— BY RICK COLLINS —
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# First Steps in Barn Preservation

Over the last 30 years, coast-to-coast and throughout the Midwest, I have looked at thousands of buildings. Together, they nearly encompass the entire breadth of the last two centuries of our built vernacular. From ornate churches with dense timber trusses and magnificent soaring steeples, to one-room log buildings constructed with Medieval techniques direct from Europe. There have been commercial and private buildings of all types and sizes spanning every era from pre-industrial to post-modern: pavilions, houses, mills, skating rinks, and of course many, many barns.

## ASSESSMENT:

All this to say, no matter what type of structure, we're always following the same method and looking at the same things in order to identify: 1) what we have and 2) what to do. Examples around the world tell us, barring catastrophic events, if a timber frame is dry and maintained, there is no reason to expect anything less than an indefinite lifespan- hundreds or even thousands of years.

When we begin to look at a building and determine priorities for its care, we always consider the owner's long and short-term objectives, resources, and budget. This full understanding informs us as we begin with an identification of what we call the "scope of work". Over and over again we find the most important factor in identifying an efficient scope of work that will be able to be completed fiscally and be a success (which may include a phased approach over decades) is really understanding this greater context along with the objective for the building.

## PRIORITIES FOR CARE:

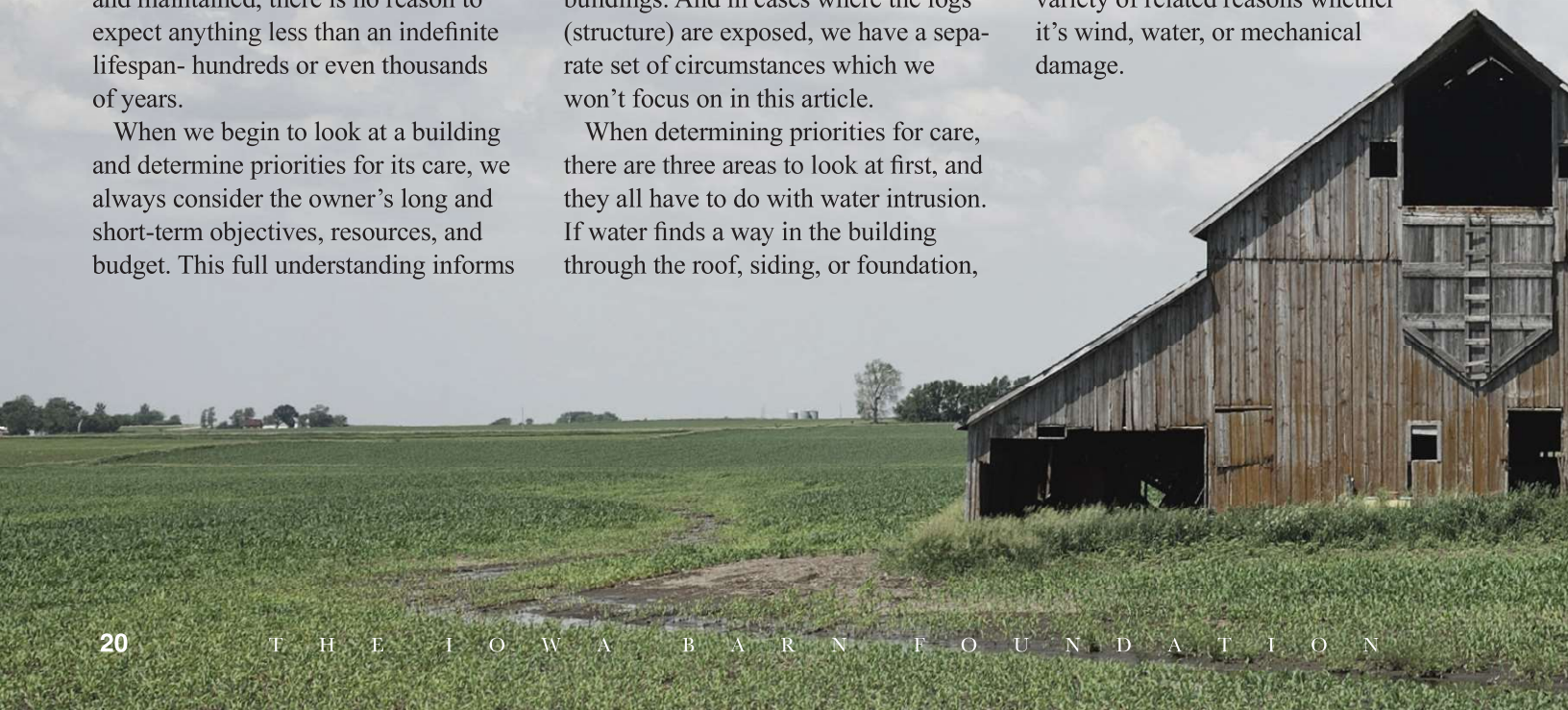
Most buildings we see are clad structures. This means the frame (structure) is covered (clad) by siding or stone or brick. The foundation can be as minimal as piers – and may include piles of rocks, stacked stone, brick, or rubble. In clad structures, the roofing material and the siding material should be looked at as a protective skin - something to be replaced over time as it wears from the elements. The exception to this clad structure building type, of course, is log buildings. And in cases where the logs (structure) are exposed, we have a separate set of circumstances which we won't focus on in this article.

When determining priorities for care, there are three areas to look at first, and they all have to do with water intrusion. If water finds a way in the building through the roof, siding, or foundation, then we have a building at risk and in active decline. Water infiltration creates a situation for progressive rot and quickly opens additional damage (and cost) from insects, fungal decay and animals.

## SIDING:

It is not uncommon for wood siding from the 19th century to last 100 years or more if maintained with oil or paint. In the case of stone or brick– that life span is centuries if attention is paid to refreshing mortar every 80-100+ years. If the cladding is not maintained or replaced when damaged, the building loses its protection and structural problems will start in the walls, sill plates, and foundation. Failed siding generally tends to cause damage more slowly and in more isolated immediately surrounding areas than failures at the roof or foundation do.

Secondarily we look at windows and doors during an assessment of a potential project. These also often fail for a variety of related reasons whether it's wind, water, or mechanical damage.



## ROOFING:

Unfortunately for us in the Midwest, many buildings were built with wood shingles or shakes originally and then covered with asphalt shingles– or even something like a concrete asbestos shingle. In these cases, we often find significant roof damage as parts of those layers of shingles have blown off and allow water to penetrate the building. Water leaking through the roof causes damage to the roof structure, which include the rafters and the purlins, and then of course running down to damage posts, sill plates, and floor systems.

## FOUNDATION:

The causes and types of foundation failure include many common scenarios. Settling of the foundation (underbuilt footings), spalling (loss of the fired face and/or pulverizing) of the brick or stone units (excessive moisture during freeze thaw cycles, incompatible mortar, poor drainage), exposure (unmaintained mortar joints wearing away) or under mining (by animals, water, or abutting concrete) all open the door for water and structural shifting.

These are the primary areas of focus when we are assessing a building, and the objective is to isolate which one or more of these factors are most critical. Large roof failure is by far the most important issue to deal with and foundations are second (with siding being as well in some cases).

Another component to our assessment strategy is examining the structure of the building from the standpoint of modern engineering and what the future of the building might be. Even though engineering and construction in the 19th and early 20th century was highly evolved, it's often the case (as is today) that the original builders may have omitted some framing or undersized some components due to budget, time, mistake, or other factors. Many buildings are also modified as their primary use changes and evolves over time. We look at this as well, and consider what sort of structural improvements might be made to the building.

Examples of increasing capacity and adding redundancy are sistering of rafters, adding additional structure to plates, adding lateral ties from the gable end of the buildings to the first interior bent, or reinforcing the floor system. As mentioned above, in some cases during the assessment of the structure, we identify that components have been moved or removed overtime– especially in agricultural buildings. As agricultural technology and machinery evolved, more clearance and bigger spaces became necessary. Parts of the original frame were taken out to accommodate. These commonly include upper straining beams, posts, girts, and tie beams. In many cases we add these components back in, or strengthen them with a variety of methods. How we go about it depends on practical things like budget as well as the historical significance of the building and repair work.

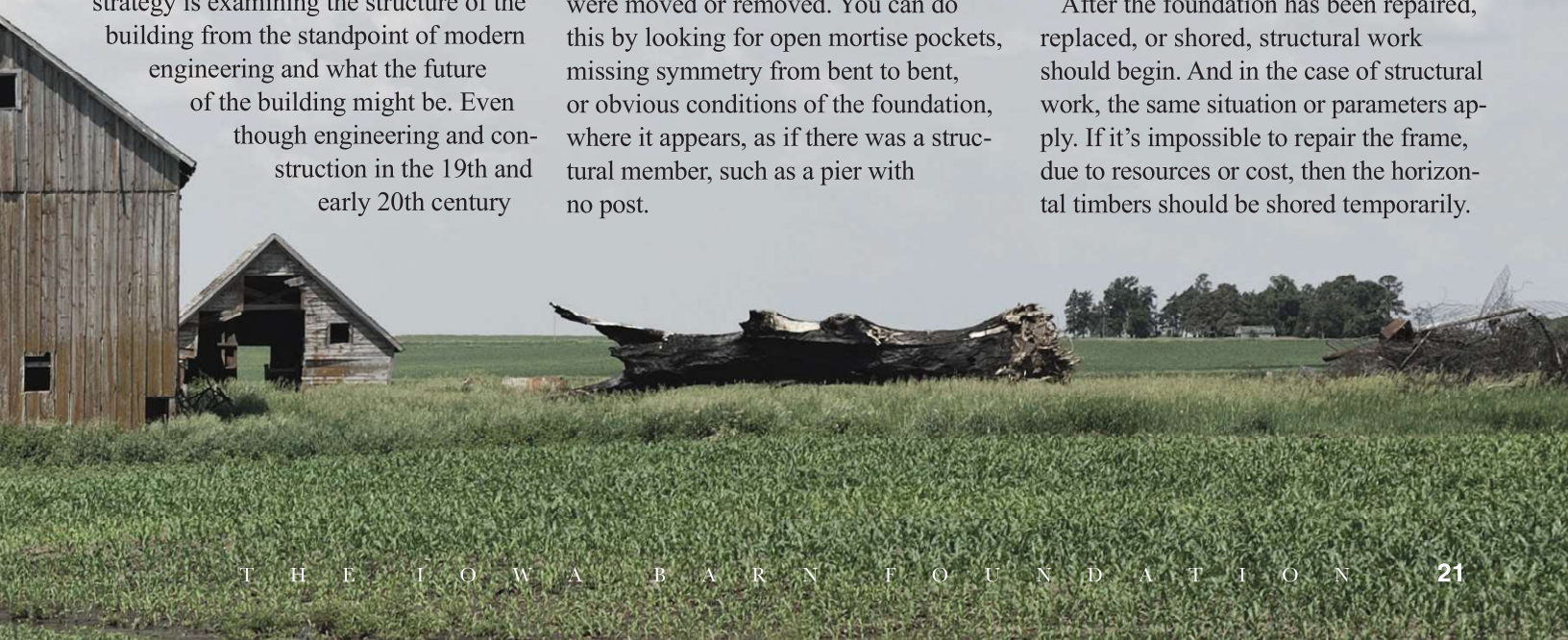
Prior to hiring a professional to make an assessment and repairs– you can observe these three primary areas: siding, roof, foundation, and investigate whether it appears as if structural components were moved or removed. You can do this by looking for open mortise pockets, missing symmetry from bent to bent, or obvious conditions of the foundation, where it appears, as if there was a structural member, such as a pier with no post.

It's important to remember that buildings made of wood have memory, and that even though a barn or a structure might be sagging, due to a failed foundation, a missing post, or a missing tie beam, it may be returned to its original position without damaging the wood in almost all cases. Obviously, if a building is sagging substantially, or if the condition of a purlin or a rafter plate has developed several inches or more of deflection it may make the most fiscal sense to leave a little of the undulation– make the main goal to shore the frame and keep it safe and secure.

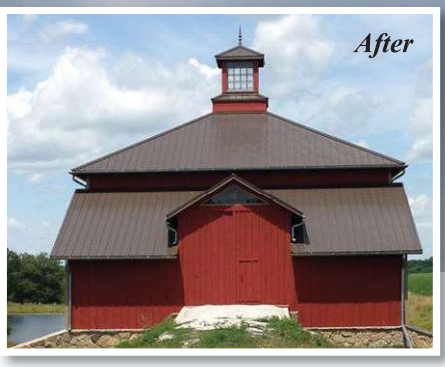
## ORDER OF OPERATIONS:

So, in terms of establishing priorities, it's important to have the foundation in a condition that allows the structure to be worked on. This may mean repairing, or replacing the foundation, or in the case of phasing (budget constraints), just the temporary shoring of the foundation, so that the frame can be brought back into what we call a "parallel and flat" condition. It's not as important to level the building as it is to bring the surfaces back into parallel. This means the top of the foundation wall is parallel with the sill, the sill is parallel with the rafter plate, the rafter plate is parallel with the purlin plate, and the purlin plate is parallel with the ridge. There is an acceptable amount of difference between these things, and in the case of a 60 foot building for example, an out of parallel condition of around an inch is within reason.

After the foundation has been repaired, replaced, or shored, structural work should begin. And in the case of structural work, the same situation or parameters apply. If it's impossible to repair the frame, due to resources or cost, then the horizontal timbers should be shored temporarily.



# Nearly any barn can be saved…


With the foundation repaired or shored, and the frame repaired or shored, we move to the roof. If the roof is in need of repair or replacement, this becomes the top priority. If there is a roof back on the building work to the foundation, and the frame can occur at a later date if needed.

Siding is often the last item of these things to address as installing new siding prior to working on the frame of the foundation causes difficulty and bringing the frame back where it needs to be or hinder access for the frame repairs. This is not to say it's always the case though, in some cases, we have temporarily closed (mothballed) a structure with steel or plywood to keep out weather and animals while well-thought plans and fundraising are made for future work. In these cases windows and doors can be enclosed temporarily, but these should follow as the last item to consider. All of this can and should change and be dictated by the objective for the building. If it's important to get the building dry and still have some utilization of the building well, these general scopes of work and order of operations are modified. For example, temporary doors are quite a normal procedure. There are many cases (with barns) that call for lifting the building up, installing a new foundation and piers, leaving the existing siding on, installing a new roof, and installing new wood siding over the original siding.

Historic fabric (ie. the materials used in the original construction) are important and part of the story of the structure. It's with the utmost respect that we approach the care and repair of our collective cultural heritage– the historic agricultural buildings still in our landscape. We quite often advocate for leaving as much historic fabric intact as possible. This often saves money too, and we see it frequently in the reinforcement of floors as we bring them up to an increased capacity for public or greater use. In these cases the original joists remain and are "sistered" (doubled up) with another joist. In the case of roofs, we sometimes see the need to reinforce by sistering rafters and purlins. This increased capacity of the roof can be needed due to under-building, failure, or updated engineering requirements (responding to greater wind or snow loads).

**MATERIALS AND MANY CHOICES:** In all the above-mentioned cases it's possible to use modern lumber, lumber directly from a sawmill, engineered lumber, or reclaimed material. New components and repairs can be exact replications, hidden, obvious utilitarian, steel, all wood, cutting edge European timber fastening systems, or a mix of it all.

The most important part of our work, and what I would like to convey to you is that the critical path is to save the building. To do that we must keep it dry. When you go out later today or tomorrow to look at your barn: First look at what damage is being caused by water intrusion, then look for structural damage, which may include missing/removed components, and look at the foundation. Making a list of these things and establishing a quick sketch of your building to mark locations both in plan and in elevation is supremely helpful in starting to or beginning to isolate the priorities. Documentation with photography is useful overtime too as we often see the patterns of damage that might be happening when we look at buildings over years or decades. When this information is captured it's simplified– easier to understand, discuss with others, and track. We have a fraction of these buildings left now and they deserve our attention and care.

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Rick Collins is recognized for his expertise in both the history and the future of timber frame building. His portfolio encompasses visionary buildings that redefine the role of wood in the built environment, as well as authentic restoration and preservation work.

Rick is a structural timber expert, who is committed to the Preservation & Continuation of our built and natural heritage: A Master Carpenter with formative experience in metalwork and mechanics, and one of only 20 people in North America to carry the certification of Journey Worker Timber Framer, he has a BS in Forest Science from the University of Illinois at Urbana-Champaign. Rick served in the USMCR as a Combat Engineer, studying engineering and building science. He is also a self-taught scholar in the methods and tooling that were used by Europeans who settled the Midwest from the 1600s-1800s.

A long-time cultivator of creative energies within the US timber framing trade, today Rick focuses his energy as a consultant and a subject matter expert – adding to the efficiency, and context of a project by grounding process with practicality and linking community with place.

# BARN ASSESSMENT CHECKLIST

Barn Owner Name (Please Print): _____ Date: _____

Barn Address: _____

Barn Type: _____ Build Year: _____

Barn Dimensions (WxLxH): _____

## FOUNDATION ASSESSMENT:

Type:
☐ Continuous ☐ Piers/Interrupted

Material:
☐ Poured Concrete ☐ Concrete Block ☐ Natural Stone
☐ Brick ☐ Clay Tile ☐ Mix/Other

Visual rating of foundation condition
*(1=poor, 2=typical, 3=excellent)*
☐ 1 – complete structural failure
☐ 2 – moderate repairs required
☐ 3 – no structural or surface damage

Observed foundation issues *(i.e. settling under footings, poor drainage, water erosion, tree/brush growth, crumbling, mortar loss, animal damage, displaced walls, cracks, failed repairs):*

_____

_____

Lowest level floor:
☐ Dirt ☐ Concrete Slab ☐ Other _____

## ROOF ASSESSMENT:

Type: ☐ Wood ☐ Asphalt ☐ Composite ☐ Metal

Number and type of layers under current roofing

_____

Visual rating of roof lines *(1=poor, 2=typical, 3=excellent)*
☐ 1 - multiple crooked or wavy lines
☐ 2 - some burps in ridge or eaves
☐ 3 - really straight ridge & eavelines

Roof Condition: Percent holes/missing sections_____

Presence of Gutters & Condition:

_____

_____

Additional Roof Observations (with locations):

_____

_____

## SIDING ASSESSMENT:

Type:
☐ Wood ☐ Metal/Wood ☐ Metal ☐ Other _____

Visual rating of siding condition *(1=poor, 2=typical, 3=excellent)*
☐ 1 - large holes and gaps, missing battens
☐ 2 - some open areas
☐ 3 - intact and weather tight

Additional observations including condition of siding, doors, and windows (with locations):

_____

_____

_____

_____

_____

_____

## INTERIOR FLOORING AND FRAME ASSESSMENT:

Visual rating of lower flooring *(1=poor, 2=typical, 3=excellent)*
☐ 1 - very unsafe: uneven, inclined, holes/rot
☐ 2 - safe: even, level, some localized rot
☐ 3 - very safe: even, level, clear of rot

Visual rating of upper floor condition
*(1=poor, 2=typical, 3=excellent)*
☐ 1 - poor (need to replace entirely)
☐ 2 - typical (needs some repairs)
☐ 3 - excellent (very little needed)

Frame: ☐ Stick framing ☐ Mix ☐ Other _____

Joinery type: ☐ Mortise & Tenon ☐ Metal Brackets/Plates
☐ Nails/Bolts ☐ Mix

Describe the level of clean out required - hay loft, upper floor, lower floor:

_____

_____

_____

Observed damage to structural framing (with locations) – *removal of framing for equipment access, prior repairs, frame out of square, joints pulled apart, rotten wood*:

_____

_____

_____

_____

_____

_____

Photo Documentation
☐ Exterior photos from each direction – N, E, S, W
☐ Interior photos facing each direction on each level
☐ Detailed photos of damaged areas or unique components