

August 23, 2022

Joe Dehnert  
IMEG Corp.  
1817 South Ave West, Suite A  
Missoula, MT. 59801

RE: Structure Relocation Assessment  
Dougherty Ranch Building  
3285 Flynn Ln., Missoula, MT.

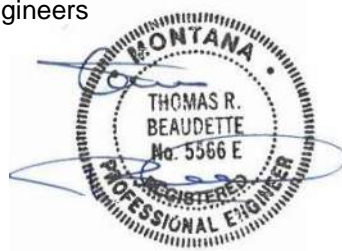
Joe:

At your request, we have performed a limited structural conditions assessment of the Historic Flynn Ranch Building at 3285 Flynn Ln, Missoula, MT. Tom Beaudette, PE visited the site on August 17, 2022 in order to assess the building's condition. This evaluation is strictly with the intent to determine the feasibility of moving the structure. However, we have also provided a summary and synopsis general condition of the structure. The findings and recommendations in this report are based on visual observations made at the site

The enclosed report details our observations and recommendations for structural relocation. We understand that this report is general in nature. A more in-depth structural analysis and design effort by a professional relocation contractor is mandatory. We are available to assist with that effort. If you have any questions regarding the enclosed report, or if we can be of further assistance, please contact Tom Beaudette at (406) 360-9333.

Sincerely,

DCI Engineers



Tom R. Beaudette, PE



## Limited Structural Conditions Assessment–Relocation Feasibility Dougherty Ranch House – 3285 Flynn Lane, Missoula, Mt.

It is our understanding that the intent of this report is to provide a structural conditions assessment of the Dougherty Ranch House to assist in determining the feasibility of moving the building from its present location. The small Ice House immediately to the west of the main structure is included in this report. .

Per a general discussion on-site, the Dougherty Ranch House was constructed in late 1800's. The building has unreinforced brick perimeter walls supporting wood floors (2) and roof. This report describes the methods of investigation, structural description and conditions, and a review of items deemed applicable to the feasibility of relocating the building. At the end of this report and pictures, we have provided rough sketched structural plans to supplement this report and also assist any further discussions and decisions.

### **Method of Investigation**

Investigation was by visual observation only and limited to those structural elements that were exposed to view. No destructive investigation or materials testing was performed at the time of the visit. Assumptions were made concerning the elements that could not be observed directly based on our understanding of the surrounding structure and our experience with buildings of a similar nature.

### **Structural Description & Condition Observations**

The Dougherty Ranch House is a two-story structure over a basement. The structure is constructed of unreinforced brick perimeter walls supporting wood floors (2) and wood framed roof. The building has a base footprint of 40' x 46' with a bump-out of the north side and a bay window element on the southwest corner. The north extension and southwest bay are one level with wood roof. Please reference the attached sketched structural plans concerning the following:

#### ***Exterior***

The exterior walls are 24' high, quad-wythe unreinforced brick (approx. 18" thick). With the exception of the north bump-out and southwest bay, the brick and mortar are in fair to good condition. Degradation of the brick on the north bump-out is extensive. (See Pic #6). There is evidence of differential settlement and moisture deterioration of the brick on the southwest bay (See Pic #4).

Wood framed elements exists on East side (Main Porch – See Pic #1), North side (Entry Roof – See Pic. #3 & #5) and West side (Small Side Porch). These wood framed exterior roofs and porches are in poor condition.

#### ***Basement/Foundation***

The basement of the building has approximately 8' clear from a dirt floor to bottom of main floor joist. The perimeter walls are mortared stone in fair condition with the exception of significant moisture infiltration and deterioration in the SW bay bump-out. On the eastern two-thirds, there are two lines of interior brick piers supporting girders and the upper structure. On the west side, there exists a boiler room with brick walls. Please reference Basement Plan, SK-1 for the general layout of the basement.





### **Main Floor Framing**

The main floor is supported by the exterior walls and interior piers. There are 9x10 wood girders bearing on the brick piers and brick walls. The main floor has lapped 1x planking on 3 x 10 joist at 16" o/c. – typical. Please reference Main Floor Framing Plan, SK-2 for general framing layout of the main floor.

### **Second Floor Framing**

The second floor framing generally replicates the main floor. The joist on the west side deviate slightly. Please reference Second Floor Framing Plan, SK-3 for general 2<sup>nd</sup> floor layout

### **Attic Floor Framing**

The attic floor framing replicates the second floor framing. There is 1x planking on 3x10 attic floor joist spanning to the common bearing walls on the main and upper floor. Please reference the right side of the Roof Framing Plan, SK-4 which generally show the attic floor framing.

### **Roof Framing**

The roof structure has an approx.. 6:12 pitch. The hipped roof creates a common eave line all around the perimeter. There are 3x7 rafters at 24" o/c spanning from the exterior brick walls (See Picture #10) to an intermediate double 3x8 girder line (All four sides – See Picture #11). The girders are supported on 10 - double 2x7 posts which bear on distribution plates bearing on the attic floor framing. The posts are offset from the bearing wall below, however the distribution plates and attic floor joist are adequate to distribute the roof bearing offset. Please reference the Roof Framing Plan, SK-4 showing the roof configuration.

### **Misc.**

Interior Walls and Ceiling: Virtually all interior walls (bearing or otherwise) are 2x6 with lathe and plaster finishes. The ceilings have been modified from the original plaster to an applied fiberboard. Some ceilings have the original plaster.

Brick Chimneys: There are two, in-wall chimneys (See Pic. #2) and a main interior fireplace on the southeast side. The interior fireplace extends through the attic (See Pic #12).

### **Relocation Discussion**

The main 40' x 46' portion of the Ranch House is very well constructed and in fair to good condition. It has withstood the test of time and until recent years well maintained. Condition of materials for the main footprint will not be an issue. . The north wall bump-out and the southwest bay extension are in poor condition. Their condition, along with bump-out footprint logistics will likely deem them not relocatable. The three wood framed exterior porch and canopy elements will be removed prior to any location effort. The brick chimneys extending above the roof line will need to be removed. Any relocation effort needs to consider:

### **Footprint**

The main footprint of the building is 40' x 46'. This two-story brick walled building will be difficult, if not logistically impossible to cut into segments for a relocation effort. So a short side dimension of 40' will likely dictate the move to be in the immediate vicinity of the present location.



### ***Height***

The main building has 24' tall brick walls with an additional approx. 10' high roof structure for an overall height of around 34' above main floor level. This height is an obvious factor in any relocation effort and as with the footprint issue, any relocation to be in the immediate vicinity of the present site.

### ***Weight***

The 24' tall, quad wythe brick walls weigh approximately 1.8 tons per foot of wall length. Allowing for around 10% of window/door openings, just the exterior walls weigh 270 tons. The wood framed interior structure is relatively light, but the plaster walls are not. Estimating 30 psf dead load for main floor, second floor and both level walls along with 20 psf for the attic floor and roof structure, that adds around 70 additional tons. So an estimate for the 40' x 46' portion is around 340 tons. The floors, interior walls and roof weight is considered a conservative estimate. The brick wall estimate is not.

### ***Building / Exterior Grade***

The main floor level is approximately 2' higher than exterior grade. There are window well openings on the north and south side. So these openings would be convenient and available to bring moving beams and equipment under the main wood framed structure. The wood framed portion is not positively connected to the foundation and piers (See Pic # 8 & #9) so jacking and raising the wood framed portion will not be an issue. The brick walls, however, sit directly on and mortared to the stone foundation wall. So lifting the perimeter brick walls off the foundation will require strategically placed and spaced transverse beams, needle shoring, etc.

### ***Misc.***

As with any structural relocation, the interface connections between the floors and walls along with the roof and walls will need to be justified. The main floor structure is not connected to the brick walls (Sitting on a foundation ledge – Pic # 9). But the jacking beams will accommodate bearing for the main floor and brick walls. The second floor joist are pocketed into the brick walls where joist run perpendicular. Where joist are parallel, there is minimal to no positive connection. A connection will need to be established prior to a move. The roof structure is not positively connected to the walls (See Pic #10). Connections can easily be installed, along with attic bracing prior to a move.

### **Ice House Building**

The Ice House building has a 16' square footprint. There are 10' high, triple wythe brick walls with an approximate 5' high pyramid, hip roof atop for around 15' overall height from grade. There exists a thin concrete floor at grade level. The building is in poor condition. The eave lines at several locations show serious moisture deterioration. There are several diagonal crack lines in the brick walls which evidence differential settlement. A large, through-wall crack is located over the door on the east side (See Pics #14 & #15).

The walls of the Ice House weigh around 36 ton. The roof weight is incidental. With the separation crack on the east side, any relocation effort will require steel cable banding for stabilization. The base of the brick walls is directly at grade. So a jacking and raising effort will require excavation for beams, jacks etc. The small footprint and height make this building relocatable. The weight, condition of brick and relationship to ground work against that effort.



## **Structural Relocation Summary**

The Historic Dougherty Ranch House was found to be in adequate structural condition. Once the wood framed exterior porches and canopies along with the one level north and southwest extension from the main footprint have been removed, the main 40' x 46' portion will be immediately accessible. Grade relationship to main level allows for easy access for cribbing, shoring, jacking, etc. The height, weight and footprint are significant hurdles. Any of which dictate that relocation will be in the immediate vicinity to the present location. Any of which will dictate this move be completed by a moving specialist with extensive experience. Once the relocation is complete, the north and southwest brick portions can be reconstructed (recommend wood framed with brick veneer wythe to match original exterior). The wood porches and canopies can also be reconstructed. Please note that the floor to wall and roof to wall connections needed for the move can then be used to justify final code approval for occupancy.

The Ranch House is structurally capable of a relocation effort. The cost of relocation is the obvious wild card. A cost estimate is beyond the scope of this report and our expertise. We are available to assist a moving contractor with any questions or suggestions that may arise.

Attached:

Pictures	-	1 – 15
Reference Plans	-	SK-1 – SK-4





Picture #1 – East Elevation W/  
Wood Framed Porch



Picture #2 – South Elevation  
Showing Bay Corner



Picture #3 – North Elevation  
Showing Bump-out





Picture #4–SW Bay Bump-out  
Showing Moisture Infiltration



Picture #5 –North Bump-out and  
Porch



Picture #6 –North Bump-out  
Brick Deterioration





Picture #7 –Basement Brick Piers



Picture #8 – Shimmed Bearing – Girder on Pier



Picture #9 – Joist Bearing on Perimeter Stone Wall Ledge.  
4 Wythes Brick on Stone Wall





Picture #10 – Rafters Bearing on Exterior Brick Wall



Picture #11 – Attic Girder/Posts & Rafters



Picture #12 – Brick Chimney in Attic





Picture #13 – Ice House NW Elevation



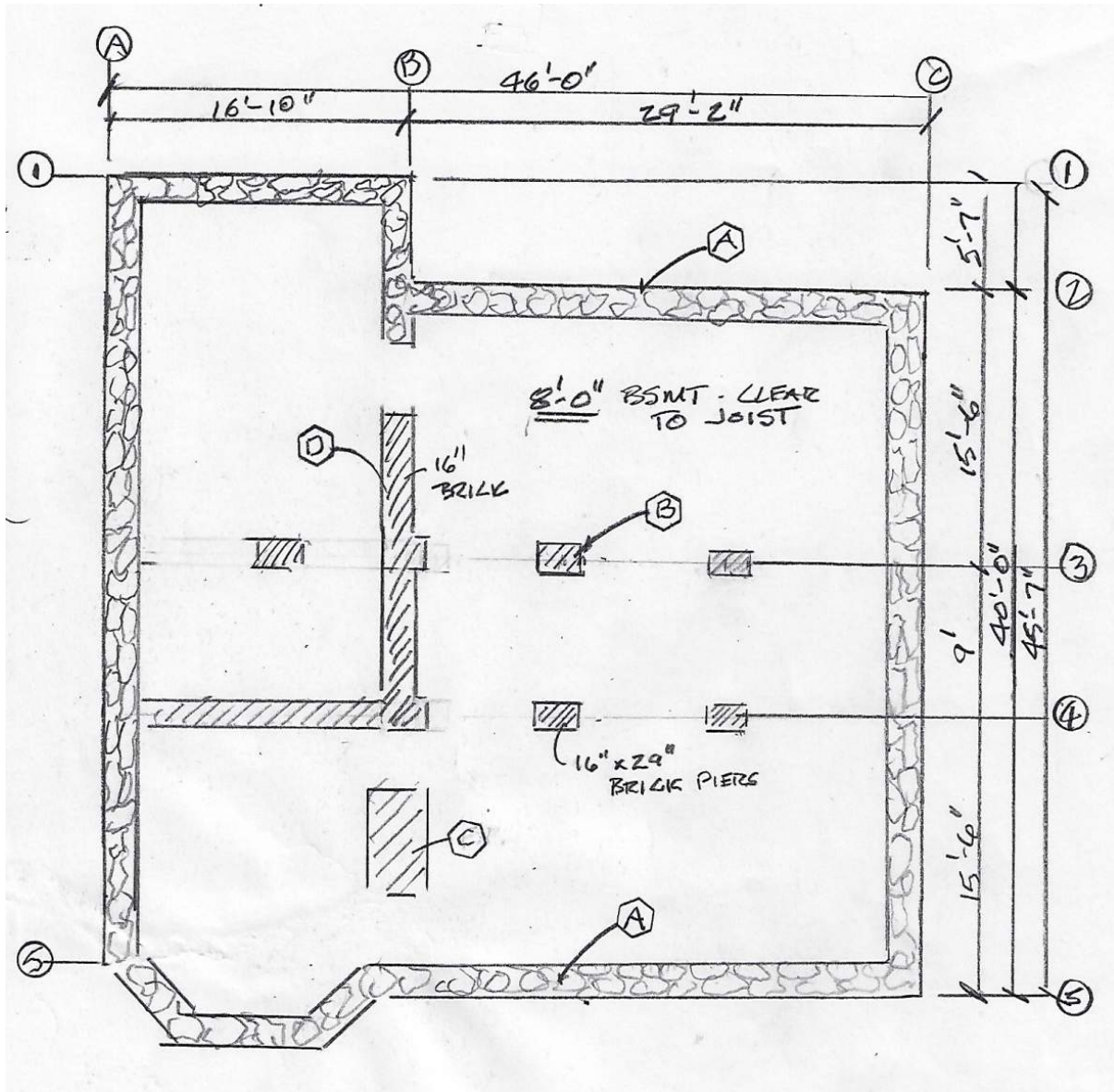
Picture #14 – East Wall Separation



Picture #15 – East Wall Crack – Interior




- A - APPROX. 24" THICK MORTARED STONE PERIMETER WALLS
- B - 16" X 29" BRICK PIERS
- C - 2'-6" x 5'-0" FIREPLACE
- D - TRIPLE WYTHE BRICK WALLS

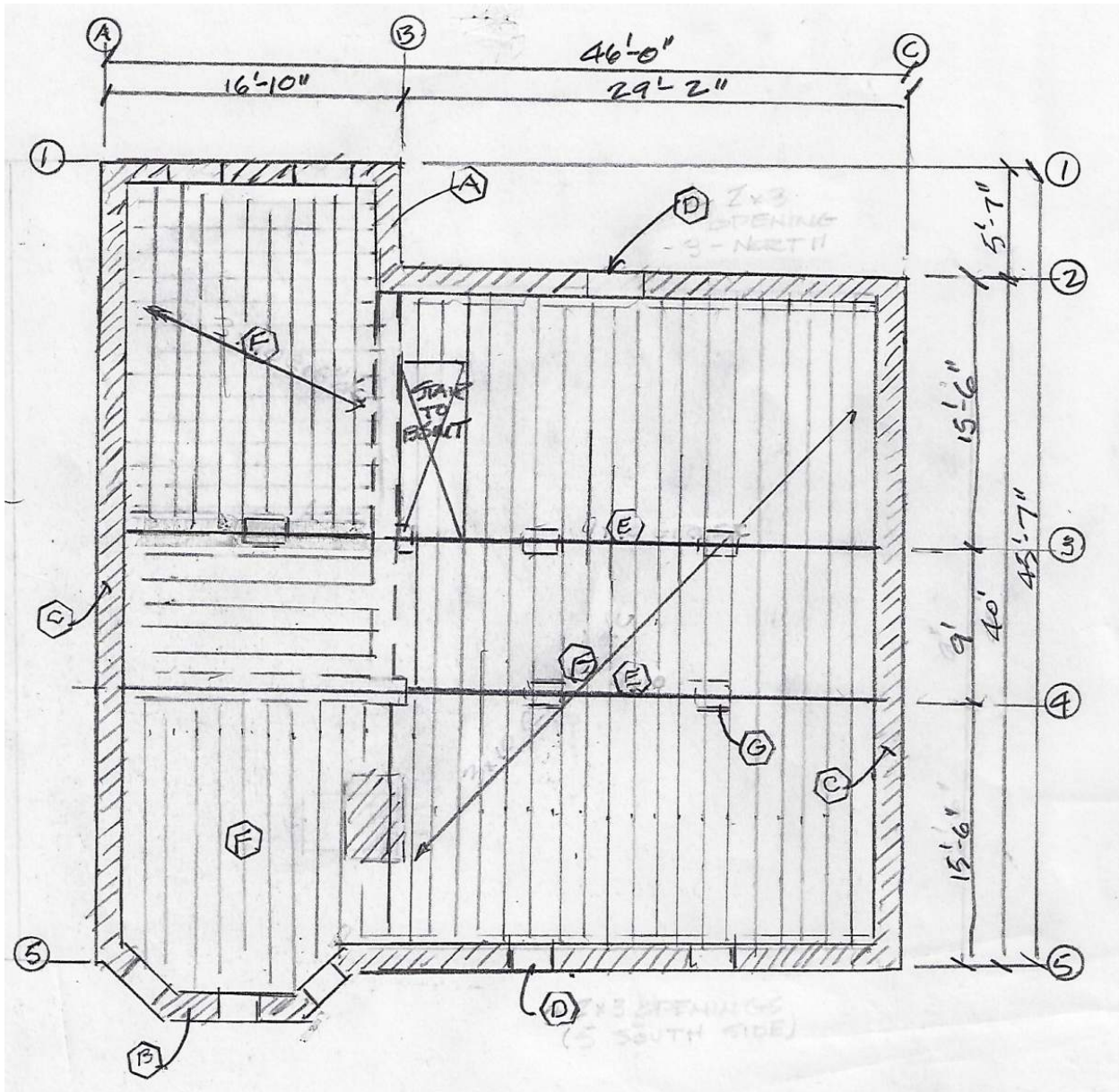


**BASEMENT FLOOR PLAN**

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		DOUGHERTY RANCH HOUSE 3285 FLYNN LN - MISSOULA	DATE:	AUG 2022
	DESCRIPTION:	REFERENCE PLANS	BY:	TOM B
			SKETCH NO:	SK-1


- A - NORTH WALL BUMP-OUT
- B - SOUTHWEST BAY EXTENSION
- C - QUAD WYTHE BRICK WALLS – MAIN FLOOR TO ROOF
- D - APPROX. 24" X 36" WINDOW WELL OPENINGS
- E - 9 X 10 GIRDER
- F - NOM. 3 X 10 JOIST @ 16" O/C – TYP.
- G - BRICK PIERS BELOW



**MAIN FLOOR FRAMING PLAN**

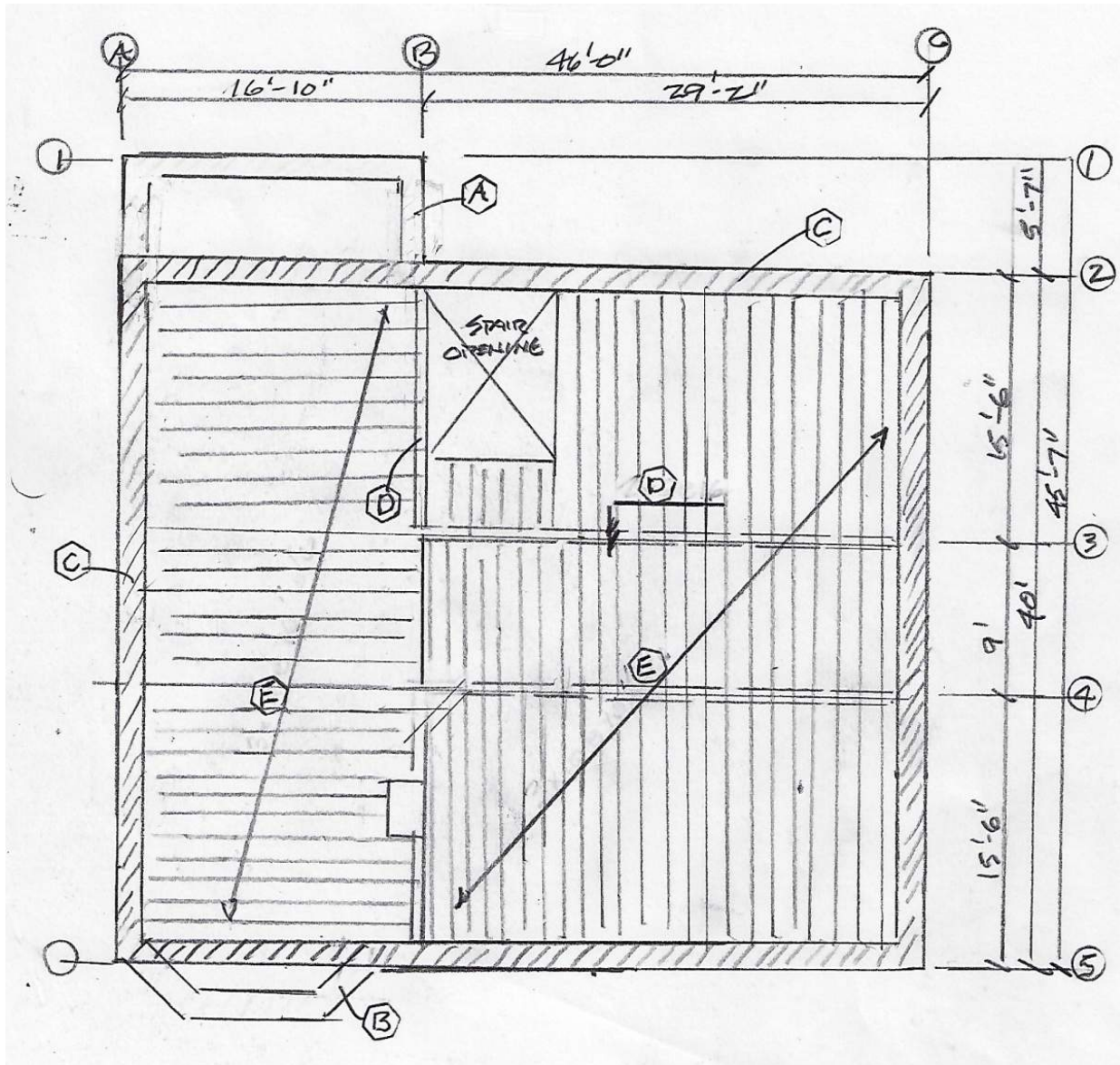
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	DESCRIPTION:	REFERENCE PLANS	BY:	TOM B
			SKETCH NO:	SK-2




- A - NORTH WALL BUMP-OUT
- B - SOUTHWEST BAY EXTENSION
- C - QUAD WYTHE BRICK WALLS – MAIN FLOOR TO ROOF
- D - 2X6 @ 16' O/C BEARING WALLS
- E - NOM. 3 X 10 JOIST @ 16" O/C - TYP



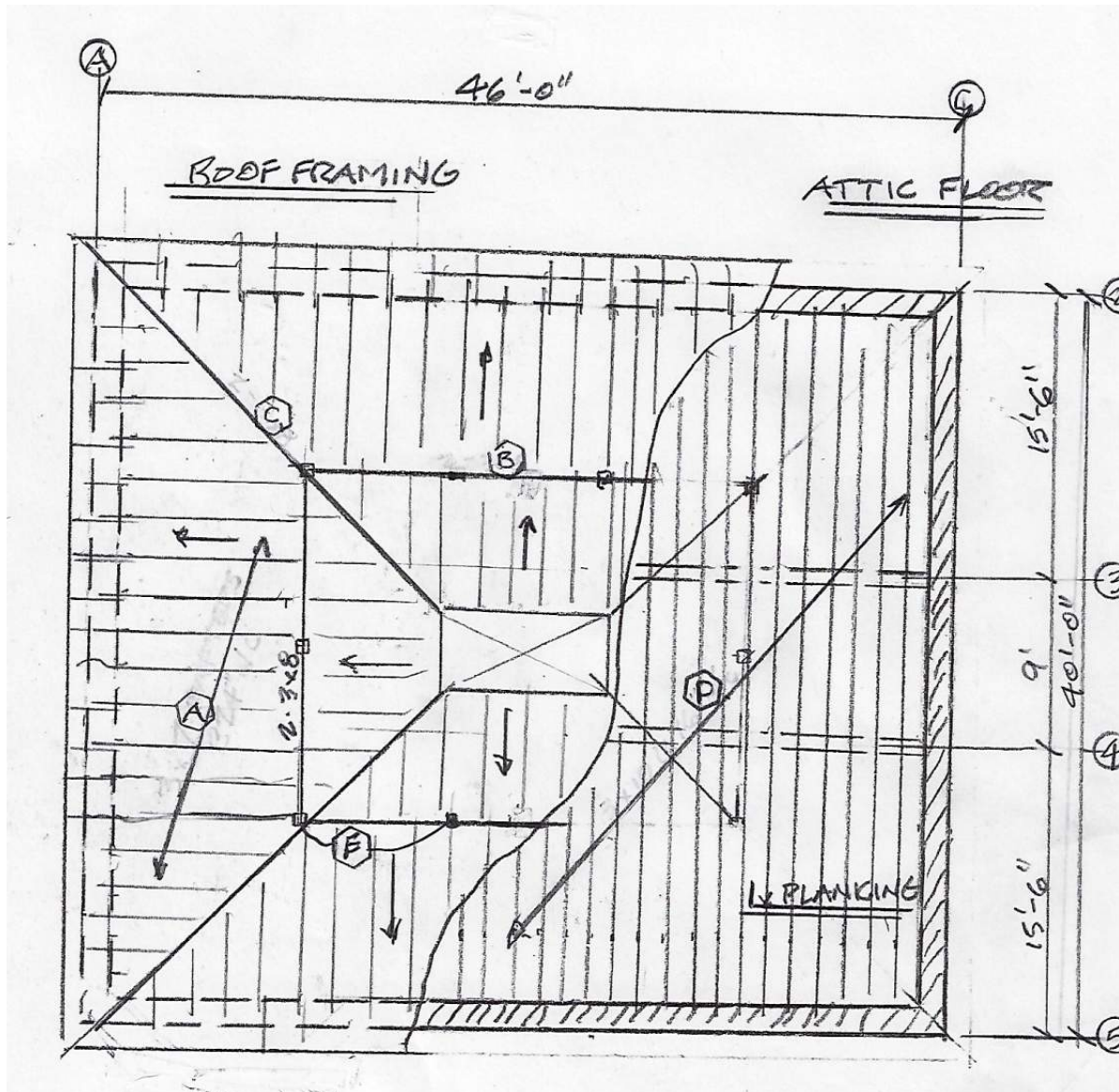
## UPPER FLOOR FRAMING PLAN

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	DESCRIPTION:	REFERENCE PLANS	BY:	TOM B
			SKETCH NO:	SK-3


- A - NOM.. 3 x 7 RAFTERS @ 24" O/C - TYP
- B - 2 - 3 x 8 GRIDERS ALL AROUND
- C - 2 - 3 x 8 HIPS - TYP. AIN FLOOR TO ROOF
- D - NOM. 3 x 10 ATTIC FLOOR JOIST @ 16" O/C - MATCHES 2nd FLOOR FRAMING
- E - DBL 3 x 7 POSTS FROM ATTIC FLOOR TO GIRDER (10)



## ROOF FLOOR FRAMING PLAN

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