



NEMO EVALUATION REPORT



Ironstone Strong, LTD.

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SUBJECT: Ironstone Tile Roof Covering System

SCOPE: This Evaluation Report is issued under F.A.C. [Rule 61G20-3](#) and the applicable rules and regulations governing Product Approval of construction materials in the State of Florida. NEMO Evaluations has evaluated the product described herein for compliance with the [Code sections noted herein](#). This Evaluation Report consists of pages 1 through 6.

CODE: 2020 Florida Building Code, 7th Edition

JURISDICTION: Non-HVHZ

NEMO CATEGORY: Steep-Slope

FBC CATEGORY: Roofing

FBC SUB-CATEGORY: Roofing Tiles

CSI DIVISION: 07 00 00 Thermal and Moisture Protection
07 30 00 Steep Slope Roofing
07 32 00 Roof Tiles
07 32 13 Clay Roof Tiles

METHOD: Method 1, Option C – Codified Material, Evaluation by Evaluation Entity

COMPLIANCE STATEMENT: **Ironstone Tile Roof Covering System**, as produced by **Ironstone Strong, LTD.**, has demonstrated compliance with the Code sections noted herein through testing in accordance with the referenced Standards, rational analysis and an ongoing quality assurance program. Compliance is subject to the Installation Requirements and Limitations of Use set forth herein.

QUALITY ASSURANCE: Evidence of current quality assurance shall be listing and labeling in accordance with the requirements of [NEMO|cert](#).

CONTINUED COMPLIANCE: This Evaluation Report is valid until such time the named product(s) change, the referenced Quality Assurance changes, or the evaluated Code provisions change. NEMO Evaluations requires, at minimum, a complete review of this Evaluation Report with each 3-year Code Cycle.

BUILDING PERMIT REQUIREMENTS: As required by the Building Official or Authority Having Jurisdiction to evaluate the installation of this product.

ADVERTISEMENT: The Florida Product Approval Number (FL#) preceded by the words “NEMO Evaluated” may be displayed in advertising literature. If any portion of the Evaluation Report is displayed, it shall be displayed in its entirety.

CERTIFICATION OF INDEPENDENCE:

- ✓ NEMO ETC, LLC does not have, nor does it intend to acquire or will it acquire, a financial interest in any company manufacturing or distributing products it evaluates.
- ✓ NEMO ETC, LLC is not owned, operated or controlled by any company manufacturing or distributing products it evaluates.
- ✓ This is a building code evaluation. NEMO ETC, LLC is not, in any way, the Designer of Record for any project on which this Evaluation Report, or previous versions thereof, is/was used for permitting or design guidance.





1. CODES, PROPERTIES AND STANDARDS:

| CODE | SECTION | PROPERTY | STANDARD | YEAR |
|--|--------------------|--|------------------|------|
| 2020 Florida Building Code, 7 th Edition | 1507.3.4, R905.3.4 | Material standard | ASTM C1167 | 2011 |
| | 1507.3.7, R905.3.7 | Application requirements | FRSA/TRI (09-18) | 2018 |
| | 1504.2.1 | Overturning moment & Wind characteristics | SSTD 11 | 1997 |
| | 1609.5.3 | Wind load determination | | |

2. PRODUCTS:

TABLE 1: EVALUATED COMPONENTS

| TRADE NAME | NOMINAL DIMENSIONS | | DESCRIPTION | MATERIAL STANDARD | | MANUFACTURING LOCATION |
|--|---|---|--|----------------------------------|----------------------------|----------------------------|
| IRONSTONE PORCELAIN TILE | 12-inch wide x12-inch long x 0.36-inch thick | | Flat profile, porcelain (vitrified clay) roof tiles | ASTM C1167, Type III, Grade 1 | | San Luis Potosi, Mexico |
| |  | | | | | |
| BATTEN AND HANGER SYSTEM | Batten: | 2-inch wide x 47.5-inch long x 0.02-inch thick | Proprietary fastening system | Batten: | ASTM A653 | Apodaca, Mexico |
| | Hanger: | 5-inch long x 0.083-inch diameter | | Hanger: | ASTM A240, Type 304 S/S | |
|  | | | | | | |



3. INSTALLATION:

- 3.1 **Ironstone Tile Roof Covering System** shall be installed in accordance with **Ironstone Strong, LTD.** published installation instructions, subject to the [Limitations of Use](#) noted herein. In case of conflict between published installation instructions and this evaluation report, this report governs.
- 3.2 Evaluated Assemblies:
- Deck:** Min. 15/32-inch APA rated, exterior-grade plywood sheathing or nominal 1-inch lumber
- Slope:** Min 4:12
- Underlayment:** Underlayment shall hold current Florida Product Approval for use with mechanically attached tile roofing systems.
For underlayment systems prescribed by the [FRSA/TRI Florida High Wind Concrete and Clay Roof Tile Installation Manual](#), Sixth Edition, underlayment attachment shall be in accordance with prescriptive requirements.
For proprietary underlayment systems, underlayment attachment limitations shall be in accordance with the underlayment Product Approval.
Note: **Ironstone Strong, LTD.** requires use of an Approved self-adhering leak barrier underlayment for slopes 5:12 and below.
- Battens:** Battens shall be spaced 9½-inch o.c. ± ½-inch between each course.
- Hangers:** Hangers shall be installed maximum 6-inch o.c. through pre-punched hanger-slots in batten.
- Fasteners:** 12-ga., corrosion-resistant steel, ring-shank roofing nails of sufficient length to penetrate plywood sheathing or for minimum ¾-inch embedment into lumber sheathing spaced maximum 6-inch o.c. (at every hanger location)
- Interlayment:** 12-inch wide **Ironstone HDPE Tile Liner** installed shiny-side-down installed over each batten, and fastened maximum 1-inch from the top edge using 12-ga., corrosion-resistant steel, ring-shank roofing nails of sufficient length to penetrate plywood sheathing or for minimum ¾-inch embedment into lumber sheathing spaced between 5 ft and 6 ft o.c. Vertical overlaps shall be minimum 12-inches.
- Tiles:** **Ironstone Porcelain Tiles** shall be tightly butted together in hangers positioned on top of the interlayment. Each tile shall be secured by minimum two (2) hangers.
- Note:** Refer to Section 4.7 herein for wind resistance commentary and limitations.

4. LIMITATIONS OF USE:

- 4.1 This is a building code evaluation. NEMO ETC, LLC is not, in any way, the Designer of Record for any project on which this Evaluation Report, or previous versions thereof, is/was used for permitting or design guidance. NEMO Evaluation Reports are not to be construed as representing any attributes not specifically listed, nor are NEMO Evaluation Reports to be construed as an endorsement of the subject of the report or a recommendation for its use. There is no warranty by NEMO ETC, LLC, express or implied, as to any finding or other matter in this report, or as to any product covered by the report.
- 4.2 This Evaluation Report is not for use in FBC High Velocity Hurricane Zone jurisdictions (i.e., Broward and Miami-Dade Counties).
- 4.3 This Evaluation Report pertains to above-deck roof components. Roof decks and structural members shall be in accordance with FBC requirements to the satisfaction of the Authority Having Jurisdiction.
- 4.4 This Evaluation Report does not include evaluation of fire classification. Refer to **FBC 1505** for requirements and limitations regarding roof assembly fire classification. Refer to **FBC 2603** for requirements and limitations concerning the use of foam plastic insulation.
- 4.5 This Evaluation Report does not include evaluation of roof edge termination.
- 4.6 Refer to **FBC 1511** or **R908** for requirements and limitations regarding recover installations.
- 4.6.1 For mechanically attached components over existing roof decks, fasteners shall be tested in the existing deck for withdrawal resistance. A qualified design professional shall review the data for comparison to the minimum requirements for the system. Testing shall be in accordance with [ANSI/SPRI FX-1](#) or [Testing Application Standard TAS 105](#).



4.7 Wind Load Resistance:

4.7.1 The **Ironstone Tile Roof Covering System** has a coefficient of lift (C_L) of 0.562 and has an allowable overturning moment (M_a) of 48 ft-lbf, when installed in accordance with [Section 3](#).

4.7.2 Allowable overturning moment is the result of testing for wind load resistance based on allowable wind loads, and reflects ultimate performance divided by 2 (a 2 to 1 margin of safety has already been applied).

4.7.3 Pre-calculated ultimate design wind speed limitations at various exposure conditions, overhang configurations, mean roof heights and roof slopes are noted in Tables [3A](#) and [3B](#) based on design parameters set forth in [Table 2](#). Selection of the appropriate configuration (gable vs. hip roof), exposure category, overhang condition, mean roof height, roof slope and risk category is the responsibility of the user, subject to acceptance by the Authority Having Jurisdiction For parameters falling outside these constraints, refer to FBC 1609.5.3.

| TABLE 2: PARAMETERS FOR PRE-CALCULATED ULTIMATE DESIGN WIND SPEED LIMITATIONS | | | |
|---|---|-----------|--|
| PARAMETER | REFERENCE | SYMBOL | VALUE |
| Aerodynamic uplift moment (ft-lbf) | Ironstone specific | M_a | 48 |
| Lift coefficient | Ironstone specific | C_L | 0.562 |
| Exposed width (ft) | Ironstone specific | b | 0.98 |
| Length (ft) | Ironstone specific | L | 0.98 |
| Moment arm (ft) | Ironstone specific | L_a | 0.74 |
| Roof slope | Project specific | θ | Project-specific 4:12 through 12:12 |
| Roof pressure coefficient | ASCE 7-16, Figures 30.3-2B through 30.3-2I | $G C_p$ | Various |
| Exposure Category | FBC 1609.4.3 | N/A | B, C or D |
| Topographical factor | ASCE 7-16, Section 26.8.2 | K_{zt} | 1.0 |
| Wind directionality factor | ASCE 7-16, Section 26.6 | K_d | 0.85 |
| Ground elevation factor | ASCE 7-16, Table 26.9-1 | K_e | 1.0 |
| Mean roof height (ft) | Project specific | h | Project-specific 15 through 60 |
| Ultimate design wind speed (mph) | FBC 1609.3 | V_{ult} | Various |



TABLE 3A: ULTIMATE DESIGN WIND SPEED LIMITATIONS, VULT (MPH)

CONFIGURATION: GABLE ROOF

| EXPOSURE CATEGORY | OVERHANGS? | MEAN ROOF HEIGHT (FT) | ROOF SLOPE | |
|-------------------|------------|-----------------------|-----------------------|------------------------|
| | | | 4:12 < SLOPE ≤ 6.1:12 | 6.1:12 < SLOPE ≤ 12:12 |
| B | No | ≤ 15 | 187 | 196 |
| | | 15 < h ≤ 20 | 179 | 188 |
| | | 20 < h ≤ 30 | 169 | 177 |
| | | 30 < h ≤ 40 | 162 | 169 |
| | | 40 < h ≤ 50 | 157 | 164 |
| | | 50 < h ≤ 60 | 153 | 160 |
| | Yes | ≤ 15 | 168 | 179 |
| | | 15 < h ≤ 20 | 161 | 172 |
| | | 20 < h ≤ 30 | 152 | 162 |
| | | 30 < h ≤ 40 | 145 | 155 |
| | | 40 < h ≤ 50 | 141 | 150 |
| | | 50 < h ≤ 60 | 138 | 147 |
| C | No | ≤ 15 | 153 | 160 |
| | | 15 < h ≤ 20 | 149 | 156 |
| | | 20 < h ≤ 30 | 143 | 149 |
| | | 30 < h ≤ 40 | 138 | 145 |
| | | 40 < h ≤ 50 | 135 | 142 |
| | | 50 < h ≤ 60 | 134 | 140 |
| | Yes | ≤ 15 | 138 | 147 |
| | | 15 < h ≤ 20 | 134 | 143 |
| | | 20 < h ≤ 30 | 128 | 137 |
| | | 30 < h ≤ 40 | 124 | 133 |
| | | 40 < h ≤ 50 | 121 | 130 |
| | | 50 < h ≤ 60 | 120 | 129 |
| D | No | ≤ 15 | 139 | 146 |
| | | 15 < h ≤ 20 | 136 | 142 |
| | | 20 < h ≤ 30 | 131 | 137 |
| | | 30 < h ≤ 40 | 128 | 134 |
| | | 40 < h ≤ 50 | 125 | 131 |
| | | 50 < h ≤ 60 | 123 | 129 |
| | Yes | ≤ 15 | 125 | 133 |
| | | 15 < h ≤ 20 | 122 | 130 |
| | | 20 < h ≤ 30 | 118 | 126 |
| | | 30 < h ≤ 40 | 115 | 129 |
| | | 40 < h ≤ 50 | 113 | 120 |
| | | 50 < h ≤ 60 | 111 | 118 |



TABLE 3B: ULTIMATE DESIGN WIND SPEED LIMITATIONS, VULT (MPH)

CONFIGURATION: HIP ROOF

| EXPOSURE CATEGORY | OVERHANGS? | MEAN ROOF HEIGHT (FT) | ROOF SLOPE | | |
|-------------------|------------|-----------------------|-----------------------|-------------------------|------------------------|
| | | | 4:12 < SLOPE ≤ 4.3:12 | 4.3:12 < SLOPE ≤ 6.1:12 | 6.1:12 < SLOPE ≤ 12:12 |
| B | No | ≤ 15 | 187 | 232 | 187 |
| | | 15 < h ≤ 20 | 179 | 222 | 179 |
| | | 20 < h ≤ 30 | 169 | 209 | 169 |
| | | 30 < h ≤ 40 | 162 | 201 | 162 |
| | | 40 < h ≤ 50 | 157 | 194 | 157 |
| | | 50 < h ≤ 60 | 153 | 190 | 153 |
| | Yes | ≤ 15 | 185 | 198 | 173 |
| | | 15 < h ≤ 20 | 177 | 190 | 165 |
| | | 20 < h ≤ 30 | 167 | 179 | 156 |
| | | 30 < h ≤ 40 | 160 | 172 | 149 |
| | | 40 < h ≤ 50 | 155 | 166 | 145 |
| | | 50 < h ≤ 60 | 151 | 162 | 141 |
| C | No | ≤ 15 | 153 | 190 | 153 |
| | | 15 < h ≤ 20 | 149 | 184 | 149 |
| | | 20 < h ≤ 30 | 143 | 177 | 143 |
| | | 30 < h ≤ 40 | 138 | 171 | 138 |
| | | 40 < h ≤ 50 | 135 | 167 | 135 |
| | | 50 < h ≤ 60 | 134 | 166 | 134 |
| | Yes | ≤ 15 | 151 | 162 | 141 |
| | | 15 < h ≤ 20 | 147 | 158 | 137 |
| | | 20 < h ≤ 30 | 141 | 151 | 132 |
| | | 30 < h ≤ 40 | 137 | 147 | 128 |
| | | 40 < h ≤ 50 | 134 | 143 | 125 |
| | | 50 < h ≤ 60 | 133 | 142 | 124 |
| D | No | ≤ 15 | 139 | 172 | 139 |
| | | 15 < h ≤ 20 | 136 | 168 | 136 |
| | | 20 < h ≤ 30 | 131 | 162 | 131 |
| | | 30 < h ≤ 40 | 128 | 158 | 128 |
| | | 40 < h ≤ 50 | 125 | 155 | 125 |
| | | 50 < h ≤ 60 | 123 | 153 | 123 |
| | Yes | ≤ 15 | 138 | 147 | 128 |
| | | 15 < h ≤ 20 | 134 | 144 | 125 |
| | | 20 < h ≤ 30 | 130 | 139 | 121 |
| | | 30 < h ≤ 40 | 126 | 135 | 118 |
| | | 40 < h ≤ 50 | 124 | 133 | 116 |
| | | 50 < h ≤ 60 | 122 | 131 | 114 |

4.8 All components in the roof assembly shall have quality assurance surveillance in accordance with F.A.C. Rule 61G20-3. For components listed herein that are produced by a manufacturer other than the report holder on Page 1 of this Evaluation Report, refer to the Product Approval of the component manufacturer.