▪ POTATO WAREHOUSES

- Usually two-level structures with potatoes stored in the lower level
- The drive-in floor had multiple trap doors for depositing potatoes below
- Floors, walls, and bins were slatted for ventilation
- Most potato warehouses in Minnesota postdate 1900

Minnesota's principal potato-growing regions were 1) counties north of the Twin Cities such as Anoka, Isanti, and Chisago and into the cutover; 2) the Red River Valley, and; 3) north central Minnesota between the Twin Cities and the Red River Valley.

Potato warehouses arose from farmers' need to preserve the best market possible for their crops. While improvements in production and harvest in the early 1900s made it possible to boost volume, the potential to glut the market also increased (Moore et al 1920: 581). To avoid this problem, warehouses were needed that could protect potatoes from post-harvest elements such as cold weather, sprouting, mold, shrinkage, rot, and rodents. Most potato warehouses in Minnesota date from 1900 or later. Similar structures were also used to store onions.

Traditionally, potatoes were planted on Good Friday and harvested in late summer or early fall. Those harvested for family use were stored in bins in the farmhouse basement, or in the farm's root cellar. If potatoes were grown for sale, a potato warehouse was built. Unlike crops such as grains, potatoes were tricky to hold and they needed optimal conditions and constant monitoring while in storage.

Maintaining temperature was the most important function of a potato warehouse. The interior needed to be sufficiently cool to keep potatoes dormant but warm enough to avoid freezing. Experts recommended temperatures between 34 and 38 degrees Fahrenheit. Artificial heat was usually not needed, but stoves were used if necessary. As technology improved, temperature specifications for storing different types of potatoes emerged. Proper ventilation required intake and outtake flues at regular intervals around the structure. After World War II, more modern warehouses used electric fans to circulate air (Moore et al 1920: 582; Kelley 1930: 371; Wooley 1946: 289).

Warehouses were generally two-level structures built in areas with sufficient drainage. Some farmers built into hillsides to augment water runoff. Early warehouses were built completely into the ground like typical root cellars, but later models extended partly above ground with an access door, a gabled roof, and windows in the working areas within the warehouse. In 1920 the most common models were partly above ground. Wagons could drive through the above-ground portion of the warehouse to deposit potatoes through the floor into storage bins on the lower (below-ground) level (Moore et al 1920: 582).

Lower levels had concrete floors sloping toward a drain tile in the middle. The foundation walls were typically hollow tile, or poured concrete framed out with 2" x 4" studs and covered with

See also
Root Cellars
Developing the Cutover, 1900-1940
Appendix: Focus on Minnesota Crops

boards. Hollow tile walls were occasionally extended above ground to the roof to maximize the structure's ability to stabilize temperature, but the upper level was more typically woodframe (Moore et al 1920: 582).

The above-ground walls needed to be insulated. Farmers used a variety of insulation including cork products, mineral wools, hair felt, rock wool, vegetable fibers, wood shavings, and sawdust.

Typically, ceilings were low, with a maximum of 2' of air space between the top of the potatoes and the ceiling. This provided insulation for the produce while preventing condensation from dripping onto the potatoes. Slanted ceilings aided air circulation, which also hindered the formation of water vapor. Slatted floors and walls were used for the same reason.

Openings covered with trap doors were cut in the upper-level floor. They were generally two feet wide and could extend the length of the building. One author explained, "The wagon enters at one end of the building, the potatoes are dropped through the trap into the proper bin, and the wagon goes straight on and out the door at the other end" (Moore et al 1920: 582). Some later model warehouses built along railroad tracks had featured a gabled dormer with a chute filling railroad cars.

Warehouse doors needed to be wide enough for easy access, that is, sufficiently large to accommodate people carrying bushels of potatoes, or, if a larger warehouse, a wagon. Doors were important for ventilation as they could be opened or closed to create an immediate effect of cooling or warmth. Sliding doors were discouraged because they tended to leak more air.

Bins also needed to be constructed and arranged for proper ventilation. The size of the bins depended on the maturity of the potatoes but generally ranged from five to eight feet in width and eight to ten feet in depth. The bin walls used double-slatted partitions with a false floor to permit the circulation of air through all sides of the pile. The slats needed to be correctly spaced so the potatoes couldn't be bruised between the slats and then rot (Wooley 1946; Kelley 1930; Whitnah 1923).

Potato warehouses needed equipment for handling and managing the crop. These items included a manhole, thermometer, sack elevator, trap doors, conveyors, hopper for sacking, potato sorter, stove, and scale.

PREVALENCE

Potato warehouses were concentrated in Minnesota's principal potato-growing regions. It is likely that some well-preserved examples will still be standing.

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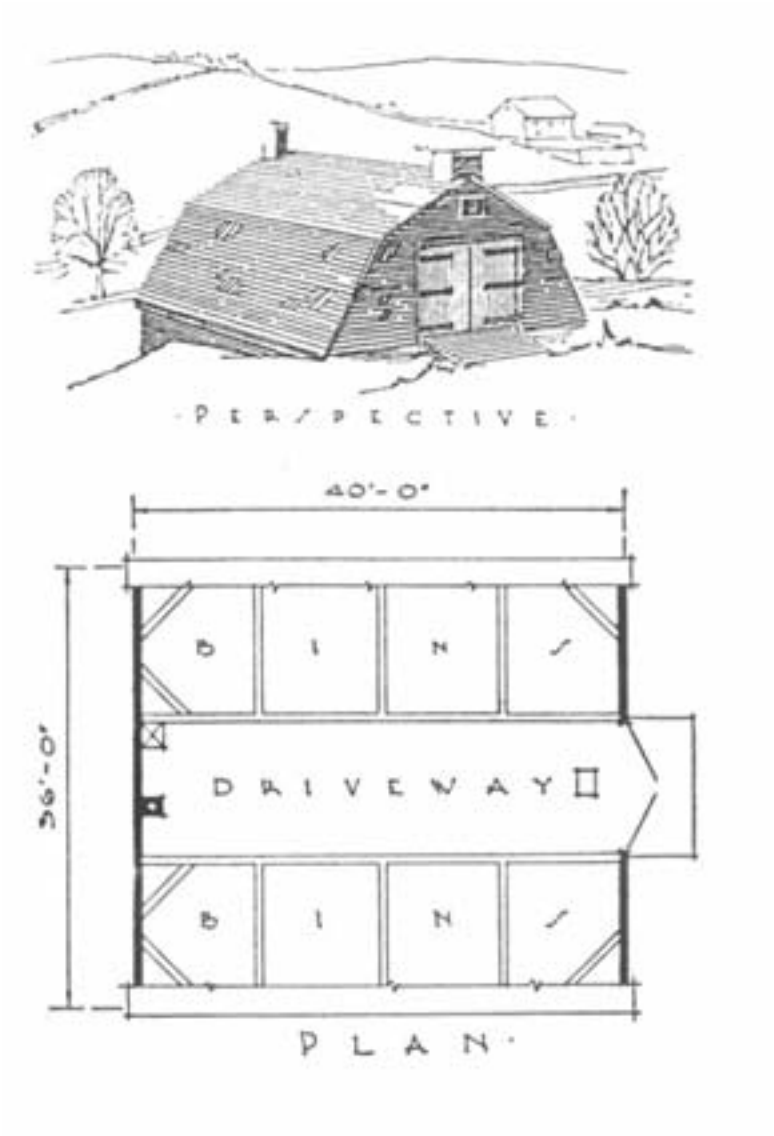

Drawing of a 40′ x 56′ banked potato warehouse published in a 1941 agricultural engineering text whose authors were from the University of Illinois. From Carter and Foster's *Farm Buildings* (1941).

Potato warehouses had large bins in which to store the crop, and slatted bin walls and floors for ventilation. The potatoes were usually stored in a fully- or partially-excavated lower level. The warehouse in this photo is atypically large; it may be on a large farm or be the warehouse of a buyer or middleman. Location unknown, circa 1910. (MHS photo)

▪ POULTRY HOUSES

- Found on nearly all Minnesota farms by 1890
- Often the animal building nearest the house
- Often built within or adjacent to the orchard or garden
- Lighting was critical to egg-laying so houses were oriented so windows faced south or east
- Usually made of wood to be warm and dry, usually well-insulated
- By 1950 new buildings were designed to support larger flocks and mechanization

Chickens were the most common type of poultry in Minnesota. The poultry houses described herein – also called laying houses or hen houses – were most often used for chickens, but could also house the ducks, turkeys, and geese raised in much smaller numbers on Minnesota farms. Turkeys, which were even more susceptible to disease than chickens, were not common in the state until about 1950.

Many farms had a separate brooder house in which chicks were raised during the time they needed special care. See "Brooder Houses," another individual farm elements section.

In 1875-1900, raising poultry was a key way in which Minnesota farms diversified away from a wheat-only regimen. In 1914 poultry was being kept on at least 90 percent of Minnesota farms. A University of Minnesota specialist wrote in 1914, "Poultry pays the farmer in most cases better than any other farm enterprise when the small amount of money usually invested is considered." He advocated that average-sized farms should have sufficient waste grain, extra vegetables, and other discarded food to keep a flock of at least 100 hens profitably (Smith 1914: 170).

Until 1950 eggs were the commodity most often sold off the farm, while both eggs and poultry meat were important sources of food for the farm family.

In 1930 most Minnesota farms had 70-150 chickens, with the average flock being about 100 birds. Poultry became increasingly important in the 1930s and 1940s. Between 1932 and 1948 both the number of chickens raised and the number of eggs gathered increased considerably (Hady and Nodland 1951). In 1939, 90 percent of Minnesota farms kept poultry, and the average farm produced 775 dozen eggs per year (Engene and Pond 1940; Engene and Pond 1944). New buildings were constructed in 1910-1940 to support this increased production.

Before World War II, large-scale poultry farming was not common in Minnesota with one exception – near the Twin Cities. In 1930 about four percent of farms surrounding the Twin Cities raised significant numbers of poultry to feed the urban population (Engene and Pond 1940). After the war, consumption of poultry meat, as well as eggs, increased. Methods to control chicken and turkey diseases improved, and large-scale growers emerged. In the 1950s and 1960s, Minnesota's poultry industry became concentrated in central Minnesota, especially in Kandiyohi, Swift, Meeker, and Stearns counties.

See also
Brooder Houses
Appendix: Focus on Minn Livestock

On average-sized Minnesota farms, eggs were traded or sold in local markets on a weekly basis, with whole or dressed chickens being sold less often. Income from eggs, cream, and butter – plus the occasional sale of livestock – was often the only money that came into the farm between harvests (Thompson 1913: 7). Caring for poultry was commonly the farm woman's responsibility and "egg money" was often spent at her discretion although it went usually for household rather than personal purposes (Thompson 1913: 9). In 1951 a Minnesota Agricultural Experiment Station Bulletin confirmed that women were primary raisers of poultry in that era (Hady and Nodland 1951: 14-15).

Development of Specialized Poultry Houses. According to Allen G. Noble, in early settlement periods throughout the U.S. chickens were often allowed to wander about farms choosing their own places to roost and nest. Eggs for the table were gathered as needed. Eventually farmers built makeshift shelters or remodeled buildings into poultry houses to protect the birds from predators and weather and to make egg-collecting easier. As the potential for poultry income grew, poultry house design received increasing attention (Noble 1984: 116). Until 1950 in Minnesota, however, it was still fairly common to let chickens run free and to, for example, fence the vegetable garden to keep the chickens out, rather than fence the chickens in.

As early as 1891 the Minnesota Farmers' Institutes were encouraging the state's farmers to use sound chicken house practices to increase productivity. One author explained in 1892, "Experience has proved that twenty fowls, properly housed, provided with suitable food, pure water, clean nest boxes, plenty of dust, lime in some form, and gravel, will return more clear profit than fifty, kept as they generally are upon farms" ("Model" 1891; "Convenient" 1892: 203).

A University of Minnesota author wrote in 1914:

> Better poultry houses are needed on our Minnesota farms. Poultry is one of the farm's largest and most successful industries, financially. That the financial benefits of this branch of the farm might be materially increased by providing better quarters for the fowls will be conceded by all those who are acquainted with the conditions which surround poultry raising in Minnesota. That many of the farmers themselves realize this situation is evinced by the fact that for several months past the Poultry Section at University Farm has received almost daily requests for plans of a poultry house suitable to Minnesota farm conditions. To meet this demand, a house for one hundred laying hens that can also be used for such other purposes as poultry houses in general are used for – that is, for housing surplus stock in the fall, and as a combined breeding and laying house in the spring – has been planned (Smith 1914: 165).

Design Goals. Hens were sensitive animals that wouldn't lay eggs, or would only lay small eggs, if their housing was too cold, hot, drafty, damp, or dark. Birds of all ages were susceptible to diseases and pests, with chicks and young birds being particularly vulnerable (hence the need for specialized brooder houses). The best poultry houses were dry, clean, well-ventilated, roomy enough to provide exercise, warm during cold weather, and well-lit with some darker areas. Many houses were built with removable roosts and other fixtures so that the building could be given a thorough annual cleaning with disinfectant (Cooke 1925: 84).

Many of the diseases and parasites that threatened poultry lived in the soil for up to three years. Hence some farmers built poultry houses on skids so they could be moved to new ground, or built elevated runs so that the birds would not come into contact with the soil. These practices were even more important for brooder houses because chicks were particularly susceptible.

Lighting was another critical design consideration because hens slowed their eating, activity level, and egg-laying in the late fall and winter when daylight declined. As egg supplies decreased during winter months, egg prices rose, giving farmers strong incentive to devise ways to increase winter laying.

Location. The poultry house was usually the closest outbuilding to the farmhouse so that women could conveniently tend chickens and gather eggs while also cooking, cleaning, churning butter, and caring for children. Poultry houses were usually sited within, or near, the farm orchard and/or adjacent to the vegetable garden to make good use of space, help make women's labor more efficient, and allow poultry to keep the insect population down near the fruits and vegetables. The houses were not sited in the shade of large trees because maximum sunlight was needed. The poultry house was often placed on the leeward side of a windbreak or hedge to help it stay warm. The site needed to be well drained, and fresh green grass was helpful. Houses almost always faced south or east to catch maximum sunlight. Post-World War II poultry buildings were also sited for easy access to electrical service, feed storage, and truck access.

Size. The size of the poultry house was generally determined by the size of the flock. Three to four square feet of floor space per bird was recommended, with smaller breeds needing less space (Cooke 1925: 77; Cooke 1948: 3). Plans distributed by the University of Minnesota included poultry houses in a range of sizes including 12′ x 14′, 16′ x 30′, 16′ x 32′, and 24′ x 24′. Using the recommended capacity just noted, these buildings would have housed flocks of 38, 136, 146, and 164 birds (*Farm Building Plans* 1953). Poultry houses made up of several side-by-side pens or cribs were often called "continuous" or "long" houses. They were sometimes the result of farms expanding their housing as the size of the flock grew.

In 1914 the University of Minnesota developed plans for a "Minnesota Model Poultry House." Several sizes may eventually have been designed, but the first was a 16′ x 30′ shed-roofed building covered with vertical siding. On the main facade the house had three double-hung windows with transoms and two small, low chicken doors. There was a pedestrian door on one end wall. The interior was divided into two spaces with the largest occupying two-thirds of the interior. The cost of materials was about $1,650 in 2003 dollars (Smith 1914). The University also designed "Minnesota Model" brooder houses (Smith et al 1936).

Stories. Most poultry houses were one story tall, but some were a story and a half to allow feed, bedding, or other items to be stored in a loft.

Two-story poultry houses were much less common. A national history of poultry production indicates that "Multi-storied houses appeared in the 1920s, first in the Northeast and later in the Midwest and other parts of the country" (Hanke et al 1974: 227). Two-story houses were sometimes used in locations where land values were high. A two-story structure could also result in a net savings of materials over two one-story buildings (Midwest Farm 1933; Barre and Sammet 1950: 260). The Midwest Plan Service offered plans for two-story houses in both 1933 and 1937. A 20′ x 20′ building, for example, could house 175 to 225 hens. Plans for much larger two-story

houses were offered by Midwest Plan Service in 1937 and by the University of Minnesota in 1953. They were 26′ x 100′ and 28′ x 86′, respectively, and both included an indoor feed room. A 1948 University source suggested a two-story house might be useful for flocks of more than 1,000. In 1943 an article in *Agricultural Engineering* (Otis and White) provided an analysis of a two-story poultry house on breeder George Ghostley's farm in Anoka. The text suggested that large, two-story houses were fairly new in Minnesota (Cooke 1948: 15; Midwest Farm 1933; Midwest Farm 1937; *Farm Building Plans* 1953; National Plan ca. 1950; Otis and White 1943).

Materials. Poultry houses were generally not expensive to build or operate. Only simple carpentry skills were needed, and some farmers built them with wood harvested on the farm or with salvaged materials. Some farmers remodeled old buildings. Some even built poultry houses of straw, although these were usually temporary.

Most poultry houses in Minnesota were framed with dimensional lumber and sheathed with wood siding. Some were sided with tar paper, especially in northern Minnesota's forest cutover areas. Some had interior walls of lath and plaster. Experts favored wood over masonry materials like brick, hollow tile, or concrete block because wood was better at keeping moisture and frost from accumulating.

In the late 1930s and 1940s new building materials and methods were introduced. Pole-frame and factory-built structures (either fully- or partly-prefabricated) were sold for poultry housing, just as they were for cattle and hog shelters and for storing grain and farm machinery. In 1933 a modular steel poultry house was being advertised in *Successful Farming* magazine ("New Steel" 1933). In 1955 Stran-Steel was promising "There's a Quonset for Every Job on Your Farmstead," including housing poultry (Stran-Steel 1948; Stran-Steel 1957).

Roofs. Poultry house roofs were often shed, gabled, or saltbox, and were covered with conventional roofing materials. Shed roofs were easier to construct and had the advantage of shedding rain to the rear rather than forward into the chicken yard. Since a poultry house needed a low ceiling to conserve heat, the total height of the building was often around 6′ to 7′. Gable-roofed houses accommodated more insulation in the attic and were often called "straw loft" houses. Some poultry houses also had roofs with a half-monitor projection that provided extra windows in a clerestory. Houses with clerestories may have been less common in Minnesota than other states because of winter heat loss from the extra windows.

Floors. Makeshift poultry houses often had dirt floors that might even be below grade and therefore cold and soggy. A few experts suggested that dirt floors could be used for flocks of less then 200 but cautioned against moisture accumulation. Wood floors were sometimes built with tar paper sandwiched between two layers of wood for warmth and to keep out moisture. While wood was popular, some specialists pointed out that wood floors were vulnerable to gnawing rats who might raid the nests (Welch 1906: 256). Poured concrete floors were promoted for washability. In some plans the University of Minnesota noted that floors could either be poured concrete or carefully-laid layers of coarse gravel, topped by fine gravel, topped by hard-packed clay, and then topped by a final layer of fine sand (*Farm Building Plans* 1953). Whatever the floor material, experts recommended that houses have a foundation of mortared stone, brick, or concrete that was laid deep enough to prevent frost heave. It was optimal to build the foundation high enough to allow the floor to be elevated about 1′ off the ground. Most floors were covered with straw bedding to protect hens from cold and to reduce humidity (Cooke 1943: 4; Wooley 1946: 88).

Doors. A people-sized service door that opened inward was usually placed on the main facade or on an end wall. Both service doors and interior doors were usually hung about 8"-10" above the floor so the bottom edge of the door wouldn't scrape the pile of accumulated droppings and bedding straw which grew higher as the winter progressed. Since doors were hung higher than floor level, tall thresholds were needed so the chickens wouldn't escape. Experts advised that doorways be sufficiently wide to allow a thorough annual cleaning, including removal of nesting boxes and other interior fixtures.

Many poultry houses had small chicken doors, about 1'-square, that allowed the birds free access to the outside. Angled gangplanks led from the doors to the ground (or to elevated poultry runs). The walkways often had strips of lath nailed crosswise at intervals. The small doors were generally closed during the winter and at night to keep out cold and predators.

Ventilation. Environments with damp, cold, or overly-humid air made poor poultry houses. Good ventilation was important to preventing the build-up of pathogens, dust, and ammonia, and to keeping the interior dry (Greene "Poultry" 1904: 239; Smith 1914: 165). In the simplest poultry houses the door was simply propped open – a practice that didn't support fine adjustment of air quality. Features that improved ventilation included adjustable window sash, windows on the end walls, transom or window openings covered with screens of muslin cloth, louvered openings, and passive ventilation flues. The flues consisted of hollow wooden channels that began at a point about 3" above the floor and extended up through the roof. Muslin screens over window openings tended to clog with dust and were superseded by adjustable louvers and wire mesh screens.

As flocks grew larger the need for ventilation increased. Around 1950, for example, the National Plan Service was providing plans for a large 1 1/2-story poultry house with a 40' x 40' footprint and a storage loft for feed and bedding. The lower 4' of the front wall was entirely covered with woven wire fencing for ventilation, anticipating the open sides that would become standard on large poultry houses after 1960 (National Plan ca. 1950).

Insulation and Heating. To protect the birds from cold it was recommended that ceilings be about 6' tall and walls and ceilings be 4" to 6" thick and well-insulated. If the building's roof was higher than 6', a loft space was created and filled with insulation. Until 1940 most chicken houses were insulated with straw or fine wood shavings. Sawdust was not recommended because it settled and could cause rot near sills and studs. Structural insulation board was being tested and recommended in 1937 according to one author (Ward 1937). Barre and Sammet wrote in 1950 that exposed insulation board did not hold up well to the pecking of chickens (Barre and Sammet 1950: 250).

During long Minnesota cold snaps, insulation was sometimes not sufficient and heat lamps or other artificial heating was used (Fox 1940).

Windows. Windows on the south elevation were preferred to allow strong sunlight to shine inside. Sunlight helped heat the building and maximize brightness during the late fall and winter when the birds stopped laying as daylight declined. Many experts recommended that about one-quarter of the south elevation of the building consist of windows, but some cautioned that too many southern windows could cause overheating during the day. Some suggested that the interior be whitewashed four times a year to increase reflective light and facilitate cleaning (Brown 1910: 150).

Artificial Lighting. By the 1920s research was confirming that artificial light helped sustain egg-laying through the late fall and winter, and farmers were encouraged to install lights when their farms were electrified to take advantage of winter egg prices.

Despite the fact that electric lights could significantly increase winter egg production and profits, poultry houses were not the first farm buildings to receive electric lights. On most Midwestern farms, the house and dairy facilities were usually lighted first. One study of electrification on demonstration farms in 1927 found fewer than one-third had lights in their hen houses (Brown and Boonstra 1927: 213). During the 1930s poultry house lighting increased statewide.

According to University of Minnesota poultry specialist Cora Cooke, a common practice was to light the hen house from 5 a.m. until daylight and again from dusk until about 8 p.m. Usually the house was equipped with dimmers to simulate natural light changes. Cone-shaped reflectors around the lamps helped even the light. The lamps were usually placed about 6' from the floor (Cooke 1948: 14-15). Specific lighting schedules were eventually found to be unimportant – according to a 1974 history of the poultry industry, "Experiments with various lighting schedules showed clearly that it made little difference whether one used morning lights, evening lights, or both, to lengthen the hens' working day. Even dim all-night lights were reasonably effective" (Hanke et al 1974: 232).

Runs and Sun Porches. Many poultry houses were built with fenced yards south of the house. Continuous poultry houses often had an exercise run extending from each interior pen and chicken door. Yards or runs could be "freshened" by seasonally planting new crops of small grains within them (Smith et al 1936: 4). Fences had to be sized so birds couldn't fly over them, and horizontal boards along the base of the fences were sometimes needed to keep out invaders. Chicken yards often had feed troughs.

Some poultry houses had "sun porches" attached to the south side, or free-standing in the yard. They were usually elevated above the ground so that the birds could exercise without direct contact with disease-harboring soil. Sun porches were usually long and narrow and built of a combination of wood and poultry netting. Their tops were sometimes built of glazed windows (somewhat like a cold frame for starting seedlings) to allow the chickens to receive beneficial sunlight during cool weather (Fox 1940).

Some farmers used lightweight movable roosting shelters made of wire mesh that were placed in a yard or pasture. The structures were often called "range shelters" (Cooke 1943: 4).

Interior Arrangement. Experts recommended that a poultry house have two or more interior pens. Multiple pens allowed birds to be separated by sex and age (both strong determiners of behavior) so that each population received appropriate care. Breaking up the flock prevented disease from spreading, and also helped the caretaker keep better track of individual birds and their health. Interior dividing walls were often solid near the floor to prevent floor drafts and chicken fights, but made of wire netting above to facilitate air circulation.

Equipment. Most chicken houses had dust boxes, roosts, nesting boxes, broody coops, water containers, and food troughs. Some experts suggested that poultry houses also include a place for a pencil and paper for daily record-keeping. Most of the equipment could be built on the farm, although after 1950 it was often factory-made. In 1953 the University of Minnesota was still

providing plans for farm-built alfalfa racks, droppings pits, roosts, nests, removable nests, community nests, water stands, and sorting crates for separating birds (*Farm Building Plans* 1953).

Dust Box. Dust boxes were shallow wooden boxes (e.g, 2′ x 5′ x 6″) that allowed chickens to take dust baths, which kept them free from lice (Cooke 1925: 83). One author wrote in 1906, "Did you ever see a hen so happy as when she can kick her feathers all full of dust and then lie in the warm sunshine?" (Welch 1906: 263). Dust boxes were filled with road dust or ashes and placed in a sunny spot on the floor.

Roosts. Most poultry houses had wooden roosts or perches on which the birds could settle. Many roosts were simply parallel sets of wooden rails that could be removed for cleaning. The roosts were built at a uniform height so the birds didn't fight over the highest perch (Moore et al 1920: 564). Many houses had removable droppings boards beneath the roosts that caught the droppings and could be taken outside for cleaning. Some roosts had a curtain to keep the chickens warm at night.

Nesting Boxes. Individual nesting boxes were wooden or metal cubicles attached in tiers to the walls, the lowest about 18″ above the floor. A 16′ x 30′ poultry house might have 30 nesting boxes. Some had hinged doors so the nests could be darkened to discourage hens from eating their eggs. While they were initially square, many later nesting boxes had circular openings. Community nests were spaces large enough to accommodate several birds at once. They were used because hens liked to nest together, but needed to be sized correctly so the eggs wouldn't be broken.

Broody Coops. Broody coops were used for "broody hens" or those hens which were sitting on eggs until they hatched into chicks (a three-week process). Farms needed a significant number of new chicks each year to keep the laying flock young and productive. A simple broody coop could consist of a poultry-net enclosure that was hung in an upper corner of the poultry house. The coop was placed near the ceiling so that other hens wouldn't roost on top of it. Male birds or sick hens could also be segregated in the broody coop. By 1900 some farms had incubators powered by kerosene or another fuel that provided consistent heat to hatch eggs. By the 1910s commercial hatcheries were becoming more common and by the 1920s many farms bought chicks instead of hatching their own, unless only a small number was needed. After the late 1930s hatcheries sold sexed newborns, which allowed farmers to spend their feed dollars on chicks that would become laying hens, rather than on undesirable male chicks.

Water and Food Containers. Water containers and food troughs or "feeders" were sometimes attached to interior walls to maximize floor space and to keep the hens from standing in the food pans or scratching dirt into them (Greene "Poultry" 1904: 245). Some troughs were portable to facilitate thorough cleaning of both the trough and the house (Cooke 1948: 13). Some feeders had hoppers to store and dispense the feed. Water containers were sometimes shallow pans or rectangular galvanized iron boxes. Water stands were wooden frames designed to hold pails of water. If the house was furnished with running water, a stand might be placed by the spigot.

Alfalfa Rack. An alfalfa rack or green feed rack was a hopper-like enclosure attached to the wall with sides built of poultry netting. The rack was filled with chopped alfalfa or other fodder. A 1937 source suggested that "green cured alfalfa" had just come into favor in the 1930s as winter feed (Midwest Farm 1937).

Droppings Pit. A droppings pit was an elevated platform made of poultry netting that was sometimes placed under the roosts. Bird droppings fell through the netting, keeping the birds clean. The framework was periodically tipped up and the manure removed from the floor.

Electrical Equipment. As farms were electrified in the 1930s-1950s, farms increasingly used electrical equipment in the poultry house. Devices included artificial lighting systems, electric waterers, drinking water warmers, heat lamps, brooder heaters, egg incubators, ventilation fans, feed conveyors, egg conveyors, egg coolers, egg cleaners, egg candlers, egg graders, and burglar alarms. By 1954, 39 percent of the state's poultry farmers had an insulated poultry house and 20 percent had a fan-ventilated house; both were more common among large producers (Hjort and Manion 1955: 35).

Egg-Cooling and Storage. Eggs needed to be gathered twice a day and cooled as quickly as possible. A 1954 Minnesota survey found that "56 percent of farmers gathered eggs in a pail or can, 40 percent used a wire basket, and 4 percent used some other container" (Hjort and Manion 1955: 35). Properly stored, eggs could last at least six months. Historically Minnesota farms cooled and stored eggs underground – for example, in a root cellar, other outdoor pit, or basement – or in a cooled building such as an icehouse or springhouse. In 1954, 66 of Minnesota poultry farmers stored their eggs in the house basement, 13 percent in (or on) the house porch, 11 percent in the kitchen, and 10 percent in another location such as a refrigerator, pumphouse, well, barn, or "egg house" (Hjort and Manion 1955: 36). Mechanical cooling equipment such as evaporative coolers, spray coolers, and basket coolers were still uncommon. To protect egg quality, by 1961 experts were recommending a homemade cabinet egg cooler for flocks under 2,000 and a room-type cooler for flocks over that number. Egg coolers contained shelves with wooden slats or mesh-covered holes. Wire baskets of eggs were placed on the shelves and fans moved air through the cabinets to cool the eggs (Neubauer and Walker 1961: 273).

Fattening Houses. Fattening houses were uncommon and were only used by large-scale poultry producers. They were small one-story buildings in which broilers (chickens to be sold for meat) were kept in tiers of crates while being fattened for market (Plumb 1918: 377).

TRENDS IN THE 1940S-1960S

Research conducted in the 1930s and 1940s suggested that poultry could flourish under colder temperatures than had been previously thought, and poultry house designers responded with larger screened windows and more ventilation. Experiments in feeding revealed the benefit of various supplements and the positive effect of all-mash diets on egg production.

By this time artificial lighting was having a significant impact on poultry raising. A 1953 Rural Electrification Administration survey of farms in Ohio and Indiana before and after electrification showed that within five years of electrification the number of laying hens increased 55 percent, the number of chicks hatched increased 130 percent, and the number of turkeys raised increased 109 percent – largely due to electricity (Pringle 1953: 330). As electricity was adopted, the need to align poultry houses with south-facing windows for lighting diminished.

After World War II the population of the U.S. increased considerably, as did consumer demand for meat. "Broilers," or poultry raised for meat, became increasing important in Minnesota. Poultry raising moved away from an enterprise distributed on farms throughout the state. Some Minnesota

farmers enlarged their flocks, taking advantage of improvements in breeding, feed mixtures, labor-saving building designs, and mechanized equipment. The majority of farms stopped raising poultry entirely, unable to compete with farms that were mechanizing. One effect of this change was to displace Midwestern farm women from one of their traditional farm jobs (Jellison 1993: 156-157).

By 1950 poultry houses on some large farms included multi-storied buildings and/or buildings designed to support mechanized equipment and other new techniques. Eggs, water, feed, and manure were all handled in new ways to maximize efficiency. By the mid-1950s, flocks of 500 to 1,000 layers were common in Minnesota, and turkey flocks were often 1,000 birds or more (Cavert 1956: 23). Most Minnesota poultry became concentrated on a few large-scale farms, mainly in central and west-central Minnesota.

Features introduced in the 1950s and 1960s to facilitate controlled growing environments and intensive production included:

- buildings deeper than traditional narrow poultry houses (e.g., 36' or more deep)
- two-story houses
- confinement housing
- centralized feed centers around which pens were arranged
- mechanical overhead feed carriers
- bulk feed storage
- better placement of feed troughs to make feeding more efficient
- better placement of nests to speed egg collection
- 6- to 12-case egg coolers; egg cooling rooms
- larger pens
- mechanical ventilation to mitigate crowding
- concrete exercise runs
- isolation areas for sick birds
- radiant slab brooders
- slat or wire floors for cleanliness and manure handling, especially in milder climates
- use artificial insemination
- elimination of roosts
- increased use of cage houses in which birds were confined to wire cages installed in rows (Barre and Sammet 1950: 262-263; Neubauer and Walker 1961: 86- 95).

In 1956, Minnesota ranked second in chicken production and fourth in turkeys (Roberts et al 1956: 396). In 1972, just 62 farms grew nearly two-thirds of Minnesota turkeys (Tweton 1989: 277).

PREVALENCE

Since poultry was kept on at least 90 percent of Minnesota farms in the first half of the 20th century, a poultry house was found on nearly every farmstead. It is expected that many will still be standing. Early examples of the post-World War II trend toward raising very large flocks with mechanized production methods may also be extant.

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In addition to being in the Minnesota Historical Society archives, this photo appears in the 1925 *Minnesota Farmers' Institutes Annual* article "House the Flock for Comfort" by Cora Cooke, a longtime member of the University of Minnesota faculty. Cooke's caption reads: "The old and the new. Mrs. Beck at Barnum still finds the old log [poultry] house useful in addition to her new straw loft house." Note that the gabled house had ventilators or heater chimneys and an addition on its left end. All had expansive south-facing windows. The log poultry house could perhaps have been used seasonally as a brooder house. Beck Farm, near Barnum, circa 1912. (MHS photo by Horton)

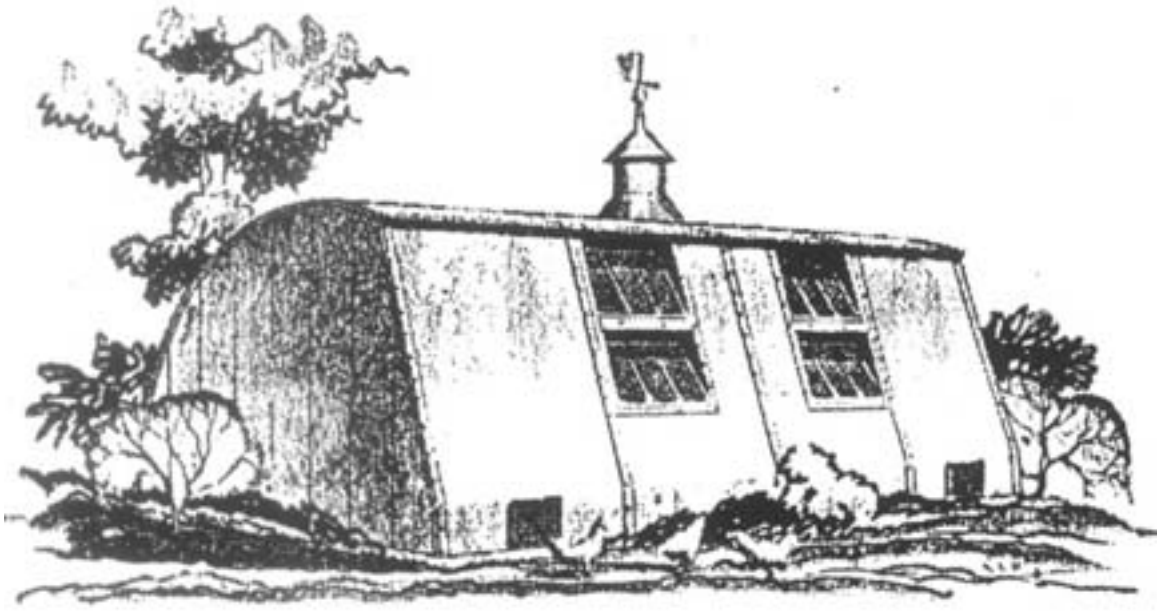
Poultry house designs changed little over many decades. This type of house was sometimes called "continuous" because it was made up of a series of adjacent interior pens. The house in this photo had roof vents as well as exercise runs built of poultry netting stretched between wooden posts. There were boards at the base of the fencing to keep out rats, foxes, and other marauders. An orchard of young trees was growing within the runs. Location unknown, circa 1915. (MHS photo)

The average Minnesota farm produced 775 dozen eggs in 1939. Eggs were taken to market about once per week, a job made easier by the automobile. Location unknown, 1952. (MHS photo by Norton and Peel)

A 12′ x 18′ poultry house like this one would only be suitable for a small flock of about 60 chickens. Built circa 1924, this house has clapboard siding, eight double-hung windows, and a pedestrian door in the end wall. Its shed roof is covered with rolled asphalt roofing. Scott Farm, Garrison Township, Crow Wing County, 2003. (Gemini Research photo)

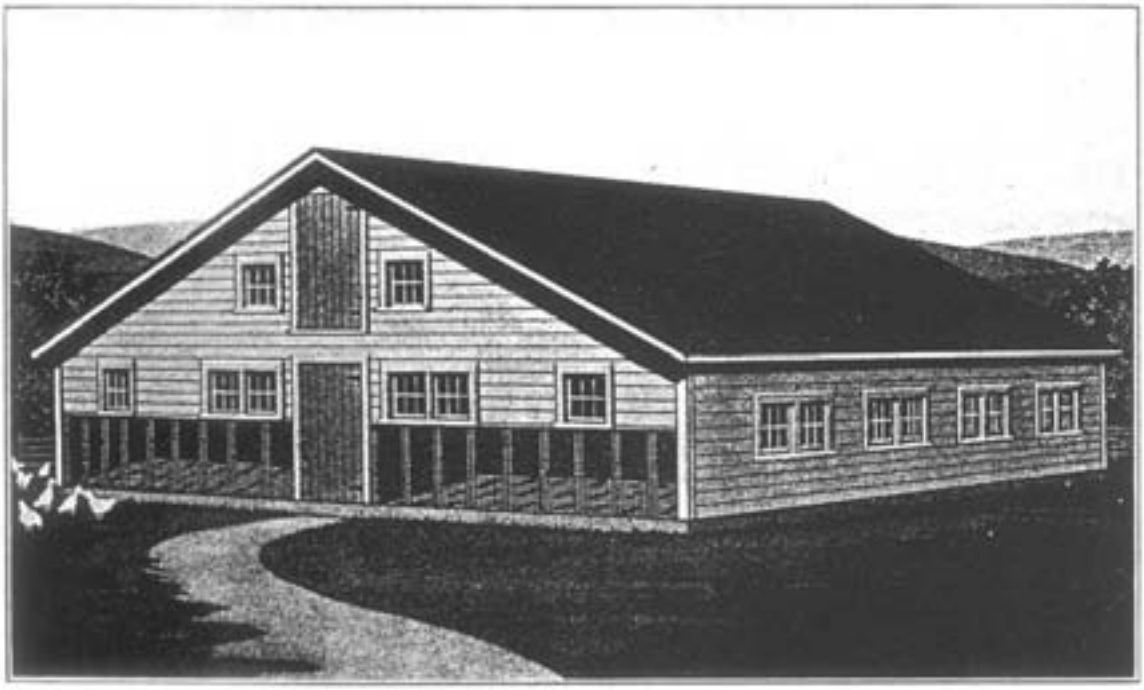
Most poultry houses were built of wood so they would be warm and dry. This house had a broody coop made of wood and poultry netting (mounted in the upper corner near the ceiling) where hens sat on eggs for new chicks to replenish the flock. Along the left wall were roosts on which the birds could settle over a droppings board that was removable to facilitate cleaning. Near the lower left corner of the photo were nesting boxes. The floor of the house was covered with straw bedding. This photo, which is in the MHS archives, also appears in Cora Cooke's 1925 article "House the Flock for Comfort" (*Minnesota Farmers' Institutes Annual*). Location unknown, circa 1910. (MHS photo)

This photo in the Minnesota Historical Society collection was also featured in the 1923 Minnesota Agricultural Extension Service bulletin by G. A. Lundquist entitled "What Farm Women are Thinking." The building had nesting boxes attached to the wall, a feed trough, and a metal stand that was probably used for a heater. The upper portion of the dividing wall (upper right corner of photo) was made of poultry netting to facilitate air circulation. Location unknown, circa 1910. (MHS photo)



A steel poultry house available in the 1930s. It was sold in modular sections to make a building either 20′ x 14′ or 20′ square. From *Successful Farming* (Oct. 1933).

Improvements in poultry farming included selective breeding, reducing disease through better building design and sanitation, and optimizing feed mixtures. These advances spurred continual increases in productivity after 1920. Two-story poultry houses like the one shown here were uncommon in Minnesota, but some farmers built them where land values were high. Location unknown, circa 1925. (MHS photo)



Around 1950 the National Plan Service was providing plans for this 40′ x 40′ poultry house with a storage loft for feed and bedding. The lower 4′ of the front wall was entirely covered with woven wire fencing for ventilation, anticipating the open sides that would become standard on large poultry houses in subsequent decades. From *Practical Farm Buildings* (ca. 1950).

■ POWER HOUSES

- Power houses were usually small woodframe buildings
- Stationary gas engines were used by 1900
- Before the 1930s a significant number of farms generated their own electricity for lights and small appliances
- The most common method for generating electricity was a gasoline engine with a generator and storage batteries

In the years before electrification, many Minnesota farms used a stationary gas engine to provide power for chores, or to generate electricity. Such engines and generators were commonly housed in a small woodframe building called a power house.

Power houses were often free-standing buildings located near the farmhouse or between the farmhouse and barn. These were small, insulated buildings, often woodframe, with a footprint that might be 8′ x 8′. Engines and batteries were usually mounted on a raised platform, often concrete, to protect them from moisture. The house often had an outlet hole for the gasoline exhaust (Brooks and Jacon 1994: 66).

STATIONARY GAS ENGINES

Farm engines that burned gasoline or kerosene were available by 1895, and by 1912, there were many brands of engines providing one to ten horsepower. Farmers used these engines to run all kinds of machinery, including corn shellers, grinding mills, grain cleaners, feed choppers, silo fillers, hay balers, concrete mixers, water pumps, lighting plants, washing machines, butter churns, cream separators, tool grinders, saws, lathes, and post drills. While useful, early gas engines were unreliable, especially in cold weather. When farms were electrified, stationary gas engines were generally replaced with cheaper, safer electric chore motors (Barlow 2003: 131).

ELECTRICAL GENERATION EQUIPMENT

In Minnesota electricity was little used on farms before 1917 although "an occasional farm had electricity as early as 1909," according to the University of Minnesota. It was estimated that about five percent of all Minnesota farms had electricity in 1929, and that the larger and more prosperous the farm, the more likely it was to have electricity. Most of these electrified farms were generating their own electricity, rather than receiving it from outside transmission lines (Cavert 1930: 8, 11, 67). (See "Utility Poles and Equipment," another individual farm elements section, and the essay entitled "Focus on Farm Electrification" in this report's appendices for more information on electrification.)

In 1939, about five percent of Minnesota farms (or about 9,760 farms) were lighting the farmhouse with electricity generated on the farm. Three parts of the state were above the state average: six

See also
Utility Poles and Equipment
Windmills
Water Power Structures
Appendix: Focus on Farm Electrification

percent of farms in the southeastern counties, seven percent of farms in the southwestern counties, and eight percent of farms in the Red River Valley were lighting the house with home-generated electricity in 1939. This compares with about 25 percent of Minnesota farms in 1939 that were lighting the farmhouse with electricity from an outside line (Engene and Pond 1944: 28).

The most popular farmstead electric power plant (also called "lighting" plant) was the gasoline-powered engine that drove a generator, which was combined with a set of batteries for power storage. Other methods of generating power – including wind power generators and water power generators – had to rely on steady wind or water flow and were less popular (Musselman 1912: 136; Mowry 1915: 4-5; Keilholtz 1921: 109; Kline 2000: 99-104; Wolfe 2000: 522).

The average farm plant produced only about one kilowatt of electricity – just enough for lights and a small motor. Home electric plants rarely powered major home appliances because their generating capacity was too low, and because electrically-powered barn equipment generally took priority over household uses. Several surveys in the 1920s and 1930s, however, found that farm families used home power plants mainly for household tasks such as lights, ironing, and running the washing machine and cream separator (Kline 2000: 104; Jellison 1993: 99).

The gas-powered engine that ran the electricity generator was often portable and often used for other purposes on the farm. Keilholtz wrote in 1921, ". . it was common practice to cart the engine anywhere about the place for ordinary gas engine jobs" such as separating cream, pumping water, sawing wood, running grinders, or washing clothes. Because the gas-powered engine was often taken away from the generator, a bank of batteries was often needed so that "electricity was available, theoretically anyway, without running the engine all the time" (Keilholtz 1921: 109).

In addition to supplying electricity for lighting, the farmstead electrical plant could also power a small stationary electric motor for running a grinding stone, corn sheller, fanning mill, root chopper, meat grinder, or other small machine. The electricity from home generators was not recommended for pumping water. Rather, a University of Minnesota publication advised farmers to buy a small gas engine just for pumping water for the stock, thus preserving the life of the larger and more expensive home electric plant (Stewart "Electricity" 1921: 115-116).

By 1916 there were some 100 companies manufacturing farmstead electric plants. One of the most popular was the Delco power plant, made from 1913 to 1947 by Dayton Engineering Laboratories of Ohio. Typically, an on-farm Delco plant consisted of a 32-volt, direct-current system with storage batteries and an energy capacity of 850 watts. (An electric iron used almost all of the output from an 850-watt Delco plant.) By 1935 at least 367,000 Delco-Light plants had been sold in the U.S. (Kline 2000: 103).

Midwestern farms commonly installed a low-voltage on-farm system of 32 volts, which required a battery of about 16 storage cells. A 110-volt system, which required a battery of about 60 storage cells, was too expensive for most farms. The low 32-volt system was not recommended if farm buildings were widely scattered, however, because the transmission wires required for a low-voltage system were too large to be practical for long distances (Keilholtz 1921: 110).

The basement of the house was probably the most common place for the farmstead electrical plant (Kline 2000: 104). But agricultural engineers suggested placing the plant in or near the building where most of the current would be used (Keilholtz 1921: 110). This saved installing long lines of

expensive wire. "For example, don't place the electric plant at the house if there is only a moderate usage of current there, [and if] it is planned to run a milking machine twice a day at the barn with a 1/2, 3/4, or 1-horsepower motor" (Keilholtz 1921: 110).

Farmstead electric plants were one of the most complicated technologies on the farm, delicate, and often troublesome. Farmers often described the generators as notoriously unreliable. The engines were usually gas-powered, but some used other fuels, such as natural gas, liquid propane gas, alcohol, or kerosene. Early engines had to be cranked by hand to start them. Later self-starting engines were an improvement (Keilholtz 1921: 109; Wisconsin Motor 1960: 651).

After 1935, as centralized high-line power service became available, the number of farm electrical plants began to decline. However, some farmers who had already invested in gas engine-powered pumps, milking machines, and milk coolers were somewhat slow to adopt electricity because they felt that discarding working equipment would be wasteful and foolish (Schaenzer 1957: 447; Kline 2000: 208).

By 1954, the USDA estimated that there were about 28,000 home electrical plants in use on American farms (Schaenzer 1957: 445).

PREVALENCE

Many farms had a stationary gas engine or electric generator sheltered in a power house. It is likely that many power houses were eventually converted to other uses such as storage. Some may still be standing.

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A power house (left), grinding tool (front), and granary (right). Both buildings were covered with pressed metal siding simulating brickwork. Location unknown, circa 1910. (MHS photo by Harry Darius Ayer)

It was common on Minnesota farms to use a gasoline-powered generator to produce electricity for lighting, and to move the gasoline engine around the farm to power equipment that would saw wood, separate cream, sharpen tools, or wash clothes. Location unknown, circa 1925. (MHS photo)

■ PRIVIES

- Earth vault privies were the simplest type
- Concrete vault and dry earth privies were recommended as more sanitary
- Still constructed in the early 1950s

Privies, also called outhouses, were small, unheated, outdoor toilets used before indoor plumbing became available on farms. They were usually square or rectangular woodframe buildings with gable or shed roofs. A typical outhouse might be 4' square. Most had vents in the gable ends and a small, high window. Many were portable (e.g., rested on skids) and could be moved to new locations as needed. Inside the building was a raised wooden toilet seat with one or more openings, sometimes covered by hinged wooden lids.

Early farm privies were usually earth vault (also called earth pit or deep vault) toilets that had an open pit underneath the building. The outhouse was moved when the pit became full. Farm educators excoriated the use of earth vault privies. In 1901 F. L. Marsh wrote in *Farmers' Institutes Annual* wrote: "That horrible abomination, the deep vault, is in common use in country and village. It should never be used. It is not only offensive, but forms a hotbed for the breeding of such disease germs as those of typhoid fever. The contents are continually draining down into the soil, where the germs will live for a long time, and there is often danger of their reaching the well" (Marsh 1901: 136).

The concrete vault privy was considered more sanitary. This style of outhouse sat over a poured concrete vault that had to be periodically cleaned out. It was recommended that the entire privy be raised on a concrete foundation.

Another style, the dry earth privy, also rested on a stone, brick, or concrete foundation. Underneath the toilet seat was a moveable, water-tight galvanized iron box, sometimes mounted on runners. A hinged door at the rear of the privy allowed the box to be removed periodically and emptied. Inside the building, next to the toilet seat, was a box containing fine dry earth, peat powder, or slaked lime. This was frequently sprinkled in the box to speed decomposition (Marsh 1901: 136; *Farm Building Plans* 1953).

Privies were usually located a "prudent distance" from the well and farmhouse and were moved as needed (*Minnesota Farmscape* 1980: 5). Dry earth privies were sometimes attached to other buildings or placed in the space between two buildings (Marsh 1901: 138).

The 1940 census indicated that only 12 percent of Minnesota farmhouses had running water. The University of Minnesota's Vernon Davies wrote in 1947, "Minnesota does not make a favorable showing in comparison with other states with respect to water and bathroom facilities and mechanical refrigeration. There was a higher proportion of flush toilets in farm homes in 32 other states, running water and private bath in 33 other states, and mechanical refrigeration in 37 other

See also
Cesspools and Septic Tanks
Farmhouses

states according to 1940 census data. Only North Dakota, South Dakota, and Missouri in the Midwest show a lower ranking" (Davies 1947: 10). Minnesota farmhouses also lagged far behind its urban houses in modern conveniences.

In the early 1950s the University of Minnesota was still publishing plans for farm outhouses (*Farm Building Plans* 1953). As late as 1960, 20 percent of Minnesota farmhouses still did not have running water and indoor toilets (Jellison 1993: 55, 169).

PREVALENCE

Privies were built on virtually all Minnesota farms. Some are still standing – both examples that are intact and some that were altered for other purposes after indoor plumbing was installed.

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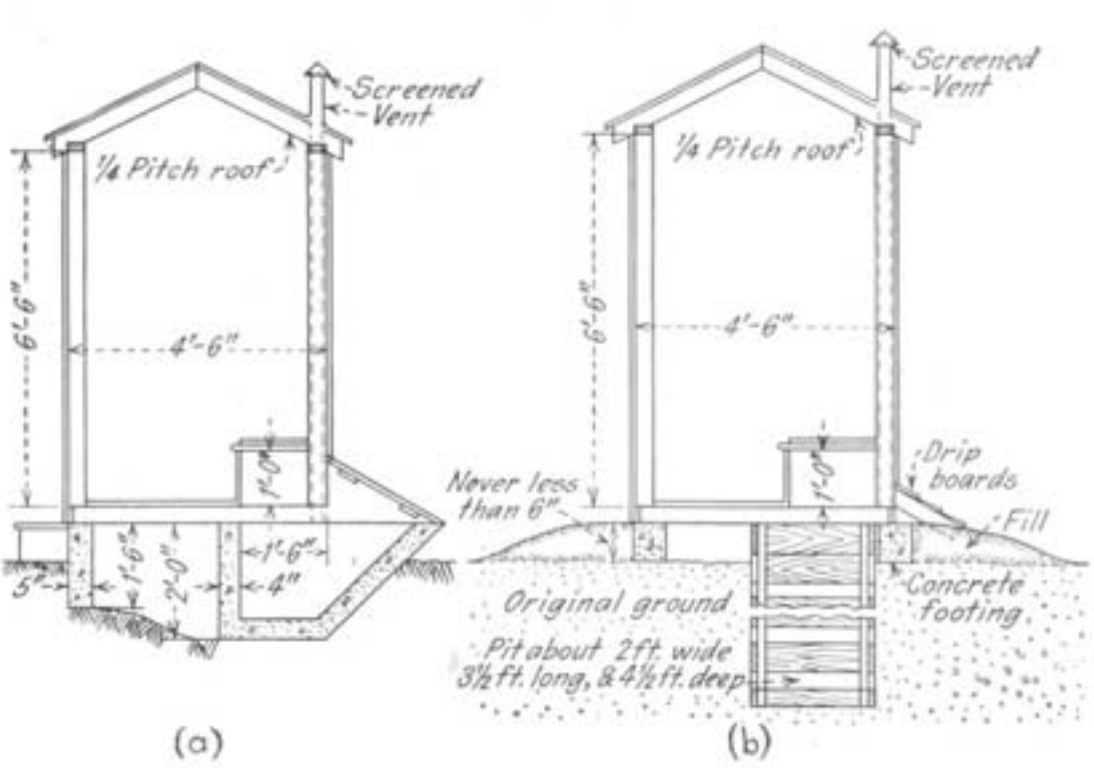
A farm privy or outhouse near Apple Valley, 1951. In 1940 Minnesota ranked 33rd among states in the number of farmhouses with flush toilets. (MHS photo)



This drawing illustrates a concrete vault privy on the left and an earth vault privy on the right. From Wooley's *Farm Buildings* (1946).

■ PROPANE GAS STRUCTURES

- A pressurized gas used for heating, cooking, and operating crop dryers and other equipment
- Propane tanks were often located near the farmhouse or in the farmyard
- Bulk tanks likely date from the 1940s or later

Propane gas is a fossil fuel found underground mixed with natural gas and petroleum. It is stored in liquid form in pressurized tanks. Propane is the most common of several "liquefied petroleum" or "LP" gasses, and the terms "propane gas" and "LP gas" are often used interchangeably.

Propane was first "bottled" and sold in 1912, about two years after it was discovered. In 1927 the first domestic propane gas appliances were developed. The principal industry group was organized in 1931 as the National Bottled Gas Association. Sales of propane gas and gas-burning appliances and equipment increased considerably after World War II (National ca. 2002).

Fixed propane bulk tanks were generally located above ground in the farmyard mid-way between the farmhouse and another building in which the gas was used. Farms also used portable "bottles" or cylinders of propane that were installed on pads or racks on the side of farmhouses and other buildings.

Farm bulk tanks were refilled by propane dealers (including farmers' cooperatives) who drove to farms in tanker trucks. Dealers also delivered bottles of gas, or farmers picked them up on trips to town.

Today about one-half of U.S. farms use propane to heat farmhouses and other buildings and to fuel equipment like crop dryers and chicken brooders.

PREVALENCE

Propane tanks and associated equipment are found on farms throughout Minnesota. Most likely date from the 1940s and later. Examples that predate that era are probably uncommon.

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See also
Farmyards
Power Houses
Farmhouses

Bulk propane tanks usually stood near the farmhouse, or between the farmhouse and another building in which the fuel was needed. Propane was commonly used for heating and cooking, as well as for drying crops, fueling brooders, etc. Scott Farm, Garrison Township, Crow Wing County, 2003. (Gemini Research photo)

■ PUMPS AND PUMP HOUSES

- Pumps were found on nearly all farms to pump water from wells, springs, lakes, and cisterns
- Pumps were powered by hand, wind, or gasoline or electric motor
- Pump houses protected pumps from freezing

One of the essential features on almost every farm was the pump. Except for artesian wells, most wells required a pump to raise the water. These pumps used air pressure to force water up through a pipe. They could be powered by hand, by a windmill, or by a gas or electric motor (Stewart 1922: 13). (See also "Wells," "Windmills," and "Cisterns," three other individual farm elements sections.)

There were many types of well pumps. Simple, hand-operated pitcher pumps were commonly used indoors to pump water from a cistern. Pumps with drop cylinders, which had to be submerged in water, were used in shallow wells that had been dug or bored. For deeper wells, suction and force pumps were used. These types of pumps were capable of lifting water through a long pipe or into an elevated tank (Brooks and Jacon 1994: 67, 71; Stewart 1922: 13-15).

Pumps commonly used for irrigation were horizontal and vertical centrifugal pumps, deep well turbine centrifugal pumps, and plunger and air lift pumps (Brooks and Jacon 1994: 67, 71; Stewart 1922: 13-15).

To prevent freezing, pumps could be located above ground in an insulated pump house or underground in a covered dry well. Pumps were sometimes used with pressurized water tanks, which also could be housed in the well pit (Marsh 1902: 65; Stewart 1922: 11; Brooks and Jacon 1994: 72).

In artesian wells, natural pressure on the water table automatically delivers water to the surface. A 1933 USDA bulletin advised farmers to use heavy casing and valves to regulate the water flow and preserve their artesian wells (Brooks and Jacon 1994: 73).

When the farm had a good spring, a hydraulic ram was a simple and cheap way to pump water. This device harnessed the energy of the water flowing downhill through a pipe and into a circular pressure chamber. It produced an intermittent, but reliable, stream of water (Mowry 1914: 99-100).

Farms could also pump lake water by using a siphon pipe. It could raise the water as much as 25' above the lake to fill a cistern (Stewart 1922: 6).

Pump houses were small buildings that housed pump machinery. They were often located at the base of a windmill. They were usually one-story, square or rectangular woodframe structures with poured concrete floors. The floor usually sloped away from the pump platform to promote drainage. Pump houses had to be insulated or heated to protect the pump from freezing (Brooks and Jacon 1994: 66-67).

See also
Wells
Windmills
Water Tanks and Tank Houses
Cisterns

University of Minnesota specialists urged farmers to use insulated, above-ground pump houses rather than well pits, because "the pump and machinery can be kept dry, clean, and sanitary and the equipment is easier to reach for service and repairs" (Brooks and Jacon 1994: 67). Elevated water tank houses for storing water were sometimes built above pump houses (Stewart 1922: 2).

PREVALENCE

It is assumed that historic pump houses are likely to be extant on some Minnesota farms. Many were likely converted to other uses such as storage when they were no longer needed.

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A hydraulic ram could be used if the farm had a good spring. It worked with the energy of the spring flow to produce an intermittent but reliable stream of water. Location unknown, circa 1920. (MHS photo)

A hand-operated well pump at the base of a steel windmill tower. Photo taken near Nassau in Lac qui Parle County, circa 1912. (MHS photo)

A pump house at the base of a windmill. Photograph taken near Welch in Dakota County, circa 1909. (MHS photo)

■ ROADS, LANES, TRACKS, SIDEWALKS

- An efficient farm road system minimized the amount of land devoted to roads and lanes
- Narrow unimproved lanes led between buildings, from farmstead out to fields and pastures, and between fields and pastures
- Livestock tracks were narrow well-worn paths made by animals
- The preferred driveway approached the house from one side

PUBLIC ROADS

In many parts of Minnesota – especially where flat topography permitted it – public roads were created along the section lines of the original Public Land Survey. These lines tended to form the boundaries of individual farms, rather than traveling through them. Straight roads were not the rule, however, and many public roads were winding and crooked because they were routed to bypass steep hills, lakes, ponds, and other low areas (Wayne 1977: 22).

Public roads sometimes evolved from private farm lanes or "cartways." Cartways were sometimes 16' or one rod wide, while public township roads were 32' or two rods wide.

Township and other public roads were used by farmers to access fields that were discontinuous from the primary farm. Geographer John Fraser Hart explained, "In Minnesota many local roads, which at first glance might be considered nonessential because no dwellings front on them and they carry little traffic, are actually vital because they provide the shortest routes between farmsteads and noncontiguous tracts of land" (Hart 1975: 87).

Mechanization advanced the construction of public roads. While horses could handle uneven trails with mud and ruts, the adoption of farm cars and trucks with their smooth tires spurred the improvement of hard-surfaced, all-weather rural roads. At first farmers only used their cars in good weather because of poor rural roads. The number of automobiles on American farms more than doubled between 1920 and 1950, and the number of farm trucks increased eighteen-fold during the same 30-year period. By 1953, there were 4.4 million farm automobiles and 2.6 million farm trucks in this country, and roughly two-thirds of American farms were located on an improved road (Cavert 1956: 20-25).

Farms on unimproved roads were at a big economic disadvantage. "When everybody lived on a mud road and used horses, it didn't make much difference whether one lived on a main road or on a side road," wrote one historian in 1956. "Today, being off the good road may mean lack of a milk pickup, of school bus facilities, and in some cases, the lack of electricity and telephone service" (Cavert 1956: 25).

See also

Roadside Markets
Animal Underpasses
Cattle Guards
Garages
Farms
Boundary Markers

For decades farmers were largely responsible for the maintenance of public roads in rural Minnesota. Farmers were taxed for road maintenance, an obligation they paid in either cash or, more often, road-dragging labor. In the 1910s and 1920s state road and bridge funding and the state highway department were established, and local governments began to buy equipment to maintain rural roads. As a practical matter, however, many farmers took it upon themselves to drag, grade, and clear snow from the public roads near their farm. This practice continues today on little-used township roads.

Motor transportation and improved roads made consolidated school districts and agricultural extension programs feasible. Cars and better roads "greatly enlarged the shopping area and widened the horizon of farm families" (Cavert 1956: 20). And mechanized transportation brought big changes in how farm products were marketed and distributed, creating global markets – and global competition (Cavert 1956: 20-25; Hart 1998: 374).

Farm Roads, Lanes, Cartways. Private routes within a farm were usually called roads, lanes, or cartways. The distinction sometimes depended on their width and level of improvement. Lanes or cartways were often narrow, generally unimproved routes that led between buildings, led from the farmstead to the fields and pastures, and connected fields and pastures to one another.

Lanes or cartways sometimes developed "informally" through the continued use of a customary path. Lanes were used to move livestock and equipment around the farm in everyday operations. They were sometimes improved with small bridges or other built structures, in which case they might be called "roads" (Hart 1998: 107; Howe 1940: 6; *Farm Building Plans* 1953)

Farmers tried to arrange their fields and pastures so as to minimize the amount of land that had to be sacrificed to unproductive roads and lanes. W. M. Hays wrote in 1894, "A simple lane around two or more sides of the barn, and leading, as an artery from the heart, to all the barn lots and out to the center of the farm, communicating with all the fields is a rarely found but most convenient thing" (Hays 1894: 275). Because pastures and fields were usually fenced, farmers also tried to reduce the number of gates that had to be opened and closed (Howe 1940: 5).

Experts encouraged farmers to maintain the roads and lanes within the farm. The University of Minnesota's Andrew Boss advised in 1914, "A day or two expended annually in putting the roads on the farm in good condition will often save much loss of time" (in getting stuck in the mud, for example) (Boss 1914: 162). Tractor-drawn drags and later equipment such as front-end loaders eased this task.

Livestock Tracks. Livestock tracks or "cow paths" were narrow, worn paths made by animals, often walking single-file. Dairy cows, for example, often walked in well-worn tracks between pastures and the dairy barn.

Driveways. The main entrance driveway usually served both the house and the farmyard. It had to be wide enough for farm vehicles and was usually sloped to reduce snow drifting. To be serviceable all year round, it also needed a gravel or hard surface (Snyder 1950: 5).

Driveway location and length was dependent on farmstead layout. In the late 19th and early 20th century, it was recommended that farmsteads be placed in the center of farms to provide the most efficient access to surrounding fields, which was particularly important when relatively slow draft

horses were used. By the 1910s competing theories were recommending that farmsteads be placed closer to the public road. According to the University of Minnesota's Boss and Pond in 1951, this arrangement "avoids the necessity of maintaining an all-weather road [driveway] from the public road to the farmstead. In northern climates it may require considerable effort to keep a long lane free from snow in winter. In the days of horse travel this was not so important [because horses could walk over snow and sleighs were used] but with practically all road travel motorized it is important to keep a road open and passable at all times" (Boss and Pond 1951: 161). They also point out that "passing travel will create interest and break the monotony of daily routine in the household" and that telephone and electrical lines are more accessible if the driveway is shorter and the farmstead closer to the public road (Boss and Pond 1951: 161).

The preferred entrance drive approached the house from one side, then passed near the service door at the back of the house, and led to the garage. A good driveway arrangement included a turn-around area near the service door, and parking near the main entrance of the house to encourage visitors to come to the main door. The main drive usually branched off to the farmyard, which served the barns, stockyards, grain and feed storage buildings, and other business areas. Snow drifting patterns were also important in driveway placement (Cady 1919: 2; Snyder 1950: 5; Hunt 1937: 8, 12; *Farm Building Plans* 1953).

Sidewalks. Sidewalks were desirable near the house. Usually made of poured concrete, they provided a safe, hard surface for walking, led visitors to the main door, highlighted interesting features of the landscape, and kept the house cleaner. Farmers were advised to install one sidewalk leading from the parking area to the main door and another leading from the back door into the farmyard (Hunt 1937: 10; Snyder 1950: 5).

PREVALENCE

It is expected that roads, lanes, and driveways will be found on virtually all farms in all parts of the state, but may have been altered. Historic sidewalks may be less prevalent. Livestock tracks will be most evident in permanent pasture areas or on other land that has escaped tilling.

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This circa 1950 aerial photo shows a hierarchy of public road, driveways, and smaller field lanes. This was a prairie area, judging by the windbreaks and the straight, unwavering public road, which was aligned north and south. From *Modern Farm Management* by University of Minnesota professors Andrew Boss and George Pond (1951).

A well-landscaped farm driveway. Photo taken near Duluth, 1935. (MHS photo)

Even as early as circa 1900 this farm had a neat lawn with a sidewalk near the house. Holton Farm, Lac qui Parle County, circa 1900. (MHS photo)

Narrow lanes or cartways connected buildings, linked the farmstead with fields and pastures, and formed routes between fields and pastures. Stearns County, 2004. (Gemini Research photo)

A well-worn livestock track along the edge of a stream. Most were made by animals walking single-file. Stearns County, 2004. (Gemini Research photo)

ROADSIDE MARKETS

- Small woodframe market structures used for selling seasonal produce
- Usually located along well-traveled highways
- Popular between about 1915 and 1965

Roadside markets or stands were generally used on farms that were located adjacent to well-traveled roads. They became fairly popular in Minnesota with the advent of autos, and were common through the 1960s. One author wrote circa 1950, "The automobile traffic on public highways has made it possible for farmers in many sections of the country to build up a good retail trade with steady customers" (National Plan Service ca. 1950).

Small market stands were operated seasonally by farm families who sold "farm fresh" fruit, vegetables, eggs, poultry, milk, cream, honey, and other products. The University of Minnesota's Andrew Boss and George Pond, writing in 1951, cautioned farmers, "The gain in prices received for goods sold must be sufficient to pay for the time of the attendant who gives the service," and concluded, "Roadside markets can not be given a blanket endorsement. Many of them tell their own story of disillusionment by rusty signs, and dilapidated housing or abandonment" (Boss and Pond 1951: 336).

Three popular plan catalogs for farmers, all released around 1950, contained plans for about eight styles of roadside markets. Some of the markets depicted were permanent, while others were portable to offer flexibility of location. All were one-story woodframe structures, and most had gabled roofs. Some markets had roof projections to protect customers during inclement weather (National Plan ca. 1950; National Plan 1951; *Farm Building Plans* 1953).

The smallest structures measured 3' x 4' and 6' x 6' while the largest was 16' x 20'. One structure depicted in the plan catalogs had a counter on which produce could be displayed and cash exchanged. Both sellers and buyers stood outside of the simplest open-walled structures, while the most elaborate were fully enclosed with display shelves and bins. One variation offered a lunch counter. Several markets had hinged doors and shutters that were hooked to the ceiling when the stand was open, but could be closed tightly during the off-season.

PREVALENCE

Farm roadside market stands were built along busy roads throughout the state. They may have been especially popular near the edges of towns and in recreational or tourist areas. Some are likely to have survived, although those built of strong materials may have been adapted to other uses, and those made of more flimsy materials may be in very poor condition.

See also

Orchards
Gardens (Vegetable)
Greenhouses, Hotbeds, Coldframes
Roads, Lanes, Tracks, Sidewalks

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An "attractively arranged" roadside market depicted in a 1951 text on farm management written by University of Minnesota faculty. From Boss and Pond's *Modern Farm Management* (plate 22).

■ ROOT CELLARS

- Essential for the storage of food for the kitchen, crops for sale, and livestock feed
- Located near the kitchen, near the livestock barn, or between the farmhouse and fields
- Several forms were popular
- Ventilation flues were important

On nearly all Midwestern farms, some form of "root" or vegetable storage cellar played a crucial role in family and business operations, particularly before the advent of electric refrigerators and freezers. Jaakkola and Frericks wrote that prior to electrification, "storing food was a major challenge" that involved canning, pickling, smoking, drying, and curing, as well as cold storage. Food needed to be preserved for home use, for cash sale, and for livestock feed. Root cellars were also known as "storm" or "cyclone" cellars because they could provide refuge during severe weather.

A 1999 study by Rivercrest Associates found "the root cellar was by far the most common" ancillary structure on farmsteads in Minnesota's cutover region [presumably after the outhouse] (Henning et al 1999: 54).

Farms that sold market produce could increase profits with a root cellar. Adequate storage meant farmers could time their sales and avoid glutting the market with too much produce when prices were low. (Some farms that raised apples or other fruit also had the option of paying to store their crop in a communal commercial facility.)

Root cellars stored a wide variety of produce and crops including apples, carrots, turnips, squash, potatoes (for eating and seed), salt pork, smoked meat, eggs, milk, cream, butter, and cheese (Noble 1984: 88). Eggs could be held for six weeks if conditions were correct. While sometimes used by necessity, the root cellar did not work well to store dairy products because the cream and butter picked up the taste of the stored vegetables (Jaakkola and Frericks 1996: 28).

The number of root cellars increased in the early 1900s as farms raised more livestock and used more root crops such as rutabagas, turnips, and mangels as livestock feed. This was especially common in areas like northeastern Minnesota where growing sufficient quantities of corn was difficult.

Some root cellars were built within or adjacent to a livestock barn. Some were located adjacent to the farmhouse foundation and accessible from either outside or from the basement. Others were located closer to the fields.

Borrowing from their ancestors' resourcefulness, Minnesota's earliest settlers constructed small cellars from the materials at hand including packed earth, logs, and fieldstone rubble. Those settlers near rivers used river bluff caves for the same purpose. Root cellars then became more elaborate.

See also

Potato Warehouses
Springhouses and Springboxes
Icehouses
Dairy Barns
Appendix: Focus on Minnesota Crops

A small cellar might be 8′ x 10′, and a large structure 20′ x′ 36′ (Midwest Farm 1937). To maximize their effectiveness, cellars needed to control temperature, humidity, circulation, and light (Structural 1941). All were low, windowless structures.

Air circulation was especially important during the first three to six weeks of storage. Vegetables during this time go through a "sweating" period during which they give off heat and excess moisture, and ventilation is crucial. Most cellars used passive flues to move the air. After World War II, some farms used electric fans (Hotchkins and Hunt 1943: 4; Moore et al 1920: 590).

Within the cellars, farmers used slatted wooden baskets or bins that allowed air movement through the produce (Kelley and Amundson 1933: 9). Some cellars also included racks, shelves, barrels, and boxes.

Root cellars were built in several common forms:

Pit Storage. Simple pit storage consisted of wooden barrels filled with produce placed into the ground and then covered with dirt and straw to maintain the proper temperature – neither freezing nor warm enough for sprouts and rot. Air intakes, long aluminum or steel pipes, were built into these pits to allow the movement of air (Hotchkins and Hunt 1943: 6).

Ground Cellars. Ground cellars were built into the ground but with an outside entryway, usually a door. Ground cellars used the cold already trapped in the soil and clay to cool the produce. They were often built into the sides of slopes to reduce digging and take advantage of natural drainage and air circulation. Southern and eastern slopes were preferred in order to protect the cellars from northwesterly winds (Pflughoeft 1914: 193).

The above-ground portion was often built of stone rubble. Some experts recommended hollow tile walls; the dead air in the tile provided "satisfactory" insulation. To prevent groundwater seepage through the tile, a cement wash provided a waterproof barrier (Moore et al 1920: 589). The upper portion of a ground cellar could also be built of curved wood covered with canvas and a cement wash.

Stand-alone Cellars. Stand-alone cellars emerged in the 1920s, but were uncommon in Minnesota. These above-ground structures had concrete foundations in areas where extreme cold temperatures might occur or, in warmer regions, concrete posts or piers to keep the produce off the ground and to aid air circulation. The raised platform could accommodate motorized vehicles for more convenient loading and unloading (Kelley and Amundson 1933: 9, 36). To prevent freezing, experts recommended that cellar walls and roofs be double-layered, leaving space in between to create insulating dead air (Midwest 1933). Some cellars were built with glazed tile and others were built of brick or clapboard. A stand-alone cellar illustrated by Carter and Foster had a width of 8′, a length of 8′ to 16′, and a ceiling height of 7′ (Carter and Foster 1941: 288).

Basement Cellars. Basement cellars in farmhouses offered farmers the convenience of storing produce close the kitchen. They were more challenging to use because ventilation could be difficult and furnaces, if located in the basement, could make conditions too warm. Experts recommended dropping interior shafts from a window to the floor. To avoid overheating from the furnace, farmers

could partition a section of the basement, and seal the area with two layers of wood and insulation (Hotchkins and Hunt 1943: 8).

Outside Cellars Connected to the Basement. This type of cellar was built below ground outside the basement wall but accessed from the basement via a small door. As with other cellars, ventilation pipes and drains were crucial to maintain the proper environment for storage.

The use of root cellars for home use on Minnesota farms declined in the 1950s and 1960s. During this period fewer farmers fed root crops to cattle and hogs, the last farms were electrified, more farms could afford mechanical refrigerators and freezers, transportation had improved so that farmers made more trips to the store, and pre-made frozen foods became more popular.

PREVALENCE

Root cellars of various types were built throughout Minnesota. They were especially common in the cutover. The largest root cellars may have been built on farms that fed root crops to livestock or sold produce for cash. It is likely that some well-preserved examples are still standing.

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This ground cellar may have been built of canvas stretched over curved sticks and rough boards. Note the ventilation flues. Location unknown, circa 1910. (MHS photo)

Root cellar (a ground cellar type) of Finnish construction. John Kurnicki Farm, St. Louis County, 1937. (MHS photo)

Many root cellars were built of stone rubble. Some were dug into hillsides; others were partly excavated and then banked with earth and sod. Konristo Farm, Carlton County, 1918. (MHS photo by *St. Paul Dispatch*)

A ground cellar of at least part concrete construction, covered with sod and ventilated. Location unknown, circa 1910. (MHS photo)

▪ SAUNAS

- Most saunas are found in northeastern Minnesota on the farms of Finnish immigrants
- The earliest saunas were smoke saunas, built from the 1880s-1920s
- Later saunas used steam created by sprinkling water over rocks heated on a wood stove
- Many saunas were rectangular structures built of logs

Large numbers of Finnish immigrants settled in northeastern Minnesota beginning in the last decades of the 19th century. While the landscape and climate of this area may have been appealing because of the "striking resemblance to their native Finland," the primary incentive to move to this part of the state were the jobs on the iron ranges which had begun shipping ore in the 1880s (Gudmundson and Winckler 1991: 11).

While some immigrants remained miners, others began to farm the marginal land. These Finns cleared the land and built farm buildings of rough hewn timber. The first structures were usually the house, cattle barn, hay barn, and smoke sauna (*savusauna*) – "the classic quartet of the rural Finnish farmstead as composed at the turn of the century on American soil" (Gudmundson and Winckler 1991: 14; Alanen 2000: 2.112-2.127).

Saunas or bathhouses are a distinctive feature of farms wherever Finnish immigrants settled (Lockwood 1988).

Finns took saunas to socialize, to bathe, and as an important ritual removed from everyday activities. Yvonne R. Lockwood wrote, "To Finnish-Americans, sauna . . . is more than a bathhouse. It links past and present, Finland and the United States, Finns and Finnish-Americans; it is an ancient tradition and a symbol of ethnic identity" (Lockwood 1988; see Lockwood for a description of sauna custom).

Farmstead buildings were often built many feet apart because of fire danger, but the sauna was frequently closer to the back door of the house than the other buildings.

The first Finnish saunas, built from the 1880s-1920s, were heated by wood fires. "The smoke from the fire that built up in the snug building was released by a small vent prior to bathing but nonetheless blackened the walls" (Gudmundson and Winckler 1991: 15)

Later saunas, most built in the early 1900s, had a wood stove upon which rocks were piled. Bathers put water on the hot rocks to create steam. Many of these saunas replaced earlier smoke saunas which were then abandoned, used for storage, or, in at least one instance, "converted to a diminutive two-stall livestock stable" (Gudmundson and Winckler 1991: 16).

Most Finnish saunas were rectangular structures built of rough-hewn logs varying in size from 10' to 14' in width by 18' to 23' in length. A few were square; one original smoke sauna, ca.

See also
Farmhouses
Housebarns

1897-1903, was 12' square (Koop "Hill" 1989). One sauna was unusually large, roughly 16' x 23', and was probably planned to accommodate a big family "and possibly their friends, since it is a Finnish tradition to share sauna with neighbors" (Gudmundson and Winckler 1991: 28; Alanen 2000: 2.112-2.127).

The horizontal log walls of many early saunas have solid double-notched corner joints, logs rising from the sill to the ridge in each gable end, one small door and two windows. The wooden door was usually in a gable end and the structure most often had a brick chimney. Occasionally, larger saunas had three or four windows. Sometimes the logs extend only up to the eaves with corrugated metal covering the upper gable end. Frequently cheese cloth chinking was used between the tightly-fitting logs. Other variations featured walls sheathed completely or partially with drop siding. Some settlers covered log walls with asphalt shingles at a later date.

Some saunas rested directly on the ground, some had concrete foundations, and others had rubble stone and timber pier foundations. Gable roofs were usually covered with corrugated metal, wood or asphalt shingles, or rolled asphalt.

While the earliest smoke saunas usually had just one room – "people undressed in the house and streaked naked to the sauna" – most had two rooms separated by a log or board partition (Lockwood 1988). The changing room had a concrete or wood floor, benches, and pegs on the walls for hanging clothes. Sometimes the changing room had a small window through which light would shine from a kerosene lamp into the dark steam room.

Original saunas had one or two smoke holes, "narrow sliding wooden panel[s] on the back wall . . . used to ventilate the smoke and regulate the temperature" (Koop "Matson" 1989). Later saunas sometimes had a small window in the steam room. From one to four plank benches or platforms were placed along the walls. The sauna room usually had a concrete floor under wooden planks or pine boards over log joists.

One unusually large sauna had four rooms – a changing room, a chamber to store wood, a sauna wash room, and the steam room – no doubt to provide ample space for a large family and friends (Gudmundson and Winckler 1991; Koop "Nelimark" 1989; Alanen 2000: 2.112-2.127).

PREVALENCE

Although some saunas may be found on farms elsewhere in the state, they are primarily seen, and sometimes still in use, in northeastern Minnesota on farmsteads settled by Finnish immigrants and their descendants. They are likely to be rare.

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A 10′ x 18′ log sauna built circa 1920 by Finnish immigrants to northern Minnesota. Hill Farm, Pike Township, St. Louis County, circa 1988. (MHS photo by Michael Koop)

■ SCALE HOUSES

- Small woodframe sheds built to shelter scales used to weigh crops or livestock
- Found primarily on large farms

Scale houses sheltered farm scales used to weigh products like crops and livestock. A National Plan Service catalog from circa 1950 that was marketed in the Midwest indicated, "Scales are becoming quite common on large farms" (National Plan Service ca. 1950).

Scale houses are especially associated with the rise of Minnesota livestock industries in 1900 through the 1940s. It is not clear how many Minnesota farms built scale houses, however. Rather than having their own on-farm scale, it is believed that most farmers had their crops weighed at the elevator and their animals at the stock exchange or slaughterhouse. However, producers specializing in livestock may have used scales in scale houses to help track weight gain and feeding regimes.

Geographers Noble and Cleek described a typical scale house as a "simple, tunnel-like structure with open gables" (Noble and Cleek 1995: 157). The scale house in the National Plan Service's circa 1950 catalog was a gable-roofed, woodframe structure that resembled a small garage with no gable end walls. The building measured 13.5' x 17.5' and was tall enough for a vehicle and wagon to be driven through it. The house sheltered a 3-ton capacity scale mounted in a below-grade pit. The plan suggested that moveable gates could be used to corral livestock onto the scale (National Plan Service ca. 1950).

PREVALENCE

It is suspected that scale houses were not prevalent on Minnesota farms. It is not known how many may be extant.

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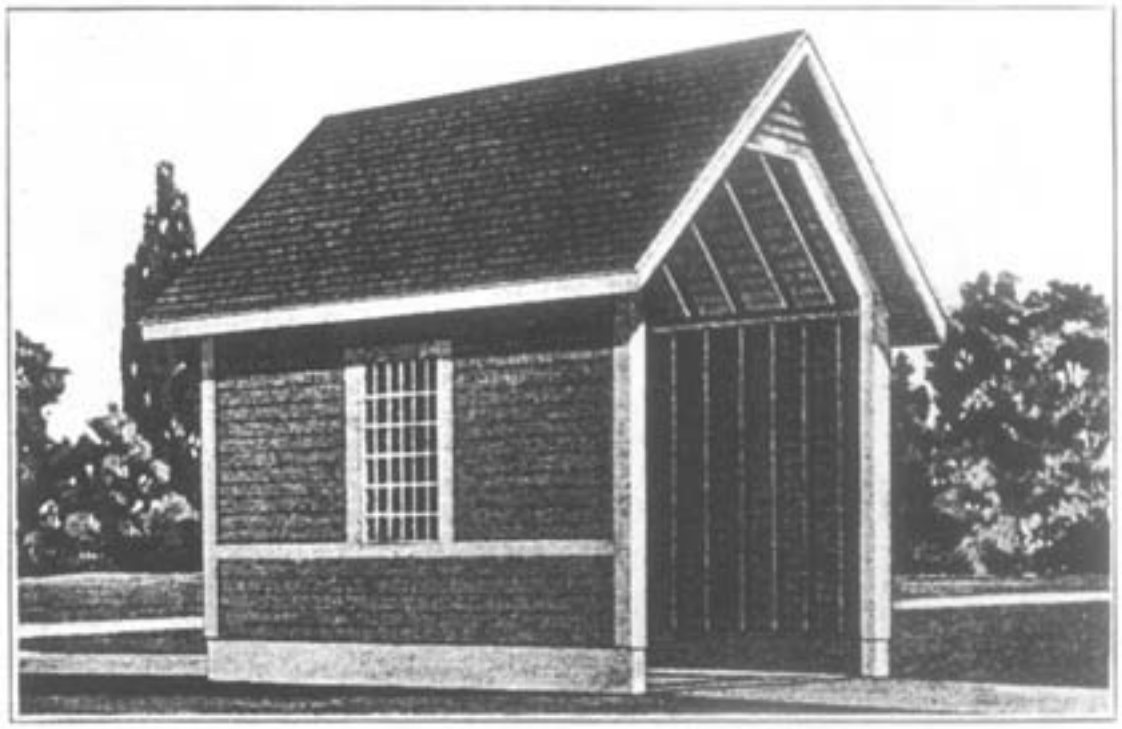
See also

Granaries, Elevators, Bins, Dryers
World War II & Postwar, 1940-1960



This woodframe scale house sheltered a scale on which crops or livestock could be weighed. From the National Plan Service's *Practical Farm Buildings* (circa 1950).

▪ SHEEP BARNS

- Except when lambing, sheep needed little shelter and were often raised with only make-shift winter protection
- Sheep barns often resembled beef barns with open sides but with more interior partitions
- Two-story barns offered storage for hay and bedding, one-story barns often required a nearby storage structure
- Barns designed specifically for sheep were not common in Minnesota

In 1895 Minnesota had only a few hundred thousand sheep, despite having a climate well-suited for sheep husbandry (Shaw 1895). The number grew, however, as Minnesota farms diversified into mixed crop and livestock systems over a 30-year period that spanned the turn of the 20th century. A 1914 farm publication advised that "sheep, kept in small flocks on the average farm, are a profitable asset," and University of Minnesota experiment stations, educators, and extension agents promoted sheep raising. A 1914 publication counseled that the average Minnesota farm of 177 acres could add 30 to 50 breeding ewes to its operation (McKerrow 1914: 177). Before World War II experts also recommended that sheep be allowed to graze on the farmstead lawn to keep it neatly clipped.

Sheep, like beef cattle, tended to be durable animals that required only minimal shelter from rain, snow, and the most severe cold. In fact, sheep in an enclosed barn suffered more from overheating than from cold temperatures (Ashby 1916: 25). Spending time outdoors also stimulated the appetite and increased weight gain. Before the 1950s some Minnesota farmers kept their sheep in straw buildings which provided satisfactory, inexpensive shelter (Shaw 1900: 79-80; Morris and Zavoral 1943: 4). Some experts advocated that sheep barns have a good roof but were far less concerned with the quality of the walls (Gregg 1906: 242).

A barn built specifically for sheep was the exception on Minnesota farms (Johnston 2004). Even after the introduction of winter lambing in the 1960s to help capture Eastern markets, it was typical to house sheep in structures originally built for other purposes.

Sheep barns were often sited near other farm buildings or near the house to help deter constant threats from dogs and wolves. It was common to situate the barn with the openings facing south, or so that an adjacent building could serve as a windbreak. If a sheep barn did not include provisions for storing feed and bedding, another structure was needed for storage (White et al 1936: 11).

Many sheep barns shared characteristics with other livestock housing. For example, they were best sited on well-drained land downwind from the house. Ample natural light and good ventilation were important. Attached yards were needed to allow the animals to exercise and feed outdoors. Sheep barns often had vehicle openings wide enough for a wagon or manure spreader to enter.

See also
General Purpose or Combination Barns
Develop of Livestock, 1900-1940
Appendix: Focus on Minn Livestock

Well-drained earthen floors were satisfactory, but concrete floors were recommended for "service alleys, feed rooms, around water troughs and other critical areas" (Neubauer and Walker 1961: 78).

Like beef barns, sheep barns were often partly-open to keep the sheep cool and allow them to freely move about. Sheep barns often had more interior partitions than beef barns, however, in part because lambs were often born indoors during cold months, whereas beef often calved in the pasture. Farmers who used interior pens usually kept several sheep to a pen. Sheep barns often had moveable interior partitions for handling, sorting, and lambing. The yards outside could also have movable gates and fences to create smaller pens for breeding and sorting.

Sheep differed from cattle in that they bunched and crowded at doorways, rather than following one another in single file. Thus sheep barns had large animal doors – at least 8' wide – to prevent sheep from being crushed and injured.

Some sheep barns had a central alley with feed troughs down each side, and many also had outside feed bunks. (Grains were often fed inside while hay was fed outside.) Creep feeders allowed lambs to reach the grain while keeping the larger ewes out. Interior pens often had individual feed boxes and water cups, and interior salt boxes were common until salt blocks or "licks" were introduced in the 1960s. Outdoor feed bunks were often 12' long, allowing 2' of feeding space per adult sheep. Some troughs were "reversible," meaning they could be turned upside down when dirty and be ready for instant use.

A common size for a Minnesota sheep barn was 24' x 32' – sufficient for 30 to 50 ewes. This typical barn, recommended over many decades, usually consisted of a single open room with a manger along one wall. There were often two fenced lambing pens in a corner and a large sliding door to keep the sheep inside during stormy weather (McKerrow 1914: 177-178; White et al 1936: 12; Midwest Farm 1937; Morris and Zavoral 1943: 3; National Plan Service ca. 1950; *Farm Building Plans* 1953).

A more elaborate barn from 1920 had two wings – one 36' x 70' and the other 30' x 40' – which were divided into individual pens, a horse stall, a feed room, and a shepherd's room. There was a silo linked to the feed room, and hay and grain were stored in the upper loft (Moore et al 1920: 575-576).

By the early 1950s pole-frame sheep barns with steel and aluminum siding were in use (National Plan Service ca. 1950; Reynolds 1953).

Shepherd's rooms and wool rooms were not often seen in Minnesota sheep barns, and usually only appeared in larger buildings. The wool room was the space in which sheep were sheared. It included a wool-sack holder that held the wool during shearing, and a wool box to store the wool until it was sold. On most Minnesota farms, sheep were sheared on a canvas or in a clean spot in the barn and no special room was used (Shaw 1895: 253).

Some sheep producers had outside vats or sheep "dips" in which the sheep were immersed in diluted insecticides to deter ticks and other pests. The dips were often elevated tanks approached by ramps, but could also be below-grade pits.

PREVALENCE

It is expected that barns built specifically for sheep will not be common in Minnesota. Some might be associated with pre-1940 diversified farming, and some may be associated with the rise of the state's more concentrated livestock industries.

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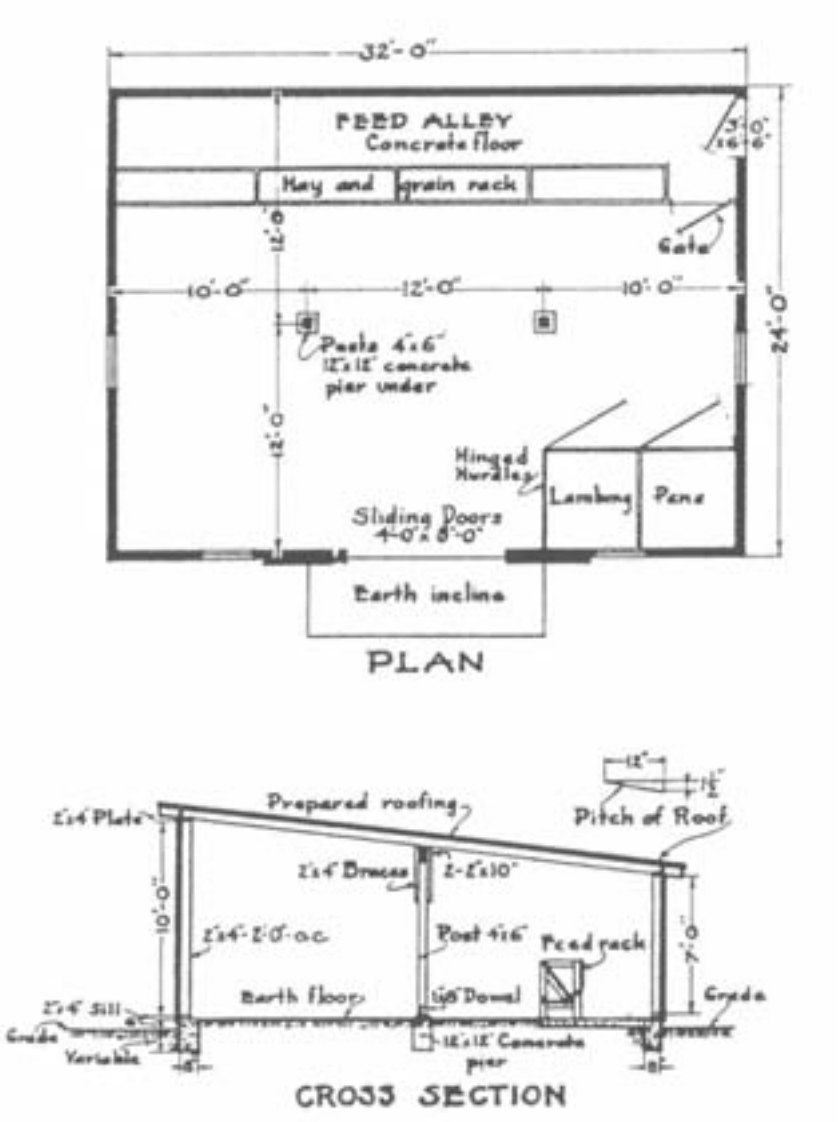
One of the advantages of keeping sheep on your farm was they could keep the lawn grass clipped. This practice was common through World War II. Location unknown, circa 1910. (MHS photo by Harry Darius Ayer)

Sheep, like beef cattle, were not particularly sensitive to the cold. Sheep barns and beef barns were often among the simplest animal shelters on the farm. Location unknown, circa 1925. (MHS photo)



This basic 24' x 32' sheep barn was recommended by the University of Minnesota in 1936, but is consistent with sheep barns recommended during many decades by several organizations. It consisted of an open room with two lambing pens, a dirt floor, and a concrete feed alley and manger along one wall. From "Barns", White et al (1936).

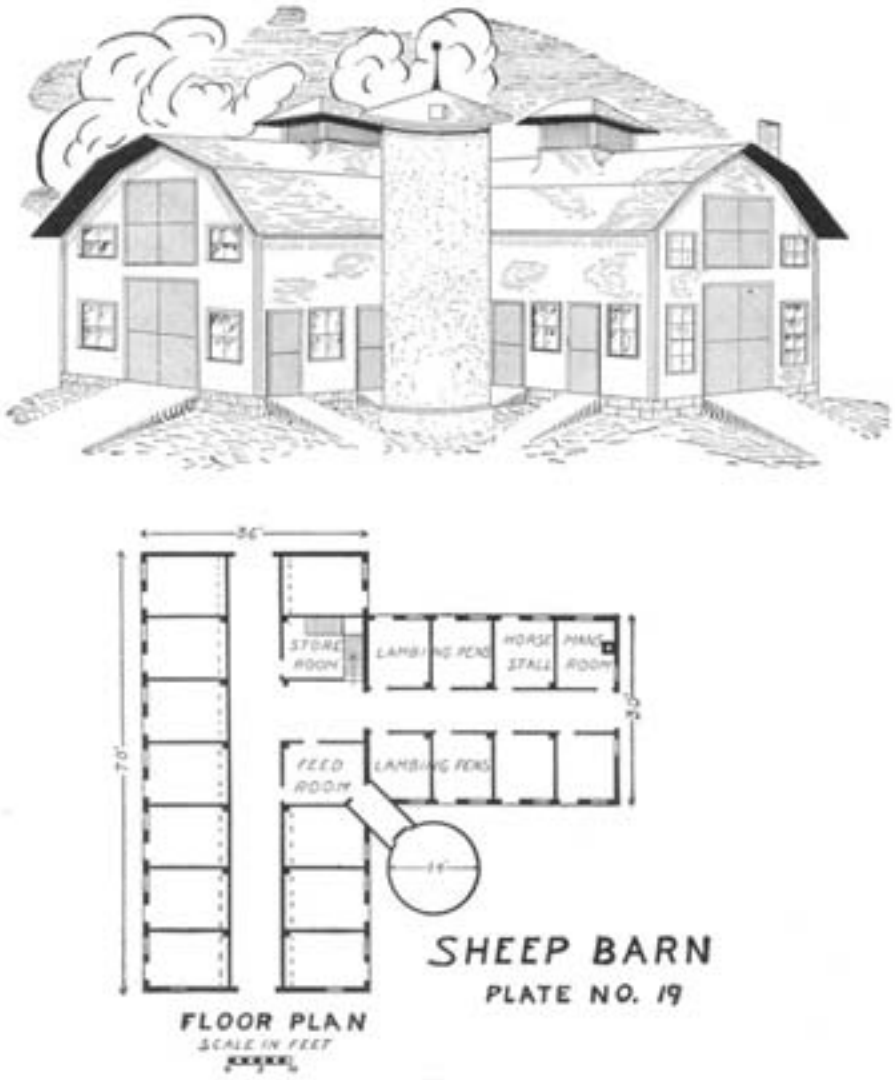


Fig. 1

A more elaborate sheep barn could have an attached silo, individual lambing pens, a feed room, and a shepherd's room. This plan was issued by the North Dakota Experiment Station and appears in a 1920 manual read by Midwestern farmers (Moore et al 1920).

▪ SHELTERBELTS

- Shelterbelts were planted perpendicular to the prevailing winds, and were usually a single row wide
- Many field shelterbelts in Minnesota were planted as part of 1930s conservation efforts
- Many mature field shelterbelts were cut down to accommodate large machinery and irrigation equipment

A field shelterbelt was a narrow barrier of plantings, often a single row of trees or shrubs, that protected farm fields and crops from wind damage and erosion. Field shelterbelts also increased soil moisture by trapping snow and reducing evaporative loss, provided wildlife habitat and shelter, reduced snow drifting on roads by acting as a living snow fence, and beautified the landscape (Stoeckeler and Williams 1949: 192-193).

They were often planted in prairie areas. An early farm expert from southwestern Minnesota, one of the windiest parts of the state, observed in the 1890s that farmers in that area were planting white willow for living fences and field shelterbelts (Ludlow 1894: 277).

Most field shelterbelts in Minnesota and throughout the Midwest, however, were planted after 1934 as part of federal conservation programs spurred by the severe droughts of the 1930s. The New Deal's Shelterbelt Program, for example, was created in 1934 and paid farmers to plant and cultivate trees to reduce soil erosion (Stoeckeler and Williams 1949: 192; Hanke 2004).

According to Stoeckeler and Williams, "The shelterbelt project, sometimes referred to as the Prairie States Forestry Project, was established in 1934, a time of serious drought, dust storms, and depression. Its purpose was to plant badly needed shelterbelts and at the same time provide work for people in the drought-stricken Great Plains" (Stoeckeler and Williams 1949: 192). Thousands of miles of field shelterbelts were planted in the 1930s and 1940s. Later, many of those shelterbelts in Minnesota were cut down to make way for large, modern implements and irrigation equipment (Hanke 2004).

Field shelterbelts were planted perpendicular to the prevailing winds. In Minnesota, primary field shelterbelts were usually oriented north-south. A modern farm conservationist explained that for best results, belts of trees were planted at intervals: "Since the zone of protection provided by a single shelterbelt is limited, a series of shelterbelts is required to protect the whole field. Two to four rows are commonly planted per quarter section. Erosion-prone soils may require as many as eight shelterbelts per quarter section" (Timmermans and Casement 2001). Demonstration shelterbelts planted by the University of Minnesota in the 1970s-1990s commonly ranged from a quarter-mile to one mile in length ("Agroforestry in Minnesota" 1999).

The width of field shelterbelts involved trade-offs. Farmers had to balance wind and erosion protection against loss of productive cropland. "While it seems apparent that wider belts add

See also
Erosion Control Structures
Fields and Pastures
Windbreaks
Woodlots

somewhat to the benefits, it is probable that the narrow belt yields the greatest return on the land occupied" (Stoeckeler and Williams 1949: 194).

In addition, multi-row field shelterbelts were more expensive to establish than single-row belts, and more work to maintain. For that reason most field shelterbelts planted on the prairies were single rows. Experts also advised that a field shelterbelt should be no wider than it was tall (Stoeckeler and Williams 1949: 194).

Successful shelterbelts had to be planted with native plant stock for maximum drought-resistance and hardiness: "It is extremely important that the planting stock be grown from seed produced in the general locality in which the trees are to be planted" (Stoeckeler and Williams 1949: 196).

Shelterbelts of trees eventually fell in disfavor with some farmers because they could cause snow to accumulate unevenly, take up an unacceptable amount of land, rob soil moisture from adjacent crops, and harbor weeds. In recent decades shelterbelts have been superceded by other erosion control methods including leaving stubble in the field during the winter, conservation tillage, and strip cropping or alternating strips of crops with strips of fallow land.

PREVALENCE

It is not known how many historic shelterbelts have survived on Minnesota farms, but they are likely found in prairie areas. Like all vegetative features, they are subject to natural change through plant reseeding, disease, and death. Shelterbelts were often superceded by other erosion-control methods, and many have been removed to accommodate large field equipment. A full, intact set of shelterbelts is likely rare.

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Shelterbelts, as well as a windbreak, are visible in this photo taken in 1983 near Lamberton in Redwood County. (MHS photo by Vincent H. Mart)

▪ SILOS

- Silos were ideally strong and airtight
- Minnesota's first silos appeared in the late 1880s; many were built in 1900-1920
- Silos transformed the profitability of dairy farming and led to the spread of dairying throughout Minnesota
- Nearly all dairy farmers had a silo, but silage was also fed to beef cattle, sheep, and draft horses
- Silos could be horizontal or vertical, permanent or temporary, above or below ground
- Materials included wood, stone, brick, reinforced concrete, concrete block, cement stave, clay tile, galvanized metal, asbestos, and glass-lined steel

Silos were storage containers in which chopped corn stalks, grasses, legumes, sorghum, sunflowers, and other green fodder could be preserved through the winter months while maintaining its high nutritional value. The silage fermented until all air was used from the silo, and then reached a stable state that preserved it. Vertical silos did not necessarily need roofs because the weight of material helped keep air from reaching the silage at the lower levels (Lindor 2004).

Minnesota farmers fed silage to dairy cows, beef cattle, sheep, draft horses, and, very rarely, hogs and poultry. In 1937 most Minnesota corn was being grown for silage except in the southernmost "Corn Belt" counties where it was fed to livestock as grain.

Silos were particularly useful in northern climates where a short growing season didn't support cultivating more profitable cash crops. In northern and central Minnesota, silos could preserve field corn that didn't always fully ripen by the end of the season. Silos also enabled farmers to use stalks, roughage, and other crop by-products. In the 1950s, Minnesota farmers also began to ensile shelled corn to make concentrate livestock feed.

Silos and the rise in Minnesota's dairy industry went hand in hand. Dairy cattle only gave milk from spring to fall when they were fed on green pastures. Limited to this schedule, farmers were unable to participate in higher-priced winter markets for milk. The silo transformed dairy farming by allowing animals to be fed green fodder year- round, which encouraged cows to give milk through the winter. According to geographer Allen G. Noble, this was especially advantageous to farmers near large urban areas: "Urban dwellers constituted a steadily growing market for milk, a market that existed throughout the year despite fluid milk's seasonal availability" (Noble 1984: 72). With a silo, a farm could also feed more dairy cattle and feed them better-quality winter rations. In fact, a silo increased the stock-carrying capacity of a farm by more than one-fourth (Wayne 1977: 30-37). Farmers also found that dairy cows required less water in the winter if fed silage (Noble 1984: 72).

In 1911 C. R. Barns of the University of Minnesota wrote, "The owner of a dairy herd of more than ten or a dozen cows, who has failed to erect a silo, is now to be regarded as 'behind the age.' The gains from its use are so manifest, that the number of silos being erected in Minnesota grows with

See also

Dairy Barns
Beef Barns
Hay Barns
Diversification & Rise of Dairy, 1875-1900
Appendix: Focus on Minnesota Crops

a rapidity that is at once a tribute to the intelligence of our dairy farmers and a prophecy of still further advances in animal husbandry" (Barns "Corn" 1911: 117).

Cornell University's G. F. Warren wrote in 1916, "The most striking change in the dairy industry in the last century has come in connection with the use of the silo" (Eckles and Warren 1916, rpt. 1921: 221).

And University of Minnesota dairy expert R. M. Washburn wrote in 1931, "No dairy or general livestock farm is properly equipped for economical production until a silo of some sort is provided" (Washburn 1931: 240).

EARLY DEVELOPMENT

According to Noble, ensiling fodder was a centuries-old practice. In modern times, experiments with ensiling – especially corn that had not ripened – were conducted in Europe beginning in the 1860s and in the U.S. around 1875. Innovators in Maryland, New Jersey, and Illinois apparently built the first silos in the late 1870s. In 1882 the USDA counted 91 silos on U.S. farms, most of them in New England, although others probably existed (Noble 1984: 70-71).

Noble explained that silos were only slowly adopted by average-sized farms beginning in the 1880s, and that "as late as 1910 articles still implored the conservative farmers not to continue to look upon a solo 'as an extravagance'" (Noble 1984: 72).

In 1895 there were more than 50,000 silos in the U.S. and by 1903 there were an estimated 300,000 to 500,000. Eckles wrote in 1950 that many of the silos in the Midwest were built between 1910 and 1925 (Eckles 1950: 486). In 1924 Wisconsin was the state with the most silos (100,000), followed by New York (which had half as many), followed by Michigan and Ohio (Noble 1984: 72).

In Minnesota the first experiments with the use of silos began in the 1880s. According to Vogeler, "By 1880, silos had appeared in Wisconsin; by 1882, in Michigan; and by 1884, in Minnesota" (Vogeler 1995: 108). By 1889 the *Minnesota Farmers' Institutes Annual* had published an article on building a square silo in a basement barn.

The University of Minnesota's C. H. Eckles wrote in 1950, "Some interest in silos [in Minnesota] was aroused between 1885 and 1895 as the result of experimental work," suggesting that silos built before the mid- to late-1890s were in the vanguard of the movement (Eckles 1950: 486).

Silos proliferated slowly in the state but were built more rapidly around 1910 as farmers continued to diversify and as silo designs were improved. The importance of having a silo became obvious to many Minnesota farmers around 1914 when the corn crop in most counties did not ripen. Farms with silos were able to store the yet-green crop and feed their animals over the winter (Gould 1889; "The Beneficent Silo" 1915: 270).

The University of Minnesota reported that Minnesota had 36,278 silos in 1927, or about one silo for every five farms (Schwantes and Torrance 1937: 2). Brinkman wrote that in Stearns County alone there were 1,200 silos in 1922 (Brinkman 1988: 18). In the mid-20th century, average Minnesota farms had one silo, but those with larger herds might have two or three (Lindor 2004).

OVERVIEW OF SILO FORMS

Silos were built in two general forms, vertical (sometimes called "tower") and horizontal.

The first modern silos, dating from the mid- to late-1870s and horizontal in form, were "pit" silos or fully- or partly-excavated holes lined with straw, stone, or another material. Wisconsin's first silo, built in 1877, was a pit silo.

The earliest vertical silos were square structures usually built of wood or stone. Farmers found, however, that the square shape bowed outward and led to air pockets in the corners. This caused silage to rot despite attempts to make the silos taller so the heavy silage would settle into the pockets. Subsequent octagonal and round forms worked better, and square silos were rarely built after 1900 (Beedle 2001: 3-4; Noble 1984: 74).

The first successful round vertical silo was developed by F. H. King of Wisconsin's state agricultural experiment station in the early 1890s. The King or Wisconsin silo was made of two layers of horizontally-placed wood boards (Noble 1984: 74).

Wooden silos were prone to deterioration from the acidic silage and were not very strong, especially when empty. Some farmers continued to build stone silos and, beginning in the mid- to late-1890s, also used brick and concrete. In the early 20th century, improved silos of reinforced concrete, concrete block, structural clay tile, cement staves, and galvanized metal were built.

Temporary silos were useful when a crop failed unexpectedly, and were used to serve a recently-enlarged herd, to meet wartime production increases, or when money or building materials were scarce. Many were made of straw bales, inexpensive boards, wood fencing, or plywood, or were simply below-ground pits or trenches. Some renters built temporary silos so they could take them along when they moved from farm to farm.

BUILDERS

Farmers often made their own silos, especially before 1920. Technical help was available from county agents, farmers' groups, and agricultural schools and experiment stations. Forms or molds for poured concrete silos could often be rented. By 1915, however, many experts were recommending that farmers seek professional help for silo construction, unless a lower-cost or temporary model was being built.

A large number of companies offered commercially-made silos. The 1909-1914 issues of the *Minnesota Farmers Institutes Annual*, for example, contain numerous advertisements for silos of wood, poured concrete, clay tile, cement stave, and metal. A 1919 University of Minnesota author indicated that most silos at that time were commercially-made (Wilson 1919: 6). Cement staves and other materials were heavy to ship and were usually sold by dealers who worked in small local territories. These dealers often built the silo for the farmer (Lindor 2004).

LOCATION AND SIZE

While some vertical silos were incorporated within the massing of a barn, most were built outside so that barn floor space would be spared. The silo was connected to the barn via a small

passageway, room, or chute. While experts noted that the south or east sides of the barn protected the silo from wind, and exposed it to the sun which helped silage stay unfrozen, many agreed that good accessibility for filling and unloading was the most important factor in determining location. In the 1970s Noble studied the siting of silos in Ohio and found the most popular location to be at the gable end of a barn. He found detached silos – unconnected to any building – to be uncommon (Noble 1984: 73; Wilson 1911: 66; Louden 1923: 5).

The size or capacity of the silo helped determine the size of the farm's dairy herd. The diameter of a silo was determined largely by the amount of silage one man could unload each day. Silage was removed from the top surface, and taking an even amount was important to minimize silage decay. It became standard to remove a 2" to 4" per day – just enough to keep up with the rate of spoilage. The height of the silo helped determine capacity, but, in the days before mechanical unloaders, overall size was limited by the effort to unload the silo (Wilson 1911: 66; Lindor 2004).

Before World War II most silos were 12' to 14' in diameter and about 35' to 40' tall, which was about the height of a barn roof. A silo 12' x 38' or 14' x 30' could provide winter feed for about 25 cows in an average situation, but could feed many more sheep, calves, feeder cattle, or draft horses. One 1920 source indicated it was not cost-effective to build a silo for fewer than 10 cows. When mechanical unloaders became popular after World War II, silos grew taller and wider. In the 1960s they averaged about 20' in diameter and about 60' high (Beedle 2001: 12, 15; Carter and Foster 1941: 253-254; Moore et al 1920: 532).

BASIC PARTS OF A VERTICAL SILO

The foundation and floor of a vertical silo were placed below grade and were almost always concrete. By about 1910 floor level was standardized at 4' to 6' below the level of the barn floor. The foundation, or lower portion of the silo walls, needed to be very strong to withstand the force of the wind and the pressure of the silage. Below-grade walls were commonly 10" thick. The foundation sometimes extended above grade for extra strength and durability (Beedle 2001: 12).

The upper walls of a vertical silo needed to be sturdy enough to withstand the considerable outward pressure of the contents when full, and were generally 6"-8" thick. It was important for interior walls to be smooth so that, as the silage settled, it would not stick to the walls and form air pockets that spoiled surrounding silage. The inside walls of wooden silos were usually treated with oil or creosote, and masonry walls were typically coated with cement, all in an effort to help silage settle and keep the corrosive silage from coming in contact with the wood or mortar.

Silo roofs, according to Noble, followed a chronological progression through gabled, conical, hipped conical (some with flared eaves), low dome, and hemispherical forms (Noble 1984: 77). Roofs were first made of wood, and later of metal. About 10 to 15 percent of Minnesota silos had no roofs (Lindor 2004).

Silo door openings were usually vertically aligned up the silo, and integrated with a ladder. The door openings and ladder were often covered by (i.e., contained within) a long vertical chute of wood or metal. The silo chute was usually about 30" in diameter. The silo door openings, often 20" x 30", were covered by door panels made of double-layered wood. As the silage level decreased from the top down, the farmer removed each door panel and successively hooked it into the opening above.

Most silos were filled through a door in the roof with a mechanical silo filler, which was a two- to three-day job. The first silo filler was developed around 1926, and by the mid-1930s they were fairly common in Minnesota. Silo fillers had a powerful fan that forced air and chopped silage up a long tube (Schwantes and Torrance 1937). Some groups of farmers cooperatively owned a silo filler and formed a silo filling "ring". In the years before mechanical fillers were used, silos were often filled with a sling suspended on a boom (Lindor 2004).

Vertical silos were unloaded from the top until the development of the glass-lined silo, which was generally unloaded from the bottom.

Most silos were emptied by hand until after World War II. The farmer ascended the ladder (up inside the chute), climbed into the silo, stood on the silage, and loosened 2"-4" of the material with a pitchfork, chopping it away from the walls if it was frozen. The loose silage was then pitched down the chute. Although engineers began to experiment with silo unloaders immediately after World War II, it wasn't until the late 1950s and early 1960s that automatic unloaders were widely used.

By 1960 there were two principal types of unloaders for vertical silos. The surface or top unloader either rested on top of the silage or was suspended from the roof. As the silage level lowered, so did the unloader. The unloader spit silage out through the silo door and the material dropped down the chute. The second type, called the bottom unloader, was developed first for glass-lined silos. It was generally an auger attached to the inside of the silo near the floor. While silage unloaders could be successfully used when the silage was fresh and loose, frozen silage was troublesome and had to be chipped into smaller pieces for an unloader to have enough power to move it (Lindor 2004).

VERTICAL SILOS: WOODEN, BUILT 1890s-ca. 1950

Wooden silos were used in Minnesota from the 1890s to about 1950. They were often made of cypress, fir, redwood, or white pine (which was less desirable). The wood was frequently treated with a chemical preservative such as creosote. Wooden silos were also coated with boiled linseed oil on the inside, and oiled or painted on the outside. Like all silos, they had to be well-anchored to their foundation. While long-lasting, wooden silos were at times tricky to build and maintain, and were usually lost if a barn burned. Wooden silos took several forms, described below:

1. **Horizontal Wooden Silos**. Some wooden silos were made of boards installed horizontally after being soaked and bent into circular shapes. The wood was often tongue-and-grooved like flooring. The popular King or Wisconsin silo, which originated in Wisconsin in the 1890s, had horizontal boards and double-wall construction. Wooden silos made of horizontal boards were sometimes hard to build and the boards could spring or warp.

2. **Wooden Panel Silos**. An improved version of the horizontal wooden silo was called a wood panel silo. On the outside of the horizontal boards was a set of vertical boards, evenly spaced around the silo, that extended from top to bottom. Around the vertical boards was yet another layer of reinforcement in the form of metal bands or hoops.

3. **Wooden Hoop Silos**. Wooden hoop silos consisted of round wooden hoops – spaced about 3' apart – onto which two complete layers of vertically-aligned tongue-and-groove flooring

were nailed, one inside the hoops and one on the exterior. Occasionally the outside layer was omitted.

4. **Wooden Stave Silos**. Wooden stave silos were built of wood that ran vertically like the staves of a barrel. The wood was commonly 2" x 6" tongue-and-groove. The staves were reinforced with bands or hoops, first made of wood and later of iron or steel. The bands were usually closer together toward the bottom of the silo where the pressure was greatest. Turnbuckles on the bands had to be adjusted periodically, and were sometimes troublesome. Sources in both 1920 and 1950 reported the wooden stave silo to be the most common silo in the U.S. (Moore et al 1920; Eckles 1950: 490). Farmers were advised to buy a manufactured stave silo rather than try to fashion their own. Wooden stave silos could be disassembled and rebuilt and were therefore considered somewhat movable.

5. **Wooden Stud and Sheathing Silos**. Often homemade, wooden stud and sheathing silos were low-cost silos built of two layers of horizontal sheathing nailed on the inside of vertically-aligned studs, with acid-proof paper between the layers. Plywood sheathing and dimensional lumber studding were sometimes used. No steel reinforcement was generally required. A variation, the Gurler or plastered silo, was sometimes covered on the outside with asphalt roofing, and then plastered inside. Wire fencing was sometimes placed around the bottom of the silo for more strength. Wood stud and sheathing silos were somewhat common during and immediately after World War II when farm production was up and building materials were limited.

6. **Timber Crib Silos**. A timber crib silo was made of 2" x 4" or 2" x 6" boards laid in an octagon footprint with overlapping end joints to form a strong structure. A 12'-diameter silo required 7'-long boards. The inside of the silo could be surfaced with tongue-and-groove flooring or cement plaster. The outer surface could be covered with plaster or rolled asphalt roofing. In the 1920s the timber crib silo was recommended as an inexpensive, easily-built silo for Minnesota's northeastern cutover counties where wood was plentiful.

Commercially-made wooden silos were offered to Minnesota farmers by a number of companies. In 1912, for example, the Kretchmer Manufacturing Company of Council Bluffs, Iowa, was advertising the Great Western Fir Stave Silo. In 1914 the Welles-Thompson Company of Minneapolis was making the Arctic Silo, a wooden structure built with "interlocking horizontal staves" of Washington fir. The name "Arctic" probably refers to claims that wooden silos were less likely to freeze than those of stone, brick, or concrete (Welles 1914).

VERTICAL SILOS: STONE, BUILT ca. 1890-1910s

Beginning around 1890, stone silos – both square and round – were being built in Wisconsin. No references to stone silos in Minnesota were encountered during this context study, and they are presumed to be very rare (Beedle 2001: 8).

VERTICAL SILOS: BRICK, BUILT ca. 1895-ca. 1920

Brick silos were built in Minnesota beginning in the mid-1890s, but were not as common as most other types described herein. A proponent of brick silos for Minnesota wrote in 1909, "A brick silo properly constructed is not only the very best silo made, but will last a lifetime without that constant

attention that must be given the [wooden] stave silo which at the best will in time rot out" (Henry 1909: 220).

Most brick silos were double-walled with an insulating 2" air space between the layers to help keep silage from freezing. The majority had embedded reinforcing bands, rods, or wire linking the courses. It was important that the inner wall be laid as smoothly as possible so the silage would settle evenly rather than forming air pockets that would cause spoilage. Brick silos were then coated with an interior wash of cement to make the interior smoother, and to keep the acidic silage from deteriorating the mortar. Some brick silos were built with decorative brick patterns near the top.

VERTICAL SILOS: REINFORCED CONCRETE, BUILT ca. 1890s-PRESENT

The phrase "concrete" silo often refers to silos built of monolithic, reinforced concrete. Vogeler writes that Wisconsin had circular concrete silos by the late 1880s, suggesting that Minnesota had concrete silos by the 1890s (Vogeler 1995: 108). These silos were made by pouring concrete into wooden forms (about 3' tall) that were successively moved upward after the mixture cured. Reinforcing rods within the walls could include metal strips, wires, iron hoops from old wooden silos, old steam pipes, and wire fencing (Wilson 1911: 68).

Forms for reinforced concrete silos could be rented from agricultural experiment stations and some farmers' organizations, and were also owned by building contractors. In 1920 a poured concrete silo cost more than a wooden stave silo but less than silos of structural clay tile, concrete block, or brick. Reinforced concrete silos were considered the most durable type by one source in 1920. In general, reinforced concrete silos were less prevalent than concrete stave silos (Moore et al 1920: 527, 532; Lindor 2004).

VERTICAL SILOS: CONCRETE BLOCK, BUILT ca. 1905-ca. 1960s

Silos made of curved concrete blocks, introduced around 1900, were more expensive than reinforced concrete silos and not as strong. Concrete block silos were not as popular as either reinforced concrete or cement stave silos (Beedle 2001: 9).

Some farmers chose to make their own concrete blocks on the farm, which could lower the cost. Typical blocks were 8" x 8" x 16". Strength was added with metal reinforcing rods. When building a silo with concrete blocks, it was important that the blocks be well-laid so that the interior of the silo was smooth. The inside was then plastered or coated with cement to smooth it further and protect the mortar from silage acid.

VERTICAL SILOS: CEMENT STAVE, BUILT 1905-PRESENT

Cement stave silos were one of the most common silo types in Minnesota. Cement staves were masonry units that hooked together with interlocking edges. (They were often called "cement" staves, although "concrete" would be more accurate.) The units were about 30" long, 10" wide, and 2.5" thick.

Cement staves were invented in 1905 by the S. T. Playford Company of Elgin, Illinois. The first cement stave structure was a circular stock tank built in 1905 in Michigan, and silos were built soon

thereafter. Some cement stave silos were constructed with mortar between the joints. Most, but not all, had exterior steel bands or rods to stabilize the silo against outward pressure. The inside wall of the silo was sealed with a thin concrete mixture.

Cement stave silos were promoted as being permanent, durable, and resistant to fire. They were cheaper than silos of brick and clay tile, and no special masonry skills were needed. They were more durable than concrete block silos and did not need the forms used in monolithic concrete. The reinforcing hoops or bands tended to deteriorate through time, however. Stave grain bins were similar to stave silos but had more reinforcing hoops because of greater outward pressure (Kaiser 1919: 8-10).

There were more than one dozen major manufacturers of staves in the Midwest in 1919. Construction companies often held exclusive cement stave silo dearlerships. Among Minnesota's many cement stave companies were the Minnesota Silo Company of Willmar, the Minnesota Cement Construction Company of Fergus Falls, Norling Brothers Silo Company of Svea, and the Minnesota Keystone Silo Company, location unknown. Several Minnesota companies were long-lived and some are still in operation including the Hanson Companies of Lake Lillian, established in 1916 (Kaiser 1919: 41). One 1980 source indicated that cement stave silo manufacturers could be identified by unique decorative designs (e.g., checkerboard patterns) made with staves near the silo top (*Minnesota Farmscape* 1980). This context study was not able to corroborate that information.

VERTICAL SILOS: STRUCTURAL CLAY TILE, BUILT 1908-ca. 1960

The first round silo of structural clay tile was built in 1908 at Iowa State College in Ames. In 1950 Eckles wrote that the tile silo "has become popular in recent years" (Eckles 1950: 491). Clay silo tiles were generally about 12" x 8" x 4". The silos' 8"-thick walls were reinforced with twisted wire or rods placed in the mortar at predetermined intervals, often connected to the door frame. Experts cautioned that the tiles should be laid evenly so the silo had a smooth interior surface. It was recommended that the inside then be plastered to create walls that were smoother and more watertight (Structural Clay 1941: 9).

Clay tile was also molded into interlocking staves and used to build stave silos. One 1940 source indicates that clay stave tiles were relatively new and were advantageous because they needed no mortar (Fox 1940: 53). Such silos were not widely built and are apparently rare (Beedle 2001: 10).

Many companies sold clay tile silos to Minnesota farmers. They included the Minnesota Farmers' Brick and Tile Company of Austin, the Zumbrota Clay Manufacturing Company of Zumbrota, the A. C. Ochs Brick and Tile Company of Springfield, and the Mason City Brick and Tile Company of Mason City, Iowa.

VERTICAL SILOS: GALVANIZED METAL, BUILT ca. 1910-ca. 1960s

Galvanized metal silos became available in the early 20th century and were made of riveted or bolted sheets of metal. The metal was sometimes corrugated. Exterior bands or hoops often provided additional support. Like wooden silos, steel silos needed to be firmly anchored to their poured concrete foundations. A 1940 source indicates this type of silo was numerous in some areas of the Midwest (Fox 1940: 53). During World War II, an "experimental site-welded silo," and a steel dairy

barn and milk house, were built in Madison by the University of Wisconsin in cooperation with Carnegie-Illinois Steel Corporation (Witzel 1945: 415).

Most metal silos were made by commercial companies such as the Butler Manufacturing Company of Kansas City and Minneapolis, which in 1914 was advertising the Butler Special Metal Silo. Another company, the Kretchmer Manufacturing Company of Council Bluffs, Iowa, made a galvanized silo with a cypress lining that was being advertised in 1912.

VERTICAL SILOS: GLASS-LINED METAL, BUILT 1947-PRESENT

The glass-lined silo was introduced in 1947 in Wisconsin. These silos had an enameled steel exterior to which a glass liner was fused. Brands included the dark blue Harvestore, the light blue Sealstore, and the dark green Cropstore.

Also called oxygen-limiting silos, glass-lined silos were airtight and therefore preserved silage and "haylage" (silage made from hay that could be stored without drying) with less spoiling. Most glass-lined silos were taller than earlier silos and were unloaded at the bottom, rather than from the top. They were considerably more expensive then conventional silos. Glass-lined silos resisted corrosion from silage acids and supposedly did not freeze, although early Harvestores often froze in practice (Lindor 2004).

According to Noble, the first glass-lined silo, the Harvestore, first received notice in 1948 "when it was exhibited at the centennial Wisconsin State Fair, although manufacture of units was subsequently delayed by steel shortages in 1949 and 1950. After 1950, the conspicuous Harvestore silo with its brilliant metallic blue color . . . has increasingly come to be the mark of a commercially successful farmer. During the 1960s, the cost of a Harvestore silo was more than twice that of a concrete-stave silo, so that normally only the most efficient farmers operating on the largest scale could afford the investment" (Noble 1984: 78-79. For a farmer's-eye view of the Harvestore, see Hoffbeck's *The Haymakers* (2000)).

Vogeler indicated in 1995 that Harvestore silos were most common in the states of Wisconsin, Minnesota, and the southern half of Michigan (Vogeler 1995: 109). In Minnesota more Harvestore-type silos were built in central and southern Minnesota where the largest and most successful dairy and livestock farms were concentrated.

VERTICAL SILOS: ASBESTOS, BUILT ca. 1945-ca. 1960

Some silos of asbestos were made during World War II (Beedle 2001: 15). It is presumed they are rare in Minnesota.

VERTICAL SILOS: FENCING, BUILT ca. 1930-ca. 1960s

"Fencing", "pen", or "paper bag" silos were built of fencing lined with sisal or craft paper. Several types of fencing were commonly used including "crib" fencing (also called "snow" fencing), picket fencing, and woven-wire fencing. These silos were generally temporary. They were used to supplement an existing silo, take care of a crop that was damaged or failed to ripen, or fill an emergency need. The silos were usually 8' to 15' tall and made of two to six overlapping layers of

fencing. If the height exceeded the diameter, the silo needed to be reinforced with vertical poles. While termed temporary, they could last for several years with some repair.

HORIZONTAL SILOS: PIT, BUILT ca. 1870s-ca. 1960s

Pit silos were the first type of silos developed; they date in the U.S. from the 1870s. Pit silos were also used in the 20th century when a farmer needed a silo quickly, or when building resources were scarce.

A common pit silo from the 1920s used a 10'-deep cylindrical pit. The pit was dug in stages with the walls of the first stage given two to five coats of plaster before the silo was deepened. The structure was often reinforced with a circular poured concrete collar that extended from below the frost line to a point 1' above the ground. If the herd was small, the silage was usually removed with a pulley, rope, and basket. If the herd was large, a windlass and wooden box was used (Moore et al 1920: 530-532; Carter and Foster 1941: 265).

Pit silos were relatively cheap to build and kept the silage unfrozen. However, pit silos were hard to keep waterproof unless built in very well-drained soil or in a location where the water table was low.

HORIZONTAL SILOS: TRENCH, BUILT ca. 1880s-PRESENT

Like pit silos, trench silos were developed early in the silo's evolution and then called upon again in times of financial hardship, war, or emergency because they could be built quickly and were inexpensive. In the 1920s, for example, farmers in northwestern Minnesota built trench silos to salvage what was left of their crops after the region was hit by early frost. Built at agricultural experiment stations during many decades, trench silos were also promoted in the 1950s during times of high crop production (Lindor 2004). They could be built without special skills and didn't need a blower to fill. However the walls of trench silos tended to collapse if not well-planned, the spoilage rate was high, and the silos were hard to keep waterproof. Some trench silos were used for haylage.

A 10'- or 12'-wide oblong trench silo might be 8' deep. Some were unlined, but more permanent trench silos were lined with stone, brick, poured concrete, wood, or several layers of plaster. The trench was then filled with fodder and topped with straw, chaff, and dirt. Some had a wooden gabled roof. Silage usually had to be removed from a trench silo more rapidly than from a vertical silo since it spoiled at a faster rate. Sometimes the trench was built near a cattle feeding yard.

Modern trench silos are sometimes lined with treated wood. They are usually found on farms that feed cattle and where the silage is used fairly quickly.

HORIZONTAL SILOS: BUNKER, BUILT ca. 1955-PRESENT

Bunker silos were like trench silos, but were generally built above-grade. They were made with three low walls, usually of reinforced concrete, and were filled and emptied with a tractor-loader. In 1955 the Minnesota Agricultural Experiment Station tested the technology by building two experimental bunker silos at the North Central Experiment Station in Grand Rapids. Each silo was 16' x 62' with a capacity of 120 tons. The more successful of the two designs was built with

cantilevered poles set into a concrete floor to support the timber plank walls. The other design, with poles held up by exterior angled braces, collapsed during the second season. The silage was covered with sawdust during the first two seasons and, in 1957, plastic film (Briggs et al 1958). In the late 1950s bunker silos were one-half to three-quarters the price of a conventional vertical silo. They were easy to build but the silage in them spoiled quickly. Like trench silos and silage bags, bunker silos were often built near the cattle yard to save labor. They were used for dairy and beef herds, and sometimes arranged for self-feeding. Some bunker and trench silos were used for haylage rather than traditional silage.

Bunker silos are still widely built in Minnesota and are often covered with sheets of black plastic held down with worn tractor tires.

HORIZONTAL SILOS: SILAGE BAGS, BUILT ca. 1950s-PRESENT

Silage bags are long, narrow, airtight plastic bags in which fodder ensiles. *Agricultural Engineering* reported in 1956 that research was being conducted using tubular 50- to 70-ton plastic bags, and that the experiments were largely successful. The journal indicated that plastic bags were also being used inside the top of vertical silos to reduce spoilage (Staff 1956: 742).

Today silage bags are common in Minnesota. They are relatively inexpensive and can be placed near the feeding cattle, although they can be torn if not handled carefully. The bags are filled with a silage blower and unloaded with a tractor-loader.

PREVALENCE

It is believed that cement stave silos were the most common type of silo built in Minnesota and that more cement stave silos survive than any other type. Wooden, square, stone, and structural clay tile stave silos are rare in the state. Those built of structural clay tile, brick, metal, pre-1945 concrete block, and pre-1945 poured concrete are believed to be uncommon. The remnants of pit and trench silos may be encountered, especially examples in cutover counties and examples built after World War II. Silos built before 1900 should be considered to be in the forefront of the movement in the state.

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Silos were becoming common in Minnesota around 1910, and by 1927 the state had one silo for every five farms. The farmers in this photo are filling a silo with a sling system. Ronning Farm, Lac qui Parle County, circa 1915. (MHS photo)

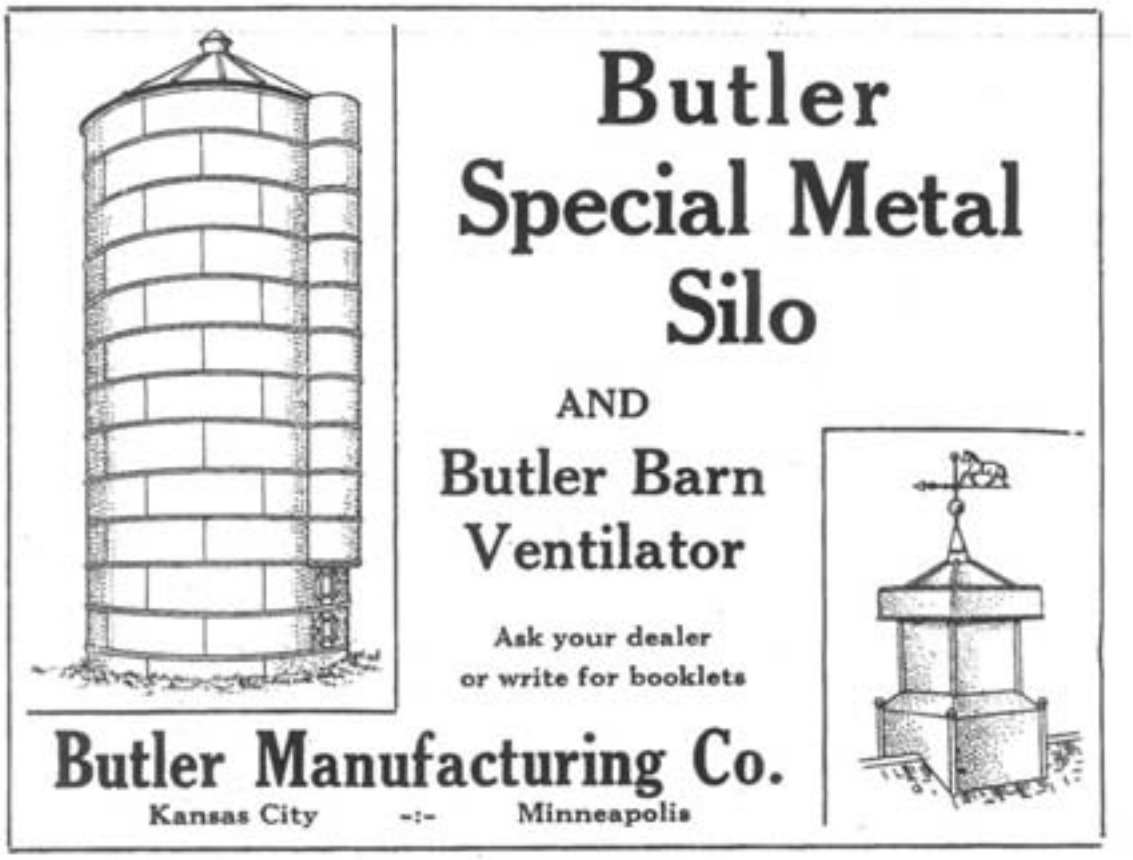
Some horizontal wooden silos were reinforced with vertical boards and then a set of iron bands. This silo, which had both vertical boards and bands, was under construction. Blackinere Farm near Albert Lea, circa 1910. (MHS photo by Harry Darius Ayer)

Vertical stave silos, first built in the 1890s, were easier to construct than those of horizontal wood and became more popular. The tongue-and-groove staves were reinforced with iron bands whose turnbuckles were periodically tightened. Note the belt-operated silo filler and the lightning rod on the silo roof. Location unknown, circa 1910. (MHS photo by Harry Darius Ayer)

Brick silos were first built around the turn of the century. They were expensive to construct and, like all silos built of masonry units, had to be lined with a coating of concrete to protect the mortar from the corrosive silage. Henry Farm, location unknown, circa 1910. (MHS photo by Harry Darius Ayer)

Reinforced concrete silos were built in layers by moving the forms successively upward. Like most silos, this one was attached to the barn. Location unknown, circa 1910. (MHS photo by Harry Darius Ayer)

Cement stave silos were introduced in 1905. The staves were assembled either dry or with mortar. The silo interior was usually plastered with a thin layer of concrete to make it waterproof. Most cement stave silos had reinforcing hoops, which could be either flat bands or round rods. In the mid-20th century, cement stave silos were probably the most common type of silo being built in Minnesota. Elfstrom Farm, Traverse County, 1983. (MHS photo)



Galvanized steel silos were built by companies like Butler Manufacturing, which still makes steel buildings today. Some metal silos were lined with cypress. Until about 1950, silos were unloaded by the farmer who climbed up the ladder (often inside a chute) and into the silo. The farmer pitched a 2"-4" layer of silage down the chute. It fell into a cart and was hauled to the cows. Advertisement from a 1914 issue of the *Minnesota Farmers' Institutes Annual*.

▪ SMOKEHOUSES

- Small buildings used to preserve meat, particularly before refrigeration
- Often doubled as storage sheds when not used for smoking
- Built on many Minnesota farms beginning in the mid- to late-19th century

Smoking meat, like canning meat, was an important method of preserving food on Minnesota farms before refrigerators and freezers became widespread. Smoking also imparted extra flavor (which occurred when the meat became exposed to the creosote from the fire). According to geographer Allen Noble, many farms smoked in the late fall and early winter when the butchering was done. Animals were commonly butchered in the fall when seasonal grasses went dormant, in part to reduce the number of animals that needed to fed over the winter (Noble 1984: 89).

Brinkman and Morgan encountered smokehouses made of logs, milled lumber, and chamfered concrete blocks in their early 1980s study of farm architecture in central Minnesota. Many of the German Catholic families that settled in central Minnesota butchered all of their own meat in the years before 1960, and smoked much of it. Butchering six hogs and a cow at one time was not uncommon, and neighbors sometimes gathered to collectively butcher and smoke (Brinkman and Morgan 1982).

Scholar LaVern J. Rippley wrote in 1981 that the smokehouse was an outbuilding that "almost universally stood on the German farmstead in Minnesota" (Rippley 1981: 61). In the same anthology, anthropologist Gary W. Stanton wrote that smokehouses were ubiquitous on farms in particular regions of the U.S., and that they were likely associated with a variety of cultural groups including Germans (Stanton 1981: 77).

Smokehouses were built in Minnesota beginning in the mid- to late-19th century. By 1910 many types were in use "ranging from simple contrivances, that are more or less on the makeshift order, to well-built permanent smoke-houses" (Paterson 1914: 191-192).

Despite this variation in types, four factors were common to a well-functioning smokehouse: it needed to be fireproof, have a good ventilation system so the temperature could be controlled, hold the meat high enough so that it would be smoked rather than cooked, and be insect free.

The smokehouse was usually built in a location convenient enough to allow it to be constantly monitored while in use, but far enough away from other structures to pose no fire risk.

A small quantity of meat could be smoked in a wooden box or barrel. A 6′ x 6′ smokehouse was typical for an average size farm. A height of 10′ to 12′ kept the meat high enough above the fire so that it wouldn't overcook. If the smokehouse was also used as a storage shed or tool house, its footprint was often bigger (Paterson 1914).

See also
Farmyards

Smokehouses were generally windowless and had only one door so that they were as airtight as possible. If the door was wood, it could be lined on the inside with a sheet of metal to prevent fires. While the floor could be of dirt, more substantial smokehouses had concrete floors.

While fireproof materials such as brick, stone, concrete block, and hollow tile were recommended, many farmers built smokehouses of logs or dimensional lumber with the fire pit located in the center of the floor well away from the walls.

Farm experts, on the other hand, recommended that, if a wood structure was used, the fire pit not be located within it, but in a separate unit outside of the main structure. A stove pipe or vent was used to draw the smoke from the firebox into the smokehouse. It is not known how many farmers used this more complex design (National Plan Service ca. 1950).

A smokehouse roof could be either flat or gabled, but accommodated a vent system to draw the smoke "freely over the meat and out of the house" (Moore et al 1920: 1167). Some smokehouses had vents on the roof and in the eaves.

Some interior fireboxes were made of poured cement. The Midwest Plan Service indicated in 1937 that some fire pits in smokehouses were also used for "making soap, rending lard, or heating water for butchering" (Midwest Farm 1937).

PREVALENCE

Smokehouses were widely built throughout Minnesota, but their use declined with the proliferation of on-farm refrigerators and freezers. It is anticipated that some smokehouses may be standing, and a few may still be used for their original purpose.

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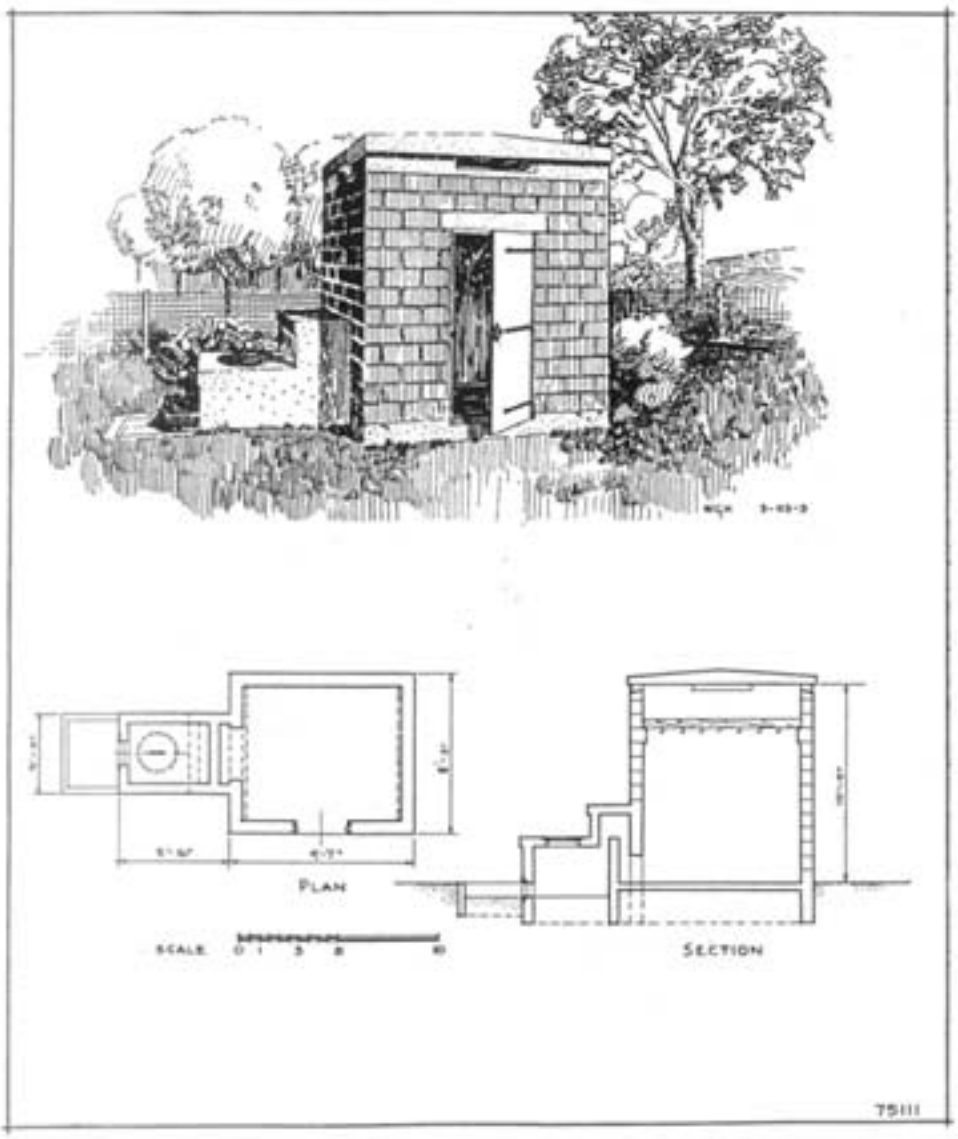

Designed by agricultural engineers for a plan catalog published in 1937, this smokehouse could be built of hollow tile or concrete block. Its floor, roof, and firebox were poured concrete. The 10′-tall smoke room measured about 8′ x 9′, while the firebox extension was about 4′ x 5′6″. From Midwest Farm Building Plan Service catalog of plans (1937).

▪ SPRINGHOUSES AND SPRINGBOXES

- Located on farms with natural springs, generally in hilly areas
- Used to both protect the quality of drinking water and to cool products like milk and eggs
- Used for passive gravity separation of milk before centrifugal separators
- Superseded by milk houses and mechanical refrigerators

Minnesota farm families have used natural springs for both drinking water and cooling since the early settlement era. Springhouses were built to keep animals, plants, and surface run-off away from springs, and to provide a cool place to store food, particularly dairy products and eggs that needed to be cooled and stored. Before mechanical cream separators came into widespread use in the 1890s, springhouses were used to passively separate milk and cream. The whole milk was poured into a bowl, which was placed in cold, shallow springhouse water, and the cream separated from the milk as it cooled. Some springhouses also served as washhouses where dairy equipment and other items were washed (Scharf 2004).

Merill E. Jarchow wrote about Minnesota's pre-1885 farms, "Preserving foods was not easy. . . . Smoking and salting generally insured meat against spoiling, but milk and butter were not so easily kept fresh. . . . Springhouses or cellars were almost necessities on the farm, and it was a good idea for the farmer to spend part of the winter putting up ice for the next summer" (Jarchow 1949: 87).

Jaakkola and Frericks quote Minnesota food historian Marjorie Kreidberg, who explained:

> To early Minnesota settlers lucky enough to have a spring-fed pond or stream on their property, the springhouse was indispensable. The water provided a measure of cooling that was increased by the protective insulation of the structure's walls. Within the springhouse cans of milk, jars of cream, tubs of butter, and possibly some cheese could be kept for short periods of time even in warm weather (quoted in Jaakkola and Frericks 1996: 28).

Springhouses were built beginning in the early settlement era. They were usually small rectangular or square structures with gabled or hipped roofs. They were built of logs, milled lumber, stone, brick, concrete blocks, and poured concrete. The lowest part of the building was often built of masonry for durability.

Springhouses were generally located at the base of a slope where the natural spring emerged from the ground. They were often dug into the hillside. Springhouses were sometimes fenced to keep livestock away, and shallow trenches were sometimes dug above the springhouse to divert contaminated surface water away from the spring (Brooks and Jacon 1994: 70).

Inside, springhouses often had a trough in which the water collected. Butter, cream, and eggs were stored in crocks that were placed in the cold flowing water. Both dairy products and eggs had to

See also
Milk Houses
Root Cellars
Icehouses

be quickly cooled and stored in cold conditions. Properly stored, products like butter, eggs, and cheese could be kept for many weeks.

As dairying advanced, many farmers built milk houses in which milk and separated cream was cooled in metal cans standing in water-filled cooling tanks. (See "Milk Houses," another individual farm elements section.) Springhouses were also superseded by mechanical refrigeration, usually made possible by the electrification of farms.

The springbox – a variation on the springhouse – was a primarily underground structure for collecting and protecting spring water. They were usually made of brick or concrete, and were at least 4' deep and 3' wide, and extended at least 1' above the ground (Brooks and Jacon 1994: 70).

PREVALENCE

In Minnesota, springhouses and springboxes were built primarily in hilly areas where natural springs were found. Some are likely to be extant, with the earliest examples being the most rare.

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This fieldstone springhouse was standing in Mille Lacs County in the early 1980s. It was built into the side of a slope, which was typical. From Brinkman and Morgan's *Light from the Hearth: Central Minnesota Pioneers and Early Architecture* (1982).

■ STOCK TANKS

- stock tanks held water for livestock to drink
- tanks of sheet steel were manufactured by at least 1901
- wood, poured concrete, and cement staves were also used

Stock tanks, also called watering troughs, were circular, oval, or rectangular tanks that held drinking water for livestock. They could be located near a barn or stockyard, or in a more remote pasture, as long as a source of water was available. Supplying water to valuable livestock was important to keeping them healthy and productive. Dairy cows, for example, gave more milk if they were given sufficient water. Some farmers filled their stock tanks with rainwater captured in a cistern.

Many of the earliest tanks dating from the mid-19th century consisted of, and were modeled after, wooden barrels cut in half. More durable tanks were usually made of reinforced concrete or galvanized metal and were perhaps 4' wide and 8' to 12' long. Steel stock tanks were available by at least 1901, the year Butler Manufacturing Company was founded and began producing them. Concrete tanks sometimes had an apron of pavement extending around the base. Tank walls were low to allow livestock to freely drink. The inside walls were often sloped to allow ice to rise as the water froze. Round stock tanks were sometimes made with commercial silo forms. Most tanks were fed from the farm water system via metal pipes (*Farm Building Plans* 1953).

A University of Minnesota Experiment Station bulletin explained in 1934: "The water supply is always a problem on any livestock farm. . . . A large supply tank . . . should be located on ground high enough so that water can be piped from it to automatic waterers regulated by float valves. These waterers, carrying a small supply of water, will be refilled as the water is consumed. They may be kept from freezing by kerosene lamps. The drinking tank is best located out-of-doors but in a place protected from the wind. The supply tank may be filled as needed by a windmill, gasoline engine, or electric-powered pump" (Crickman et al. 1934: 56-58).

PREVALENCE

Pre-1960 stock tanks may still be fairly common on Minnesota farms, particularly if they were built of poured concrete.

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See also
Stockyards
Fields and Pastures

The earliest stock tanks were wooden. This tank stood on a farm near Lake Lillian, Kandiyohi County. Circa 1920. (MHS photo)

Most stock tanks were made of poured concrete like this one, or of galvanized metal. Location unknown, 1911. (MHS photo by Harry Darius Ayer)

This concrete stock tank stands in permanent pasture, away from the farmstead. Nearby are a well and a wooden chute for restraining stock. Pope County, 2004. (Gemini Research photo)

▪ STOCKYARDS

- Fenced enclosures for livestock, usually near the barn(s)
- Often located south or east of barns for shelter from northwesterly winds
- Usually unpaved; hog yards and feeding areas for other stock eventually paved for cleaning

Stockyards – also called cattle yards, barnyards, feedlots, pens, or paddocks – were sturdy, fenced livestock enclosures, usually located adjacent to the barns. Built since the early settlement period, they were often enclosed with wooden fences. Stockyards were usually located fairly close to the house and principal barn so farmers could keep an eye on the livestock. They were often placed south or east of the barns for maximum sun, warmth, and protection from winter winds.

Stockyards usually contained feeding structures like troughs, racks, and bunks; stock tanks for water; manure piles or pits; hog wallows and sheep dips; and livestock chutes.

Grass was maintained in some stockyards, while others were grazed and trampled so that little vegetation grew. By the 1940s many yards, especially for hogs and dairy cows, were paved with concrete to facilitate cleaning. The University of Wisconsin tested gravel for a dairy yard in the early 1940s but found it to be too impermanent. University of Minnesota staff were discussing "blacktop" or bituminous paving for yards in the mid-1950s (Witzel and Derber 1952: 638; Neubauer and Walker 1961: 66).

Separate stockyards were usually created for pigs, cattle and horses, and poultry. It was desirable for cattle yards to adjoin the main fields, and for hog yards to adjoin smaller fields, so the animals could be easily turned out to eat crop residue. Stockyards on farms that specialized in livestock were usually larger than those on diversified farms.

Farmers often divided stockyards – either temporarily or permanently – into smaller pens to facilitate sorting the animals by age or sex, rounding them up for veterinary treatment, or loading them for shipment. Pens for cattle, which get nervous when confined, needed to be very sturdy, and it was not uncommon for farmers to have to repair their bull pen weekly. Pens were often made of strong boards nailed to massive posts or old railroad ties (Hart 1998: 181; Kable 1936: 471).

In 1960 some U.S. dairy farmers were experimenting with a circular configuration in which pie-shaped, fenced yards radiated from central milking and storage facilities (Cleaver 1960).

PREVALENCE

Stockyards were built on virtually all Minnesota farms that cared for livestock. Many were fairly small and located adjacent to barns. It is expected that many stockyards were dismantled after

See also

Fences
Stock Tanks
Beef Barns
Sheep Barns

Appendix: Focus on Minn Livestock

1960 as Minnesota farms phased out of livestock. Fences were removed and yards converted to grass or gravel surfacing. Farmsteads with intact sets of fenced stockyards may be somewhat rare.

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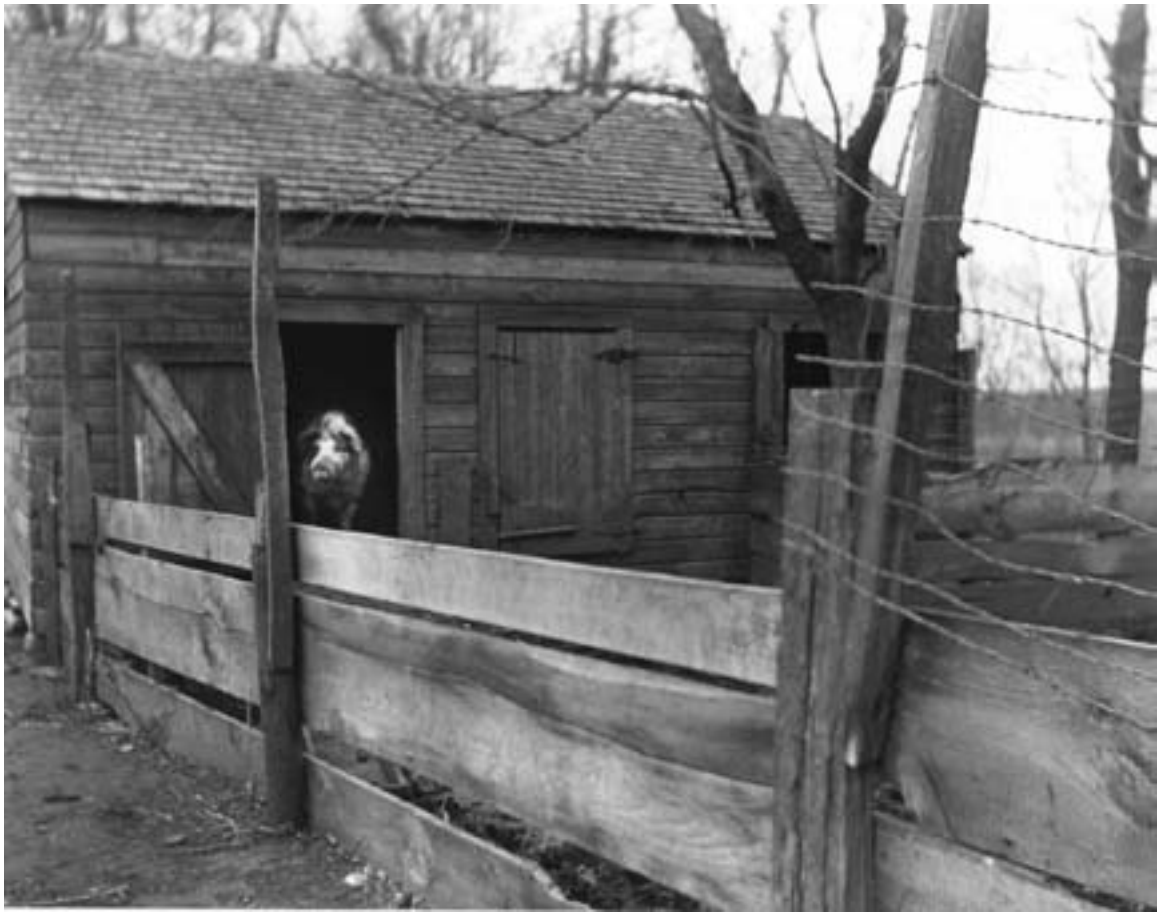
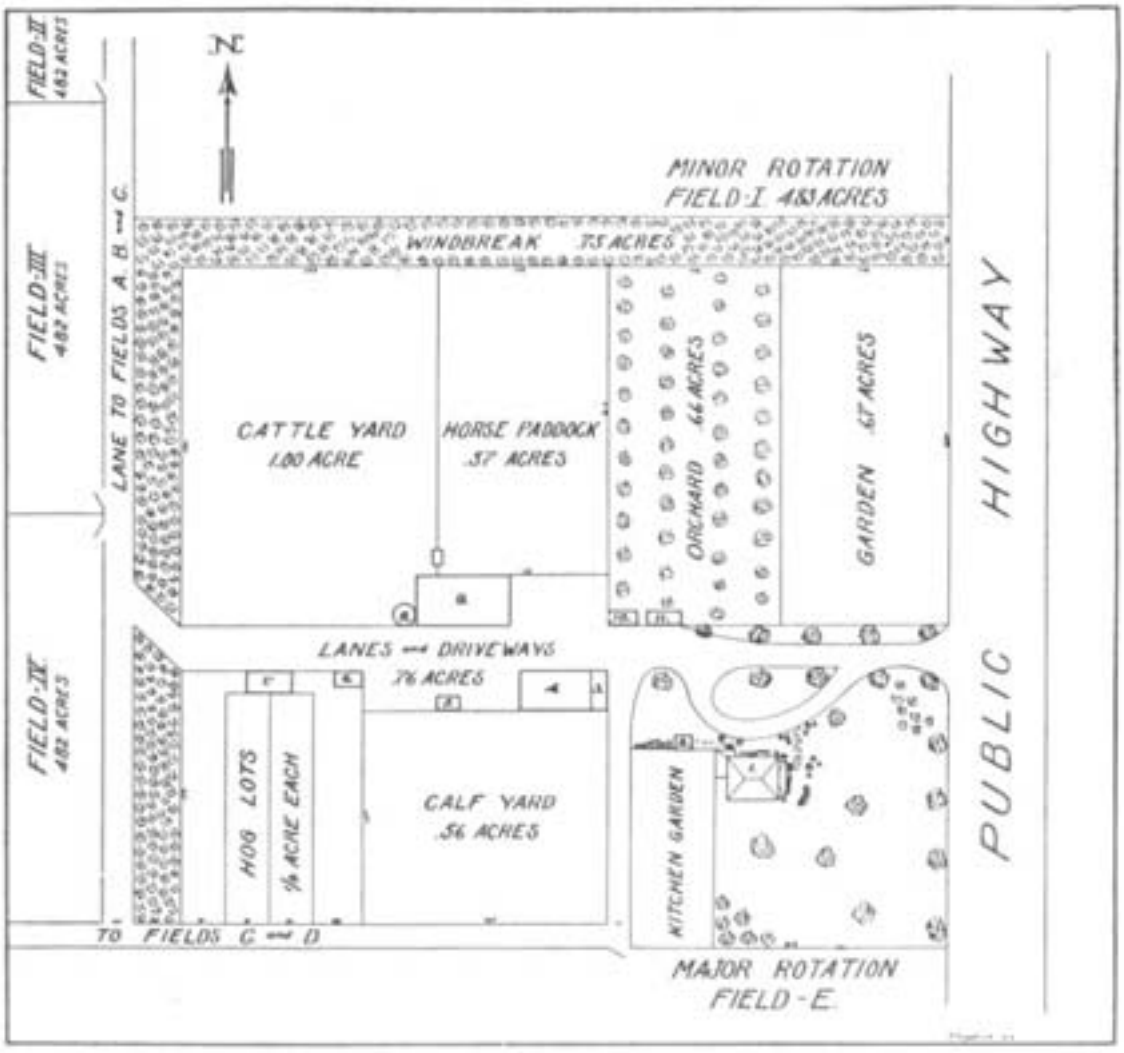


Stockyard adjacent to a hog barn. Location unknown, circa 1915. (MHS photo by Louis Enstrom)

Sows and their litters in a yard in Washington County, photographed in 1913. (MHS photo by Runk)

A small yard for sheep. Cutover farms raised an average of 24 ewes per farm in 1939. Hubbard County, circa 1915. (MHS photo)

A large stockyard with its necessary sturdy wood fence. Meyer Farm, near Potsdam, Olmsted County, 1959. (MHS photo by Eugene Debs Becker)



The 1914 book *Farm Management* by Minnesotan Andrew Boss illustrated a typical diversified farm with separate yards for cattle, horses, calves, and hogs. Each yard was located adjacent to the appropriate barn (Boss 1914).

A hog farm with extensive stockyards and nearby fenced fields. Location unknown, circa 1910. (MHS photo by Harry Darius Ayer)

▪ SUGARHOUSES

- Processing maple sap into syrup and sugar was traditional among Native Americans and adopted by Euro-American farmers
- Sap was processed in the sugarhouse, usually built in a "sugarbush" or grove of sugar maple trees

Native Americans were processing maple sap into syrup and sugar long before the first European explorers arrived, making those two products "among the oldest agricultural commodities" in the nation (Vogue 1994). For Euro-Americans who adopted the practice, maple syrup and sugar were "strictly a sideline farm crop" although occasionally the production expanded into a commercial operation (Vogue 1994). Most sugarhouses in Minnesota probably predate 1940.

Minnesotans, particularly in central and northern counties, usually tapped maple trees in February and March. Geographer Allen Noble explained that the "traditional production" of maple syrup and sugar involved "boring holes into the maple trees, placing a tube called a spile in the hole, and allowing sap to drip into covered pails or buckets hung from the spile" (Noble 1984: 99). The sap was collected and brought to the sugarhouse, which was usually standing in the grove of sugar maple trees.

Sugarhouses were often built in a "sugarbush," or grove of sugar maple trees, some distance from other farm buildings. Sugarhouses varied from one-room buildings measuring about 10' x 18' to larger two-room houses that might be 16' x 36' in size. The single-room structures housed "the firebox, also called the arch, a chimney pipe, the long shallow metal evaporator pan, and various jugs, bottles, and other miscellaneous equipment." Larger houses separated the "syrup boiling and sugar making operations" (Noble 1984: 99).

Within the well-ventilated house, the sap was boiled in large kettles over open fires. The wood was stacked inside the sugarhouse, outside in a neat pile, "or in an open-sided lean-to addition to one of the gables" of the house (Noble 1984: 99). Open fires were eventually replaced by shallow-pan evaporators. It took about 43 gallons of the watery sap to produce one gallon of syrup (Vogue 1994).

In 1941-1950, maple sugar harvesters in 11 states produced about 166 tons of sugar and 1.977 million gallons of maple syrup each year (Roberts et al 1956: 198).

Small maple syrup producers still collect the sap in buckets or plastic bags and carry it to the sugarhouse. Some larger operations skip the buckets and use tubing to carry the sap all the way to the sugarhouse, which is ideally located "at the foot of a bank or small slope" (Noble 1984: 99).

See also
Developing the Cutover, 1900-1940

PREVALENCE

Sugarhouses were often built in central and northern Minnesota where native sugar maple trees grow. It is not known how many pre-1960 sugarhouses are still standing. Some may have been converted to other uses such as storage.

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It took about 43 gallons of maple sap to produce one gallon of syrup. This sugarhouse was photographed circa 1905 near Long Lake in Hennepin County. (MHS photo by Sweet)

▪ SUMMER KITCHENS

- Usually located near the rear of the farmhouse and close to the pump and garden
- Often a small, free-standing, gable-roofed structure
- Often converted to other uses when farms were electrified

Used in Minnesota since the last quarter of the 19th century, summer kitchens were auxiliary cooking structures that were usually detached buildings. For convenience, they were usually located a few feet behind the farmhouse and close to a source of water and the vegetable garden. While they were often detached for fire safety, summer kitchens were sometimes connected to the main house via an enclosed passage. Sometimes summer kitchens were shed-roofed additions built onto the farmhouse (Peterson 1992: 99, 160; Noble 1984: 97).

According to geographers Noble and Cleek, who surveyed farm structures nationwide, "Detached summer kitchens are associated with settlements of Pennsylvania Germans, Hungarians, French-Canadians, Belgians, Russian-Germans, and Finns. Most immigrants from the British Isles did not build summer kitchens" (Noble and Cleek 1995: 146).

The earliest summer kitchens were furnished with fireplaces, and later structures had stoves with stove pipes. In summer months these kitchens were used for cooking, baking, canning, and other hot chores to keep the main house from getting too warm. Noble noted an added benefit: "The mess associated with the greatly augmented scale of summer cooking, when additional hired hands and helpers had to be fed, was removed from the dwelling," as were flies and other pests (Noble 1984: 97; Noble and Cleek 1995: 146). During the winter, after the cooking was moved back into the house to help heat it, the summer kitchen was often used for storage of freezable items. Sometimes the summer kitchen was used during the late fall and early spring for farm chores that required an enclosed sheltered area.

Historian Christopher Bobbitt, who studied summer kitchens in Harrison County, Indiana, wrote in 1989, "For nearly five months out of the year, [the] summer kitchen served as the center of all the family's activities except sleeping and entertaining company; the main house could thereby be kept clean and cool." He also wrote (with perhaps some conjecture): "The yearly move to and from the summer kitchen was a major but welcome event, a ritual marking of the seasons" (Bobbitt 1989: 228).

Bobbitt indicated that some of the summer kitchens he studied were specifically designed for the purpose, while others were small buildings that had served as the family's first home, or a springhouse or smokehouse. Those Bobbitt studied were "remarkably consistent in size and proportion," often with footprints of 12′ to 14′ by 20′ to 22′. Noble indicated 16′ x 20′ was a common size. Many summer kitchens had windows and doors on opposing walls for cross-ventilation (Bobbitt 1989: 228-229).

See also
Farmhouses
Smokehouses
Farmyards

The summer kitchens Bobbitt studied were often divided into two rooms with a temporary or permanent partition. They sometimes had a loft used for storage or for sleeping quarters for hired help. They were used for eating meals, as well as for cooking. Many summer kitchens Bobbitt studied were used through the 1930s and still extant in 1989 (Bobbitt 1989: 230).

Many farms stopped using summer kitchens for cooking when electricity was installed and modern cooking ranges were purchased in the 1930s-1950s. Many then began new lives as farm workshops, sheds, bunkhouses, or smokehouses (Bobbitt 1989: 235-236; Noble 1984: 98).

PREVALENCE

It is believed that summer kitchens were widely built on Minnesota farms. After they were no longer used for that purpose, many were converted to farmhouse entry rooms, bunkhouses for hired help, storage sheds, smokehouses, and similar uses. Many are likely to be still standing, although intact examples, especially with original chimneys, windows, etc., are assumed to be fairly rare.

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This summer kitchen may date from about 1930. It had a simple design with three windows for ventilation. A stove (removed) stood against the rear wall (opposite the door), with the stove pipe projecting through the roof. Anderson Farm, Stevens County, 2005. (Gemini Research photo)