507 FOURTH STREET SW
STRUCTURAL ASSESSMENT
FOR THE CITY OF ALBUQUERQUE

APRIL 29, 2010

SMPC ARCHITECTS

SMPC Architects
PRINCIPLES OF DESIGN.

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PRINCIPLES OF DESIGN.

EXECUTIVE SUMMARY

This former home at 507 4th street was probably constructed between 1905 and 1919 and has been vacant for many years. The 1,091 square foot house needs to be repaired and protected from the elements and continued vandalisms to curb (or slow down) its continued deterioration. Parts of this report are intended to give the City of Albuquerque estimated probable cost of construction and some guidelines to make necessary structural repairs to stabilize the building to be used as a residence.

The house should be repaired to retain its exterior historic characteristics. Important items include the stone foundation, brick walls, wood headers, sills and trim, roof line and gables. The fire damaged areas and west wall are away from the street, not readily visible and may be changed, modified or even covered with an addition to help make the structure usable as a home. This addition would lend itself to include kitchen and bathrooms since the house has no working plumbing. The interior has little left of historic value. A new interior structural furring wall would be ideal to run new electrical and insulation.

Several trips were made to the site with representatives from the City of Albuquerque, Bacchus Consulting Engineering and the Jaynes Corporation to observe the condition of the house and review options for repairs. The report for structural repairs is attached. Also attached on the last page is a summary of cost for these repairs.

It should be noted that additional improvements will need to be made to make the structure usable. The house should be made weather-tight and needs to be reroofed and re-flashed. Windows will need to be replaced by similar styled windows which would be double hung insulated wood units. The existing front door and frame needs to be repaired and new doors provided throughout. New utility connections, sitework, HVAC, plumbing, electricity and interior finish work will be required. The cost of these improvements is not included this report.

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Albuquerque - Official City Website

Address Query

Search Results

The following address was the closest match:
507 4TH ST SW

City Council District: 3 - BENTON
County Commission District: 2 - Art De La Cruz
NM House of Representatives: Miguel P. Garcia **NM Senate:** Gerald P. Ortiz y Pino

School Districts
Elementary: DOLORES GONZALES **Middle:** WASHINGTON **High School:** ALBUQUERQUE

Neighborhood Association:BARELAS
Sector Plan:BARELAS

Zoning: SU-2 **Zoning Description:** NCR

City Platting Information
Lot: 1A **Block:** N Subdivision: ATLANTIC & PACIFIC ADDN

Flood Zone:
Flood Zone: X
For questions about floodplain information, please contact the COA Floodplain Manager at 924-3986 - bbingham@cabq.gov

Police Beat / Area Command: 224 / VALLEY
Jurisdiction: ALBUQUERQUE **Zone Atlas Page:** K14 (opens in new window)

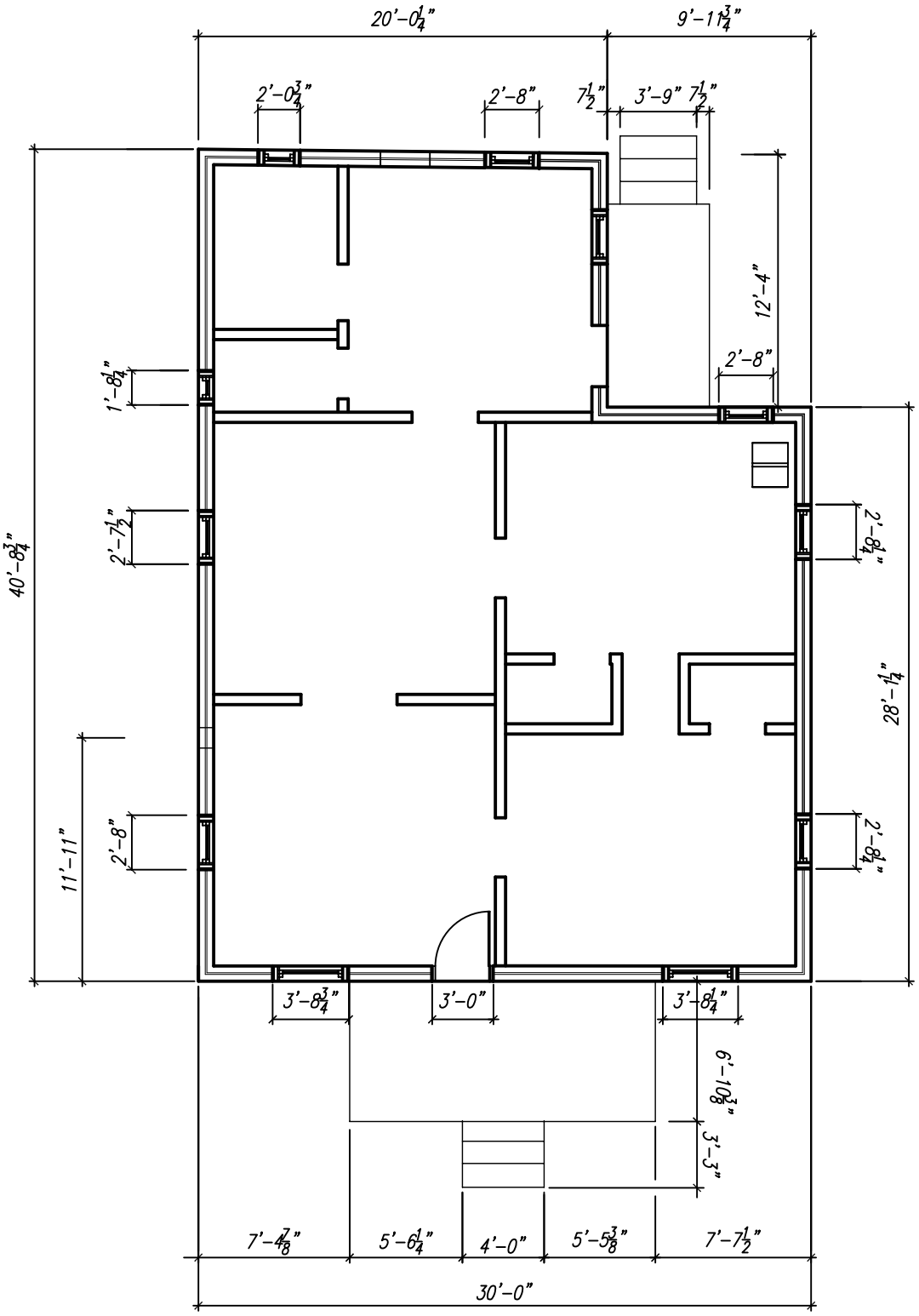
Ownership Data from Bernalillo County Assessor
(County Assesor data updated to December 2008)
Name: CITY OF ALBUQUERQUE
Address: PO BOX 2248 , ALBUQUERQUE NM 87103
UPC: 101405713827220408
Tax Year: 2009 **Tax District:** A1AM
Legal Description: LT 1-A BLK N PLAT OF LOTS 1-A, 5-A & 9-A ATLANTIC & PACIFICADDITION CONT .0878 AC
Property Class: R **Document Number:** 2008051371 050508 WD-E
Lot Size: Call 505-222-3700 or visit Bernalillo County Assessor's website

Estimated Acres: 0.1
Disclaimer:County Assessor data and Acres are not maintained by the City of Albuquerque and should never be used for legal purposes.

Open Advanced Map Viewer in a new window

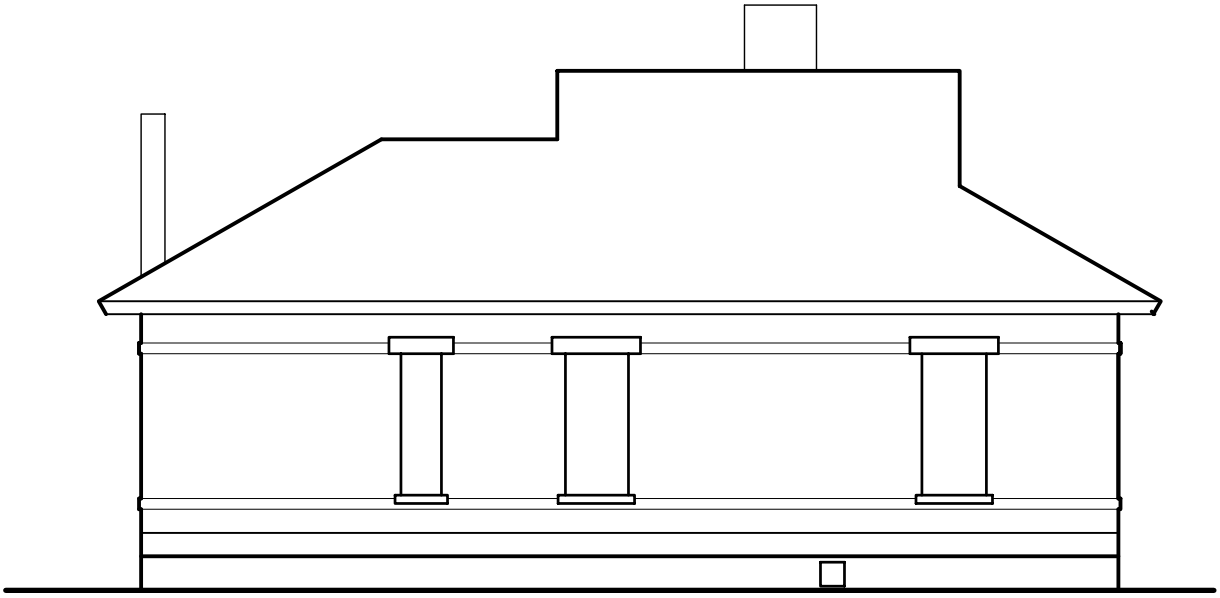
» New Address Search


COAL
SU-2
SU-2
4TH



NORTH

FLOOR PLAN
1/8"=1'-0"

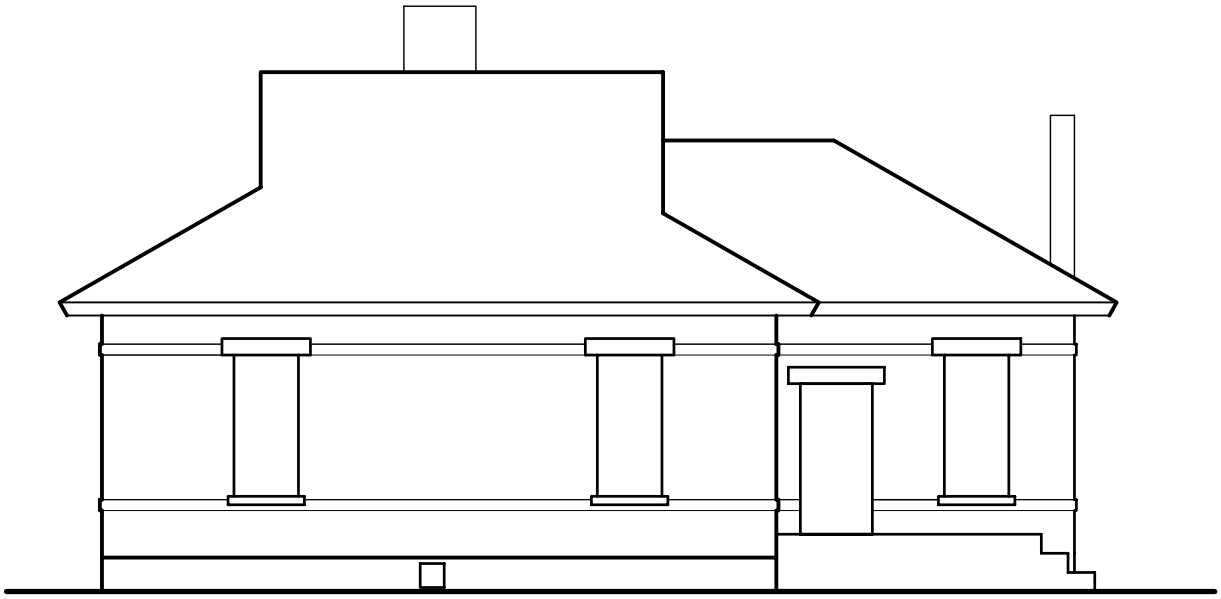


SOUTH FACADE

EAST FACADE

ELEVATIONS

1/8"=1'-0"

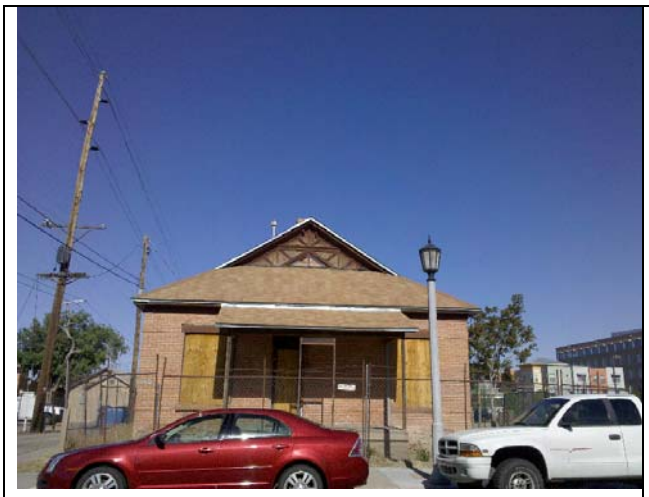


NORTH FACADE

WEST FACADE

ELEVATIONS

1/8"=1'-0"



Street View

East Facade.

Southeast Facade

South Facade

Southwest Facade

Norhtwest facade

North Facade

Fire damage at northwest porch

Typical stone foundation comprised of various stones with eroding mortar

Front porch roof deck

Window header fire damage at northwest facade

West façade, bowed horizontally and vertically

Interior at southeast

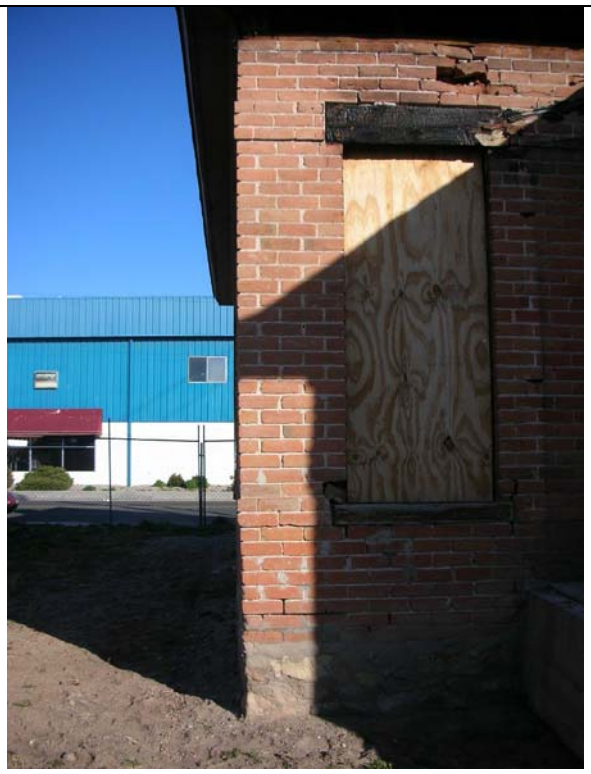
Interior brick flue, fire damaged bottom chords removed

Interior - north

Interior- northwest

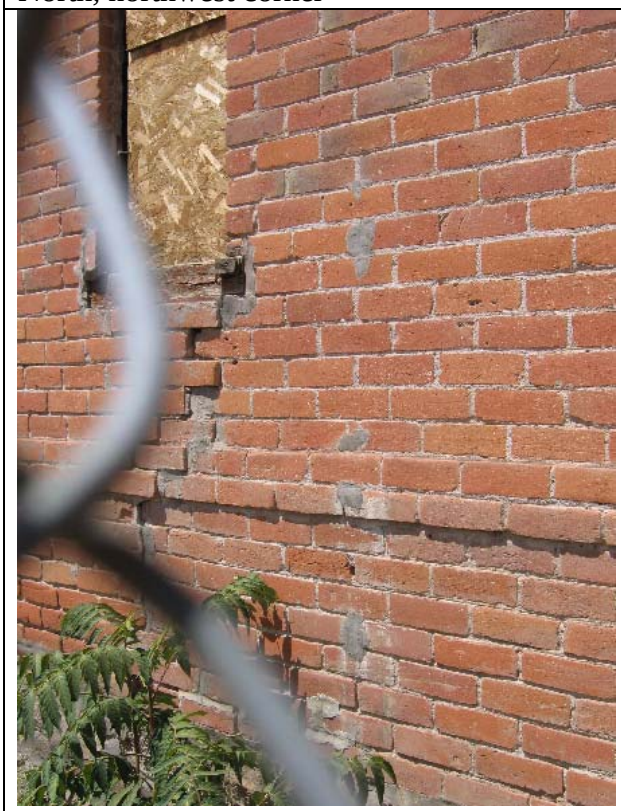
North wall

Brick and mortar erosion



North, northwest corner

Interior to exterior wall



South Facade

West Facade

BACCHUS
CONSULTING
ENGINEERING

Charles Bacchus, PE, PhD
David Vasquez, PE, MSCE

STRUCTURAL EVALUATION
UNOCCUPIED HOUSE AT 507 FOURTH STREET SW
ALBUQUERQUE, NEW MEXICO

INTRODUCTION. This is the report of a limited structural evaluation plus recommendations for repairs / modifications for a house located in southwest Albuquerque. It is currently unoccupied and in its current condition is not suitable for occupancy. The primary purpose of this evaluation is to determine if the house can be economically renovated/ rehabilitated for use as a residence. The evaluation described in this report consisted of visual inspection of the house followed by an analysis of the structure of the house. The analysis is based on field observation and measurement of structural members. No tests were made of the structural members to determine their material properties. The material properties used in the structural analysis are estimates based on known values of materials used at the time the house was constructed. The drawings which accompany this report were prepared by personnel of SMPC Architects.

The information contained in this report is not sufficient to serve as the basis for renovation of the house. If the decision is made to renovate the house, complete structural construction documents based on the recommendations contained in this report plus construction documents of other design disciplines (Architectural, Mechanical, Electrical) will be required.

At one time, the house was served with water/sewer, electricity and gas but these are now inactive. Before the house can be restored to use, these utilities must be restored but a discussion of that process is beyond the scope of this report.

DESCRIPTION OF STRUCTURE. The house is of single story construction with a shallow crawl space and a pitched roof. The roof and floor are constructed of wood; the walls are double wythe brick cavity walls; the foundation (other than two porches which were added later) consists of irregular rock with mortared joints. The foundation and floor slabs of the porches are of cast-in-place concrete.

The original house was apparently built in the 1920s. Its plan dimensions are approximately 40' 8" (east-west) x 30' 0" (north-south) with a notch measuring approximately 12' 6" (east-west) x 8' 0" (north-south) at the northwest corner. The finish floor of the building is approximately three feet above the surrounding grade. The east side of the building faces south Fourth Street.

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At some time after the original construction, enclosed porches were built along the east wall and in the notch at northwest corner.

The porch along the east wall is centered on the wall and measures approximately 10' 0" (east-west) x 15' 6" (north-south). Steps leading to the porch are located along the east side of the porch and are centered on it. Based on the remaining construction, the porch had studs spaced at approximately 16 inches on center with screen wire on their faces.

The porch in the northwest corner measures approximately 9' 0" (east-west) x 5' 6" (north-south) and has steps on the west side. The superstructure of this porch was at some time destroyed by fire.

STRUCTURAL ANALYSIS.

Roof Framing. The roof framing consists of 2 x 4 (actual size) joists spaced at approximately 24 inches on center with 1 x 12+/- sheathing members spanning perpendicular to the joists. The sheathing members are positioned so that there is a space of approximately 2 inches between adjacent members. The original roofing consisted of cedar shingles which can be seen from inside the building between the sheathing members and also on the east and west sides of the building where there is a discontinuity in the roof slope.

At some time, asphalt / composition shingles were placed over the cedar shingles. These shingles appear to be in relatively good condition except at some locations around the perimeter of the roof where there has been some damage to both the fascia framing and the shingles. Each area of the new shingles appears to be in a plane indicating that a layer of sheathing such as plywood or OSB may have been placed over the original cedar shingles before the new shingles were installed. However, there is no positive indication that such a layer exists.

The roof rafters are typically are supported on short (approximately 1 foot high) wood stud wall which is supported by the exterior walls. The connection between the roof joists and the stud wall was made by toe-nailing. At best, this connection is questionable and strengthening will be will be required if the house is renovated.

There are few diagonal braces spanning from the roof joists to the tops of some of the interior partitions. However, there are only a few of these quasi-trusses and the diagonal bracing members are not interconnected so that there is a significant possibility of buckling of the diagonal members under significant loading.

There are ceiling joists, again full size 2x4s, which bear on the interior partitions and on the exterior walls. These joists provide a tension tie between the roof joists and should not be removed without careful consideration and replacement by other members to duplicate their function. Even if the ceiling joists are left in place, the connections between the ceiling joists and their supports and between the ceiling joists and the roof rafters are suspect and should be reinforced.

The analysis of the roof framing system was concentrated on the roof joists. In making the analysis, the connections between the various members were assumed to be adequate to transfer the calculated forces from one member to another as necessary. Standard structural analyses were made for two different sets of loads: one set an (approximation) of the loads, both dead and live, which are calculated to be actually imposed on the structure; the other set the loads required by the building code which are rightfully required to be more conservative than the actual expected loads.

In both cases, the roof joists were determined to be significantly overstressed, particularly when the loads mandated by the building code were applied.

However, the roof structure does not exhibit any major distress.

There are at least three possible explanations for this result.

First, the loads used in the analysis, although less than those mandated by the building code may still be greater than those which have actually been imposed on the structure.

Second, the joists may have been made from higher quality wood than was assumed. The properties used were based on experience in this type of construction, although intentionally conservative values were used.

Third, a more sophisticated structural analysis of the type not often used in this type of construction may change the results. Included in this category are stiffened plate and shell structures. This type of analysis is time consuming and is almost never justified in the analysis of the structure of a house, particularly when there is no knowledge of the material properties of the various structural elements which make up the system and there is uncertainty regarding the adequacy of the connections which join the system elements.

Exterior Walls. The exterior walls of the house are double wythe brick with a total thickness of approximately 10 inches resulting in a cavity with a width of approximately 2-3/4 inches. If the cavity in this type of wall is filled solidly with grout of an appropriate type or if the two wythes are connected with mechanical ties of a specified type at the specified spacing, the wall may be considered to be a composite wall of the appropriate thickness. In this case, there is no connection between the two wythes except at the top and bottom of the wall and those connections are questionable. The wall must therefore be analyzed as a cavity wall.

The walls were constructed using lime mortar, that is, mortar which contains no portland cement. Lime mortar does not add to the strength of the wall but only provides a good bedding for the brick.

In some cases, brick units have been removed, either intentionally or otherwise, from the exterior wythe of the wall. The resulting gaps should be filled with a brick with properties comparable to those of the original brick using lime mortar with properties comparable to the properties of the original lime mortar used. The use of brick of the type now used with portland cement based mortar could result in additional damage to the wall.

There has been cracking in many areas of the wall, some of it structurally significant. Some of the cracking has been caused by loads, primarily wind loads. Some has been caused by differential settlement. All of the cracks should be filled with lime mortar; in more serious cases it may be necessary to remove and replace the brick adjacent to and crossing the crack, again using lime mortar.

There has been some bowing of some of the walls. It may be possible to construct an addition to the house on the west side which, if properly detailed, could be used to support to exterior wythe but this is not a practical solution for all of the exterior walls.

Other procedures may be used to strengthen and stiffen some of the other exterior walls but they are typically expensive; their cost may exceed the benefits which might be derived.

The walls are the structural element which requires the most work and, with the exception of the foundation, will be the most difficult and expensive to renovate. Nevertheless, unless the walls are adequately strengthened and stiffened, occupation of the house is not possible.

Interior Walls / Partitions. The interior partitions are typically constructed of 2x4 stud framing with 1x2 wood laths running horizontally and spaced at approximately 2-1/2 inches on center. Originally there was a plaster coating on the laths but in many cases it has been removed. Nevertheless, the interior partitions are a strong and stiff structural element, although they were probably not intended to be a part of the structural system.

If so desired, it should be possible to remove and or relocate some of the partitions but this should be done with care and alternate structural elements provided.

Floor Framing. The floor (with the possible exception of the interior partitions) is the strongest structural element in the house. The floor joists are 2x12s spaced at 16 inches on center with a span of approximately 14 feet. The decking consists of 3/4 inch x 4 inch tongue and groove hardwood spanning perpendicular to the joists. Usually in this type of construction there is a subfloor consisting of plywood or OSB sheets or, more commonly at the time this house was constructed, 1x planks running diagonally to the joists. In this case there is no subfloor.

Nevertheless, our analysis indicates that the floor has a load capacity well in excess of that required. The only significant problem could be a large concentrated load acting between the joists.

There is some curling of the hardwood flooring. It will be necessary to sand the sheathing during refinishing operations and this should remove the curling although it will probably be necessary to renail the flooring in some areas and it may be desirable to renail the floor throughout.

Foundations. The original foundation for the house consists of natural boulders in mortar beds. The depth of embedment is not known. With this system, there is no possibility of reinforcement. There has been some cracking of the mortar joints at various places indicating possible differential settlement or possibly wracking loads such as those which might be caused by wind.

In a few places, there has been some pointing of some of the mortar joints using what appears to be a portland cement based mortar. The pointing may be structurally adequate but it is unsightly.

If considered necessary, either now or in the future, the foundation could be reinforced by the construction of a reinforced concrete wall around the perimeter of the structure. Depending on the extent of the reinforcing in the wall, that is, will it be necessary to tie the new wall to the existing foundation, this construction of the new wall could be relatively inexpensive. However, it would change the appearance of the building. With a limited budget, there are several other repairs which take precedence but the foundation wall should be observed periodically to insure that there is no degradation in its appearance.

Porches. As noted above, two porches for the building were added at some time after the original construction. The superstructure of one of these was destroyed by fire at some unknown time. The foundations and floor slabs of these porches are constructed of concrete, probably with little or any reinforcing.

The superstructures of these porches could be restored to their original condition but the overall appearance of the house would be different than at the time of the original construction.

RECOMMENDATIONS FOR MODIFICATIONS. With significant rehabilitation and strengthening, this building can be restored for use as a residence.in accordance with the requirements of the International Existing Building Code. Structural rehabilitation must be sufficient to insure that the structure can resist without damage the normal loads specified for residential construction and can resist without collapse significant overloads. Without major renovation and major cost, the building cannot be made to meet the requirements of the International Building Code for new construction. Unless those requirements are satisfied, the building cannot be used as other than a residence.

Changes which are made must be carefully considered and implemented to avoid making adverse changes to the structural load path. Examples of changes which should be carefully considered include changes to the interior partitions or to exterior brick walls.

The recommendations given in the following paragraphs should be considered to be the minimum which will comply with the intent of the International Residential Building Code. Other modifications may be required to enhance the value of the house and it is possible that other problems requiring structural modifications will be discovered during the reconstruction process. Also, as noted earlier, at the present time, there are no active utilities serving the house.

Roofing and Roof Framing The existing roof joists require strengthening and/or reinforcing to be able to support the loads specified in the building code. The asphalt shingles, although apparently still serviceable, are not part of the original construction and are not character with the original construction. There are at least two possibilities for renovation.

One is to completely remove the roofing including shingles, decking and joists and replace them with a roof which is not only in character with the construction of the original house but is also capable of resisting the specified roof loads.

The second is to remove the asphalt shingles and then make an evaluation of the cedar shingles. Depending on their condition, it may also be necessary to remove and replace some or all of them. It will also be necessary to reinforce the existing joists. It should be possible to attach reinforcing joists to the sides of the existing joists although this would have to be done from the inside of the house and would be very labor intensive and expensive. Alternately, intermediate supports bearing on interior partitions could be constructed to shorten the spans of the existing joists. The partitions themselves probable have adequate capacity to support the additional load but it would be necessary to construct additional foundations in the crawl space beneath the existing first floor, again a tedious and expensive process. Use of this method would not result in an acceptable roof diaphragm to resist and distribute lateral loads byt a diaphragm could be constructed at the ceiling level.

Exterior Walls. The exterior walls were probably intended to act as double wythe cavity walls but there is no indication that they were tied together in an acceptable manner. It would be possible to tie them together using drilled in adhesive anchors but there are questions about the efficacy of this procedure. It may be more efficient to remove the interior wythe and replace it with studs connected to the exterior wythe so that the studs become to structural element and the brick is a veneer.

There are also a number of cracks in both wythes which require repair. The brick used in those areas where brick has been removed or has cracked to the extent that it is no longer useable should be taken from walls which are removed or replaced; the use of modern brick may lead to further problems. For the same reason, tuckpointing of cracks and joints should be done with lime mortar so that the difference between original and new construction is minimized.

As discussed above, all of the walls exhibit some bowing but the west wall is the worst. It has been suggested that an addition could be constructed on the west side could be constructed to brace the wall as well as to provide additional floor space. The extra floor space would no doubt be welcome but the wall would now be an interior wall which couod be demolished and replaced by a stud wall.

Interior Partitions. The partitions along with the first floor are the strongest structural element in the house. As stated above, it might be possible to extend them to the roof to help support the roof framing although constructions of foundations would be required.

It may be possible to remove some of the partitions to create larger spaces within trhe house but this should be carefully considered, particularly if the partitions are to be used to help- support the roof.

Floor Framing. The strength of the floor framing is adequate for a residence but there is no subflooring and the finish flooring is unsightly. Renovation of the existing flooring is possible but the results may not be satisfactory.

As an alternate, new tongue-and groove finish flooring could be installed but it should span in the same direction as the existing flooring. This is not typical but it should be possible if some preparatory work is done on the existing flooring and the joints if the new floor are offset from those in the existing flooring.

Foundation. The existing foundation is described earlier in this report. A possible method for reinforcing the existing foundation was presented but it would alter the appearance and character of the house. It may be possible to construct a perimeter wall on the inside of the existing foundation wall which would provide the desired support to the existing foundation wall but it would be less efficient and more expensive.

If some of the interior partitions are to be used as supports for the roof structure, additional foundations will be necessary to provide support for those partitions. This work must be done in the crawl space.

CONCLUSION This structure may be as much as one-hundred years old. If constructed today, many of the construction procedures would not be acceptable. Nevertheless, it is in relatively good condition, especially considering that it has been abandoned for a number of years and has received only limited maintenance.

In its present condition, it is not suitable for human habitation. With major renovation, it can be made to meet the requirements of the International Existing Building Code although upgrading it to meet the requirements of the International Building Code would be difficult. Unless the structural system (and other aspects of the building) are brought up to the requirements of the International Building Code, it must remain a residence; other uses, such as a small office, are not permitted.

PROBABLE COST OF STRUCTURAL REPAIRS

The outline below itemizes structural repairs that have been estimated for probable cost of construction:

1.Shore the building as necessary before commencing work **$25,071**

2. Provide additional support to foundation by forming a steel reinforced, poured in place concrete foundation at interior of existing stone. This can be accomplished with a grade beam, 8" x 36" with 3 horizontal #4 rebars and vertical #4s at 24" O.C. The existing stem wall can be epoxy anchored into the new foundation.

$32,940

3. Remove loose stem wall mortar and replace **$3,660**

4. Add a wall constructed of 4" 16 gauge studs @ 16" O.C. with steel reinforced sheathing on the interior side of the exterior walls to support the roof structure. Tie into the existing brick wall.

$18,300

5. Remove loose mortar and repoint brick walls and chimney. Replace 20% of brick. Chimneys should be capped.

$75,142

6. Provide mechanical ties to connect the double wythe brick. This can be accomplished by drilling through interior brick wall at no less than every 288 sq. in. to epoxy anchor a threaded rod to exterior brick, epoxy anchor and attach washer and nut to interior brick to new C-stud.

$32,940

7. Replace headers and window sills with two 4 x 6. **$8,296**

8. Reinforce rafters with one 2 x 6 sandwiched to each chord. Provide diagonal bracing.

$9,150

9. Provide Simpson ties to reinforce roof trusses and connect to walls **$7,320**

10. Remove and replace roof deck with 5/8" OSB and reroof with asphalt shingles and provide flashing.

$27,450

11. The most visibly damaged west wall and northwest porch area should be partially removed, with corners to receive 12" columns, new foundation and wood stud wall. A future addition could be added to the west. Salvaged brick could be used for replacement.

$13,115

12. Sand floor wood deck, add 1" x 8" plank flooring (or other wood flooring) to run perpendicular to floor joists and cover existing deck joints.

$17,843

Sub-total = $271,227
10% Soft cost = $27,122
10% Project contingency = $29,834

Total = $328,184