

APPROVAL REPORT

**X-ENP-19 L15, X-EDN19 THQ12, X-EDNK22 THQ12,
S-MD 10-16X7/8 HHWH PILOT POINT AND
S-MD 12-14X1 HHWH STITCH FOR SECUREMENT OF
STEEL FORM DECK IN LIGHTWEIGHT CONCRETE
ROOF DECK CONSTRUCTION**


Prepared for:

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Project ID: 3029102

Class: 4454

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Authorized by: 
G. A. Smith, Director and Assistant Vice President

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ROOF DECK CONSTRUCTION**

from

**HILTI, INC.
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I INTRODUCTION

- 1.1 Hilti, Inc. submitted their X-ENP-19 L15, X-EDN19 THQ12, X-EDNK22 THQ12, S-MD 10-16X7/8 HHWH Pilot Point and S-MD 12-14x1 HHWH Stitch fasteners for evaluation to determine if they would meet the Approval requirements of the **Standard** listed below for securing steel form deck in lightweight concrete roof deck construction.
- 1.2 Previous tests have been conducted with X-ENP-19 L15, X-EDN19 THQ12, X-EDNK22 THQ12, S-MD 10-16X7/8 HHWH Pilot Point and S-MD 12-14x1 HHWH Stitch fasteners. See Reports 3011115 and 3021719 for details.
- 1.3 This Report may be reproduced only in its entirety and without modification.
- 1.4 **Standard:**

| Title | Class Number | Date |
|---|--------------|----------|
| Lightweight Insulating Concrete Roof Deck | 4454 | May 1998 |

- 1.5 Examination included small scale comparative Tinius Olsen Testing. Full scale test data was released by Celcore, Inc., Cellular Concrete, LLC, ES Products, Inc. and Siplast, Inc.
- 1.6 Testing shows that the Hilti, Inc. X-ENP-19 L15, X-EDN19 THQ12, X-EDNK22 THQ12, S-MD 10-16X7/8 HHWH Pilot Point and S-MD 12-14x1 HHWH Stitch fasteners, as evaluated in this program, meet the Approval requirements of the **Standard** listed above.
- 1.7 **Listings:** The evaluated constructions meet the FM Approvals criteria when installed as specified in the **CONCLUSIONS** of this report. The products and FM Approved constructions will be listed in RoofNav.

II DESCRIPTIONS

All products are as described in RoofNav. Fastener drawings are on file at FM Approvals.

III EXAMINATION AND TESTING

- 3.1 Samples were submitted for examination and testing as described below.

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- 3.1.1 Tests conducted were as required by the **Standard** listed in paragraph 1.4 above. FM Approvals interior fire testing were waived because of previous satisfactory performance in prior Approval programs.
- 3.1.2 The fastener samples were produced under the FM Approvals Facilities and Procedures Audit program as indicated by FM Approvals labels. All samples were considered to be representative of standard production and were examined and tested as indicated below.
- 3.1.3 All components incorporated into test samples were selected by FM Approvals personnel. Test samples were prepared by, or under the supervision of, FM Approvals personnel.
- 3.1.4 All test data is on file at FM Approvals under 3029102 along with other documents and correspondence applicable to this program.
- 3.2 Tinius Olsen Side Lap Pull Out Testing – Tests were performed to compare the performance of S-MD 10-16X7/8 HHWH Pilot Point and S-MD 12-14x1 HHWH Stitch side lap fasteners with the securements used to fasten steel form deck side laps in lightweight concrete deck construction.
- 3.2.1 Tests were conducted to evaluate the ability of the fasteners to resist forces which would pull the fastener out of the form deck side lap.
- 3.2.2 The tests were completed by installing the side lap fasteners in steel deck specimens. The fastener was attached to the upper jaws of the test machine while the steel deck specimen was clamped to the moveable crosshead below. The force was exerted at a constant rate of 2 in./min (50 mm/min) in a direct line parallel to the shank of the fastener.
- 3.2.3 The test results and averages are shown below.

| Deck Thickness ga. (mm) | Securement | Test 1 lb (N) | Test 2 lb (N) | Test 3 lb (N) | Average lb (N) |
|----------------------------|------------------------------------|------------------|------------------|------------------|-------------------|
| 26 (0.45) | S-MD 10-16X7/8 HHWH Pilot Point | 180 (801) | 192 (854) | 155 (689) | 176 (781) |
| 26 (0.45) | S-MD 12-14x1 HHWH Stitch | 220 (979) | 203 (903) | 180 (801) | 201 (894) |
| 26 (0.45) | ICH Traxx/1 | 130 (578) | 150 (667) | 136 (605) | 139 (617) |
| 22 (0.75) | S-MD 10-16X7/8 HHWH Pilot Point | 311 (1383) | 302 (1343) | 336 (1495) | 316 (1407) |
| 22 (0.75) | S-MD 12-14x1 HHWH Stitch | 358 (1592) | 316 (1406) | 318 (1414) | 331 (1471) |
| 22 (0.75) | ICH Traxx/1 | 188 (836) | 247 (1099) | 226 (1005) | 221 (983) |

- 3.3 Tinius Olsen Deck/Fastener Pull-Out/Pull-Over Testing - Tests were performed to compare the performance of X-ENP-19 L15, X-EDN19 THQ12 and X-EDNK22 THQ12 fasteners with the various securements used to fasten steel form deck in lightweight concrete deck roof construction.
- 3.3.1 Tests were conducted to evaluate the ability of the fasteners to resist forces which would pull the fastener out of the structural steel support or pull the steel form deck over the head/washer of the fastener.
- 3.3.2 The tests were completed by attaching 3 in. (75 mm) wide by 20 in. (510 mm) long steel deck specimens to structural steel. The ends of the deck were folded up over a spacer and attached to the upper jaws of the test machine while the structural steel substrate was clamped to the moveable crosshead below. The force was exerted at a constant rate of 2 in./min (50 mm/min) in a direct line parallel to the shank of the fastener.

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3.3.3 The test results and averages are shown below.

| Deck Thickness ga. (mm) | Steel Thickness in. (mm) | Securement | Series | Test 1 lb (N) | Test 2 lb (N) | Test 3 lb (N) | Test 4 lb (N) | Ave. lb (N) |
|-------------------------|--------------------------|---|--------|----------------|----------------|----------------|----------------|----------------|
| 26 (0.45) | 0.180 (4.6) | X-EDN19 THQ12 | 1 | 816 (3630) | 793 (3527) | 792 (3523) | xxx | 800 (3560) |
| 26 (0.45) | 0.118 (3.0) | X-EDNK22 THQ12 | 1 | 839 (3732) | 900 (4003) | 821 (3652) | xxx | 853 (3796) |
| 26 (0.45) | 0.25 (6.4) | 1/2 in. (13 mm) diameter weld with washer | 1 | 990 (4404) | 1198 (5329) | 1109 (4933) | xxx | 1099 (4888) |
| 26 (0.45) | 0.25 (6.4) | X-ENP-19 L15 | 1 | 1093 (4862) | 1175 (5226) | 1059 (4710) | xxx | 1109 (4933) |
| 26 (0.45) | 0.25 (6.4) | 3/8 in. (10 mm) diameter weld with washer | 1 | 1934 (8602) | 1395 (6205) | 1297 (5769) | 1118 (4973) | 1436 (6387) |
| 24 (0.60) | 0.180 (4.6) | X-EDN19 THQ12 | 1 | 1062 (4724) | 1086 (4831) | 1111 (4942) | xxx | 1086 (4832) |
| 24 (0.60) | 0.118 (3.0) | X-EDNK22 THQ12 | 1 | 1089 (4844) | 1187 (5280) | 1181 (5253) | xxx | 1152 (5126) |
| 24 (0.60) | 0.25 (6.4) | X-ENP-19 L15 | 1 | 1452 (6458) | 1368 (6085) | 1410 (6272) | xxx | 1410 (6272) |
| 24 (0.60) | 0.25 (6.4) | 1/2 in. (13 mm) diameter weld with washer | 1 | 1800 (8006) | 1733 (7708) | 1425 (6338) | 1198 (5329) | 1539 (6845) |
| 22 (0.75) | 0.25 (6.4) | 1/2 in. (13 mm) diameter weld | 1 | 1670 (7428) | 379 (1686) | 573 (2549) | 855 (3803) | 869 (3866) |
| 22 (0.75) | 0.25 (6.4) | 5/8 in. (16 mm) diameter weld | 1 | 1619 (7201) | 1988 (8843) | 564 (2509) | 167 (743) | 1085 (4824) |
| 22 (0.75) | 0.25 (6.4) | Teks 5 | 1 | 1176 (5231) | 1112 (4946) | 1044 (4644) | xxx | 1111 (4942) |
| 22 (0.75) | 0.180 (4.6) | X-EDN19 THQ12 | 1 | 1422 (6325) | 1385 (6160) | 1149 (5111) | xxx | 1288 (5728) |
| | | | 2 | 1262 (5614) | 1313 (5841) | 1229 (5467) | 1255 (5582) | |
| 22 (0.75) | 0.118 (3.0) | X-EDNK22 THQ12 | 1 | 1328 (5907) | 1291 (5742) | 1266 (5631) | xxx | 1378 (6130) |
| | | | 2 | 1571 (6987) | 1503 (6686) | 1340 (5959) | 1348 (5997) | |
| 22 (0.75) | 0.25 (6.4) | 1/2 in. (13 mm) diameter weld with washer | 1 | 1491 (6632) | 1044 (4644) | 1555 (6917) | 1514 (6734) | 1501 (6676) |
| | | | 2 | 1438 (6397) | 2135 (9499) | 1126 (5009) | 1705 (7586) | |
| 22 (0.75) | 0.25 (6.4) | X-ENP-19 L15 | 1 | 1759 (7824) | 1645 (7317) | 1585 (7050) | xxx | 1663 (7397) |
| 22 (0.75) | 0.25 (6.4) | 3/8 in. (10 mm) diameter weld with washer | 1 | 535 (2380) | 1688 (7508) | 1789 (7957) | xxx | 1719 (7646) |
| | | | 2 | 2164 (9627) | 2005 (8920) | 1825 (8117) | 2027 (9017) | |

IV MARKING

4.1 The manufacturer shall mark each box or packing container with the manufacturer's name and product trade name. In addition, the box or container must be marked with the Approval Mark of FM Approvals.

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- 4.2 Markings denoting Approval by FM Approvals shall be applied by the manufacturer only within and on the premises of manufacturing locations that are under the FM Approvals Facilities and Procedures Audit program.
- 4.3 The manufacturer agrees that use of the FM Approvals name or Approval Mark is subject to the conditions and limitations of the Approval by FM Approvals. Such conditions and limitations must be included in all references to Approval by FM Approvals.

V REMARKS

- 5.1 The securement of the roof system must be enhanced at the building corners and perimeter as outlined in FM Global Property Loss Prevention Data Sheet 1-29.
- 5.2 The roof covers must be installed using a FM Approved roof perimeter flashing system. See RoofNav.

VI FACILITIES AND PROCEDURES AUDITS

The Hilti, Inc. manufacturing locations in Chiao Tou, Kaoshiung Hsien, Taiwan, China and Schaan, Liechtenstein are subject to periodic audit inspections to determine that the quality and uniformity of the materials have been maintained and will provide the same level of performance as originally Approved. The facilities and quality control procedures in place have been found to be satisfactory to manufacture product identical to that examined and tested as described in this report.

VII MANUFACTURER'S RESPONSIBILITIES

- 7.1 To assure compliance with his procedures in the field, the manufacturer shall supply to the roofer such necessary instruction or assistance required to produce the desired performance achieved in the tests.
- 7.2 The manufacturer shall notify FM Approvals of any planned change in the Approved product, prior to general sale or distribution, using Form 797, Approved Product Revision Report.

VIII DOCUMENTATION

No new documentation was created as a result of this program.

IX CONCLUSIONS

- 9.1 The test results indicate that the Hilti, Inc. X-ENP-19 L15, X-EDN19 THQ12, X-EDNK22 THQ12, S-MD 10-16X7/8 HHWH Pilot Point and S-MD 12-14x1 HHWH Stitch fasteners meet the FM Approvals Standard 4454 Approval requirements when installed as follows.
 - 9.1.1 S-MD 10-16X7/8 HHWH Pilot Point and S-MD 12-14x1 HHWH Stitch side lap fasteners are acceptable alternates to the ICH Traxx/1 and Stitch Teks 1 side lap fasteners when used to secure steel form deck side laps in lightweight concrete deck roof construction.
 - 9.1.2 X-ENP-19 L15 is an acceptable alternate to a 1/2 in. (13 mm) diameter weld with washer when used to secure 26 ga. (0.45 mm) thick form deck for all wind ratings.
 - 9.1.3 X-ENP-19 L15, X-EDN19 THQ12 and X-EDNK22 THQ12 are acceptable alternates to a 1/2 in. (13 mm) diameter weld with washer or a 3/8 in. (10 mm) diameter weld with washer when used to secure 26 ga. (0.45 mm) thick form deck for wind ratings of Class 1-90 and below.

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- 9.1.4 X-ENP-19 L15, X-EDN19 THQ12 and X-EDNK22 THQ12 are acceptable alternates to a 1/2 in. (13 mm) diameter weld with washer or a 3/8 in. (10 mm) diameter weld with washer when used to secure 24 ga. (0.60 mm) thick form deck for wind ratings of Class 1-90 and below.
- 9.1.5 X-ENP-19 L15, X-EDN19 THQ12 and X-EDNK22 THQ12 are acceptable alternates to a 1/2 in. (13 mm) diameter weld, a 5/8 in. (16 mm) diameter weld, a Teks 5 fastener or a ICH Traxx/5 fastener when used to secure 22 ga. (0.75 mm) thick form deck for all wind ratings.
- 9.1.6 X-ENP-19 L15, X-EDN19 THQ12 and X-EDNK22 THQ12 are acceptable alternates to a 1/2 in. (13 mm) diameter weld with washer or a 3/8 in. (10 mm) diameter weld with washer when used to secure 22 ga. (0.75 mm) thick form deck for wind ratings of Class 1-90 and below.
- 9.1.7 X-ENP-19 L15 is an acceptable alternate to a 1/2 in. (13 mm) diameter weld with washer when used to secure 22 ga. (0.75 mm) thick form deck for all wind ratings.
- 9.1.8 The use of two X-EDN19 THQ12 and X-EDNK22 THQ12 fasteners are acceptable alternates to a 1/2 in. (13 mm) diameter weld with washer or a 3/8 in. (10 mm) diameter weld with washer when used to secure 22 ga. (0.75 mm) thick wide rib form deck for wind ratings above Class 1-90.
- 9.1.9 The use of two X-ENP-19 L15 fasteners is an acceptable alternate to a 3/8 in. (10 mm) diameter weld with washer when used to secure 22 ga. (0.75 mm) thick wide rib form deck for wind ratings above Class 1-90.
- 9.2 Refer to RoofNav for fire and hail ratings for the above assemblies.
- 9.3 Tests show that the tested roof constructions in and of themselves would not create a need for automatic sprinklers.
- 9.4 Since a duly signed Master Agreement is on file for this manufacturer, Approval is effective as of the date of this report.
- 9.5 Continued Approval will depend upon satisfactory field experience and periodic Facilities and Procedures Audits.

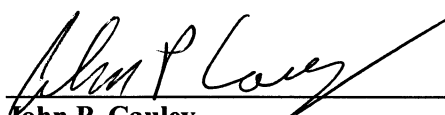
TESTING SUPERVISED BY: John P. Cauley

PROJECT DATA RECORD: 3029102

ORIGINAL TEST DATA: None

ATTACHMENTS: None

REPORT BY:



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