

Assessment for Geraldine Coffman
Historic Crawford/Shoaf Barn
<https://khri.kansasgis.org/index.cjm?in=045-6833>
Inspection on September 24, 2020
November 6, 2020



DESCRIPTION

The barn at 646 North 100th Rd., Overbrook, KS 66524 is a red timber frame barn built mostly of 6" x 6", 4" x 6", and 4" x 4" Pine timbers with a gable roof. It was designed to protect horses and smaller farm animals. Mangers to feed the draft horses continue in the 2 west stalls. The four bents span about 33' north to south giving a 12' bay on each side of a 12' central bay which used to be a drive through. The main building's wall plates are set on a low stone foundation. The gable ends are decorated by cutting the siding board bottoms in sawtooth fashion and drilling the teeth. A rain hood projects to the east to protect the hay trolley track from weather. The barnyard falls slightly to the west. The roof of the shed, constructed in pole barn fashion, is connected to the west side to protect cattle that enter from the open south side. Also the only battens run from the gable's teeth to the shed roof.



OBSERVATIONS OF SYSTEMS, MATERIALS, CONFIGURATIONS, AND CONDITIONS

Exterior

Foundation

Some stones are visible around the perimeter.

Ramp/Driveway

Access to the barn is gained from the south grassy driveway from the road.

Siding

1" x 12" vertical pine siding covers the building. The north side has been neatly overlaid with steel siding. A minor amount of paint is cracked and peeled.

Trim

A narrow fascia has been applied at the entire roof edge.

Roof

Corrugated steel sheets overlays the sheathing. No rust is visible. The roof was not examined for loose or lost nails/screws.

Drainage

Half round gutters line the eaves while round downspouts "Y" together on the east end to a cistern in the yard. The west end of the south gutter spills to the shed roof and the shed floor is muddy.

Openings

Doors

The owner reports that the hay door in the east gable has been secured so it can not open. From the inside, the drive door in the north can be seen secured in place. The south face has three doorways. The central sliding door will not move since it drags on the ground. The stalls in the SW and the NW use the door in the west end of the south face. The Dutch door in the east end serves the SE storage room.

Windows, Hatches

The east side has four hatches, some latched on the inside and some outside. The west side of the shed has one always open window.

Hardware

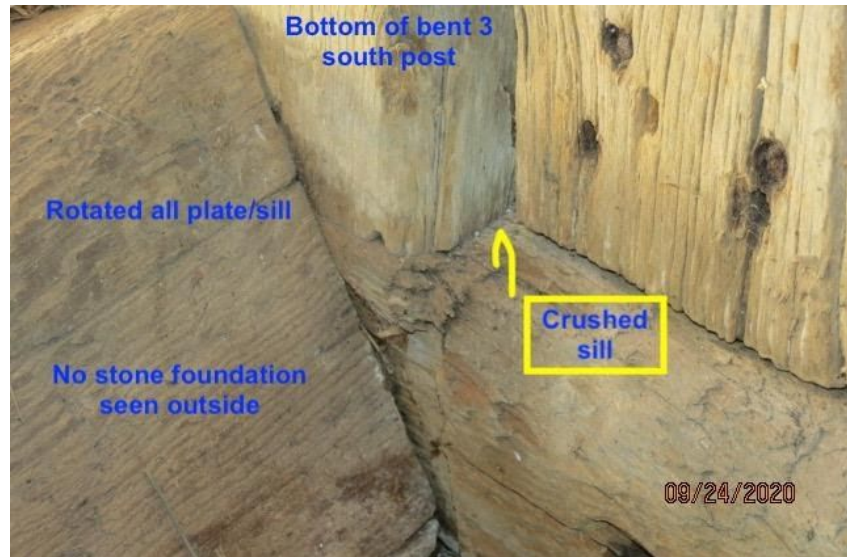
The latches and hinges are mass produced. Fasteners are mass produced round nails and bolts.

Interior

Foundation

Perimeter

Where the wall plate is accessible, which includes most of the east and west and multiple points in the north and south, it is rotted, compressed under posts and often the top is at the elevation of the adjoining soil. It would appear that the stone foundation has sunken, allowing the entire barn to settle. This can be seen at the threshold for the storage room door which has been repaired with concrete. The replaced bottom of the SE corner post now sits on the concrete at grade in stead of on a timber wall plate.



Post support

Since the posts are carried by the wall plate, when the sill/plate settled, the barn settled at that point also. This poses a problem for any part of the barn cut to fit at a particular elevation in that it no longer fits and performs the function for which it is designed. As well, wooden elements like the posts are exposed to unintended forces like becoming the means of excess pressure on the sill.



Frame

Joinery

Mortises and tenons are secured with wooden pegs when nails are not employed. Scarf joints are mostly nailed. Braces are through nailed at a butt joint. Some of them are more secure under compression because of haunches cut into beams and posts.

Support

The posts and beams of 6" x 6" sawn pine timber make up the 4 bents (count from the east) and the beams joining them. The roof plates are 4" x 6" beams laid on flat to give plenty of width upon which to install the rafter birds mouths. The 6" x 6" wall plates were mentioned in the Foundation Observations above as in need of replacement due to deterioration.

The bents are arranged with three posts each. The center post is topped with a beam running between the two end posts which are topped with a roof plate. The lofts are held up by 2" x 10" pine joists suspended by beams set into the center post and end posts. The posts stand upon the wall plates.



The loft floor joists help tie the end bents to the center bents. The center bent end posts are united by the roof plate and the drive door headers. A 6" x 6" tie was used to connect the tops of the center posts of bents 2 and 3 but it is absent. There remains a half of an angled scarf joint over the posts. Perhaps the tie was removed for internal loft filling, as it was in the middle of that operation, directly under the hay trolley track. No longer can hay be wagoned in and hoisted to the end lofts.

Between bents 2 and 3 logs with boards on top of them have been placed as an extra loft. No evidence of fasteners was found to hold them in place so only the friction of their weight connects them to these bents. The original tie beam is still missing.

2" x 4" pine rafters 2' on center carry the sheathing of 1" x 6" boards with 4" spacing to support the corrugated roofing.

Bracing

The 4" x 4" diagonal braces are fastened to the beams and posts at 45 degree angles with round nails, except for one set of band steel braces installed on the south end of the center bents upward from the top beam to the end post. The purpose of braces is to maintain the members aligned with one another as originally installed to avoid distorting effects of wind and other live and dead load forces. Braces are in all the ordinary strengthening locations!



Openings

Between the shed and the loft are two "vents"

Flooring

The NE rooms have thin concrete floors cracked and broken up. The others are dirt.



Drainage

Floors are at grade or below. As a result, any free flowing liquid will not escape the building. The floor of the cattle shed is muddy.

Partitions

The walls for the stalls and NE rooms are a mix of widths, styles, and orientations of wooden boards.

Electrical

The wiring I saw was non-metallic conductor decades old but still in serviceable condition. There was one situation of exposed bare wires.



Mechanisms

The track, trolley, and hay hook remain in place though hay in this barn is no longer loose but bailed.



PRIORITIES, RECOMMENDATIONS, AND ROUGH COSTS

PRIORITY	RECOMMENDATION IN ORDER OF PROCESS	ROUGH COST
1	Remove/disassemble all non-structural materials that may obstruct foundation/frame replacement, including the first floor floor.	Approximately \$1,600 - \$3,200
2	Remove all manure, bedding, and fodder to original grade.	Approximately \$200 - \$500
3	Expose the plates and post bases which may require repair/replacement inside and out. Do not shorten siding boards unnecessarily due to the negative aesthetic effect. Horizontal cuts should be made so as to shed water like the way the Dutch door is divided.	Approximately \$3,000 - \$4,000
4	Replace the bottoms of deteriorated posts, like the bottom of the south east corner post, using appropriate vertical scarf joint. Note: When replacing the bottoms of posts decisions need made as to how the post will be connected to the wall plate below and how timbers are connected end to end. One may follow the lead of joints already used or find another way. Up to 16 posts. 1.5 joints each	Approximately \$100 - \$900+
5	Raise the building. Once the posts are whole again, use them to lift the building to install the plates and work on the foundation. 1188 square feet.	Approximately \$14,256 - \$23,760
6	Replace all wall/sill plates. 204', 16 M/T joints, 6 Scarf joints	Approximately \$6,100 - \$10,100

7	Replace the entire damaged foundation. More decisions are necessary as more information is gathered. These questions need answers: 1. Is it desirable to replace the foundation no deeper than it is at present (It is best to keep the depth of the foundation uniform in relation to the frost line so it rises and falls at the same rate all around.)? 2. Is it desirable to install the foundation bottom below the frost line to eliminate effects of soil expansion and contraction? 3. Is it desirable to replace the foundation entirely or to place the building on piers (A faux foundation can be installed between the piers). 4' tall x 204' = 816 sq. ft. face of foundation, mostly buried.	Approximately \$5,700 - \$13,600
8	Raise the floor to be above surrounding areas for good drainage. This includes the cattle shed.	Approximately \$440 - \$880 (dirt)
9	Repair the wiring, removing that which has been abandoned.	Approximately \$100
10	Repair the disturbed exterior surfaces. Remove any paint which has lost adhesion, following applicable Federal lead paint requirements.	Approximately \$5000 - \$7,000

Assessment for Eric Jackson
Historic McQuillan Barn <https://khri.kansasgis.org/index.cfm?in=045-6057>
Inspection Performed 9/24/2020
November 6, 2020



DESCRIPTION

The Western style barn at 1320 North 1 50th Rd., Baldwin City, KS 66006 is a timber frame livestock barn built mostly of 6" x 6" and 4" x 4" timbers with a gable roof, a shed roof connected to the west gable end, and set on a loose stone foundation. A very small rain hood projects to the east to protect the hay trolley track from weather. The four bents span about 36' north to south giving a 14' bay on each side of a 6' central bay. To the west of the cattle shed is another shed with south and north side cattle openings. This assessment is for the main barn.

OBSERVATIONS OF SYSTEMS: MATERIALS, CONFIGURATIONS AND CONDITIONS

Exterior

Foundation

Stones are visible primarily on the east end below the siding

Ramp/Driveway

None

Envelope/Siding

1" x 8" shiplap installed vertically

Trim

A narrow fascia is installed on the gable ends

Drainage

A half round gutter hangs from the south roof edge and a steel downspout runs to corrugated plastic tubing diagonally across the east end to the muddy ground on the north side.



Roof

Rusty (very much so on the north) corrugated sheet steel roofing is installed over shake shingles (seen from the loft).

The south roof is elevated at the eave above the sign on the wall (the third bent from the east is under this irregularity). The ridge droops between the third and fourth bents. the north eave bows up in the center. Otherwise the roof is whole.

Openings

Doors- The south has two dutch doors, a man door, a cattle doorway out of the shed and a hatch door to the loft. The East has no openings except where siding is absent. The north has a Dutch door to the hallway, at the west end NW stall, and a doorway onto the cattle shed.

Windows/Hatches

The north has a hatch to the loft in the center. The south side has a matching hatch.

Vents

Openings from the loft on the west end vents the cattle shed (IMG_0071)

Hardware

The hinges and latches are was manufactured and heavy rusted

Interior

Foundation

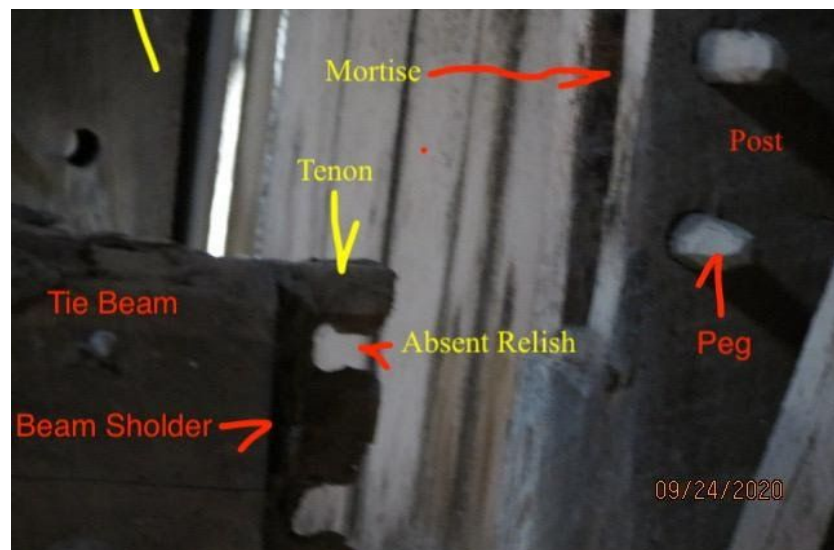
Perimeter- Stones are visible some places but not others. The order of the stones appears haphazard and many have fallen from the laid up wall.

Wall Support/Basement- There is no basement but on top of the laid up stones a 6" x 6" timber is visible as a wall plate, part of the building frame.

Frame

Joinery

A comment about installing pegs: the connection of the tie beam of bent 2 to the north post is the basis of the following where the mortise is empty of the tenon. The tenon on the end of the beam has holes for the pegs but no beam between the peg and the end of the tenon. That missing material is called "relish". When there is not enough relish (that is the distance of material from the side of the peg to the end of the tenon) there's not enough strength to hold the tenon in the mortise when there is tension on it. Pegging instructions guide making strong joints. A peg should be installed so that there is at least 4 times the diameter of the peg to the end of the tenon and 1 1/2 diameters to the side of the post or a beam sholder. If the post does not have enough relish material it will break out when



tension is applied just like you see the relish broken out of the tenon in this application. The dimension for the relish is even less than the distance from the side of the post to the peg. When you pull against crossgrain, you are pulling against the weakest grain, the end grain, and the the relish will split away.

When one is installing 6 x 6 timbers one has to take extra special care with peg installation because you don't have a lot of lumber to work with. If this joint were done to optimum, it would have a tenon in a through mortise, the peg would be 1 1/2 inches from the side of the post, add 1 inch for the peg to make 2 1/2 inches and that leaves 3 1/2 inches from the opposite side of the post for tenon relish.

Typically in this barn the mortises are too shallow, the tenons too short, and the pegs installed too close to shoulders and edges.

Support

Vertical

Some post bottoms are deteriorated from being in the soil and muck and on a rotted wall plate. The southeast post bottom has been replaced and now sits on a stone instead of the timber sill plate, which has rotted away.



An interesting feature of the bents is the posting. Each bent has four posts sitting on plates and another in the loft. On the first floor there are two posts from a timber plate to the header beam running north and south at the loft level. On the second floor, the loft, there is one post from the floor level to the top beam of the bent supported in the middle of its span. The end bent posts run the full height of the bent to the roof plate.

Horizontal

The wall sill plate is the most deteriorated structural member. It allows the barn posts to settle onto the foundation stones or into the earth.

In addition to the wall plates there are tie beams in the bents to link the north and south walls together. Those walls have girts, roof plates, and wall plates to hold the posts in sequence and as nailers for the siding and accessories.

Diagonal

For the most part there are plenty of braces in the barn. They are installed with nails to the posts and beams rather than with mortise and tenon, and peg.

There are braces from the beams to the posts under the loft and there are braces at the tops of the end posts to the roof plate, from the center top post to the top bent beam, and from the queen posts to the purlins.

Still, braces are a problem area. Some are not fully attached. There are places where the installation of braces would have provided needed support. Some braces were not installed and now damage is occurring. For instance between the queen posts and the purlins there is one brace to one side rather than two in opposite directions. As a result the queen posts are bending badly from the stresses on them.

The stressors are as follows:

- some of the weight on the purlins falls to the queen posts where the roof load is split (some of it alls to the roof plate),

- the weight on the queen post falls to the center summit beam of the bent toward the center post in the bent.

- Also the roof above the wall and purlin is pushing the perimeter posts downward in the outside wall.

Since the inner posts are not settling as much, the weight from the purlin is partially absorbed by the queen posts by bending sideways, because it cannot push the top tie beam down enough. Because the queen post lacks a brace to the purlin on one side it distorts in the direction of the missing brace.

To the degree that the queen posts resist the roof lowering, as the weight falls on these angular members they tend to push the bottom of the roof slope outward. So on both north and south sides the main tie beam tenons have pulled out of their mortises and damaged the brace connections between that tie beam and the post in the outer wall, as is seen mostly on the north side. Had the brace connections been of the older style mortise and tenon, and peg, they would have resisted more the tie beam's movement from the post.



As well, the tie beam is pushed down by the queen post. Since its weight is cantilevered from the center post it has bent down and is lower than the mortise intended for it.

One might ask a question, "why are the separations greater on the north side?" Another phenomenon exists. The primary Kansas winds push the south wall and roof toward the north. Aided by the roof angle, the north roof load is pushed toward and downward onto the north wall. This adds pressure away from the tie beam and downward pressure to an already settling structure.

Another missing brace is missing at the south end of bent three (counting from the east). The header beam is not braced to the post but there is a two by eight attached to the post has a bolster, seemingly anticipating the beam being extracted from the post. An electrical panel is installed where the brace would be, there is no shadowing or patina on the wall boards, indicating there was a brace there originally as there is appropriately on the north end of this beam.

The brace issues and connection issues are mere indicators of a larger issue.
The foundation has failed.

Roof

The 2" x 4" rafters on 2 foot centers adequately support the roof sheathing which is of various widths, ages and conditions. Some shows water stains and other boards have a lighter patina showing that they are newer, having replaced earlier ones decades ago.

Openings

One can look into the cattle shed from the barn.

Flooring

The floor of the lower level is covered with manure, fodder, and bedding in a manner that presumes dirt underneath, but the hallway between the center bents has a deteriorated plank floor on 2" x 4" joists. the NE granary tongue and groove wood floors are rotted and only a few inches above soil. The loft floor is planked with 8" shiplap siding (was there a sale?) spanning the 2' on center 2" x 10" fourteen foot east to west joists.



Partitions

The first floor is divided into three large stalls of different sized lumber and some smaller rooms made up of shiplap wood.

Electrical

There is an electrical panel and some lighting.



Plumbing

No plumbing is evident.

Drainage

The floors are at similar levels as the grade outside so no good drainage occurs.

Devices

The track and trolley hay hook system is in place. A 1" rope runs from the trolley through a pulley and down a shaft on the west loft wall to the lower level.



In the center of the loft is an opening to the hall below for dropping hay to the animals. In the loft a simple set of 2" x 4" guards prevents hay from falling prematurely and clogging this chute during mow filling.

PRIORITIES, RECOMMENDATIONS, AND ROUGH COSTS

Priority	Recommendation	Rough Cost
1	Remove/ disassemble all non-structural materials that will obstruct foundation replacement, including the first floor floor	Approximately \$1,600 - \$3,200
2	Install a roof drainage system for the north side to keep water away from the foundation at least ten feet downhill	Approximately \$300 - \$800
3	Remove all manure, bedding, and fodder to original floor grade	Approximately
4	Remove all first floor siding to expose the plates and posts which require repair/replacement. Don't shorten siding boards unnecessarily due to the negative aesthetic effect of repairs. Horizontal cuts, if necessary, should be made so as to shed water after reinstallation 408 brds. 68 hrs.	Approximately \$3,000 - \$4,000
5	Replace the deteriorated post bottoms. Once the posts are whole again, they may be used to lift the building to install the plates and work on the foundation. Note: When replacing the bottoms of posts decisions need to be made as to how the post will be connected to the wall plate below and how timbers are connected end to end, like for corner and scarf joints. It is easiest to follow the lead of joints already in use rather than find another way. The distance from the roof plate to the bottom of each post is the same for each post. These may be crafted one at a time. Props may be inserted under the girts/nailers or tie beams and the plate may be removed from below to give clearance. 16 con. to sill plate. 2 -6 scarfs.	Approximately \$3,000 - \$7,000
6	Repair the spreading condition in the loft by pulling the barn back together. Rather than having to replace the entire beams, where the relish has been pulled out of tenons, the post mortise could be deepened and a spline installed to replace the short tenon with a longer one. Then when the barn is pulled back together the joints can be held together with pegs after gluing plugs in the old peg holes and drilling appropriately located holes for maximum strength. 4 joints. Come-a-longs. 4 @ 6hr	Approximately \$1,200 - \$3,600
7	Raise the building so the roof plate is level and so the bottom of the wall plates are at least 1" above the top of the proposed foundation top. Once the posts are whole again, use the twelve of them with cribs, bridges (from the internal crib to the exterior one), and jacks to lift the building to install the plates and work on the foundation. The corner bridges will be diagonal to the walls. 2.75 hr. @ crib. 16 cribs.	Approximately \$4,000 - \$7,000
8	Replace all deteriorated wall/bottom plates. Provide for tie downs to the foundation/piers. 4 corners + 4 scarfs + 140' timber	Approximately \$1,100 - \$2,000

9	Install siding to keep the weather out. Vintage siding may be found.	Approximately \$5,000 - \$10,000
10	Replace the entire damaged foundation. More decisions are necessary as more information is gathered. These questions need answers: Is it desirable to replace the foundation no deeper than it is at present (It is best to keep the depth of the foundation uniform in relation to the frost line so it rises and falls at the same rate all around.)? Is it desirable to sink the foundation bottom below the frost line? Is it desirable to replace the foundation entirely or to place the building on piers (A faux foundation can be installed between the piers so it looks original).	Approximately \$4,000 - \$10,000
11	Reinstall the loose braces and install some new2 braces. Add a second brace to each of the 4 center queen posts. Also move the electric service panel and add a brace in the third bent. The age of the wood will require pre-drilling and the use of 1/4" to 5/16" lag-bolts 4" and 6" long rather than nails	Approximately \$400 - \$800
12	Repair the wiring.	Approximately \$100
13	Raise the floor level to be above surrounding areas for good drainage. 36' x 28'=1,008 37.3 yds.	Approximately \$280 - \$600 dirt
14	Tighten/replace loose or missing nails/screws in the roof. 1,008 - 1,300 pieces	Approximately \$1,500 - \$4,000
15	Power wash and paint the exterior siding to prolong outside materials' life.	Approximately \$5,100 to \$7,140 for 2,040 square feet of siding.
16	Power wash and paint the roof to prolong outside materials' life.	Approximately \$2,955 to \$4,137 for 1,182 square feet of roofing

Barn Assessment for Lisa Allen

Inspection September 23, 2020

November 7, 2020

HISTORIC BROWN BARN

[HTTP://KHRI.KANSASGIS.ORG/INDEX.CFM?IN=045-0000-00294](http://KHRI.KANSASGIS.ORG/INDEX.CFM?IN=045-0000-00294)



DESCRIPTION

General

At 458 E 1400 Road, Baldwin City, Kansas 66006 the barn is located on a slope of about 3 feet by 45 feet, downward to the southwest. Its gable roof protects its timber frame. This western style barn was set up with a threshing floor between drive-through sized doors on the east and west sides consistent with farming practices early in this barn's life.

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EXTERIOR

Foundation

The barn sits on a ledge of rock seen to the west, with no basement. Laid up stones with some concrete support the outer wall. The east and west sides are 33 feet long while from north and south it is 24 feet across.

Envelope

The siding is 1" x 12" pine boards with contoured battens over the cracks between the boards. A little white paint is evident on the siding and trim.

Openings

The east side has three openings with the round louver hidden behind the Poison Ivy tree. The hinged hatch to the loft is above the drive-through doorway. The hanging doors have a residue of red paint.

The barn is oriented so the hay door in the gable is at the north end. Three other openings are in the north end of the barn. Two open from granary rooms and one opens from the loft above.





Three openings exit the west side of the barn. There is a

man door in the middle, a side opening hatch to the north of it, and another hatch to the south of it in the stall area. The wear and other evidence indicates there used to be a sliding drive-through sized door. The battens are contoured except for the former drive through door where they are 1 x 2s.

The south face has 4 openings which appear modified. The Dutch doors at the corners may be original but the center side hinged window may have been installed later. It has faded red paint, different from the rest of this side. The siding in the center of the south wall terminates above the bottom of the center girts of Bent 1 and the battens change at the break from being contoured to simple 1x2s below. Perhaps the shelter inside was divided originally and there were high openings that have been filled. The gable contains the fourth opening in the form of a round louver.





Roof and Trim

Corrugated steel roof sheets keep rain and snow out. The hay trolley track projects to the north but a rain hood to protect it from weather is absent. Also unusual is the eaves and the rafter tails which are covered by soffit and fascia.

Storm water falls from the eaves to the ground. As is typical, the barn has no gutters.

Ramp

Eastward from the sliding doors a soil ramp levels the hillside to ease vehicle entry. It is held in place on the south side by large stones.

INTERIOR

Frame

The frame is constructed of 4 timber frame bents of 6 x 8 sawn pine timber with beams of 6" x 6", 6" x 8" and 4" x 4" timbers and 2" x 10" joists for the first floor and the loft.

The posts are set on 6" horizontal x 8" vertical timber plates. Sidewalls have 4" x 4" girts and 2" x 4" intermediate nailers. 4" x 4"s provide the diagonal bracing.

The braces, posts, and beams are held together by mortise, tenon, and peg joints.

The interior first floor is three basic areas. The south bay is all open with a dirt floor for livestock to come and go for shelter. Between the second and third bents is a work/storage area, probably the original threshing floor, and the shorter space between bents three and four is granary rooms and a stairway to the loft which is in the north east corner. The walls around the granary in the NW corner are 1" x 6" tongue and groove boards.

The second floor is all hayloft with a protected center opening for dropping hay to the animals on the first floor. The two by fours around the opening prevent hay from falling

through as the mow is filled. This maintains an open shaft all the way to the top of the stored hay for feeding hay to the animals.



Also in the peak is an area which appears to be filled in. One wonders if early on there were plans for a cupola on top of the barn.

The floor of the loft has a variety of boarding. Over the granary the 1" x 6" boards have tongues and grooves. The remaining joist covering has different widths of pine board.



OBSERVATIONS OF SYSTEMS, MATERIALS, CONFIGURATIONS, AND CONDITIONS

Exterior

Foundation

Many stones are out of place from the foundation. The north wall has had concrete formed up to support the wall plate.



On the west side the taller wall has been repaired by repointing but cracking indicates uneven loading and lack of adhesion between the stones in the wall core.



The absence of a post bottom at the SW shifts weight northward on the west wall concentrating load where it was not intended. Stone is removed from the south foundation wall and some has been mortared together. Much of the wall looks as though it has been replaced with concrete.

The east foundation is not visible from the outside due to the vegetation and the ramp.

Ramp

The level of the soil outside the drive-in doors rises so only a little ramp is necessary.

Siding

The boards give the appearance of pine wood. Most of the siding is a deteriorated wood gray though under the eaves some white paint remains. 15 % of siding is missing and the other is split and/or loose. Though the south receives water due to prevailing winds it receives no additional storm water from the roof. The oldest siding on the west side below the eaves, is more feathered at the bottom than the oldest siding on the south side.

On the north side boards were removed to repair the wall plate but were not replaced. The 2 by lumber of the new plate shows deterioration. These examples show the effects of water not directed away from the barn.

Trim

Some battens are broken or missing. From a well preserved piece, like from under the eaves, a mill can cut knives to duplicate the design. Canadian Fir is a good straight grained durable wood for cutting battens. When installing battens, nail between the siding boards into the girts to allow for contraction and expansion of the siding. An interesting metal batten is used at the sliding doors, so battens do not impede door movement. It is an inverted steel rib.

Roofing

The rusty steel sheets are not original. The gaps between the sheathing on the inside show shake shingles were used first. The corrugated sheets seem secure but should be examined for missing/loose nails. Screws with sealing heads resist the wind forces better than nails, especially in old weathered, dried, sheathing.

Drainage

Since storm water falls from the eaves to where the wind blows it, its damaging effects are seen mostly on the west wall where clean saw cuts on the bottoms of the siding can no longer be seen due to wear. Storm water is held north of the ramp where ground water joins it to soak slowly under the building, and to move slowly along the north foundation to the west .

Openings



Doors The sliding doors function. The west man-door sags on the side opposite the hinges. Of the four halves of the south Dutch doors, one remains. Latch and hinge placements inform where doors used to hang.

Windows

The hinged covers on some windows are misaligned with the opening. This is symptomatic of fasteners loosening and wearing. After squaring and securing the barn the same can be done to the opening covers.

Vents

Scaling paint and damage to louvers expose the weathering of the vents like this one in the Poison Ivy.

Hardware

Interesting hooks and rings here and there fit the story of blacksmith ownership. The other hardware appears to be mass manufactured.

Interior

Foundation

Perimeter

The interior of the foundation that can be seen is consistent with the exterior deterioration. For instance, stones are out of place in the south end of the east wall and the entire south wall.

Frame

Post support

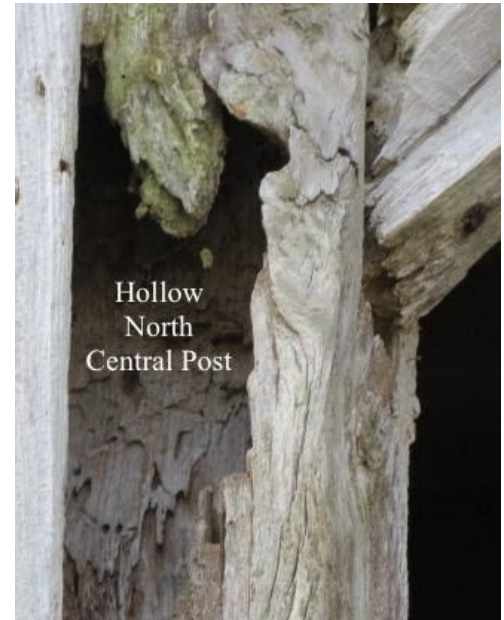
The center posts of bents 2, 3, and 4 (counting from the south) remain at their original heights. The outer walls have settled due to rotted and termite eaten post bottoms and wall plates.

Beams

The south ends of the 4" vertical x 6" horizontal roof plates bow downward from bent 2 southward.

Braces

The 4" x 4" braces are performing their duty of keeping



corners square with one exception. The brace to the west of the north center post is very loose in its mortise to the post due to much rotted material. The other tenons are held firm by pegs in the post and beam mortises.

Amenities

The stairway to the loft in the NE corner replaces the normal ladders one frequently finds.

Sheathing

Boards of various widths and many with untrimmed edges span 2 feet between the 2" x 6" rafters and support the earlier shake shingles and the corrugated sheet roofing. Deterioration is not evident.



Flooring

The 1st floor boards of the east side, especially by the steps, are rotted. The Loft boards are sound but are showing water damage by the hay door.



Partitions

A short wooden fence prevents passage between the south bay and the threshing floor bay, except on the ends. Walls on the east and south of the granary prevent entry except by the doorway in the east end of the granary south wall.

Devices

The track for the hay trolley is still in the peak of the barn. Its trolley rests at the north end. A hay hook was not seen nor the necessary ropes to operate the mow loading equipment.



PRIORITIES, RECOMMENDATIONS, AND ROUGH COSTS

PRIORITY	RECOMMENDATION IN ORDER OF PROCESS	ROUGH COSTS
1	Remove the Poison Ivy tree. Research what time of year is best and what methods are necessary	Approximately \$300 - \$1,000
2	Research and determine A. the depth of the stone shelf all the way around the barn. B. 1. if the barn can be set entirely on the shelf, though above frost line, the foundation will need anchored to the shelf. B. 2. if it is desirable to replace the foundation no deeper than it is at present. It is best to keep the depth of the foundation uniform in relation to the frost line so it rises and falls with temperature changes at the same rate all around. b. 3. if it is desirable to sink the foundation bottom below the frost line, if that is possible. C. if it is desirable to replace the foundation entirely or to place the building on piers. A faux foundation can be installed between the piers to look original.	Approximately \$560 - \$800
3	Install a roof drainage system to keep water away from the foundation at least ten feet and downhill.	Approximately \$300 - \$800
4	Remove all non-structural materials on the first floor, including the threshing floor, to provide access. Restore at the end of the construction. Examine all joists in bays 3 and 4 for fitness for reuse. Repair/replace as necessary. Take care so materials may be reassembled. 40 man-hours+.	Approximately \$1,400 - \$2,000
5	Remove all first floor siding to expose the plates and posts which require repair/replacement. 1,368 sq. ft.	Approximately \$460 - \$1,100

6	Repair deteriorated posts. Notes: Before replacing the bottoms of posts decisions need made as to how the post will be connected to the post above, the wall plate below, and how sill timbers are to be connected end to end. One may duplicate joints already used or find a better way. Once the posts are whole again, they may be used to lift the whole barn. A. Replace the top of the post in the center of Bent 4 (north bent) and its braces (It may be easier to replace the whole post or to fill the void with structural epoxy). B. Replace the bottom of the NE corner post. C. Replace the bottoms of the 3 posts in the first bent (south) using an appropriate vertical scarf joint. 40' of timber, 17 Joints	Approximately \$2,400 - \$4,750
7	Repair/Replace the loft level girt of Bent 1.	Approximately \$300 - \$500
8	Remove the excess soil inside of the foundation perimeter so dirt is no closer than 4" of untreated wood.	Approximately \$100 - \$200
9	Lift the building to install the plates and to replace the foundation.	Approximately \$9500 - \$15,840
10	Examine the bottom plate of bents 2 and 3 for continued use. Repair/replace as necessary.	Approximately \$2,500 - \$3,100
11	Replace all wall plates from south of bent 2 west post, across the south side, up the east side, across the north side and connect to the west plate at the NW corner. Two 6" X 8" X 24+', one 6" x 8" x 12', and 35+' more for the east side. 6 joints minimum.	Approximately 3,800 - \$5,000

12	Replace the entire damaged foundation. More decisions are necessary as more information is gathered. These questions need answers: A. Is it desirable to replace the foundation no deeper than it is at present (It is best to keep the depth of the foundation uniform in relation to the frost line so it rises and falls at the same rate all around.)? B. Is it desirable to install the foundation bottom below the frost line to eliminate effects of soil expansion and contraction? C. Is it desirable to replace the foundation entirely or to place the building on piers (A faux foundation can be installed between the piers).	Approximately \$3,200 - \$7,300
13	Install siding to keep the weather out. Vintage siding may be found.	Approximately \$5000 - \$6,500
14	Provide flooring material in the stall area for drainage and clean-ability like with compacted clay, compacted stone with fines, concrete or planking. 288 sq. feet./ 10.67 yards. Clay ranges in price from about \$35 to \$40 per cubic yard, including delivery. Concrete slabs cost between \$4 and \$8 per square foot including labor.	Approximately \$230 - \$400 for clay. \$1,152 - \$2,304 for concrete.
15	Have the building examined for active termites and treated as necessary.	Approximately \$0 - \$280 per inspection.
16	Install first floor joists where needed. \$35 each ground contact.	Approximately \$200 - \$1,000
17	Reinstall non-structural elements which had been removed for access. 24 - 40 man-hours	Approximately \$800 - \$2,000
18	Power wash exterior surfaces prior to painting to provide better paint adhesion.	Approximately \$250 - \$500
19	Paint the roof and siding with appropriate surface covering.	Approximately \$6,870 - \$9,618

Assessment for Dave Maycock
from an inspection on
September 22, 2020 at 9:00 AM
Historic Barnes Apple Barn <http://khri.kansasgis.org/index.cfm?in=045-0000-00585>
November 6, 2020



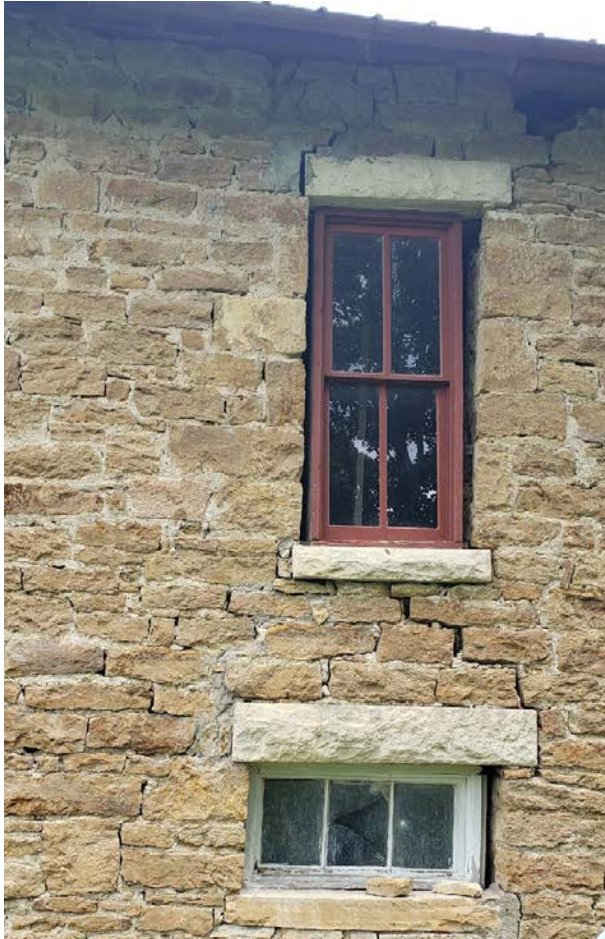
DESCRIPTION

The Barnes 60' by 31' fruit barn at 713 E 1728 Road, Baldwin City, Kansas 66006 is constructed of laid up limestone blocks in the side of a hill in the manner of a bank barn. The basement opens out to a flat pasture.

Three double hung windows in each side of the first floor provide light and ventilation as do the sliding windows in the level below. The east first floor has two double hung windows and one such window in the loft above. The east end of the basement has a wide door and two high horizontal windows.

The west facing double front doors open inward from a large white stone threshold and the eagle faced lintel. This entry of angled boards is flanked to the sides and above with double hung windows.

A red painted raised rib metal smartly clads the gable roof surrounded by a number of trees on the east end while the west opens to a grass lawn.



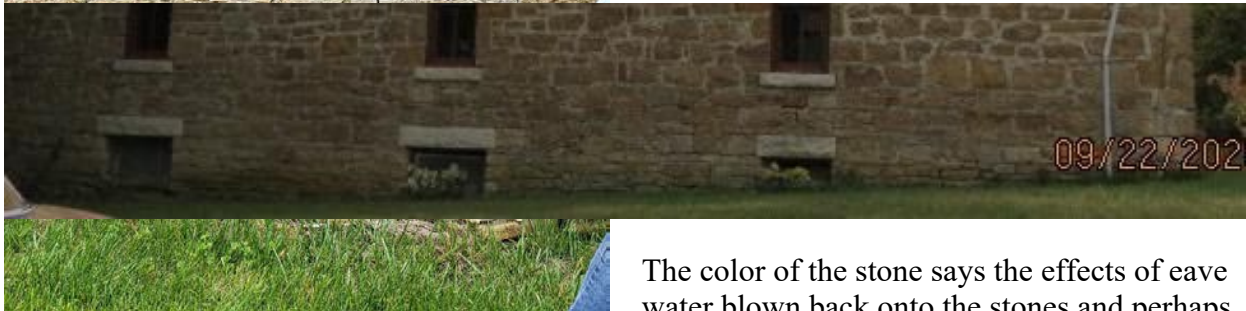
OBSERVATIONS OF SYSTEMS: MATERIALS, CONFIGURATIONS AND CONDITIONS

Exterior

Foundation

Vertical cracks (wider at their tops) run the full height of the building at the western window on the north face and the eastern window on the south face, indicating that the foundation has settled mostly on a diagonal to the northeast. Other cracks and breaks like in the sill of the west basement window on the south side show a generally unstable base.

Lay of the land



The color of the stone says the effects of eave water blown back onto the stones and perhaps from splash. There is no patina below the first layer of stone under the south basement sills. A similar line is seen on the north side, but higher, as is the ground level. Also, the washed out mortar joints point to erosion of the mortar and soil that was against it.

The north side also indicates change. From the north yard the center and west basement window sills seem below the turf saying, "I've settled or someone dumped a bunch of dirt here and spread it out".

Roofing



The raised rib steel roof appears whole and prevents entry of precipitation.

Trim

The eaves have sculpted rafter tails so the fascia is very narrow and has weathered red paint. The fascia following the roofline of the gable ends is absent on the east and the west side has a material inconsistent with the age of the barn, chipboard.



Drainage

Rain falls to the ground under the eaves since there are no gutters and downspouts. The soil is eroded at that point permitting more water to drain toward the stone foundation and the east end of the basement rather than away from the barn.

Openings

Doors

The doorway to the basement is damaged on the north side where the door frame is absent. There is no door there.





Windows

The south basement sash slides sideways into pockets in the stone foundation. The first floor and loft windows and door are graced with one-piece sills and headers of a lighter color. The lintels of the west openings are sculpted to be arched at their tops. The basement only has the lighter colored headers, though the darker sills are one piece of stone. The double hung windows have two vertical panes per sash of glass with distortions.

Hardware

The front door hardware is not original.

Interior

Foundation



Perimeter

Mortar is missing from many joints, stones have fallen from the lower east end of the north wall, and vertical cracks correspond to those in the first floor walls. As water enters the stone wall, then freezes, it ruins the mortar and breaks the stones so gravity pulls them out.

Basement

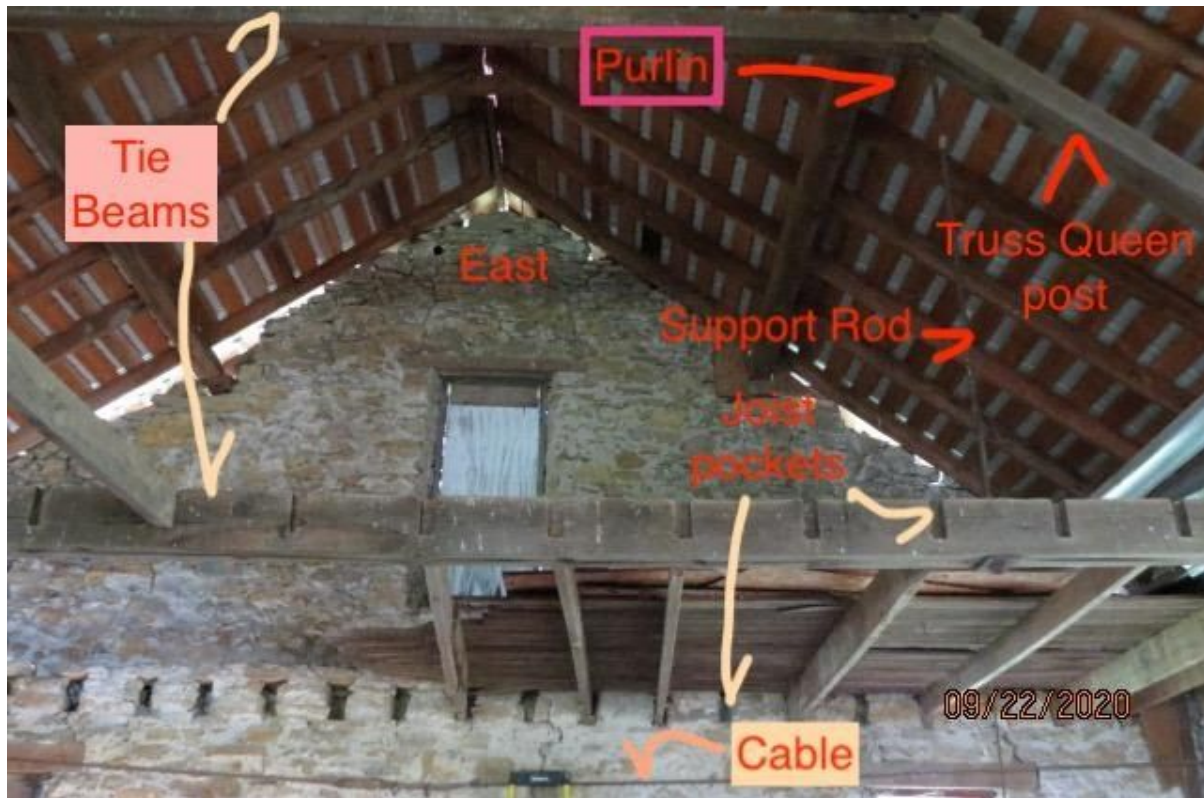
The dirt floor is covered with manure.

Post support



The bases of the basement post are not visible.

Frame **Support**



There are four “bents” (more of a truss assembly) north to south across the space whose beams lay on top of the walls without appearing secured. The joist notches in the beams above the first floor are now empty except in the SE corner. These failures to connect results in lack of horizontal support between the stone walls, both east to west and north to south.

Bracing

The “bents” have some diagonal bracing so they hold the purlin and rafter system in good form. The cable/rod spanning the inside of the east end under the loft is not taut.

Sheathing

The sheathing for the roof still has gaps between the boards like when it carried shake shingles. This is an acceptable way to underlay the raised seam metal roofing material. About 50% of the sheathing has been replaced, indicated by its lighter patina.

Openings

From inside one can see daylight around the windows.

Flooring

Tongue and groove 1” x 3”+- boards serve as main level flooring.

Partition

Interior walls are evidenced by a few studs remaining in place.

Electrical

The fabric covered wiring cable is minimal and not always secured in place.

Drainage

The basement, inside the door, has an area at least 3' in diameter where water puddles.



PRIORITIES WITH RECOMMENDATIONS AND ROUGH COSTS

Priority	Recommendation	Rough Cost
1	Eliminate a primary cause of the damage to this fruit barn. Install gutters, downspouts, and regrade so groundwater runs away from the barn so water can not remain any closer than 10 feet of the building nor in the basement. If soil is put against the building, repoint it first.	Approximately 124' of Gutters \$480-\$1,440 Grading of 80 Cu.Yds. \$600- \$1,200
2	Determine whether the building is still moving. Structural engineers have methods of discovering this essential data.	Approximately \$300 - \$1,000
3	Restore the original basement floor elevation. The buildup of manure and other sediments must be removed to protect the posts and their bases. This debris endangers the rows of posts installed under the summer beams supporting the first floor joists. If the floor level is raised, raise all non-"ground contact treated" lumber off of concrete and at least 4 inches above soil.	Approximately 67 Cu. Yds. \$500- \$1,000

4	Determine how far the foundation extends below grade. Grade is the original level of the basement floor. Since the building is not heated and subject to freezing temperatures inside, grade is the starting point of cold temperatures reaching downward to make the building rise and fall with changes. Determining the depth of the footing will assist in knowing how much to do to cease the motion that is damaging the stonework. When building this barn ordinary practices of the day were used. Few foundations for buildings were installed to extend below the frostline, which is 30 inches in this area. Soils were not tested for load capacity. The foundation with the most soil on the outside, by the weight of the soil and its friction on the wall, provides a level of protection from frost pushing it upward. The eastern portion of the foundation has less to hold it when soil heaves and sighs with frost and thaw so less friction to resist all movement, like settling into moisture softened or other frail soil. If there are certain types of clay or Loess soil, their capabilities are limited. Much of Kansas is in a Loess soil zone.	Approximately one half day of digging/probing in the basement @ \$35 hour \$140- \$200
5	Remove all trees within 10 feet of the barn. Eight 30' trees @ \$300 TO \$700 each=	Approximately \$2,400- \$5,600
6	Stabilize the foundation which has sunken. Working on and under the foundation will stress the walls above. Frost, moisture, weight, and lack of reinforcement has caused the barn to settle into the soil. Whether one only stabilizes or attempts to raise the barn, the same techniques can be used for either. A foundation contractor may mud jack, add a footing below the present one a segment at a time, or add piers as necessary. Obtain counsel from the foundation repair contractor as to when to repoint the building in relation to their processes. The risks in raising the barn to close the cracking are great. Debris would need to be removed to allow the cracks to rotate shut. The stone walls are not flexible so the forces necessary to move the walls are likely to crush them. Full restoration would involve disassembly and rebuilding most of the building on a modern and unseen foundation.	Approximately Raise building and replace foundation \$20 to \$80 per square foot. \$36,000 - \$144,000

7	Re-point all the limestone walls inside and out to tie it together with mortar approved for historic structures. Repair the basement wall and doorway simultaneously. Inside 3,321sq. ft. and outside 2,133 sq. ft.= 5454 sq. ft. roughly.	Approximately @ \$8 to \$12 a sq. ft. = \$43,632 to \$65,448.
8	Provide north to south connection. Anchoring the bottom beam of the trusses to the stone walls would help. 8 points. Mortar in. 8 Hours	Approximately \$300- \$600
9	Tie the east end to the west end. Reinstall the loft joists, securing them in their beam pockets and anchor the end joists to the stone wall and wood beams. Add a means of keeping the joists straight under compression. A floor or solid wood blocking would keep the joists parallel. Rods or cabled can be used. 8 points. 12 Hours.	Approximately \$450- \$900
10	Tie the roof plates to the top of the north and south walls and the tie beams to limit movement. 32 points. 32 hours.	Approximately \$3,200- \$6,400
11	Seal around the windows to prevent moisture from entering the walls.	Approximately \$300- \$600
12	Install a basement door frame and door.	Approximately \$1,500- \$3,00
13	Restore lighting and receptacle outlets as needed.	Approximately \$100+
14	Repair exterior woodwork, primarily the gable trim. 4 Hours.	Approximately \$150- \$300
15	Repair exterior painted surfaces. 300 square feet.	Approximately \$750- \$1050

Assessment for Nancy Yonally
Inspection performed September 22, 2020 at 1:00 PM
Historic Shirk/Lewis Barn <https://khri.kansasgis.org/index.cfm?in=045-5635>
November 4, 2020

DESCRIPTION

General

The late nineteenth or “turn-of-the-twentieth-century” gambrel roofed Western style barn at 1359 N. 1900 Road in Lawrence, Kansas 66044 is the largest building on this farm. It is set on relatively flat ground in the broad Kansas river valley. The owner reports this to have been a potato farm early on. This is evidenced by various implements stored here and in other buildings. A generous rain hood projects to the east to protect the hay trolley track from weather for when it was a hay barn for draft horses used in farming.



As well, she said this was used as an event venue since the 1990s run by her father, then the owner. He had his name on the barn so deliverymen would know they had found the right farm.
East Face

Exterior

Lay of the land

The ground level slopes to the SSW so soil on the south side of the barn is lower than on the north and east sides by several inches.

Foundation

The foundation is poured concrete about 6 inches wide and several inches above ground in the south. Each major area (the north “shed”, the south “shed”, and the main barn) has its own foundation. The depth of the foundation is not clear due to walkways (slightly sloping from the walls, running most of the way around the building, and adjoining the foundation) preventing much probing.

Envelope

Very white painted shiplap siding covers the outside of the studs walls and trim.

Openings

Doors

The east has three sliding doors, including the drive door in the center. As well the loft door is under the rain hood. The west face lacks the north sliding door as that is where the west addition joins.

The north face has one door which seems not operable.

From the south, one sees the entry to the livestock shelter and the livestock door to the stable.

A Dutch door exits the west end of the north “shed” addition.

Windows

The loft has glass windows on each side and below the hay door and a hatch below it. A square window graces the east end of the south “shed”.

The north side has a couple of covered windows.

A small 4/4 double hung window lights the loft of the west end of the north “shed”. The main barn windows are nearly identical on the west as the east. Instead of a hay door there is a 1/1 double hung window.

Roof

The roof is covered with black asphalt shingles. Some flashing is installed between the west extension and the siding.

Drainage

Rain falls to the ground from the eaves. There are no gutters and downspouts.

Interior

Frame

The original barn has standard planed dimensional lumber. Except for the south side of the west extension, the barn has concrete floors. There is no basement but there are lofts above most of the areas with a variety of joist sizes and heights.

The north “shed” has several lofts at different elevations supported by 2” x 6” pine joists supported variously. On the south side of the west end is a sheltered area for animals with a dirt floor. Though under roof the animal shelter is open to the south so the livestock may come and go.

The south “shed” area has stalls joining the wall of the main barn and individual hay shoots from the main loft to their mangers. The western three stalls seem to be part of the extension of the main barn to the west (among other things, the loft floor above is a newer style of tongue and groove board having a center anti-warp groove).

2” x 4” pine stud framing forms its east and west walls while the north and south walls have 2” x 6” pine studs and plates. The loft 2” x 10” pine floor joists bare on the north and south walls and central posts. The main barn has a drive-in door on the east and west sides. The first floor is mostly wide open with posts each side of the drive aisle. To the north of the west door a metal staircase rises to the loft. The center of the loft has a fence around a rectangular opening to the first floor. The hay trolley could drop a hay hook through this hatch to retrieve hay from wagons when this could not be done under the rain hood. The hay guard, to allow hay to stack around it to form a shaft for hay hook activity, now protects patrons from descending unexpectedly. Plywood covers the openings to the shoots to the horse stalls for the same reason. Empty hay wagons then drove out the other side.

OBSERVATIONS OF SYSTEMS: MATERIALS, CONFIGURATIONS AND CONDITIONS

Basic Structure

This barn has had additions. The main barn was extended to the west, stalls appear added to the south, storage was added to the north, and the north “shed” has been extended and widened to the west and southwest.

Exterior

Siding/Walls/Trim

Looking from the East, the north and south walls lean to the north. Looking from the West, the north and south walls lean to the north.

Roof/Flashing

The sheathing boards under the shingles used to have wide gaps between them. The infilled boards are lighter in color probably due to less age indicating patina. The main barn and the south facing roof of the west end of the north “shed” has been overlaid, probably with plywood, rather than be filled in. The goal was to lay all the asphalt shingles on a single plane. The roofing material is in reasonably good condition.

The sheathing modification indicates the barn once had shake shingles and that they have been replaced. This is to be expected in that shake shingles are usually good for 50 years and the building is 120 years old.

Flashing is minimally needed since the roofs of the additions continue from the original. Step flashing can be seen where the north addition roof passes to the west of the main barn and widens causing the asphalt shingle roofing to abut the wooden shiplap siding.

Drainage

Since storm water falls from the eaves and to where the wind blows it, its damaging effects are usually seen at the bottoms of walls. It is seen in rot at the bottom of the siding on the north side where there is no way for water to run away from the barn. Ground water from the north yard, west of the house, migrates toward the barn also. As it collects along the north foundation it softens the soil so it compresses under load.

Foundation

The footing and foundation system, including the interior posts in the main barn, appear not to have settled since the concrete floors and walkways were poured, except for under the northernmost wall. Pipe jacks are installed inside to shift weight to the floor from the foundation.



Siding is pressed down against the walkway and outward showing it is under pressure.



Perimeter

In the west animal shelter, the south enclosing wall has settled due to rotted posts.

Post support

In the west animal shelter, posts in the middle of joist spans show deterioration and /or are loose.

Interior

Frame

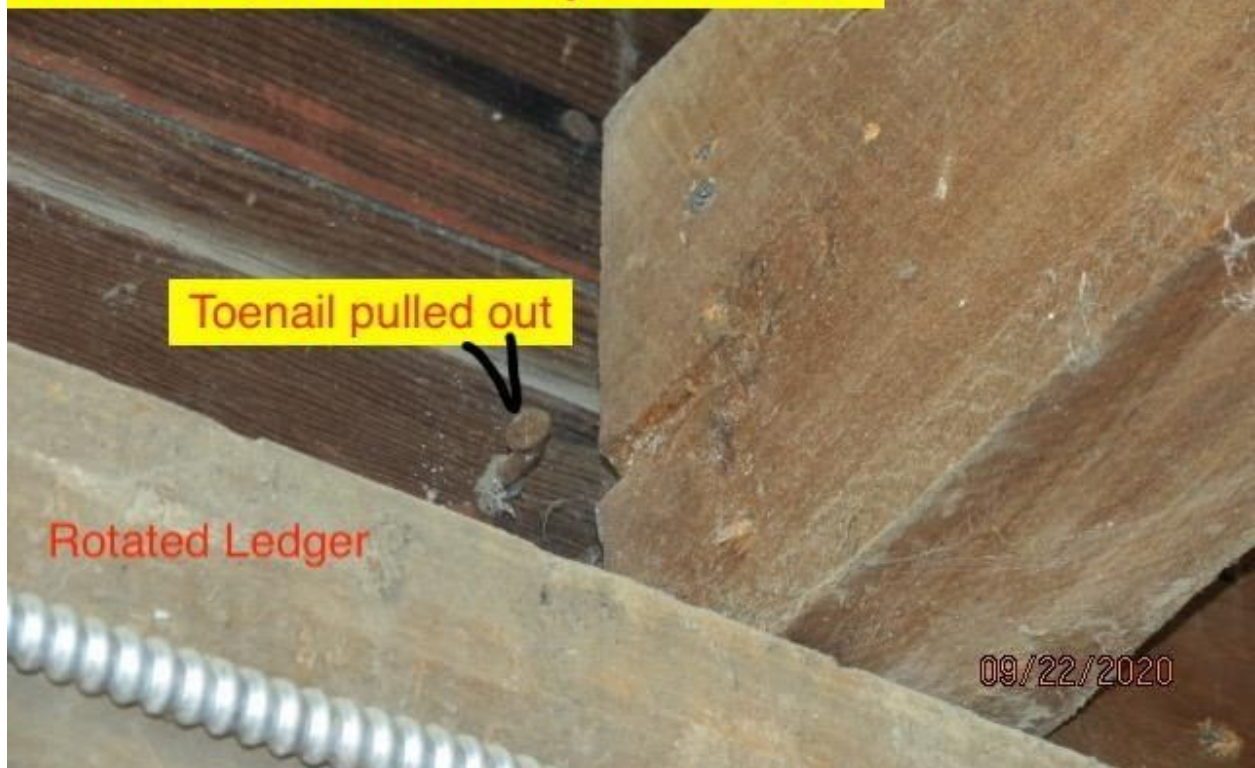
North Shed

The studs below the gable in the north "shed" west wall are canted in excess of 5 degrees to the north.

The top of the north "shed" wall tips outwardly toward the north.

Some joists for the lofts of the north side "shed" east end are about 16 foot 2" x 6"s on 2 foot centers and are sagging. They rest on a single plate next to the top of the studs of the north wall. Where they join the main barn siding they sit on a ledger strip. The top of this 2 x 4 ledger is rotating northward pulling away from the wall. One large nail every 2 feet "holds" it to the main barn studs.

North shed, south end 4th joist from east.



Some joists from a north “shed” loft with a 6 foot ceiling height pass through the main barn siding and are nailed onto the side of the 2 x 6 studs of the main barn extension.

Also the west end of the north “shed” has had siding replaced.

Main Barn

The north main barn wall leans to the north at its top, as seen from the inside northwest corner looking east.

The posts down each side of the center aisle of the main barn sit on top of concrete blocks with the floor poured around . Each wooden post bottom is above the floor about 6 inches. These posts appear sound.

The headers over the east and west drive doors sag.

The west main barn wall has siding and studs replaced.

Above the main loft there is NO diagonal bracing in the gable ends of the barn to resist wind pressure and little below the loft.

No diagonal bracing in the gable end walls!



South Shed

The gnawed stall boards and the post at the outer portion of the side stall wall indicate the stalls to be old. The posts predate the floor since the floor was poured around them. The floor is poured at an angle so the floor could be washed and squeegeed out.

The ledger strip for those last three stall ceiling joists are a 1 x 6 nailed on the side of the studs. This is a weaker assembly than the joists to the east which are supported by one by sixes let into the sides of the studs.

The west end wall shows its repairs to consist of adding a sister alongside and adding a new plate. The bottom of the west wall for the stalls where termites and rot had destroyed the bottom plate and a few stud bottoms. Slots show where the plate was slid in from the outside around the tie down bolts (neither of which is secured) on the foundation wall.

This side also has 2" x 6" joists for the loft above that are on 16 foot spans. The flooring above is tongue and groove 5" lumber.

Above the space is a storage space with some long lumber. It is not clear why tongue and groove boards were used in that triangular loft space except to prevent chaff and other hay dust from spooking the horses as it fell through cracks.

The door out the south wall of the south stall area has no header and therefore has allowed the plate above and the loft floor to settle at that point. This is not major but there really should be a header installed from each cripple on the side of the door all the way across to support the three joists set above that doorway.

Floors



The concrete in the stall area exhibits no expansion joints so it is no surprise that the floor has cracked and heaved in this building subject to freezing soil. These tripping hazards should be eliminated and the floor repaired so it can drain to the exterior.

Partitions

The bandstand/refreshment walls in the NE corner in the main barn consist of vertical 2 x 4 studs and horizontal boards and serve merely as dividers with no need for much structural strength.

Electrical

The wiring consists mostly of metal clad cable commonly called BX. There are some newer runs. Without close examination it appears properly installed though some junction boxes lack covers. Any abandoned wiring should either be removed or remain in condition as if still in use.

Plumbing

There is no plumbing.

PRIORITIES WITH RECOMMENDATIONS AND ROUGH COSTS



The NE corner, from the east, is not parallel to the neighboring plumb building nor the relatively plumb sliding door on the north addition.
The north wall bows toward the north.



Though the SE corner trim, seen from the east, is relatively square with the siding and the trim over the door it is not parallel with the plumb white pole to the left/south.

P r i o r i t y	Recommendation	Rough cost
1	Stabilize or remove the north leaning list from this grand barn. There are several issues affecting the leaning/settling of the barn. Rain on the north roof falls to the ground. Ground water drains from the north toward the foundation. The moisture in the soil makes it less able to carry the weight of the building, allowing the building to settle. Plus, wind blows persistently from the south and southwest always using the roof angle and gravity to rotate the barn downward and northward. The constant wind always transfers load to the top of the northernmost wall through the rafters. This not only rotates that wall but is pulling joists loose from the main barn wall. Water, wind, and weight move the building. The structure itself must be examined for its part in the movement. The canted studs in the west end of the north addition show lean. Much of the structure is either vertical or horizontal but structures need diagonal bracing to resist rectangles becoming parallelograms. Built in the days of balloon construction this barn lacks the benefit of experience to give it the strength of modern bracing techniques. In addition, the numerous bowing beams and joists show the effects of undersized lumber. It is clear that the building is distorted and we see different forces that have contributed to that. The leaning of the barn is similar to the pivoting of the hands of a clock. The attached hand turns very little where it is attached in relation to the end of the hand where greater movement can be seen. The main point of attachment in this barn is at the bottom of the southernmost wall. Others are the main barn walls and its central post bases. Each pivot point receives pressure northward and downward adding changes to the dynamics. At each connection of lumber a certain amount of slack exists. As the figurative clock hand moves, slack is removed bringing downward compression and northward movement to each part of the building. This movement must be stopped before the connections and materials fail further, to maintain the barn erect. A structural engineer is necessary to calculate the energy being exerted against the barn, to determine how to halt the movement and to repair the damage, and to devise means of straightening the barn safely.	Approximately \$3,000 to \$100,000+

2	Install a roof drainage system to keep water away from the foundation at least ten feet and downhill.	Approximately \$700 to \$2,200
3	Regrade the yard north of the barn.	Approximately \$1,500 to \$2,500
4	Repair the connections and reinforce/replace the bending loft joists in the north “shed” tying the north “shed” wall to the main barn through the lofts to pulling it back in line as necessary to stabilize it.	Approximately \$50 to \$500
5	Lift the north shed building to install the new foundation then prepare the wall to be out of the way since the barn settling on the north side.	Approximately \$4,700 to \$11,000
6	Repair/Replace the foundation under the north wall of the north shed.	Approximately \$1,100 to \$4,500
7	Replace the posts or their bottoms and provide footings at least to the depth of the rest of the footings for all the posts in the west animal shelter.	Approximately \$200 to \$500
8	Repair or replace broken joists in the livestock shelter.	Approximately \$50 to \$200
9	Install a header above the south livestock door.	Approximately \$50 to \$200
10	Reinforce the headers above the drive doors.	Approximately \$50 to \$200
11	Repair/replace the stall partition posts, if the stalls are used for livestock.	Approximately \$200 to \$500
12	Repair/replace flooring material in the stall area for safe walking, drainage, and clean-ability.	Approximately \$2,600 to \$7,000
13	Repair the disturbed or deteriorated exterior surfaces. Remove any paint which has lost adhesion, following applicable Federal lead paint requirements.	Approximately \$500 to \$14,100

Assessment for the Historic Bahnmaier, G. J. Barn
Elsie Middleton, Owner

Site visit November 5, 2021 by Thomas A. Kennedy



Report Completed December, 2021



This project was funded by the Douglas County Heritage Conservation Council's
2021 Barn Assessment Grant Program.

DESCRIPTION:

The limestone barn, built by G. J. Bahnmaier, is about 42 feet east to west and 33 feet north to south. The ridge of the gable roof runs east to west and is wood frame, as are the gable walls. Interior framing is post and beam forming stalls for horses, a milking parlor, and much storage for hay above and to the west. Not all of the materials were new but seem to be from a prior barn.

OBSERVATIONS OF SYSTEMS, MATERIALS, DESIGNS, AND CONDITIONS:

EXTERIOR:

Foundation- The most soil erosion is at the northeast corner so the top of the foundation there is 12 inches above grade, that being the step out at the bottom of the main building wall where the wider stone wall is laid up from a lower point under ground. Foundation stone was found at 20 inches below grade but not at 24 inches. Much of the foundation step out around the building is at grade except on the north and east sides where the lay of the land falls away from the building toward the stream. The foundation was designed to rest on soil at least 32 inches below grade. The north and east side need more protection from frost.



Ramp/Driveway- There is no doorway wide enough through which to drive a tractor or a team of horses so there is no delineated driveway into the building. Short concrete ramps rise to the doorways on the east and north. It is reasonable to conclude that there was some sort of driveway along the east side under the hay hood.

Envelope/Siding- The bulk of the building is laid up yellowish limestone to the level of the roof plate, which also serves as a wall plate in the gable ends. Some stones are absent, like at the bottom of the opening above the south doorway. Some cracking has developed like above the north door in the west wall.



Horizontal lap siding is applied directly to 2 x 4 studs on 2 foot centers to form the gables. Paint is not evident on any of that wood. Butt joints in the siding



frequently fall between the studs rather than at a stud. Most of the siding is weathered to a point that it cannot be used again in a renovation.

Trim- Under the Stone archers wood and stones have been used to square up the space for the doors and could be considered trim.

Roof- The roofing material is corrugated sheet steel with minimal rust.

Drainage- Half round gutters and round downspouts have been used to carry storm drainage from the roof to the ground. Some pieces are absent as is evident by the empty brackets on the exterior wall. The south gutter is gone.

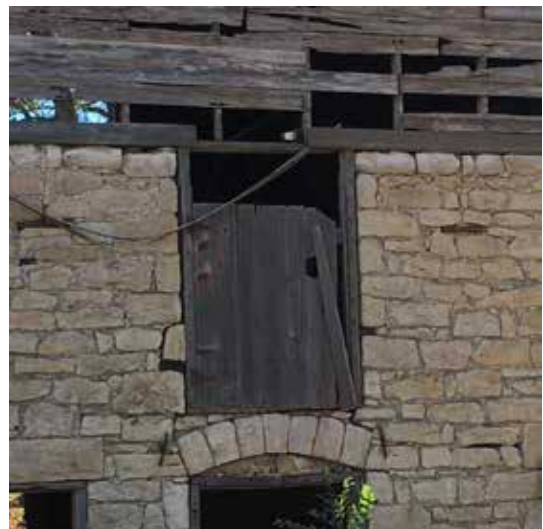
Openings:

Doors- Three doors, each, grace the east and west sides while one doorway each penetrates the north and the south walls. Shallow arches support the outside masonry above these openings, while used timbers support the inner wythe of stone. Shallow stone arches hold the stonewall above the doorways.

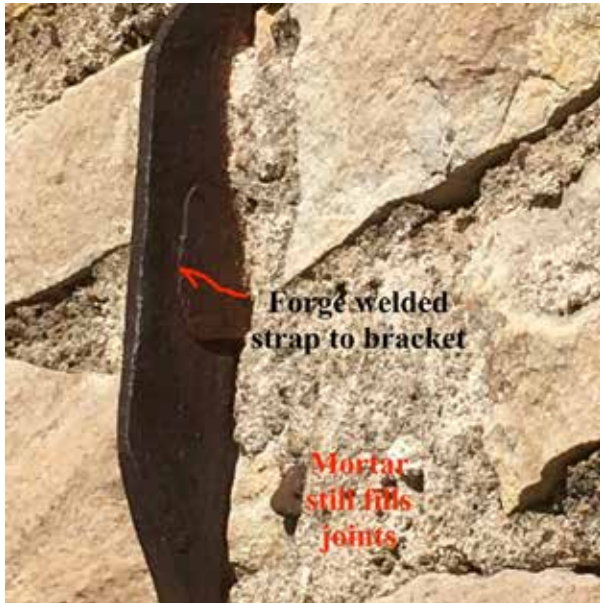
At least four doors are absent. The others are no longer square, plum or whole. The doors are vertical boards with a horizontal board nailed across the top and another across the bottom and then a diagonal brace spans between the horizontals. Nails have been driven through and bent over as in the saying, "Dead as a door nail".

Above the both center doors is a gap in the stonewall with a door which opens out from the loft. The east one is immediately below the hay door (absent).

Windows/Hatches- Large stone lentils longer than the openings are wide hold the stonework above the window breaches. There are no framed windows though some openings have covers made like the doors.



Vents- The vent in the east gable is a rectangular hole in the siding between two studs approximately 2 feet by 3 feet vertical.

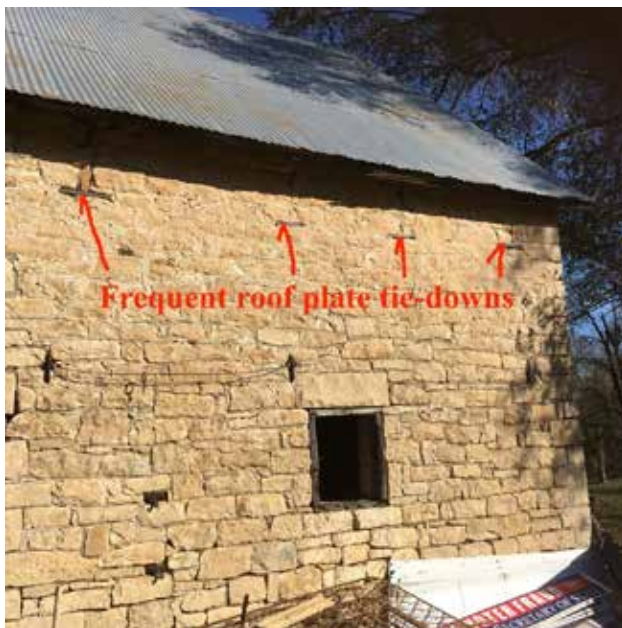


Hardware- Six steel "T" brackets hold the



tie-beam ends so they don't pull through the stone wall on each side, a hay trolley track, runs more than the length of the barn under the collar

ties (why it protrudes from the west gable is not known), eight roof plate tie-down bolts run down each side and 5 are mounted along the gable ends and strap hinges hold the doors on. Many round nails hold the building together.



East of the south doorway two pieces of hardware are mounted but their use is not determined.

Since door latches are pieces of wood nailed to the door frame to hold the door closed when the latch is turned to horizontal they are not considered hardware.

INTERIOR:

Roof- Below the corrugated roofing is gap sheathing of different widths above the rafters. 2 x 4, 2 x 6, and some other sizes of lumber are used for roof rafters with the larger ones trimmed vertically to fit, where needed. They are supported mid span close to splices on sawn purlins and braced with sawn lumber of miscellaneous sizes. The purlins are held up by queen posts mounted in



the
loft

notching around the timbers they join at each end for what seem to be the original members. Later modifications rely more on nails for fit.

Frame: Many of the timbers are not squared up and often still have their bark, as if they were harvested from the farmstead, and are only just big enough. When a flat side was desired the logs have been hewn by either broad axe or adze.

Where the queen posts do not line up with the loft floor joists/beams or don't have a beam supporting the joists immediately under the queen posts, header beams are added between the loft floor joist/beams so the weight on a queen post falls on two beams. The horse stalls and granary area have this condition.

On the north side in the milking parlor floor joist/beams have sagged so additional posts and beams have been added.

All of the joists are spliced in the middle of the barn but not always over good support. The picture above on the right shows a bolster bent downward and an undersized beam split because of the way it is notched and not supported.

Among the loft beam joists that run from one side of the barn to the other are six tie-beams lag bolted to hand forged steel anchors that pass through the stone wall on the north and south. Two of these have been removed along with the other loft materials for the western half of the barn.

This removal combines with other actions to weaken the barn several ways. When horizontal forces from outside are applied to the walls, like straight line strong winds, they lack the reinforcement designed into them originally. The joist-beams allow a stressed wall to pass some of the damaging force to the other wall so they work together to provide roughly twice the resistance.

Also, the tie-beams handle forces from above that push outward as gravity pulls downward, and from inside the barn when wind tries to get out after coming in openings.

The roof has cross-ties above the hay track.

The roof, without low horizontal bracing, is an inverted "V". The weight of the roof and other stresses, like use of the hay troll, pull downward on the mass pushing outward on the legs of the "V". Damage is seen toward the east end of the south wall. The roof plate has moved outward while the stone wall stayed in place aided by the tie-beams and brackets.

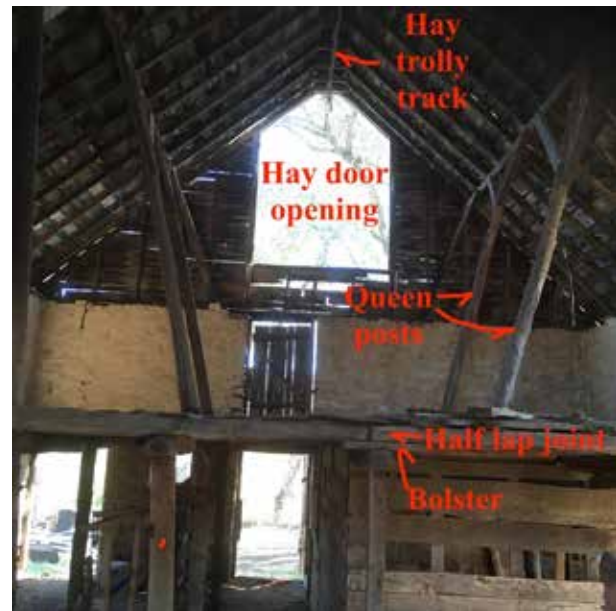
The queen-posts mostly carry vertical weight to the ground breaking the structure into 3 inverted "V"s thus reducing the forces in each. By setting these at some angle instead of plumb some horizontal stresses have been dealt with north to south. The diagonal braces at the tops of the queen-posts handle horizontal forces east to west. Angled posts help but cannot replace horizontal support.

Often barns are designed to connect the rafters or roof plate to the queen-posts. Such a design should have prevented the rafter from excessive push of the plate. Horizontals in that location would not interfere with the hay conveyance system.

Above, it was mentioned that extra posts and beams have been added in the milking parlor. The loft floor has settled. The loft floor structure is the base of the queen-posts which are below their original elevation. Each side of the roof is concave due to the purlins being let down with the queen-posts.

The various parts of the roof structure tied together makes an assembly so it stays together as each part helps its neighbor, though under stresses it was not intended to maintain. It will fail eventually unless repairs are made.

The loft settling can be caused by several



things. The bottoms of posts set on or in the ground tend to rot and crush the rotted material. That allows them to lower whatever is sitting on them. The beams seem to have bent. Is this due to the heavy loads or were they that shape when they were put in place? Timber frame barns were often built with green beams and posts so they may bend to adjust to stresses until they cure.

The current loft is large compared to many and has room for many tons of loose hay, possibly more than its capacity to hold up. At 30' x 20', with straight and angled walls, it is about 6,000 cubic feet. Loose hay, well settled, is said to weigh about 8.25 pounds per cubic foot. That calculates to 49,500 pounds or 24.75 tons. In 600 square feet that comes to 82.5 pounds per square foot. Living rooms must be built to carry 40 PSF (Pounds per Square Foot) and warehouses must handle 400 PSF. A 4x4x8 hay bale weighs around 1800 to 2000 lbs. which is 14 to 15.67 pounds per cubic foot. That bale is at least 56 pounds per square foot laying on one side. Today's compacted bales would nearly double the load on the loft structure if completely filled and it has been damaged under lighter loose hay loading.

With half of the loft removed, more hay can be stored because it rests on the floor. It requires no structure to support its weight. have been used that needed extensions to reach the purlins from the ground, including one utility pole.

The longer queen posts that replace the loft purlin posts raise other issues. Being nearly plumb they provide less horizontal support for the barn roof. The diagonal bracing has been removed from the southwest one. Some are not long enough and their extensions have problems. Vertical strength relies completely on the nails holding the stilts to two of them. They could sheer off or bend and pull out. Also there is no bracing to keep the stilts from distorting.

Diagonal- Along the tops of the queen-posts braces are installed up to the purlins. These help keep the posts plumb east to west. They provide the primary rigidity to the assembly.

Sheathing- The sheathing is lumber between $\frac{3}{4}$ of an inch and 1 inch thick x any number of widths between 5 inches and 12 inches. Some may be wider. The roof sheathing boards assist to form a membrane to add more stiffness to the assembly. Being nailed tight to the rafters holds them apart and square. Tight connections reduce movement of the parts as parts are tied together as a unit. The sheathing looks stained from moisture which has gotten through, probably at the end of the life of the prior roofing material.



Openings/Hatches- The west gable has a high opening for ventilation while the east gable has a hay door opening. A hatch in the floor of the loft is above the center east doorway.



Floor- The concrete floors of the horse stalls could be cleaned most easily out the the closest exit, the south doorway. The milking parlor and the granary also have concrete floors that runs between the north door and the north door of the east side. The boards on the loft floor have miscellaneous shapes, seem to be strewn around, and not secured. Those conditions plus the many openings to the space below make walking trepidatious.

Drainage- The trough in the concrete floor behind the stanchioned cows and to the west side of the barn was designed so waste could exit the building at the north door of the east side.

Partitions- Posts rise from the wood plates on the floor to the loft joists and have boards nailed between them to make the partitions for the central hallway, the granary, and the horse stall.

Devices- A hay trolley track runs from outside the west end of the barn out the hay door to the end of the hay hood. Hay could be dropped anywhere along the center and spread to the north and south sides.

Electrical- A minimal amount of fabric coated conductors deliver electric current to the light fixtures mounted on metal junction boxes. One globed light fixture helps prevent fire and explosion. Metal staples and strips of leather hold the wires in place.

RECOMMENDATIONS, PRIORITIES, AND ROUGH COSTS:

Restore the horizontal connections between the north and south walls of the barn, reconnecting to the steel straps through the wall.

Install piers, at least to the depth of the base of the foundation, under each queen-post and loft post that rests in/on dirt.

Infill the stilts on top of the west purlin posts, so the purlins do not rely only on fastener sheer strength for bearing and for protection against lateral forces.

Repair all posts to raise the purlins to flatten the planes of the roof.

Anchor all posts to the base under them to resist lift and horizontal movement.

Repair or replace all loft joist/beams to full load bearing capacity.

Arrange and secure loft flooring to remove tripping and falling hazards.

Repair or replace the damaged roof plate the east end of the south wall.

Provide a level structural support from the purlins to the roof plates.

Restore diagonal bracing to the southwest purlin.

Replace all lap siding.

Repair or replace all doors, window coverings and hatch covers so all openings have a barrier to moisture from the outside.



Repair all cracks in the stonework, inside and out, with mortar of similar strength and color.

Replace absent stones, using mortar of similar strength and color.

Replace the washed away soil up to the top of the foundation wall on the north and east sides (Slope away from the building for at least 10 feet should not exceed 1 in 20 pitch).

Repair or replace the roof drainage system, spilling water no closer than 10 feet of the building.



Note: Also located on this property is a large stone house.



Assessment for the Historic Donnelly, Matthew Barn Matt Donnelly, Owner

Site visit August 27, 2021 by Thomas A. Kennedy
Report Completed December, 2021



This project was funded by the Douglas County Heritage Conservation Council's
2021 Barn Assessment Grant Program. Donnelly Assessment

DESCRIPTION:

The barn red barn located at 501 N. 1200 Road Lawrence, Kansas 66049 has a gable roof flanked by two lean-to roofs all covered with rusty corrugated steel. The wood frame walls rest on concrete foundations



and are covered with vertical 1 x 12 pine boards with some battens.

The south lean-to seems originally to have been an open livestock feeding area, with the manger outside its north wall. It is used for equipment storage now. The floor and its adjacent yard are paved with concrete. A loft covers the space. Entry is gained through two wide gated openings. Half round gutter extends westward from the backboard with hoop hanging from the eave toward the east end.

The north lean-to is set up for a white painted dairy operation with stanchions to milk a group of at least 10 cows in one place at the same time. Overhead is a loft seemingly installed as a ceiling. Entry by the livestock is from the west at the northwest corner. From the stanchions southward is a hallway/manger with a couple of Dutch doors into the main hay storage area of the barn. Some surface mount electric fixtures and fabric coated non-metallic electrical conductor gives the potential for light.

Leaving the milking area to the northeast is a hallway to the milk shed where the milk was processed for use and transport. The milk-shed is finished with lathe and plaster walls and ceiling over a smooth concrete floor. The connection between the walls and the ceiling is rounded. Electric lighting is provided. The windows are mounted in cement block walls and have slats on the outside of bug screening.

To the east of the milking parlor is a small room with damaged interior walls and a door to the exterior.

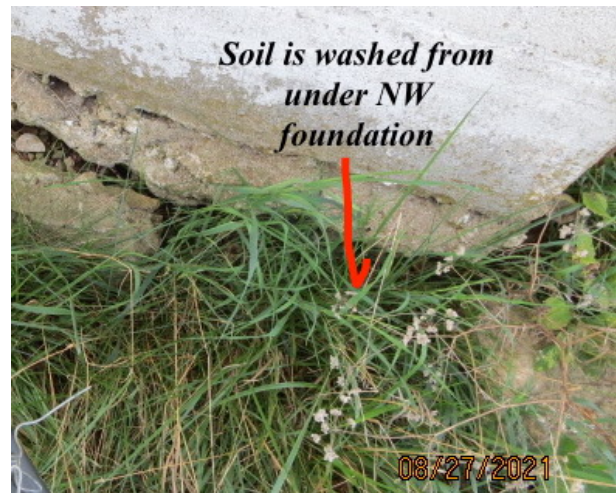
Between the lean-tos there's a wide open dirt floor with a hay trolley track in the peak of the roof, a hay door in the east gable, and a hay hood over the outer east end of the track and above the barn's main sliding door. A rectangular opening about 3' by 4' allows light to enter the bottom of the west gable. Also a wooden wall of vertical boards stands along the south side as a separation from the manger.

Overall, the length of the barn is about 63 feet, east to west, and it is about 58 feet wide.

EXTERIOR OBSERVATIONS:

Foundation- The entire barn sits on concrete foundations. To the north side of the main door the foundation penetrates the soil to at least 10 inches deep. The probe penetrated below the foundation at a depths of 12 inches. Though this is not below frost line there is only one wall found to be damaged.

Much erosion from roof drainage is found west of the milk-house and along the north wall of the north lean-to. As well, trees have grown against the building in these areas. A clump of trees have been

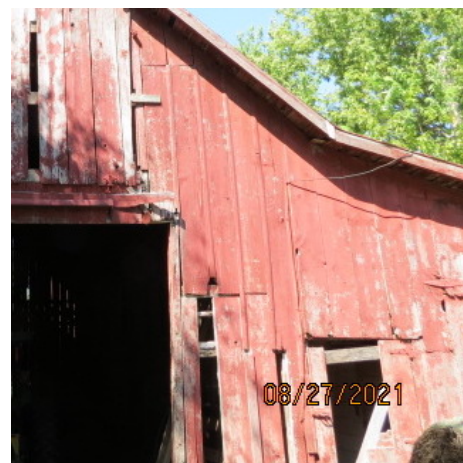


cut off a few feet above ground about 25 feet from the northwest corner and it is there that the foundation wall is broken in two places. The wall at the northwest corner has rotated.

Drainage- Erosion is undermining the foundation of the milk shed walkway and the north lean- to.

Lay of the land- The barnyard at the west side of the barn is more than a foot below the lawn on the east side.

Driveway- One drives over the lawn to enter the east barn door over a steel channel guide for the bottom of the door.



Envelope- 1 x 12 board and batten provides the siding for this barn. Here and there around the barn pieces of siding or absent and the paint is cracked and peeling.

Trim- Facia is he installed on gable flying rafters and rafter tails.

Roof- Under the rusted (See the picture on page 1 above) corrugated steel roofing sheets of the main barn and the north lean-to remain the wooden shingles of the original roof. The lighter patina of the South lean-to lumber and the similar rust patterns on the roofing panels makes one in think the south lean-to was added about at the same time as all of the corrugated roofing. No evidence of leaks was found. The lean-tos are not attached at the same elevation. The south one is it attached higher and with less pitch than the north one. While this might violate a sense of symmetry for some people it makes no structural problem for the building.

Hardware- The hanging door tracks and rollers, the hay door hinges and the south gutter are the exterior hardware.

INTERIOR OBSERVATIONS:

Frame- The main barn suffers similar damage as many others using a loose hay conveyance system. The barn has spread in the middle, north to south.

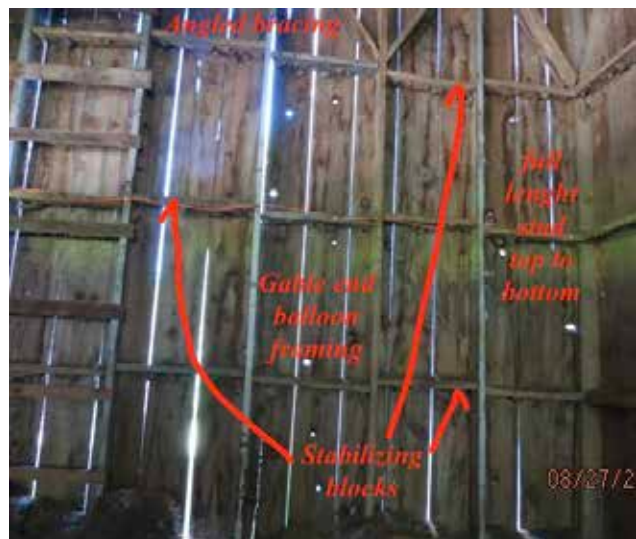
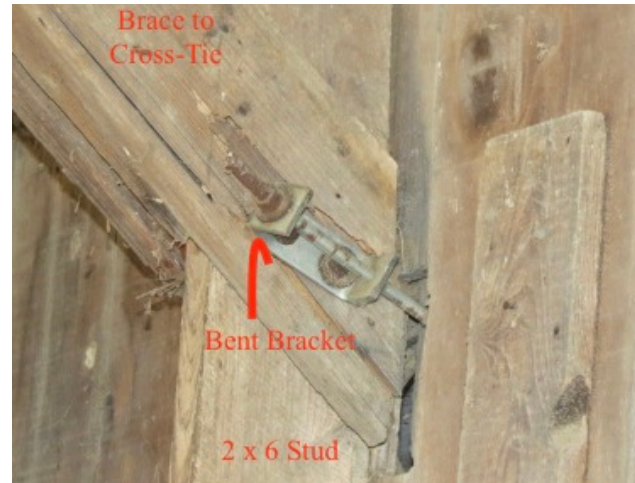
Repairs have made it impossible for the trolley to carry hay very far into the barn because collar ties have been added under the track from the west wall toward the east. The lower tie-beam assemblies have been damaged and repaired along their lengths as well as their connections to the side walls.

One metal bracket on a stud in the north wall is distorted where the all-thread bolt to a north lean-to rafter passes through it.

Other deterioration is seen. The posts by the sliding door are loose and misaligned and termites have waged war with the east bottom wall plate of the equipment storage south wall.

Any posts, such as in the milking parlor, should be examined for rotted bottoms. The joists of the milking parlor ceiling are sometimes made up of multiple pieces of lumber which are now pulling apart, warped, or broken.

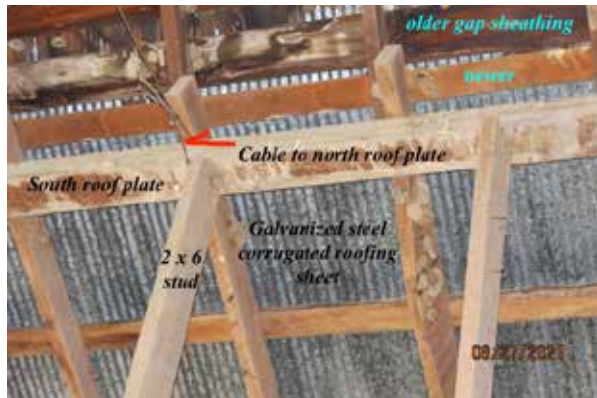
Diagonal braces toward the top of the north wall have helped to avoid east to west distortion of the building.



The west end has lovely long floor to roof balloon studs with stabilizing blocks between.

Hardware- A bracket used to hold the rafters of the north lean-to is bent. That plus latches, many hinges, the hay lifting equipment borrow, the manure carrier, the dairy piping, two cables in the hay mow and the many nails that hold the building are the interior hardware.

Partitions- The wall along the south side of the main hay storage area keeps the stored hay from falling into the manger prematurely and blocks the livestock from undermining the stored pile of food.



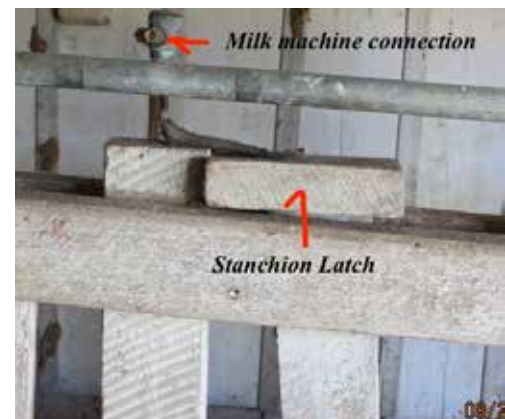
Sheathing- Gap sheathing holds wooden shingles on the main barn and north lean-to. The south lean-to has sheathing with wider gap but no wooden shingles. It would appear that the south lean-to was built at the same time that metal roofing was put on the entire structure, as it has all weathered at a similar rate.

Accoutrements- The stanchions look custom-made for this site

totally of wood.

An overhead track remains from a manure trolley.

For centuries cows were milked by hand. The first Mehring milking machines (See the ad below) were foot powered to produce suction. Around the time this barn was constructed more efficient means of milking cows were being developed. Though it could have been installed later, the pipe above the stanchions appears to be part of a vacuum system to operate machines in the next stage of efficiency, with a valve between each pair of lactating bovine. Hands were used only





to wash the udder, connect the milking machine and install/remove the suction cups and bucket.

MILKS LIKE THE CALF SUCKS — NATURALLY.

Mehring Foot-Power COW MILKER.

To no small extent, the "MEHRING" owes its success to the fact that it milks with the same pressure and suction as the calf applies. In view of this, it's only natural that cows should take to the machine kindly, and give even better results (as tests have proved) than when milked by hand.

Another feature of the "MEHRING" is that the suction can be regulated to suit each individual teat. If one teat empties before the others, the operator simply cuts off suction on that teat and continues milking.

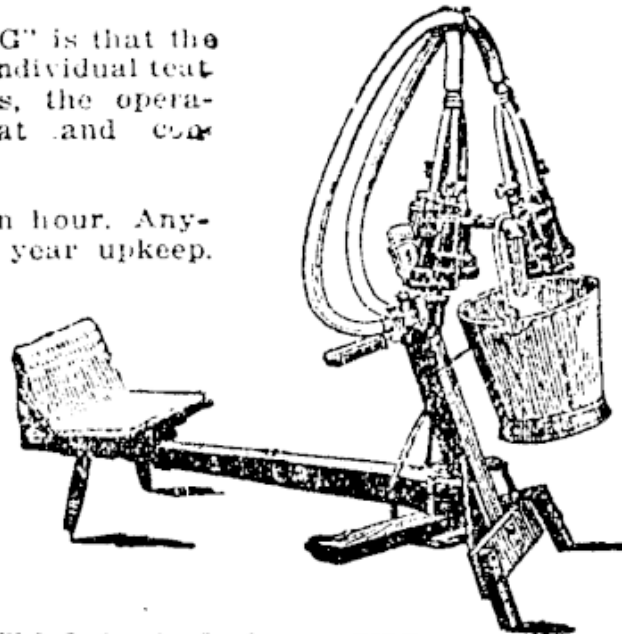
The "MEHRING" milks 20 cows an hour. Anybody can use it. Costs only 10/- a year upkeep. Simple, easily cleaned, never gets out of order. Lasts for years. Just the milking machine dairymen have long been wanting. More than 300 sold in little over 12 months. Users delighted.

LET US SEND YOU FULL
PARTICULARS, TESTI-
MONIALS, ETC.

HENRY VEALE,

Chief Australasian
Agent.

HIGH STREET,
DUNEDIN.



Utilities- Electric- The wiring system is improperly installed and faulty.
Plumbing- An anti-freeze hose connection stands at the southwest corner.

RECOMMENDATIONS BY IMPORTANCE AND ROUGH COSTS.

Replace damaged and missing siding.

Remove cracked and peeling paint, properly collecting and disposing of lead-based paint, and provide protective coating for the siding and trim.

Remove loose rust then properly provide protective surface coating for the roof.

Provide a complete storm drainage System for the eaves of the barn.

Remove vegetation and stumps from the west side of the milk shed, passageway and along the north wall of the north lean-to.

Replace the foundation along the north wall of the north lean-to to below frost-line or at the same depth as the rest of the barn below grade. The foundation under the building should at least be had a uniform depth to avoid unnecessary flexing with temperature changes.

Restore eroded soil along the west side of the milk shed and gangway and along the north wall of the north lean-to.

Consult a structural engineer regarding support between the north and south walls of the main barn. Also ask him how to tie the rafters together at the peak without blocking the hay trolley.

Restore and add support between the north and south walls of the main barn as necessary.

Repair or replace the bent bracket holding the tie to the north lean-to rafters (A piece of pipe around the bolt between the bent ends of the bracket will keep it from distorting after it is straightened).

Provide a proper hatch for the attic of the milk shed and repair the plaster.

Repair the interior walls of the room east of the milking parlor.

Remove all debris from the milking parlor/livestock pen down to the original floor.

Remove or repair the weak and damaged ceiling of the milking parlor.

Repair any posts holding up the milking parlor ceiling a structure that will continue to be used, placing them on a footing to below frost line.

Repair of the loose and hanging posts on each side of the main entry door to the barn, making sure the footing under them is sound.

Have the barn treated for termites and repair the damage caused by them to the southeast wall plate in the south lean-to.

Restore all openings in the building to their intended use and good condition.

Remove all vegetation where the drip edge is over any part of the building.

Barn Assessment for the Historic Rosenau Granary Noland and Stephanie Jones, Owners

Inspection July 30, 2021 by Tom Kennedy
Report Completed October 6, 2021



This project was funded by the Douglas County Heritage Conservation Council's
2021 Barn Assessment Grant Program.

Report

Building Description

The original portion of the barn at 545 W. 20th Street Eudora, Kansas 66025 is a 24' x 30' rectangular gable roofed structure of two cribs flanking a central drive aisle each about 8 feet wide and 30 feet long. It appears to have a slight lean to the north. At a later time, once pressure treated lumber had been developed, a 14 feet wide lean-to was attached under the north eave.

The roof is of corrugated steel on spaced sheathing. Shake shingles remain on those original skip boards. The edges of the roof are not the same on each side. A four foot roof attached above the south eave seems a remnant of another structure with a concrete floor at grade. The north eave hangs out about a foot while the overhang on the gable ends appears a bit less.

The siding is horizontal shiplap (rabbeted edges for a lap joint) about $\frac{3}{4}$ " by 6" wrapping around the first structure. Under the eaves some shadowing of red shows that the currently gray siding used to be protected by red paint.

The lean-to has wide vertical solid wooden siding boards on the north side and is open at the east and west ends.

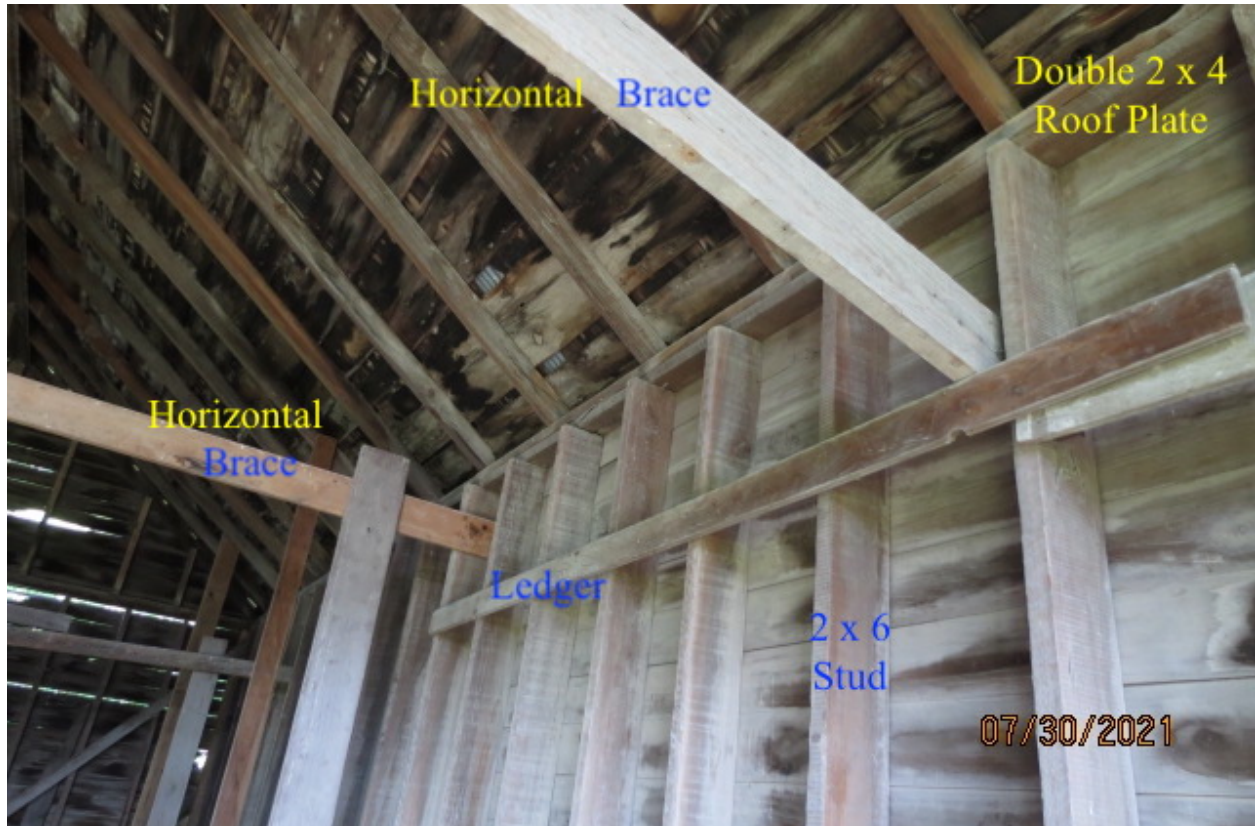
The barn frame is made of individual pieces of 2" thick lumber with a few larger timbers, maybe reused from an earlier building. Like at this southwest corner of the north crib, some structure is exposed to the weather.



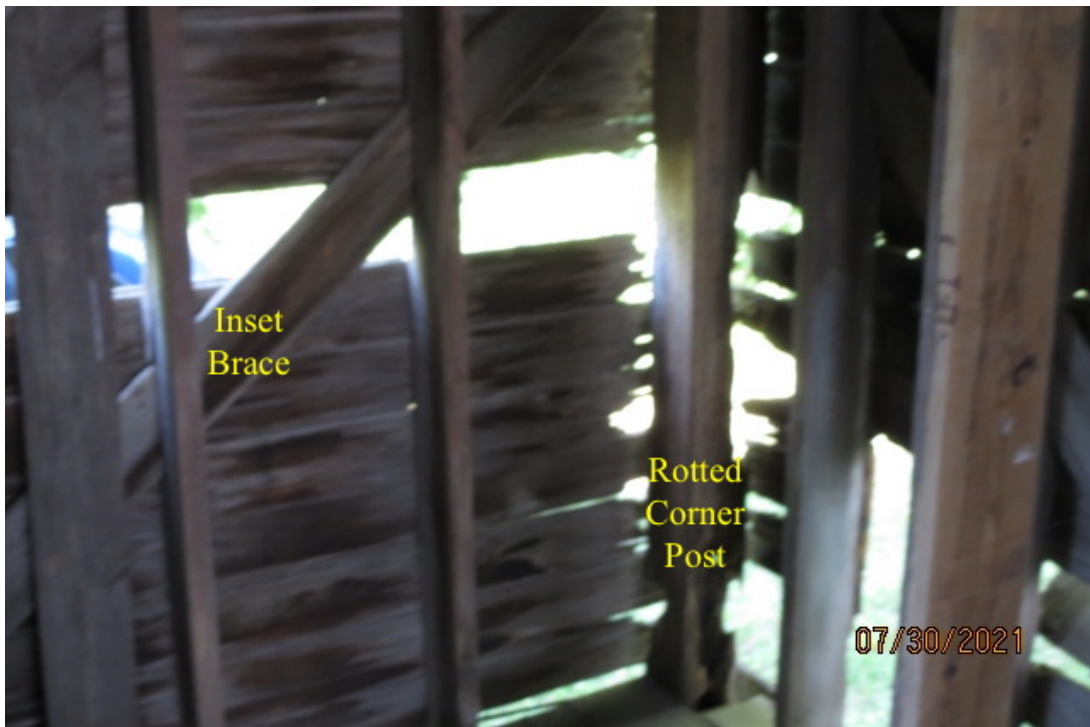
The 2 x 6 studs stand vertically on a single 2 x 8 plate every 16" on top of the foundation wall and rise to a double 2 x 4 top plate upon which the rafters rest every 24". The 2 x 8 floor joists rest on the bottom wall plate alongside the studs to which they are fastened with round nails.

The north crib has concrete poured above the foundation wall plate between the studs/joists to floor level.

Every 6 studs or so a 2 x 4 horizontal brace runs from the side of a stud to the side of another



stud to tie the building together horizontally from eave to eave.



To avoid racking, diagonal braces are cut into the corners and others are added to keep plumb the posts under the purlins.



Purlins have been installed under the rafters above the alley walls to aid the rafters. Instead of sistering horizontal 2 x 4s on top of each other, like the roof plate, the purlin has two 2 x 4s nailed together in an "L" shape, edge to flat, one laying along the other. The purlins sit atop double 2x 4 posts cut at the same angle as the roof pitch.



There is no ridgepole as the rafters from one side butt together with those of the other side. There is no loft and no evidence was seen from the floor that a hay track has ever been installed.

The 1 x 6 shiplap flooring covers the joists. The floor to wall transition has sheet metal and /or boards to block rodents out and to keep grain in.

The four foundation walls hold the crib floors above ground level with nothing between them.

Each crib has a doorway at each end opening to the aisle. The northwest door is mostly missing and the southwest door appears to be leaning against the alley wall of the south crib. The northeast door hangs from one hinge and the southeast door seems intact.

A track for a hanging door is installed outside of each end of the alley, a door remains south of the west end opening.

On the south portion of the east gable a box like a bat house extends beyond the siding.

No windows or hatches are seen.

Observations of Systems, Materials, Designs, and Conditions:

EXTERIOR:

Foundation

The 4 foundations are 8 inches thick horizontally north to south and run parallel with each other east to west about 30 feet under each main wall of the cribs. There is no structural material between them that would block ventilation or provide lateral support.



Erosion is evident at the southwest corner of the south foundation wall.

Apparently, a form was placed on the ground at the top of the footing, a little off center.

The soil which was at the level of the top of the footing is now absent where it had concrete poured and cured on top of it. Now it is showing off-set on the north side. The interior form boards sat on the soil to keep concrete from seeping under them.

The soil south of the outer form was

higher than the footing and formed a barrier to the wet concrete which flowed under the canted south form board.

All in all the grade was higher on both sides of the foundation than it is now. Perhaps this represents all.



The treated posts of the lean-to penetrate the ground to a similar depth as the concrete foundations to below 24 inches but not further than 32 inches, where tested on the west side. None seem to have settled further than the original installation. The weight of the materials each carries is only a few hundred pounds plus the live loads of wind, rain, and snow (around 20 to 30



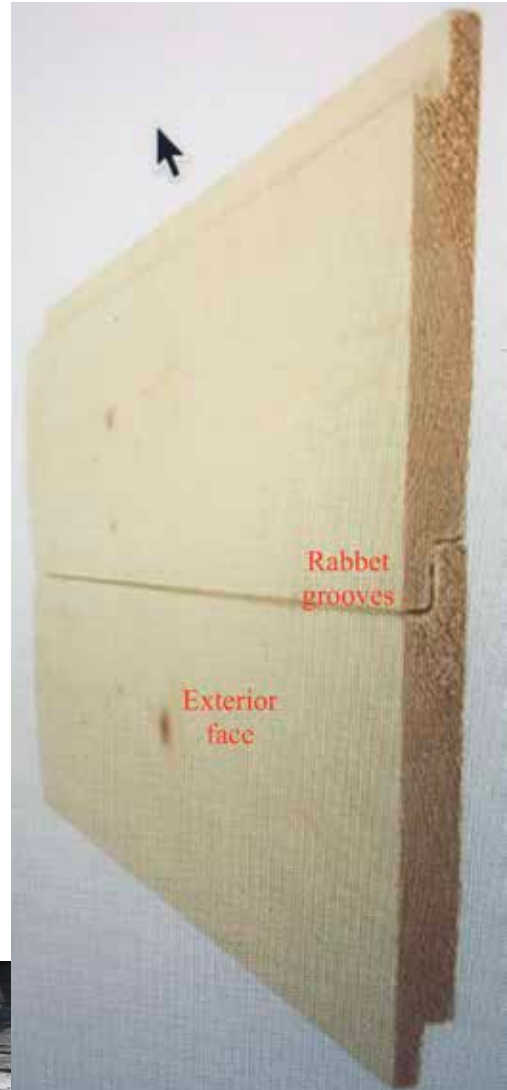
pounds per square foot depending on location).



The close vegetation to the south provides protection from the constantly moving air. Unfortunately, the limbs and leaves closer than a several feet of the structure do not allow surfaces to dry to stave off the rotting process. Small trees closer than 10 feet, or so, send roots under and against the foundations of the building, pushing upward and sideways.

Envelope/Siding

The ship-lap siding is gray in color which is typical of wood for many years without paint, but with hints of red in protected areas like under the eaves . There are numerous places where the siding is pulled away from the studs, worn through, or otherwise absent. The siding is applied directly to the studs as was typical in the day. In its present condition the siding cannot ward off the weather.



Trim

The roof edge has fascia on the gable ends and on the north eave but there are no soffits. Some fascia is absent or loose.

Roof

The finished layer of the roofing is corrugated steel with much zinc coating worn though resulting in a substantially rusted surface on the north side. The steel is badly bent and not



attached at the southeast edge. This allows rainwater and snow to fall inside.

The corrugated roof of the lean-to was previously used, judging from the number of holes in the tops of the ripples, letting in light (which is not a bad thing), and is installed at a more shallow pitch than the main roof. Most



has little coating remaining to protect it.

The original roof was wooden shingles which remain under the corrugated steel. The staining and deterioration on the underside indicate much leaking in the past, hopefully before the metal roofing was added. It is a good idea to visit the barn in a heavy rain to observe the performance of the roof.

Drainage

Erosion says water falls from the eaves to the ground. The basic lay of the land falls to the west so water does not puddle at the building. If one were to add soil to insulate the footings it would be beneficial to direct rain water to hit the ground no closer than ten feet away from the barn.

Openings

Doorways are the only openings to the outside. The south crib has two areas in its north wall



above the siding where it has no slats.

Doors

Doors were used to cover the ends of the drive-through, as evidenced by the remaining tracks on the exterior above the openings and the door hanging south of the west end of the alley. The west door bottom is 6 to 8 inches above grade.

Each crib has a doorway into the alley at each end. Their doors are in varying states of repair. The southwest door is actually leaning against the alley wall on the inside of the south crib. The northwest "door" barely fits that description due to its dilapidation.

Hardware

The minimal metal hardware includes covered tracks to hang driveway doors, joist hangers to attach the rafters to the ledger strip for the lean-to roof, hinges for the crib doors, round nails hold the structure together, and, perhaps, bolts to hold the frame to the foundation (the bolts were not seen nor were door latches observed).

INTERIOR**Foundation**

The concrete foundation walls are exposed. A vertical crack has developed in each of the two



concrete walls each side of the drive-through, consistent with how concrete behaves, it is almost



guaranteed to crack somehow. The other two walls were not explored.

As to why these have broken, there is some information:

The tops of the west ends of the foundations are 20 1/2 inches above grade. At the east ends, the wall plate is held 8 1/2 inches above grade by the concrete, making 12" of slope in 30 feet. This makes the exposure of the bottom of the foundation to the effects of temperature change different at each end. More of the footing is protected by soil cover on the east, assuming the bottom of the walls are relatively level like the tops. Soil swells when it gets wet and more when it freezes. The bottoms of the west foundation ends are closer to grade and so moisture and cold reach them much sooner than the east bottom ends. The soil at the east ends is 12 inches deeper and below frost line (30 inches). The west ends will more frequently be pushed up. Even if the rise is tiny it is stress on the rigid concrete. Stress causes cracks.

These foundation cracks are not alarming. The connecting and adjacent parts are still in line and are not causing damage to the structure above. If one desired to reduce the temperature differential stresses, this could easily be done by increasing the elevation of the soil surrounding the foundations, at least to original levels.

Wall Support

Diagonal braces are incorporated into the wood frame walls at the corners. A longer north to south brace is mounted on the end wall inside of the cribs to support the corner posts. See the interior of the southwest corner below:



Frame

The frame is a transitional type between balloon and platform. The 2 x 6 and 2 x 4 studs stand on a single 2 x 8 plate on top of the foundations and extend upward to a double 2 x 4 top plate upon which the rafters rest. The 2 x 8 floor joists rest on the bottom wall plate alongside the studs to which they are nailed (Platform construction would have the studs standing on a plate on top of the joists and floor).

Most interior walls are open studs and the back side of the siding. The roughly 3 feet of the bottom of the south crib on the aisle side is shiplap on the inside.

Why were 2 x 6 studs used and not all 2 x 4 studs? The 2 x 6s would be able to stand a greater horizontal load when the cribs are full. But maybe they had extra 2 x 6s and not enough 2 x 4s, which would probably have been adequate.

And why are used 6 x 6s repurposed in the corners? The southeast corner post was probably a roof plate of a much larger building. It has a cut out for a rafter birds-mouth and many good sized barns use nothing larger than a 4 x 6 for a roof plate or a purlin. What of the gap between the north east corner post and the roof plate? It is not an optical illusion that the north corner of the east face appears to go downhill. We have a building made up at least partially of repurposed lumber. If you have it why not use it? Farmers tend to be very practical.

Utilities

There are remnants of a rudimentary early 20th century electrical system called Knob and Tube as seen at the east end of the north purlin/post (picture below). Those materials overhead are some wire attached to a porcelain knob which used a nail, with a leather washer, and a porcelain cap to hold electrified wire away from the wooden structure in the event of overheating. A porcelain tube surrounded the wire as it passed through wooden structure. These components may remain as long as they are not electrified. They are what is left of a damaged system, but do

no harm. This otherwise excellent wiring method is not used today because it is labor-intensive



to install and hazardous because it is easily inappropriately modified.

PRIORITIES, RECOMMENDATIONS, AND ROUGH COSTS:

The first priority is to protect the building further from its number one enemy, water. Repair as needed or replace the siding and replace missing sheet metal, loose nails with roofing screws, and seal any leaks. This includes dealing with roof drainage.

Secondly, while siding is off repair the building where it has been damaged, such as the corner posts which show termite damage and rot.

Thirdly, increase bracing such as increasing the number of ties north to south, in the manner of the existing ties and adding diagonals so the north and south sides of the structure match (there are more braces for the north purlin than for the south one).

Fourth, repair the hanging door track system; repairing the west door and creating a new east door for the alley. To maintain the vintage look, the west door could be moved to the east side,

height adjusted, and the new one could be installed on the west. Coordinate with any new soil elevations.

Fifth, repair of the wall to floor connections. Restore barriers to rodents and grain leaking out.

Sixth, repair the crib doors.

Seventh, paint or otherwise protect surfaces from the weather. Trim can be added vertically to the corners at the ends of the drive-through, in a manner not disruptive to the architectural design. Protect at least the exterior surfaces (weathered and new), after proper preparation.

Eighth, further protect the foundation from frost damage. At least restore the original grade against the concrete, inside and out. The distance from the ground to the bottom of the west door is a clue to the original grade. It is almost the height of a step, which one needs to enter the cribs without difficulty.

Item	Unit price	Area to repair	Cost	Comment
Carpentry repairs	\$35 to \$100 per hour. Materials:	Repair/replace corner posts, NE corner, trim-out the corners and repair fascia to protect structural members.	\$1,400- \$4,000	

Item	Unit price	Area to repair	Cost	Comment
Doors	Carpenter: \$35 to \$100 Materials: 1x8x8s pine @ \$41. Fasteners- 50# @\$84. HARDWARE : Hinges- 8 @ \$10, Barn door rollers @\$35, 1" screws @ \$5.81 box, 3" hook/eye latches 4- @\$3.00, 6" hook/eye latches 2- @\$4.55	Build main east door, repair west main door, hang SW crib door, build NW crib door, and repair east crib doors. Doors: (2.5x8) x 4=80, (9x11.5) =101, (9x10.75) =97 for Total: 280 sq. ft.	1 week labor \$1,400 - \$4,000, 38 boards + tax= \$1,700, Fasteners + tax= \$84, Hardware + tax= <u>\$150.</u> Materials- \$1,934 Total: \$3,334 - \$5,934.	
Ship-lap siding	\$9.35 to \$14.69	E to W (30x13.5) x2 =810, Crib ends (16x13.5) x2 =432, Above E & W doors (8x2.5) x2 =40, Gabel (12x11.68) x2 =280.32, Grain bin 3.75'x25') =93.75 for Total 1,655 sq. ft.	Replace worst (710 Sq Ft.): \$6,639- \$10,430 Replace all: \$15,474- \$24,312	Worst: N. of N. crib wall 10%, S. wall 20%, E. wall 75%, W. wall 20%

Item	Unit price	Area to repair	Cost	Comment
Paint	\$2.50 to \$4 per square foot	Interior- Crib slats: 450, Crib Doors: 79.25, Grain bin 3.75'x25') =93.75, North side of North crib: 405, Inner Total 1,029 sq. ft. Exterior: N. side (30x13 = 390, S. Shiplap E to W (30x13.5) =405, Crib ends (16x13.5) x2 =432, Above E & W doors (8x2.5) x2 =40, E & W Doors (300), Gabel (12x11.68) x2 =280.32, for Exterior Total 1,847 sq. ft.	Interior (alley): \$2,573-\$4,116. Exterior: \$4,618-\$7,388 All: \$7,191 - \$11,504	Lots of choices of what to paint if painting is done.
Roofing	\$3.50 to \$6.50 per sq. foot to repair/replace. Power wash \$0.50 to \$1 per square foot. Repaint \$1.20 and \$2.72 per square foot.	Walk the roof to determine what nails need replaced with washered screws. Repair/replace damaged/loose roofing, power wash rusted areas, and paint all 1516 sq. ft.	Repair: 40 Sq. Ft. \$140- \$260 Wash: \$708- \$1516 Paint: \$1,819-\$4,123 Total: \$2,667-\$5,899	

Item	Unit price	Area to repair	Cost	Comment
Guttering	Per linear foot: Vinyl \$3 to \$5, Aluminum \$6 to \$12, Steel \$9 to \$20, Copper \$25 to \$40+	After historic preservation approval, install an appropriate roof drainage system. 64 lin. ft. including downspouts and tubing away from the building.	\$192- \$2,560	
Grading	\$6.00 to \$7.50 @ sq. ft.	10 feet beyond the building North, South, & West for 2,320 sq. ft.	\$13,920 - \$17,400	To protect foundations from freezing.
Topsoil	\$565 @10 yds.	0' to 1' for 30 x 58' + 1' to 0' x 58" = less than 43 cubic yards.	\$2,430.00	Could use ¾" minus rock or similar.
Vegetation trimming	\$50 to \$75 per hour. \$80 per large trailer load.	South of the barn- several trees plus weeds including poison ivy to the west. Trim vegetation which is within 3 feet of the drip edge of the building, removing trees within 10 feet of same.	8 man hours for \$400 to \$600. Disposal \$80 to \$160. Total \$480 to \$760.	Kill poison ivy to reduce hazard for workers. To protect the foundations and other structure and surfaces.

Assessment for the Historic O'Sullivan, John & Ann Barn Chris Marshall, Owner

Site visit August, 2021 by Thomas A. Kennedy



Report Completed December, 2021



This project was funded by the Douglas County Heritage Conservation Council's
2021 Barn Assessment Grant Program.

DESCRIPTION:

This Midwest limestone barn as an English style built by a Irish family. The English preferred to have their main door enter the center bay of their timber frame building under the eaves of the gable roof. The full-sized doorway on the opposite side of the wooden threshing floor displays the emphasis of this farm on grain.

Even though it's built on the side of a hill is technically not a bank barn, that would have a full height lower level opening downhill from the threshing floor level. The cattle shelter is not underneath but in the east bay. Three horse stalls are in the west bay. It's kind of like a split level house with its crawlspace under the main floor and the dirt floor for the cattle lower and to the side. The dirt floor of the horse stalls seems level with the threshing floor.

Lofts in the upper level of the end bays was for hay storage to feed the animals, thrown up one fork at a time from a wagon.

Ventilation and light are provided by two windows in each wall. The east window in the south wall is now blocked by the wood frame granary, added outside of the stonewall and partially covering the threshing floor doorway. In addition to the windows laid into the walls of the first level, each gable has a louvered opening laid into it.

At present, the steel roofing, sheathing, and rafters lie upside down to the northeast along with the remnants of a cupola.

This damaged but proud limestone building stands as if it is a monument to the skilled and hard-working past generations of this family.

OBSERVATIONS OF SYSTEMS, MATERIALS, DESIGNS, AND CONDITIONS:

Exterior:

Foundation- The walls of the building exterior rise from the top of the foundation, indicated by a step. The foundation is about 4 inches inside and outside wider than the 18 inch stone wall above.

The depth of the foundation was checked inside the east wall at the lowest floor of the building. Solid rock was found at 18 inches but not at 24 inches below grade.

Since the granary sits on vertical lengths of log independent of the rest of the barn, that was checked also. The northeast stump sits on a large rock at about 18 inches below grade. The southeast stump is buried about 12 inches, sits on nothing, and is very soft inside the outer shell.

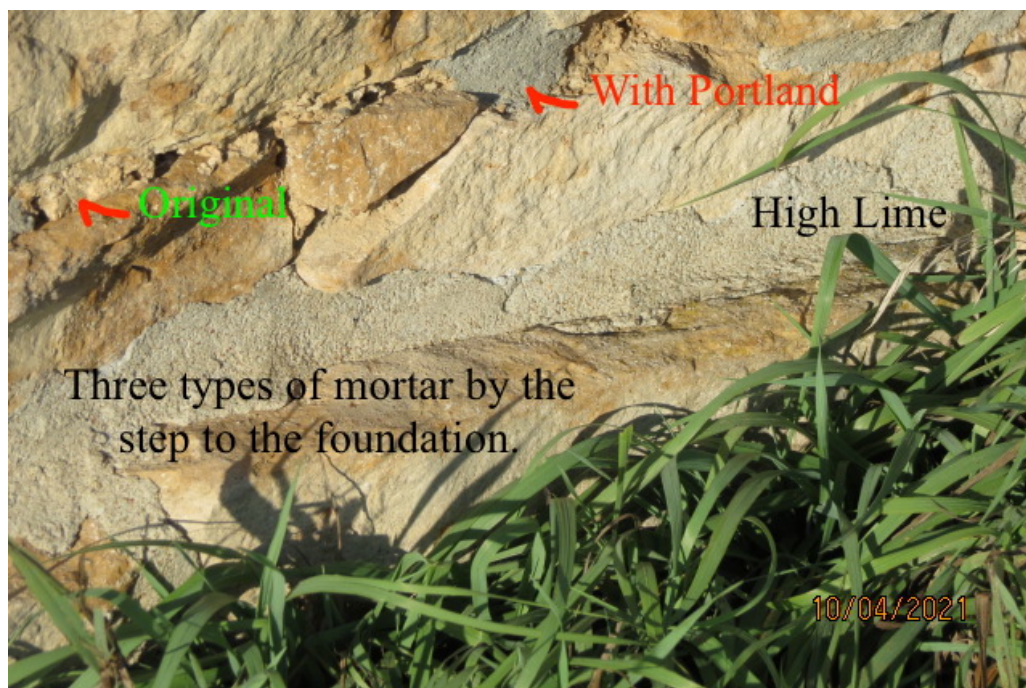
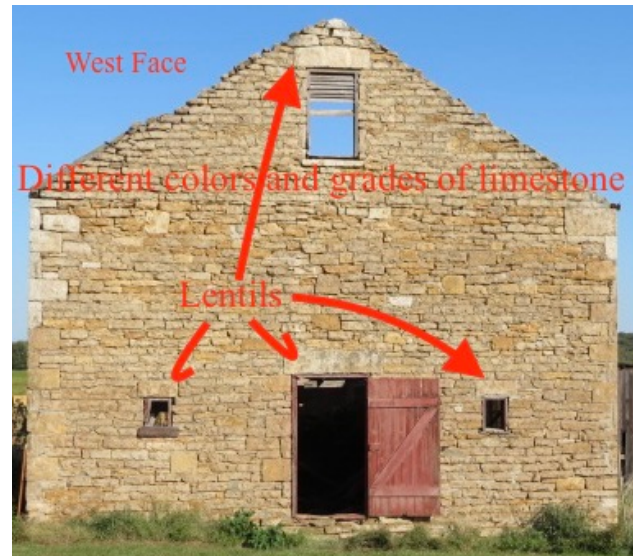


Cement blocks, with their cavities turn downward for strength, also support the south wall of this independent structure. One wonders what is under these blocks to prevent the soil from rising into them.

The foundation of the stone building appears quite sound but that of the granary needs some attention.

Ramp/Driveway- To bring in a load of hay, one proceeds down the slight grade toward the north doorway, levels out and proceeds across the threshold onto the threshing floor. If the wagon was driven in it would have to be back out because there is no ramp down to grade on the south side.

Envelope/Siding- The walls of the building are laid up with a variety of limestone shapes with cut stones defining features. At the corners and as lentils for doors and windows larger cut stones are used, frequently of a lighter color. The lentic of the two wider doorways is a large timber. The mortar between the stones has very fine sand, pieces of different kinds of stone like flint, chert, river pebbles, and sandstone. Mr. Ray Wilber, a retired mason who was visiting



while I was on site, said he saw no lime in it. Numerous places around the building where someone has refilled mortar joints with gray mortar (with Portland cement).

The granary has vertical tongue and grooved siding, some of which is deteriorated so it does not protect the structural members behind it. Perhaps the tops of the siding boards were not cut at an angle to shed water.



Trim- Most of the trim is absent from where it lay against the stone around the windows. Facia was not found on the rafter tails in the grass. Facia is not essential to a half round gutter system so we can't tell whether it was here or not.

Roof- 2 x 4 rafters on 16 inch centers were covered with 1 x 6 up to 1 x 15 sheathing boards with small gaps between them. Raised ridge steel sheets were fastened on top. The square tapered nails toe-nailing the rafters to the roof plate indicate the barn's pre- 1880 age.

Drainage- Storm drainage used to be carried from the roof by way of half round gutters and round downspouts. Brackets remain in the stone showing the path of the downspouts.

Openings:

Doors, Five doorways provide access to the barn. Diagonal braces were nailed between horizontal boards holding vertical boards together to form the doors. The north and west doors remain as does the granary door. The south gangway doorway is covered with corrugated fiberglass sheets which are not original to the barn. This needed to be openable when the threshing floor was being used.

Windows/Hatches- Further research/examination is necessary to determine what was in the window frames to keep the weather out and provide light. Now some windows are covered with hardware cloth, some are wide open, and some are boarded up. The two granary hatches are closed.

Vents- The west loft opening still has some louvers but the east opening only has one slat.

Hardware- The triangular strap hinges allows the granary door and hatches to swing. The different style of hinges show repairs with what was on hand and/or a laissez-faire attitude. Rollers are attached to the north 12' high doors to allow them to move sideways on the track to open fully. Heavy copper cable at the east side of the barn indicates it had a lightning rod system. An "S" bracket is installed on each side of the threshing doors seemingly aligned to attach to the tie-beams on the inside of the building.



Interior:

Foundation- A stone wall under the east side of the threshing floor provides support for the east ends of the threshing floor joists.

Frame:

Materials- The lumber in the barn is surprising because it appears to be mostly of uniform dimensioned and planed pine wood as if the original rougher cut or hand hewn timber has all been replaced. Now it needs replaced, little is reusable to renovate this barn safely.

Vertical- Some posts remain so it can be discerned what the original frame design was. Posts sit on stones but frost protection could not be confirmed. At least one post has pulled away from the beam above it, indicating an inadequate footing, to which it had been toenailed only and with round nails (available after 1880).



Horizontal- Enough beams and joists remain to determine the original design. Scarf joints in beams made it possible to put each end of a beam in a stone pocket and then assemble the joining members.



Diagonal- The main structure is the stonework so perimeter bracing is inherent in the solid wall. Interior bracing of the frame would be expected but none is visible.



Joinery- Visible are scarf joints, mortises, tenons, and peg holes so it is clear



that the old interior framing was mortise and tenon post and beam style. Also visible are butt joints that are toenailed in place. These further indicate that modification of the original design and timbers has been done.

Sheathing- Another item that indicates major repairs that is the lack of gap sheathing typically used under wooden shingles which would have been used in the original construction.



Openings/Hatches- The doors of the granary hatches swing outward and are latched on the inside.

Floor- The threshing floor is two inch thick wood planking. The livestock areas have dirt floors.

Drainage- The floors of the east and west bays are below the level of the door sill. No structural provision is seen for the removal of liquid animal waste.

Partitions- Little can be said about the partitions between the bays and between the stalls except that they do indicate divisions in the spaces.





Devices- Pegs are driven into the stonewall to hang tack and other equipment

Utilities:

Electrical- Individual electrical conductors service the metal junction boxes to provide lighting in the barn. A copper cable at the east side of the barn indicates it had a lightning rod system.

Plumbing- The only plumbing that remains is the pipe that comes through the foundation at the west doorway to supply Acetylene gas for lighting. The owner spoke of the



carbide gas generating building behind the house.

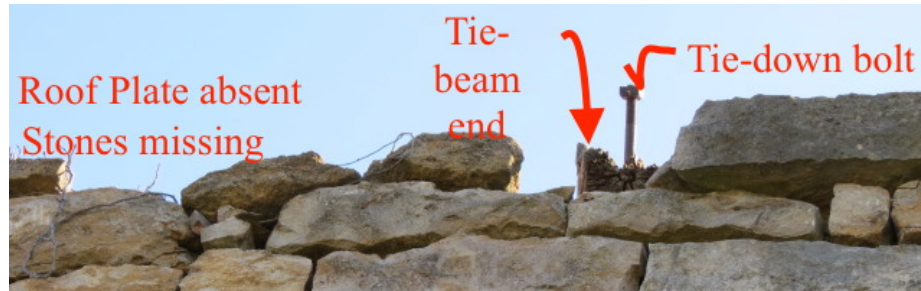
PRIORITIES, RECOMMENDATIONS, AND ROUGH COSTS:

Replace the missing stones using a mortar of similar strength and color to the rest of the building. A local masonry institute or historic preservation organization can assist in finding someone to

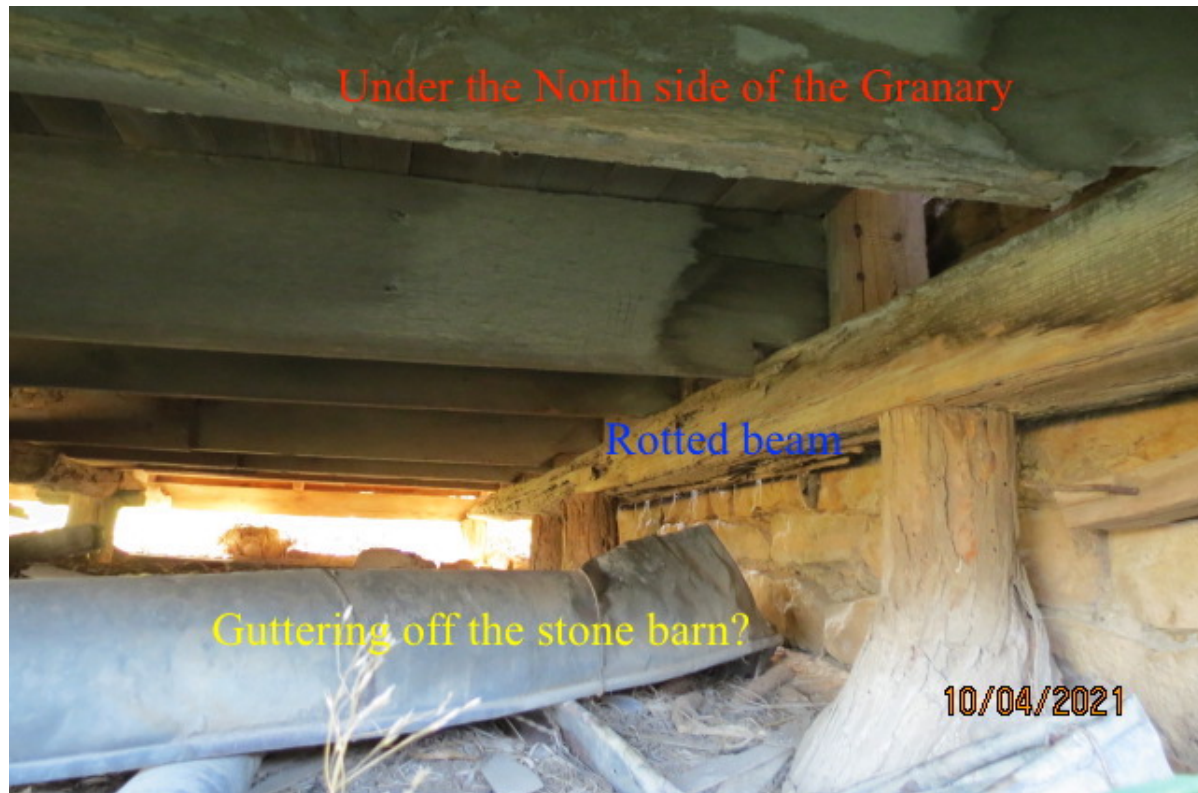
analyze the mortar and devise a recipe to duplicate it from current materials.

Replace inappropriate and absent mortar.

Embed additional tie-downs in the stone walls to hold the roof



structure on in windy conditions. Follow current minimum code requirements. Tie the building together from roof ridge down into the ground.



Install piers for all posts, at least to the depth of the current foundation, including connectors for new posts in the barn and the granary.

Replace the timber framing using mortise and tenon post and beam techniques. Reconnect to the steel brackets through the north and south stone walls.

Replace the roof structure and covering, tying it to the stone walls and the interior framing.

Install a barrier where the granary meets the main building to keep out rain and snow.

Repair any damage to the granary roof.

Replace all the windows as similar to the original as possible (If there is glass within reach of any livestock protect it from breakage).

Restore the loft louvers.

Repair/Replace the threshing floor.

Restore interior partitions as near to the originals as possible.

Replace the fiberglass south door covering with a movable door to replicate conditions necessary for winnowing grain on the threshing floor.

Replace the east livestock door, repairing the door frame as well.

Tune-up the granary door and the west livestock door.

Repair or replace the piers holding up the granary and any other structurally unsound underpinnings. It is advisable to use materials that look like the sections of logs now supporting the granary for the above ground portion.

Rewire as needed, abandoning the present electrical system.

Restore the lightning rod system.

Restore the storm drainage system, gutters and downspouts draining at least 10 feet away from the building.

Scrape and paint any old wood surfaces that remain on the exterior that were previously painted, like the north drive doors.

Repair or replace the granary siding which looks like it has never been painted.

Re-grade the perimeter of the building to restore coverage at least up to the level of the step-out of the foundation wall.

Assessment for the Historic Sowers, Mathias S. II Barn Martha Coffman, Owner

Site visit August 13, 2021 by Thomas A. Kennedy
Report Completed October, 2021



This project was funded by the Douglas County Heritage Conservation Council's
2021 Barn Assessment Grant Program.

Building Description:

The barn red painted barn at 624 N. 100 Road of Lawrence, Kansas has a gable type steel roof and vertical siding. Overall the building is a rectangle about 30 feet east to west and 63 feet north to south sitting on a stone foundation.

The barn is wrapped with standing wooden shiplap siding approximately 7 inches wide, except for the north which has vertical raised ridge flat steel siding overlaying the original boarding.

The rafters and their tails are not open on the exterior but are covered with fascia and soffit.

Roof drainage has been accomplished by way of half round gutters at the roof edge. Some remains at the northeast corner.

Entering the barn on all sides is accomplished at a similar grade to the lay of the land which slopes slightly downward to the west.

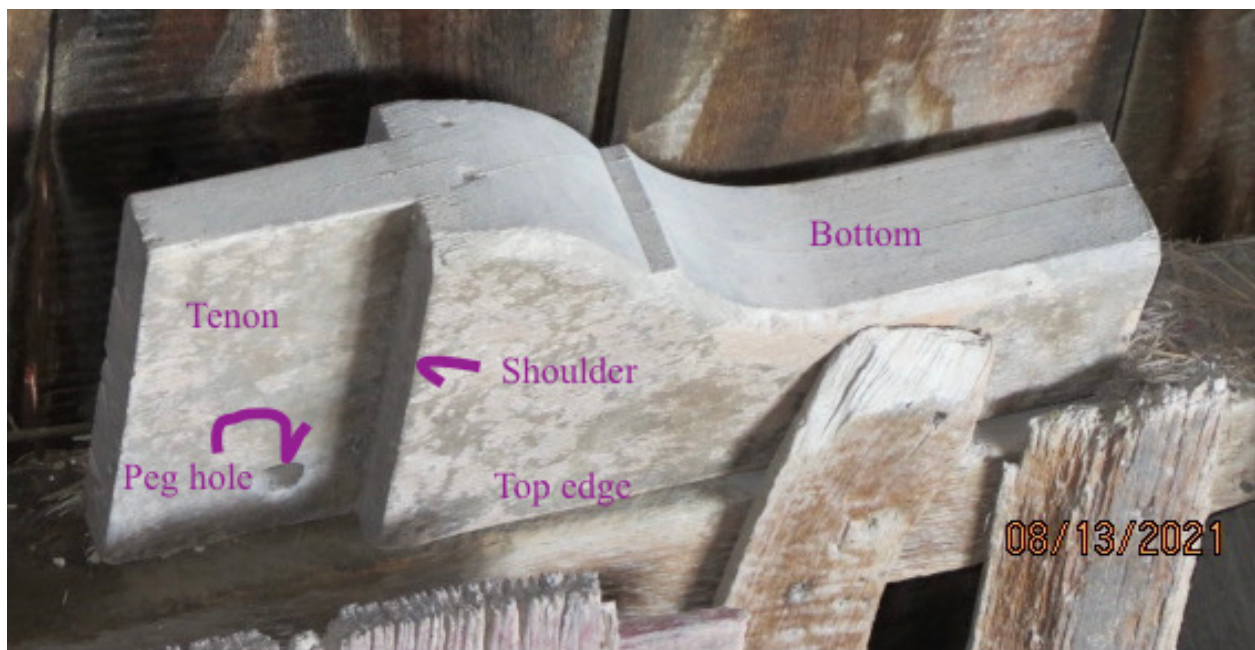


The main doorway is a 12 foot south facing sliding door opening. Above that entrance, the hollow round track, with a slot in the bottom, is absent the two doors which would hang, when open, on the 7' piece of track extending to each side of the opening. Two sets of rollers hang just inside on the east wall of the aisle.

The corrugated steel roof gives the impression of the south portion being slightly gambrel (see Observations: below) on the south end of the east side and transitioning to the gabled north portion. The steel covers gapped wooden sheathing.



Above the main door is a hay door without hinges and the hay hood above it. The track for the hay trolley and hay hook extends to the south end of the hood. The hay carrier (trolley or unloader) and the hay hook rest above the south loft on the steel track (would have been wooden before the 1890s) which extends the entire length of the barn.



A remnant of a bygone era is a tie beam end that is sitting upside down on a girt of the east wall.

The interior of the barn is laid out differently for the older south portion than for the newer north portion. The south has 5 spaces and the north has 3 spaces.

The southern portion has a 14 foot wide central aisle/ driveway/ gangway north to south. On the west side it has rooms with doors opening out to the aisle and along the east side is one long space with one slatted door.

The west rooms are as follows. The southwestern room has the remnants of a wooden floor. Horizontal shiplap siding is installed on the north and east on the outside of the studs. Wide boards stand about three feet high around the south and west walls inside of the studs. The second room from the south has a couple of water leaks from overhead onto the dirt floor. The next room northward also has a dirt floor. Some farm paraphernalia remains in each room.

A stone wall, with a 6 x 6 timber plate on top of it, supports the interior west wall of the gangway.

Above these rooms and the aisle are planed 2 x 10 joists on 2 foot centers for a hay mow. The joists rest on a beam at the top of the west wall of the gangway and span to the posts and studs of the east gangway wall.

The east wall of the gangway has no beam under the loft joists like the west side. The Joists are nailed to the sides of the studs and posts. There is a beam about 3 feet above the loft floor and at the same level with the roof plate.

The floor boards of the hay mow are not circle sawn but are marked straight across as with a bandsaw or pit saw blade. They are regular enough to indicate a mechanical pit saw (first patented in this country around 1839). These floorboards are evidence of the south portion of the barn being older than the north.



Materials and techniques used in the northern portion are from a later period. Rafters and posts are all of planed lumber. The technique of sandwiching angular braces between purlin members is probably a better technique for securing braces than cutting the ends off the braces at 45° angles and nailing them to the post and beam. As seen below, the joint can pull apart if nailed. The braces in the above picture are nailed to the 4 x 4 post. In

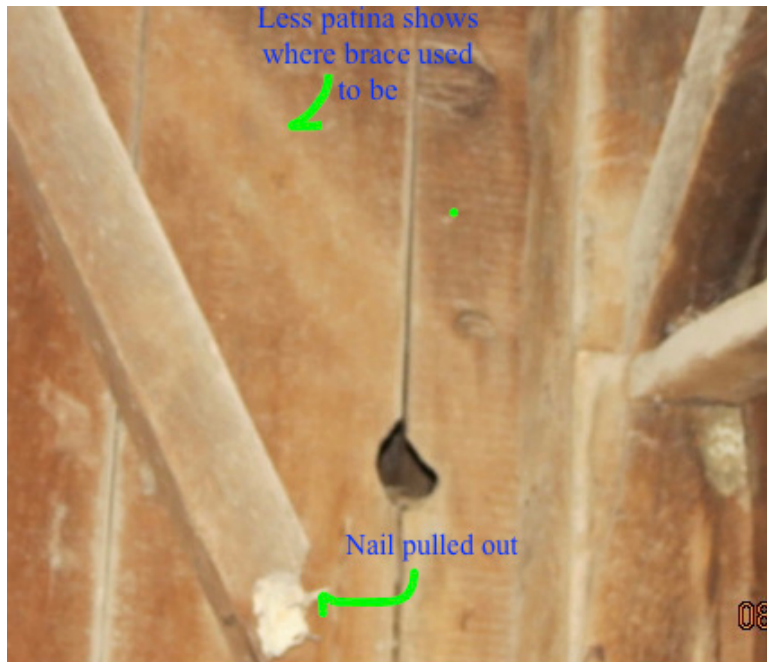


another instance, the brace is nailed but in a notch on the underside of the roof plate and is less likely to slide away from or toward the post. This was probably done in the southern portion of the barn because the rough circular sawn plate was not of uniform thickness, another indication the south portion was built first. There are no nails seen. A mortise and tenon joint could look the same and be more sound.

It does not necessarily make a stronger purlin to put the brace between the header parts. The two 2 x 4s nailed together makes a better header because they hold each other over their entire length.

The use of the southeast corner of the barn is a mystery. There are some vertical boards from the wall plate up to the first girt in the north end of it. There are no doors to the exterior and no ceiling or loft above, though it appears to have had a hatch to the east hinged inside. The east wall of the drive is made of 3" wide slats with space between them giving the impression that it was used for a corn crib or calf stall but only the one wall out of four is slatted. The floor looks like concrete spread on the dirt floor and wood nailers laid in it for a wooden floor to be fastened.

There is one piece of wood that is heavily termite eaten laying on the floor close to the middle.



The west diagonal brace, originally nailed in place, is separated from the northeast post at the brace's bottom. The brace hangs by nails at its top. The south end of this space also has braces that are loosened, pulled away about 3/8 of an inch, from their nail connections.

Another feature of the southern portion is the steps that rise northward to the loft along the northeast side of the gangway. The treads are mounted in a dado with a slat underneath on the

sides of the 2x stringers and the stringer on the west side is lower. The support for the loft joists along the stairway is a single 2 x 10. A crooked pole runs up from the ground past the west stringer and is set under this single "header". The east to west joists supporting the ends of the



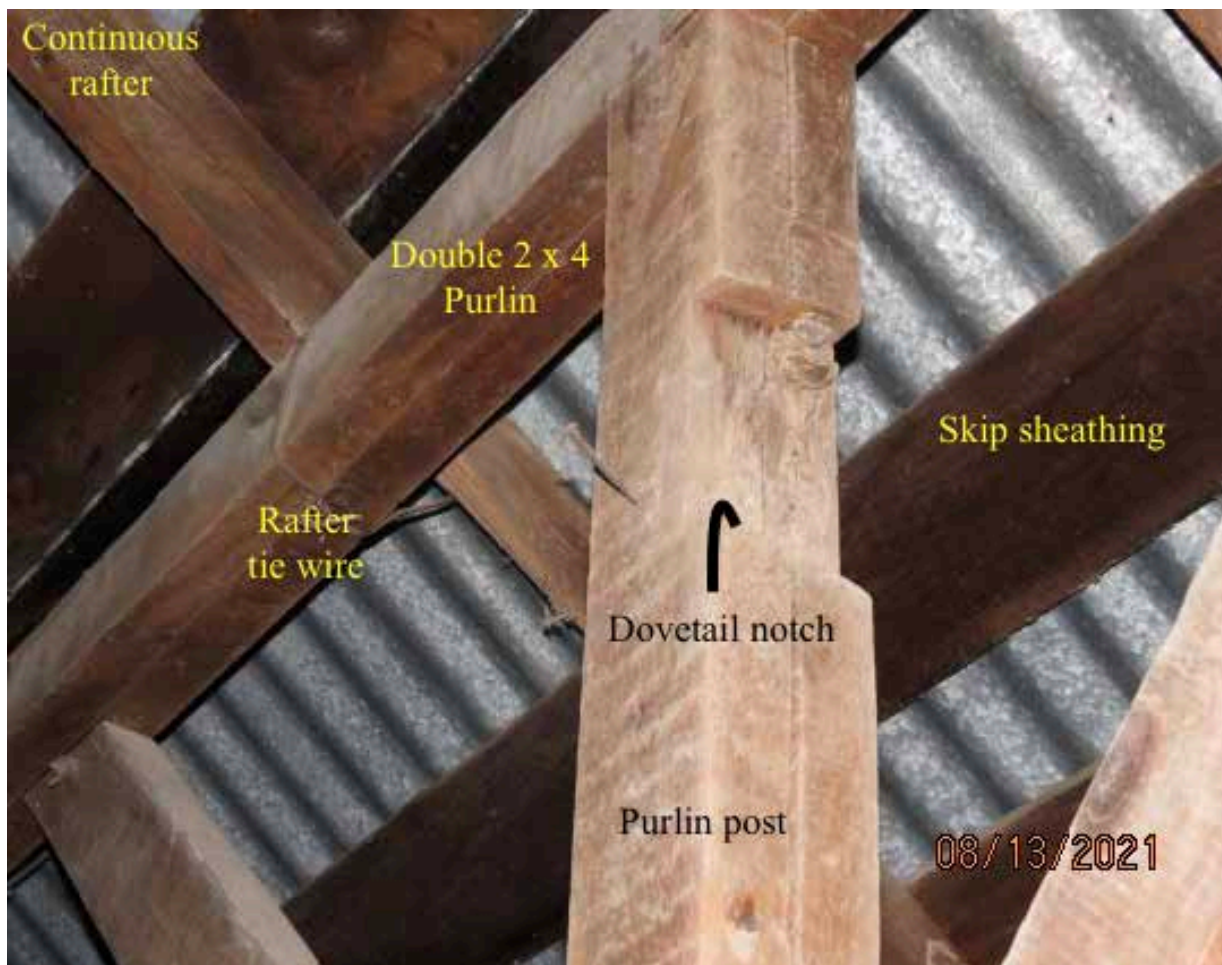
opening are single 2 x 10s.

The north portion of the barn has two wide open areas with a narrow aisle/ picketed manger running north to south between them. This aisle is narrow at 4 feet compared to the south at 14 feet.

One must step down from the south 34 feet of the building to the north portion of the building loft. Looking southward from the center of the loft the south gable end shows where boards were replaced with used boards. The old nail holes admit light.

Looking northward from the south loft, several items are seen. The openings in the north gable end are covered by the exterior sheet metal siding. Also, the purlin posts on each side are out of plumb. Posts on the west side lean west at their tops. The posts on the east side lean east. The 4 x

4s used as posts in the north loft were apparently connected by tie beams with dovetail joints. Those tie beams are no longer present but the dovetail notches in a side of the posts remain.



These posts sit on the 6 x 6 north/south header under the loft joists.

Dovetails may be seen in the southeast area where a 2x board has been added (less darkening indicates less age and not original).

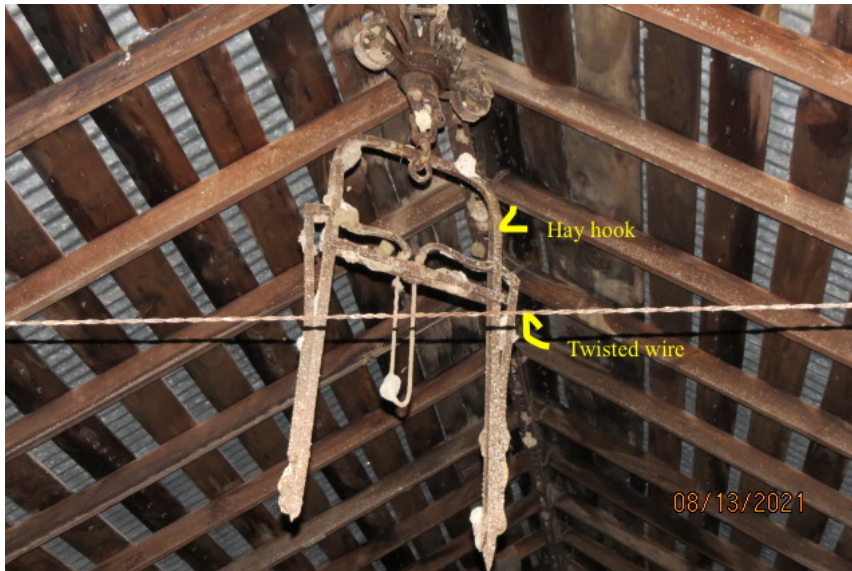




Mortises and cut off tenons (secured with large nails instead of pegs) at the inside tops of the south purlin posts show where tie beams had been installed, but are no longer in place.

An example of the missing tie beam can be seen in the south gable. The west end (nearly 3 feet) of the 4 x 4 girt/tie beam remains. The tenon for the other end is cut off and remains in the mortised post.





Twisted heavy wire stretches between the east and west purlins four times over the length of the barn. Similar wire is used to wrap around the purlin and the rafter joints as well as the rafter and the roof plate. These rafter ties are similar to what is used in modern times as hurricane clips to keep members from pulling apart and high wind. The story that at least part of the south roof was blown off and reinstalled is reinforced by the split out pieces of rafter above the roof plate

and abandoned nails.

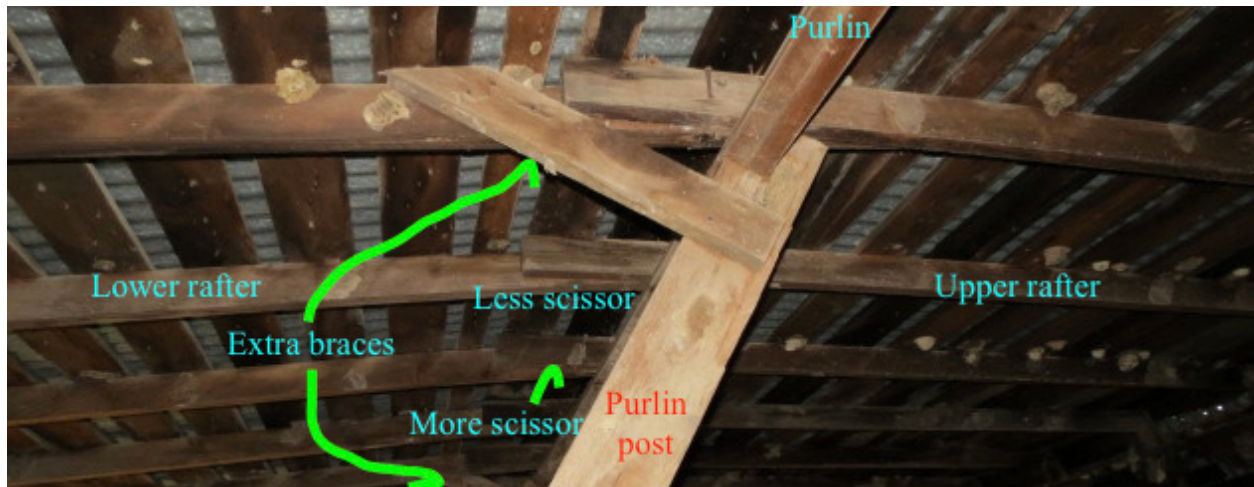
The wall at the juncture of the north and south portions is framed of 6 x 8 posts and the 6 x 6 headers running north and south to carry the loft joists. The headers are set on ledges (like a notch) on the post sides (Headers are solid timbers or laminated lumber spanning a distance and carrying a load of wall or joists). These are held in place with mortise and tenon joints.

Along the top of the east and west exterior walls, the north roof plate has separated from the south roof plate where the north and south portions of the barn meet. The east side has about an inch gap and the west side about 3/4 of an inch separation of the toenailed butt joint (toenailing is used when it is impossible to nail straight through one piece of lumber into another so the nail is driven at an angle).



The rafters of the north addition are continuous 2 x 4s from the peak to the roof plate. Whenever they built the north end, they obtained beautiful 20 foot long straight two by fours for rafters.

In the south roof, where the two-piece rafters lap over the double 2 x 4 purlins, the lower ends, from the purlin to the roof plate, are at a steeper pitch, and they are not all at the same angle. This is what gives the impression of a gambrel styled roof above. The interior walls under the purlins



along the central aisle seem not to have settled, at least they are higher than the outside walls. .

A sliding cattle door and swinging gate combination north of center in the east wall admits livestock. The three strap-hinged man-door about 7 feet from north end of the west side provides passage for livestock to the west feed pen.

Half way up the south wall, above the main doorway, a 2' x 3' out-swinging door indicates a hatch from the south loft. Note occasional horizontal cuts on the outside around the barn where openings have been made in the past but seem unused at present like the one about 20 feet north of the southeast corner.

This barn frame has a timber frame style. It has posts sitting on a large timber plate, holding up timber roof plates, with smaller beams called girts or nailers between the posts. Diagonal timbers brace the corners. Many of the beams and posts are made up of laminating smaller lumber nailed together side-by-side, using two methods. For example the north purlins are two pieces of lumber sandwiching the diagonal braces with a gap along their length between the braces. The south purlins are two pieces of lumber sitting on edge nailed side to side continuously with the braces nailed underneath. The main joints between posts and beams are mortises (squared large hole) where tenons (end of timber reduced to fit inside the mortise) are inserted. Most of them are held together with large round nails (47.jpg) rather than wooden pegs (30.jpg). Some square nails (obsolete after the 1880s) have been used. This is not a purist timber frame where wooden pegs are used instead of steel or wrought iron nails.

The description above refrained from judging the condition of the barn. The following section will critique the methods and materials used.

OBSERVATIONS OF SYSTEMS, MATERIALS, DESIGNS, AND CONDITIONS:

EXTERIOR:

Foundation- A 5/16th inch steel probe on a drill was driven at a 45 degree angle into the soil outside the south foundation under the west door post. It found nothing but dirt 16 inches down but rock was encountered at 12 inches below grade under the wall. The southwest post has a large rock at the surface. Rock was hit about 18 inches down but not past about 24 inches. Between posts there's only dirt below about 12 inches but there are stones all along underneath of the wall plate. All of the foundation appears to sit above the 30" deep official frostline and at a variety of depths.

Exterior walls (mostly east and west)- The wall structure has settled and there are several contributing factors resulting from two natural conditions: water and temperature. Rain and snow cause roof drainage outside which adds water to the moisture of animal droppings inside the barn, where some liquid evaporates but much is held (The feeding pens have several inches of manure and bedding built up. This is great for holding moisture in one's garden but less desirable in a building). So there is moisture on each side of the foundation stones in varying amounts.

Storm drainage system- The half round gutter system is in bad condition and most is absent. Water therefore falls to grade beside the foundation stones. Difficulties develop from water falling on the ground. The first result is splash. Water builds up on top of the soil creating puddles and exposing stones. Both cause water to bounce upward and sideways. To one side is



the siding on the building. Even where there is gutter, excess water damages paint and impregnates the wood stimulating decomposition as is seen at the bottom of the siding. It is not likely that a jig saw was used to make this lacy feature.

The second result is movement generated by saturation of the soil under and around the foundation. The weight of the building is pulled by gravity downward into the softened soil over time, especially where the most water is. Drying dirt shrinks and cracks. Wet soil initially pushes upward then is displaced by the building weight. Drying soil allows the structure to return to a lower elevation. This building is damaged by that cycling.

Wet soil also is affected by temperature. It swells when it gets hot in the summer as water fills the ground with vapor trying to escape to the surface. The sheer volume of water also adds to the volume of the soil. Wet dirt swells when it gets cold as air bubbles collect in ice. The closer soil is to the surface the more water it encounters to be absorbed and frozen. The depth at which water is not likely to freeze is called the frostline. Foundations are now required to sit on ground below that point to protect them from the freeze / thaw movement which has moved this barn.

The sinking foundation telegraphs affects to other parts of the building. Below is listed issues which have developed because of foundation movement. Of course this is assuming that the standards of level and plumb were used in the original construction. Something is level when it is on a line at a right angle from something which is plumb. Something is plumb when it is in line

with a weighted free hanging string that has stopped swinging. There are several places where the barn tells us it has settled.

The first clue to settlement is on the outside standing to the south and looking north, the barn seems to frown where the ends of the door track turn down. Looking higher you find the second clue. At the near edge of the metal roof on both sides of the gable the line from the peak to the eave is not straight, the lines turn down from the central point above the purlin, mostly on the east side. This indicates that the south and west walls are now lower than the walls along the central corridor which carry the purlin. Again, the impression that the roof is gambrel is made, primarily on the east side.

Interior:

There is more evidence of settlement inside the barn. Looking at the north and south ends of the southeast quarter one sees un-level beams. They are higher toward the center of the barn and lower to the eastern outer wall. This tells us that the east wall has settled.

Another example of settlement is the leaning stairs. They are lower on the west side where the stringer is not fastened to other structure. That stringer sits on the ground, lower than the east stringer which is fastened to the east wall of the passageway. This issue was apparently acknowledged in the past as indicated by the rough post under the header alongside the stair opening. The joist against which the stairs lean is lower at the west stringer, rising slightly to its support to each side. Today's standards require the headers around a stair opening to be stronger. The joists on the ends of the opening are carrying their load plus the load of an additional joist minus the square footage of half the opening. They are carrying almost twice the load they were designed for. Nowadays each of those joists would be doubled and the header alongside the steps would also be doubled. We don't know what is under the west stringer bottom to keep it from sinking further. The structure around the top of the steps is inadequate.

Another indication of building settlement can be seen when standing in the south loft looking northward. All of the posts carrying the purlins are leaning outward. While the joints of the roof structure are not coming apart, they are under stress more than their original design. They were designed as a triangle with a level bottom and the peak of the barn being the peak of the triangle. Now the roof is an inverted "V" with nothing holding its legs together at the bottom. The tie-beams running across the barn from one purlin post to its corresponding post on the other side, east to west, have been replaced with four twisted wires after the barn spread. Even the tie in the south gable has been cut off. Where the ties are gone the peak and the roof between the purlin posts is pulled downward and the bottom of the upside down V spreads so the purlin posts are pushed apart at their tops.

Since the lower ends of the rafters are sitting on a wall one would expect two things that are happening but to a lesser degree. As the upper end of the rafter comes down, one would expect it to pivot on the purlin as a fulcrum and raise the outer/ lower end. As one looks straight down the east and west exterior walls, there is some bowing outward by the east and west walls in the middle of their length, but no rise. But there is another force exerted against the lower ends of the rafters. The rafters sit on a plate on top of the outside wall and are fastened. As the wall lowers, it

counters the effects of the lowering peak keeping the rafters straight where the forces are equal. These forces working against each other makes the barn not look in as bad a shape as it is.

Because the south end of the east wall has settled more than the west and north (the forces are not equal), the rafters are actually bending at the joint as they pass over the purlin, giving the impression of a gambrel roof. They have two different pitches on each side of the roof.

The lowering outside wall fastened to the rafters pulls the rafters down. That pulls the posts holding the purlins outward. As the outside wall lowers it pulls the ends of the rafters down and since the purlin does not go down it puts a bend in the roof especially on the east side which is settled the most. The downward motion is seen in the peak, the roof, and walls.

Because the south portion of the barn has purlin posts full sized (6 x 6) and continuous from the purlin to the ground and the east side and east to west running joists at a higher level, it has not more resistance to spread than as seen in the leaning north purlin post tops (4 x 4).

Also the use of the hay trolley system also contributed to spreading the purlin posts. It pulled down on the tops of the rafters and vibrated the assembly as a load of hay was conveyed from one end to the other. This further aggravated the settling condition.

Other items of note can be seen on the interior:

There are wet places like at the southeast corner of the east roof plate. The loft floor, especially under the ridge, is frequently water splashed for the entire length of the barn.

Venting of stored hay and soiled bedding is accomplished only through various cracks and doorways because there are no intentional openings.

The structure of the building raises some questions:

The first question is: Why is the support for the south loft different on the east side from the west. It makes one think that the original design did not include a loft over the gangway which may have been used as a hay lifting area. But then that would mean there was not much hay storage area, especially since there seems never to have been a loft above the southeast pen. Secondly, Why was the style of the barn frame chosen with ties across the loft when they would be in the way of the hay conveying system? Perhaps it was added later.

Third, what other changes happened, in addition to adding wire around various joints, when part of the south roof was blown off? Perhaps this is why the horizontal timber was added across the southeast space, to keep the east wall from moving eastward.

Fourth, what was the reason for excluding venting systems from the barn design? This omission is possibly why the roof got lifted.

PRIORITIES, RECOMMENDATIONS, AND ROUGH COSTS:

There are structural issues regarding the barn that need corrected and maintenance projects which need performed.

Remove manure and bedding from the feeding pens, then provide a well-draining floor.

Remove debris and other obstructions so the sill plate and post bottoms may be examined more closely.

Replace deteriorated sill plate and post bottoms as necessary.

Reinstall tie beams between purlin posts, loosely until the building is let back down on a sound foundation. Tighten the connections.

Repair the connection between the north and south portions.

Replace the foundation with piers or footings and foundation walls, lifting and leveling the building to restore balanced loading of the structure. Many distortions will mostly correct themselves.

Repair the damaged rafters and their connections.

Tie the barn together vertically from the rafters to the ground. It would have been interesting to watch them pull the roof back on after it was blown off.

Repair the structure around the stair and make the stairs level and plumb.

Repair any damaged connections between the east ends of the south loft joists to the east gangway wall, now relying on the sheer strength of the nails.

Reconnect all loose and missing bracing.

Repair the leaking roof.

Restore the storm drainage system so water falls no closer than ten feet from the building.

Install newly manufactured south hanging doors to keep the weather out.

Repair/replace siding that does not keep the weather out.

Restore the interior spaces to intended usability, if discernible.

Add ventilation while maintaining architectural integrity.

Assessment for the Historic Sutton Barn

Adam Meyers, Owner

Site visit November 19, 2021 by Thomas A. Kennedy
Report Completed December, 2021



This project was funded by the Douglas County Heritage Conservation Council's
2021 Barn Assessment Grant Program.

DESCRIPTION:

206 N. 2 150th Rd. at Overbrook, Kansas has a gambrel style barn with two shed additions, one from each of the gambrel eaves. The gray painted 3 inch tongue and groove siding is vertical with white trim.

The hay track extends under a hay hood at both the north and south ends above a large bottom hinged hay door and a set of double sliding doors. The south end of the shed additions have a large four square pane window but with the old sliding doors intact to protect them. The north ends have a set of patio doors, also protected by the original double sliding doors. One set of sliding doors is the only opening on the east and west sides.

The gambrel barn spans about 20 feet while the addition trusses spread the barn 16 feet to each side of the main gangway which stretches roughly 56 feet south to north. 2,800 square feet of smooth concrete fills the entire expanse of floor with a slight pitch to the south.

The interior structure is totally exposed which makes it easy to enjoy the trusted lumber that makes up the gambrel roof and the "sandwich" trusses of the additions while leaving much room for hay and equipment or dancing. A marble topped bar has been installed along the north end of the east wall for serving the partygoers in the events this barn may now entertain.

OBSERVATIONS OF SYSTEMS, MATERIALS, DESIGNS, AND CONDITIONS:

Exterior:



Foundation- The foundation rises in the soil from the depth of about 30 inches to a step back to the short concrete wall that surrounds the building under the 2 x 6 stud walls.

Roof drainage has washed away soil from the southeast corner leaving only about 10 inches of the foundation covered.

There are some minor cracks in the foundation that have no misalignment so there is no damage that needs repair. caulk would exclude water.

Ramp/Driveway- At this time there is no ramp away from the south doors so entry may only be gained by wheeled or large equipment through the north doors.

Lay of the Land- The ground slopes from the north to the southeast where one steps down twice to exit the south center. To the east one steps down 3 risers from a small deck to a gravel walkway. To enter the west one step up is all that is needed while the north doorways are an easy transition at grade.

Envelope/Siding- The barn presents itself well but there are miscellaneous places in the siding and trim, including rafter tails, that are rotted to the point of no longer holding paint.



Trim- Trim is installed around the openings. Facia and soffit are nonexistent but that makes it easier to find what needs repaired.

Roof- The corrugated steel roofing has lifted in places and one piece at the northwest eave is actually torn for better than 6 inches. Many nails are visible having been pulled out of the rafters.

Drainage- the stormwater falls from the eaves to the ground and runs downhill to the south. This has caused some erosion.

Openings:

Doors- All the doorways have working sliding doors, except for the east door which is obstructed from closing. Hay doors of approximately 50 square feet each fill the gambrel gables.



Windows/Hatches- The south windows (east and west ends of the face) are stationary with square aluminum tubing.

Vents- No vents were observed apart from the ventilation hay doors can provide.

Porch- The broad steps up to the east deck are not uniform and can be tripping hazards.

Hardware- The hinges for the hay doors are oval shaped cast-iron, bolted in place.

Interior:

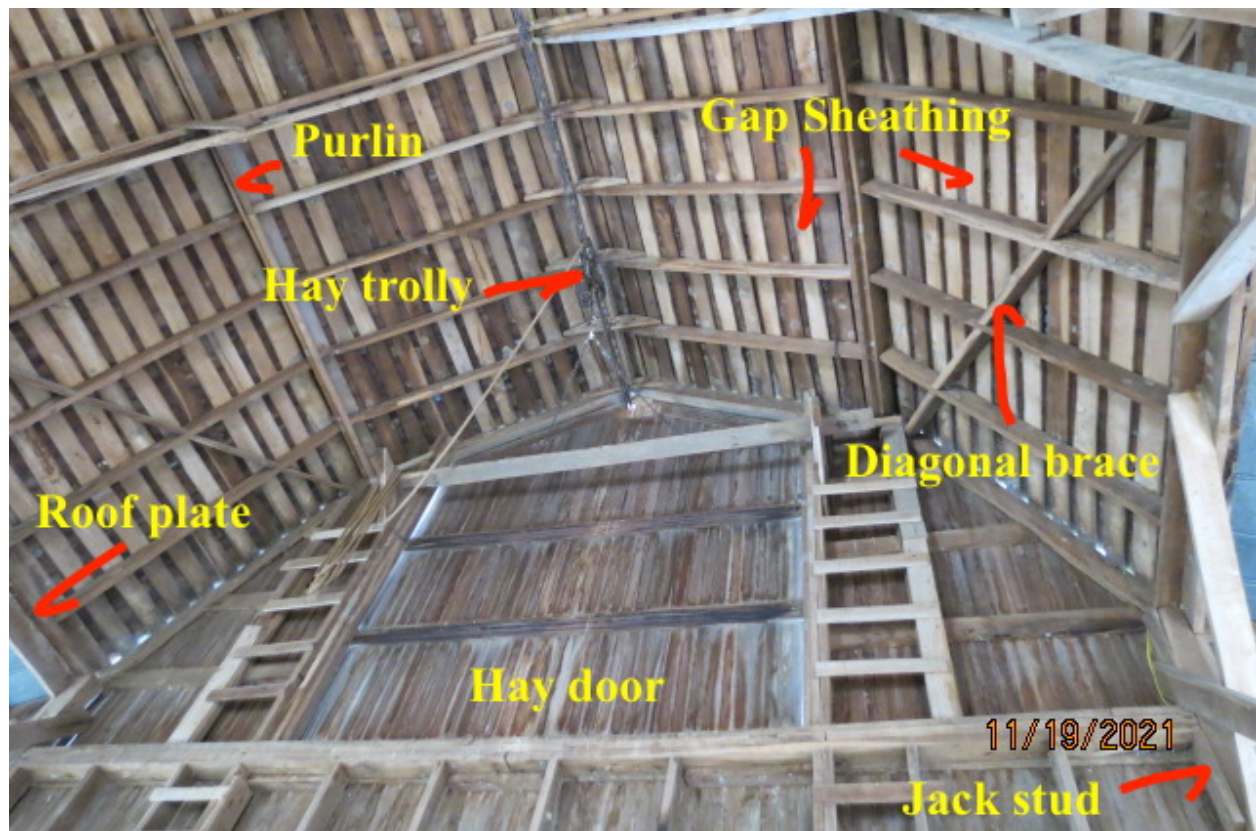
Frame:

Vertical- The walls are made of 2 x 6 studs to a height of the roof plate of the addition eaves. 2 x 6 wooden plates are at the tops and bottoms of the studs. The top plate runs at that height in the north and south walls to the 6 x 6 posts that rise to the upper ends of the rafters that join the gambrel roof. Heavier studs and girts/nailers from the plate in the walls rise to join the rafters. A 6 x 6 beam spans the gable end of the gambrel barn between the like sized

posts. Above that point the opening for the hay doors is framed in with something like 3 x 4 studs and girts.

The beams and posts of the gambrel are walnut and oak solid timbers. The bottoms of at least two posts are badly deteriorated: second from south in the west row and northernmost in the same row (walnut post in the wall). These posts seem not connected to their concrete bases.

Horizontal- The rafters of the gambrel portion are 2 x 4 on 2' centers between 2 x 4 and 2 x 6 lumber joined side to edge in an "L" configuration into beams. These purlins and roof plates are held in their places by angular braces and lots of nails!



Diagonal- Many pieces of wood in this barn run at an angle from one member to another to maintain their configuration. This is especially important in windy areas

where pressure can be exerted consistently to the triangular shapes designed to make the barn strong and



to function properly.

Joinery- Where a heavy beam joins a heavy post a jack stud is installed down the side of the post to a plate or similarly supported beam below to carry the weight associated with the upper beam. Nails hold the parts together but carry little weight. Nails rely on friction to bind wooden parts together. The nails are held along their length by friction and their head adds a barrier to being pulled out of the outer board. When enough are used they bind one part to another by friction between the boards.

Though many connections have been renewed in this barn by replacing wood, some bad joints remain, like at the east end of the center truss of the east addition where the plate is rotted away. At least four stud bottoms are badly deteriorated in this way.

Sheathing- Gap sheathing is used on the gambrel roof where wooden shingles remain under the steel sheets.

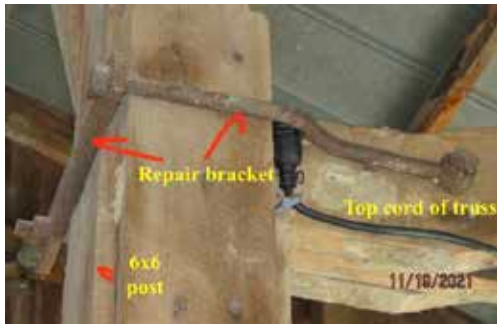


Hardware/Devices- The two south windows have some interesting hardware with two hanging gates to slide across their openings.

The hay trolley is at the north end of the track on the inside. Slats across studs rise from the floor to each peak to tend to the hay transport mechanism and to mount the hay stack to spread hay or to throw down some feed.

The sliding door track systems hang easily on their fat wheels. The rafters in the additions are the top cord of a "sandwich" truss. All the joints are overlaps rather than butt. The double top and bottom cords have the angled braces "sandwiched". The oval hay door hinges appear attractive as well as

functional.



An interesting and effective bracket reconnects a truss to a post.

Roof battens for nailing the roofing materials run between the trusses, butt nailed to the top cord,. Often the battens are on top of the top cord, overlapping them, and the roofing does not nail or screw to the top cord, but not here. Numbers of battens are rotted or broken like the five in the northwest space between trusses. 11 battens on the east side are badly deteriorated.

As is common when placing a wall on a concrete floor or wall, plates and tie downs are used, but about 12 more bolts could be used.

Utilities:

Electrical- Modern wiring has been installed for equipment like a sound system and many lights.

Plumbing- There is no plumbing, just porte-potties and hand wash stations out the northwest corner.

PRIORITIES, RECOMMENDATIONS, AND ROUGH COSTS:

Protect the southeast foundation up to the step-back to the wall resting on it at least by backfilling it.

Replace rotted exterior wood siding and trim.



Replace loose roofing nails with gasket screws.

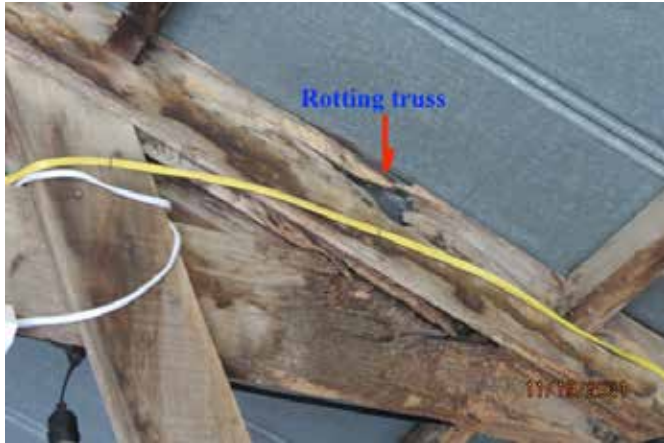
Provide a roof drainage system to direct water away from the building at least ten feet.



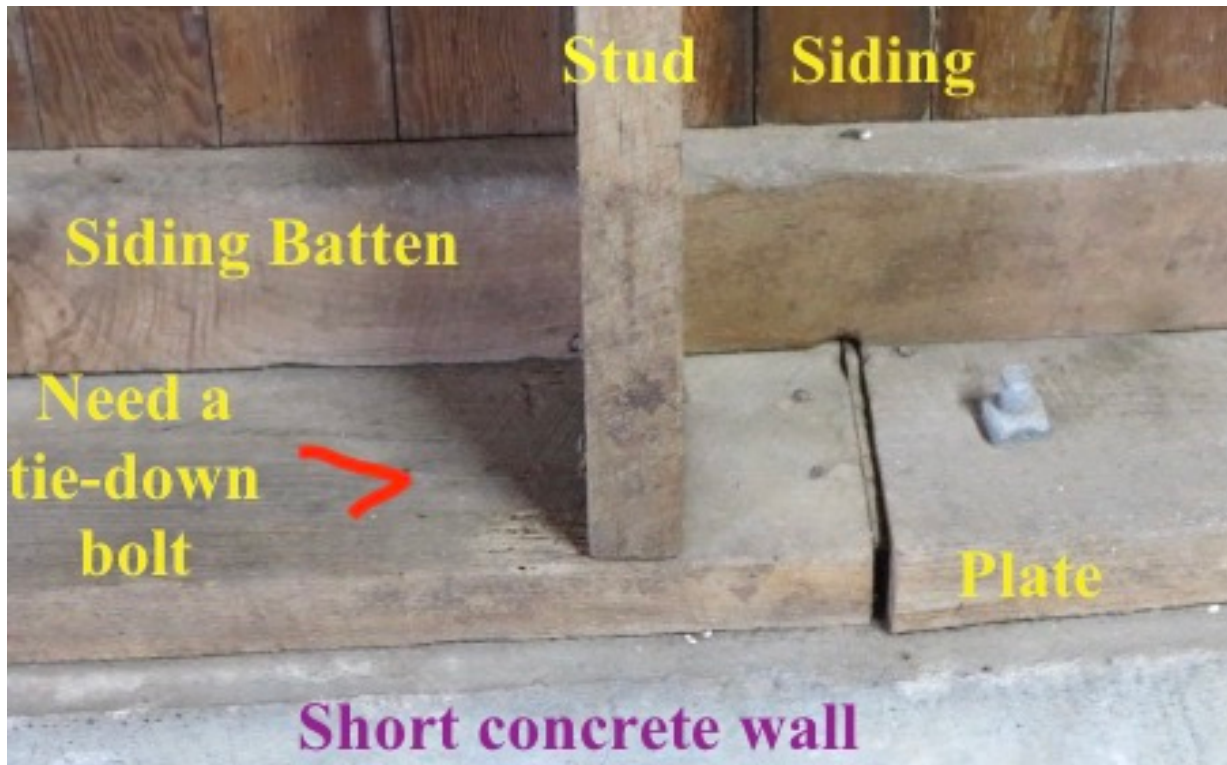
Restore the east sliding door to full operation.

Repair or replace the rotted bottoms of posts and studs.

Replace other termite eaten and/or rotted wood including roof battens and plates.



Secure the posts to structure below them.



Secure the plates to structure below them.
Repair the deteriorated or missing bracing.

Make sure all ladder rungs are secure for use to protect rambunctious revelers.

Assessment for Jan Elder
Historic Reynolds Barn
<http://khri.kansasgis.org/index.cfm?in=045-6156>
based on inspection performed September 23, 2020
November 6, 2020



The East Face

DESCRIPTION:

The hay barn at 571 East 1000th Rd. in Baldwin City, KS 66006 is a gable roofed dimensional lumber structure in the Western style, with the shed roofs on the north and south sides. The sheds add 25 feet to the original 20 foot wide structure. A generous rain hood projects to the east to protect the hay trolley track from weather. Much of the white paint is worn off the siding. The interior runs 30' east to west. The main barn has a wide open space for lots of hay but it has no loft. The lay of the land has about a foot of elevation drop to the NE. The dirt floor has been filled in toward the top of the foundation wall which makes it somewhat level.

OBSERVATIONS OF SYSTEMS, MATERIALS, CONFIGURATIONS AND CONDITIONS:

Exterior

Foundation

The 6" poured concrete probes to be about 6" below grade with some kind of footing under it, leans outward, and is fractured to multiple lengths. The north shed sits on its own mortared stone and concrete wall foundation, stepped down from the main barn, which has broken in several places especially west of center. At least six trees of several inches in diameter grow against this north foundation.

Siding

1' x 6" vertical shiplap siding envelopes the barn

Trim

A narrow fascia wraps all roof edges

Roof



Corrugated steel has been laid over shake shingles. The roof edge is damaged high and low on the east end of the south shed. Sheet roofing is absent from about 18" of the north main roof. Rust is seen on the shed roofs. The pitch of the shed roofs is less steep than the main roof. The roof of the north shed joins the main barn wall a few feet below the eaves of the main barn roof. The roof of the west end of the north shed is full of holes and is caved in; the rafters, purlin, plates, and sheathing are rotted.

Drainage

Water falls to the ground and runs north

Openings

Doors

The east side has a stock doorway into the north shed, a Dutch door into the north side of the south shed directly into the main barn. Another door enters the east end of the north shed. The south shed has a man-door at the east end of the south side to enter the workshop. The south end of the west side has a man-door hung with plastic sheet into a granary/storage room, a large entry doorway into the main barn, and a sliding door into the north shed. At the east end of the north shed's north wall is an open doorway.

Windows/Hatches

The east side has a hay door at the peak. Below is a closed hatch. South of the Dutch door are two windows, one of which is covered with plastic sheeting.

The north side has three open windows, the east of which is boarded over.

The west face has three openings, one could call windows. The south window is covered with plastic sheet and gives light to the south shed. The open one in the gable is small and more like a vent but light enters. The large square hole in the wall south and above the main door also admits light and air.

The south has three windows, two with plastic sheeting and one with screen wire.

Interior



Foundation

Perimeter

In the main barn the short foundation wall tilts outward at its top indicating a narrow footing and/or a shallow footing. Also it is not connected to the foundation/plate under the north and south side posts.

Post support

The three posts supporting each of the two purlins rest on a timber on the soil which seems sound

Frame

Vertical

Dimensional lumber provides the up and down support for this hay barn. 2" x 6"s either single, sandwiched, or letter shaped (T or L) stand between plates and receive girts.

Horizontal

Dimensional lumber provides the crossways support in the walls of this hay barn. 2" x 6"s either single, sandwiched, or letter shaped (T or L) run between, on, or under posts. The timbers under the purlin posts are the only east to west floor level ties to keep opposite walls together except at the corner connections to the walls.



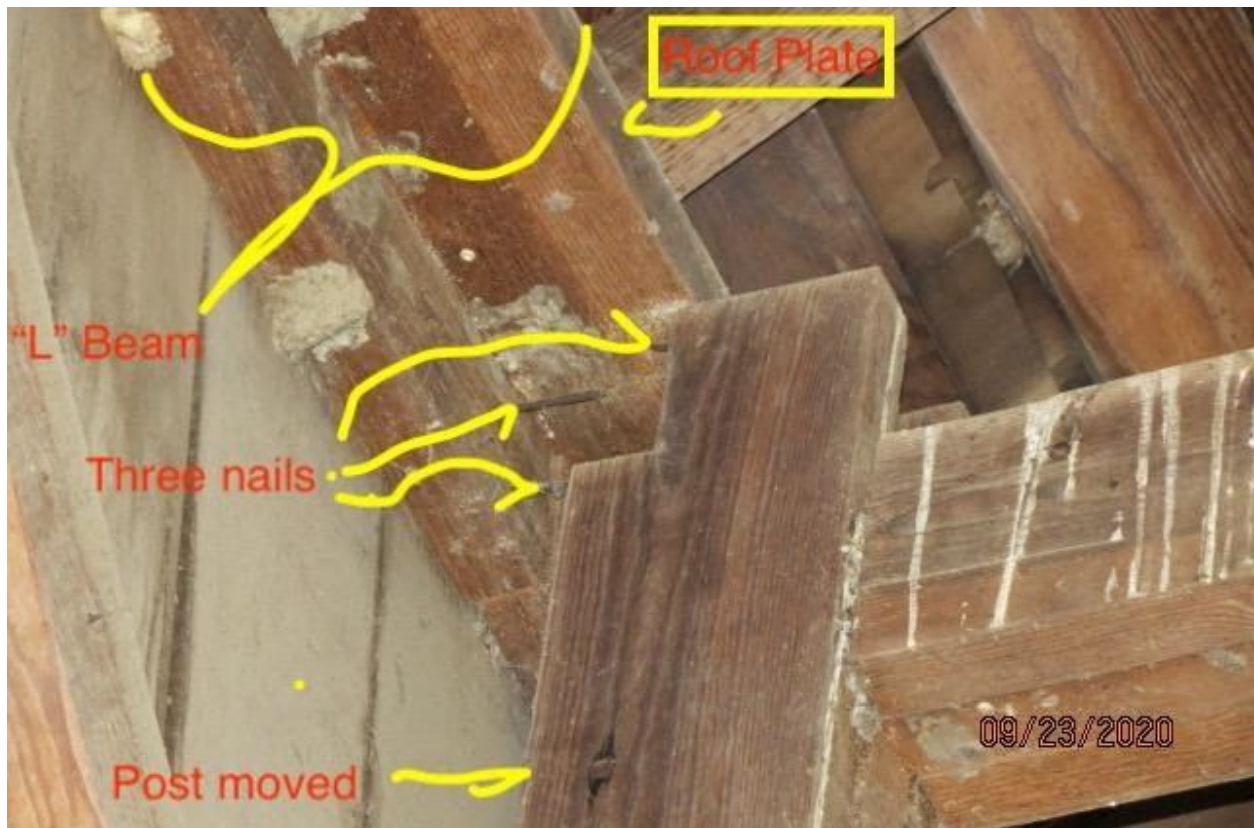
The north to south tie beam is the only member, except the east and west walls, working directly against the natural spread of a weighty gable roof and the downward pull a loaded hay hook moving along the track. Both ends of the tie beam have separated from the purlin/roof plate (See Joinery below).

Diagonal

The braces across the corners, connecting the purlin to the gable ends, help by shortening the unsupported center of the beam span adding help to keep it straight.

Dimensional lumber provides the angular support for this hay barn. 2" x 6"s and 2" x 4"s singly brace posts to plates and plates to plates. High in the building are many braces so it has remained square and plumb where walls joined.

Joinery



Round nails fasten the sides and ends of lumber together as in the picture where three nails were used to hold the center tie and post to the roof plate. That joint and its twin have pulled apart allowing the barn to spread north to south.

Sheathing

Spanning 2' between 2" x 4" rafters, 1" x 6" pine boards with roughly 2" gaps between them provide the nailing surfaces for the roofing above.

Flooring

The North shed concrete floor, contoured, is lower than the others due to the lay of the land. The south shed has a concrete floor. The main barn has dirt for flooring. This carries heavy hay loads, not the structure.



Walls/Partitions

The walls of the workroom are large sheets of light colored material. The rest of the wall to the south shed is vertical 1" x 12" pine boards. The partitions are 8 feet tall so the rooms are open above the walls to the main barn. The partitions are held vertical by their "T" configuration and a single 2" x 4" vertical tie to the rafters. Miscellaneous horizontal boards tie studs together.



The primary walls perform several services. They keep the weather out, help to keep the roof aloft, and provide a barrier to stacked hay from exiting the barn without notice. This last function raises questions about the ability of the large expanses of shiplap siding to restrain avalanches of loose hay or a slide of weighty bails. How much siding has been replaced over the last hundred plus years? None appears newer than the rest, which could be a good indication but we have no idea how much hay the barn has actually housed. This building is not over

built but has stood for a hundred years. It can stand longer with maintenance, repair, and additional fasteners.

Electrical

Non-metallic sheathed cable serves the lighting in addition to numbers of extension cords.

Accessories

The north shed is fitted with pole hay mangers. The track in the peak of the barn was for the hay hook system when loose hay was hefted from wagons.

PRIORITIES	RECOMMENDATIONS,	ROUGH COSTS
1	Repair the north and south connections of the central tie beam across the peak of the barn to the purlins/roof plates.	Approximately \$500 to \$1,000
2	Prevent future spread of the walls at ground level. A method which could be used would pour reinforced concrete piers 12" below frost line (30") at each of the 16 posts and connect the posts to the piers. Note: By spreading the top side of the piers and rebar to support the current tilting foundation, further foundation repairs would not be necessary, though it would still look damaged. Make sure the wall plate is anchored to the foundation.	Approximately \$1,200 to \$3,200.
3	Remove trees growing within 10 feet of the barn.	Approximately \$50 to \$200
4	Repair/replace the north shed foundation.	Approximately \$1,100 to \$4,200
5	Replace the west half of the north shed.	Approximately \$1,000 to \$5,000
6	Repair damaged roofing, examining the entire roof for missing or loose nails/screws.	Approximately \$200 to \$2,000
7	Paint the rusted roof panels. For 1,528 square feet.	Approximately \$1,836 to \$3,827
8	Repaint the barn to extend the life of the exposed surfaces after securing all nails. For 1,560 square feet.	Approximately \$3,900 to \$5,460
9	Remove the extension cords. Have electric power properly wired to those spots where lighting or receptacle outlets are needed.	Approximately \$0 to \$500

Assessment for the Historic Kropf Barn

Gina Schumann, Owner

Site visit September 9, 2021 by Thomas A. Kennedy
Report Completed December, 2021



This project was funded by the Douglas County Heritage Conservation Council's
2021 Barn Assessment Grant Program.

DESCRIPTION:

The barn at 60 N. 1400 Road in Berryton, Kansas looks like a Gothic Arch style with two shed additions. The construction type is a laminated wooden truss. The slight point at the peak gives it the Gothic look, and then it rounds down to a 32" high concrete wall above the floor set on concrete footings. The outside distance between the walls is about 32 feet. Across the post-less expanse inside one must look over a 100 feet to the hay hood above the north gable from the road side.

The raftered shed roofs join the bows/trusses below where the main roof becomes more vertical and extends about 17' to the east and west, each having a 22" overhang. The entire building is covered with galvanized corrugated steel sheets.

All the doorways are large enough to allow passage of livestock and equipment. Each doorway has been provided with a track for a sliding door. Three doorways provide access on each end. Cattle gates block all but the northeast of these openings. Two 6' sliding doors close the opening atop a ramp 17.5" above grade in the east center. One of the doors for the west center door is flat on the ground and the other is absent. Only one side hinged door hangs in the hay doorway. Like most of the doors the other one is gone.

Eight squarish windows evenly spaced along the east and west sides let in sunlight. Three do the same for the south gable and two flank the hay doorway on the north.

Three cupolas vent the roof peak.

That west gangway is now used for equipment storage. The east gangway is used for cattle feeding. The center arena has bails of hay and straw stored in the south end and a 4 wheeled track steer.

OBSERVATIONS OF SYSTEMS, MATERIALS, DESIGNS, AND CONDITIONS:

Exterior:

Foundation- The foundation extends 33" below the floor to what appears to be a 24" wide by 6" deep footing the bottom of which is exposed on the east side, south of the doorway.

Ramp/Driveway- The five west doorways our entered at grade. The east side of the southeast doorway concrete ramp is 16 1/2 inches above grade. The south side of the east doorway concrete ramp is 17 1/2 inches above grade. The ramp is cracked and pulled away from the building far enough for an animal's foot to get caught.

Envelope/Siding- The corrugated steel siding shows some rust and about six sheets worth is absent from the ends.

Trim- Nothing protects the rafter tails or for posts.

Roof - The corrugated roofing is consistently rusted and the equivalent of 17 sheets is absent allowing the number one enemy of buildings enter.

Drainage- Roof drainage has caused erosion, especially on the east side of the building.

Openings:

Doors- Only one door remains and that door hangs in tatters west of the south center door. Rather than one fold down hay door as many barns have there are two side hinged doors, one of which is not present.

Windows/Hatches- The window frames are raw, weathered wood.

Vents- The cupolas are spaced so each handles a similar amount of air.

Hardware- The tracks for the sliding doors are covered to keep the weather out.

Interior:

Foundation:

Perimeter- Soundness characterizes the wall in the footing. Flaws are a seen in the wall between the arena and the west manger, a little north of center. Some cold-pour lines are evident as are a few cracks. None are serious enough to call for repair.

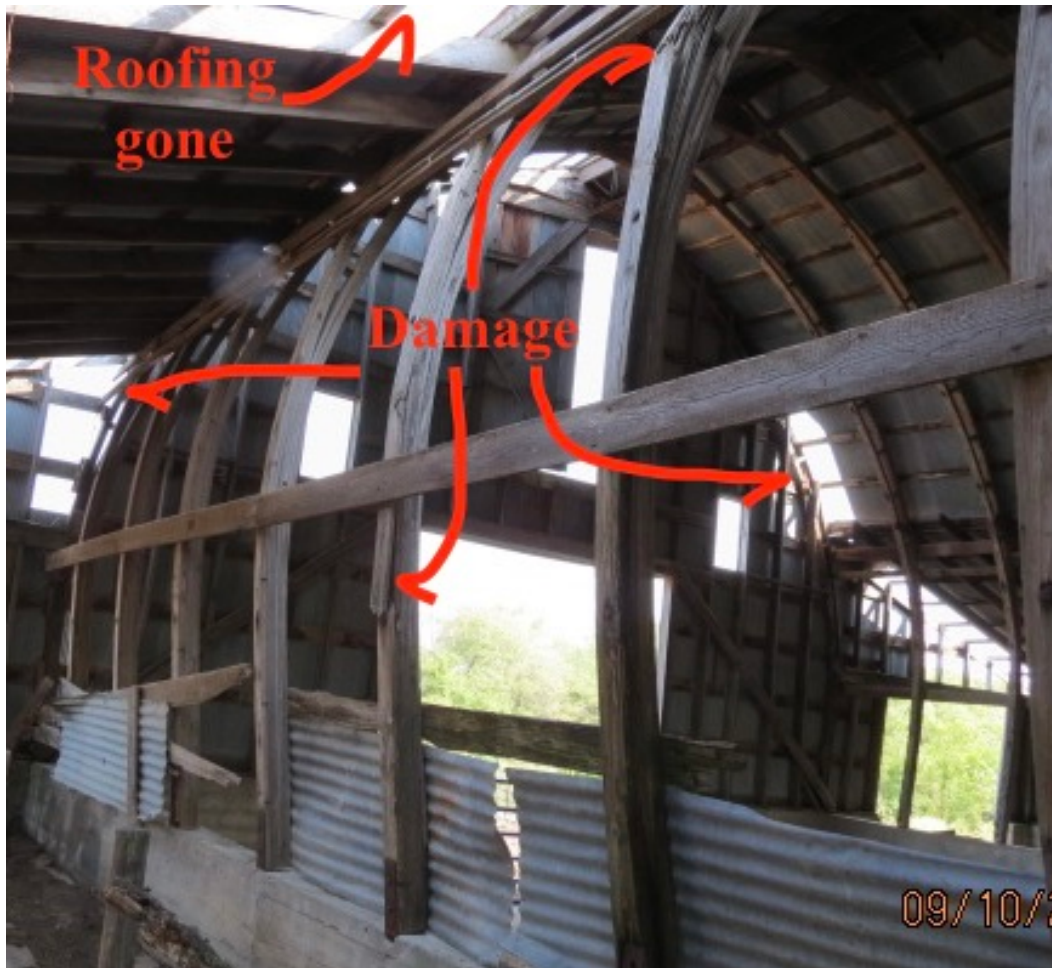
Basement- There is no basement.



Frame: The barn is made of laminated wooden bows held together with bolts. They are 3 5/8" by 3/4" pieces of straight grained pine (probably Yellow Pine) in six layers adding up to four and three-quarter inches at the bottom end.

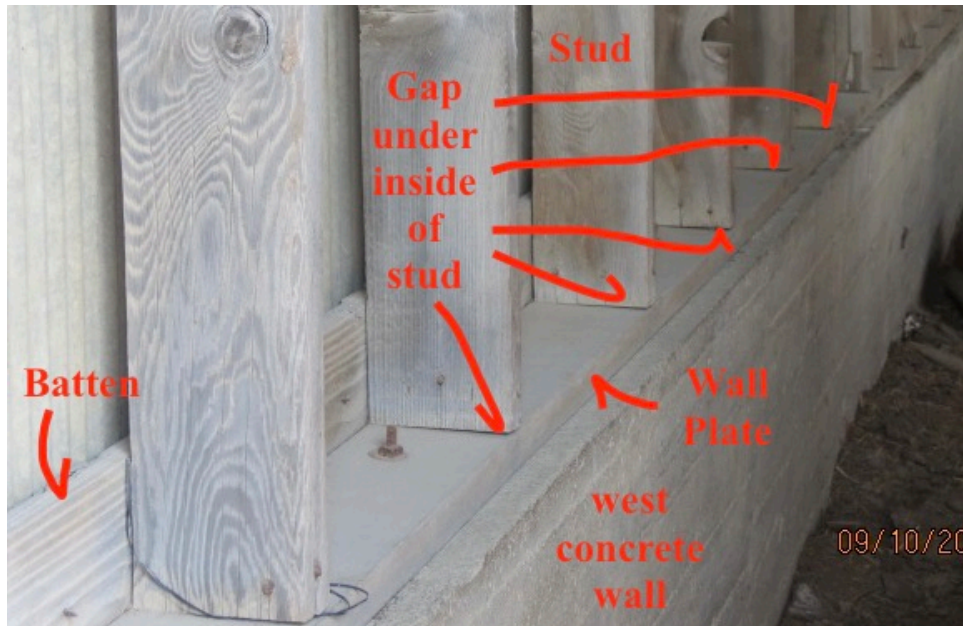
As the assembly rises, it changes from a laminated post into a laminated truss. Between the outer three and the inner three laminations are 2 x 4 blocks of various lengths to increase its load bearing capability. This continues to the peak where it turns, forming a mirror image down to the concrete

wall on the other side of a large open area. Each bow is formed of two identical trusses joined at the peak with gusset plates. This is done 26 times separated by 4' on-center, extending the barn to



100'.

These bows have been weakened because of damage and increasing stresses.



width of the barn.

The building is distorted east to west. A slight clue is seen at the bottoms of the east and west wall studs where they meet the plate. The west studs in the picture are lifting off the plate on the inside while resting on the outer corner. A level says they lean west at the top to the tune of 4" in 4'. This is true on both sides. This is at least 8 inches of spread over the



When looking down the length of the barn alongside the bases of the bows, one notices a couple of things. The first is that the bows spread further above where they are bolted to steel plates set into the top of the wall, so the distance between them just below where the addition rafters join is greater than at their bottoms on the wall. Some is not surprising, but how much is appropriate?

Secondly, they do not curve equally, indicating that some have bent more than others. This is probably because the stress on them is beyond the uniform expected loading and those with less strength have bent more.

The question comes to mind, "What structural elements should keep the bows from spreading and bending further?". Perhaps the rafters might do that. The rafters are pushing outward against the top plate on the outer wall but the results is a rotation of that wall so they are not providing enough support. The rafters are not holding the bows enough. Another question comes to mind, "Were the bows designed to carry half the weight of the lean-to roof as well as the live loads of wind, rain, and snow, which they are having to do?". Also, "Were they designed to handle the loads when some bows were lost?", as has happened.

Some stabilization efforts are seen in the southwest corner of the arena with boards nailed on



place and come-a-longs in place to pull the corner together. The south bow has pieces missing on its west side. The north bow is likewise damaged though not quite as badly. At least six bows require rotted and broken portions replaced while dealing with the excess spread.

Wall Support- The outside walls have 2 x 6 studs with 2 x 6 plates top and bottom. Bolts are embedded vertically in the 32" tall x 8" thick concrete walls to pass through holes drilled in the plate so nuts and washers may pull the plate tight to the top of the wall. Rafters are secured to the top plate above the 2' on-center studs. If placed between the studs the plate would need doubled, one 2 x 6 on top of the other. The wall on each side of the south central door is damaged. The studs on the east side no longer rest on the plate which has been pushed inward and split. The west plate is also pushed inward and split. These need replacement.



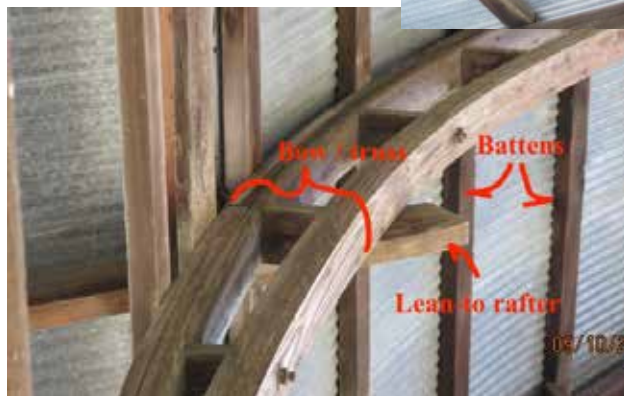


The southwest corner of the arena is badly deteriorated.

Horizontal- The 2 x 6 rafters on 2' centers for the additions span over 15 feet from the bows to the top wall plates and at a shallow pitch. These seem less than adequate and makes one wonder about the 16 rafters northward from the center of the west side that have been sistered because they have been broken as if by impact.

Diagonal- When wind blows

at the end of a wall without siding or wallboard, its tendency is to move the unanchored top portion and eventually lay the studs on their sides. Lateral support is needed in any wall, like at least a sheet of plywood at the corners. This can be done by numerous means. No wood is used for that purpose on this barn but the sheets of steel siding perform some that function. The east and west walls



appear plumb and square north to south so no repairs are called for in that direction.

Joinery- Butt and overlay joints held by nails of appropriate size are the norm. The number of tie-down bolts is sufficient at 4 feet apart but the diameter ($\frac{3}{8}$ ") is less than minimum now usually required. Bolts hold the overlapping joints and blocks in the bows. The connections are doing their

jobs except in the weather damaged bows.

Sheathing- The materials to which the roofing, siding, and flooring are normally attached is called sheathing. The 1 x 6s on the outside of the stud walls might be called gap sheathing or, being on 2' centers, they may be called battens.

Floor- The west lean-to area has a concrete floor. $\frac{1}{4}$ " minus limestone is spread in the east gangway and the arena and is retained by the curbing of the doorway ramps.

Drainage- No liquids stand in the center or in the west gangway but there is no obvious drain system. The cattle have access to the east gangway from the north and footing is pretty sloppy from their waste. There is no obvious drain for this east space.

Partitions- Each side of the arena is an aisle or gangway. They are separated off by a concrete wall, on which the bows are attached.

Devices/ Hardware/ Accouterments- The hay transport system runs in the peak of the barn from the south to out under the hay hood in the north.

The gates of the barn are of two types: contoured flat steel and tubular steel. The parts of each type are welded together. The northwest gate is covered by corrugated sheet goods.

Bolts hold the wooden plates to the concrete walls.

Many nails hold the building together.

The west gangway has a manger along the inside wall that is 3 feet wide and has a concrete curb.

The east cattle shed has a wooden manger along part of the outside wall.

Utilities:

Electrical- Wiring in steel conduit is in the roof structure serving at least one covered bulb.

PRIORITIES, RECOMMENDATIONS, AND ROUGH COSTS:

It is acknowledged that this structure was built early on in the life of building codes and we cannot make it new. Work on it at this time must be completed to meet the standards of the current local authorities.

Have a structural engineer evaluate the capabilities of the barn assembly to resist lateral and vertical forces in all directions with a focus on the bows which hold up the roof of the main barn and at least half of the loading from the additions.

Have a structural engineer design means to stabilize the barn to prevent it from further spread while being worked on.

Have a structural engineer design repairs/modifications to raise the roof, to restore the bows and to prevent the barn from falling.

According to the engineer's recommendations, stabilize the bows to prevent them from further spread while being worked on.

Have the engineer critique the adequacy of all structural elements like the lean-to rafter system.

Make the repairs/modifications the structural engineer recommends.

While working on the roof system add brackets to tie all parts to the ground.

Restore soil to the east side of the building to cover the foundation with at least the same amount as the rest of the barn.

Replace the missing siding and replace missing/loose nails with gasketed screws per manufacturer's specifications.

Replace the missing roofing and replace missing/loose nails with gasketed screws per manufacturer's specifications.

Properly protect the damage roofing from further corrosion.

Provide a roof drainage system to direct water so it will stay away at least 10 feet away from the building.

Repair the east ramp to protect the feet of the livestock.



Repair the wiring system to full functionality by approved means.

Assessment for the Historic P.L. Dolby Barn Jonathan and Hamilton Slate, Owners

Site visit November 19, 2021 by Thomas A. Kennedy
Report Completed December, 2021



This project was funded by the Douglas County Heritage Conservation Council's
2021 Barn Assessment Grant Program.

DESCRIPTION:

The D. L. Dolby barn has a gable roof with a hay door and a hay hood on the south end above double drive door into the barn. The barn is covered with corrugated galvanized steel sheets over red painted Dutch lap siding (visible at the southwest corner). The barn has three lean-tos attached. The one on the north side has a drive door on the west end of it and another drive door on the north side 15' opposite the original drive door into the main barn. Another lean-to is lower to the northeast corner and extends out to the east wall of the east lean-to. The east lean-to is about 27 feet wide, east to west beside the 30 foot wide main barn. Both are about 36 feet north to south.

The roofs on the lean-tos and east side of the main barn are corrugated steel sheets. The west side of the main barn has shake shingles.

The lay of the land falls from the west to the east. The east lean-to floor is a few feet lower than the main barn floor.

The layout of the barn has a livestock feeding pen on the west side of the first floor, a plank floored gangway from north to south in the center, and storage rooms or stalls on the east side (If horses were kept here no gnawing was done, as is common with them). One climbs to the loft in the south east corner. The north lean-to has space for equipment storage and a granary on the east end. The northeast lean-to is one big room with two outside man doors and man doors to each of the other lean-tos. The east lean-to is a 27 x 36 feet space with posts running north to south down the middle, a loft above (with southwest hatch door to the exterior) and its lower level south side completely open.

It appears that later owners, with less knowledge and skill in construction, added to Mr. Dolby's original livestock serving creation.

OBSERVATIONS OF SYSTEMS, MATERIALS, DESIGNS, AND CONDITIONS:

Exterior:

Foundation- Under the west side of the barn stone is laid up into a wall to about a foot above grade. Stone was found under the south end of it at a depth of 20 inches. At the opposite corner of the barn stone was found at 2 feet of depth under the foundation. Inside the east addition stone was found at 6 inches depth and there was no way to check deeper. The east foundation wall of the original barn is built on that. It would appear that the whole building is sitting on a ledge of rock.

Along the south side, the laid-up stone foundation wall has crumbled. For example, at the east side of the southeast livestock door, the posts are dislodged from the stone on which they sat.

The result of the south wall damage has the



south barn weight falling on the next post to the north, causing the beam above to crush.

When passing between the north sheds one observes the missing foundation stones to the south

Ramp/Driveway- Referring to the south sliding door under the hay door as a drive-door is a misnomer because there is no ramp up to that door. There is no evidence of there ever having been a ramp. Since it is under the hay door a driveway must have run along the side of the building to bring the wagons of hay. It is grassed over now.

Envelope/Siding- The Dutch lap siding seen at the southwest corner is seen again in the north lean-to and the east side of the main loft where the lean-tos have protected an original exterior wall of the barn. The vertical tongue and groove siding protects the two north lean-tos, though some corrugated steel has been added. The east side of the east shed is covered with boards and battens while the south is completely covered with corrugated steel as is most of the original barn. None of the painted surfaces have enough paint to say it is doing their

protective job.

Trim- The windows and some doorways have a narrow board around the opening as trim



and it is painted white.

Roof- The west face of the main roof still has wooden shingles. It needs attention due to the many holes. Corrugated steel sheets provide the roofing material for the other slopes.

Most is heavily rusted and several sheets are missing from the east lean-to.

Drainage- The only roof drainage system is half round gutters on the east lean-to and that is in disrepair and poorly installed. The gutter hangs so low that most water will overshoot it especially in a good storm. What water gets into it runs to the downspout that drops water right at the southeast corner of the building endangering the foundation of the lean-to. Extra round downspout is in its loft.

Openings:

Doors- The south sliding door, with a man door incorporated into it, appears to be an opening to admit the south wind in conjunction with opening of the north door of the



central hall to thresh grain. The sliding doors of the northwest lean-to fit that name better as that space is more suited for equipment storage.

The sliding doors for the west doorway of the north lean-to appear to be leaning against the west wall of the main barn. The north side door hangs in place on its track.

The northeast lean-to has a man-door by its west end out its north side, a door to the steps up to beside the granary, and another man-door in its east end. One may pass into the east shed southward by way of two doors, a door with a high sill, and by a larger opening. Why four ways? The loft of the east lean-to has a doorway out its southwest corner and a ladder up to the main loft whose siding has been removed. Also, a door exists the east wall of the lower level of this room, north of the windows. None of the doors is square anymore.

Windows/Hatches- We'll call the west door to the main loft a hatch, like those in the north gable and the north side gable of the large east lean-to.

Along the west wall of the livestock pen are two sashless windows less than 2' square.

Three windows of different size without sash bring light, moisture, and air into the east lean-to, (the smallest serves the loft).

Vents- Other than the hatches there are no vents

Hardware- there are three kinds of hardware and this barn: the hinges for the various doors, the hay track and pulleys of the hay conveyance system, and the track and rollers of the sliding doors.

Interior:

Foundation- The beam running north to south under the center of the joists for the floor of the east 3/2 of the gambrel barn sags in the middle. It is supported by a piece of log on end under the half lap joint on edge in the middle of the roughly 10 x 12 timbers (as viewed from the neighboring space).

Frame- The frame of this barn is made of uniformly cut and planned pine lumber. When speaking about the frame of this barn, one must distinguish between the original gable roofed barn and any of the sheds. The two types of structure are built differently. For instance, the walls of the original barn have 2 x 6 balloon (start at the lower level and continue to the roof) studs on 2 foot centers (from the center of one piece to the center of the next, usually measured from the side of one to the same side of the next) with lots of diagonal bracing and 2 x 6 ledger strips cut in to hold the joists for the floor above.



The gable ends cap the studs from below with a beam, at a level just under the height of the roof plate, then continue the rafters with additional studs. The studs rest on a 2 x 6 wall plate and are capped with a double (two plates on top of each other for increased strength) roof plate. 2 x 6 pine studs in the walls on 24 inch centers provide very good vertical and horizontal strength. The Dutch lap siding is nailed to each stud at 2 foot intervals. Diagonal bracing is set into the wall several times over their lengths and in each direction at the top of each stud.

The walls of the north lean-to also has studs for vertical support, a bottom plate for anchoring to the foundation, and a top plate on which to rest the rafters but that's where the similarity stops. The studs are on 4 foot centers, a 2 x 4 batten (girt) halfway up, and have a 2 x 4 single top plate. The tongue and groove siding nails top, middle, and bottom, so at about 4 foot intervals. The northeast lean-to walls are similar, even to the fact that there is no diagonal bracing. The walls are of a similar design as the roof structure for the two north lean-tos.

Comparing the roof structures is interesting. The original barn has 2 x 4 rafters on 24 inch



centers spanning 7 1/2 feet between each bearing point from the roof plate to the purlin to the ridge at a sharper pitch of 6" in 12". The lean-tos each have spans of 2 x 4s and 2 x 6s exceeding 15 feet at about 3.5" in 12" pitch on 4' centers. Note that the 2 x 4 rafter, 1st in from the west, of the north shed sags in the middle of the span (more obvious in the picture of the outside).





The span of the east shed rafters is about 14 feet from the single 2 x 4 roof plate to the purlin and then to the original barn, some with one piece of wood! A couple of things come to mind. The purlin does not run across under the roof evenly (see the bottom of a purlin post base).



Also, the connections to the older barn are tenuous, and that the upper end does not sit on a header or ledger strip, does not pass through the siding and nail onto the side of a stud but they often sit on one of the diagonal braces, which were not designed for that purpose, and nailed in place. Like the other shed roofs, these are on a 3" - 4" in 12" pitch centered every 4 feet.

There is deterioration of different parts of the barn but most of Mr. Dolby's portion was build much more substantially in the first place!

Horizontal- Enough water has come through the main loft floor to damage the joists, even some of the repairs. Elsewhere, the rafters that sag confirm that these are under-sized.

Diagonal- The primary barn has more diagonal bracing than most! See the picture of the main loft walls in the "Roof" section above. The loft of the east shed has angled bracing.

Joinery- Where braces are cut in and notches are cut to fit beams the fits are precise. The connections the east shed rafters to the main barn are less so. The use of sistered battens in the walls of the east shed made it harder to be precise.

Sheathing- Mr. Dolby's barn and the east shed use gap sheathing for the roof. See the picture of the main loft in the "Roof" section above.

Openings/Hatches- Where the east shed joins the main barn, siding is removed. At the floor of the northeast stall, some of the interior tongue and groove wall has been removed providing access to a hatch door openable from the east shed. What is that about?

Floor- The concrete slabs in the north sheds are no longer whole. The west end of the northeast shed is curious as it looks like pieces of limestone laid with a flat side up.

The central hall is well suited to threshing grain.
Smooth concrete spreads the granary floor.

Drainage- Any liquids entering spaces would pass through cracks between stones or floor boards, except for the livestock pen which looks like it can be one large puddle.

Partitions- Two walls partition off a granary head high in the northeast corner of the north lean-to. The north and east walls are covered with flat sheet metal. The partitions have



tongue and groove siding on the outside of the 2 x 4 studs. Why not on the inside?
The stalls of the main barn are partitioned with 2 x 6 studs with slats up about 6 feet on the outside and tongue and groove siding on the inside. The south end has corrugated metal siding applied horizontally for about 12 feet on the east and west sides. These cover the south doorway to the space which has a slat nailed on the outside so it cannot be opened.
A small storage room is divided off further south.

Devices/Accessories- The three lightning rods maintain their glass balls.

Electrical- A yard light graces the hay hood, a GFCI receptacle serves the livestock pen, a porcelain light fixture is seen as one looks from the loft ladder, and a splice not in a junction box glares at a former electrical inspector.

PRIORITIES, RECOMMENDATIONS, AND ROUGH COSTS:

Repair the foundation problems including below frostline support (or to solid rock) of the summer beam, lifting the settled areas of the barn.

Replace deteriorated loft joists.

Consult with a structural engineer regarding the adequacy of beams posts and rafters, especially those in the lean-to structures.

Repair/replace all damaged, inadequate, poorly supported structural members.

Repair or replace the roofing material.

Repair/replace all doors, hatches, windows.

Install a storm drainage system to move water at least ten feet away from the building.

Repair the electric system.

Backfill the livestock pen. Compacted $\frac{1}{4}$ " limestone with fines elevated in the center would promote drainage.

Assessment for the Historic Thome, N.F. Barn I

Dennis Thome, Owner

Site visit October 22, 2021 by Thomas A. Kennedy
Report Completed December, 2021



This project was funded by the Douglas County Heritage Conservation Council's
2021 Barn Assessment Grant Program.

DESCRIPTION:

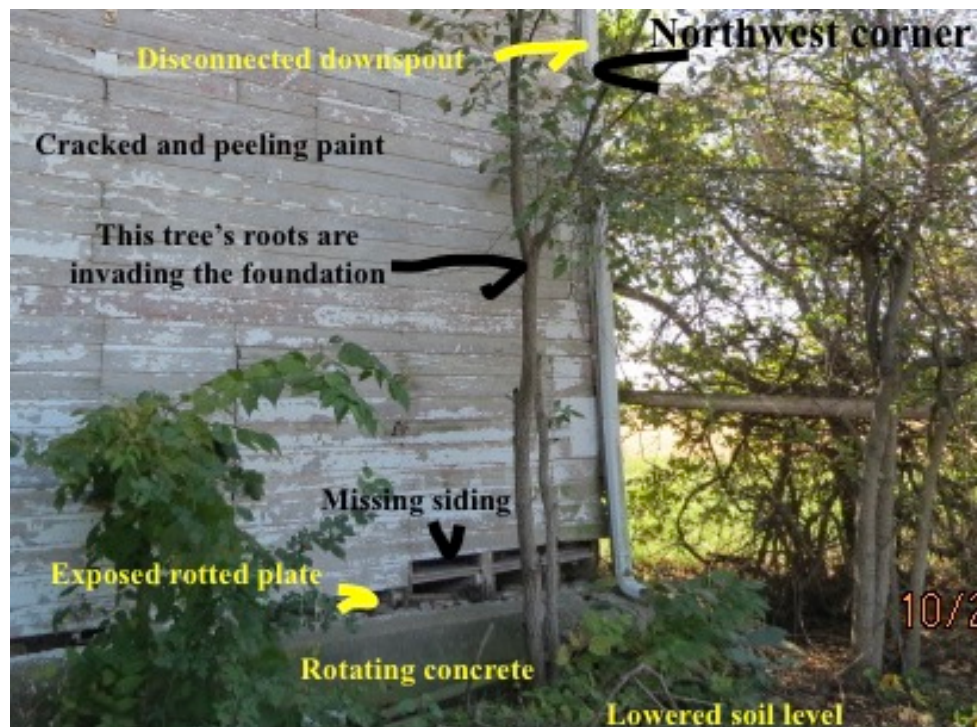
The N. F. Thome I barn at 1036 E.1000 road Lawrence Kansas is a large white barn with a metal gable roof. Its peak runs more than 50 feet north to south. A 40 foot drive-through aisle, north of center, runs from east to west. The peak stands about 28 feet tall. At the north end of the east wall a Dutch door enters a stable. When one would need a saddle or harness one would pass around the west stall wall to the center aisle and then walk west and north into the tack room. Livestock may enter a Dutch door in the west end of the south wall and be fed in a pen south of the gangway. East of the pen is a utility area, which also has a Dutch door to the exterior. The granary appears to be in a nearby building to the east.

Five lofts provide hay and other storage. The main hay storage is in the north over the stable and tack room. Additionally, above each end of the drive-through, is a floor higher than the other lofts and less accessible to the hay conveyance system. The east one even has a guard rail over the gangway. At the north loft height, two lofts serve the south side, one over the west end of the cattle pen and one over the utility space and manger. This leaves about 12 feet between them except for a walkway which seems to have been added when the stairway was added up to the southeast loft alongside the drive-through. The design of the barn is for the keeping of large farm animals.

OBSERVATIONS OF SYSTEMS, MATERIALS, DESIGNS, AND CONDITIONS:

Exterior:

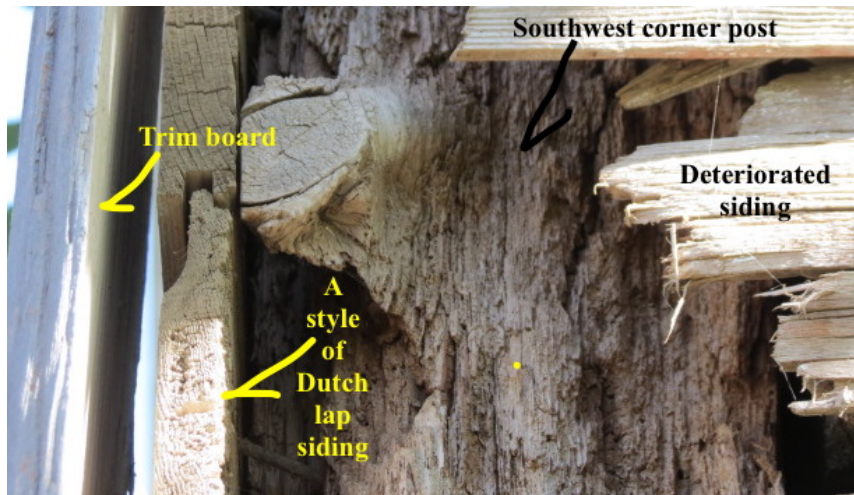
Foundation- The foundation is a combination of laid up stone and poured concrete to depth above 12 inches below grade just north of the main entrance. Grade on the north side of



the building is lower so exposed stone was covered with mortar. This has cracked and rotated out from the building at its top allowing water in, water expands when it freezes so it breaks concrete.

Trees have invaded the soil under and by the foundation. Their roots are known to break concrete and displace structures. This foundation is already shallow

and weak.

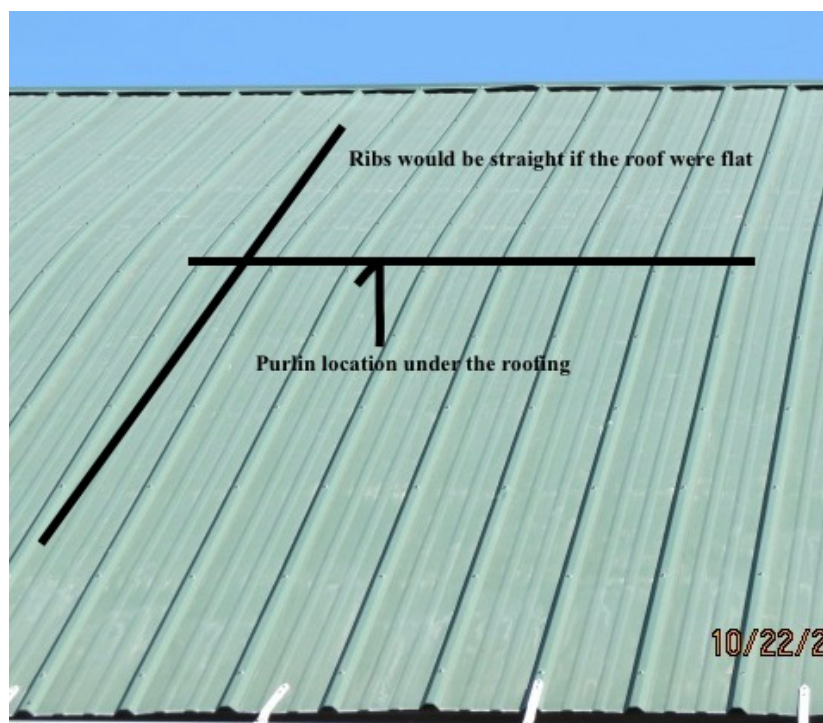


Envelope/Siding- The Dutch lap siding is horizontally installed. At the east end and the bottom of the north wall, the north end of the west wall, and the west end of the south wall siding has rotted away allowing water to enter and rot the structure behind it. Other siding is absent from the south wall. The cracked and peeling paint does not provide adequate weather protection.

Ramp/Driveway- Entrance to the barn is at grade, though at its northeast corner one must step up a little.

Trim- Six inch wide trim boards run up the corners. 4 inch trim boards are flat against the siding along the window sides and tops with a sloped sill at the bottoms. Regarding the doors, only the northeast Dutch door has trim and that is in the form of a drip edge at the top. The trim has much cracked and peeling paint.

Roof- The rafters span 23.5' and the purlin, in the middle of the span, cuts the roof load by about 50%. The pitch is 7.5" rise in 12" of horizontal run. Over the 2 x 4 rafters the roof has 1 x 6 gap sheathing with wooden shingles on it. A fairly new raised ridge green colored metal roof shows a flaw. For a gable roof, the west side is not as flat as it ought to be. At about the location of the purlin, beneath a ridge is seen. This indicates either that the purlin has raised or that the west wall of the barn is lower than originally designed. This



bends the roof downward. Other indications reflect the lowering of the west wall.

Drainage- Drainage from the roof streams on the west side to a 6 inch aluminum gutter, some water falls to the south downspout and other water falls to the ground sense the north downspout is disconnected. The east steel half-round gutter is rusted and disconnected from its north downspout so water falls to the ground at the northeast corner. Not having the downspouts connected has caused damage to the siding, to the structure behind the siding, to the foundation, and to the landscape. Falling water is blown against the siding, increasing wear and tear and saturation. Water has entered the foundation repairs, frozen and pushed mortar outward. The washed-away soil has caused puddling and increased soil saturation thereby destabilizing the stone foundation. By not running water at least 10 feet away from the building, the water has facilitated the stone foundation to settle further into the ground. It is understood that the west foundation has been replaced with concrete down to the area of the frost line, which is 36 inches.

Openings:

Doors- Three of the seven exterior doors need repair. The 4 drive-doors are pretty sound but the Dutch doors are no longer square and whole. Also, the cracked and peeling paint does not provide adequate weather protection.

Windows/Hatches- Of the six double hung type windows, three are in the upper east side, one is in each of the gables, and one serves the west side of the southeast loft. The windows have much cracked and peeling paint. Much of the glass has been broken out.

Vent- The only vents are the doors and windows when they're open.

Hardware- Door hinges, the plate for a straightening-cable, a lightning rod cable, and many nails are the extent of the hardware on the outside.

Interior:



Foundation:

Perimeter Wall Support- Some work can be done to repair the damage to the walls. The plate at the bottom of the north wall is deteriorated to the point that it's no longer fully effective over its length to evenly distribute the wall load on the foundation. The cable installed from the top of the north end of the east wall to the ground by the west wall effectively lifts that northeast corner. This uses the studs in the western part of the north wall as a fulcrum upon which to pry up the east end. This was necessary because the bottom of the wall under that corner has failed. This has done nothing to repair of the cause of the damage, especially in the west end of the wall. Perhaps this could be considered as only a step in the process of repairing the wall and foundation issues.

As stated above, the west wall of the livestock pen has had substantial work done under it. A foundation has been dug and poured to support the wall and to protect it from frost damage. the wall was not lifted. Other problems can arise because now the building will flex differently. Previously the building rose and fell with changes of temperature mostly as a unit. Now, one section of the wall is stabilized while the rest of the building moves.

When sistering the studs in a wall, a technique very good at carrying the vertical load of the wall is to replace the bottom of the rotted stud. The technique now used to repair the west wall added a piece of stud material along the side of the existing stud and fastened that to the plate below. This has the load falling to the fasteners between the two pieces of stud. If not enough fasteners were used, the stud can fail. The suggestion is to cut off the rotted stud to sound material, add the sister along side, preferably lapping past the cut at least 18 inches, and then put a new piece of stud snugly underneath the old one and secure that to the sister. The weight of the wall will fall on the replacement stud bottom, end grain to end grain, with the screws or nails or bolts pulling them together. This makes a sound repair without making the fasteners so crucial to success as load bearers.

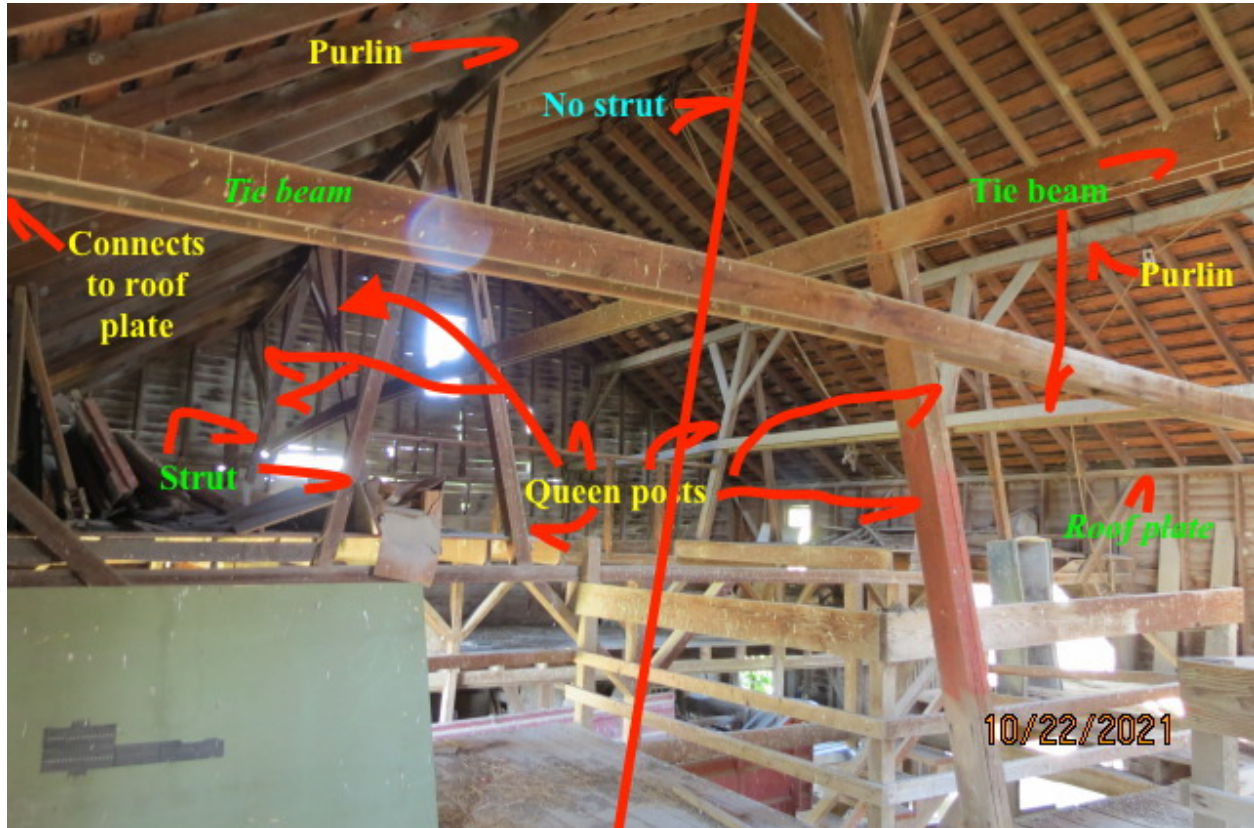
Vertical loading in a wall is only part of what a wall does. Forces are exerted on a wall horizontally from every direction. That's why it's important to pass the sister so far beyond the end of the old damaged stud. A long repair can exert a lot of leverage on the connection between the two. In Kansas, a major issue is wind. Whether wind blows constantly, exerting constant pressure or erratically, exerting intermittent pressure, it is still pressure. Also, other things push against walls.

Today's construction requires buildings to be tied to their foundations, as this one appears not to be, to resist the forces that would move a building off its foundation. Future repairs will include such connections so as to prolong this barn's life.

Frame:

Materials and Methods- The beams in this barn are not one solid piece of material. They are made of individual pieces of lumber, like 2 x 6s with spacers between and they join by passing by each other and having nails driven through both.

Vertical- For the most part the posts and other vertical lumber are doing their job. Some damage is evident in the south wall of the drive-through at the west end where some pieces are offset. Other than making sure they are on a good footing nothing else is really



necessary to repair these.

In the loft above, a crucial timber seems to be missing. Queen posts typically have a strut that runs at a different angle up to the same point under a purlin. The south taller set of queen posts lacks this diagonal support. What makes this particularly interesting is the fact that the east/west running tie-beams sandwich each of the longer queen posts and pass by as if going to connect to the strut, that is not there. Perhaps the designer determined that it was adequate for those tie-beams to connect to the roof plate forming the bottom side of a triangle. This is what the tie-beams supporting the shorter queen posts do with their strut. If there were no strut no triangle would be formed since their tie-beams do not connect to the roof plate. A triangle is much stronger than a 4 sided shape. The strength is there in the triangle without needing the strut for the tall south queen posts.

Horizontal- Tie-beams run on each side of the drive-through from the front wall to the back on posts that rise to the higher lofts. As noted above another tie- beam connects the south set of queen posts to each other and the roof plates. These hold the building together from east to west. The end walls of the barn also have a tie-beam of double 2 x 6s running from the front roof plate to the back roof plate (short queen posts run from this plate to

the end of the purlins). It should be noted that the north wall has a substantial bow northward. It is difficult to determine whether this existed before the diagonal cable was installed. Certainly tightening the cable could cause this buckle. Another two sets of tie-beams hold the barn from north to south.

The ledger strips (seen in the picture with the electrical knobs below) are not notched into the studs but have many nails to hold the butt joint.

Diagonal- Diagonal braces like at the tops of the queen posts, tops of the posts alongside the drive-through, and between the roof plate and various studs have served to keep the building square.

Sheathing- As is typical of the day when this barn was built, no sheathing is behind the siding. Nowadays, a few sheets of plywood at the corners, properly fastened, illuminates the necessity of cutting and fastening all the diagonal braces. Before plywood, other techniques were used.

Openings/Hatches- The tack-room door appears sound.

The closet like structure in the southeast corner of the tack-room has a diagonal ceiling opening to the gangway and an unknown purpose.

Floor- The lower floors are dirt. The loft floors are $\frac{3}{4}$ " thick and all seem sound.

Drainage- The livestock pen floor does not seem higher than the areas around it. The horse stalls are similar. These do not have typical build up of manure that holds moisture and because deterioration to post bottoms.

Partitions- The partitions of the stalls and the pen how are made of materials various sizes but strong enough to hold the animals.

Devices- Upon entering the horse stable, a device attached to some piping presented a mystery. It would appear that somewhere on the premises a carbide generator produced acetylene gas that was used by this device to give off light.

The hay trolley system appears to be intact in the peak of the barn.



A steel cable has been installed across the north end.

At some point, electricity was brought into the building as seen by the large insulators on the



south end of the east side. Porcelain knobs on the underside of joists are sign posts of knob and tube wiring which has been replaced by a more up-to-date electrical service.

PRIORITIES, RECOMMENDATIONS, AND ROUGH COSTS:

Remove trees so their drip line several feet away from the building.

Replace the deteriorating foundation below frost line.

Raise the barn so its bottom plate is on one flat level plane and parallel to its roof plate.

Regrade soil surrounding the barn so water will be no threat.

Replace all deteriorated wood. Protect the structure from further decay by using preservative treated, naturally durable wood (like cedar, redwood, black locust or black walnut), or wood of a species that is naturally resistant against decay .

Provide a storm drainage system to direct all water at least 10 feet away from the building.

Repair or replace the siding.

Repair the doors to plumb and square.

Repair the windows.

Restore the lightning rod system.

Assessment for the Historic Younger Barn John Younger & Harrison Cody Thomas Haynes, Owners

Site visit September 24, 2021 by Thomas A. Kennedy
Report Completed December, 2021



This project was funded by the Douglas County Heritage Conservation Council's
2021 Barn Assessment Grant Program.

DESCRIPTION:

At the hilltop address of 852 E. 800 Road by Lawrence, Kansas a fresh red gable roofed barn stands alert! Its hay hood and hay door aim east to greet the sun each day. The wide door slides aside to brighten the milking shed and granary. The cows, in their 7 stanchions, have shared their white gold. As the farmer releases them, they saunter out the Dutch door at the north end of the east end to graze the day away.

The draft horses crunch on their grain and hay with their backs to the south. Perhaps their harnesses will warm a bit before they dress for the day's labor. They hang in waiting on the outside wall behind them.

A newborn calf nudges its mother in the southwest birthing stall as it sniffs for something to eat. The farmer cleans up his milking parlor, spreading fresh straw thrown down from the mow overhead and the day is under way. He catches the aroma of biscuits and bacon wafting in the west Dutch doors from the house. He is proud of this work of his hands. Having the mill come to rough saw logs off the farm and then to nail the planks together before they cured was quite the feat that first year.

This cozy home for farm creatures has served many years with its rough sawn oak and other wood species with few wounds and some weathering on this windy hilltop.

OBSERVATIONS OF SYSTEMS, MATERIALS, DESIGNS, AND CONDITIONS:

Exterior:

Foundation- Multiple probings found solid rock about 22 inches below grade on the north and south ends so the barn seems to sit on a slab of limestone. The laid-up stone wall has some vertical cracks between the north Dutch door and the north west corner but nothing serious. The wall becomes less visible going south and along the south side as the grade rises. Approaching the northeast corner a concrete ramp has been installed for the cows. It is held in place by retaining wall to its north. As one tiptoes through poison ivy along the north side erosion is seen. The uncovered eaves I have washed soil off the stone alongside the foundation. As the foundation wall was laid up the mason carefully cut lines in the mortar to make it as attractive as possible down to where the soil started. Now, 8 to 10 inches of stone below that line is exposed and puddling has washed the gravel.

Envelope/Siding- 7 inch shiplap siding covers most of the building installed vertically. The shiplap on the milk shed extension is a bit more narrow and more finely planed. All the siding show some wear has one suspects it has not always been painted. One wonders why the southeast corner was extended.

Trim- Trim is accomplished by paint, has the corner boards are painted gray. Facia covers the flying rafters on the ends and the rafter tail butts.

Roof- The roof was it originally wooden shingles over gap sheathing, but that has been covered with corrugated steel roofing. Much of the galvanized finish has worn off.

Drainage- Roof drainage where is dealt with in the foundation section above.

Openings:

Doors- one of the five Dutch doors is not being used as it is in the tack room wall in the stable and is behind the sliding door when it is open. The Dutch doors all function, including the one in the south loft, but they're not all square. Needless to say repairs have been made through the years as the hinges on the individual doors do not all match.

Windows/Hatches- Two windows are in the east gable and three are on the north side of the first floor. One small window looks out to the south from the stable. Two hatches serve the loft. The one above the east center Dutch door has a ladder. A set of stairs has been erected for the hatch by the horses manger.

Vents- A louver is in the west gable. A hole for the hay conveyance rope also provides ventilation in the east gable.

Hardware- One of the three lightning rods still has his glass ball. Lightning rod cable as seen on the ground at the west end the north side.

Interior:

Frame: The roof plate is made of 2 x 6s one on top of the other, which is necessary because there are no studs to rest the rafters over. This is built in a manner similar to timber frame technic with posts, but made up of smaller lumber, and beams, built in the same



fashion.

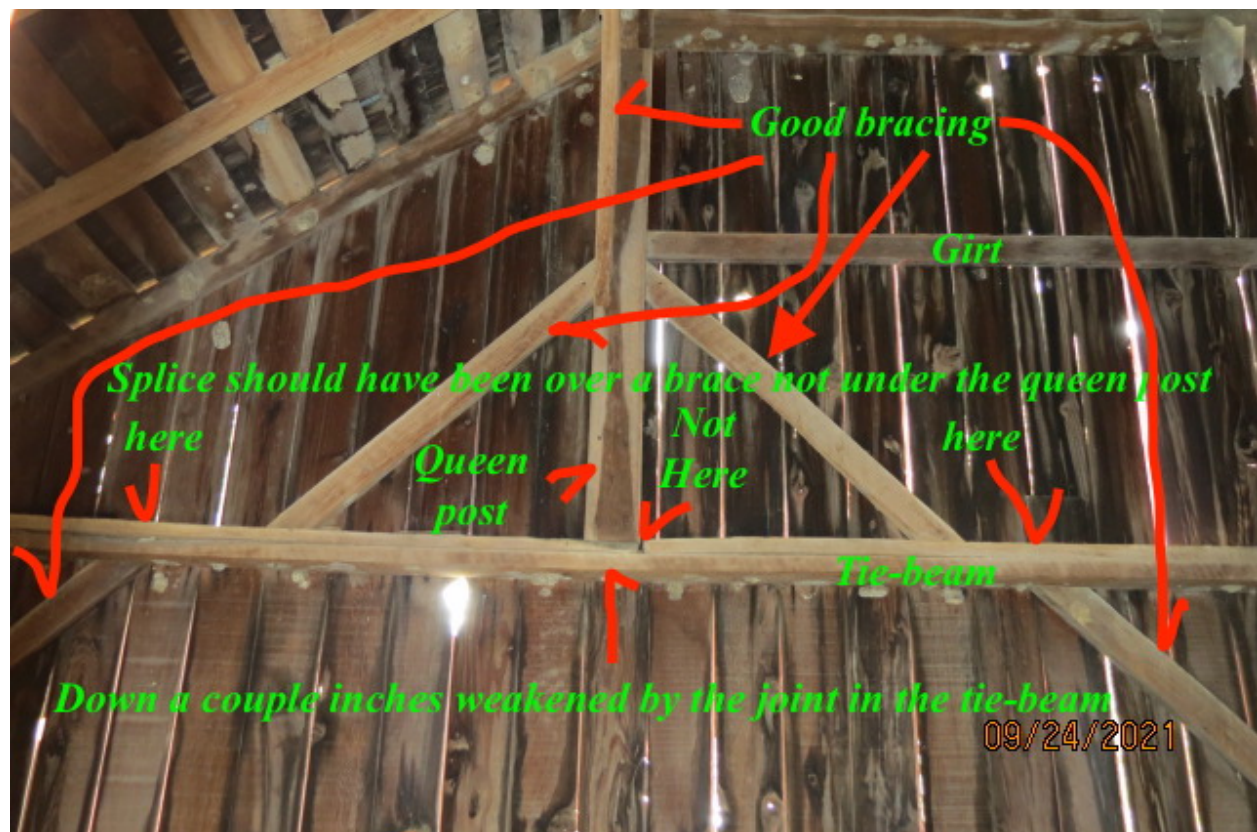
Vertical- The post in the line of stanchions is rotted off at the bottom. It was set in the dirt. See the "Floor" section picture below.

As one looks around in the first floor under the joists there seems to be sloping towards the middle.

Horizontal- One girt is provided between the bottom plate and the top plate for nailing siding.

Tie beams run all the way across the barn high enough to provide support for the queen posts but low enough not to interfere with the function of the hay transportation system.

One configuration of timbers demonstrates some stress. The west gable bows out some. Its tie beam, at the height of the roof plate and upon which the queen post sits, is bowed downward as well. The location of the splice is crucial. A third plank in the tie beam would have give more



strength horizontally and vertically.

Diagonal- Diagonals at every post top and bottom in the first and second floor are key to why the barn is still in good shape. The technique of sandwiching braces between horizontal and vertical 2 x 6s has been very effective. There are so many diagonals its as if the carpenter had a hand saw that could only cut a 45° angle.

Openings/Hatches- In addition to the Dutch door the outside opening for the milking parlor has a gate on the inside.

Floor- Some concrete floor, including a trough for the cows in their stanchions, has made this barn more cleanable than some. The concrete flooring in front of the stanchions



has a cavity under it. A snake has made it his home. The loft floor boards are of various widths and ages. Some are quite worn from having been outside in the weather for a long time, but most seem sound. some boards are loose and there are gaps here and there.

Drainage, The trough behind the cows in the milking parlor has no obvious termination to vacate the liquids.



Partitions- Various spaces have different partitions. They seem appropriate.

Devices-

The stanchions have a sample latching mechanism so the cows cannot get their heads out once they are in. Sheet metal is installed along the wall behind the cows to protect the wall from splash.

Utilities:

Electrical-

In numerous locations splices are made in modern wiring not in a junction box.



DISCUSSION OF CHANGE OF USE

The owner has expressed to desire to use the barn for residential purposes. Code jurisdictions usually require a building to be brought to today's standards for the new use when there is a "change of use". "Change of Use" is technical terminology. In this case the barn would be moving from an animal dwelling to a human dwelling. This is two different use groups for building officials. The issues to be dealt with are divided into various construction disciplines: The strength of the building, energy issues, sanitation, and habitability are major categories. Regarding the strength, probably no engineer worth their salt would certify the strength of the materials is this barn as adequate. that is not saying they are not, they would just have to put their professional seal on such a statement! When building frames are reused they are usually surrounded with structure that actually holds everything up. One product is structural insulated panels (SIPs) that sit on a new footing/foundation surrounding the barn. It gets into such things as the ceiling height, the minimum of which is often 7 feet. The barn may need lifted for the first floor to comply. There are such things as the number of electrical receptacles, spacing of plumbing fixtures, as well as heating, cooling, and ventilation issues. It will probably take an architect who is used to working in the applicable jurisdiction (Douglas County) to survey the property and do a rough plan to help the owner determine the possibilities and costs.

PRIORITIES, RECOMMENDATIONS, AND ROUGH COSTS:

Restore cover with soil for the foundation which is exposed at the north side.

Replace torn roofing sheet metal.

Replace loose or missing nails on the roof with gasketed roofing screws.

Remove loose rust and properly coat the roof with a protective finish.

Install a storm drainage system to disperse water at least 10 feet away from the building.

Lift the loft to a common plane.

Install water resistant footings for all posts to below frost line or to solid rock.

Repair or replace all post bottoms.

Repair the sagging west tie beam in the west wall.

Repair all loose boards and other hazards in the loft floor.