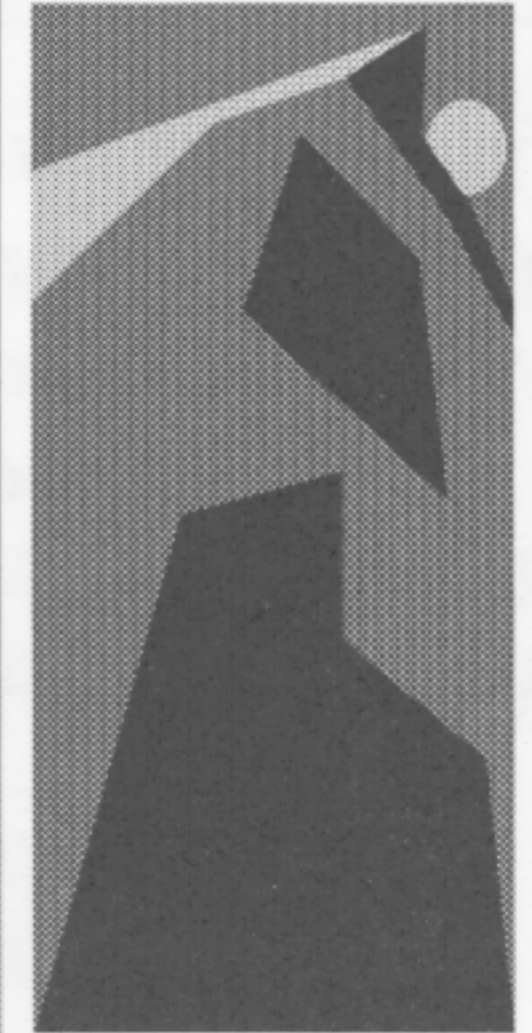


BARN



AGAIN!

A NATIONAL PROGRAM
TO PRESERVE HISTORIC
FARM BUILDINGS

BARN AID SERIES

NUMBER 2, NEW SPACES FOR OLD PLACES

The National Trust for Historic Preservation
Successful Farming Magazine

NEW SPACES FOR OLD SPACES



Ron Seuntjens' livestock barn, before rehabilitation for machinery storage

In the 1800s, farmers depended on their barns to store their crops and house their animals. Cozy pens beneath the haymow provided shelter from harsh winter storms and summer heat. Spacious lofts above offered ample storage for crops and feed. This efficient system worked well for generations. But the close spaces, low ceilings, and smaller doors of the old barns makes them seem almost useless for today's agricultural practices. A

farmer of today standing next to a twelve-foot-high combine contemplating an eight-foot-high barn door might conclude that the situation was hopeless.

This was the situation that Ron Seuntjens faced when he bought the Morningside Stock Farm in 1987. This farm possessed one of the finest collections of farm outbuildings in the neighborhood north of Mapleton, Iowa. But like many older farm buildings, the two barns on the place

had become dated for modern agricultural uses and had fallen into disuse and disrepair.

Confining old barns can be transformed into new storage spaces.

One of the biggest obstacles to reuse was the lack of clearspan space in the barns. The lofts and support columns prevented entry by larger tractors or equipment. The barn doors were too small for large machinery. Ron Seuntjens faced a difficult decision. Were the barns worth saving? Was it cost-effective to restore them? If so, how should he go about modifying an old barn for a new use? With the help of the BARN AGAIN! program, Seuntjens discovered, as have many farmers across the country, that practical preservation could save his barns and save him money!

The solution to the problem was found in an innovative barn rehabilitation technique. By removing or raising the haymow and adding new structural supports, the confining spaces of an old barn can be transformed into a large open space suitable for any number of farming uses.

Altering the haymow structure permitted Seuntjens to add new 14-foot by 18-foot doors, providing full and easy access to new interior space without damaging the historical character of his old barns.

How to put your old barn back to work

The first thing to consider when contemplating a barn renovation project is the proposed use. If your new use will require the entire floor area of your barn, the full haymow will need to be removed. If you need clearspan space in only part of your barn, you can remove a portion of the haymow, or even raise the level of the haymow, keeping some mow space for storage of hay or grain. The decision to remove part or all of your haymow depends on your particular space needs and budget requirements.

Once the interior alterations are complete, you may have to enlarge an existing door or install a completely new door to ensure easy access to your shop or

storage area. Yet another issue to think about is the floor. An existing dirt floor may have to be replaced or a

concrete floor may need to be repaired, depending on your intended use.

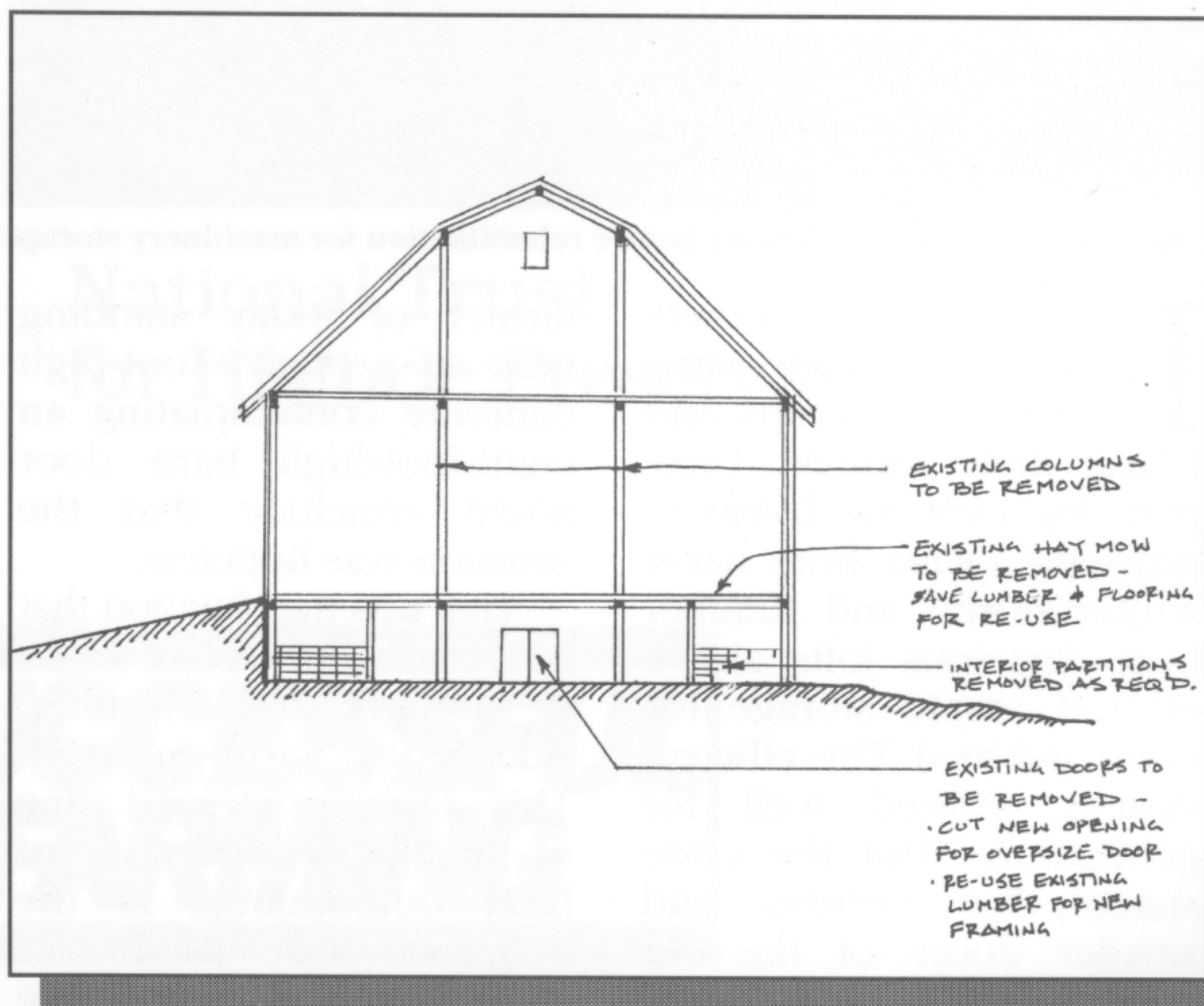
New spaces checklist

Before starting your project, consider the following:

- ✓ Overall condition of barn: foundation, structure, roof, siding
- ✓ Proposed use: machinery storage, hay storage, farm shop, other
- ✓ Space needs: main level, mow level
- ✓ Size of door needed
- ✓ Floor requirements
- ✓ Cost: Comparison with new structure

In modifying your barn to create more space, you will be removing structural elements that are crucial to the barn's integrity.

While your barn may seem to be the most basic structure on your farm, it is actually a complex series of interrelated parts designed to carry and distribute heavy loads. Each part must be capable of carrying its share of the total building load. In modifying your barn to create more space, you will be removing structural elements that are crucial to the barn's integrity. Therefore, it is critical that the load be redistributed onto a new support system.



Post and beam barn before modification

Barns vary greatly in design and structural engineering, and loadings on farm buildings take many different forms. The most obvious are the loads pressing vertically downward. Loads from wind, snow, the weight of the structure, and the weight of equipment, all exert tremendous pressure on your barn. All new structural components need to be able to withstand the same load stresses that the building was originally designed to carry.

The most common method for redistributing the load is a series of trusses and cross braces.

Step one: designing and building trusses

First evaluate how your haymow beams and floor act as structural elements in your barn's design. Unless you are certain of your abilities, seek advice from an engineer, architect, or contractor in this evaluation process. Once you have determined how your floor and beams contribute to the overall stability of your barn, you can design a system to compensate for the removal of these elements.

The most common method for redistributing the load is a series of trusses and knee braces. These new elements replace columns and supports that will be removed from the barn to open up new space. Additionally, they provide structural support for walls, compensating for the removal



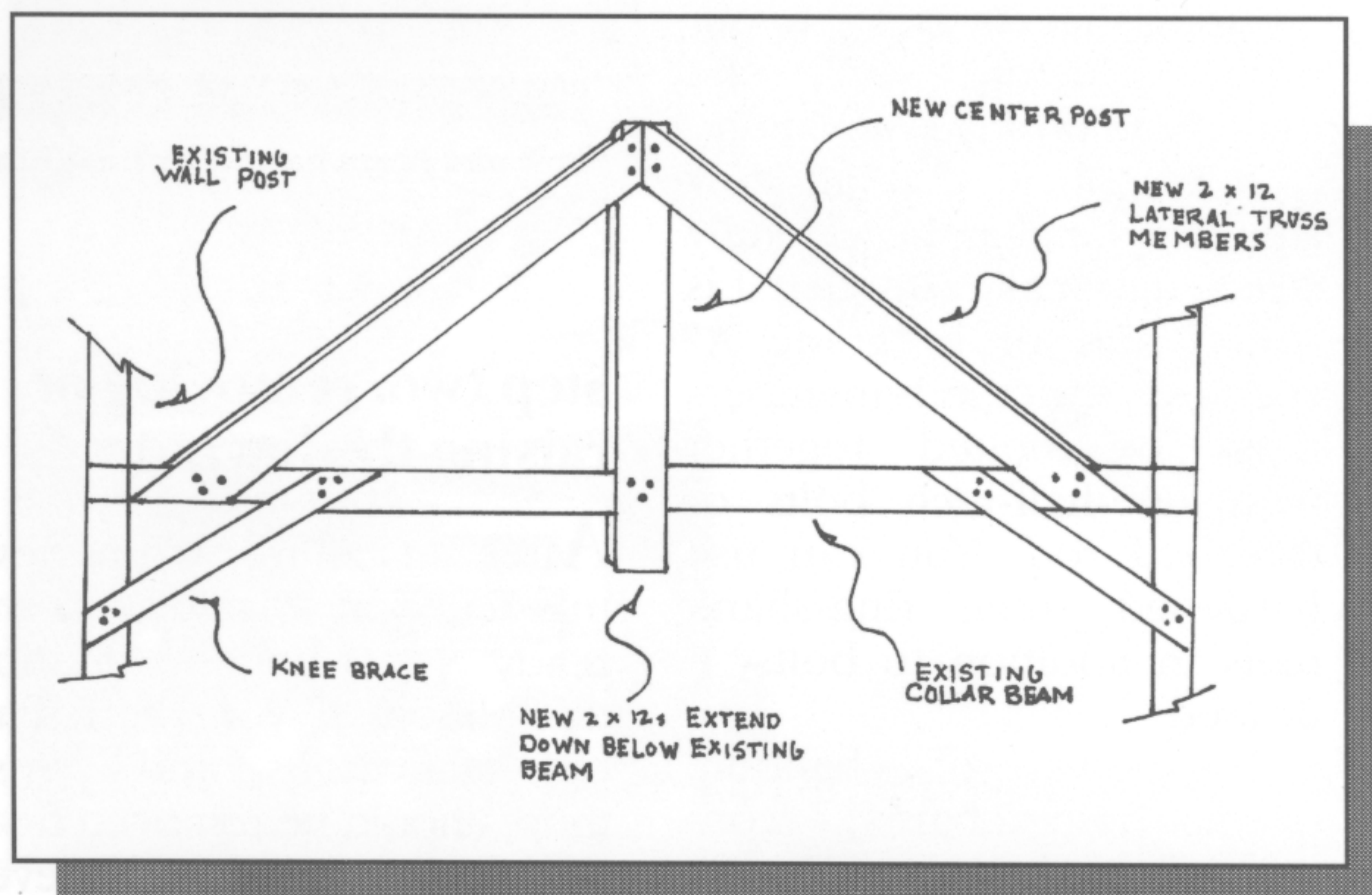
Interior of Newton barn, showing new truss and knee braces (foreground) and original post and beam structure (background)

of the haymow floor.

Although truss design will vary according to the specific needs of your barn, in a standard post-and-beam structure there are common characteristics. The construction of a central structural truss system generally consists of a new center post resting on an existing cross-collar beam. The new post is secured by sandwiching it

between two two-by-twelves cut two feet longer than the post.

Once the new center post is secure, then lateral truss members, usually two-by-twelves, can be attached to the top of the new center post and to the outside ends of the cross-collar beam, forming a large, V-shaped truss. In addition, angle braces, called knee braces, can be installed



Truss detail

from the truss to the existing wall post for added stability and wind bracing.

Once you have designed a new structural system for your barn, you can construct and install the trusses and knee braces. Generally you will need a truss at each collar beam. If you are removing only a portion of your haymow, trusses will be needed only in the area where the mow is removed, if at all.

Always remember, working on barn frames can be dangerous, especially if you aren't sure of what you are doing, or don't have the proper tools to carry out the job!

Remember that all new supports need to be in place **before** any demolition begins. This enables you to use the old haymow floor as a work platform while ensuring that stresses on your barn structure will be minimized during renovation.

It is critical that all new structural lumber be carefully selected to make sure that it is sound and of a "grade A" species. Structural members must be bolted together with one-half-inch bolts or threaded rod. You can use hardened steel, ring-shank nails in addition to bolts, if desired.

Haymows of balloon, or stick-framed barns, constructed of dimension-lumber wall studs and rafters, can also be removed or raised using a

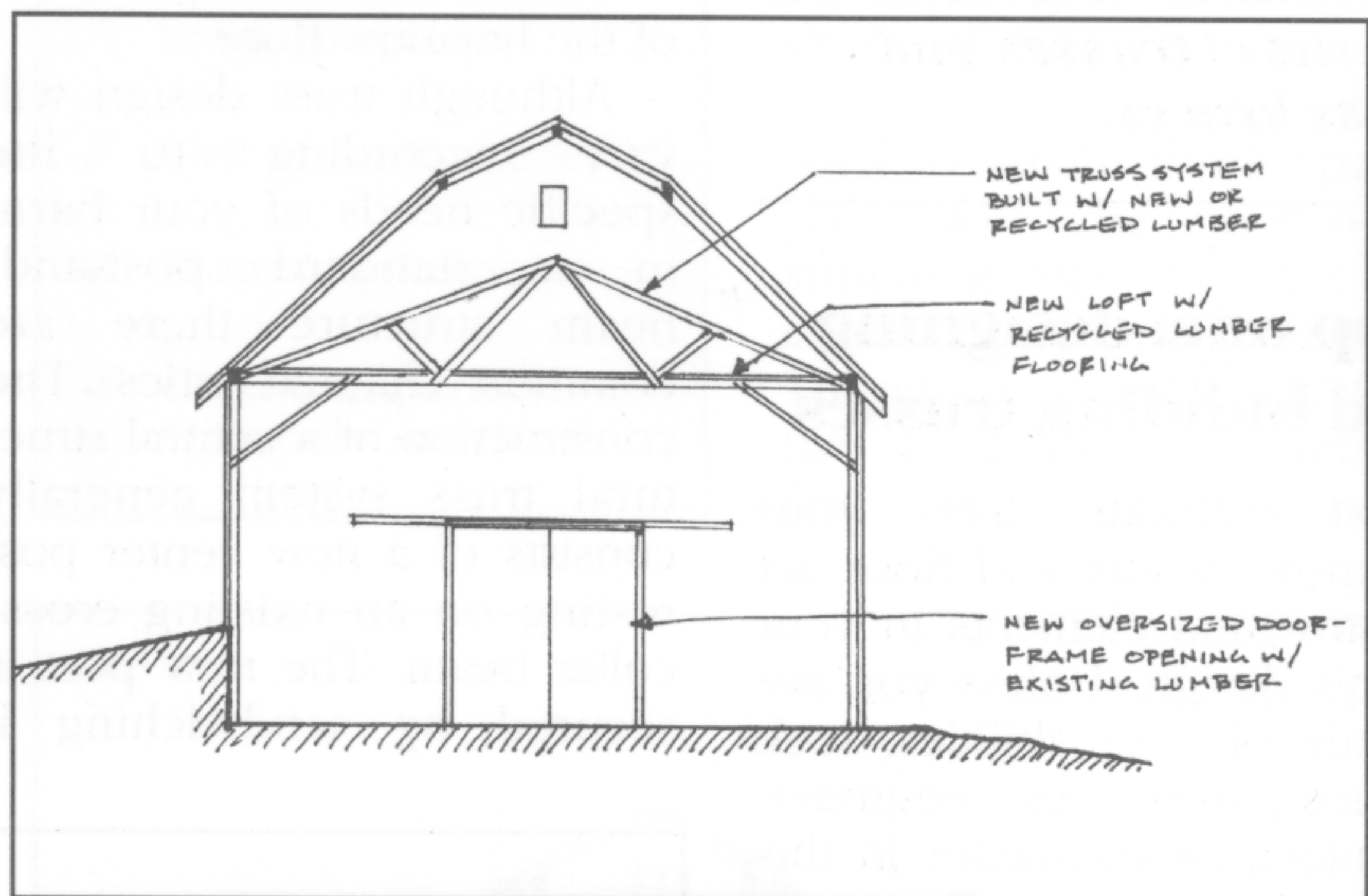
similar technique. In these barns, trusses are constructed of dimension lumber, (two-by-fours or two-by-sixes). Generally one truss is installed at each rafter in the area where the mow will be removed.

An alternative to constructing trusses on-site is to order factory-built trusses from a building supply company. These can be made to order to fit almost any design requirement. The cost will be considerably greater than if you build the trusses yourself (generally \$150 to \$200 per truss).

worry about the condition of your barn floor at this point. Simply clear out any debris that might be in your way during demolition.

Next remove the mow floor boards. Be sure to save all this lumber as it can be reused to help cut costs in your project, especially if you are raising the haymow. Once the floor is gone, carefully remove beams and floor supports opening up your barn interior.

If you intend to raise your mow, at this point you can reconstruct the haymow at the collar-beam height.

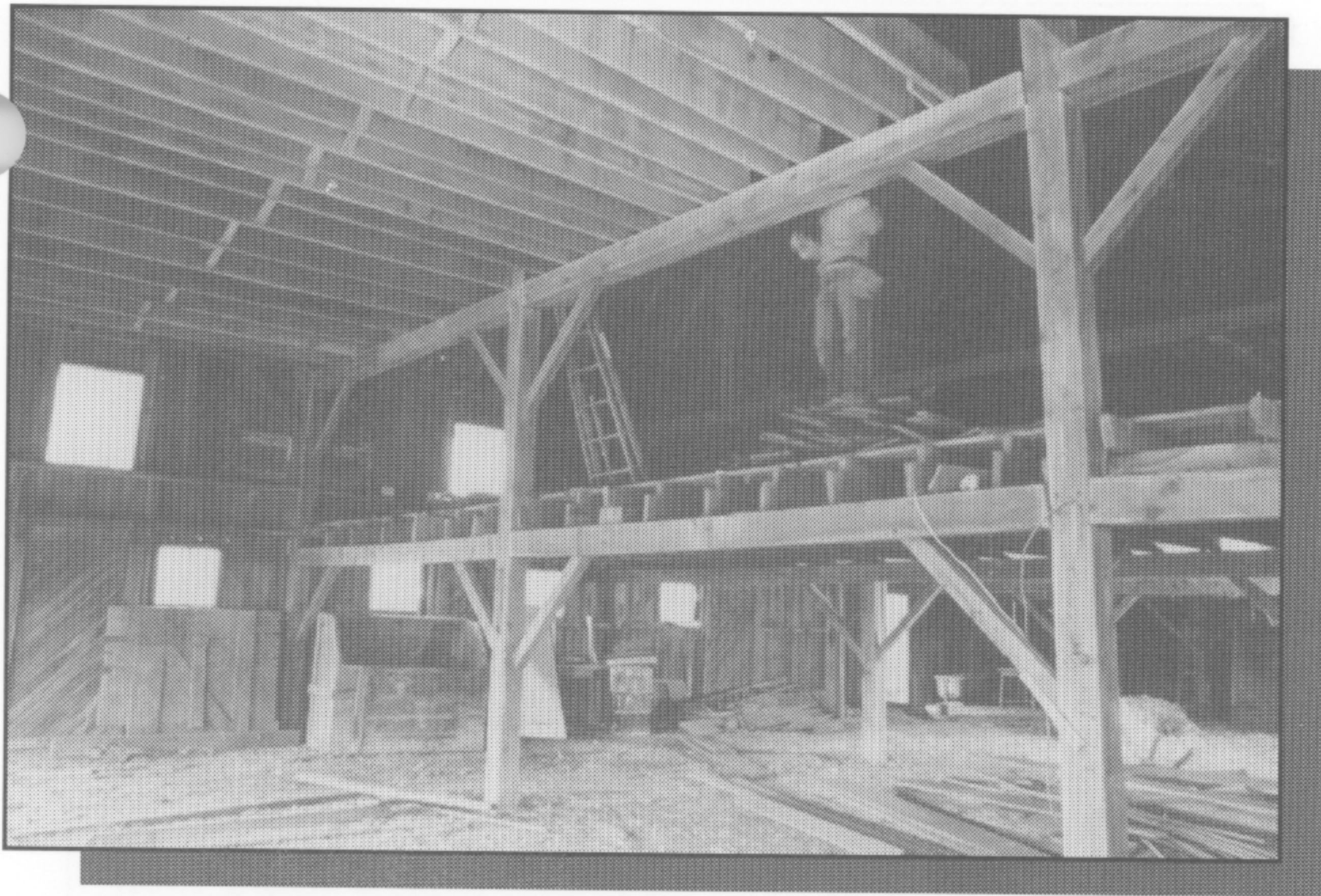


Post and beam barn after modification

Step two: removing or raising the haymow

After installing your new truss support system, you are ready to begin interior demolition. If your barn has old stanchions and pens, those should be removed first. Clearing out the ground level will facilitate the removal of the haymow floor. Don't

Depending on the structural system of your barn, you may be able to raise the level of your haymow without constructing trusses. In some post and beam barns, the floor joists and boards can simply be removed from the eight-foot-high cross beams and reinstalled at the higher, collar-beam level. With this method you can get as



Raising a haymow to collar-beam level

much as eight feet of additional clearance without constructing trusses.

Step three: doors

When you raise or remove your haymow floor, you may also have to enlarge an existing door or install a completely new door to allow easy access for large equipment. Several types of doors are available. Keep in mind that a new, oversized door will drastically alter the appearance of your barn.

In most cases, existing materials can be used to construct a new door, saving you money while maintaining the important historical features of your old barn.

After completing the interior of his barn, Ron Seuntjens faced a difficult

choice when it came to door options. Rather than destroying the historic character of his barn with a modern metal or overhead door, he installed a sliding door built to perfectly match with the original board-and-batten barn siding. In most cases, existing materials can be used to construct a new door, saving you

money while maintaining the important historical features of your old barn.

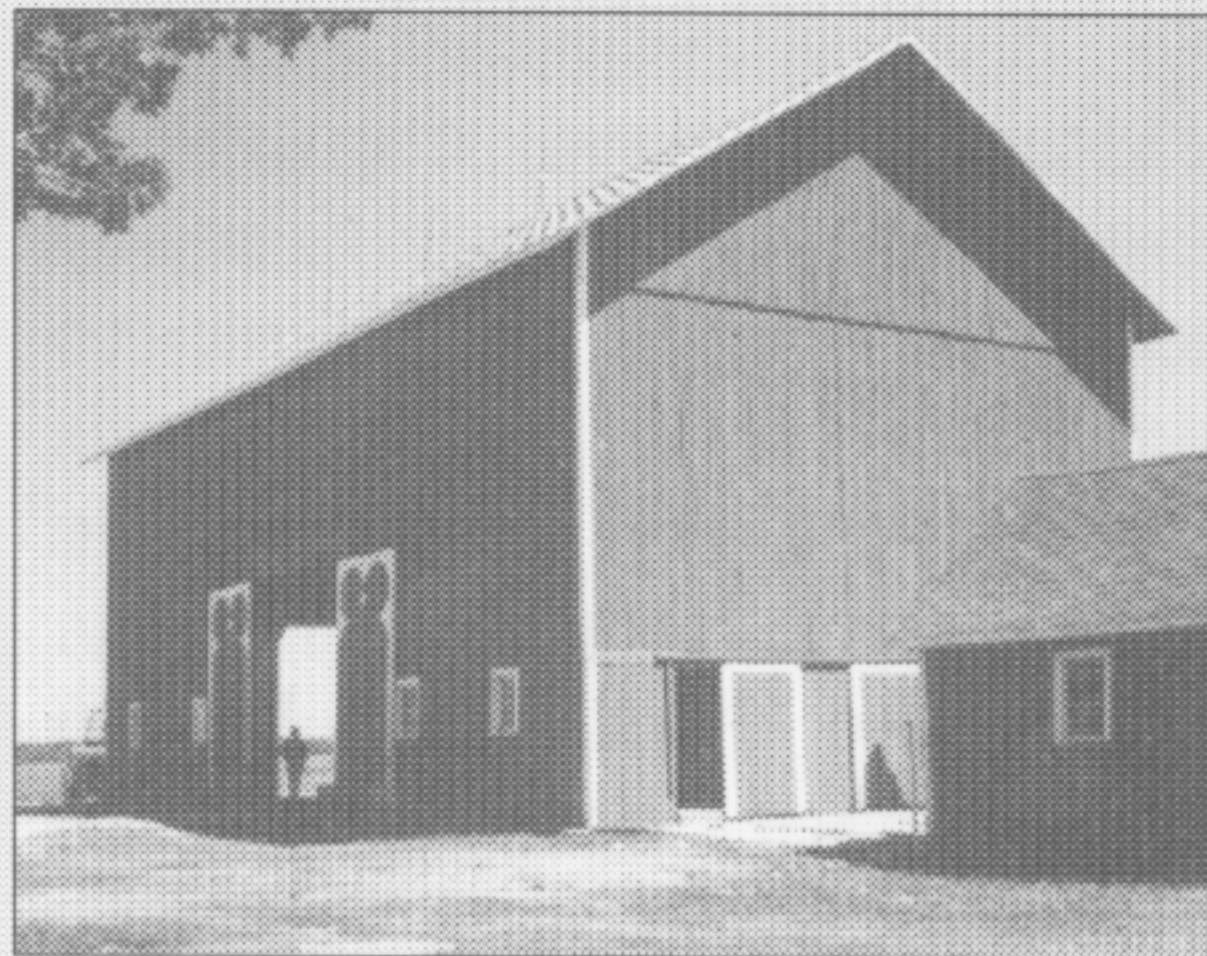
Step four: floor

After you have completed the above steps you are ready to put your barn back to work! Even if your floor is not perfect you may be able to use the barn right away. Once the barn has begun to pay for itself you can consider adding a concrete or less expensive *Stonecrete* floor. *Stonecrete* is a commercially available rough aggregate compound. It contains a higher concentration of stones, resulting in a rougher surface, than concrete. If you intend to use your barn as a workshop, concrete is still the best option because of its smoothness. If texture is not a factor in your intended use, then *Stonecrete* can be used at about one-half the cost. If you do install a concrete floor, be sure the



Ron Seuntjens' barn, after rehab, with sliding wood doors

Success story



In 1986, Darrell Newton of Nashville, Michigan, began a barn renovation project on the 1,500-acre farm he operates with his father. Like Ron Seuntjens, Newton had an old barn and needed machinery storage space. By using the trussing technique, Newton was able to save his gable-roofed dairy barn and provide a dry storage space for his combines and other large equipment. He increased the useable space in his barn from 408 square feet to 2,018 square feet, while still leaving room in a renovated haymow for more than 1,700 bales.

Project cost: \$4,300

Cost of comparable new building: \$12,000

Savings: \$7,700, plus no increase in property taxes!

floor slopes to a drain. There's no such thing as a perfectly level floor!

If your barn has a basement there are some additional considerations. You must be sure that the floor of your barn is strong and solid enough to support heavy equipment once you do get it through the door.

Examine the supports in the basement. Look for evidence of rot, especially around nails and bolts. Look for cracking and other signs of structural failure from heavy loads. Repair or reinforce your floor system as needed. After you are satisfied that the support system is in good shape you can add a second layer of floor boards to create a strong and stable platform for your equipment.

If you have concerns about the integrity of your floor you should consult an engineer who can determine floor load capacity.

Getting the job done

Barns are large and complicated structures and renovation projects may require the help of a qualified contractor. Many farmers find that their local

Unless you are certain of your abilities, you will probably need assistance from an engineer, architect, or contractor in evaluating your barn's structural system.

contractor is not familiar with the methods of altering large wood structures and is reluctant to take on an old barn restoration of this type. You may find that all the bids on the work are prohibitively high.

The best solution to this problem is to hire a barn specialist to assist with your project. Check with the agencies listed on page seven for names of barn rehabilitation specialists. These contractors understand the process and are very willing to work with local craftsmen and farmers. This team approach can save money and ensure that everyone is comfortable with the working conditions.

Tips for working with contractors

1. Before meeting with a contractor, prepare a drawing and list of work to be done.
2. Get at least three estimates before choosing a contractor.
3. Check references and contractor credentials (license, bond, insurance).
4. Agree on a completion date.
5. Agree on a payment plan.

-from Dexter Johnson

Estimated costs

Below are estimated costs for common old barn modification and renovation. These figures are based on contracted work. If you do all or part of the job yourself, the figures would be much less. All prices will vary according to region, type of barn, and extent of renovation.

- **Structural work:** Average cost for removal of haymow, addition of truss system, and construction of larger doors runs between \$4,000-\$7,500, including labor.
- **Doors:** Sliding wood doors can be built of existing materials for little or no cost. A new metal overhead door can cost as much as \$3,500.
- **Floors:** Installing a 4"-thick reinforced concrete floor inside a barn runs from \$2.00 to \$4.00 per square foot. *Stonecrete* costs about \$1.00 to \$2.00 per square foot. Since a new floor can be the most expensive part of this type of project, you may want to wait until the barn is paying for itself before installing a new floor.
- **Overall costs:** Overall the average cost for turning your old barn into an active and working part of your farm operation is remarkably inexpensive. The savings over construction of a comparable new building averages fifty percent or more, not counting "hidden costs" such as demolition, backfilling and grading, utility hookups and increased property taxes.

Another benefit to restoration versus new construction is flexibility. You can do the renovation in stages, putting the structure to work right away, and adding finishing touches later.

For more information

Organizations and agencies:

State Historic Preservation Office (SHPO): Advice on maintaining the historic character of your barn and information on the National Register of Historic Places and rehabilitation tax credits. Some

SHPOs also maintain a list of rehabilitation contractors, craftsmen and architects. Contact the state government directory for your state.

Cooperative Extension Service: Information about farm needs and assistance with specific building projects and plans. Contact the land grant university in your state, or your county extension agent.

BARN AGAIN! Program: General advice and assistance with barn rehabilitation projects. Contact (303) 623-1504.

Publications and videos:

BARN AGAIN! - A Guide to Rehabilitation of Older Farm Buildings, National Trust for Historic Preservation and Meredith Corporation, 1988, 18pp.

Barn Again!: Celebrating the Restoration of Historic Farm Buildings, Nebraska ETV Network/University of Nebraska-Lincoln Television, 1991. (Order from GPN: 1-800-228-4630).

Balanced Construction in Farm Buildings, Roy Taylor, Extension Agricultural Engineer, University of Idaho, Moscow, ID 83843.

Connectors Used in Farm Building Construction: General Types and Application, Roy Taylor, Extension Agricultural Engineer, University of Idaho, Moscow, ID 83843.

"Giving Old Barns New Life: Repairing the important structural features of a sagging barn takes time, ingenuity, and careful work, but it's well worth the effort," *Country Journal*, June, 1985.

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The Barn Aid Series is designed to provide farmers and other barn owners with technical information on specific problems related to the restoration and reuse of older barns. Comments on the usefulness of this series are welcomed and should be addressed to BARN AGAIN!, National Trust for Historic Preservation, 910 16th St., Suite 1100, Denver, Colorado, 80202. (303) 623-1504, Fax (303) 623-1508, e-mail mpro@ossinc.net. Also available from the National Trust, *BARN AGAIN!: A Guide to Rehabilitation of Older Farm Buildings*. To receive a copy of this publication send \$5.00 check or money order to the National Trust.

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