GALVANIZED ROOFING
FOR FARM BUILDINGS

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Galvanized metal sheets are serviceable and economical for roofing farm buildings. If you select, apply, and maintain the sheets as recommended in this circular, your roofing should last as long as the building. Galvanized metal sheets were put on the buildings shown below when they were built in 1902 and 1904, and are still giving excellent service.
GALVANIZED METAL for roofing barns and other service buildings is justifiably popular among Illinois farmers. It can be put on easily and quickly with no special skill. And it gives long years of service when well selected, properly applied, and maintained from time to time.

SELECTING GALVANIZED ROOFING

There are six things to consider when you select galvanized roofing: the kind of base metal, the amount of zinc coating, the gage (thickness), style, and width of the sheets, and the special shapes you will need.

Base metal. All common grades of steel sheets rust unless protected from the weather; that is the reason they are galvanized—coated with zinc. If a small amount of rust-resistant material such as copper is added to the steel in manufacturing it, the sheets will have greater protection against corrosion.

Zinc coating. The amount of zinc coating, not the weight or composition of the base metal, determines the rust-free life of galvanized roofing. Buy only sheets that are labeled to show the weight of this coating. Seal of Quality grade, which has a zinc coating of 2 ounces to the square foot, costs more than commercial grade, which has 1.25 ounces to the square foot, but is preferable. And in the long run Seal of Quality grade is more economical because you won’t have to paint it so often.

Gage. For roofing (and siding), choose either 29-gage sheets that have been hardened by cold rolling or 28-gage annealed sheets. You may wish to use 26-gage sheets, but sheets thicker than this cost more because of their heavier weight and are harder to pierce with roofing nails.

Style. Galvanized roofing comes in two basic styles, corrugated and V-crimped. Choose the style that fits your purpose and taste. Cor-
rugated sheets are stiffer and nailing girts can be spaced as much as 24 inches for 1\(\frac{1}{4}\)-inch sheets and up to 36 inches for 2\(\frac{1}{2}\)-inch sheets.

V-crimped sheets are considered by some people to be more attractive. When applying them, lay them on a tightly sheathed deck or on boards spaced to cover about half the roof area. If such a foundation is not provided, the roofing is likely to be noisy and may be damaged by wind.

Regardless of style, galvanized sheets should be put on according to the manufacturer’s directions. Once they are on, avoid damaging them when you walk on the roof. You can do this by stepping only on points of support. If you don’t, the sheets will bend and eventually side-lap leaking will occur.

**Width of sheets.** Roofing sheets with 1\(\frac{1}{4}\)-inch corrugations are 26 inches wide; those with 2\(\frac{1}{2}\)-inch corrugations are 27\(\frac{1}{2}\) inches wide. Either of these sheets covers a net width of 24 inches and allows a side lap of one and one-half corrugations — one edge up, the other down. (Used as siding, a side lap of one corrugation is enough, so sheets with 2\(\frac{1}{2}\)-inch corrugations need be only 26 inches wide to cover a net width of 24 inches.)

**Special shapes.** In laying your roof, you will need such items as ridge rolls, valleys, and hips. Figure out what special shapes you will need and order them at the same time you order the roofing. You will be compensated for their slight extra cost because strips from ordinary sheets never work very well when they are bent to cover the hips of gambrel roofs or to cap the ridge.

Galvanized sheets are made to cover a net width of 24 inches. Sheets must be uniform for easier application, leak-proof side laps, and neat appearance. The overall width of the sheet is of minor importance so long as you get a lap of one and one-half corrugations at each side.
It is better to order ridge roll and other special shapes when you are ordering the rest of your roofing than to make your own from a straight sheet.

STORING GALVANIZED ROOFING

Always store the sheets on end in a dry building until you are ready to use them. If the building has a dirt floor, stand the sheets on planks or blocks. Take the clips off the bundles so air can circulate among the sheets.

When moisture is present, galvanized sheets in bundles act as an electric battery. A weak current is produced which gradually breaks down the zinc coating and deposits a white powder. This powder, known as wet storage stain, makes the sheets unattractive. There is nothing to be concerned about so long as you can rub off the powder with your hand and smooth the surface, for this shows that the zinc coating is still intact. But if the powder does not rub off and the surface remains rough, the zinc coating is damaged. In that case, you will want to remove the deposit with a stiff brush and paint the sheets with a durable paint before you put them on your roof. If you don’t, they may begin to rust, which will shorten their useful life.
Store the sheets inside on a dry floor, as in the picture at the left, not flat on the floor, as in the picture below.

APPLYING GALVANIZED ROOFING

Though it takes no special skill to apply galvanized roofing, you have to be careful in putting it on. Sheet metal is tough but fails when misused or carelessly applied.

The roof frame must be sound, and braced to hold it rigid during periods of snow, wind, and ice. Any sagging of the roof will loosen the sheets and permit leakage.

Metal roofing can be put on over old shingles. The added weight

Galvanized roofing can be put on directly over shingles as is being done here, but it is better to use nailing girts.
Galvanized roofing for Farm Buildings

Galvanized sheets are recommended for roofs that slope 3 inches or more per foot. Roofs flatter than 3 inches per foot tend to develop leakage trouble along the side laps.

![Diagram showing roof pitch angles](image)

amounts to only 2 or 3 pounds to each square foot of roof. If inspection of the roof shows signs of deterioration such as rotted sheathing or rafters, take off the shingles and replace the damaged parts. Galvanized sheets are often applied directly to the old shingle surface, but a better method is to separate the metal from the shingles with nailing girts. For nailing girts, you can use native lumber rough-sawed to full 1-inch thickness and 4 inches wide, or common 2 x 4s. Nail each girt at each rafter. Seal the air space between shingles and metal along the gable ends with trim to keep out rain and snow.

If you use nailing girts over the rafters for a new roof, put filler

Where rafters are spaced 24 inches, put filler strips between the nailing girts. Nails can then be driven all along the rafter line to make tight side laps.
strips on the rafters between the girts so that you can nail at any point along the rafter line.

**Special nails are required** to "hold" the sheets and provide a weather-tight surface. Changes in temperature and humidity cause wood as well as metal to expand and contract slightly. These changes make the nails "creep" or pull out of the wood. To counter this, galvanized nails with lead heads and screw shanks are the most effective. The lead head seals the place where the nail goes through; the screw shank supplies maximum holding power and resists creeping. Galvanized nails with lead heads and smooth shanks may also be used, but only if they are long enough to be clinched on the underside of the nailing girt. You will need 1½ to 2 pounds of nails for each 100 square feet of roofing.

**Start laying sheets at the end of the roof** away from the direction of prevailing winds. Then wind, snow, and rain will blow over the laps and not under them. It is best to lay sheets in vertical rows from the cave to the ridge so that all side laps are directly over a rafter. Let the sheets project 3 inches beyond the edge of the roof at the caves. Make the end laps 6 inches or more. Make the side laps one and one-half corrugations.

Start laying sheets at the lower corner away from prevailing winds. This will keep wind, rain, and snow from blowing under the laps.
Nail at the top of the corrugation, never in the valley.

You will find that nails drive more easily if you hold them at a slight angle. Space nails 6 to 8 inches along the side laps and 5 inches across the end laps.

Drive the nails down until the sheets are snug, but do not flatten the seams or corrugations.

Flattening the sheets will make them wider so that the side lap will "creep" past the rafter line. To prevent this "creeping," tack each sheet in place before you start to nail.

Pull out rusty nails and replace them with new lead-head screw-shank nails driven at a new angle so they will penetrate new wood.

REPAIRING THE ROOF

The main object in repairing a roof is to keep it weather-tight. To do this, replace roof boards as they wear out and nails as they become rusty. If sheets overlap between framing members where there is no wood to nail to, use sheet-metal screws to draw the sheets together and make the joint tight.

Roofs having slopes less than 3 inches per foot (⅛ pitch) often leak, even though the sheets are tight. On such roofs ordinary asbestos wicking can be placed between the sheets at the lap to form a gasket; nails or screws are then used to draw the sheets together.

Asbestos wicking

Use a single strand of wicking, not over ¼ inch in diameter. Soaking the strand in a thick metal-paint paste will make a tighter seal.
Use sheet-metal screws to draw sheets together where nails cannot be used.

PAINTING GALVANIZED ROOFING

When to paint. Paint preserves the base metal and improves the appearance of the roof. Galvanized roofing should be painted as soon as the zinc coating begins to break down. You can tell this is happening when the original color begins to fade and dark spots appear. If you wait until rusting occurs, you will have to brush vigorously with a stiff broom or brush to remove loose particles and scale. And you will need more paint.

Paint your roof in warm weather: the paint will stick better and give you more coverage. Before painting, be sure the sheets are dry and free from dust and dirt. If the roof is corroded, paint all rusted spots after removing loose particles and scale, and allow them to dry before painting the entire roof.

Kinds of paint. Paints on metal roofs are subjected to extremes of cold, heat, and moisture, which cause many of them to fail.

Metallic zinc paint gave the best service, according to tests conducted from 1932 to 1948 and analyzed by the Illinois Station. This
paint is a mixture of 80-percent zinc dust and 20-percent zinc oxide mixed with linseed oil. Soybean oil may be used in place of linseed oil in the manufacture, at least up to 60 percent of the total amount of oil. The color of this paint is battleship gray; a gallon weighs 23 pounds. One coat can be expected to protect the roof against rust for 5 to 8 years. The tests also indicated that this period of protection can be more than doubled if a second coat is applied within 4 years of the first coat. Metallic zinc paint was also found to be an excellent primer under other paints put on as finishing coats.

Iron oxide paint, the common red barn paint, is often used as metal paint. The better grades are acceptable, but not the low grades. Red and blue lead paints are excellent as primers on metal roofs but not as finishing coats. When used as finishing coats, they deteriorate rapidly and wash off. Do not use lead paints where rain water is collected for animals or people because of the danger of lead poisoning.

Asphalt paints are the least expensive per gallon, but they have the lowest coverage of any of the commonly used paints. Their main

A good paint job will make your roofing last longer.
value is to seal small breaks or holes in old roofing. Do not apply other paints on roofing that has been painted with asphalt paint. The oils in the asphalt “bleed through” and break the new paint film.

Reflective paints. Aluminum paint is widely used on metal roofs for its reflective value. As long as it stays bright, this paint may keep temperatures inside buildings as much as 10 degrees below outside temperatures on a hot day. It should not be used as a first coat over rusted roofing because it breaks down quickly under such conditions. It can be used as a finishing coat over a primer.

White paint does the best job of reflecting sunlight and keeping temperatures in buildings lower than outside temperatures. If the zinc coating of the sheets is intact, white paint can be applied without a primer. But if the galvanized surface shows any sign of rust, use a primer such as metallic zinc paint. Choose a “chalking” (“self-cleaning”) white paint; it resists staining and dulling better than other white paints. Titanium dioxide, zinc oxide, or lead compounds impart the “chalking” quality to paint. If you use a lead paint, be careful; it can be toxic to livestock.

Spraying or brushing. Metal paints can be put on with a brush or spray gun. If you have only a small area to paint, brushing takes less time and bother. If you have an area of several hundred square feet to paint, spraying is quicker and more economical.

SALVAGING GALVANIZED ROOFING

Galvanized sheets on old roofs can be salvaged and used again if they are removed carefully and are straightened, cleaned, and painted. Old sheets should be used on temporary structures rather than on new permanent buildings.

In salvaging and using sheets, observe these recommendations:

- Avoid bending or pulling nail heads through the sheets in removing them.
- Seal the old nail holes with solder or sheet-metal screws.
- Paint the sheets with a durable metal paint, applying two coats to the rusty sides.
- Put the sheets on the second building with the same side up as on the first. Reversing the sheets puts the old nail holes at the bottom of the valleys and increases the danger of leakage.
**PROTECTION AGAINST LIGHTNING**

To protect a building against damage by lightning, a path must be provided for the electrical discharge to reach moist earth without passing through such nonconducting parts of the structure as wood, brick, tile, or concrete. This path must be made continuous from the highest part of the building to moisture in the earth.

For greatest protection of your permanent buildings, lightning-rod equipment should be installed according to the "Code for Protection Against Lightning." This code is set forth in the National Bureau of Standards Handbook H40, which you can obtain at nominal cost by writing to the Superintendent of Documents, Government Printing Office, Washington 25, D.C. Standardized equipment approved by the Underwriters Laboratories and guaranteed by a bonded installer is available from several dealers in Illinois.

On buildings that have metal roofs, the roofing itself forms part of the electrical path. That path extends from ridge to eaves, so you need to add only conductor cables and pipes or rods to form "grounds" that extend down to permanent moisture in the earth.

For more detailed information about lightning protection, see Farmer's Bulletin 1512, *Protection of Buildings and Farm Property From Lightning*, available from your farm adviser or the Department of Agricultural Engineering, Urbana.

**Grounds.** A building needs at least two grounds placed at diagonally opposite corners. On large barns and sheds, more grounds are needed because the distance between grounds must not be more than 100 feet as measured around the building. Keep conductor cables and grounds at least 6 feet away from telephone and electric wires, and do not connect to any telephone or electric ground.

Drive the ground pipe down to permanent moisture. This depth varies with soil conditions, but a good general rule is to sink a 10-foot piece of ½-inch galvanized pipe, leaving 1 foot above the ground. A 10-foot solid rod can be used instead, if it is at least ¾ inch. The path from the eaves to the earth can be completed with ½-inch galvanized pipe, ¾-inch steel cable, or with No. 2 copper cable. If you use steel cable, see that the strands are no smaller than No. 14 wire. Inspect the installation at least once a year and replace parts as needed.

**Other metallic parts.** Connect all metallic parts of the building, such as hay tracks, steel beams, pipes, and ventilators, to the grounding
system. Hay tracks can be joined to the metal sheets at each end of the ridge. Stanchions, pipes, and other inside metallic items can usually be joined to the grounding system. If this is impractical, inside grounding can be used. An inside grounding system must have at least two grounds reaching to permanent moisture in the earth.

Lightning rods. Projections such as cupolas and chimneys, which are nonmetallic and are likely to be struck and damaged, need to be protected by lightning rods. Bond the rods to the metal roofing with a contact area of at least 3 square inches.

Four things to watch when running a cable from a metal roof to a ground:

1. Have at least 18 inches of contact between roof and cable.

2. Bend should have a radius of at least 8 inches where it passes over the eaves; total change in direction should be no more than 90 degrees.

3. Clamp the cable to the building so that passing machinery will not snag it. Galvanized pipe straps or large staples can be used. Insulators are not needed.

4. Join the cable and ground pipe with a tight, sturdy connection. Galvanized cable-splicing clamps or U-clamps can be used for this job.
FOR INFORMATION concerning any problem about galvanized roofing that is not discussed in this circular, Illinois residents may write the Department of Agricultural Engineering, College of Agriculture, University of Illinois, Urbana.
Some of the many questions farmers have asked about galvanized roofing that are answered in this circular:

Does my roof have enough slope to make galvanized roofing practicable?

What guides are there in shopping for galvanized sheets?

Which is better, to order special shapes or plan on making them myself?

What is the best way to store galvanized sheets?

If my sheets have "wet storage stain," should I remove the stain before putting them on my roof?

How do I prepare my roof for galvanized sheets?

What is the best procedure in applying galvanized sheets to my roof?

When should I paint galvanized sheets and what paint is recommended?

Can I salvage galvanized sheets and use them again?

What do I need to do to protect my building against lightning?