

Weakened Roof Assemblies: An Analysis of Safe Home Grant Applications



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Preface

Home owners, insurance industry groups, and the federal, state, and local governments are all evaluating methods to increase a home's ability to withstand hurricane forces winds and reduce property damage/loss. Older homes built to less stringent building codes are especially vulnerable to high wind events. Applying construction adhesives to the underside of a roof system, inside a home's attic, is a practical and effective measure to increase a home's roof strength.

This research project was supported by the Adhesive and Sealant Council and the U.S. Department of Housing and Urban Development's Partnership for Advancing Technology in Housing (PATH) program. The Adhesive and Sealant Council is a trade association representing manufacturers and suppliers in the adhesive and sealant industry. The PATH program is a public-private partnership of leading-edge home builders, manufacturers, researchers, professional groups, and Federal agencies concerned with housing. By working together, PATH partners improve the quality and affordability of today's new and existing homes, and help to create the next generation of housing for America's families.

Newport Partners conducted the data gathering and analysis associated with this research report. Newport Partners is a consulting firm specializing in market, policy, and code research for the residential and commercial construction industry.

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Introduction

Federal, state, and local agencies, along with the home construction industry, have been placing increased attention on improving the roof strength of existing homes. One such state program is South Carolina's Safe Home Grant Program. Besides offering home owners an opportunity to have a grant cover a portion of their home strengthening improvements, the program receives and stores home inspection reports as part of the grant application. The grant application documents must include a professional (certified wind inspector) evaluation of the roof assembly for every submitted home: and, therefore, these forms can be used to assess the status of roof assembly systems on existing homes in the state of South Carolina.

This analysis on roof assemblies uses data obtained from 78 grant applications to the SC Safe Home Grant program. Specific attention was given to analyzing the current state of roof assemblies and attachment characteristics.

These application forms provide information on the quality of roof connections in existing homes that would otherwise be extremely expensive and difficult to obtain. The majority of the reviewed homes were sheathed with OSB or plywood and secured with 6d or 8d nails. However, many of the homes had missed nails, with 25% of the reporting homes averaging either two or three missed nails per 4' section of sheathing-truss connection. Depending on nail spacing, these homes could have anywhere from 6% to 37% of their nails providing no withdrawal or lateral strength to the roof assembly.

These certified home inspections included in the grant applications demonstrate that this type of grant program is necessary and potential damage to homes and personal property could be extensive if South Carolina suffers an extreme high wind event, such as a hurricane or tornado. Existing homes in South Carolina, and the southeast, could benefit from roof strengthening strategies that don't require complete re-roofing. One cost effective strategy is to apply construction adhesives to roof truss-sheathing connections from inside a home's attic to increase roof assembly strength without replacing shingles or roof tiles.

SC Safe Home Grant Program

The South Carolina Department of Insurance administers the South Carolina Hurricane Damage Mitigation Program, commonly known as the SC Safe Home program. The

program was authorized by the Omnibus Coastal Property Insurance Reform Act of 2007 and has distributed nearly \$2 million to 397 grantees.

South Carolina created the grant program to assist home owners in improving their homes' resistance to hurricanes, tornadoes, and other high wind events. The program has two main goals: reduce the damage that occurs during extreme weather events and, correspondingly, reduce insurance premiums paid by home owners. Additionally, the state believes that stronger homes will not only save lives but will also minimize post-event recovery efforts and the associated costs borne by state and local governments.

The grant program reimburses home owners who "make their property more resistant to hurricane and wind damage" (www.scsafehome.gov). The following is a list of home strengthening improvements that qualify for reimbursement.

- Roof-deck attachment
- Secondary water barrier
- Roof covering
- Bracing gable ends
- Reinforce roof to wall connections
- Opening protection
- Exterior door protection, including garage doors
- Tie-downs
- Addressing problems associated with weakened trusses, studs, and other structural components
- Repair or replacement of a manufactured home's piers, anchors, and tie-down straps

Projects funded through the SC Safe Home grant program require a dollar-for-dollar match. The state limits reimbursements to no more than \$5,000 per project. Therefore, if a project's total cost is \$7,500 the state will fund \$3,750 to the project; and for projects over \$10,000 the state will fund only \$5,000. However, for low-income home owners the program still pays a maximum of \$5,000 but the matching requirement is eliminated. A low-income home owner would only have to pay \$1,000 out-of-pocket for a \$6,000 home improvement, if approved.

In order to be classified as a low-income home owner, they need to have either a total annual adjusted gross household income of less than 80 percent of their county's median annual adjusted gross household income or their home must have an assessed value of \$150,000 or less. Additionally, the entire grant program is restricted to homes that have either an insured value or assessed tax value of \$300,000 or less.

Data Collected

All Uniform Inspection Reports (UIR) and Home Survey Checklists (HSC) received from August 1st, 2007 to January 31st, 2008 by the SC Safe Home grant program were requested for this research project through the SC's Freedom of Information Act. In total,

78 grant application packets were obtained by Newport Partners from the South Carolina Department of Insurance; however a portion of the application packets received didn't contain both a UIR and HSC.

The **Uniform Inspection Reports** are to be completed by a state certified wind mitigation inspector. The report is a check box style report and provides a basic overview of the characteristics of the inspected home. Below is a partial list of the details included on the UIR, a sample report is included in the Appendix.

- Wall construction type
- Roof covering
- Roof geometry
- Roof deck attachment
- Gable end bracing
- Roof to wall attachment
- Secondary water resistance
- Opening protection
- Anchoring and assessment of manufactured homes

A total of 55 Uniform Inspection Reports were obtained and reviewed. Note: not all of the checklists filled out every data field on the UIR.

The **Home Survey Checklist** is a more detailed inspection form completed by the certified wind inspector. The checklist provides information on the home's elevations, as well as details on wall cladding, windows, reinforcements, and wall construction materials and lengths. The HSC includes details on the roof assembly, including the sheathing material and thickness, attachment mechanism, spacing and material of framing members, and roof to wall connection information.

A total of 45 Home Survey Checklists were obtained and review. Note: not all of the checklists filled out every data field on the HSC.

Findings

Of the 78 applications reviewed, 75 homes were constructed with wood framing. Of the other three homes, one was constructed with un-reinforced masonry, one was constructed with reinforced masonry, and one was a manufactured home.

The majority of the homes submitting applications for the SC Safe Home grant program were built between 1980 and 2000. The following is a table listing the years the submitting homes were constructed.

Year Home Was Built	1939	1946	1955	1960-65	1966-70	1971-75	1976-79	1980-85	1986-90	1991-95	1995-00	2001+	N/A
Number of Homes	1	1	1	4	4	6	3	19	19	11	11	2	1

The Uniform Inspection Reports has a checklist on roof deck attachment details that shows most roof sheathing is either plywood/OSB fastened with either staples, 6d or 8d nails.

Characteristics	Quantity
Plywood/OSB roof sheathing attached to the roof truss/rafter (spaced a maximum of 24" O.C) by 6d nails or staples, regardless of fastener spacing. –OR- Batten decking supporting wood shakes or wood shingles.	31
Plywood/OSB roof sheathing with a minimum thickness of 7/16" attached to the roof truss/rafter (spaced a maximum of 24" O.C.) by 8d nails spaced at 6" along the edge and 12" in the field when the design wind speed for your site is greater than or equal to 100 mph.	20
Plywood/OSB roof sheathing with a minimum thickness of 15/32" attached to the roof truss/rafter (spaced a maximum of 14" O.C.) by 8d nails spaced 6" along the edge and 6" in the field when the design wind speed for your site is greater than or equal to 120 mph.	15
Dimensional lumber/Tongue & Groove decking with a minimum of 2 nails per board or Reinforced Concrete Roof Deck	5
Unknown	5
Other	1

Notable observations include the five homes with dimensional lumber roof sheathing were all built in 1966 or earlier and the five 'Unknown' homes indicated that the attic was inaccessible.

The Home Survey Checklist provides a deeper look into the fastening mechanisms used in these homes. No home reported having staples or 10d nails as a fastening mechanism.

Fastener	Quantity
6d nails	15
8d nails	24
8d or 10d screws	1
Spray adhesive or construction adhesive	1

Although a smaller sample of Home Survey Checklists was obtained, the findings are consistent with those reported on the UIR. The one home indicating the use of 'spray adhesive or construction adhesive' was built in 1975; although, the HSC has separate boxes for spray adhesives and construction adhesive, this application checked both boxes. Again, five of the homes were unable to submit data on fastener type because the wind inspector didn't have access to the attic.

The Home Survey Checklist also asked for the average number of missed nails in a 4' section of the roof assembly. Forty applications were reviewed that completed this section of the HSC.

Average number of missed nails per 4' section of truss	0	1	2	3	4+
--	---	---	---	---	----

Number reporting	18	12	6	4	0
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If the nails were attached with a spacing of one nail every 6", a 4' section will have a total of 8 nails, while a nail spacing of one every 3" will have a total of 16 nails per 4' section of sheathing-truss connection. For the ten homes averaging 2 or 3 missed nails per 4' section, anywhere from 12.5% to 37% of the total nails in the roof assembly will not be attached to a framing member, depending on nail spacing. While homes averaging 1 nail miss per 4' section will have between 6% and 12.5% of the nails not providing any wind uplift resistance to the roof assembly.

One of the wind inspectors recommended reattaching the roof deck because it "has the most number of missed nails I have ever seen" (Record #50). On this particular Home Survey Checklist the wind inspector noted the number of missed nails per 4' section was 3. This leads one to believe that other homes with 3, and even 2, missed nails per 4' section is a substantial number and these homes are very likely unprepared for the next high wind event.



Picture of nails missing the truss

Conclusion

A thorough review of the applications to the SC Safe Home Grant program reveals that existing homes in the region are unprepared for future high wind events. Many of these homes are not only built to older code standards, but also reported a high percentage of roof sheathing nails inadequately attached to the roof truss. The data indicates over 50% of the homes have 6% or more of their metal fasteners providing no benefit to the roof assembly, and further, 25% of the homes have somewhere between 12.5% to 37% of their metal fasteners providing no additional strength to the roof assembly. The data reviewed suggests that a significant number of homes and home owners in South Carolina, and potentially the southeast, are at risk of experiencing major home damage in an upcoming storm.

Home owners and state agencies should continue to find ways to improve existing homes' roof assembly strength. However, for many home owners replacing the roof covering to add more nails to the roof deck can be costly and inappropriate when the roof covering is in good shape or uneasy to replace, such as tile. Home owners should investigate applying construction adhesives to the truss-sheathing connection from inside the attic. This option can increase roof assembly wind strength without the unnecessary costs of re-roofing the entire home.



SC Safe Home

South Carolina Comprehensive Hurricane Damage Mitigation Program

Uniform Inspection Report Inspector Key

Inspection Date: _____

Owner Information

Owner Name: [REDACTED]		Contact Person: <u>SAME</u>
Address: [REDACTED]		Home Phone: _____
City: [REDACTED]	Zip: [REDACTED]	Work Phone: _____
County: [REDACTED]		Cell Phone: _____
Insurance Company: [REDACTED]		Policy # [REDACTED]
Year of Home: <u>1997</u>	# of Stories: <u>1</u>	Email: _____

1. Wall Construction Type: Check all wall construction types for exterior walls of the structure and

percentages for each:

- ☐ Wood Frame 100 %
☐ Reinforced Masonry _____ %
☐ Other: _____ %

- ☐ Un-Reinforced Masonry _____ %
☐ Poured Concrete _____ %

Procedures

Information needed to answer this question is found in: Sections L-1, L-2, L-3, and L-4.

- See page 7 of the checklist

2. Roof Covering: Date of Installation: 1997 ORIGINAL

- A. ☐ The roof covering was installed after the effective date of the 2003 South Carolina Building Code.
 B. ☐ The roof cover was installed before the effective date of the 2003 SCBC but all tabs are well adhered to shingles below or appears to be in good condition if other than shingles.
 C. ☒ The roof covering has loose tabs, cracks or bowed shingles or is rusted metal.
 D. ☐ Unknown or Undetermined.

Procedures

Information needed to answer this question is found in: Section F-1 Roof Covering

- Refer to section F-1A

3. **Roof Geometry:** What is the roof shape(s)? (Porches or carports that are not structurally connected to

the main roof system are not considered in the roof geometry determination)

- A. ☐ Hip Roof with no gable inset (Dutch Hip) greater than 50% of the width of the hip.
- B. ☒ Gable roof with a pitch greater than 3/12 – OR- Gambrel Roof
- C. ☐ Other: any other roof shape or combination of roof shapes including gable roofs less than 3/12, flat, mansard and other roof shapes.

Procedures

Information needed to answer this question is found in: Section F-1, F-2, F-3, F-4, and Q

4. **Roof Deck Attachment:** What is the weakest form of roof deck attachment?

- A. ☒ Plywood/OSB roof sheathing attached to the roof truss/rafter (spaced a maximum of 24" O.C.) by 6d nails or staples, regardless of fastener spacing. -OR- Batten decking supporting wood shakes or wood shingles.
- B. ☐ Plywood/OSB roof sheathing with a minimum thickness of 7/16" attached to the roof truss/rafter (spaced a maximum of 24" O.C.) by 8d nails spaced 6" along the edge and 12" in the field when the design wind speed for your site is greater than or equal to 100 mph.
- C. ☐ Plywood/OSB roof sheathing with a minimum thickness of 15/32" attached to the roof truss/rafter (spaced a maximum of 24" O.C.) by 8d nails spaced 6" along the edge and 6" in the field when the design wind speed for your site is greater than or equal to 120 mph.
- D. ☐ Dimensional lumber/Tongue & Groove decking with a minimum of 2 nails per board or Reinforced Concrete Roof Deck.
- E. ☐ Unknown, unidentified or no attic access.

Procedures

Information needed to answer this question is found in: Section Q & R

5. **Gable End Bracing:** For roof structures that contain gables, please check the weakest that apply:

- A. ☒ Gable End(s) are NOT braced.
- B. ☐ Gable End(s) are braced at a minimum in accordance with the IBC/IRC 2003 or 2006; to qualify the home must have been permitted in compliance with one of these codes.

- C. ☐ Gable ends are braced according to the requirements of SSTD 10 or one of the other accepted high wind prescriptive standards
- D. ☐ Not applicable, unknown or unidentified. (No Gable)

Procedures

Information needed to answer this question is found in: Section U

- If gable end are rated "braced" used the building code (found on pg 1) to determine B or C

6. **Roof to Wall Attachment:** What is the weakest roof to wall connection?

- A. ☐ Toe Nail: rafter/truss anchored to top plate of wall using nails driven at an angle through the rafter/truss and attached to the top plate of the wall.
- B. ☒ Clips: Metal attachments on every rafter/truss that are nailed to one side (or both sides in the case of a small diamond type clip – H1 style) of the rafter/truss and attached to the top plate of the wall frame or embedded in the bond beam.
- C. ☐ Large metal connectors (H10 style) and Single Wraps e.g. metal straps secured to every rafter/truss with a minimum of 3 nails, wrapping over and securing to the opposite side of the rafter/truss with a minimum of 1 nail. One side of strap must be attached to the top plate of the wall frame or embedded in the bond beam.
- D. ☐ Double Wraps: Both Metal Straps must be secured to every rafter/truss with a minimum of 3 nails, wrapping over and securing to the opposite side of the rafter/truss with a minimum of 1 nail. Each Strap must be attached to the top plate of the wall frame or embedded in the bond beam in at least one place.
- E. ☐ Structurally connected or reinforced concrete roof.
- F. ☐ Unknown: Unidentified or no attic access.

Procedures

Information needed to answer this question is found in: Section T and Q-1

7. **Secondary Water Resistance (SWR):** (standard underlayment or hot mopped felts are not SWR) SWR

Includes self adhering polymer modified bitumen roofing underlayments applied directly to the sheathing or closed cell foam adhesives applied to seams in the attic.

- A. ☐ SWR Barrier (not foamed on insulation) applied as a secondary means to protect the dwelling from water intrusion. Verification of SWR is required for exterior applied bitumen roofing underlayments. Verification can be by roofing contractor's affidavit that it was

applied directly to the bare wood roof decking before the felt paper or other type of primary underlayment was applied.

- B. ☒ No SWR OR- Unverifiable

Procedures

Information needed to answer this question is found in: Section S

8. **Opening Protection:** What is the weakest form of wind borne debris protection installed on the

structure? (Exterior openings include, but are not limited to: windows, doors,

garage doors, skylights, etc. Product approval may be required for opening

protection devices without proper rating identification)

- A. ☐ **Hurricane**

All exterior openings are fully protected at a minimum with impact resistant coverings, impact resistant doors and/or impact resistant glazing that meets the requirements of one of the following for "Large Missile Impact":

- FBC Product Approval System TAS 201, 202, 203 or ASTM E 1886/E 1996 or SSTD-12
- TDI Product Approval System ASTM E 1886/ E 1996 or SSTD-12
- Miami-Dade Product Approval NOA PA 201, 202, 203

- B. ☐ **Not Rated**

Any opening covered with; impact resistant coverings/products OR- shutter protection devices manufactured before 1994 or a system that cannot be identified as FBC, TDI or Miami/Dade product approved as listed above. This rating also applies to wood structural panels that can not be verified as meeting the requirements of Section 1609 and Table 1609.1.4 of the IBC/IRC 2003 OR 2006.

- C. ☐ **Wood Panels:**

Plywood/OSB meeting the requirements of Section 1609 and Table 1609.1.4 of the IBC/IRC 2003 OR 2006.

D. ☒ **None**

One or more exterior openings are not covered with a Windborne Debris Protection device. This rating also applies to after-market window films.

Procedures

Information needed to answer this question is found in: Section G-1, G-2, G-3, G-4

9. Anchoring and Assessment of Manufactured Homes ("Mobile Homes"):

Indicate the date when the home was built. If it was built after 1994, please indicate whether the home is a zone I, zone II, or zone III home. The questions following the year of manufacture and wind zone rating address the anchorage of the manufactured home.

Date home was constructed: _____

If built after 1994, is it a

- A. ☐ Zone I
- B. ☐ Zone II
- C. ☐ Zone III

What type of attachment and spacing is used?

- A. ☐ Metal strapping minimum 1-1/4" wide and 0.035" thick at spacing less than or equal to 5'
- B. ☐ Metal strapping minimum 1-1/4" wide and 0.035" thick at spacing greater than 5'
- C. ☐ Metal strapping with smaller dimensions than those listed above
- D. ☐ Cable Wires

How many straps are attached to each anchor (check the smallest number)?

- A. ☐ One
B. ☐ Two

How are diagonal straps attached to the frame?

- A. ☐ There is no diagonal strap
B. ☐ Hook with no wrap attachment
C. ☐ Wrapped around frame
D. ☐ Wrap with cable clamp (cable wires only)
E. ☐ Anchor to anchor wrap

What is the angle of the diagonal strap?

- A. ☐ Much less than 45°
B. ☐ About 45°
C. ☐ Much greater than 45°

Are stabilizer plates used with the anchors?

- A. ☐ Yes
B. ☐ No

What is the positioning of the anchor heads relative to the ground surface?

- A. ☐ Flush with ground
B. ☐ Part of the rod extends above the ground surface
C. ☐ Bent or angled away from home

Are any of the straps loose or noticeably sagging?

- A. ☐ Yes
B. ☐ No

Are any of the bolts in the anchors loose, corroded, or otherwise severely rusted?

- A. ☐ Yes
B. ☐ No

Are any of the anchor straps spliced?

- A. ☐ Yes
A. ☐ No

If yes, how many crimp seals are used to splice the straps?

- ☐ 1 (Single)
☐ 2 (Double)

Home Survey Checklist

Section A Inspector Information																																	
Date Assigned: <u>10-23-07</u>		Date Inspected: <u>10-27-07</u>																															
Inspector: <u>[REDACTED]</u>		Inspection Company: <u>[REDACTED]</u>																															
Start time: _____		Finish Time: _____																															
Dates of Attempted Calls: 1st ☒		2nd _____ 3rd _____																															
Section B Owner Information																																	
Owner's Name: <u>[REDACTED]</u>		Contact Person: <u>SAME</u>																															
Property Address: <u>[REDACTED]</u>		Home Phone: <u>[REDACTED]</u>																															
City: <u>[REDACTED]</u>		Work Phone: _____																															
County: <u>[REDACTED]</u>		Cell Phone: _____																															
Zip Code: _____		E-Mail Address: _____																															
Insurance Co: _____		Policy Number: _____																															
Section C General Building Information																																	
Year Built 	Number of Stories ☒ 1 Story ☐ 2 Story ☐ 3 Story ☐ 4 Story	Foundation ☐ Pier/Piling ☐ Slab on Grade ☐ Stem wall	Foundation Restraint ☐ Anchor Bolts ☐ Cut Nails ☐ Rebar ☐ None																														
Building Code 																																	
Wind Speed <u>130</u> Exposure Cat <u>B</u> C WBDR No <u>Yes</u> (Circle one) (Circle one)																																	
Section D Signature																																	
I acknowledge that (inspector name) <u>[REDACTED]</u> ID Number <u>[REDACTED]</u> inspected the home at the address shown above and no damage was caused to the home and/or any property.																																	
Printed Name: <u>[REDACTED]</u>		Date: _____																															
Signature: <u>[REDACTED]</u>																																	
Section E Codes																																	
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Right Elevation											
Section F-2 Exterior Roof Information											
Roof Shape					Roof Complexity						
☒ Gable ☐ Hip ☐ Flat ☐ Gambrel ☐ Mansard ☐ Other					☒ Simple Roof Shape ☐ Moderate Roof Shape ☐ Complex Roof Shape						
Section G-2 Window Openings											
Number	Quantity	Window Type	Floor	Opening in Inches		Protection					
				Width	Height	Code	Yr. Installed				
1	2	DH	1	36	38	X					
2											
3											
4											
5											
6											
7											
Section H-2 Doors											
Number	Quantity	Door Type	Floor	Opening in Inches		Protection		Glazed			
				Width	Height	Code	Yr. Installed	Yes	No		
1											
2											
3											
4											
Section I-2 Skylights					Section J-2 Gable Ends (all dimensions in inches)						
Quantity	Daylight/Back		Protection		Quantity	Height	Bottom Chord Width	Vent			
	Width	Height	Code	Yr. Installed				Width	Height		
					1	64	360	60	12		
Section K-2 Wall Cladding (circle floor)											
Aluminum Siding		1	2	3	4	Stucco		1	2	3	4
Vinyl Siding		1	2	3	4	Brick Veneer		1	2	3	4
Wood Siding		1	2	3	4	Painted Block		1	2	3	4
Section L-2 Wall Construction (circle floor) Record number of feet of each wall type per floor											
A	Concrete Block Un-Reinforced			1	2	3	4				
B	Concrete Block Reinforced			1	2	3	4				
C	Solid Concrete			1	2	3	4				
D	Wood/Light Metal Frame			1	2	3	4				
Section M-2 Reinforcement Check: (check 3-5 locations for entire house)											
Not Applicable		Left Corner		Window/Door		Right Corner					
Section N-2 Carport					Section O-2 Porches						
(Circle Applicable) ☒ None ☐ Built-In ☐ Attached ☐ Detached Number of Cars: _____					(Exclude Pool Screen Enclosure) (Circle Size and Type) Size Type Small Open Medium Screened Large Enclosed						
Section P-2 Soffits											
Overhang (inches)		Horizontal Length (linear feet)									
16		30.5									
Type		Solid/Wood/Other									
		Vinyl/Aluminum									
		None									

Back Elevation											
Section F-3 Exterior Roof Information											
Roof Shape						Roof Complexity					
☐ Gable		☒ Hip		☐ Flat		☒ Simple Roof Shape					
☐ Gambrel		☐ Mansard		☐ Other		☐ Moderate Roof Shape					
						☐ Complex Roof Shape					
Section G-3 Window Openings											
Number	Quantity	Window Type	Floor	Opening in Inches		Protection					
				Width	Height	Code	Yr. Installed				
1	4	DH	1	34	36	X					
2	1	DH	1	22	38						
3											
4											
5											
6											
7											
Section H-3 Doors											
Number	Quantity	Door Type	Floor	Opening in Inches		Protection		Glazed			
				Width	Height	Code	Yr. Installed	Yes	No		
1	1	SI	1	32	80	X					
2											
3											
4											
Section I-3 Skylights						Section J-3 Gable Ends (all dimensions in inches)					
Quantity	Daylight/Buck		Protection		Quantity	Height	Bottom Chord Width	Vent			
	Width	Height	Code	Yr. Installed				Width	Height		
Section K-3 Wall Cladding (circle floor)											
Aluminum Siding		1	2	3	4	Stucco		1	2	3	4
Vinyl Siding		1	2	3	4	Brick Veneer		1	2	3	4
Wood Siding		1	2	3	4	Painted Block		1	2	3	4
Section L-3 Wall Construction (circle floor) Record number of feet of each wall type per floor											
A	Concrete Block Un-Reinforced		1	2	3	4					
B	Concrete Block Reinforced		1	2	3	4					
C	Solid Concrete		1	2	3	4					
D	Wood/Light Metal Frame		1	2	3	4					
Section M-3 Reinforcement Check: (check 3- 5 locations for entire house)											
Not Applicable		Left Corner		Window/Door		Right Corner					
Section N-3 Carport				Section O-3 Porches				Section P-3 Soffits			
(Circle Applicable) None Built-In				(Exclude Pool Screen Enclosure) (Circle Size and Type)				Overhang (inches)		Horizontal Length (linear feet)	
Attached Detached				Size Type Small Open Medium Screened Large Enclosed				12		66	
Number of Cars: _____								Type		Solid/Wood/Other Vinyl/Aluminum None	

Left Elevation											
Section F-4 Exterior Roof Information											
Roof Shape					Roof Complexity						
☒ Gable ☐ Hip ☐ Flat ☐ Gambrel ☐ Mansard ☐ Other					☒ Simple Roof Shape ☐ Moderate Roof Shape ☐ Complex Roof Shape						
Section G-4 Window Openings											
Number	Quantity	Window Type	Floor	Opening in Inches		Protection					
				Width	Height	Code	Yr. Installed				
1	2	PH	1	28	40	X					
2											
3											
4											
5											
6											
7											
Section H-4 Doors											
Number	Quantity	Door Type	Floor	Opening in Inches		Protection		Glazed			
				Width	Height	Code	Yr. Installed	Yes	No		
1											
2											
3											
4											
Section I-4 Skylights					Section J-4 Gable Ends (all dimensions in inches)						
Quantity	Daylight/Buck		Protection		Quantity	Height	Bottom Chord Width	Vent			
	Width	Height	Code	Yr. Installed				Width	Height		
					1	64	360	24	12		
Section K-4 Wall Cladding (circle floor)											
Aluminum Siding		1	2	3	4	Stucco		1	2	3	4
Vinyl Siding		1	2	3	4	Brick Veneer		1	2	3	4
Wood Siding		1	2	3	4	Painted Block		1	2	3	4
						Other		1	2	3	4
Section L-4 Wall Construction (circle floor)											
A	Concrete Block Un-Reinforced				1	2	3	4			
B	Concrete Block Reinforced				1	2	3	4			
C	Solid Concrete				1	2	3	4			
<u>D</u>	Wood/Light Metal Frame				1	2	3	4			
Section M-4 Reinforcement Check: (check 3-5 locations for entire house)											
Not Applicable		Left Corner		Window/Door		Right Corner					
Section N-4 Carport				Section O-4 Porches				Section P-4 Soffits			
(Circle Applicable) ☒ None ☐ Built-In ☐ Attached ☐ Detached Number of Cars: _____				(Exclude Pool Screen Enclosure) (Circle Size and Type) Size Type Small Open Medium Screened Large Enclosed				Overhang (inches)		Horizontal Length (linear feet)	
								16		30.5	
								Type		☒ Solid/Wood/Other ☐ Vinyl/Aluminum ☐ None	

Section Q Roof Deck			
1-Materials	2-Deck Thickness	3-Roof Deck Attachment	4-Spacing
☐ No Access ☐ Plywood ☒ OSB ☐ Planks/Dimensional Lumber ☐ Concrete-Structural Connection ☐ Deck over Battens ☐ Battens ☐ Metal Deck ☐ Other	(Nominal) ☐ No Access ☐ 3/8" ☐ 7/16" ☐ 1/2" (15/32) ☐ 5/8" (19/32) ☒ 3/4" (23/32) ☐ 1" ☐ Other	☐ No Access ☐ Staples ☒ 6d Nail ☐ 8d Nail ☐ 10d Nail ☐ Screws (=> #8 x 2.5") ☐ Spray Foam Adhesive ☐ Construction Adhesive	only for 8d, 10d, screws ☐ > 6"/12" ☐ 6"/12" ☐ 6"/6"
Roof Slope: _____ /12		Average # of missed nails in 4' of structure: ☐ 0 ☐ 1 ☒ 2 ☐ 3 ☐ 4+	
Section R Roof Structure Materials		Section S Secondary Water Barrier	
☐ No Access ☐ Rafters ☐ Wood Trusses ☐ Light Metal Trusses Spacing: 12" 16" 24" >24" (Circle one)		☐ Exterior How verified: Photos Documents Other (Circle Applicable) ☐ Interior Spray Foam Adhesive: ☐ Y ☐ N ☒ None ☐ Y ☐ N If none, is there > than 4 feet of height? ☐ Y ☐ N	
Section T Roof to Wall Connection			
☐ None ☐ Toe Nail ☒ Clips ☐ Large and Single Wrap ☐ Double Wrap ☐ Unknown ☐ No Access Severe Corrosion 3 or More Nails Every Truss/Rafter Installed Straight up/down Y N ☐ ☐ Y N ☒ ☐ Y N ☒ ☐ Y N ☒ ☐ If Unknown, Explain why: _____			
Section U Gable End Wall Construction		Section V Building Footprint Area	
Gables 4 feet or more in height: Count: ☐ No Access ☐ Not Braced - Cathedral Ceiling ☐ Not Braced - Flat Ceiling Braced Gables: ☐ Balloon ☐ Deck/Diaphragm ☐ Diagonal Bottom or X Bracing ☐ Horizontal Continuous ☐ Masonry Cathedral ☐ Masonry Flat Ceiling Gables less than 4 feet in height: ☐ Total number of ALL Gables: ☐ (Total must equal # of gables listed on four elevations)		Plan View of House (for calculating building footprint area) $\begin{array}{r} 66 \\ 30 \\ \hline 1980 \end{array}$	
Gable Wall Sheathing (check type) ☐ Plywood ☐ Non-wood / Insulation ☐ OSB ☐ None ☐ Planks ☐ Masonry		Total Building Footprint Area = <u>1980</u> sq. ft.	

Example Calculations

From Section L-1, L-2, L-3 and L-4					
	L-1	L-2	L-3	L-4	Total
1 Add the four A1 numbers					
Add the four A2 numbers					
Add the four A3 numbers					
Add the four A4 numbers					
Total Type A-Concrete un-reinforced					
2 Add the four B1 numbers					
Add the four B2 numbers					
Add the four B3 numbers					
Add the four B4 numbers					
Total Type B-Concrete reinforced					
3 Add the four C1 numbers					
Add the four C2 numbers					
Add the four C3 numbers					
Add the four C4 numbers					
Total Type C Solid Concrete					
4 Add the four D1 numbers					
Add the four D2 numbers					
Add the four D3 numbers					
Add the four D4 numbers					
Total Type D Wood/Light Metal					
5 Add the four total lengths					
6 Divide total A by the total length					
7 Divide total B by the total length					
8 Divide total C by the total length					
9 Divide total D by the total length					

From Section L-1, L-2, L-3 and L-4					
	L-1	L-2	L-3	L-4	Total
1 Add the four A1 numbers					0
Add the four A2 numbers					0
Add the four A3 numbers					0
Add the four A4 numbers					0
Total Type A-Concrete un-reinforced					0
2 Add the four B1 numbers	65	35	10	45	155
Add the four B2 numbers					0
Add the four B3 numbers					0
Add the four B4 numbers					0
Total Type B-Concrete reinforced					155
3 Add the four C1 numbers					0
Add the four C2 numbers					0
Add the four C3 numbers					0
Add the four C4 numbers					0
Total Type C Solid Concrete					0
4 Add the four D1 numbers		10	55		65
Add the four D2 numbers					0
Add the four D3 numbers					0
Add the four D4 numbers					0
Total Type D Wood/Light Metal					65
5 Add the four total lengths					220
6 Divide total A by the total length					0%
7 Divide total B by the total length					70%
8 Divide total C by the total length					0%
9 Divide total D by the total length					30%