

*a national trust publication*

# Using Old Farm Buildings

*by Mary M. Humstone and Dexter W. Johnson*





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**W**hat can you do with the old dairy barn, now that you have sold your herd? Does the sturdy old barn your grandfather built have to go too, or can it be saved and put to a new use? *Using Old Farm Buildings* answers these and other questions frequently asked by owners of outdated barns, granaries, and other buildings on working farms and ranches.

## Why Are We Losing Our Barns?

Across the country farmers and city dwellers alike are concerned about the disappearance of our nation's traditional farm structures. With the decline in the number of individual farms and the total acreage of farmland over the past several decades, hundreds of farmsteads have been abandoned or demolished. Even on working farms, historic farm buildings are threatened as changing farm practices, equipment, and technologies have made older buildings obsolete.

Why are we losing so many historic barns? Why aren't they used for today's farming operations? Traditional farmsteads of the late 19th century and early 20th century had as many as a dozen different buildings, each designed for a particular use. They were built to accommodate the typical activities of a general farm, which included raising cows, hogs, and chickens as well as a variety of grains and vegetables. Barns and stables were built to shelter draft horses or mules, with large overhead storage areas

for loose hay. Smaller buildings such as the spring house, out-house, wash house and woodshed accommodated the domestic activities of the farmstead.

Today the specialized buildings of 75 or 100 years ago are no longer needed. Most farms produce only one or two major commodities. Few farmers keep a family dairy cow or raise just a few hogs or chickens. Draft horses and mules have been replaced by a series of increasingly large tractors. Hay is baled and stacked by machine, or wrapped in plastic and left in the field. Grain is stored in weathertight bins and moved by conveyors. The scale of operations is also very different. A 1910 hog farrowing house that once sheltered six sows is not of much use on a modern farm where at least 20 sows are needed to make the operation pay.

Even the older horse and dairy barns that have plenty of room are difficult to adapt to new farming uses. Modern livestock operations require sophisticated mechanical systems that can be difficult to install in century-old barns. Farmers who have no livestock may want to use their large barns for storing grain, hay, or machinery. But small openings, low clearances, and interior structural supports make it difficult to move today's gargantuan farm equipment inside these old buildings.

Preservation on the farm has also been hampered by a prevailing attitude that "newer is better" and a lack of information about the rehabilitation of rural buildings. With most available literature stressing new construction, farmers have often had to improvise



ise if they wanted to convert an old barn for a new use. Information about historic preservation, including the National Register of Historic Places and the historic rehabilitation tax credits, has not been widely circulated in rural areas.

## BARN AGAIN!

In 1987 the National Trust for Historic Preservation and *Successful Farming* magazine launched BARN AGAIN!, a national program to preserve historic farm buildings, to stem the loss of our country's historic barns. Through research, demonstrations, and award programs, BARN AGAIN! has developed cost-effective techniques for rehabilitating older barns and putting them back to work on the farm.

From the start, farmers around the country responded enthusiastically to the BARN AGAIN!

*Most modern farm equipment is too large to go through older barn doors.*

— Photo by Barbara Pabl

*Cover: Traditional farmstead showing a variety of farm buildings.*

— Photo by Mary Humstone



program. The program was launched with an article in *Successful Farming* announcing cash awards for the best examples of older barns that had been rehabilitated for new farming uses. In the first four months of the program, more than 500 farmers from 35 states responded to the call for entries. Their stories provided proof that older farm buildings can be economically adapted, to new uses, that doing so can save the farmer money, and that farmers cherish the heritage represented by their old barns.

This initial research was supplemented with four demonstration projects that illustrated four very different reuse scenarios: a dairy, a hog farrowing unit, round-bale hay storage, and large equipment storage. Each demonstration project also illustrated common rehabilitation techniques: rebuilding foundations, replacing structural members, straightening walls, repairing siding, painting, enlarging openings, and repairing roofs.

The original program goals were fulfilled with the publication in December 1988 of *BARN AGAIN!—A Guide to Rehabilitation of Older Farm Buildings*. But the program was far from over. Thousands of farmers ordered copies of the *Guide* and asked for still more information. Newspapers and magazines ranging from the *New York Times*, the *Chicago Tribune*, *Time*, and *Smithsonian* to local farm weeklies were publishing stories about the program. The demand was too great to end the program after one year.

More than a decade later, *BARN AGAIN!* is still going strong. The program is managed by the National Trust's Mountains/Plains Office in Denver, with the help of *Successful Farming* editorial staff. The program provides advice and assistance to about 1,200 barn owners each year through the *BARN AGAIN!* Hotline, presents annual awards

for the best examples of older barns rehabilitated for new farming uses, and conducts training and workshops for barn owners. The program has also helped launch statewide barn preservation programs in eight states and has been the subject of an hour-long public television program, a National Building Museum exhibit, and a Smithsonian Traveling Exhibition Services exhibit. *BARN AGAIN!* has published six technical barn rehabilitation publications and more than 35 articles in *Successful Farming*.

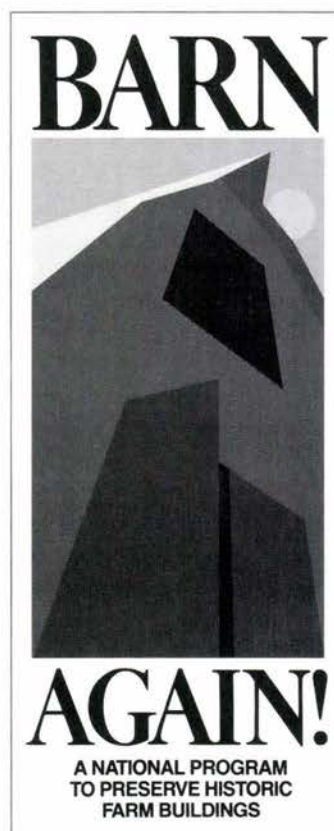
### Using Old Farm Buildings—Third Edition

In 1988, North Dakota State University agricultural engineer Dexter W. Johnson drew upon his long career working with North Dakota farm operators to produce the 16 case studies published in the original edition of *Using Old Farm Buildings*. At the time, the conventional wisdom in agricultural circles was that old barns were relics of the past, worthy only of preservation as museums or historical landmarks. *Using Old Farm Buildings* was the first publication of its kind to graphically illustrate how older barns could be economically adapted for new farming uses. It was originally published by North Dakota State University as Agricultural Engineering Research Report No. 88-1 and was later reprinted as a National Trust *Information* publication. Support for the publication was provided by a grant from the National Trust for Historic Preservation's Critical Issues Fund. Matching funds were provided by the State Historical Society of North Dakota, the North Dakota State University



*By enlarging doors and raising ceilings, farmers can adapt older barns for new equipment, as illustrated by this BARN AGAIN! demonstration project. More than a decade later BARN AGAIN! is still going strong.*

— Photo by John Waters





Agricultural Experiment Station, and the NDSU Centennial Committee. *Using Old Farm Buildings* received a "Blue Ribbon Award" in the 1989 educational aids competition of the American Society of Agricultural Engineers.

Of the 16 barns featured by Dr. Johnson in the 1988 edition, seven are still being used as described. This third edition includes these seven as well as eight new projects. Although some of the projects described in this publication are several decades old, all of these barns are actively used today. Cost figures given for the projects reflect the cost at the time project was completed.

## Why Preserve Older Barns?

Many barn owners have found that adapting their older buildings can be an economical alternative to demolishing them and building new. BARN AGAIN! statistics show that the average rehabilitation project costs half as much as demolition and new construction. Using an existing building can minimize the investment necessary to start a new enterprise. Barn owners can save money by doing a job in phases and doing much of the work themselves, eliminating the need to finance a project.

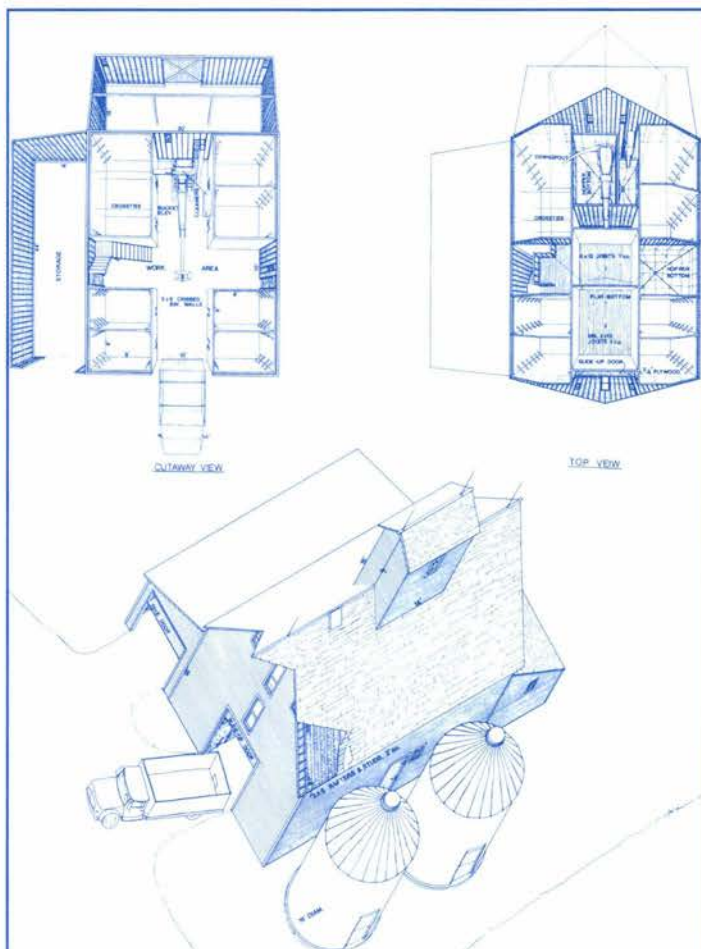
Aside from practical considerations there are many personal reasons for using an old farm building. Many owners are reluctant to tear down a building that has been "part of the family" for generations and that may even be an important local landmark. But few can justify the expense of rehabilitating a crumbling old barn just for the sake of preservation. By adapting the building for a new use on the farm, operators can save money and save a piece of history too.

Many barn owners want to save an older barn, but just can't figure out how to use it in their operation. Others have a need for a particular type of facility and wonder if the old barn can fill that need. Almost everyone who considers a barn rehabilitation project wonders what it will cost and if it's practical to do. The experience of other barn owners can provide helpful ideas about layout, construction materials, construction procedures, and costs. This publication illustrates 15 actual barn rehabilitation projects, selected to show various construction methods and uses adaptable to most old farm buildings.

## Seed Cleaning and Grain Storage

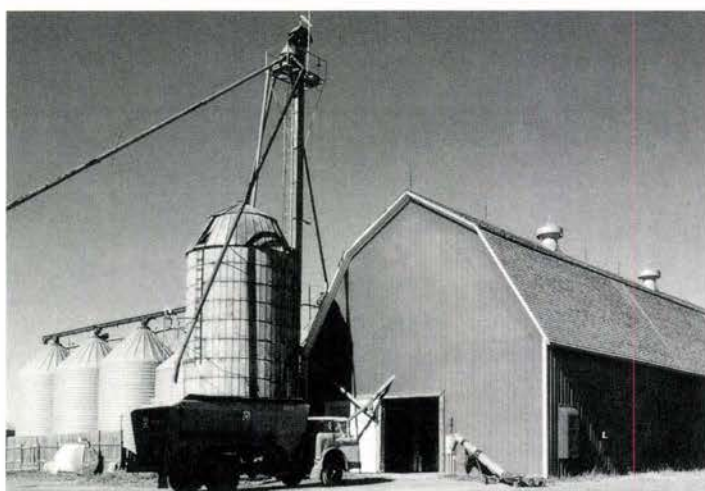
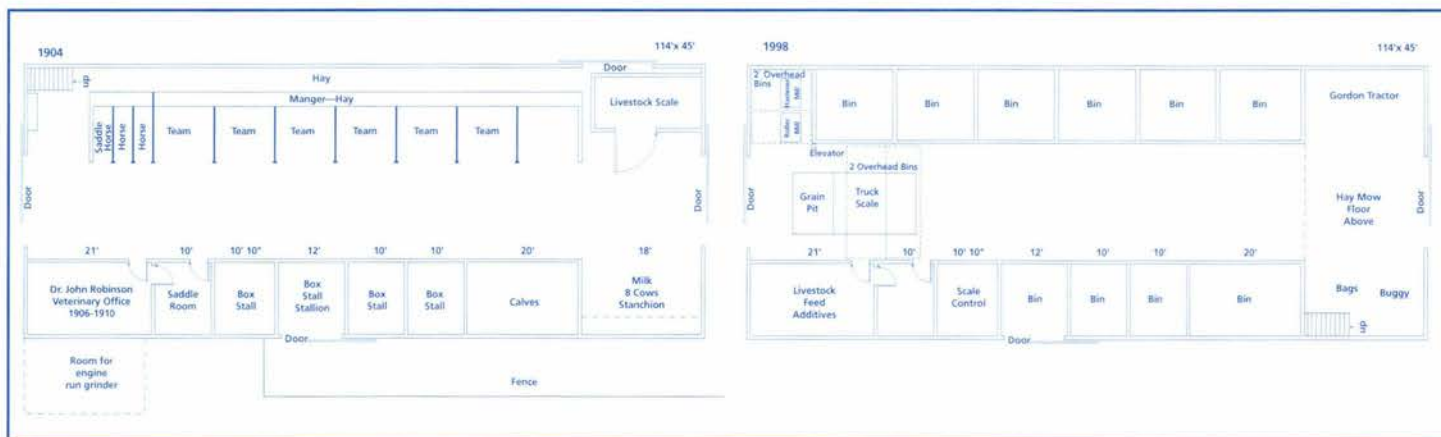
The addition of an elevator, two lean-tos and interior grain bins transformed this 1890 dairy barn into a efficient seed cleaning and grain storage facility. The 30-by-44 foot, two-story, gable-roof barn provides nearly 10,000 bushels of storage, and workspace for seed-cleaning machines. Two 2,500-bushel round steel bins provide additional grain storage outside the old barn. The barn has functioned well in this capacity for more than 40 years, with just a new coat of white paint applied periodically.

Trucks are backed into the barn and unloaded via a moveable eight-inch auger to the 40-foot high, 1,200 bushel/hour bucket elevator, which moves the grain up and drops it through an overhead downspout into storage bins or cleaners. Uncleaned grain is stored in the eight, 8-by-8 foot, full-height, flat-floor bine of 2-by-6 inch cribbed-wall construction. Cleaned grain is stored in five metal-lined, hoppers, over-



head bins that are supported by 6-by-6 inch joists on two-foot centers. The flat-bottom bin above the alley is supported with 2-by-12 inch joists on one-foot centers. A 16-foot-wide, side lean-to adds extra storage space for bags and equipment, while a second lean-to at the rear of the barn is used to collect screenings from the cleaning equipment.

*This 1890 dairy barn is now used as a seed cleaning and grain storage facility.*



*Built in 1904, this barn has been converted into a grain processing and storage facility.*

— Photo by Mary Humstone

## Grain Processing and Storage

This large (114-by-45 foot) barn was built in 1904 for \$1,800. It originally contained stalls for six teams of horses and three saddle horses, plus stanchions for eight milk cows and four box stalls. In 1960, all the stalls, mangers, box stalls, and stanchions were removed and the barn was converted into a complete grain processing and storage facility. For the past 40 years, it has been the most heavily used building on the 5,000-acre grain and livestock farm in central North Dakota.

Once the interior partitions were removed, the owners poured a concrete floor, then constructed grain bins between the haymow support posts spaced ten feet

apart. The bins were constructed of 2-by-6 inch studs on one-foot centers. Cross-tie wires were later added at one-foot intervals at the six-foot level, and two-foot intervals at the ten-foot level. A total of 10 storage bins, five on each side of the central driveway, provide 40,000 bushels of flat-bottom grain storage. A pit was dug for a grain dump, and a truck scale was also installed so that all harvested grain can be weighed as it is brought into the barn. A cup elevator conveys feed grains from the pit to the inside storage bins via overhead augers and wheat and other grains via a grain leg to nine outside steel bins or the grain dryer.

A hammer mill and a roller mill and additional overhead steel bins complete the processing facility. Two overhead hopper-bottom bins supply the roller or hammer mill. Five additional overhead bins dump processed oats, barley, corn, protein feeds, etc., into a mixer truck. The feed is mixed with corn or hay silage loaded from bunker silos and fed to cattle in a 950-head capacity feed lot run by the grandson of the original owner.

Most of the haymow floor was removed to accommodate the 20-foot-high, 14-by-16 foot grain bins. A 20-foot section at the north end of the barn provides two

levels of storage space. The former saddle room in the southeast corner of the barn now holds sacks of mineral feed and other supplies.

Every day, year-round, one to three truckloads of grain are processed in the barn, depending on the number of cattle to feed. "This barn is probably the most used barn of any on a comparable-sized farm anywhere—especially for its age," says the owner.

## Grain Storage

After heavy use as a livestock barn, this 1917 arch-roofed barn was converted for grain storage in 1955. Almost every inch of the 72-by-30 foot barn is used in this economical conversion. The barn holds 16,000 bushels of grain in eight bins, as well as 600 bushels of seed in two additional overhead bins. The central driveway is used for storing machinery such as combine heads. The barn is filled with grain every year, and the owner reports no problems with moisture or rodents.

To adapt the barn for its new use, the owner removed all interior stalls and partitions and replaced them with eight plywood, 10-by-18-by-30 foot grain bins, four on each side of the barn. Each bin is reinforced with steel cables to reduce pressure on the walls of the barn. Above the drive-

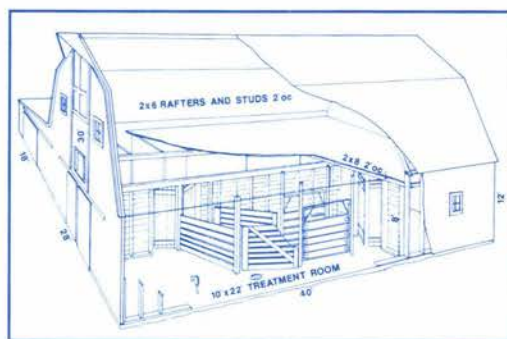


way, in the haymow, two additional bins each hold 300 bushels of seed. Grain is loaded and unloaded from the outside of the barn. Bins are filled by an auger elevator through chutes installed in the barn's roof and emptied through chutes installed in the outside walls of the barn, toward the bottom of each grain bin.

When the barn was adapted for its new use, the existing siding, which had deteriorated during the Depression, was replaced with matching wood siding. Side windows were covered over at this time and new doors, haymow windows, and trim installed. Now the barn is painted every four to five years to keep the wood in good shape. A new asphalt roof was installed in 1994.

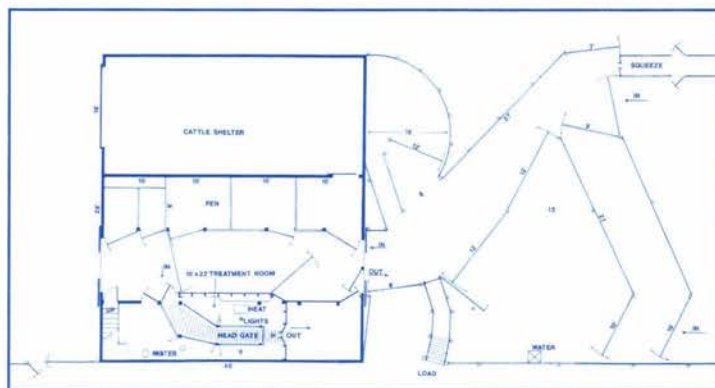
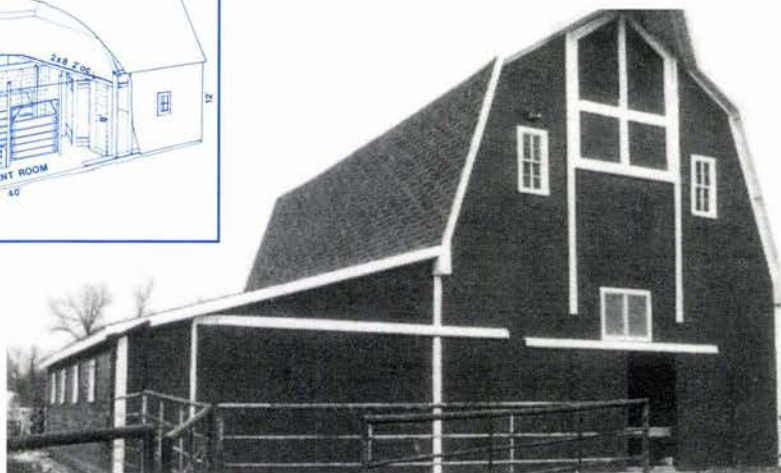
## Beef Cattle Maternity and Hospital

In North Dakota, wet, cold weather often creates problems during spring calving. This 28-by-40 foot, two-story, gambrel-roofed barn was converted for severe-weather shelter and a treatment facility for cattle and saddle horses. In this set up, the main sorting, squeezing, and loading chutes are located outside the barn. The main floor of the barn was divided into three 8-by-10-foot calving and hospital



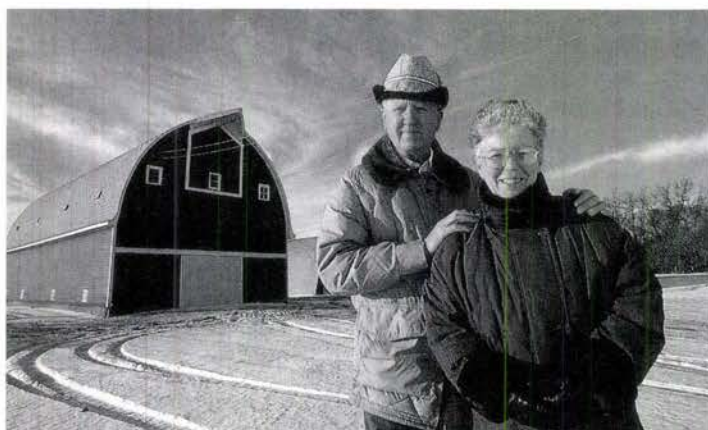
pens and a 10-by-22 foot treatment room. Existing 6-by-6 inch mow-support posts were used to support the pen partitions. The enclosed treatment room was equipped with offset electric lights, as well as a 1,500-watt radiant heater over the chute-headgate to provide the light and quick heat needed for veterinary work in cold, wet weather. Sorting, treating, loading, or otherwise handling cattle can be done by one person in this system. The 18-foot-wide lean-to was converted for cattle shelter.

Extra rafter and wall bracing was needed to prevent further wind damage to the 30-foot-high mow space used for storing baled straw and hay for emergencies. The mow also provides insulation for the cattle area below, reducing heat loss, drafts, and condensation. The owner's investment of \$1,000 in materials in 1978, plus his own labor, brought him a treatment facility that has served him well for more than 20 years.



*For 20 years, this gambrel-roofed barn has served as a severe-weather shelter and treatment facility for cattle and saddle horses.*

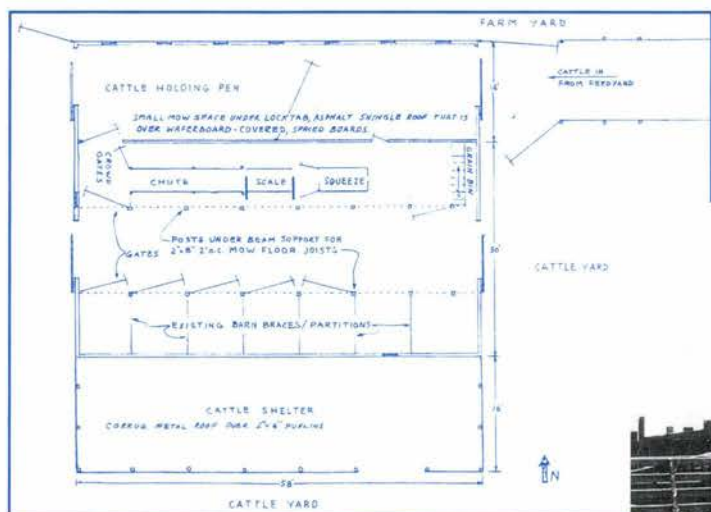
— Photo by Dexter Johnson



*Formerly used for livestock, this 1917 barn was converted for grain storage in 1955. A coat of paint every four or five years keeps the wood in shape.*

— Photo by Mitch Kezar





*Built by the owner's grandfather in 1917 as a stable and dairy, this barn now comfortably handles a 300-to-400 head herd of cattle.*

— Photo by Dexter Johnson



## Beef Cattle Handling

Cattle handling has replaced horse stables and dairy as the primary use for this two-story, gambrel-roofed barn. The barn measures 30-by-58 feet, with side lean-tos of 18 feet and 16 feet. Five horse stalls were converted to sick pens for cattle, using the original two-inch-thick, plank partitions. Six cow stanchions were removed and a mow-beam support post moved and re-braced to make room for a central alley and a squeeze chute with scale. The haymow is used for storing a

small amount of hay and straw for the sick pens. Supplementary heat during the winter is provided by a space heater.

Cattle enter the barn from the feed yard into a holding pen located in the 18-foot-wide north lean-to. From there they are herded into the chute, scale, and squeeze. Sick pens double as temporary storage for cattle that are sorted off during the weighing and working process. Monthly weighing of backgrounded calves and other treatment for the 300-to-400-head herd is handled comfortably

through this system. A second lean-to on the south shelters cattle in bad weather. "The whole system works really well, plus it is dry and always out of the wind," says the owner.

The barn was built by the current owner's grandfather in 1917. Barn repairs, maintenance and equipment, including roofing, siding repair and painting, replacement of some sill beams and windows, and installation of the cattle handling equipment has cost about \$10,000 over the past 20 years. The barn is an essential part of the family ranch operation.

*This 1908 dairy barn provides a comfortable environment for both livestock and owners.*

— Photo by Mitch Kezar



## Calving and Cattle Handling

This 40-by-100 foot barn was built as a dairy in 1908 with an unusual two-story tower on one end where hay wagons could be unloaded, fully protected from the weather. Although the barn had been neglected for many years, the current owner decided it was in good enough condition to rehabilitate for a new use.

The stalls and stanchions were



replaced with calving pens and catching and squeeze chutes for working the cattle. There are three catching areas in the barn. The main catching chute is used for vaccinating, de-horning, branding, de-licing, implants, and many other treatments. The other two are used for problem births and for assisting calves who can't nurse. The six calving pens are used in harsh weather to accommodate first-time heifers and older cows with birthing problems. A small insulated room equipped with heaters and heat lamps was constructed in one corner of the barn for quickly warming up cold calves.

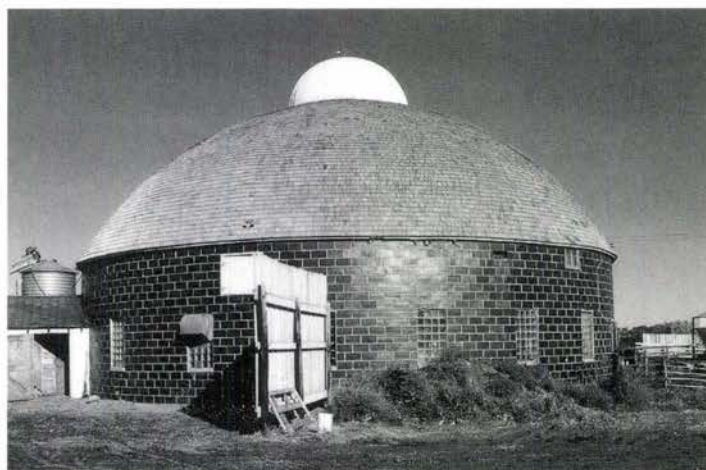
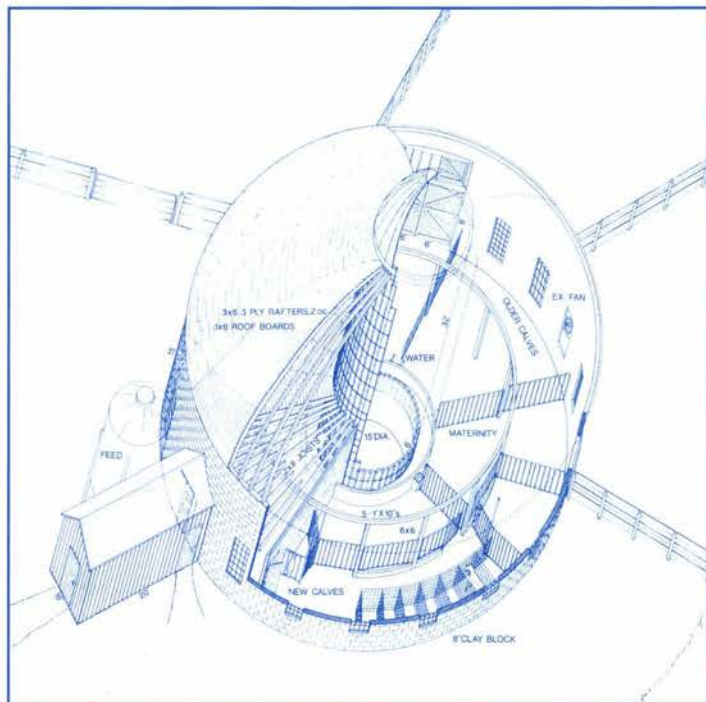
For convenience in feeding the calves in bad weather, three grain bins were installed in the haymow. The bins are loaded by an auger. The grain is gravity fed from two of the bins into a small hammer mill, and from there flows into a main floor bin to be fed to the calves. Grain can also be moved the length of the 100-foot barn using trailers that are loaded on the west end of the barn and moved to the east end, where grain is fed.

The double-sided barn stays warm in the winter and cool in the summer, making a comfortable environment for both livestock and owners. A coat of Minnesota red paint, applied every four or five years, keeps the barn in good shape. The owner estimates he has spent \$12,000 on his barn over the past 20 years, for repairs, equipment, and maintenance.

## Dairy Calf Housing

When dairy operations expand, the old stanchion barn is often adapted for housing calves for herd replacements. The overhead mow provides storage space for hay and bedding and helps insulate the barn. Mow support posts also support the numerous pen partitions. From 1923 to 1970, this 62-foot-diameter, ceramic-tile round barn served as a milking barn, with 20 stalls for the family's dairy herd. In 1970, a parlor barn was constructed for milking and the round barn was converted for a maternity barn and year-round calf growing and production facility. The round barn plays a very useful and profitable role on the 700-acre dairy farm, allowing the farmer to raise all of the replacement stock for his 85-head milking herd.

Six pie-shaped steel pens were installed in one half of the barn, as well as a cow stanchion used for artificially inseminating heifers. The barn currently houses about 45 calves from birth to 300 pounds. The maternity pen permits cows to calve indoors with close supervision. Newborn calves are placed in individual floor-level, bedded pens for six weeks to control sucking on each other. After switching to a hay/grain ration, calves are moved over to larger and larger group pens with adjoining outdoor pen space. The calves can easily be fed hay and grain from the barn's ample haymow, which stores up to 5,000 bales of hay and straw. An exhaust fan ventilation system is used for cold weather. Door openings are adjusted for air movement in moderate weather. Straw bedding and indoor hay/grain feeding is done by hand. Pens are cleaned periodically with a skid-steer loader through the 12-foot-wide rear door.



*This ceramic tile round barn has been converted for a maternity barn and a year-round calf growing and production facility.*

— Photo by Mary Humstone





*Barns can be successfully adapted to meet changing operational needs. This Vermont barn continues to provide housing for dry cows and bred heifers with storage on the upper levels.*

— Photo by John Walter

## Dairy Housing For Dry Cows and Heifers

Using an older barn can make it possible for a young farmer to get an inexpensive start in farming. As the operation grows, the barn can be adapted to fit changing needs. This Vermont dairy farmer says his 1903 barn made it possible for him to get started in the dairy business in the 1980s. Although the barn is no longer used for milking, it is still an important part of the expanded dairy operation, housing dry cows and bred heifers.

The three-story, gambrel-roofed barn required extensive foundation repairs, but otherwise was in good condition. A new concrete

floor was poured in the original basement stable and 50 home-made freestalls were installed. Three maternity pens and a California-style milking parlor for 10 cows were built. A lean-to added to one side of the barn provided housing with rubber-filled cow mattresses. A pump was installed to move manure from the barn to a manure pit. Cost of this initial investment in 1983 was \$29,000, a savings of \$39,000 over the cost of a new, comparable facility.

Ten years later, with the herd up to 110 cows, a new housing facility was built, and the old barn was remodeled once again so the milking parlor could accommodate the larger herd. Freestalls were replaced with suspended stalls. Ventilation in the lean-to was improved by borrowing a technique from swine housing, adding screens and adjustable curtains. This phase cost \$10,000 in 1993.

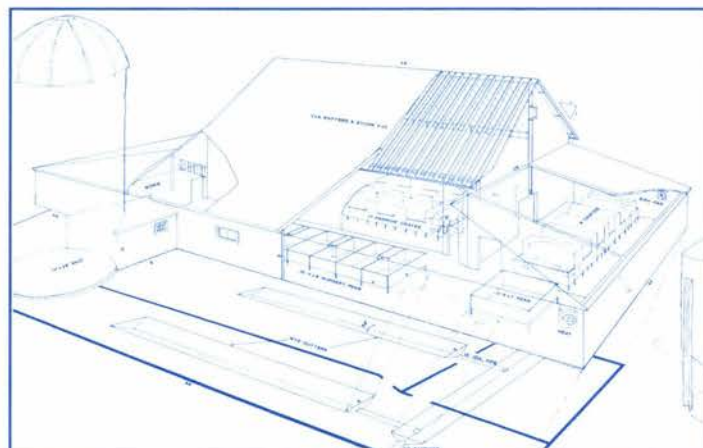
Today, the family milks 160 cows in a new milking parlor, but the old barn continues to provide housing for dry cows and bred heifers in the lower level, with horse stalls and hay storage in the middle level and storage of light machinery in the upper level.

## Swine Farrow and Nursery

This two-story, 28-by-48 foot horse and dairy barn has been in continuous family-farm use since 1904. The great-grandson of the original builder now uses the barn. Over the years, three lean-tos and a 14-by-34 foot silo were added, resulting in a 44-by-86 foot building. The barn was originally converted for hogs in 1973. As the family's hog operation grew, and the farrowing schedule intensified, the owners installed raised, slatted-floor farrow crates and nursery pens along with gravity-drain, wye gutters in the floor for liquid manure handling to a nearby earth-banked manure storage.

Round steel feed bins by the barn are filled with a tractor-powered grinder-mixer. Electric-motor-powered conveyors distribute feed to feeders within the barn, and 100,000 BTU propane-fueled heaters supply heat in the farrow room and the nursery. Exhaust ventilation fans continuously draw fresh air from the straw-filled mow down through manually adjustable ceiling inlets which mixes with air inside the barn to control moisture and odor. Straw and alfalfa are stored in the haymow.

This type of renovation is a low-cost, practical use for many such two-story barns. The out-of-pocket expense, estimated at \$22,000 in 1984, is mostly for equipment that can be moved again later should a new barn be constructed or the swine operation discontinued.



*The great-grandson of the original builder now uses this dairy barn as a swine farrow and nursery.*



## Hog Finishing

Five generations have used this 100-by-40 foot, gambrel-roofed barn built in 1892. Its original slate roof is still in good condition. In 1993 the current owner adapted the former horse and dairy barn for finishing hogs.

The old sandstone foundation was replaced with concrete, and new concrete floors were poured. All doors and tracks were repaired, and siding was railed and painted. The interior of the barn was divided into three large pens, holding from 65 to 95 hogs each. A 32-by-112 foot finishing shed, containing four additional pens, was added onto one side of the barn, with a bulk feeding tank at one end. Automatic feeding and watering systems were installed in the main barn and the lean-to, and old wiring was replaced. A portion of the main barn was left open to provide space for storing equipment and unloading wagons of straw into the 5,000-bale capacity haymows.

The natural ventilation provided by the barn's large sliding doors is supplemented by two large fans installed in the north wall of the lean-to, and regulated with timers and thermostats. Pens are cleaned with a Bobcat loader. Manure is loaded onto a large spreader to be spread on fields immediately or temporarily stored in a pile. With this set up, 500 hogs can be finished at a time.

The finishing shed cost \$23,000 in 1983, and rehabilitation of the old barn cost under \$20,000 in 1993. The owner was able to take a 10 percent tax credit available for rehabilitation of buildings built before 1936, resulting in an estimated savings of \$60,000 over the cost of a comparable new building. "Repairs on the barn have updated it and kept it useful in a modern age," says the owner.

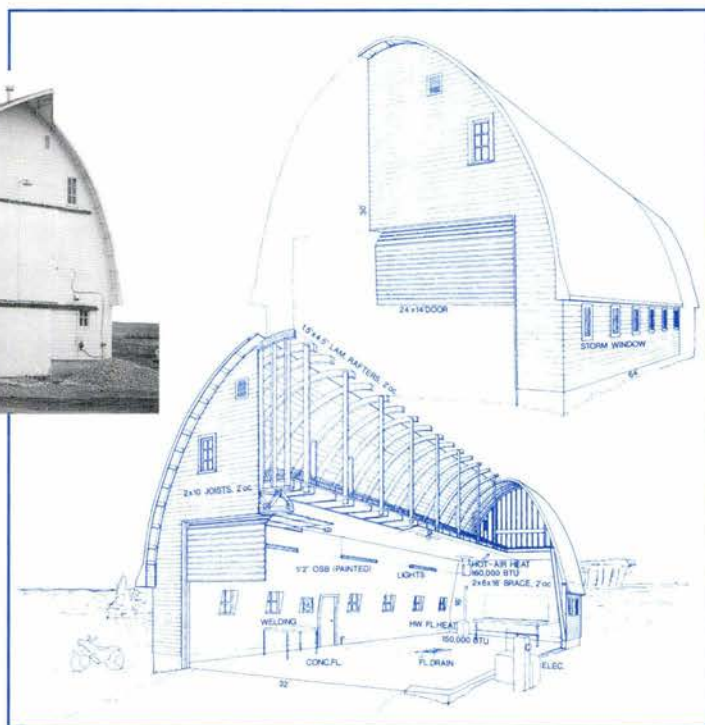
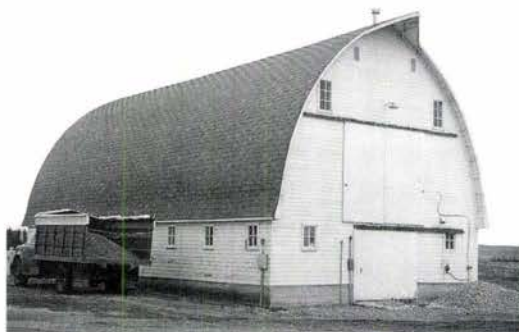
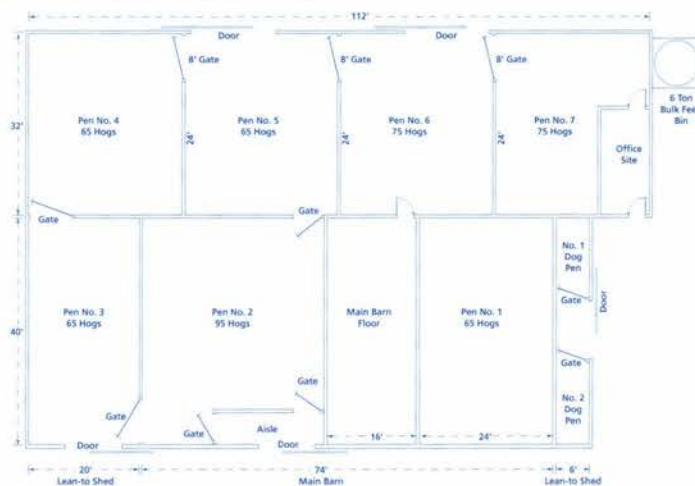


*This 100-year-old dairy barn is now used for finishing hogs.*

— Photo by Olen Genter

## Farm Repair Shop

This two-story, 32-by-64 foot arch-roofed barn was unused in 1982 when the owners decided to rehabilitate it for an insulated, heated shop. It is now intensively used year-round for farm equipment repairs. The lower walls were insulated with six-inch batt insulation and sheathed inside with 1/2-inch oriented strand board, and painted with white enamel for brightness and ease in cleaning. The mow floor was cut loose and jacked up to provide the 16-foot-high interior

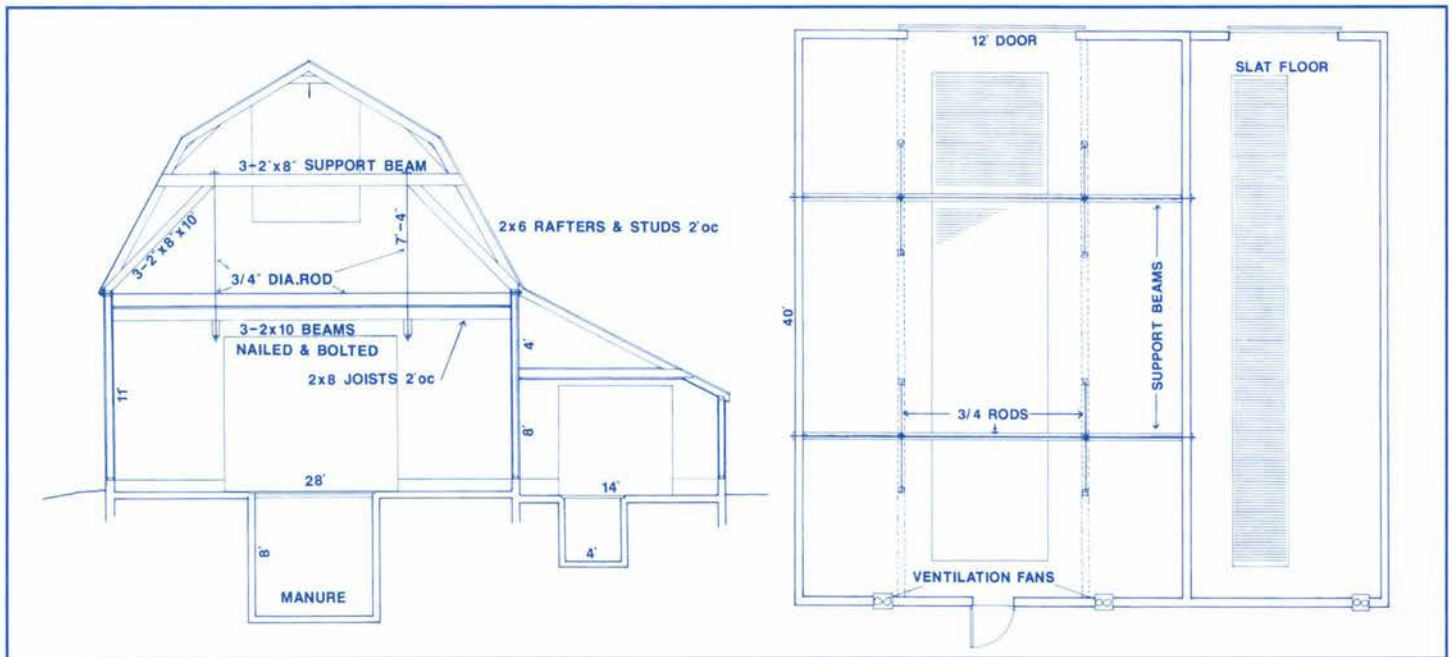


space needed for modern machinery. To maintain strength, a 16-foot-long, 2-by-6 inch brace was added to each rafter and gusseted over with 1/2-inch plywood. Insulation was blown in 14 inches thick over the ceiling. The 24-by-14 foot insulated overhead door is on the back wall, preserving the barn's historic appearance from the farmyard. This door arrangement also removes the usual farm shop

*The owners now use this barn year-round for farm equipment repairs.*

— Photo by Dexter Johnson





*The owners reconfigured the interior supports of this barn to make it accessible for tractors and other large equipment.*

clutter from the view of the farmyard. The new five-inch thick concrete floor was sloped to a grated central floor drain that siphons water out through a four-inch PVC drainpipe to an outside seepage pit. Oil is periodically skimmed out of the floor drain while sediment is cleaned out by hand to avoid plugging the disposal system.

The building is warmed by propane-heated water circulated through four 200-foot circuits of  $\frac{3}{4}$ -inch diameter polybutylene pipe placed in the concrete floor—one circuit in each quarter of the floor. The foundation exterior was insulated to conserve floor heat. Double 80-watt fluorescent light fixtures are located every 10 feet around the edge of the ceiling. About \$15,000 was spent in 1982 for concrete, insulation, bracing, sheeting, heating, electric wiring, and lighting. Labor was extra.

## Clearspan Support for Haymow Floor

Most two-story barns are constructed with close-spaced posts and beams to support the mow floor load. These posts and the low (usually about eight-foot) ceiling clearance make older barns difficult to adapt for use with modern machinery. In this example, the interior of a 1913, 28-by-40 foot dairy barn was reconfigured to make the building accessible for tractors and other large equipment. Simple, built-up beams of 2-by-8 inch lumber were installed about halfway up the gambrel roof. These support  $\frac{3}{4}$ -inch-diameter steel rods that angle down from the upper beam and are firmly anchored under the two main mow-floor support beams. The mow support beams were reconstructed using three 2-by-10 inch studs nailed and bolted together with 28-gauge metal sandwiched between them. The mow floor was jacked up four feet and refastened to the studs just below the top wall plate to provide 11 feet



*The North Dakota State University Hettinger Experiment Station adapted this barn for sheep research by replacing the stanchions with lambing pens.*



of clearance on the ground floor. This technique makes an older, two-story barn into a flexible facility for any number of uses. This barn was originally converted for machinery storage, then remodeled for feeder pig production. Now it is used for vehicle and machine storage.

In larger buildings, bigger and heavier beams can be similarly installed to support the mow floor. Added bracing is important to secure the support beams and concentrated wall loads. Careful design and installation is essential when removing posts and raising or removing the haymow floor.

### Ewe Lambing-Nursery

This 34-by-70 foot double-walled dairy barn was originally constructed to house 32 cows in stanchions, with four 8-by-12 foot maternity and calf pens. In 1968, the North Dakota State University Hettinger Experiment Station adapted the barn for sheep research by removing the stanchions and replacing them with lambing pens and jugs (small pens).

Ewes are wintered outdoors, but have access to shelter in the 28-foot-wide lean-to that was added in 1970. At lambing time (early January), shorn, close-up ewes are penned overnight in one of the eight-foot-wide pens in the main barn. Ewes with newborn lambs are penned in 4-by-5 foot jugs for two to three days until lambs are mothered up. Orphan and bum lambs are penned in a separate room near the office to provide special care. Ewes with lambs are moved from the jugs into eight-head, ewe-lamb groups, and then to 32-head, ewe-lamb groups, in two adjustable pens in the lean-to. From there the groups are moved to pens in another barn to grow until weaned.

To reduce pneumonia problems, the lambing barn is heated and ventilated by exhaust fans. The overhead mow holds straw and hay bales and provides temperature and moisture control. Indoor pens are manually bedded with straw. Manure cleaning is done with a skid-steer loader. A 2-by-6-by-5 foot concrete tank was constructed in the old upright silo pit to dip sheep for convenient, effective tick control.

### Multipurpose Use— Lambing and Customer Pick Up Area

In addition to being practical facilities for farming operations, older barns can serve as marketing tools for retail farm businesses. In this Oregon example, a 42-by-64 foot, gable-roofed dairy barn built in 1904 was rehabilitated as the centerpiece of an organic, community supported agriculture operation. The beau-

tifully restored barn, as well as the historic farmhouse and pumphouse/windmill and the well-kept grounds, attract customers to the farm and encourage them to linger.

The barn had been neglected for many years before the farm was purchased by the current owners. The first job was straightening the structure. The side walls were pulled together with winches and cables and braced, and the cupola was rebuilt. Rotted posts and sills were replaced, and new cedar shingle roofing was applied. Siding and windows were repaired and painted. Inside, old stalls and stanchions were removed and rotted flooring was replaced. A south-facing loafing shed, added to the barn in 1920, was repaired and is used by the farm's herd of Hampshire sheep. Inside the main section of the barn, lambing pens and chutes for working the lambs and ewes were added.

*Older barns can serve as marketing tools for retail farm businesses. This Oregon barn now serves as the centerpiece of an organic, community-supported agriculture operation.*

— Photo by George Burnette







*The owner was able to take advantage of the historic rehabilitation tax credits for the rehabilitation of this 1918 round barn.*

— Photo by Michael Slaughter



A leaf dryer for drying strawberry leaves was installed in the haymow. One end of the barn was converted for a pick-up area for the farm's 100 customer/members. The barn rehabilitation project cost \$25,000 in 1985, but the cost was offset by a 25 percent tax credit for rehabilitation of a certified historic building (now reduced to 20 percent; see page 16).

## Bull Housing

Round barns were an innovation in the early 1900s, but 100 years later they can be a challenge to convert for new farming uses. Still, their status as local landmarks prompts many operators to find ways to put them to use. This Illinois barn was built in 1918 and modeled after the demonstration barns at the University of Illinois Agricultural Experiment Station. The owner bought the barn and surrounding acreage for his cattle semen collection business.

Converting the former cattle barn for its new use required mostly cleaning and repairs. Windows, doors, dormers, and siding were repaired and painted, and a new cedar shingle roof was applied. On the inside, years worth of manure and junk were cleaned out of the barn and 10-by-10 foot steel pens set up to hold the bulls. The barn can accommodate from four to seven pens. The barn's huge, 4,000-bale-capacity haymow serves as the central hay storage space for the operation, which includes four new barns in addition to the round barn. To preserve the barn's history, the owner kept intact the original feeding mangers around the perimeter of the barn and around the central silo. Because of its construction, the barn is solid and quiet in the wind, and it maintains a comfortable temperature inside.

Since the barn is listed in the National Register of Historic Places, the owner was eligible for a 20 percent investment tax credit on his \$35,000 investment (see page 16 for more information). In addition to being a useful facility, the barn is an effective marketing tool for attracting and retaining customers in the artificial insemination business. "The barn leaves an impression on people," says the owner, which gives him an edge when working in a competitive international market. The rehabilitation has also brought praise from the local community.



## General Barn Rehabilitation Information

### **Basic Barn Types**

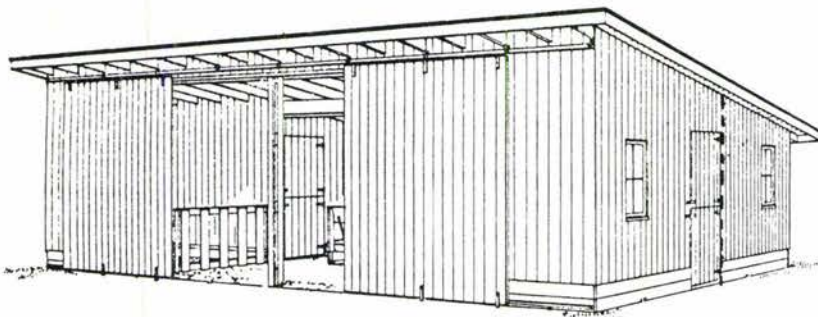
Barns are usually identified by their shape and roof design. Following is a list of the basic barn types. Additional information to help identify and date your barn is available in the publications listed at the end of this booklet.

**Shed Roofs** are single-slope roofs, usually 30 feet wide or less. Common uses of a shed-roof farm building are for machinery storage, livestock, or feed shelter.

**Gable roofs** have two equal slopes and usually span about 24 feet, although truss rafters and roof supports added to post-and-beam structures (note dashed lines) can increase the width to more than 40 feet. Gable-roofed buildings are typically used for grain storage, livestock, poultry, and farm shops. Some large gable-roofed barns have a central floor-to-ceiling hay storage space, with small mows above the side wings.

**Gambrel roof barns** (often incorrectly called "hip-roof") have a two-part pitch that allows for greater storage capacity in the overhead mow. Gambrel-roofed barns are usually 26 feet to 36 feet wide and are typically used to house livestock in the main floor and hay above. Gambrel roof rafters have varied construction and design.

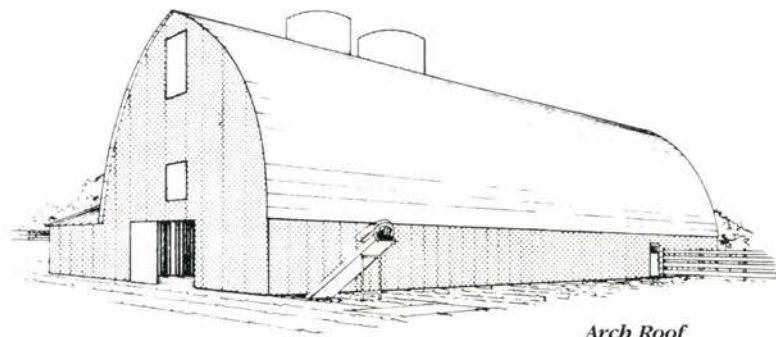
**Arch roofs** provide the greatest amount of clear-span interior space, and can be from 26 feet to 50 feet wide. A pointed arch roof is known as a "Gothic" roof, while a flatter arch is called a "rainbow." Arch-roofed barns are used for livestock, grain, and machinery storage. Like gable and gambrel roofs, arch roof rafters vary in design and construction.



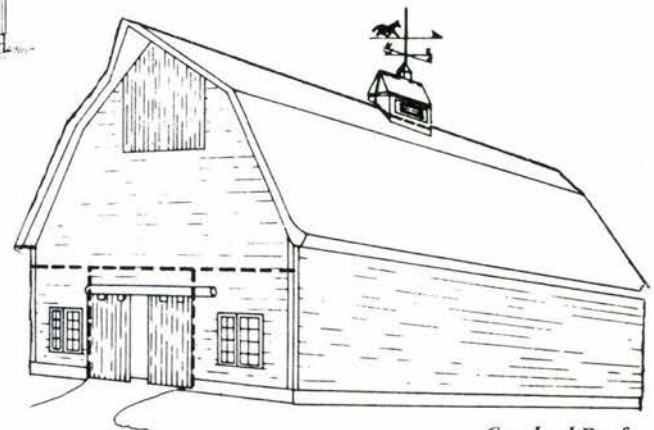
*Shed Roof*



*Gable Roof*



*Arch Roof*



*Gambrel Roof*



### ***Building Components***

The basic building components include the foundation, structural system, walls, roof, and the interior. Checking these basic components will give you a good idea if your barn is sound enough to warrant rehabilitation for a new use.

**Foundations** settle or heave because of concentrated overloads, freezing and thawing of the ground around the building, and degeneration of the foundation material. A failing foundation can result in a building badly out-of-square or out-of-plumb, as evidenced by large cracks, eave line distortions, sagging roof ridges, problems with moisture and air leakage, loosen-

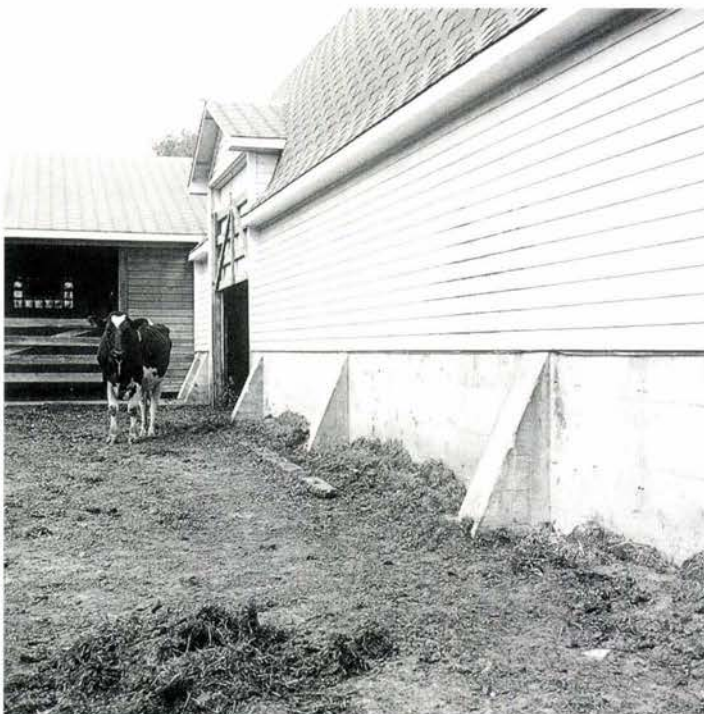
ing of framing and sheathing, and loose-fitting or stuck windows and doors. Usually it is necessary to raise the building's sills and walls to repair, reinforce, or replace a continuous foundation. Sometimes old foundations can be straightened by jacking them back into place and reinforcing.

**Structural system:** Most older barns were constructed with either heavy timber framing (post and beam) or light framing using dimension lumber (stick-framing or balloon framing). Both of these framing systems can fail because of inadequate bracing, deterioration of materials, high winds or other natural causes, or a damaged foundation. Most barn frames can

be repaired quite easily. Walls can be jacked up and rotted sills and posts replaced. Cables can be installed to slowly bring leaning walls back into plumb. Once plumb, cables or wooden braces should be installed to keep the building in place. On two-story barns, a strong cross-tie or floor joists are needed to prevent walls from spreading outward.

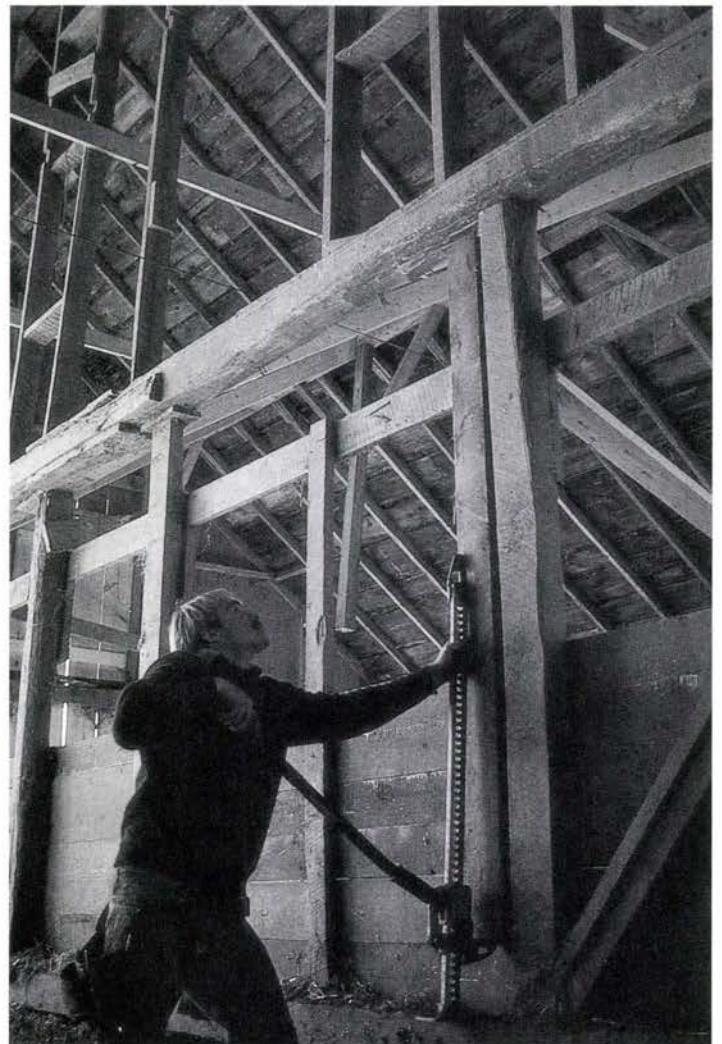
*Walls can be jacked into place, then secured with braces and/or cables.*

— Photo by John Walter



*Cracked and sagging foundations can be reinforced in place with foundation buttresses.*

— Photo by Dexter Johnson

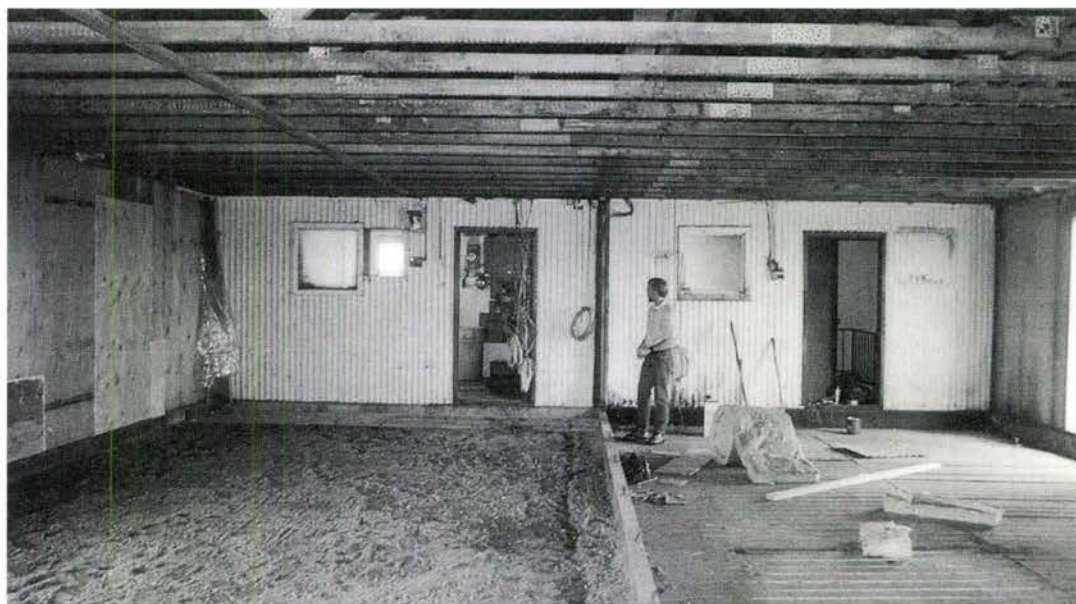




**Walls** need periodic repair and repainting to tighten and improve appearance. Using the existing siding preserves the building's original appearance. Wood siding that is not too damaged can usually be repaired by cutting out damaged portions and replacing them with in-kind material. When painting, walls should be carefully prepared by low-intensity power washing and/or scraping to remove all old and loose paint. Use a high-quality paint that is guaranteed for at least 10 years, and follow the manufacturer's instructions carefully. Energy savings and comfort can be improved by installing removable insulated panels, storm doors or windows over existing doors and windows.



**Roofing** is the most important component in keeping an older barn in good shape. Roofing materials are subject to constant wear from wind, moisture, and sun and usually need replacement every 20 to 50 years (depending on the material). Leakage is most likely to occur at eaves, valleys, and around projections through the roof such as cupolas. When reroofing a barn, removing the old roofing material will allow replacement of rotted roof boards, rafters or purlins where needed, will provide for better attachment of the new material, and will reduce roof weight. Choose a replacement material based on durability, maintenance, cost, and compatibility with the rest of the buildings on the farmstead. If you plan to apply for a tax credit for your barn rehabilitation work (see page 16), be sure to check with your state historic preservation office before choosing a new roofing material.



**Interiors** of buildings include flooring and inside surfaces. Severely cracked, heaved or deteriorated floors usually need to be removed and replaced. Interior posts, beams, and walls should be inspected and treated for rot, rodent, and insect damage and replaced if necessary. While most older barns were not originally insulated, insulation

can be added to control condensation and help moderate the temperature in cold or hot weather, especially in barns used for baby animals and as farm shops. Protect insulation with a correctly installed vapor barrier covered by durable sheeting. New heating, ventilating, water, electric wiring, and waste handling systems may also be required.

*Careful wall preparation and use of a high-quality paint will ensure a long-lasting paint.*

— Photo by John Walter

*Below: Barn interior under rehabilitation for livestock use.*

— Photo by Dexter Johnson



## National Register

The National Register of Historic Places is the official listing of buildings, sites, and objects significant in American history and culture. To be eligible for listing in the Register, agricultural buildings generally must be at least 50 years old and must be “significant” for their association with important persons or events in local or agricultural history, or as examples of a particular architectural style or construction technique. In most cases, individual barns will not be considered for the National Register; they must be part of a complex of several historic buildings.

Listing in the National Register is primarily an honorific designation and carries no restrictions on what property owners can do with their buildings. You can alter and even tear down a National Register building without consulting anyone. Listing in the National Register does not require you to open up your property to the public. Listing does hold some advantages, including tax credits and other financial incentives.

The National Register program is managed in each state by the state historic preservation office (SHPO). If you think your barn or farmstead might qualify, contact your SHPO. You will probably be asked to submit some photographs and basic information so that staff can make an initial determination of eligibility. If they think your barn or farmstead might be eligible, you will be encouraged to submit a formal nomination. This form requires a significant amount of research.

## Estimating Costs

The following list is useful for estimating rehabilitation needs.

1. Foundation repair
2. Sill, stud, and post replacement
3. Material for windows, doors
4. Siding and roofing repair
5. Insulation and vapor barrier
6. Supplemental heaters, fuel storage
7. Ventilation, fans, inlets, controls
8. Floor repair/replacement
9. Pen partitions
10. Feed storage and conveying
11. Water system, waterers
12. Electric wiring, lighting
13. Wall and ceiling sheeting
14. Painting
15. Waste handling
16. Landscaping, drives, fencing

## Evaluating your Project

Carefully evaluate alternatives before deciding whether to rehabilitate or construct new facilities. Use the “Building Components” list to evaluate the structural soundness of your barn, and use the “Estimating Costs Checklist” to help figure the total cost of the proposed project. Consider location of the existing building and its overall construction and design, as well as project cost, and evaluate them in terms of your operational goals. Consider how the older building will accommodate such things as access for vehicles, people and animals, electricity, waste handling, water, and feed. In comparing the costs of using an older building versus building new, consider how the project will be completed. Often an older barn can be rehabilitated or adapted for a new use in phases so that costs are spread out over a long period of time, with little or no debt service. Doing all or some of the work yourself will also bring costs down.

Historic significance also plays a role in deciding the future of an older barn. If the barn has special meaning to your family and/or community, it might make preservation a more attractive alternative than demolishing and building new. Also, historic preservation incentives such as tax credits can help bring down the cost of rehabilitating an older building.

## Historic Preservation and Tax Incentives

Reusing an older building can preserve family and local history and may earn tax credits or other financial incentives. If you are planning to rehabilitate a barn that is more than 50 years old, check with your state historic preservation office (SHPO) for help in developing rehabilitation

plans and in locating experienced professionals to help with your project. In addition, the SHPO can tell you whether your project might qualify for a 20 percent federal investment tax credit for rehabilitation of historic buildings. To qualify, a building must be a “certified historic structure” and be used for income-producing purposes. This excludes the house you live in but includes most farm service buildings. Rehabilitation costs must be greater than \$5,000 or the adjusted cost basis of the building, and 75 percent of existing exterior walls must be retained. Work must follow accepted preservation practices and must be certified by the state historic preservation office. In addition to the federal tax credit, some states offer their own incentives for rehabilitation of historic barns and other buildings. A 10 percent federal tax credit is also available for buildings that were built before 1936 and are not listed in the National Register. This credit can be taken by requesting Tax Form 3468 from the Internal Revenue Service.

## A Note on Safety

Safety is a number one concern when undertaking a rehabilitation project. Many of the projects illustrated in this publication should not be undertaken without proper engineering and construction knowledge and the proper tools. Accidents are common when working with jacks, old lumber, low clearances, and protruding nails, and when working at extreme heights such as on barn roofs. To avoid problems, wear protective clothing, correctly use the proper tools, and have adequate help and insurance coverage. Use ropes for high jobs.



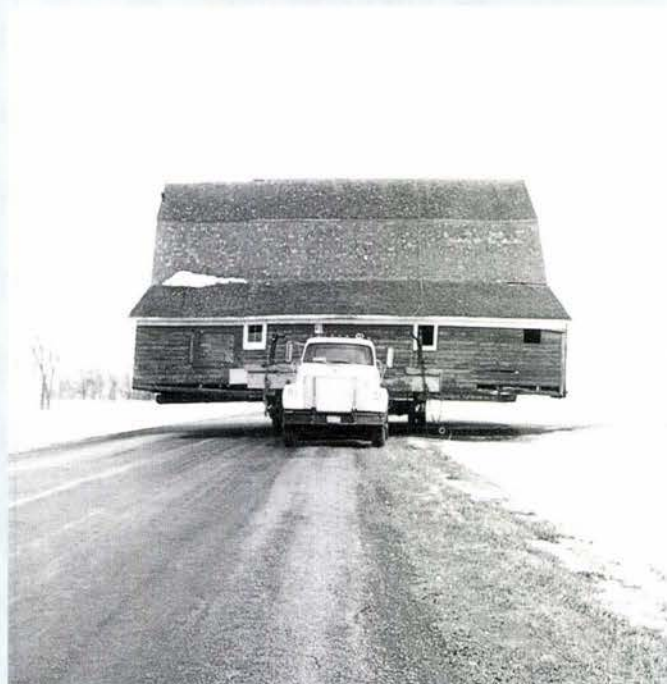
## Moving Old Farm Buildings

Although it is best to use an old building “as is” and where it is, moving an old farm building to a new site is sometimes a practical alternative to new construction. Surplus farm buildings are quite common and can often be obtained for the cost of moving them. Because of their single-wall construction, most farm service buildings weigh much less than a plastered, double-wall house, and moving damage is minimal. The cost of the move will depend on the size of the building, the distance moved, and the required route. Bridges, underpasses, and overhead wires present problems and can increase the cost in transportation and permits. Farm buildings can be moved on skids or timbers overland short distances, especially on frozen ground with little snow. Heavy duty wheels to carry long, thick building support beams are needed for moving a building over several miles.

Professional building movers are available in most areas. Consult at least three different movers to obtain price estimates, licensing and insurance information, and to determine if there will be any special problems such as overhead wires, railroad crossings, communication lines, roadway use, and associated permit needs. For additional suggestions, visit with local persons who have had buildings moved.

A new dairyman expanding on very limited capital in 1983 advertised for and located this unused 38-by-64 foot, two-story tie-stall barn. The 22-mile move, across two railroad crossings and under a large overhead electric power line, cost \$7,000. A new concrete foundation, floor, gutter cleaner, waterline installation, electric wiring, milking equipment and labor brought the total cost to \$30,000. This provided space for 30 cows, a 16-by-20 foot milk room addition, and overhead hay storage.

—Photos by Dexter Johnson





## Resources

### **Where to get help**

County extension agents can provide information about local building codes as well as plans for general construction. County agents can also help with specific farm-related questions such as livestock management and waste handling techniques. Most **extension agricultural engineers at Land Grant universities** have old building plans on file.

Local historical societies or historic preservation commissions have information about financial incentives for rehabilitating older buildings and can recommend contractors and other professional help for your project. They might also be able to help research the history of your barn, which will be useful if you decide to pursue National Register listing.

State Historic Preservation Offices (SHPOs) are part of state government and manage the National Register and federal rehabilitation tax credit programs in each state. Contact: National Conference of State Historic Preservation Officers, (202) 624-5465; [www.sso.org/ncshpo/shpolist.htm](http://www.sso.org/ncshpo/shpolist.htm).

In addition, most states have a statewide, nonprofit historic preservation organization that may be able to provide additional advice and assistance. Several states have statewide BARN AGAIN! or barn rehabilitation programs designed especially to help barn owners rehabilitate their older barns. For a listing, contact your SHPO or the National BARN AGAIN! program or visit the BARN AGAIN! website at [www.barnagain.org](http://www.barnagain.org).

The National Trust for Historic Preservation, chartered by Congress in 1949, is a private, nonprofit organization dedicated to protecting the irreplaceable. It fights to save historic buildings and the neighborhoods and landscapes they anchor. Through education and advocacy, the National Trust is revitalizing communities across the country and challenges citizens to create sensible plans for the future. It has six regional offices, 20 historic sites, and works with thousands of local community groups nationwide. Contact: (202) 588-6000; [www.nationaltrust.org](http://www.nationaltrust.org).

The National Trust's Rural Heritage Program has worked on rural historic preservation issues since 1979. The program focuses on building a rural constituency for historic preservation, creating forums for education, publishing information on rural historic preservation, providing technical assistance to rural communities, and influencing public policy to conserve America's rural heritage. Contact: (202) 588-6279; [www.ruralheritage.org](http://www.ruralheritage.org)

The National Main Street Center was created in 1980 as a human resource and technical reference center to stimulate economic development in the context of historic preservation in towns and small cities. The center conducts training courses, provides technical assistance to states and towns, helps build business and government partnerships, and operates a membership network. Contact: (202) 588-6219; [www.mainst.org](http://www.mainst.org).

BARN AGAIN! is a national program to preserve historic farm buildings sponsored by the National Trust for Historic Preservation and *Successful Farming* magazine. BARN AGAIN! provides up-to-date information to help owners of historic barns rehabilitate them and put them back to productive use on farms and ranches. The program provides technical assistance through the BARN AGAIN! Hot line, publishes rehabilitation guides, sponsors workshops, exhibits and other events and presents annual awards for the best examples of historic barns rehabilitated for continued farming use. Contact: (303) 623-1504; [www.barnagain.org](http://www.barnagain.org).

## Publications

Large blueprint sheets of most drawings shown in this publication are available at \$2 per sheet from Extension Agricultural Engineering, North Dakota State University, PO Box 5626, Fargo, ND 58105 (701) 231-7261. These and other plans are also available on the internet at [www.ageng.ndsu.nodak.edu](http://www.ageng.ndsu.nodak.edu).

The following publications are available from the BARN AGAIN! program, 910 16th St., Suite 1100, Denver, CO 80202; (303) 623-1504; [mpro@nthp.org](mailto:mpro@nthp.org); [www.barnagain.org](http://www.barnagain.org). Costs include postage and handling. Bulk prices are also available for orders of 10 or more.



**BARN AGAIN! A Guide to Rehabilitation of Older Farm Buildings.** 1997 edition. 18 page full-color guide features nine examples of BARN AGAIN! barns; barn rehabilitation checklist; roof, foundation and siding repair tips; and information on the National Register and tax credits. (Cost: \$5)

**BARN AGAIN! Preservation Information Handbook: A Guide for Individuals and Organizations.** Includes reports on BARN AGAIN! demonstration projects and award winners; addresses of state preservation offices; information on the National Register of Historic Places; introductory tax credit information; and a barn bibliography. (Cost: \$10)

**Barn Aid #1: Barn Foundations.** Analyzes major problems of stone, concrete, and concrete block foundations and shows how to remedy them. Includes a checklist for investigating foundation repairs and a guide for estimating costs. (Cost: \$5)

**Barn Aid #2: New Spaces for Old Places.** Describes how to increase clearspan space inside older barns by replacing posts and beams with trusses. Includes drawings and cost estimates. (Cost: \$5)

**Barn Aid #3: Barn Exteriors and Painting.** Information on common siding problems and repair, preparing your barn for painting, and getting the best possible paint job. (Cost: \$5)

**Barn Aid #4: Barn Roofs.** Tells about the different types of barn roofs and how to repair, replace and maintain them. (Cost: \$5)

**Guide to Tax Advantaged Rehabilitation.** Explains the qualifications and necessary steps to take advantage of tax credits. (Cost: \$6)

The **MidWest Plan Service** develops agricultural publications covering topics including agricultural engineering, farm business management, animal sciences, construction, manure management, and ventilation. Plans and booklets are available. Contact: MWPS, 122 Davidson Hall, Iowa State University, Ames, IA 50011-3080. (800) 562-3618; [mwps@iastate.edu](mailto:mwps@iastate.edu); [www.mwps.org/catalog.html](http://www.mwps.org/catalog.html).

#### **Other titles:**

Auer, Michael J. "The Preservation of Historic Barns." *Preservation Briefs* 20. U.S. Department of the Interior, National Park Service, Preservation Assistance Division. (October, 1989). Free on-line version at [www2.cr.nps.gov/tps/tpscat.htm](http://www2.cr.nps.gov/tps/tpscat.htm).

"Barn Again!: Celebrating the Restoration of Historic Farm Buildings." Video, 60 minutes. Available from GPN, P.O. Box 80669, Lincoln, NE, 68501. (402) 472-3611.

Gyrisco, Geoffrey M., ed. Compiled by Peggy Lee Beedle. *The Farm Landscape: A Bibliography of the Architecture and Archeology of Farmsteads and Settlement in Wisconsin and Areas of Origin of Its Settlers in the United States and Europe.* Madison: State Historical Society of Wisconsin, 1997.

Noble, Allen G., and Hubert G.H. Wilhelm. *Barns of the Midwest.* Ohio University Press. 1995.

Stokes, Samuel, A. Elizabeth Watson, and Shelley S. Mastran. *Saving America's Countryside: A Guide to Rural Conservation.* Second edition. Baltimore: Johns Hopkins University Press, 1997.

Vara, Jon. "Giving Old Barns New Life." *Country Journal*. (June, 1985): pp.48-60.

For additional barn preservation titles, consult the BARN AGAIN! Bibliography, available from the BARN AGAIN! program or online at [www.barnagain.org](http://www.barnagain.org).



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The third edition of *Using Old Farm Buildings* was written by Mary M. Humstone, co-founder and former director of the BARN AGAIN! program. She is currently a consultant and freelance writer in historic preservation.

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