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## Facility & Feasibility Study

### Hill Farm Barn

Crystal Lake, Illinois



**Owner:**

Crystal Lake Park District  
One East Crystal Lake Avenue  
Crystal Lake, IL 60014

**Date:**

May 16, 2016

**Project:**

1610

# Facility & Feasibility Study

## Purpose & Limits of Usage

### Study Purpose:

The purpose of this study is to provide documentation of the existing conditions, identify problem areas within the facility, provide recommendations for repairs and renovations, provide a priority list for recommended repairs, provide preliminary estimate of probable costs for the recommended repairs, and the potential for re-use and re-purposing the barn.

The Facility & Feasibility Study will provide you with a preliminary understanding of what is needed to rehabilitate or re-purpose the barn. Please note that this study is not provided as an engineered solution for corrective rehabilitation. This study is the first step of the process and is necessary to determine the “possible scope” of any engineered solutions that may be required later. Costs are estimated based on a general overview of possible and/or hypothetical scope of work and shall not be relied upon as accurate until an engineered solution has been concluded to define a specific scope of work.

This report covers only the Barn and does not cover any auxiliary structures on the site.

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# The Hill Farm Barn

The Hill Farm Barn located on Barlina Road in Crystal Lake , IL is an early 1900 5-bay bank barn with a gambrel roof. The original barn measures 34' wide x 72' long. The barn was probably built somewhere between 1900 and 1920. The original purpose of the barn was for threshing and was later converted to milking and dairy as the evidence of the troughs and milk house suggest. The style of the barn, a bank barn with a gambrel roof, suggests German craftsmanship.

## Historical Significance

Hill Farm is named after the family of advertising executive Ivan Hill from Winnetka who purchased the property in 1960 and resided there with his family until 1969 when he sold the property to real estate developers. In 1972 15 acres of the farm including all of the buildings that exist on the site today were donated to the Crystal lake Park District as preserved public space and is still being used in that manner today. Although the barn and other buildings pre-date the ownership of the Hill Family, historical data was not available prior to this.

The Hill Farm is currently being used as a community garden. The barn is currently being used by Crystal Lake Park District for storage. The old farm house is now being used as a pre-school.

## Existing Conditions

The original barn is prominent due to its size and scale and appears to be the diamond in the rough along with a large brick milk house at the northeast corner. The original barn and milk house have the real historical significance and therefore are the focus of the study. Lean-to additions were added to the original barn at a later date. These lean-to additions are very poorly constructed and significantly detract from and are causing damage to the original barn.

## Structure

The original barn was built quite stout which is indicative of a family of modest means. The barn is solid and the sight lines and stance are still very straight. This says much about the quality of the original stone foundation as well as the soundness and strength of the barn's heavy timber framing.

The barn is supported at the lower level milking parlor by 20" thick stone foundation walls at the East and West outside walls of the barn. A sill beam sits on top of the foundation walls and supports the upper outer wall posts of the timber frame structure above. Internal steel columns support the main wood beams that run the length of the barn. The main beams support true 3x12 floor joists that support the mow floor above.

The heavy timber frame above the mow floor it quite impressive and appears to be mostly constructed of white pine timber and Fir timbers. The timber frame, as inspected from the interior, is in excellent condition. Many of the timbers are oversized such as the 8x10 tie beams or girts at the North and South end walls, the 4x6 wall nailers at the outside walls, and the 4x6 lateral and sway braces. The craftsmanship of the mortise and tennon joinery is well done, regular, and precise. The original framing

posts and beams were all sawn on a gang sash saw mill. The individual bents are mostly identical with rough sawn 8x8 outer and inner posts, 8x8x32'-8"L. tie beams or girts (outside bent girts are 10x10), 6x8 top plates scarf jointed at third points, 6x6 queen posts, 6x4 queen post braces, and 6x6 queen top plates that run the length of the barn and are scarf jointed at third points. The knee braces in each bent, as well as the sidewalls, are all 4x4. Wall ties between the bents are unusually oversized at 6x4. There is also large 4x6 lateral and 4x6 sway bracing that adds significant strength and wind resistance to the overall frame. The roof is framed with true actual 2x6 rafters at 24"O.C. with no ridge board. The timber frame is beautifully crafted and has a nice natural colored patina on all of the timbers.

### Foundation

The granite stone foundation of the original barn is still very solid, is 20 inches thick, and appears to be in fairly good condition. There has been some tuck pointing done to the foundation walls over the years which is common for its age. There are also areas that could use additional tuck pointing. A significant issue with the foundation is that the foundation only exists at the East and West side walls. At the ends of the barn, the North and South ends, it appears that the stone foundations at the end walls were removed or never wrapped the corners. If the foundation walls weren't as thick as they are there would be some concern that the foundations don't wrap at the corners as is needed to brace the walls.

### Roofing

The roofing on the barn is 3-tab asphalt shingles that appears to be installed over the original wood shake roofing. The asphalt shingle roofing is in very poor condition although there doesn't appear to be any significant exposed areas or holes in the roof of the main barn with one exception at the Southwest side of the ridge. Many of the shingles have lost much of their surface granules and the heat has warped and distorted majority of the shingles. There are many of the top layer of shingles that have come off all together and lay on the ground all around the barn, but the layers underneath are still providing some protection. The roofing material is fastened to 1x12 skip board sheathing that is nailed to the true 2x6 roof rafters. The skip board sheathing appears to be in fairly good condition as are the rafters. There is no ridge board, so the roof rafters just meet at the ridge. A wooden hay fork trolley beam is hung from the rafters at the ridge.

The fascia boards, especially at the South end of the barn, are in very bad shape and need to be replaced.

The gutters for the most part are still in tack with the exception of a section at the South end of the West side. These gutters could also be restored fairly easily.

### Siding

The 1x6 horizontal lap siding that is visible is not original and has been installed over the original vertical 1x12 rough sawn white pine board and batten siding that was once painted white. Due to the condition of the horizontal lap siding I would guess that this was done in the 1970's. As is typical the siding on the South and West sides of the barn is weathered the most and is in the poorest condition due to direct sun and southwest prevailing winds. There are most definitely areas that need to be repaired or replaced especially most of the South end of the barn. Another concern is with the numerous areas that have improper flashing it is quite possible that moisture is getting trapped between the two layers of siding causing rot and peeling paint, not to mention damage to the sill beam and inner structure. In order to repair the structural issues including the sill beam much of the lower siding will need to be removed. One solution would be to remove all of the horizontal siding and restore the vertical siding to its original detail.

The windows all appear to be adequate for closure purposes. Many would be improved significantly with a good coat of primer, paint, and caulk.

#### Concrete Floor Slab

Since the barn was converted for dairy operations there are troughs and curbs in the concrete slab at the milking parlor. As is typical the concrete floor is quite uneven and rough and has been patched in numerous areas.

#### Electrical

Some modern conveniences such as electricity were added to the barn. The electrical seems to have been done quite well for a barn.

#### Mechanical

Two large ventilators at the roof were meant to keep the air moving through the barn. These ventilators are still in very good condition for their age and do not exhibit the usual buckshot holes that many barn owners inflict on this equipment. These ventilators could be removed, re-galvanized, and re-installed as part of a roof replacement and they would look like new. Typically barns were built to breathe and air flowed through the barn and out the ventilators at the roof. Since the second layer of siding was added the air flow through the outside walls has been reduced. Consequently the barn doesn't breathe the way it was intended to and consequently retains moisture longer.

#### Lightning Protection

The barn is equipped with lightning protection. The lightning protection appears to be a newer installation from when the asphalt shingles were installed since it has aluminum conductors as opposed to copper conductors.

#### Brick Milk House

A brick Milk House exists at the northeast corner of the original barn. The brick is still in very good condition as are the mortar joints. The windows are in need of some attention and possible replacement. The fascias are in poor condition and should also be replaced. The interior walls of the milk house were done in plaster.

#### Concrete Stave Silo

A concrete stave silo stands on the West side of the barn. It is connected to the barn with a very crude roof structure that is allowing significant moisture to enter the building. For its age the concrete stave silo appears to be in relatively good condition due to it probably not being used to store silage for many decades. The staves have been sprayed with gyp-crete on the interior which is holding up well. The silo is missing its top. There are some minor repairs needed to the silo.

#### Lean-to Additions

The barn is surrounded at its base on three sides with one story lean-to additions that were built at a much later date than the original barn. From the materials used they appear to have been added in the 1970's. These lean-to additions were poorly designed and constructed. The main concern is that these additions have very shallow roof slopes (3" in 12) and consequently do not shed snow. When snow sits on the addition roofs it also sits up against the sides of the original barn. This is compounded by the fact that where the addition roofs meet the side of the original barn the flashings are completely inadequate. When rain and melting snow bypasses the insufficient flashings moisture gets in to the main

barn siding and structure and has caused significant rot of the sill plate. Since the entire main barn structure bears on the sill plate this is a significant issue. The lean-to additions on the South and Southwest corner were also constructed with T-11 siding which is inexpensive and doesn't last very long. The lean-to additions have numerous holes in their roofs, damaged fascia boards, and the siding has significant rot and decay. These additions should be removed as soon as possible as they are causing further damage to the original barn. The rafters and posts should be salvaged as there is a significant amount of lumber there.

#### Corn Crib

A large corn crib sits just to the South of the barn and is not a part of this study.

#### Summary

The original barn "structure" with the exception of the exterior skin (siding and roofing) and the sill beam is in very good condition. The barn is over-built (even withstood the devastating tornado of 1965) and still stands straight and plumb. The craftsmanship is well done and precise. The barn measures 34' wide x 72' long. With 2 levels of usable space not including the loft or the lean-to the barn has almost 5000 square feet of usable space. To replace this amount of square footage with new construction today would be very expensive, and you would never be able to replace the character and charm of the old barn or its historic value to this site.

In order to preserve what is valuable about the barn short of re-purposing it or converting it for another use, some minimum restoration must be done to preserve the asset. While planning the restoration you must keep in mind there is a standard order in which renovations are done and building components are installed, so you have to think far ahead as to what the building is to become to avoid wasting time and money.

#### Recommendation for Minimum Preservation Measures

The following are recommendations in the order of priority:

1. Remove all lean-to additions that surround the barn that are compromising the original historic barn structure. Salvage all good lumber and timbers.
2. Examine areas of the barn that are exposed after the removal of the lean-to additions.
3. Remove all siding as necessary to expose any damage to the base of the barn timber structure caused by the lean-to additions.
4. Remove the structure that connects the barn to the silo as it will need to be rebuilt correctly.
5. Jack the barn structure off of the sill beam and replace all damaged sill beams. Fixing the structural issues up front is always the best course of action. Since you are jacking the barn to fix the sill beams this is an opportune time to repair the foundation.
6. Set timber structure back down on new sill beam.
7. Plumb and straighten the timber structure as required.
8. I would recommend removing all horizontal siding and restoring barn back to its original glory with vertical board and batten siding.
9. Replace all existing windows with new and add new windows to add additional light to the inside of the building.

10. Some type of roofing will be necessary. Determine the future use of the barn and proceed to address the roof accordingly.
11. Close up the lower level end walls with framed walls and large doors.
12. Level lower level floor to make it more usable.

### **Potential for Re-use and Re-purposing the barn**

Since the original barn structure is still very solid and straight, the potential for re-use and re-purposing the barn is very good.

Barns can be converted in to just about any building type. I have seen barns converted in to houses, offices, restaurants, churches, banquet halls, Ag tourism education facilities, etc. So, the sky is the limit. In its current setting I could easily see the barn become a covered roof farmer's market, an extension of the community garden. Ag education could also be integrated in to such a facility involving the local schools and the community. A multi-purpose Community Center could also be a possible re-purposing use.

The original barn is a very large structure and to replace it with a building of comparable square footage would be very extensive. Restoring a structure this large will also come with significant costs but would not approach replacement costs if planned correctly. The most important decision to make when contemplating re-purposing a barn is to define "what the barn is to become". What will its new purpose be? How will the new purpose pay for the restoration/conversion investment and sustain itself?

If the barn were to be used for an agricultural purpose and the building could be restored to its original glory, the costs would be significantly less than if the barn were to be re-purposed for a commercial purpose and need to be insulated, heated, and cooled. Under this scenario the costs to renovate it will double if not triple.

## Potential Costs

Please note there are a lot of factors that generate actual costs. These are just “ballpark figures” or “extremely rough estimates” to give you a rough idea of what costs “could be”. A fully designed and engineered solution and scope would need to be established in order to get to “real costs”. The driving factor in determining costs is defining what the purpose of the building will be. Keep in mind that this is a very large structure and costs to do anything will be significant.

### Minimum Preservation Measures

- Demolition and disposal of lean-to additions	\$15,000-\$20,000
- Structural repairs to sill plate including jacking	\$30,000-\$40,000
- Construct closures at the lower level at each end of the barn where foundation is non-existent	\$15,000-\$20,000
- Repair/replace damaged siding	\$20,000-\$25,000
- Replace barn sash windows and provide proper flashings	\$12,000-\$15,000
- Replace Roofing	\$40,000-\$50,000
- Miscellaneous upgrades	<u>\$10,000-\$15,000</u>
	\$142,000-\$185,000

### Adaptive Re-use and Re-purposing

- Renovated for an Agricultural Public use (Farmers Market, Ag Ed) (Un-insulated, restored to original with convenience upgrades)	\$200,000-\$250,000
- Renovated for a Commercial use (Community Center) (Insulated, heated, cooled, MEPFP up to code, site upgrades)	\$700,000-1M

## Conclusion

The Hill Farm Barn is a piece of local history with many unique features. This barn, while neglected for simple maintenance in its most recent history, has been very well maintained during its 100 plus year life. The barn has weathered a historic destructive tornado in 1965 without any visible signs of damage. The warmth, character, and aesthetics of this barn cannot be matched by building a modern structure to replace it. The rural character and charm it brings to the neighborhood cannot be replaced. Preservation and/or re-use/re-purposing of the barn will retain the history and the charm it has brought to this neighborhood and local community since it was first constructed.



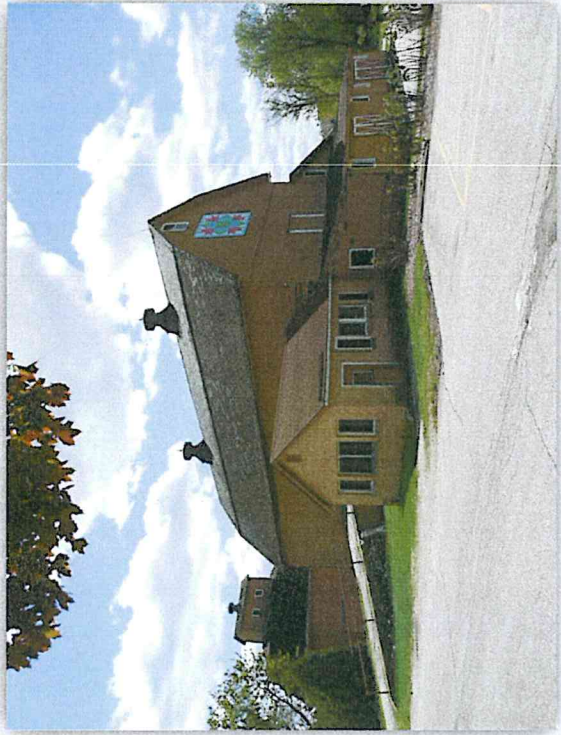


Figure 1



Figure 2



Figure 3

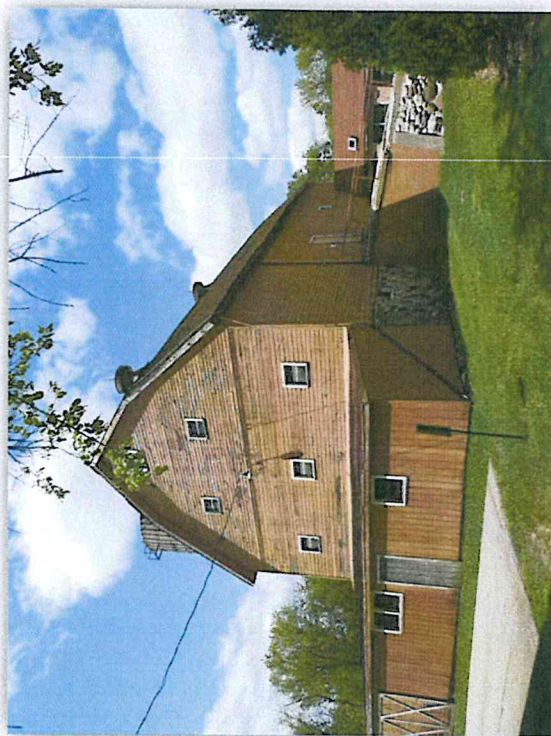


Figure 4

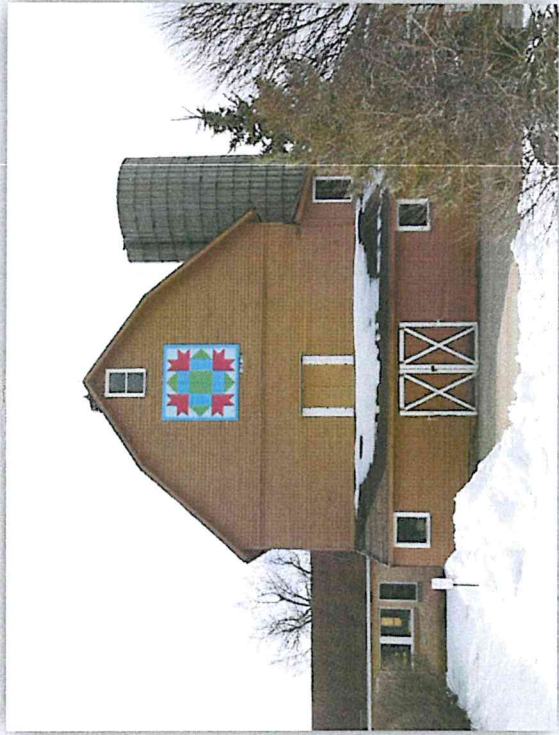


Figure 5 - Front North Elevation



Figure 6 – West Side Elevation



Figure 7 – Rear South Elevation

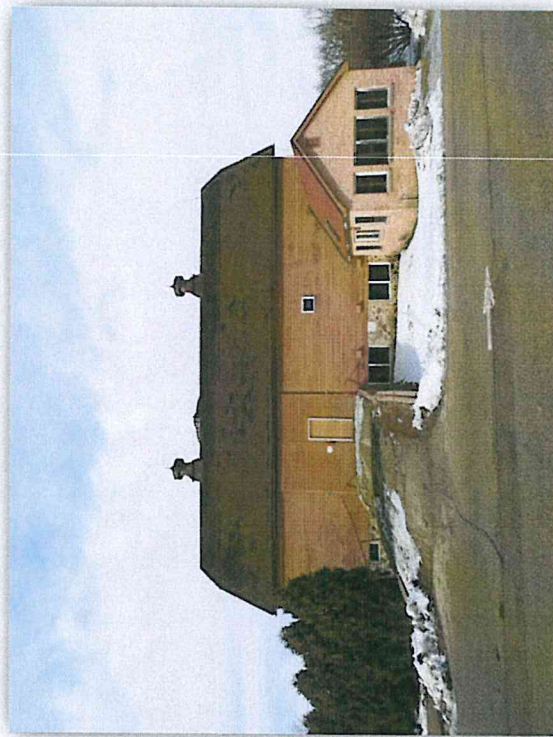


Figure 8 – East Side Elevation



Figure 9 - Loft View



Figure 10 - Side View



Figure 11 - End Wall

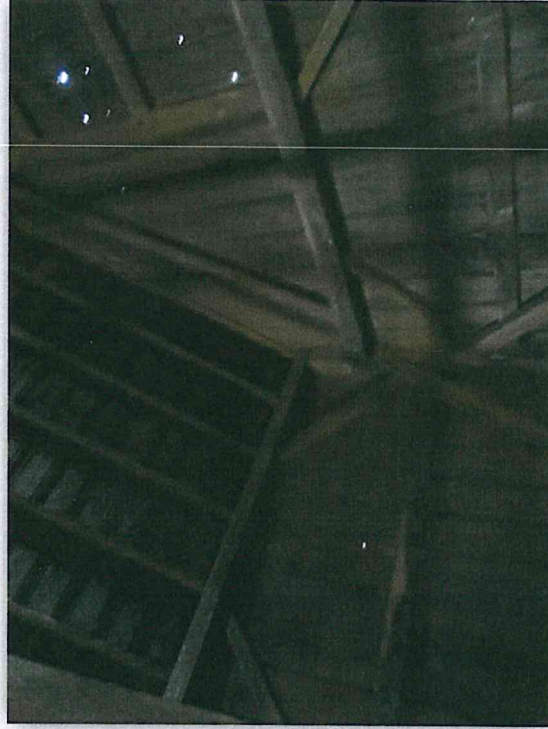


Figure 12 - Corner Bracing

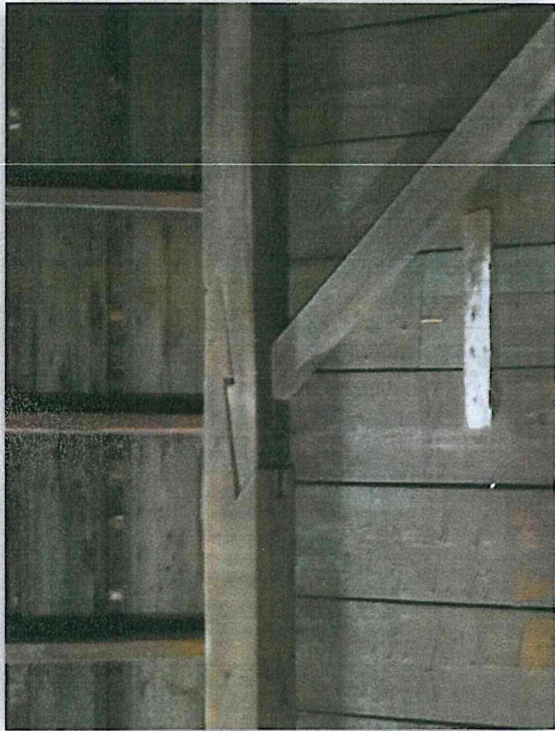


Figure 13 - Scarf Joint at Top Plate

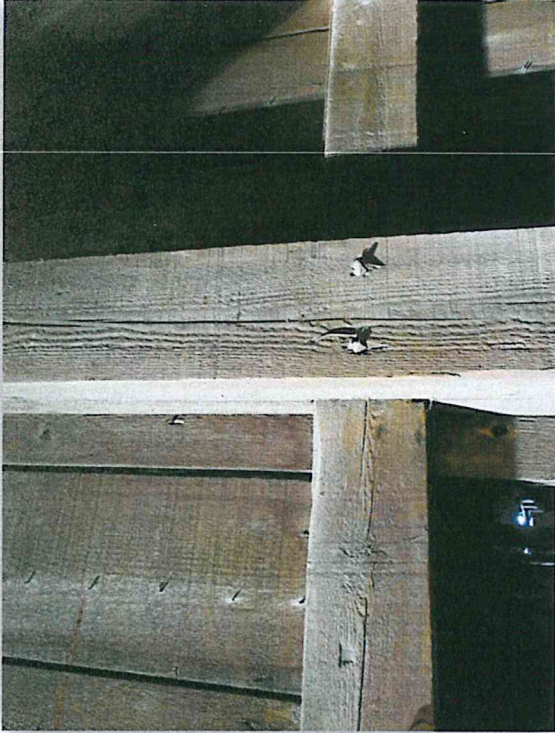


Figure 14 – Side Wall Post with Wall Ties Mortised

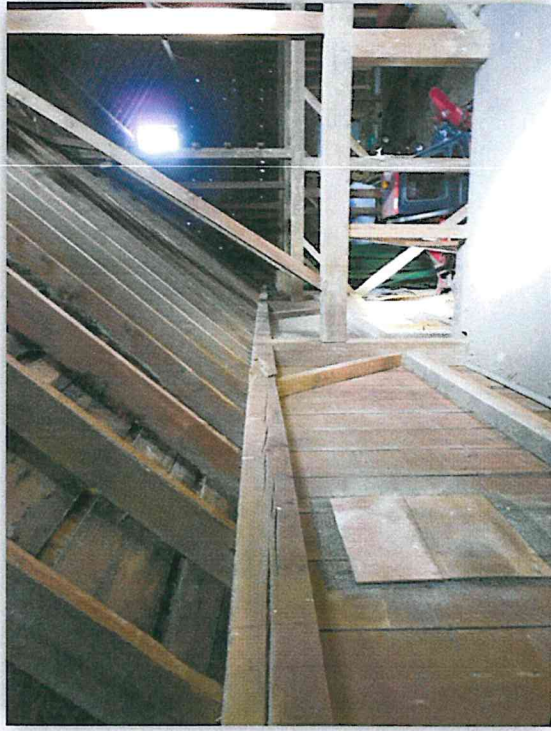


Figure 15 – Top Plate and Roof Rafters



Figure 16 – Side Wall Post with Top Plate and Tie Girt



Figure 17 - Rooms below Loft



Figure 18 – Hay Fork Trolley on Wood Rail Beam



Figure 19 – Milk House

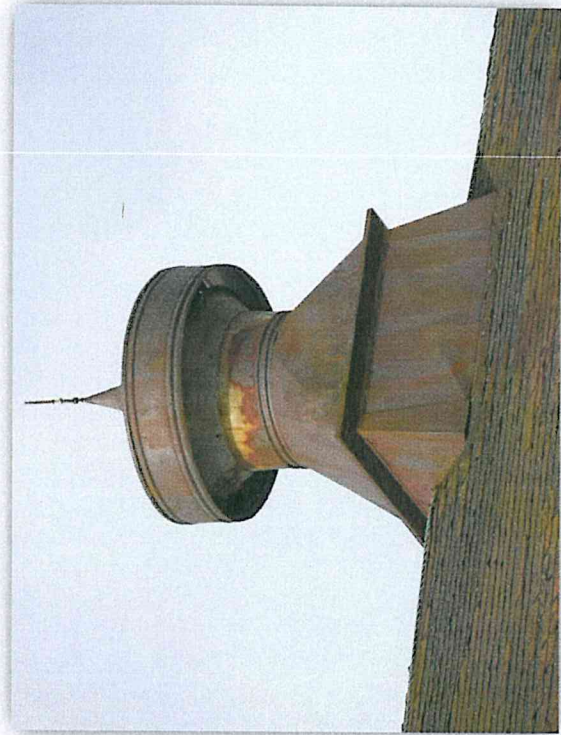


Figure 20 – Roof Ventilator

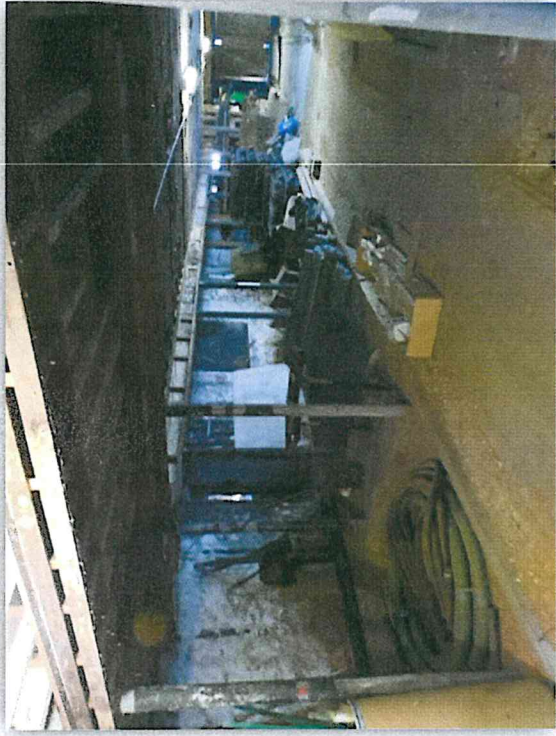


Figure 21 – Ground Level Milking Parlor



Figure 22 – Structure Supporting Mow Floor



Figure 23 – Troughs in Concrete Floor

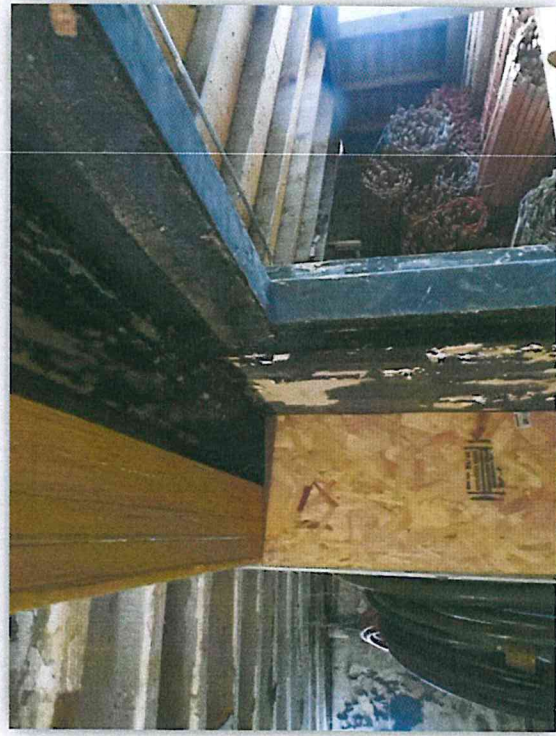


Figure 24 – Attempt to Repair Sill Beam/Header at Door

## **BARN AGAIN**

### **Examples of Re-Use / Re-Purposing / Preservation**

POST & BEAM STRUCTURES



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Before



After





Before



After

POST & BEAM STRUCTURES

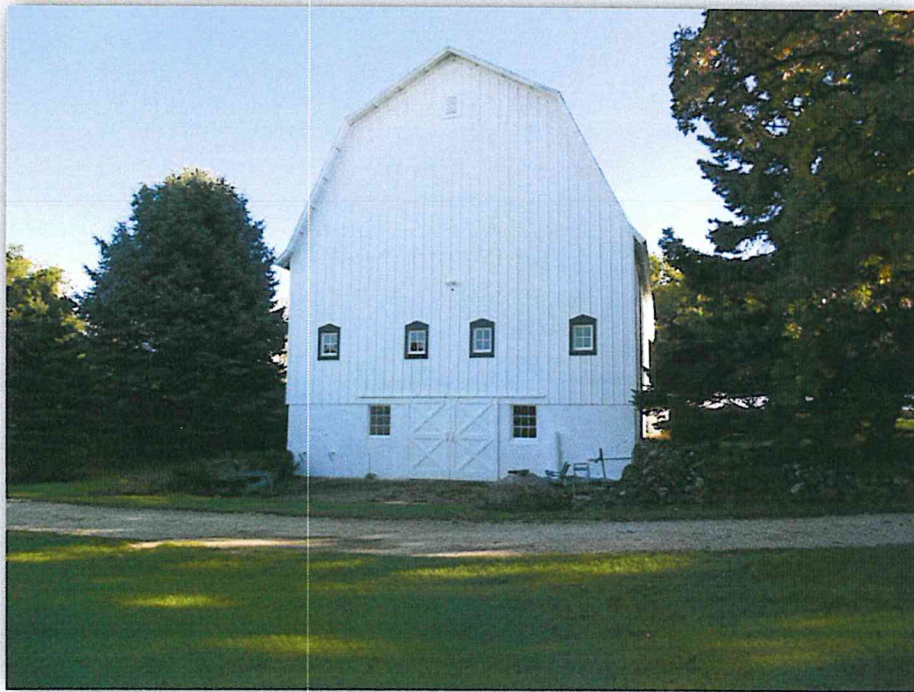


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Before



After