



HURST-ROSCHE, INC.

**STRUCTURAL INSPECTION OF  
FORD HOUSE AT CEDARS OF  
LEBANON STATE PARK**

**HR # 194-1432**

**For**

**STATE OF TENNESSEE  
REAL ESTATE ASSET MANAGEMENT  
TENNESSEE TOWER, 24<sup>TH</sup> FLOOR  
312 ROSA L PARKS AVE.  
NASHVILLE, TENNESSEE 37243**

**JUNE 10, 2022**

**HURST - ROSCHE, INC.**

561 Murfreesboro Pike

Nashville, TN 37210

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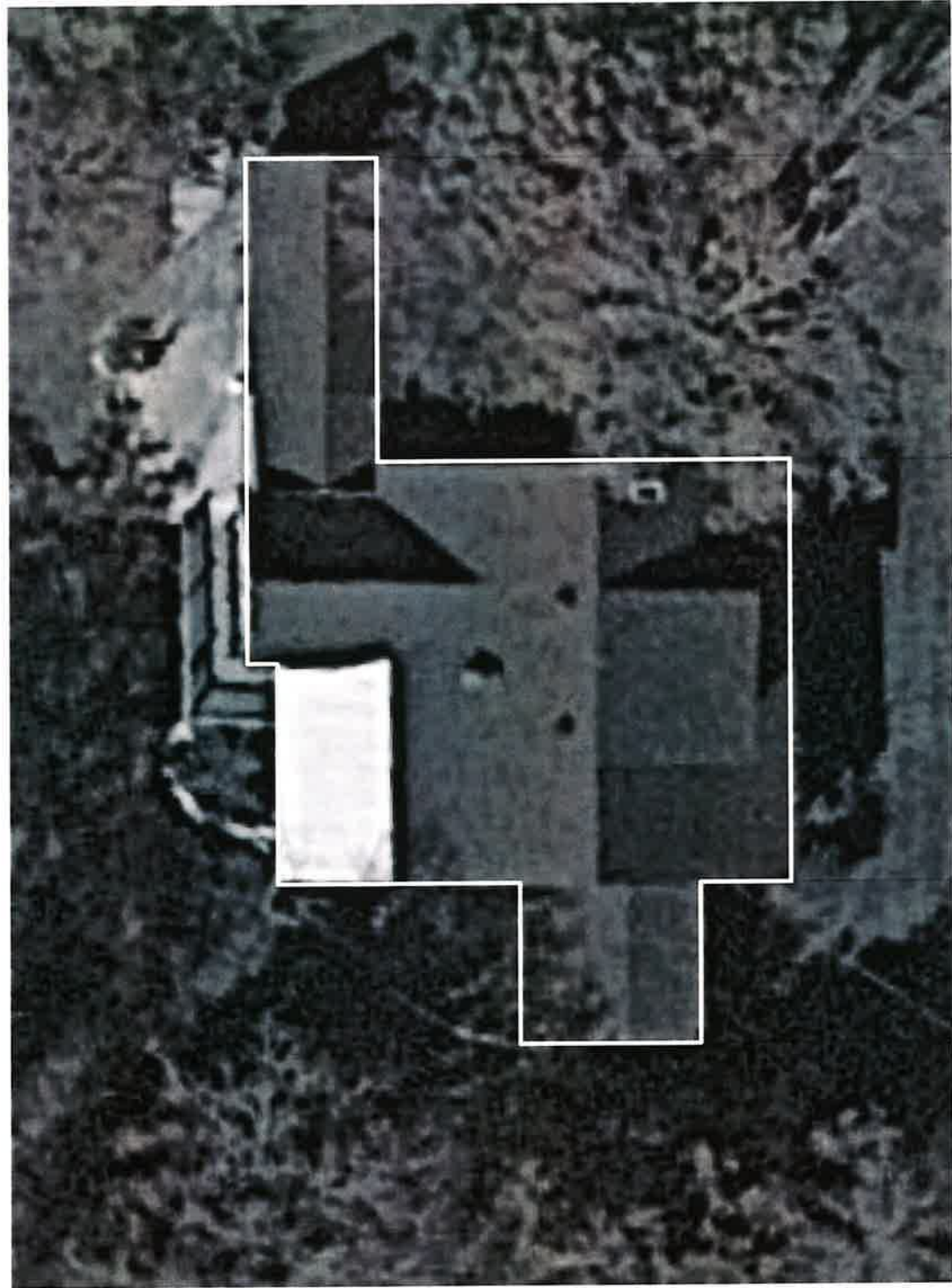


HR# 194-1432

**HR**  
 HURST-ROSCHE, INC.  
 561 MURFREESBORO PIKE  
 NASHVILLE, TENNESSEE 37210  
 PH: 615.454.6615  
PROFESSIONAL DESIGN NUMBER: 184-000298    © 2022 HURST-ROSCHE, INC.

Location Map  
 Ford House Structural Inspection  
 Cedars of Lebanon State Park  
 5220 Murfreesboro Road  
 Lebanon, Wilson County, Tennessee

SHEET NUMBER:  
**1**  
 DATE: 06/10/2022



HR# 194-1432



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Site Map

Ford House Structural Inspection  
Cedards of Lebanon State Park  
5220 Murfreesboro Road  
Lebanon, Wilson County, Tennessee

SHEET NUMBER:

2

DATE: 06/10/2022



Ford House Structural Inspection

## **INTRODUCTION**

### **PURPOSE**

The purpose of the on-site inspection was to view existing conditions of the foundation and attic, and to provide a preliminary structural assessment. Our inspection will describe any detected issues, as well as recommendations for repairs.

### **SCOPE**

The scope included limited observations of the foundation, front porch framing, 1<sup>st</sup> floor framing, and roof framing. Only those elements readily visible and accessible at the time of inspection were viewed and are addressed in this report. Any items causing visual obstruction including, but not limited to, furniture, floor or wall coverings, insulation, etc., were not removed or altered.

Although the inspection was completed by an engineer, this inspection should not be considered a formal engineering study since no calculations, structural analysis, or physical material testing was performed.

## **EXECUTIVE SUMMARY**

On May 16, 2022, Chase Connor PE, SE and John Caterino, PE of Hurst-Rosche, Inc. conducted an on-site visual inspection of the Sadie M. Ford House at Cedars of Lebanon State Park, 5220 Murfreesboro Road, Lebanon, Tennessee. Hurst-Rosche, Inc. were escorted by Nick Lewis from the State of Tennessee Department of Environment and Conservation; Lanette Phillips of STREAM; and Jeff Buchanan, Park Manager at Cedars of Lebanon State Park. It was a sunny day with a high of 78 F.

## **DESCRIPTION OF BUILDING**

The original building is a two-story residential farmhouse built in the 1920's. The roof structure consists of wood raised tie roof trusses and 2"x3¼" roof purlins spaced approximately 2'-0" bearing on wood stud load bearing walls. The top chord of the trusses extend approximately 9' beyond the interior support of the building. At the east elevation, the roof framing is supported by an unknown girder size on the exterior edge of the porch that transfers the load onto 4 exterior columns. The four columns transfer the load through the wood frame porch floor support onto continuous stone foundation. The porch framing consists of 2x8 and 2x6 wood members spaced at 1'-4" that also bearings on a continuous stone foundation and an interior main 2x8 wood girder support. The west portion of the building has a bump out kitchen area with a single web diagonal per side roof truss. The attic floor framing consists of 2"x8" at 2' spacing. The first floor framing consisted of 2"x7½" wood joists spanning from middle of the building to the exterior support. The middle support consists of built up wood members supported by individual stone piers at varying span lengths. The east building support consists of individual stone piers with a wood sill plate to transfer the first floor and attic framing loading. The west building support consisted of a continuous stone foundation with a wood sill plate to transfer the first floor and attic framing loading. The floor framing transfers load to stone foundation walls that span the perimeter of the building. Prior to the site visit, porch decking was removed, exposing the porch framing and foundation, and providing access beneath the main building. While on-site, Hurst-Rosche, Inc. was informed termite infestation remediation was performed approximately two years ago. Rehabilitations were observed throughout the building, but the design and timeline were unknown.

## **INVESTIGATION**

### **OBSERVATIONS**

#### *Foundations*

The exterior continuous stone foundation walls on the perimeter were observed to be in fair condition with a few localized cracks observed in the stone. No positive connections between the stone foundation walls and support framing were observed indicating a friction connection. The interior stone piers were in poor condition. Each pier was composed of varying size and thickness of stone creating an unusual load distribution on each pier. In some instances, the load distribution has created significant cracks in the individual stones made up of the pier. It appears that one pier near the south end has collapsed due to the lack of connection between each individual stone and between the pier and support framing. In addition, rehabilitation efforts were observed with multiple steel posts sitting on a single stone or two foundation pier.

The single stone foundation was observed to be small in size and without a positive connection. No positive connections between the support framing and stone piers were observed nor between individual stones in the same pier indicating a friction connection.

#### *Front Porch Framing*

Without the wood decking, the porch framing was observed to be in poor condition. The floor joists spanning approximately 18' were rehabbed at some point, but both members were observed with section loss due to deterioration. The original joists were observed to have as much as 80% section loss, leaving the 2x6 reinforcing joists to carry most of the load. The reinforced member added to the original joist was observed to have as much as 50% section loss. The main girder spanning 6' supporting the floor joists at the center of the porch was observed to have as much as 25% section loss. Both termite and water damage were visible on the wood framing as probable cause of the deterioration. Deflection of approximately 1.5" was observed at the wood sill member of the east entrance near the front door of the building. The wood sill member spans approximately 3' between the stone piers. With removal of the porch deck, it was observed that most of the contact area for the bearing support of the four exterior columns have been reduced. The southern most column was observed with significant section loss at the base of its column. The amount of deterioration of this column at its base has even created a loose connection at its base. Based on this deteriorated supported, the main girder running over the top of the exterior columns that also supports the roof framing has deflected significantly.

#### *1<sup>st</sup> Floor Framing*

Floor joists beneath the main building were observed to be in fair condition. Floor deflection was measured from above in varying degrees from 1.2° to 2° over a 4' level perpendicular to the joist span throughout the building. Based on observations, these deflections appear to be based on their supports more than the joist itself. The east wood sill plate between the porch and main building has deteriorated with major section loss and developed major deflections between individual piers. Section loss of an estimated 20% of the joists was observed from probing on the wood joists. It shall be noted that some areas were inaccessible under the 1<sup>st</sup> floor access. Rehabilitated framing consisting of steel circular jack posts and 4x4 wood member supporting the midspan of the floor joists were observed to be in good condition; it is unknown why they were installed. At the southwest location only one steel column support is used, and the support frame utilizes a cantilever beam action to aid in the load transfer.

#### *Roof Structure*

Structural deficiencies such as extreme deflection, warping, out of plane movement, etc. were observed on 40% of the main roof trusses. As part of these structural deficiencies, connections were observed to have loosened, torqued, or cracked at a few locations. The framing has overall deflected towards the southeast portion of the building, but it has more than likely occurred due to the deterioration of the southern most exterior porch canopy. Water staining was observed on the roof deck and framing members, but active leaks were not observed along with low moisture content readings. Roof trusses near the intersection with the kitchen roof structure have warped a considerable amount. Rehabilitation efforts have occurred with unknown reason or cause. In one instance where a support frame was installed under the bottom chords of the truss, significant bowing has occurred under the rehabilitation columns. In addition, it did not appear that the load transfer of the new columns was accounted for under the rehabbed structure.

### *Miscellaneous*

The northeast chimney was observed to have a significant amount of mortar missing above the roof line. The mortar below the roof line was observed to be in fair condition.

Based on observations in the attic, water has the ability to penetrate the building's envelope due to the observed gaps around window frames and chimney penetrations.

## **CONCLUSIONS**

### *Foundations*

The cracking in the exterior stone foundation may be repaired for strength, but to also prevent water infiltration. The crack may widen going through freeze-thaw cycles developing into a bigger problem in the future. The individual stone pier foundation warrants for a bigger concern. Due to the varying thickness, load distribution per stone per pier may concentrate loads to a small contact area that develops into a stress crack. In addition, the interaction between each stone on their individual pier is connected through friction only. As lateral forces are applied to the pier, the strength of the entire pier is reliant on the interaction between the stones. Similarly, with a positive connection between the pier and wood sill plate, the lateral strength of the building is solely reliant on the friction of these two members also. The rehabilitation foundation creates a high bearing pressure on the soil due to its small dimensional size. In addition, 2015 International Building Code recommends at least a 16 inch thick rubble stone foundation per Section 1807.1.3.

### *Front Porch Framing*

The floor joists have deteriorated to a condition that full designed replacement would solve a lot of structural deficiencies in the floor framing. Proper positive connection and full size loading contact area between the column base and stone foundation shall be installed to maintain structural stability of the structure and maintain a direct load path. In addition, the southern most column has deteriorated to a condition that requires replacement. With the deterioration of the southern most canopy, the main girder support over the columns and the three remaining columns have increased their load from original construction. In the instance of the main girder, it has exhibited extreme deflections on the south end. It would be important to expose this girder and the remaining columns to ensure of their structural integrity. Prior to replacement, it would be important to raise the attic structure to an adequate bearing height to account for the deflection/sag that has occurred due to this structural deficiency.

### *1<sup>st</sup> Floor Framing*

The wood sill plate on the east bearing wall has deteriorated beyond repair and requires complete replacement. This installation would be necessary prior to the porch floor framing replacement and would also require temporarily jacking the first floor joists up to the correct and uniform bearing heights. Floor joists that indicate significant section loss shall require reinforcement with addition of 2x wood member bridging the deteriorated joist area. Rehabilitation framing with only 1 column shall be redesigned for two/three columns to create a more redundant load path along with positive connections.



### *Roof Structure*

Roof trusses with observed structural deficiencies shall be reinforced by increasing its strength with a similar wood member connecting to itself. The structural deficiencies may have been due to deterioration due to water, extreme, or even improper design. As part of the rehabilitation, any observed connections shall be properly reconnected with appropriate connections suggested by 2015 IBC. In addition, previous rehabilitation efforts that give the structure a different load path such as the bottom chord stability with a wood support, shall be reexamined and reinforce the structural deficient members rather than realigning the load path. It is important to note that the porch frame column and reestablishing proper bearing heights shall occur first prior to attic framing reinforcement.

### *Miscellaneous*

The masonry chimney in its current condition is a major safety hazard and requires immediate attention to repoint the brick above the roof line to prevent falling brick onto the ground. It is also important to perform building maintenance by adding caulk around openings to the entire envelope of the building to prevent water infiltration.

## **RECOMMENDATIONS**

As discussed on-site, the brick chimney, porch framing with wood sill and column supports are immediate issues and are recommended for temporary support to continue occupancy of the building.

Furthermore, the following are recommendations for the structure to be completed immediately:

- Individual stone piers shall be replaced with load bearing CMU pier. This may include leaving the stone pier in place with adding fully grouted CMU pier in between existing piers.
- Replace wood sill on the east side of the main building. Align joists to proper bearing heights with new CMU supports prior to replacement of wood sill.
- Add positive properly designed connections from the building structure to the foundation to allow for proper transfer of lateral loads.
- Replace the porch joist framing.
- Replace the southern most exterior column support. In addition, provide proper bearing connections for all four columns to the foundation. The main girder and 3 northern most columns shall be exposed for further assessment. Prior to installation, the attic framing shall be set back to the proper bearing height.
- The masonry chimney shall be repointed above the roof line.

In addition, the following are recommendations for the structure to be completed during regular maintenance periods (estimated 1-2 years):

- Repair of cracks on the continuous exterior continuous stone foundation.
- Replacement of the foundation of the rehabilitation framing of the 1<sup>st</sup> floor joists that are properly designed and anchored.
- 1<sup>st</sup> floor joists that exhibit deterioration shall be reinforced to bridge the full section members together.
- Rehabilitation framing on the southwest portion shall install an additional column or two.

- Roof trusses with structural deficiencies shall be reinforced.
- Roof truss connections shall be attached properly.
- Rehabilitated framing in the attic shall verify its proper design or remove and reinforce structural members to maintain correct load path.
- Add caulking around openings in the building to prevent water infiltration into the building envelope.

## **DISCLAIMER**

Conclusions offered in the accompanying report are based upon observations and information available, known and declared at the date of our investigation and/or during the preparation of this report. The investigation and report are limited to the condition of the building structure as noted. Other hazards, including, but not limited to, environmental, lead paint, asbestos, architectural, electrical, and mechanical are beyond the scope of this investigation and are not addressed in the report. In the event that any additional information, fact, or evidence is revealed after this letter is issued, Hurst-Rosche, Inc. reserves the right to revise our conclusions. The report and its attachments are furnished as a privileged and confidential document to the addressee. Release to any other company or individual is solely the responsibility of the addressee.

Prepared by: Hurst-Rosche, Inc.



Chase Connor, S.E., P.E.



**ATTACHMENT A**

**PHOTOS**

**Ford House at Cedars of Lebanon State Park**



Photo No. 1. Overall building.



Photo No. 2. Exterior east elevation.

**Ford House at Cedars of Lebanon State Park**



Photo No. 3. Northwest elevation.



Photo No. 4. Individual stone piers at interior support.

## Ford House at Cedars of Lebanon State Park



Photo No. 5. Individual stone pier foundation at interior support.



Photo No. 6. Stone pier with crack.

## Ford House at Cedars of Lebanon State Park



Photo No. 7. Stone pier that has fallen over.



Photo No. 8. Individual stone piers on east portion of building.

**Ford House at Cedars of Lebanon State Park**



Photo No. 9. Cracks developed in stone pier.



Photo No. 10. Porch joist framing.



**Ford House at Cedars of Lebanon State Park**



Photo No. 11. Section loss in front porch framing.



Photo No. 12. Improper supported column base.

**Ford House at Cedars of Lebanon State Park**



Photo No. 13. Closeup of column base.



Photo No. 14. South column of porch framing.

**Ford House at Cedars of Lebanon State Park**



Photo No. 15. Base at south column of porch framing.



Photo No. 16. Main girder over column supports observed deflection.

**Ford House at Cedars of Lebanon State Park**

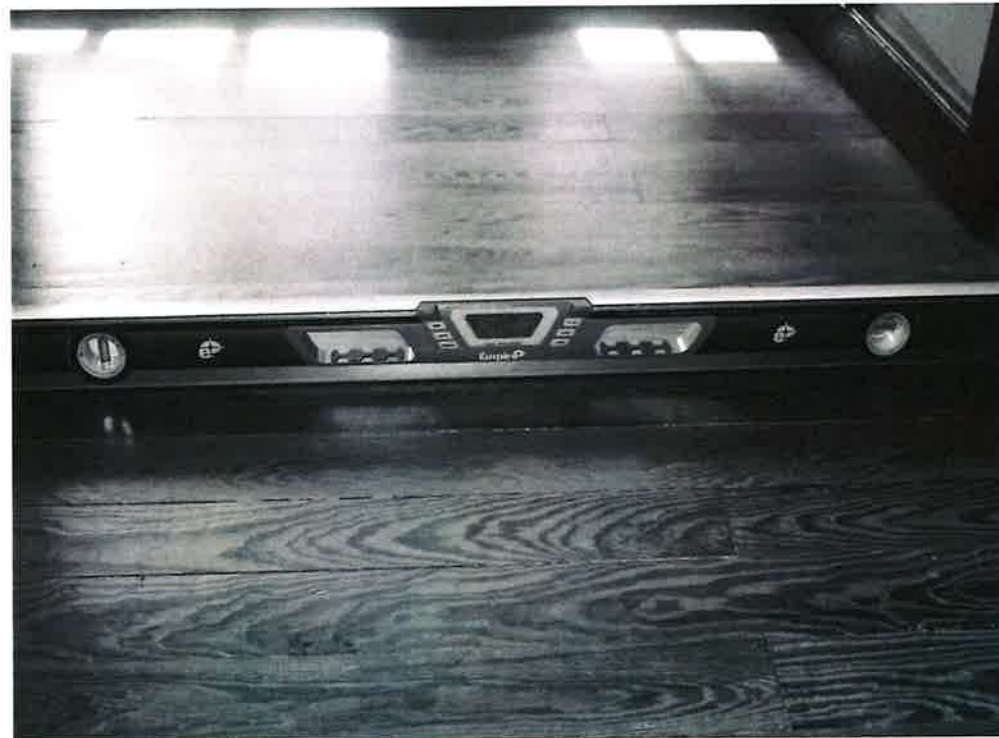


Photo No. 17. 2-degree slope in first floor near east elevation running north to south.



Photo. No. 18. Cantilever rehabilitation support with small foundation.

**Ford House at Cedars of Lebanon State Park**



Photo No. 19. Typical truss chord rehabilitation.



Photo No. 20. Truss rehabilitation with differential load path.

Ford House at Cedars of Lebanon State Park



Photo No. 21. Water staining at current members with chimney penetration.



Photo No. 22. Connections at bracing with gaps.

Ford House at Cedars of Lebanon State Park



Photo No. 23. Porch ceiling framing changes size midspan.



Photo No. 24. Porch ceiling framing with cracks at midspan.

Ford House at Cedars of Lebanon State Park



Photo No. 25. Rehabilitation framing with redistribution of load.



Photo No. 26. Gap at connections of roof trusses.



Ford House at Cedars of Lebanon State Park



Photo No. 27. Warped bottom chord of roof trusses.



Photo No. 28. Warped top chord of roof truss near framing above kitchen.

**Ford House at Cedars of Lebanon State Park**



Photo No. 29. Typical warped truss webs above kitchen area.



Photo No. 30. Rehabilitation frame for attic truss that redistributes load path.

**Ford House at Cedars of Lebanon State Park**



Photo No. 31. Crack in wall beneath attic.



Photo No. 32. Brick chimney with mortar degradation.

**Ford House at Cedars of Lebanon State Park**



Photo No. 33. Typical gap around openings.

**ATTACHMENT B**

**FLOOR PLANS**

APPROX. LOCATION OF  
PREVIOUS REHAB, TYP.

BLDG  
ADDITION,  
TYP

LOCATION OF  
COLLAPSED PIER

COLUMN TO BE  
REPLACED

2" x 7 3/4" JOISTS @ 2'-0" O.C.

2" x 7 3/4" JOISTS @ 2'-0" O.C.

INDIVIDUAL STONE PIER, TYP.

CONTINUOUS STONE  
FOUNDATION WALLS, TYP  
AROUND PERIMETER

2"x8" & 2"x6" - NOMINAL @ 1'-6" O.C.

MAIN BUILDING

FRONT  
PORCH



HR# 194-1432



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Existing 1st Framing Plan

Ford House Structural Inspection  
Cedards of Lebanon State Park  
Lebanon, Wilson County, Tennessee

SHEET NUMBER:

**B1**

DATE: 06/10/2022

ROOF TRUSSES @ +/- 2'-0"  
O.C. ABOVE KITCHEN

BLDG  
ADDITION,  
TYP

MAIN ROOF TRUSSES @ +/- 2'-0" O.C.

DEFLECTED MAIN GIRDER

REHAB FRAME

COLUMN TO BE REPLACED



HR# 194-1432



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Existing Roof Plan

Ford House Structural Inspection  
Cedards of Lebanon State Park  
Lebanon, Wilson County, Tennessee

SHEET NUMBER:

**B2**

DATE: 06/10/2022

**ATTACHMENT C**

**COST ESTIMATES**





Ford House Structural Inspection  
 HR # 194-1432  
 Cost Estimate

CALC: JJC  
 CHECKED: CJC

DATE: 06/03/22  
 DATE: 06/07/22

Estimate of Cost - Immediate Repairs				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	COST
Earth Excavation	2.00	yd <sup>3</sup>	\$200.00	\$400.00
CMU Foundation Supports	6.00	Each	\$400.00	\$2,400.00
Jacking for Proper Bearing Heights				
- 1st Floor	1	LS	\$3,000.00	\$3,000.00
- Roof Structure	1	LS	\$5,000.00	\$5,000.00
Porch Framing				
- 2x wood sill	84.00	foot	\$12.00	\$1,008.00
- 2x wood floor joists	108.00	foot	\$12.00	\$1,296.00
- 2x wood girder	6.00	foot	\$12.00	\$72.00
- 8x8 wood column	32.00	foot	\$35.00	\$1,120.00
- 2x wood decking	180.00	ft <sup>2</sup>	\$15.00	\$2,700.00
- Proper Column Base Connection	4.00	Each	\$500.00	\$2,000.00
Masonry Repointing on Chimney	30.00	ft <sup>2</sup>	\$100.00	\$3,000.00
Foundation Base Connections	27.00	Each	\$250.00	\$6,750.00
Temporary Support for Columns	1.00	Each	\$2,000.00	\$2,000.00
Temporary support for Floor Structure	1.00	Each	\$1,500.00	\$1,500.00
Mobilization	1.00	LS	\$5,000.00	\$5,000.00
			15% Contractor O&P	\$4,836.90
<b>IMMEDIATE REPAIRS TOTAL</b>				<b>\$42,082.90</b>

SUBTOTAL \$42,082.90  
 Debris Haul Away Lump Sum \$5,000.00  
 10% General Conditions \$4,708.29  
**TOTAL \$51,791.19**

Notes:  
 1. Capital outlay does not include contingency A/E design fees.



Ford House Structural Inspection  
 HR # 194-1432  
 Cost Estimate

CALC: JJC  
 CHECKED: CJC

DATE: 06/03/22  
 DATE: 06/07/22

Estimate of Cost - Regular Maintenance Periods				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	COST
Earth Excavation	6.00	yd <sup>3</sup>	\$200.00	\$1,200.00
CMU Foundation Supports	14.00	Each	\$400.00	\$5,600.00
Joist Reinforcement	10.00	Each	\$400.00	\$4,000.00
Remove Truss Support Frames	2.00	Each	\$750.00	\$1,500.00
Roof Truss Top Chord Reinforcement	35.00	Each	\$50.00	\$1,750.00
Foundation Crack Repair	20.00	Each	\$80.00	\$1,600.00
Proper Foundation for Rehab Framing	6.00	Each	\$250.00	\$1,500.00
Column Addition to Rehab Framing	2.00	Each	\$250.00	\$500.00
Roof Truss Connection Repair	20.00	Each	\$50.00	\$1,000.00
Caulking of openings	250.00	Foot	\$12.00	\$3,000.00
Mobilization	1.00	LS	\$5,000.00	\$5,000.00
			15% Contractor O&P	\$2,107.50
			<b>ADDITIONAL REPAIRS TOTAL</b>	<b>\$28,757.50</b>

SUBTOTAL \$28,757.50  
 Debris Haul Away Lump Sum \$5,000.00  
 10% General Conditions \$3,375.75  
**TOTAL \$37,133.25**

Notes:  
 1. Capital outlay does not include contingency A/E design fees.