding by builders, largely because they lack the resources to thoroughly review plans and specifications, says Bohnhoff. They rely on the architect or engineering firm to approve the plans.

"There's always a danger that a design-build firm will put profit before safety when designing a building, especially when competing in a tough job market against other design-build firms. With the conventional approach, the building is designed by an A/E firm that has nothing to gain and everything to lose by underdesigning the building," says Bohnhoff.

He says the contractor for the Arlington project was not a design-build firm. They did not prepare the drawings and subcontracted the design work

to a firm with no degreed architects or engineers, which produced a minimal set of drawings. These drawings were sent to a registered architect (not an engineer), who sealed them despite

the fact that no attempt was made to meet major design specifications.

Several people have called for the revocation of the architect's license.

"When the economy is strong, quality design-build

firms are unlikely to bid on a state project because of the red tape involved. When companies like Hardy-Geotech are allowed to submit for what will be an inferior building, quality design-builders will lose out every time," says Bohnhoff.

Chris Hardy with Hardy-Geotech refused to comment due to pending litigation. ♦

John Oncken is an agricultural writer and publisher based in Madison.

**THE DESIGN-BUILD
SYSTEM IS LARGELY
RESPONSIBLE FOR
LOWERING THE COSTS
OF MANY FARM
BUILDINGS.**