GALVANIZED ROOFING
For Farm Buildings

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GALVANIZED ROOFING
for Farm Buildings

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GALVANIZED-METAL ROOFING is used on more than one-third of the barns and other service buildings on Illinois farms. It is a durable material, and when put on right and maintained well will last for many years. But to get the best possible service from galvanized roofing, those who use it need to understand how to select it and put it on, and then to keep it in good condition.

Almost half of the metal roofs now in use in Illinois need some repairs. These include replacing damaged nailing strips or sheets, renailing, tightening loose sheets, and painting to stop damage from rust. Such repairs seldom require much money or material but they do require a few hours of labor from time to time.

These galvanized-metal roofs were put on when the buildings were built in 1902 and 1914. They are still good because they have been well cared for.
SELECTING GALVANIZED ROOFING

There are four main points to consider in selecting galvanized roofing: kind of base metal, gage or thickness of sheets, amount of zinc coating, and type of sheet.

**Base metal.** Galvanized sheets of either iron or open-hearth steel are acceptable. A small amount of rust-resistant material, such as copper, added to iron or steel when it is manufactured gives it some extra protection against corrosion. But because all common grades of iron or steel sheets will rust when the base metal is exposed to weathering, galvanizing — the process of coating iron or steel with zinc — is usually depended upon for rust protection.

**Thickness.** For farm buildings choose either 28-gage or 26-gage roofing (the lower the gage, the thicker the sheet). Sheets heavier than 26 gage are rarely used. They are difficult to pierce with roofing nails; they add to the roof load and cost more because of their extra weight; yet they give no better service than roofing of lighter gage that is properly maintained. Sheets thinner than 28 gage are too light for farm buildings; they are not stiff enough to hold up between the usual wide spacing of roof boards.

**Zinc coating.** The amount of zinc coating, rather than the weight of the base metal, determines the useful life of the sheets. Sheets having a coating of 2 ounces of zinc on each square foot are recommended for farm buildings. They last longer and need less maintenance than sheets with a lighter galvanizing, and are therefore more economical in the long run even tho the first cost is higher. Sheets having a 2-ounce coating are sold as “Seal of Quality” grade. All leading manufacturers can supply them.

**Types.** Corrugated and V-crimped are the most common types of galvanized sheets. Many manufacturers, however, make their own special types. All will give satisfactory service when applied according to the manufacturer’s directions.

Corrugated sheets are stiffer than the other types, but some people do not like their uniform appearance. “Standing seam” roofing is not commonly found on farm service buildings since a high degree of skill is needed to apply it. V-crimped roofing gives best
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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. Results when laid on a tightly sheathed deck. Otherwise it is noisy and is likely to be damaged by wind or by workmen walking on it.

Special shapes. Such items as ridge rolls, valleys, and hips can be purchased. Figure out the special shapes you will need and order them along with the rest of the roofing. Their slight extra cost is justified since strips from ordinary sheets never work very well when they are bent to cover the hips in gambrel roofs or to cap the ridge. It is never good practice to bend the sheets.

KEEP ROOFING DRY IN STORAGE

Always store the sheets on end in a dry building until you are ready to use them. If they will be on the bare ground, stand them on planks or blocks. Take the clips off the bundles so air can circulate between the sheets.
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.

When moisture is present, galvanized sheets act as an electric battery and develop current which breaks down the coating and deposits “white rust.” You may find occasional sheets that have a thin film of white rust on them. Do not use any with a heavy deposit on them. If you can rub off the film with your hand and leave the zinc coating smooth and intact, the sheet is acceptable. But if the surface remains rough, the sheet is damaged. If sheets are damaged, remove the deposit with a wire brush and apply a durable metal paint before the sheets go on the roof.

**HOW TO APPLY GALVANIZED ROOFING**

One reason for the popularity of galvanized roofing is that the common types can be applied easily and rapidly with no special skill. Careful workmanship, however, is necessary. Sheet metal is tough, but it will fail if it is misused or carelessly put on.

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

Metal roofing can be put on over old shingles. The added weight amounts to only 2 or 3 pounds per square foot of roof. If inspec-
tion of the building shows rotted sheathing or rafters or other deterioration, take off the shingles and replace the damaged parts. Sheets are often applied directly to the old shingle surface, but a better method is to separate the metal from the shingles with nail-

Galvanized roofing can be put on directly over shingles as is being done here, but a better way is to use strips.

ing strips. Native lumber, rough-sawn to full 1-inch thickness and 4 inches wide, is excellent for these strips. Start at the ridge and put the strips 1 foot apart all the way down the roof. Nail each strip 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 strips over the rafters for a new roof, put filler strips on the rafters between the nailing strips so you can nail at any point along the rafter line.

With 1x4 nailing strips on the rafters, it is a good idea to put 1x2's between the strips vertically.
Galvanized roofing requires special nails to hold the sheets and provide a weather-tight surface. Changes in temperature and humidity cause wood to expand and contract slightly. This results in the nails “creeping” or pulling out of the wood. Expansion and contraction of the roofing adds to this effect. Nails with lead heads and screw shanks are the most effective. The lead provides a seal where the nail goes thru the sheet. The screw shank gives maximum holding power and resistance to creeping. Nails with a smooth shank may be used if they are long enough to be clinched on the underside of the nailing strips. Use only galvanized nails.

One and a half to 2 pounds of nails are needed for each 100 square feet of roofing.

Start laying sheets at the end of the building 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 eave to the ridge so all side laps are directly over a rafter. Let the sheets project 3 inches beyond the edge of the roof at the eaves. Overlap the sheets 6 inches or more at the ends. Overlap corrugated roofing 1½ corrugations along each side of the sheet.

Begin laying sheets at the lower corner away from the prevailing wind. This will keep rain and snow from blowing under the laps.
Nail at the top of the corrugation—never in the valley. Space nails 6 to 8 inches apart along the side laps and 5 inches across the end laps. Drive the nails down until the roofing sheets are snug, but do not flatten the seams or corrugations. Sheets are manufactured to cover the customary rafter spacing of 24 inches. Flattening the crimps or corrugations will make the sheets wider so that the side lap will "creep" past the rafter line. To prevent this horizontal 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.

**KEEPING THE ROOF WEATHER-TIGHT**

The chief requirement in maintaining the roof is to keep it weather-tight. Replace worn-out roof boards and rusty nails. 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 the recommended minimum of 3 inches per foot (½ pitch) often leak even tho 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
Common pitches for roofs. Roofs flatter than 3 inches per foot (1/8 pitch) are seldom satisfactory for galvanized roofing because they generally leak at the laps.

draw the sheets together. 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.
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PAINTING THE ROOF

When to paint. Galvanized roofing should be painted as soon as the galvanizing or zinc coating begins to break down — certainly before the roofing rusts very much. When the original color fades and dark spots appear, the zinc coating has begun to break down. Painting at this stage takes less labor and a gallon of paint goes farther. Waiting until rust appears means extra labor for wire-brushing and cleaning rusted areas and takes more paint. Painting helps to preserve the base metal and keeps the roof looking better.

For the paint to stick on well and for maximum coverage, it must be put on in warm weather. Sheets must be dry and free from dust and dirt. If rusted, the sheets can be cleaned with a wire brush to remove loose particles and scale. First paint all rusted spots and let them dry; then apply a coat over the whole roof. Wire-brushing is not necessary if the paint is applied with a spray gun. Always sweep the roof with a broom just before painting.

Kinds of paints. Paints on metal roofs are subjected to extremes of cold, heat, and moisture which cause many of them to fail. Metallic zinc paint has given excellent service in tests. It 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. This paint is battleship gray; a gallon weighs 23 pounds. One coat of metallic zinc paint can be expected to protect the roof 5 to 8 years against any rust. Tests indicate that this protection will be more than doubled if a second coat is applied within 4 years of the first. Zinc paint is an excellent primer under other paints put on as finish coats.

Iron oxide paint, the common red barn paint used on farms, is often used as metal paint. The better grades are acceptable, but do not apply the low grades.

Aluminum paint is widely used for its high reflective value. As long as it stays bright, it may keep temperatures inside buildings as much as 10 degrees below outside temperatures on a hot day. It is not recommended as a first coat over rusted iron or steel since it soon breaks down under such conditions. It can be used as a finish coat over a suitable priming coat.
A good paint job will make your roof last longer.

Red and blue lead paints are seldom used as single coatings on metal roofs. They deteriorate rapidly and wash off unless covered by a more durable finishing coat, altho they are excellent for base coats. Do not use lead paints where rain water is collected for animals or people since there is danger of lead poisoning.

Asphalt paints are the least expensive per gallon but they have the lowest coverage of any commonly used paint. Their main value is to seal small holes or breaks in old roofs. Do not apply other paints on roofs where asphalt paint has been used previously. The oils in the asphalt "bleed thru" and break the new paint film.

**Spraying or brushing?** Metal paints can be put on with either a brush or a spray gun. Hand-brushing is simpler and quicker for small jobs because you have less equipment to care for. But for jobs of several hundred square feet, spraying is more economical because the time to do the job can be reduced to as little as one-fifth that needed for hand-brushing.
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SALVAGING AND USING OLD METAL ROOFING

Sheets of galvanized roofing can be salvaged from old buildings and used again to give many years of service if they are removed carefully, straightened, cleaned, and painted. Old sheets are seldom suitable for new permanent buildings, but they are useful for temporary structures. Follow these steps when salvaging and using old sheets:

1. Remove sheets carefully. Avoid bending the sheets or pulling nail heads thru them.
2. Seal the old nail holes with solder or sheet-metal screws or both.
3. Paint the sheets with a durable metal paint. The rusty sides will need two coats.
4. 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 buildings against damage by lightning a path has to be provided by which the electrical discharge can enter the earth without passing thru nonconducting parts of the structure, such as wood, brick, tile, or concrete. The path must be continuous from the highest part of the building to the ground. On buildings with metal roofs, the metal itself forms the electrical path from the ridge to the eaves. All that need to be added are conductor cables and pipes or rods ("grounds") extending down to permanent moisture in the earth.

Grounds. Each building needs at least two grounds, placed at diagonally opposite corners. On large barns and sheds more grounds are needed since the distance between grounds, according to the National Board of Fire Underwriters, must not be more than

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1 For detailed information on lightning protection, see Farmers' Bulletin 1512, "Protection of Buildings and Farm Property From Lightning," or "Code for Protection Against Lightning" published by the National Bureau of Standards.
100 feet, measured around the building. Keep conductor cables and grounds at least 6 feet away from telephone or electric wires. 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 use a 10-foot section of $\frac{1}{2}$-inch galvanized pipe and leave 1 foot above the ground. A 10-foot solid rod can be used if it is $\frac{5}{8}$ inch or more in diameter. Galvanized rod is better than a bare steel rod since it will last longer. The path from the eaves can be completed with $\frac{1}{2}$-inch galvanized pipe or $\frac{3}{8}$-inch steel cable or No. 2 copper cable. Inspect the installation at least once a year and replace parts as needed.

Steel cable. The steel cable must be at least $\frac{3}{8}$ inch in diameter with strands no smaller than No. 14 gage steel wire. A homemade cable is satisfactory. Fasten one end of each strand of wire to a solid post; fasten the other end to a wheel spoke. Jack up the wheel and form the cable by turning the wheel slowly. Do not use mechanical power to turn the wheel since it is likely to turn the wheel too fast and break the strands of wire. The cable can be made of any of the following combinations:

- 4 strands of No. 9 wire
- 6 strands of No. 11 wire
- 5 strands of No. 10 wire
- 7 strands of No. 12 wire

These boys are making a conductor cable of 4 strands of No. 9 wire (the other end of the cable is fastened to a fence post). When you are figuring how long a cable to make, be sure to add some to allow for contact with the sheets of roofing and for shrinkage due to twisting.
It is very hard to handle more than seven strands in making homemade cable. No. 13 and No. 14 are not suitable since they require more than seven strands.

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. A separate grounding system inside the building is often more convenient for the interior metallic items.

Four points 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.
Bond connecting cables securely to roofs. This cable connects two metal roofs; another cable runs from the lower roof to the ground.

such as stanchions and pipes. An inside system requires at least two grounds, with each ground reaching to permanent moisture in the earth.

Lightning rods. Projections such as cupolas, chimneys, and ventilators, 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.