



October 23, 2019

Mr. Mark Adamic
Arrow Claims Services
P.O. Box 2197
Stow, Ohio 44224

RE: Wind Damage Assessment for the Cedarville Township Building Located at 78 North Main Street, Cedarville, Ohio 45314 (19-811-NPM).

Dear Mr. Adamic:

In accordance with your October 14, 2019 request, EES Group, Inc. (EES) performed an inspection on October 17, 2019 to determine the extent to which the subject slate roof surfaces sustained wind damages. This was an inspection of readily available visible surfaces and did not include destructive testing. This report is a summary of our observations.

INSPECTION INFORMATION:

Insured: Cedarville Township
Claim #: OTR020303A1
Date of Loss: May 27, 2019
Date and Time of Inspection: October 17, 2019; 10:00 A.M. to 12:45 P.M.
Inspected by: Mr. Noah Monhemius, P.E.

BACKGROUND INFORMATION: The following information was obtained from Debbie Krajicek, the point of contact:

- The building was built in the late 1800's.
- Large areas of the slate tile roof were repaired and/or replaced in the late 1980's or early 1990's.
- Tornadoes passed through the area on Memorial Day, 2019. After the tornadoes, leaks were observed within the Opera House interior. From the ground, loose and lifted slate tiles could be observed.
- The Township allowed EES use of their firetruck ladder to access the roof surfaces.

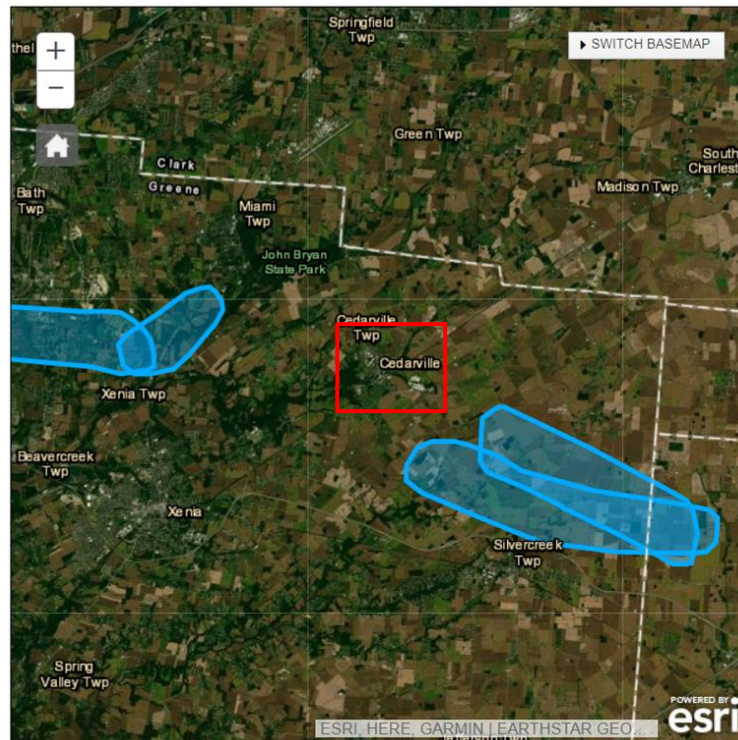
WEATHER DATA: Weather data was reviewed from the National Weather Service (NWS) Preliminary Monthly Climate Data Report from Dayton, Ohio, the closest reporting station:

NWS Wind Data: The maximum two-minute wind speed reported ranged up to 47 MPH and was recorded out of the west/southwest on February 24, 2019.

The highest peak wind gust speed reported ranged up to 63 MPH and was recorded out of the west/southwest on July 2, 2019.

The reported peak gust wind speed recorded by the NWS Climate Database did not exceed 90 MPH, the resistance threshold prescribed under Ohio building codes since ~2000. Further, the reported two-minute wind speeds did not exceed 70 MPH (~61 knots), the threshold prescribed in Ohio building codes prior to 2000.

A map obtained from the NWS showing paths of potential tornadoes from May 27, 2019 near Cedarville is reproduced below as Figure 1:



**Figure 1: Map Showing Potential Tornado Paths (Blue Shaded Areas) –
Note: None of the Paths Directly Affected Cedarville (Red Square)**

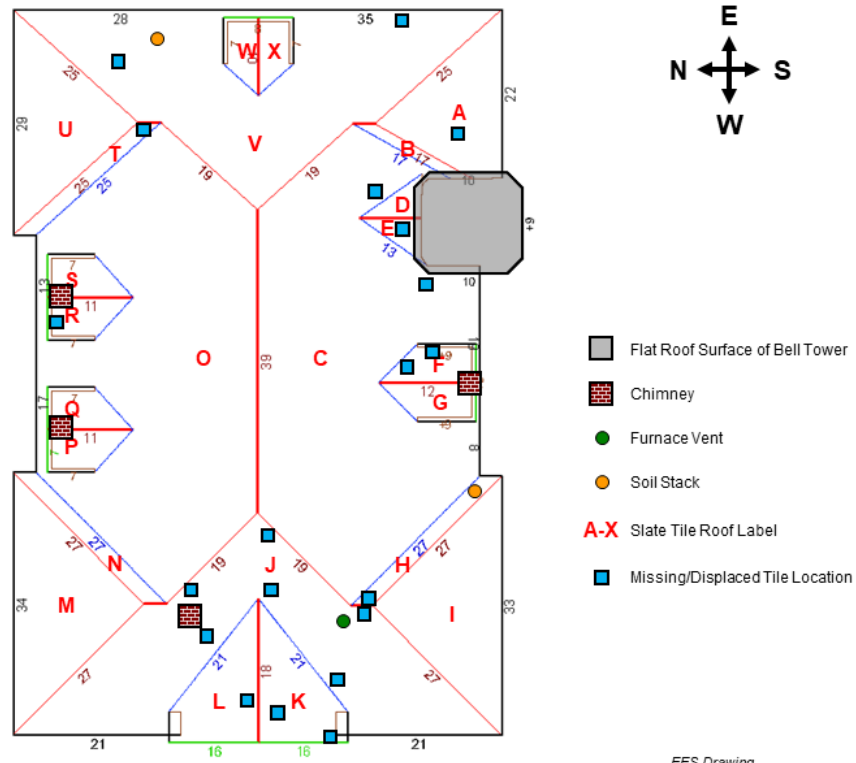
BUILDING STRUCTURES AND LAYOUTS: According to the Greene County Auditor, the building was built in 1888 and contained 11,538 square feet of interior space. The main roof surfaces were covered with slate tiles. For the purpose of this report, the building faced west.

SUMMARY OF OBSERVATIONS: A summary of our observations of the building is provided below. Photographs are included in Appendix A.

Slate Tile Roof: The main roof slopes were covered with slate tiles. Observations of the roof slopes are summarized below.

- The square and beveled-edge slate tiles measured ~8" in width and were installed at exposures ranging from ~6-1/2" to ~7".
- The slate tiles contained varying amounts of chips, cracks, delamination, and eroded holes consistent with long-term aging of the slate roof, and varied depending on the roof slope.
- Sporadic tiles contained varying weathered spot repairs (i.e., sealant, bib repairs, hook repairs, replacement tiles, etc.). The different types of repairs suggested multiple generations of repairs to the roof surfaces.
- The slate tiles were overall in fair to good condition given their age.
- Algae growth was present on the north facing roof slopes.

- The metal flashings and appurtenances (i.e., valleys, ridges, hips, chimney flashings, roof penetrations, etc.) showed signs of long-term weathering and deterioration.
- The mortar joints on some of the chimneys were deteriorated and/or missing in some areas.
- A total of approximately 20 missing/displaced slate tiles were observed on the roof surfaces. Approximate locations of the damages are provided in Figure 2 below, and details are provided in Table 1.



Front of Building

Figure 2: Roof Layout

EES Drawing
 Not to Scale,
 Layout Courtesy of
 EagleView
 Technologies, Inc.,
 October 18, 2019

Specific observations, by roof elevation, are provided in Table 1 below.

Table 1: Summary of Missing/Displaced Tiles by Elevation

ID	Elevation	Area [Sq. Ft.]	Est. # Tiles	Missing/ Displaced	% Missing/Displaced Tiles
A	South	237	632	1	0.16%
B	West	33	88	0	0.00%
C	South	1,502	4,005	2	0.05%
D	East	33	88	0	0.00%
E	West	33	88	1	1.14%
F	East	62	165	2	1.21%
G	West	63	168	0	0.00%
H	East	59	157	1	0.64%
J	South	345	920	0	0.00%
K	West	855	2,280	6	0.26%
L	South	178	475	2	0.42%
M	North	178	475	1	0.21%
N	North	355	947	0	0.00%
O	East	61	163	0	0.00%
P	North	1,502	4,005	0	0.00%
Q	West	57	152	0	0.00%
R	East	57	152	0	0.00%
S	West	57	152	1	0.66%
T	East	57	152	0	0.00%
V	West	55	147	1	0.68%
W	North	291	776	0	0.00%
X	East	983	2,621	2	0.08%
Y	North	45	120	0	0.00%
TOTAL		7,143	19,048	20	0.10%

As shown above in Figure 2 and Table 1, a total of 20 tiles, or approximately 0.10% of the roof surfaces contained missing/displaced tiles that could be the result of wind forces.

DISCUSSIONS: Discussions pertaining to EES' inspection observations and conclusions follow:

Slate Tile Roof Surfaces: The age of the slate tiles covering the building were unknown; however, based upon the condition it is likely that the majority of the roof surfaces dated back to the construction of the building (i.e., 1888). This would suggest that some of the slate tiles were ~131 years old. Some slate industry associations suggest that some types of slate tiles can have a service life of up to 150 years. Metal fasteners and flashings, on the other hand, typically have a much shorter life expectancy than slate tiles and can contribute to displaced and/or missing tiles. For example, it is not uncommon to require maintenance to metal roof flashings such as valley metal, chimney flashings, and penetration flashings as these areas are more prone to leakage over time.

Replacement of Slate Tiles: Contractors experienced in tile roofing trades will commonly remove and replace damaged slate tiles. It is typical to experience breakage to adjacent tiles during the repair process. This value will vary based on the grade of the tile (i.e., poor grade slate typically has a 3:1 reparability factor) and can range up to 3 damaged tiles for every tile replaced. As noted during the inspection, the tiles were in generally fair to good condition and contained some sporadic areas of past repairs.

CONCLUSIONS: Based on information gained during our inspection, a review of technical literature, and our professional experience, EES has arrived at the following conclusions:

- A total of 20 slate tiles were missing/displaced and may have occurred as a result of wind forces.
- The minor areas of damage would warrant spot repairs of the tiles, likely using a 3:1 reparability factor to replace the slate tiles. This would indicate an additional ~60 tiles could be damaged during the replacement of the missing/displaced tiles.

Maintenance and/or repairs should be considered to the metal flashings (i.e., chimneys, valleys, hips, ridges, and pipe penetrations) during the repair process. These materials do not typically last as long as slate tiles and are prone to leakage. Moreover, some of the mortar joints on the chimneys were deteriorated and in need of tuck pointing.

CLOSING: EES has prepared this report for your use in accordance with generally accepted inspection practices. The conclusions reached were determined with a reasonable degree of scientific certainty. The information obtained in this report is site-, date-, and time-specific and pertains to this project only, during the date and time of our inspection. The conclusions and recommendations provided in this report were based only on visual observations. No destructive testing of materials, nor collection and analysis of any materials were completed as part of this work. Thus, the conclusions and recommendations reached are limited by the extent of the work completed. Any recommendations provided should not be considered to constitute a repair estimate or specification. Should additional information be discovered, EES reserves the right to revise this report.

Although this report was prepared for the exclusive use of Arrow Claims Services, any lending institution, third party, or entity may rely upon it expressly designated by the Client, provided that EES is informed in writing. The use of the report is subject to the limitations and exceptions set forth in this report. EES will not distribute or publish this report without the Client's written consent, except as required by law or a court order.

The liability of EES with regard to professional error and omissions cannot be in excess of the fee charged for this project. Prior to the identification of any EES Group staff as a testifying expert, EES shall be notified in writing, or by the execution of an expert witness consulting agreement.

The opinions expressed in this report are based on EES' experience and available information. This inspection evaluated the conditions that existed at the time of the investigation of the subject property and does not warrant against future alteration of conditions at the subject site or subsequent changes in regulations.


EES appreciates the opportunity to provide these professional services for Arrow Claims Services. If you have any questions, or need further information, please feel free to contact our office at (614) 798-4123. Please refer to the EES project number (EES-2019-811-NPM) in all future inquiries.

Best regards,



Noah P. Monhemius, P.E.

Peer Reviewed by:



Ronald L. Lucy, RRC, RRO, IH
President

APPENDIX A

Photographs



West Exterior – Front of Building



Roof – “D” Slope – Missing Tile near Valley



Roof – Overview – Looking West



Roof – “J” Slope – Missing Tile near Ridge



Roof – Overview of “C” – South Slope



Roof – “J” Slope – Missing Tile near Chimney Penetration



Roof – “M” Slope – Overview



Roof – “K” Slope – Displaced Tile



Roof – “O” Slope – Overview



Roof – Replacement Tiles on West Slope



Roof – “L” Slope – Missing Tile near Ridge



Roof – “Y” Slope – Missing at Rake Downslope of Chimney