Plymouth Engineering, Inc.

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Plymouth, Maine 04969
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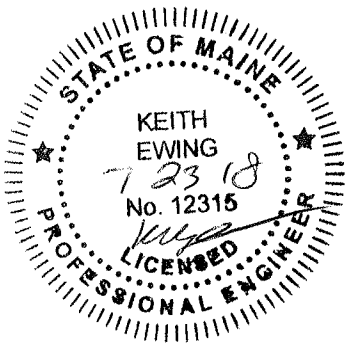
MEMORANDUM



Project No.: 17077
Project Name: TPI Harris Containers

To: Review team
From: Keith Ewing, PE
Date: July 18, 2018
Re: 93 Washington Ave. – Follow up
Cc:

1. A plumbing permit application was not submitted.
    a. The Plumber has a plumbing permit pulled - PLUMB2018-00164.
    b. The Electrical permit is – ELEC2018-00347.

2. There isn't a copy of a Notice to Proceed issued by the TPI to the Applicant for the planned construction.
    a. Attached is a copy of the letter sent with the application for the building permit application on from May 1 2017. It was assumed the City had a copy. There is also a copy of the letter releasing the client to construct the project.

3. The photographs are not time dated. There also seems to be uncertainty about the identification of the photos (one of the photos for plumbing is marked with a question mark).
    a. The Photos were taken during a progression of site visits. The question mark is a wrong key stroke on the key board. Attached are the photos from Certification and associated date.
        i. Photo 1 – 5-10-18
        ii. Photo 2 – 5-10-18
        iii. Photo 3 – 4-13-18
        iv. Photo 4 – 4-13-18
        v. Photo 5 – 4-13-18
        vi. Photo 6 – 5-15-18
        vii. Photo 7 – 5-03-18
        viii. Photo 8 – 5-03-18
        ix. Photo 9 – 6-06-18
        x. Photo 10 – 6-06-18
        xi. Photo 11 – 6-06-18
        xii. Photo 12 – 5-10-18

4. Regarding the Inspection Report requirements, with exception of the special inspections, no description exists of each Code item reviewed for compliance and non-compliant items corrected.
    a. The attached blank 2009 IBC plan review record it is used as a guide line on reviewing

all Third Party Inspection projects. These sheets give us the items that we need to review on plans and on site. It includes the specific items to be reviewed for each chapter of the code. From the area requirements of the building to walls and finishes. The specific containers were reviewed at rough steel framing including the welds (chapter 22), Rough framing is reviewed for each container as shown in the photos of the report (chapter 23). The plumbing and electrical are inspected for each container as rough in work progresses (Maine state Plumbing and NFPA 70). Once the roughs in inspections were completed then the insulation was installed and inspected (Energy code), the certificate is included below. Once sheet rock was installed the taping was inspected as installed (Chapter 8 and 25). The final inspection of units at the factory is the one for finished units with paint and final electrical. Each container is inspected as the container units are completed.

5. The letter from Michael Falvey mentions only a final inspection for a modular bathroom facility there are 6 units, no dates or types of inspections performed and results before the final.
    a. Only unit #6 has a bathroom unit in it. The rough in was reviewed as well as the final.

6. Kern Butler's certificates are more complete. Do the certificate dates = the dates of inspection?
    a. These certificates are dated the final rough in inspection and final inspection.

7. The attached certificate is signed by Aaron Cook did not sign his report.
    a. An updated certificate was included.

8. The certification label does not identify the applicable building code and year.
    a. Second page states the insulation meets IBC 2009, 2012 and 2015.

APPENDIX A

Certification Letter to City From May 1, 2017

Certification Letter for release of project to Cotton Street Holdings, May 1, 2017

Plymouth Engineering, Inc.

P.O. Box 46 - 30 Lower Detroit Road
Plymouth, Maine 04969
info@plymouthengineering.com
tel: (207) 257-2071 fax: (207) 257-2130

May 1, 2017 Job #: 17077

Portland Permitting & Inspections Department
389 Congress Street, Room 315
Portland, Maine 04101

RE: 93 Washington Ave – TPI Inspection

Dear Mr. Russell,

My name is Keith Ewing, I am a structural Engineer and my Third Party Inspection number is 204.

I have been asked to perform the Third Party Inspection for Cotton Street holdings new facility located at 93 Washington Ave. I have worked with Snap Space on other projects as the Structural Engineer and Third Party Inspector. I am familiar with their methods and construction practices.

I have reviewed the drawings G1-0, G1-1, A0-1, A1-1, A2-0, A2-1, A3-0, A4-0, A7-0 and A7-1. And the site plans of the projects.

I am anticipating working directly with the Electrition and Plumbing Installers on this project. As the client has not had plumbing and Electrical drawings produces.

IF you have any problems with me doing the Third Party Inspections please let me know.

Sincerely

Keith Ewing

Keith Ewing, PE, TPI

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Plymouth, Maine 04969
info@plymouthengineering.com
tel: (207) 257-2071 fax: (207) 257-2130

May 1, 2017 Job #: 17077

Cotton Street Holdings
75 Washington Ave. Suite 2H
Portland, Maine 04101

RE: 93 Washington Ave – TPI Inspection

Dear Mr. Harris,

My Third Party Inspection number is 204.

I have reviewed the drawings G1-0, G1-1, A0-1, A1-1, A2-0, A2-1, A3-0, A4-0, A7-0 and A7-1. And the site plans of the projects. The drawings meet the Maine Uniform Building and Energy Code.

I am anticipating working directly with the Electrician and Plumbing Installers on this project directly. A licensed Plumbing inspector and Electrical Inspector will be working on this project.t

It is okay to release the project to construction.

Sincerely

Keith Ewing

Keith Ewing, PE, TPI

APPENDIX B

Guide for site review

2009 INTERNATIONAL BUILDING CODE®
PLAN REVIEW RECORD

Plan Review #_____
Date: _____
Valuation: _____
Fee: _____

JURISDICTION: _____
(City, County, Township, etc.)

BUILDING LOCATION: _____
(Street address)

BUILDING DESCRIPTION: _____

_____

REVIEWED BY: _____

Numerals indicated in parenthesis are applicable code sections of the 2009 *International Building Code*. The plan review accomplished as indicated in this record is limited to those code sections specifically identified herein. This record references commonly applicable code sections. It does not reference all code provisions which may be applicable to specific buildings. This record is designed to be used only by those who are knowledgeable and capable of exercising competent judgement in evaluating construction documents for code compliance.

CORRECTION LIST

No.	DESCRIPTION	Code Section

INTERNATIONAL CODE COUNCIL, INC.
PHONE 1-888-ICC-SAFE • WWW.ICCSAFE.ORG

ISBN 978-1-58001-950-7

Item No. 0002PR09

11/09

CORRECTION LIST (cont'd.)

No.	DESCRIPTION	Code Section

CORRECTION LIST (cont'd.)

No.	DESCRIPTION	Code Section

NOTES: N.R. — Not required
N.A. — Not applicable

ADMINISTRATION (Chapter 1)

_____ Complete construction documents *(107.1, 107.2)*

_____ Signed/sealed construction documents *(107.1, State laws vary)*

BUILDING PLANNING (Chapters 3, 4, 5, 6)

OCCUPANCY CLASSIFICATION (302 - 312, 508)

_____ Single Occupancy *(302.1)*

_____ Mixed Occupancy *(508.1)*

_____ Incidental accessory occupancies *(508.2.5, Table 508.2.5)*

_____ Accessory occupancies *(508.2)*

GENERAL BUILDING LIMITATIONS (Chapters 5 & 6)

_____ Address identification *(501.2)*

Apply Case 1 to determine the allowable height and area and permitted types of construction for a building containing a single occupancy or nonseparated mixed occupancies. Apply Case 2 to determine the allowable height and area and permitted types of construction for a building containing separated mixed occupancies.

AREA MODIFICATIONS TO TABLE 503

Allowable tabular area, A_t *(Table 503)* 1

Area Increase Factor due to frontage, I_f *(506.2)* +

Area Increase Factor due to automatic sprinklers, I_s *(506.3)* +

Conversion factor =

Frontage *(506.2)*

North	East	South	West
_____	_____	_____	_____

Total Frontage *(F)* _____ ft. Perimeter *(P)* _____ ft.

Width of open space *(W)* = _____

Area Increase Factor due to frontage, I_f = _____ *(506.2)*

$$I_f = \left[\frac{F}{P} - 0.25\right]\frac{W}{30}$$

CASE 1 — SINGLE OCCUPANCY OR NONSEPARATED MIXED OCCUPANCIES (508.3)

Using Table 503, identify the allowable height and area of the single occupancy or the most restrictive of the nonseparated mixed occupancies. Construction types that provide an allowable tabular area equal to or greater than the adjusted building area and allowable heights (as modified by Section 504) equal to or greater than the actual building height are permitted.

DETERMINE CONSTRUCTION TYPE

Actual building area _____ ft^2

Adjusted building area _____ ft^2
actual building area ÷ conversion factor

Actual building height _____ feet _____ stories

Allowable building height _____ feet _____ stories

Permitted types of construction _____

Type of construction assumed for review *(602.1)* _____

CHECK ALLOWABLE AREA (506.4)

Allowable area per floor *(A_a)*

_____ × _____ = _____ ft^2
conversion factor; tabular area *(Table 503)*

Total floor area (all stories) _____ ft^2

Allowable floor area (all stories)

_____ × _____ = _____ ft^2
Allowable area per floor *(A_a)*; number of stories (maximum 3)

Compliance verified _____

CASE 2 — SEPARATED MIXED OCCUPANCIES (508.4)

Using Table 503, identify the allowable height and area of each of the separated occupancies within the building. Construction types that provide, for each story of the building, tabular areas (as modified by Section 506) which result in a sum of the ratios of 1.00 or less and allowable heights (as modified by Section 504) equal to or greater than the actual height of the occupancy are permitted.

Story	Group	Actual floor area	Adjusted floor area*	Actual height		Allowable height	
______	______	______ ft^2	______ ft^2	______ ft	______ stories	______ ft	______ stories
______	______	______ ft^2	______ ft^2	______ ft	______ stories	______ ft	______ stories
______	______	______ ft^2	______ ft^2	______ ft	______ stories	______ ft	______ stories
______	______	______ ft^2	______ ft^2	______ ft	______ stories	______ ft	______ stories
______	______	______ ft^2	______ ft^2	______ ft	______ stories	______ ft	______ stories
______	______	______ ft^2	______ ft^2	______ ft	______ stories	______ ft	______ stories
______	______	______ ft^2	______ ft^2	______ ft	______ stories	______ ft	______ stories

$$\text{Area ratio (single floor)} = \sum \frac{\text{Adjusted floor area *}}{\text{Allow. tab. area, } A_t \text{ (Table 503)}} = \_\_\_\_ + \_\_\_\_ + \_\_\_\_ + \_\_\_\_ = \_\_\_\_ \le 100$$

*Adjusted floor area = actual floor area ÷ conversion factor

CHECK ALLOWABLE AREA (506.5)

Three stories or less buildings ________

Four or more story buildings (Total area ratio ≤ 3) ________

Permitted types of construction ________

Type of construction assumed for review *(602.1)* ________

Compliance verified ________

MEZZANINES (505)

________ Area limitation *(505.2)*

________ Egress *(505.3)*

________ Openness *(505.4)*

________ Equipment platforms *(505.5)*

UNLIMITED AREA BUILDINGS (507)

________ Nonsprinklered, one story *(507.2)*

________ Sprinklered, one story *(507.3)*

________ Two story *(507.4)*

________ Reduced open space *(507.5)*

________ Group A-3 buildings *(507.6, 507.7)*

________ Group H occupancies *(507.8)*

________ Aircraft paint hangar *(507.9)*

________ Group E buildings *(507.10)*

________ Motion picture theaters *(507.11)*

________ Covered mall buildings/anchor stores *(507.12)*

SPECIAL PROVISIONS (509)

________ Special condition applicable *(509.1)*

________ Compliance verified

SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY (Chapter 4)

COVERED MALL AND OPEN MALL BUILDINGS (402)

________ Egress *(402.4)*

________ Mall width *(402.5)*

________ Unlimited area *(402.6)*

________ Fire separations *(402.7)*

________ Interior finish *(402.8)*

________ Automatic sprinkler system *(402.9)*

________ Standpipe system *(402.9.1)*

________ Smoke control *(402.10)*

________ Kiosk requirements *(402.11)*

________ Playground structures *(402.12)*

________ Security grilles and doors *(402.13)*

________ Standby power and emergency voice/alarm *(402.14, 402.15)*

________ Plastic signs *(402.16)*

________ Fire department access *(402.17)*

HIGH-RISE BUILDINGS (403)

_____ Construction *(403.2)*

_____ Automatic sprinkler system *(403.3)*

_____ Smoke detection *(403.4.1)*

_____ Fire alarm system *(403.4.2)*

_____ Emergency voice/alarm systems *(403.4.3)*

_____ Emergency responder radio coverage *(403.4.4)*

_____ Fire command center *(403.4.5)*

_____ Smoke removal *(403.4.6)*

_____ Elevators *(403.6)*

_____ Standby power *(403.4.7)*

_____ Emergency power *(403.4.8)*

_____ Stair remoteness *(403.5.1)*

_____ Additional stairway *(403.5.2)*

_____ Stairway doors *(403.5.3)*

_____ Smokeproof exit *(403.5.4)*

_____ Luminous egress path *(403.5.5)*

ATRIUMS (404)

_____ Use *(404.2)*

_____ Automatic sprinkler system *(404.3)*

_____ Fire alarm system *(404.4)*

_____ Smoke control *(404.5)*

_____ Enclosure *(404.6)*

_____ Standby power *(404.7)*

_____ Interior finish *(404.8)*

_____ Travel distance *(404.9)*

OTHER SPECIAL USE AND OCCUPANCY

_____ Underground structures *(405)*

_____ Motor-vehicle-related occupancies *(406, 509)*

_____ Group I-2 *(407)*

_____ Group I-3 *(408)*

_____ Motion picture projection rooms *(409)*

_____ Stages and platforms *(410)*

_____ Special amusement buildings *(411)*

_____ Aircraft-related occupancies *(412)*

_____ Combustible storage *(413)*

_____ Hazardous materials *(307.1, 414)*

_____ Groups H-1, H-2, H-3, H-4 and H-5 *(415)*

_____ Application of flammable finishes *(416)*

_____ Drying rooms *(417)*

_____ Organic coatings manufacturing *(418)*

_____ Live/work units *(419)*

_____ Groups I-1, R-1, R-2, R-3 *(420)*

_____ Hydrogen cutoff rooms *(421)*

_____ Ambulatory health care facilities *(422)*

_____ Storm shelters *(423)*

FIRE PROTECTION (Chapters 6, 7, 8, 9)

FIRE-RESISTANCE-RATED CONSTRUCTION (Tables 601 & 602 and Chapter 7)

Note: Entry in ☐ indicates required rating in hours. NC indicates noncombustible construction required.

_____ Construction classification *(602)*

COMBUSTIBILITY (602.2, 602.3, 602.4, 602.5, 603)

_____ Exterior walls

_____ Interior elements

_____ Roof

FIRE-RESISTANCE RATINGS AND FIRE TESTS (703)

_____ Ratings / Combustibility *(703.2, 703.4)*

_____ Alternative methods *(703.3, 718, 720, 721)*

_____ Rated glazing *(703.5)*

_____ Marking and identification *(703.6)*

BUILDING ELEMENTS (Table 601)

☐ _____ Structural frame *(704)*

☐ _____ Interior bearing walls

☐ _____ Interior nonbearing walls

☐ _____ Floor construction *(712)*

☐ _____ Roof construction *(712)*

EXTERIOR WALLS (507, Table 602, 705, 707.4)

	North	East	South	West
Fire separation distance	_____	_____	_____	_____
Bearing	☐ _____	☐ _____	☐ _____	☐ _____
Nonbearing	☐ _____	☐ _____	☐ _____	☐ _____

☐ _____ Opening protection *(705.8.1 - 705.8.4)*

☐ _____ Vertical fire spread protection *(705.8.5, 705.8.6)*

☐ _____ Parapets *(705.11)*

FIRE BARRIERS (707)

☐ _____ Shaft enclosures *(707.3.1)*

☐ _____ Exit enclosures/exit passageway *(707.3.2, 707.3.3)*

☐ _____ Horizontal exits *(707.3.4)*

☐ _____ Atriums *(707.3.5)*

☐ _____ Incidental accessory occupancies *(707.3.6)*

☐ _____ Control areas *(707.3.7)*

☐ _____ Mixed occupancy and fire area separations *(707.3.8, 707.3.9, 901.7)*

☐ _____ Construction *(707.5 - 707.9)*

SHAFTS (708)

☐ _____ Exceptions *(708.2)*

☐ _____ Construction *(708.3 - 708.12, 708.14)*

☐ _____ Refuse and laundry chutes *(708.13)*

☐ _____ Elevator lobby *(708.14.1, 708.14.2)*

OTHER FIRE-RESISTANT CONSTRUCTION

☐ _____ Fire walls *(706)*

☐ _____ Fire partitions *(709)*

☐ _____ Smoke barriers *(710)*

_____ Smoke partitions *(711)*

_____ Penetrations *(713)*

_____ Fire-resistant joint systems *(714)*

_____ Opening protectives *(715)*

_____ Dampers *(716)*

_____ Concealed spaces *(717)*

_____ Thermal- and sound-insulating materials *(719, 807)*

INTERIOR FINISHES (Chapter 8)

_____ Smoke development *(803.1.1, 803.9, Table 803.9)*

_____ Flame spread *(803.1.1, 803.9, Table 803.9)*

_____ Textile/expanded vinyl coverings *(803.1.2 - 803.1.4, 803.5 - 803.8)*

_____ Floor finish *(804)*

_____ Combustible materials *(805)*

_____ Decorations and trim *(806)*

_____ Acoustical ceiling systems *(808)*

FIRE PROTECTION (Chapter 9)

AUTOMATIC SPRINKLER SYSTEMS (903)
(Where required)

_____ Assembly (A-1, A-2, A-3, A-4, A-5) *(903.2.1)*

_____ Ambulatory health care facilities (B) *(903.2.2)*

_____ Educational (E) *(903.2.3)*

_____ Factory/Industrial (F-1) *(903.2.4)*

_____ High-hazard (H-1, H-2, H-3, H-4, H-5) *(903.2.5)*

_____ Institutional (I-1, I-2, I-3, I-4) *(407.5, 903.2.6)*

_____ Mercantile (M) *(903.2.7)*

_____ Residential (R) *(903.2.8)*

_____ Storage/Repair garage (S-1) *(903.2.9)*

_____ Parking garages *(903.2.10)*

_____ Windowless story *(903.2.11.1)*

_____ Rubbish and linen chutes *(903.2.11.2)*

_____ Buildings over 55 ft. high *(903.2.11.3)*

_____ Incidental accessory occupancies *(Table 508.2.5)*

_____ Additional required systems *(Table 903.2.11.6)*

_____ International Fire Code *(IFC 903.2.11.6)*

AUTOMATIC SPRINKLER SYSTEMS* (903)
(Design)

_____ Shop drawings *(107.2.2)*

_____ NFPA 13 system *(903.3.1.1)*

_____ NFPA 13R system *(903.3.1.2)*

_____ NFPA 13D system *(903.3.1.3)*

_____ Quick-response and residential heads *(903.3.2)*

_____ Actuation *(903.3.4)*

_____ Water supplies *(903.3.5)*

_____ Hose threads *(903.3.6)*

_____ Sprinkler monitoring and alarms *(903.4)*

* Also see Fire Code Sprinkler Plan Review Record

ALTERNATIVE AUTOMATIC FIRE-EXTINGUISHING SYSTEMS (904)

_____ Installation *(904.3)*

_____ Wet-chemical systems *(904.5)*

_____ Dry-chemical systems *(904.6)*

_____ Foam systems *(904.7)*

_____ Carbon dioxide systems *(904.8)*

_____ Halon systems *(904.9)*

_____ Clean-agent systems *(904.10)*

_____ Commercial cooking systems *(904.2.1, 904.11)*

STANDPIPE SYSTEMS (905)

_____ Installation standards *(905.2)*

_____ Building height *(905.3.1)*

_____ Group A *(905.3.2)*

_____ Covered malls *(905.3.3)*

_____ Stages *(905.3.4)*

_____ Underground buildings *(905.3.5)*

_____ Helistops/heliports *(905.3.6)*

_____ Marinas/boatyards *(905.3.7)*

_____ Hose connections and locations *(905.1, 905.4, 905.5, 905.6)*

_____ Cabinets *(905.7)*

_____ Dry standpipes *(905.8)*

_____ Valve supervision *(905.9)*

PORTABLE FIRE EXTINGUISHERS (906)

_____ Required locations *(906.1, 906.5, 906.6)*

_____ Installation standard *(906.2)*

_____ Size and distribution *(906.3)*

_____ Cabinets *(906.8)*

_____ Installation *(906.9)*

FIRE ALARM AND DETECTION SYSTEMS (907) (Where required)

_____ Construction documents/shop drawings *(907.1.1, 907.1.2)*

_____ Assembly (A-1, A-2, A-3, A-4, A-5) *(907.2.1)*

_____ Business (B) *(907.2.2)*

_____ Educational (E) *(907.2.3)*

_____ Factory (F-1, F-2) *(907.2.4)*

_____ High-hazard (H-1, H-2, H-3, H-4, H-5) *(907.2.5)*

_____ Institutional (I-1, I-2, I-3, I-4) *(907.2.6)*

_____ Mercantile (M) *(907.2.7)*

_____ Residential (R-1, R-2, R-4) *(907.2.8, 907.2.9, 907.2.10)*

_____ Single/multiple station smoke alarms *(907.2.11)*

_____ High-rise buildings *(907.2.13)*

_____ Atriums *(907.2.14)*

_____ Other buildings/areas *(907.2.12, 907.2.15 - 907.2.23)*

FIRE ALARM AND DETECTION SYSTEMS (907) (Design)

_____ Residential smoke alarm interconnection *(907.2.11.3)*

_____ Residential smoke alarm power source *(907.2.11.4)*

_____ Fire safety functions *(907.3)*

_____ Initiating devices *(907.4)*

_____ Occupant notification *(907.5)*

_____ Installation *(907.6, 907.7)*

EMERGENCY ALARM SYSTEMS (908)

_____ Detection system applicable *(908.1 - 908.6)*

SMOKE CONTROL SYSTEMS (909)

_____ Where required *(402.10, 404.5, 405.5, 408.9, 410.3.7.2, 1022.9, 1028.6.2.1)*

_____ Design requirements *(909.1 - 909.4)*

_____ Smoke barriers *(909.5)*

_____ Pressurization method *(909.6)*

_____ Airflow design method *(909.7)*

_____ Exhaust method *(909.8)*

_____ Design fire *(909.9)*

_____ Equipment/Power *(909.10, 909.11)*

_____ Detection and control *(909.12 - 909.18)*

_____ Smokeproof enclosures *(909.20)*

SMOKE AND HEAT VENTS (910)

_____ Requirements *(910.1 - 910.3)*

_____ Mechanical alternative *(910.4)*

FIRE COMMAND CENTER (911)

_____ Requirements *(911.1.1 - 911.1.5)*

FIRE DEPARTMENT CONNECTIONS (912)

_____ Installation *(912.1 - 912.5)*

FIRE PUMPS (913)

_____ Requirements *(913.1 - 913.5)*

EMERGENCY RESPONDER SAFETY FEATURES/ RADIO COVERAGE (914, 915)

_____ Requirements *(914.1, 914.2, 915.1)*

OCCUPANT NEEDS (Chapters 10, 11, 12)

MEANS OF EGRESS (Chapter 10)

OCCUPANT LOAD *(1004.1.1 and Table 1004.1.1)*

Location	Floor Area	÷	Sq.ft./ person	=	Occt. load	Other occt. loads	Total

CAPACITY OF EGRESS COMPONENTS *(1005.1)*

Location	Stairways	Other egress components

NUMBER OF EXITS *(1021.1, 1021.2)*

Location	Required	Shown

MEANS OF EGRESS (continued)

GENERAL MEANS OF EGRESS

_____ Design requirements *(1003.2 - 1003.7)*

_____ Door/Hardware encroachment *(1005.2, 1005.3)*

_____ Means of egress illumination *(1006)*

_____ Exit signs *(1011)*

_____ Accessible means of egress *(1007)*

_____ Means of egress doors *(1008.1 - 1008.1.3)*

_____ Special doors/Gates/Turnstiles *(1008.1.4, 1008.2, 1008.3)*

_____ Door landings/Thresholds/Arrangement *(1008.1.5 - 1008.1.8)*

_____ Door hardware *(1008.1.9, 1008.1.10)*

_____ Stairways *(1009)*

_____ Roof access *(1009.13)*

_____ Ramps *(1010)*

_____ Handrails *(1012)*

_____ Guards *(1013)*

_____ Luminous egress path markings *(1024)*

EXIT ACCESS

_____ Door number and arrangement *(1014.2, 1015.1, 1015.2)*

_____ Common path of egress travel *(1014.3)*

_____ Exit access travel distance *(1016.1)*

_____ Aisles *(1017)*

_____ Egress balconies *(1016.2, 1019)*

_____ Corridors *(1018)*

_____ Air movement in corridors *(1018.5)*

EXITS / EXIT DISCHARGE

_____ Exits/Exit doors *(1020, 1021)*

_____ Vertical exit enclosures *(1022)*

_____ Exit passageways *(1023)*

_____ Horizontal exits *(1025)*

_____ Exterior exit ramps/stairways *(1026)*

_____ Exit discharge *(1027)*

OTHER MEANS OF EGRESS

_____ Miscellaneous egress requirements *(1015.3 - 1015.6)*

_____ Bleachers *(1028.1.1)*

_____ Assembly exits & egress *(1028.2 - 1028.5)*

_____ Assembly aisles & features *(1028.6 - 1028.15)*

_____ Emergency escape and rescue *(1029)*

ACCESSIBILITY* (Chapter 11)

_____ Scoping requirements *(1103)*

_____ Accessible route *(1104)*

_____ Accessible entrances *(1105)*

_____ Parking and passenger loading *(1106)*

_____ Dwelling units and sleeping units *(1107)*

_____ Special occupancies *(1108)*

_____ Features and facilities *(1109)*

_____ Signage *(1110)*

*Also see Accessibility Plan Review Record

INTERIOR ENVIRONMENT (Chapter 12)

_____ Ventilation *(1203)**

_____ Temperature control *(1204)*

_____ Lighting *(1205)*

_____ Yards or courts *(1206)*

_____ Sound transmission *(1207)*

_____ Interior space dimensions *(1208)*

_____ Access to unoccupied spaces *(1209)*

_____ Surrounding materials *(1210, 2509)*

*Also see Mechanical Code Plan Review Record

BUILDING ENVELOPE (Chapters 13*, 14, 15)

*See Energy Conservation Code Plan Review Record

EXTERIOR WALLS (Chapter 14)

_____ Performance requirements *(1403)*

_____ Materials *(1404)*

_____ Exterior wall coverings/MCM's *(1405, 1407)*

_____ Combustible material restrictions *(1406)*

_____ EIFS *(1408)*

ROOF ASSEMBLIES AND ROOFTOP STRUCTURES (Chapter 15)

_____ Weather protection *(1503)*

_____ Flashing *(1503.2, 1507.2.9, 1507.3.9, 1507.5.7, 1507.7.7, 1507.8.8, 1507.9.9)*

_____ Performance requirements *(1504)*

_____ Fire classification *(1505)*

_____ Materials *(1506)*

_____ Roof coverings *(1507)*

_____ Roof insulation *(1508)*

_____ Rooftop structures *(1509)*

_____ Reroofing *(1510)*

STRUCTURAL SYSTEMS (Chapters 16, 17, 18)

STRUCTURAL DESIGN (Chapter 16)

STRUCTURAL DESIGN CALCULATIONS

_____ Submitted for all structural members *(106, 107.1, 107.2.1, 1604, 1605)*

DESIGN LOADS ON CONSTRUCTION DOCUMENTS (1603)

Uniformly distributed floor live loads *(1603.1.1, Table 1607.1)*

Floor Area Use	Loads Shown

_____ Live load reduction *(1603.1.1, 1607.9, 1607.10)*

_____ Roof live loads *(1603.1.2, 1607.11)*

Roof snow loads *(1603.1.3, 1608; Chapter 7 of ASCE 7)*

_____ Ground snow load, p_g *(1608.2; 7.2 of ASCE 7)*

_____ If p_g > 10 psf, flat-roof snow load, p_f *(7.3 of ASCE 7)*

_____ If p_g > 10 psf, snow exposure factor, C_e *(Table 7-2, 7.3.1 of ASCE 7)*

_____ If p_g > 10 psf, snow load importance factor, I *(7.3.3, Table 7-4 of ASCE 7)*

_____ If p_g > 10 psf, roof thermal factor, C_t *(Table 7-3, 7.3.2 of ASCE 7)*

_____ Sloped roof snow load, p_s *(7.4 of ASCE 7)*

DESIGN LOADS (continued)

Wind loads *(1603.1.4, 1609; Chapter 6 of ASCE 7)*

_____ Design procedure *(1609.6, 6.1.2 of ASCE 7)*

_____ Alternate all-heights method *(1609.6)*

_____ Basic wind speed *(1609.3; Fig. 6-1 of ASCE 7)*

_____ Occupancy category *(Table 1604.5; Table 1-1 of ASCE 7)*

_____ Wind importance factor, *I (Table 6-1, 6.5.5 of ASCE 7)*

_____ Surface roughness/Exposure categories *(1609.4; 6.5.6 of ASCE 7)*

_____ Internal pressure coefficient *(Fig. 6-5, 6.5.11.1 of ASCE 7)*

_____ Component and cladding pressures *(6.1.4.2, 6.4.2.2, 6.5.12.4 of ASCE 7)*

_____ Main wind-force resisting system *(6.1.4.1, 6.4.2.1, 6.5.12.2 of ASCE 7)*

Earthquake design data *(1603.1.5, 1613; Chapter 11 - 13 and 15 - 23 of ASCE 7)*

_____ Occupancy category *(Table 1604.5; Table 1-1 of ASCE 7)*

_____ Seismic importance factor *(11.5.1, Table 11.5-1 of ASCE 7)*

_____ Mapped spectral response acceleration, S_S and S_1 *(1613.5.1; 11.4.1 of ASCE 7)*

_____ Spectral response coefficients, S_{DS} & S_{D1} *(1613.5.4; 11.4.4 of ASCE 7)*

_____ Site class *(1613.5.2; 11.4.2 of ASCE 7)*

_____ Seismic design category *(1613.5.6; 11.6 of ASCE 7)*

_____ Basic seismic-force-resisting system *(Table 12.2-1 of ASCE 7)*

_____ Response modification coefficient, *R*, and deflection amplification factor, C_d *(Table 12.2-1 of ASCE 7)*

_____ Analysis procedure *(12.6 of ASCE 7)*

_____ Design base shear *(12.8 of ASCE 7)*

Flood loads *(1603.1.7, 1612)*

_____ Flood hazard area *(1612.3)*

_____ Elevation of structure *(1612.5)*

Other loads

_____ Concentrated loads *(1607.4)*

_____ Partition loads *(1607.5)*

_____ Impact loads *(1607.8)*

_____ Misc. loads (*Table 1607.6, 1607.6.1, 1607.7, 1607.12, 1607.13, 1610, 1611, 2404)*

Structural integrity *(1614)*

_____ Design requirements *(1614.1 - 1614.4)*

QUALITY ASSURANCE (Chapter 17)

_____ Approvals/Research report(s)*(1703, 1703.4.2)* Report No._____

_____ Statement of special inspections *(1704.1.1, 1705)*

_____ Prefabricated items *(1704.2)*

_____ Steel construction *(1704.3)*

_____ Concrete construction *(1704.4)*

_____ Masonry construction *(1704.5)*

_____ Wood construction *(1704.6)*

_____ Prepared fill and foundations *(1704.7 - 1704.11)*

_____ Sprayed fire-resistant materials and coatings *(1704.12, 1704.13)*

_____ EIFS *(1704.14)*

_____ Smoke control *(1704.16)*

_____ Wind requirements *(1706)*

_____ Seismic resistance *(1707)*

_____ Contractor responsibility *(1709)*

_____ Structural testing/Observations (seismic) *(1708, 1710)*

_____ Testing (other) *(1711 - 1716)*

SOILS AND FOUNDATIONS (Chapter 18)

_____ Soils investigations/Reports *(1803.1, 1803.2, 1803.3, 1803.6)*

_____ Soil classification *(1803.5)*

_____ Excavation, grading and fill *(1804)*

_____ Dampproofing and waterproofing *(1805)*

_____ Load-bearing values *(1603.1.6, 1806)*

_____ Foundation walls, retaining walls and embedded posts and poles *(1807)*

_____ Foundations *(1808)*

_____ Shallow foundations *(1809)*

_____ Deep foundations *(1810)*

STRUCTURAL MATERIALS (Chapters 19, 21, 22, 23)

CONCRETE (Chapter 19)

_____ Plain and reinforced concrete design/construction standard specified *(1901.2, 1908)*

_____ Construction documents *(1901.4)*

_____ Minimum concrete strength *(Table 1904.3)*

_____ Cold weather and hot weather construction specified *(1905.12, 1905.13)*

_____ Slab provisions *(1910)*

MASONRY (Chapter 21)

_____ Design method, construction standard specified *(2101.2)*

_____ Construction documents *(2101.3)*

_____ Construction materials *(2103)*

_____ Mortar type *(2103.8)*

_____ Cold weather and hot weather construction specified *(2104.3, 2104.4)*

_____ Seismic design *(2106)*

_____ Glass unit masonry *(2110)*

_____ Fireplaces/Heaters/Chimneys *(2101.3.1, 2111, 2112, 2113)*

STEEL (Chapter 22)

_____ Structural steel design/construction standard specified *(2205)*

_____ Open-web steel joist design/construction standard specified *(2206)*

_____ Steel cable structures *(2207)*

_____ Steel storage racks *(2208)*

_____ Cold-formed steel design/construction standard specified *(2209)*

_____ Cold-formed steel light-framed design/construction standard specified *(2210)*

WOOD (Chapter 23)

_____ Design method option used *(2301.2)*

MATERIAL STANDARDS / CONSTRUCTION REQUIREMENTS (2303 - 2306)

_____ Lumber *(2303.1.1)*

_____ Wood I-joists *(2303.1.2)*

_____ Glue-laminated timbers *(2303.1.3)*

_____ Wood structural panels *(2303.1.4, 2304.6, 2304.7)*

_____ Fiber-, hard-, & particle-, boards *(2303.1.5 - 2303.1.7)*

_____ Decay and termite protection *(2303.1.8, 2304.11)*

_____ Structural composite lumber *(2303.1.9)*

_____ Structural log members *(2303.1.10)*

_____ Round timber poles and piles *(2303.1.11)*

_____ Fire-retardant-treated wood *(2303.2)*

_____ Hardwood and plywood *(2303.3)*

_____ Trusses *(2303.4)*

_____ Joist hangers and connectors *(2303.5)*

_____ Fasteners and fastening *(2303.6, 2304.9, Table 2304.9.1)*

_____ Heavy timber construction *(2304.10)*

_____ Shear walls and diaphragms *(2305, 2306)*

CONVENTIONAL LIGHT-FRAME CONSTRUCTION (2308)

_____ Limitations satisfied *(2308.2)*

_____ Wind/Seismic requirements *(2308.2.1, 2308.2.2, 2308.11, 2308.12)*

_____ Braced walls *(2308.3, 2308.9.3)*

_____ Foundation anchorage *(2308.3.3, 2308.6)*

_____ Floor joists *(Tables 2308.8[1], 2308.8[2])*

_____ Wall studs *(Table 2308.9.1)*

_____ Girders *(Tables 2308.9.5 and 2308.9.6, 2308.7)*

_____ Ceiling joists *(Tables 2308.10.2[1], 2308.10.2[2])*

_____ Roof rafters *(Tables 2308.10.3.[1] - 2308.10.3[6])*

_____ Roof uplift *(2308.10.1)*

NONSTRUCTURAL MATERIALS (Chapters 24, 25, 26)

GLASS AND GLAZING (Chapter 24)

_____ Sloped glazing and skylights *(2405)*

_____ Safety glazing *(2406, 2407, 24O8, 2409)*

GYPSUM BOARD AND PLASTER (Chapter 25)

_____ Gypsum board materials *(2506, Table 2506.2, Table 2508.1)*

_____ Plaster *(2507, 2508, 2510 - 2513)*

PLASTIC (Chapter 26)

FOAM PLASTIC INSULATION (2603)

_____ Labeling *(2603.2, 2603.5.6)*

_____ Surface-burning characteristics *(2603.3, 2603.5.4)*

_____ Thermal barrier *(2603.4)*

_____ Exterior walls/Roofs *(2603.5, 2603.6)*

_____ Protection against termites *(2603.8)*

_____ Special approval *(2603.9)*

MISCELLANEOUS PLASTICS

_____ Interior finish and trim *(2604)*

_____ Plastic veneer *(2605)*

_____ Light-transmitting plastics *(2606 - 2611)*

_____ Fiber reinforced and fiberglass reinforced polymer *(2612)*

BUILDING SERVICES* (Chapters 27, 28, 29, 30)

ELEVATORS AND CONVEYING SYSTEMS (Chapter 30)

_____ Construction standard specified *(3001.2)*

_____ Hoistway enclosures *(3002)*

_____ Opening protectives *(3002.1.1)*

_____ Emergency operations *(3003)*

_____ Hoistway venting *(3004)*

_____ Conveying systems *(3005)*

_____ Machine rooms *(3006)*

_____ Fire service access elevator *(3007)*

_____ Occupant evacuation elevator *(3008)*

* Also see Electrical (Ch.27), Mechanical (Ch.28) and Plumbing (Ch.29) Plan Review Records

SPECIAL DEVICES AND CONDITIONS (Chapters 31, 34)

SPECIAL CONSTRUCTION (Chapter 31)

_____ Membrane structures *(3102)*

_____ Temporary structures *(3103)*

_____ Awnings and canopies/Marquees *(3105, 3106)*

_____ Signs *(3107)*

_____ Telecommunication and broadcast towers *(3108)*

_____ Swimming pool enclosures *(3109)*

_____ Automatic vehicular gates *(3110)*

PEDESTRIAN WALKWAYS AND TUNNELS (3104)

_____ Construction and use *(3104.3, 3104.4)*

_____ Separation *(3104.5, 3104.10)*

_____ Public way *(3104.6)*

_____ Egress *(3104.7 - 3104.9)*

EXISTING STRUCTURES (Chapter 34)

_____ Building materials *(3401.4)*

_____ Additions, alterations, repairs *(3403 - 3405)*

_____ Fire escapes *(3406)*

_____ Change of occupancy *(3408)*

_____ Accessibility *(3411)*

_____ Compliance alternatives *(3412)*

BUILDING EVALUATION SUMMARY *(Table 3412.7)*

Existing occupancy: _____ Proposed occupancy: _____

Year building was constructed: _____ Number of stories: _____ Height in feet: _____

Type of construction: _____ Area per floor: _____

Percentage of open perimeter increase: _____% Corridor wall rating: _____

Completely suppressed: Yes _____ No _____ Required door closers: _____ Yes _____ No _____

Compartmentation: Yes _____ No _____

Fire-resistance rating of vertical opening enclosures: _____

Type of HVAC system: _____, serving number of floors: _____

Automatic fire detection: Yes _____ No _____, type and location: _____

Fire alarm system: Yes _____ No _____, type: _____

Smoke control: Yes _____ No _____, type: _____

Adequate exit routes: Yes _____ No _____ Dead ends: Yes _____ No _____

Maximum exit access travel distance: _____ Elevator controls: Yes _____ No _____

Means of egress emergency lighting: Yes _____ No _____ Mixed occupancies: Yes _____ No _____

Safety parameters	Fire safety (FS)	Means of egress (ME)	General safety (GS)
3412.6.1 Building height			
3412.6.2 Building area			
3412.6.3 Compartmentation			
3412.6.4 Tenant and dwelling unit separations			
3412.6.5 Corridor walls			
3412.6.6 Vertical openings			
3412.6.7 HVAC systems			
3412.6.8 Automatic fire detection			
3412.6.9 Fire alarm system			
3412.6.10 Smoke control	* * * *		
3412.6.11 Means of egress capacity	* * * *		
3412.6.12 Dead ends	* * * *		
3412.6.13 Max. exit access travel distance	* * * *		
3412.6.14 Elevator control			
3412.6.15 Means of egress emergency lighting	* * * *		
3412.6.16 Mixed occupancies		* * * *	
3412.6.17 Automatic sprinklers		÷ 2 =	
3412.6.18 Standpipes			
3412.6.19 Incidental accessory occupancy			
Building score — total value			

* * * * No applicable value to be inserted.

BUILDING SAFETY EVALUATION SCORE *(Table 3412.9)*

Formula	Table 3412.7		Table 3412.8		Score	Pass	Fail
FS–MFS ≥ 0	_____ (FS)	—	_____ (MFS)	=	_____	_____	_____
ME–MME ≥ 0	_____ (ME)	—	_____ (MME)	=	_____	_____	_____
GS–MGS ≥ 0	_____ (GS)	—	_____ (MGS)	=	_____	_____	_____

FS = Fire Safety
ME = Means of Egress
GS = General Safety
MFS = Mandatory Fire Safety
MME = Mandatory Means of Egress
MGS = Mandatory General Safety

APPENDICES A - K

_____ Appendices adopted *(101.2.1)* _____ Compliance verified

APPENDIX C

Signed Insulation certificate.

Gaco Western
SINCE 1955

Insulation Certificate

Date Installation Completed May 18, 2018
Building Address 93 Washington Ave.
City/State/Zip Portland, Me. 04101

Application Contractor (company name) Spray Foam of Maine, LLC
Address 557 Hallowell-Litchfield Rd.
City/State/Zip West Gardiner, Me. 04345
Phone 207-724-3746 Email

Area Insulated

Exterior Stud Wall	Average Thickness	3"	R-Value	R-21
Ceiling	Average Thickness		R-Value	
Roof Deck	Average Thickness	7"	R-Value	R-49
Crawl Space/Basement	Average Thickness		R-Value	
Additional Areas Insulated	Under Floor	4"		R-28

I *(print name)* Aaron Cook as an independent contractor, certify that the Gaco Western insulation installed on this project was applied in accordance with the Gaco Western recommendations and specifications as stated on the product data sheet and the Gaco Western Application Specifications in the amount as indicated on this certification.

(signature) / May 18, 2018 *(date)*

Product	R-Value	3.5"	5.5"	R-13	R-20	R-30	R-38	R-49
GacoProFill (FR6500R)	R-4.04 at 1" | R-3.93/inch at >3.5"	R-14	R-22	3.3"	5.1"	7.6"	9.7"	12.5"
GacoFireStop2 (F5001)	R-4.1 at 1" | R-3.94/inch at >3.5"	R-14	R-22	3.3"	5.1"	7.6"	9.6"	12.4"
Gaco 052N (F052N)	R-4.2 at 1" | R-3.91/inch at >4"	R-14	R-22	3.3"	5.1"	7.7"	9.7"	12.5"
Gaco 183M (F183M)	R-6.4 at 1" | R-6.67/inch at >3.5"	R-23	R-37	2.0"	3.0"	4.5"	5.7"	7.4"
GacoOnePass (F1850R)	R-6.5 at 1" | R-7.2/inch at >3.5"	R-25	R-40	1.9"	2.8"	4.2"	5.3"	6.8"

Intertek

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Code Compliance Research Report CCRR-1043

Issue Date: 06-19-2015
Revision Date: 01-01-2018
Renewal Date: 01-01-2019

DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION
Section: 07 21 00 – Thermal Insulation

REPORT HOLDER:
Gaco Western, LLC
1245 Chapman Drive
PO Box 646
Waukesha, WI 53186
262-542-8072
www.gacowallfoam.com

REPORT SUBJECT:
Gaco F1850 Spray-applied Polyurethane Insulation

1.0 SCOPE OF EVALUATION

This Research Report addresses compliance with the following Codes:

- 2015, 2012, and 2009 *International Building Code®* (IBC)
- 2015, 2012, and 2009 *International Residential Code®* (IRC)
- 2015, 2012, and 2009 *International Energy Conservation Code®* (IECC)

Gaco F1850 has been evaluated for the following properties:

- Physical properties
- Surface-burning characteristics
- Thermal resistance
- Air permeability
- Air Barrier
- Vapor permeance
- Water-resistive barrier
- Alternative to thermal barriers
- Alternative to ignition barriers
- Use in Types I, II, III, and IV construction
- Use in Type V construction
- Duct insulation

See Table 1 for applicable Code sections related to these properties.

NOTE: This report references 2015 Code sections with [2012] and [2009] Code sections shown in brackets where they differ.

2.0 USES

Gaco F1850 spray-applied polyurethane foam insulation is used as a nonstructural thermal insulating material on or in interior and exterior walls, floors, ceilings, and roofs.

Under the IRC, the insulation may be used as air-impermeable insulation when installed in accordance with Section 3.2.3.

The insulation may be used as an air barrier when installed as described in Section 3.2.4.

The insulation may be used as vapor retarder as described in Section 3.2.5.

The insulation may be used as a water-resistive barrier on exterior walls as described in Section 3.2.6.

The insulation may be used in Types I, II, III, IV, and V construction. When used in exterior walls in Types I, II, III, and IV construction (IBC), the wall construction must be in accordance with Section 4.5.

The insulation may be used as duct insulation material when installed as described in Section 4.6.

3.0 DESCRIPTION

3.1 Materials:

3.1.1 Gaco F1850: Gaco F1850 insulation is a closed cell, medium-density, polyurethane foam plastic. The insulation is a two-component, spray-applied foam plastic with a nominal in-place density of 2.1 pcf. The insulation is produced in the field by combining a polymeric isocyanate (A component) with a resin (B component). The insulation liquid components are supplied in 55-gallon drums and 250-gallon totes, and must be stored at temperatures between 50°F and 100°F. The resin (B component) must be protected from freezing

temperatures. Gaco F1850 insulation has a shelf life of 1 year on the polymeric isocyanate (A component) and 6 months on the resin (B component) when stored in factory-sealed containers at these temperatures.

3.1.2 DC315 Intumescent Coating: DC315 intumescent coating, manufactured by IFTI, Paint to Protect, is a water-based coating supplied in 5-gallon pails and 55-gallon drums. The coating material has a shelf life of 24 months when stored in factory-sealed containers at a temperature between 41°F to 95°F. DC315 complies with ICC-ES AC456 as recognized in Intertek CCRR-1076.

3.2 Performance Characteristics:

3.2.1 Surface Burning Characteristics: The insulation, at a maximum thickness of 4 inches and a nominal density of 2.1 pcf, has a flame-spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84. Thicknesses of up to 9-1/2 inches in ceilings and floors, and 7-1/2 inches in vertical surfaces, are recognized based on full scale fire performance testing in accordance with NFPA 286. When the insulation is separated from the interior living space of the building with minimum 1/2 inch thick gypsum board, the maximum thickness is not limited.

3.2.2 Thermal Resistance: The insulation has thermal resistance (R-value) at a mean temperature of 75°F as shown in Table 2.

3.2.3 Air Permeability: Gaco F1850 insulation, at a minimum thickness of 1 inch, is considered air-impermeable insulation in accordance with 2015 IBC Section 1203.3 [not applicable under the 2012 and 2009 IBC] or IRC Sections R202 and R806.5 [2009 - R806.4], based on testing in accordance with ASTM E2178.

3.2.4 Air Barrier: Gaco F1850 insulation, at a minimum thickness of 1 inch, is considered an air-barrier material in accordance with IECC Section C402.5.1.2.1 [C402.4.1.2.1], based on testing in accordance with ASTM E2178.

The insulation, at a minimum thickness of 1 inch, is also considered an air barrier assembly in accordance with IECC Section C402.5.1.2.2 based on testing in accordance with ASTM E2357. Window and door penetrations must be flashed in accordance with manufacturer's installation instructions and the air barrier assembly must conform to IECC Section C402.5.1.1.

3.2.5 Vapor Permeance: Gaco F1850 has a vapor permeance of less than 1 perm (5.7×10^{-11} kg/Pa-s-m^2) at a minimum thickness of 0.44 inch and may be used where a Class II vapor retarder is required by the applicable Code.

3.2.6 Water-resistive Barrier: Gaco F1850 may be used as an alternative to the water-resistive barrier specified in IBC Section 1404.2 and IRC Section R703.2 when installed at a minimum of 1 inch thickness on exterior side of exterior wall sheathing.

4.0 INSTALLATION

4.1 General:

Gaco F1850 must be installed in accordance with the manufacturer's published installation instructions, the applicable Code, and this Research Report. The manufacturer's published installation instructions and this Research Report must be strictly adhered to, and a copy of the instructions must be available on the jobsite during installation.

4.2 Application:

Gaco F1850 insulation is spray-applied on the jobsite using a volumetric positive displacement pump as identified in the Gaco Western application instructions. The insulation must be applied when the ambient temperature is greater than 32°F. The insulation must not be used in areas that have a maximum in-service temperature greater than 200°F. The foam plastic must not be used in electrical outlet or junction boxes or in contact with water, rain or soil. The foam plastic must not be sprayed onto a substrate that is wet, or covered with frost or ice, loose scales, rust, oil, or grease. The insulation must be protected from the weather during and after application. The insulation may be applied to the maximum thickness in a single pass.

4.3 Thermal Barrier:

4.3.1 Application with a Prescriptive Thermal Barrier: Gaco F1850 insulation must be separated from the interior living space of the building by an approved thermal barrier of 1/2 inch thick gypsum board or an equivalent 15-minute thermal barrier complying with, and installed in accordance with, IBC Section 2603.4 or IRC Section R316.4. Exceptions are provided in Sections 4.3.2 and 4.4.

When the insulation is separated from the interior living space of the building with minimum 1/2 inch thick gypsum board, the maximum thickness is not limited.

4.3.2 Application without a Prescriptive Thermal Barrier: Gaco F1850 insulation may be installed without the 15-minute thermal barrier prescribed in IBC Section 2603.4 and IRC Section R316.4, when installed as described in this section. The thickness of the foam plastics insulation applied to the underside of the roofs, ceilings, or floors must not exceed 9-1/2 inches, and applied to vertical wall surfaces must not exceed 7-1/2 inches. The insulation must be covered on all exposed surfaces with DC315 intumescent coating at an application rate of 1.1 gallon per 100 sq. ft. to achieve a nominal wet film thickness of 18 mils (dry film thickness of 12 mils). The coating must be applied over the insulation in accordance with the coating manufacturer's instructions and this report. Surfaces to be coated must be dry, clean, and free of dirt, loose debris, and other substances that could interfere with the adhesion of the coating. The coating is applied with low-pressure airless spray equipment.

4.4 Attics and Crawl Spaces:

The insulation may be applied in attics and crawl spaces as described in either Section 4.4.1 or 4.4.2. When foam insulation is installed in an attic or crawl space in accordance with this section, a thermal barrier, as described in Section 4.3.1, is not required between the foam plastic insulation and the attic or crawl space but is required between the insulation and the interior living space.

4.4.1 Application with a Prescriptive Ignition Barrier: When Gaco F1850 insulation is installed within attics and crawl spaces where entry is made only for service of utilities, the ignition barrier must be installed in accordance with IBC Section 2603.4.1.6 or IRC Section R316.5.3 or R316.5.4, as applicable. The ignition barrier must be consistent with the requirements for the type of construction required by the applicable Code and must be installed in a manner so the foam plastic insulation is not exposed. Gaco F1850 insulation as described in this section may be installed in unvented attics in accordance with IBC Section 1203.3 or IRC Section R806.5 [2009 - R806.4] at a minimum thickness of 1 inch.

4.4.2 Application without a Prescriptive Ignition Barrier:

4.4.2.1 General: Gaco F1850 insulation may be installed in attics and crawl spaces, without the ignition barrier prescribed in IBC Section 2603.4.1.6 and IRC Sections R316.5.3 and R316.5.4, subject to the following conditions:

a. Entry to the attic or crawl space is only to service utilities, and no storage is permitted.
b. There are no interconnected attic or crawl space areas.
c. Air in the attic or crawl space is not circulated to other parts of the building.
d. Under-floor (crawl space) ventilation is provided when required by IBC Section 1203.4 [1203.3] or IRC Section R408.1, as applicable.
e. Attic ventilation is provided when required by IBC Section 1203.2 or IRC Section R806, except when air-impermeable insulation is permitted in unvented attics in accordance with IBC Section 1203.3 [not applicable under the 2012 and 2009 IBC] or IRC Section R806.5 [2009 - R806.4].
f. Combustion air is provided in accordance with IMC (International Mechanical Code) Section 701 [Sections 701 and 703].

Gaco F1850 is an air-impermeable insulation and may be installed in unvented attics, as described in this section, in accordance with 2015 IBC Section 1203.3 or IRC Section R806.5 [R806.4], when applied at a minimum thickness of 1 inch.

4.4.2.2 Application of Insulation: Gaco F1850 insulation may be spray-applied to the underside of the roof sheathing and/or rafters in attics; the underside of wood floors in crawl spaces; and to vertical surfaces in both attics and crawl spaces, as described in this section. The thickness of the foam plastics applied to the underside of the top of the space must not exceed 10 inches, and to vertical

surfaces must not exceed 8 inches. The insulation may be installed without prescriptive ignition barrier required by IBC Section 2603.4.1.6 or IRC Section R316.5.3 and R316.5.4 or a protective coating.

4.4.2.3 Use on Attic Floors: Gaco F1850 insulation may be installed exposed (no coating) at a maximum thickness of 10 inches between and over the joists in attic floors. The insulation must be separated from the interior living space by an approved thermal barrier. The insulation may be installed without the prescriptive ignition barrier required by IBC Section 2603.4 and IRC Section R316.5.3 or protective coating.

4.5 Exterior Walls in Types I, II, III, and IV Construction:

Gaco F1850 may be installed in exterior walls of buildings of Types I, II, III, and IV construction complying with IBC Section 2603.5 and as described in the section. Intertek Design Listings GWL/FI 30-01 and GWL/FI 30-02 describe the assemblies tested and certified by Intertek as complying with NFPA 285. The test wall assemblies were extended to include various wall constructions described in Tables 3 and 4 through a third-party engineering analysis. The potential heat of the foam plastic in any portion of the wall must not exceed 7142 Btu/ft^2.

4.6 Duct Insulation:

Gaco F1850 may be applied to residential ducts in attics and crawl spaces in compliance with IRC Section M1601.3. The insulation must be protected in accordance with the ignition barrier requirements of either Section 4.4.1 or 4.4.2.

5.0 CONDITIONS OF USE

The Gaco F1850 described in this Research Report complies with, or is a suitable alternative to, what is specified in those Codes listed in Sections 1.0 and 2.0 of this report, subject to the following conditions:

5.1 Installation must comply with this Research Report, the manufacturer's published installation instructions, and the applicable Code. In the event of a conflict between the manufacturer's instructions and this report, this report governs.

5.2 The insulation must be separated from the interior living space of the building by a thermal barrier as described in Section 4.3, except as described in Sections 4.3.2 and 4.4.

5.3 The insulation must not exceed the thicknesses noted in Sections 3.2, 4.3, 4.4, and 4.5 as applicable.

5.4 Use of the insulation in Types I, II, III, and IV construction must be as described in Section 4.5.

5.5 Use of the insulation in areas where the probability of termite infestation is "very heavy" must be in accordance with IRC Section R318.4 or IBC Section 2603.8 [2012 - 2603.9] [2009 - 2603.8], as applicable.

5.6 Jobsite certification and labeling of the insulation must comply with IRC Section N1101.10 [2012 – N1101.12] [2009 – N1101.4] and IECC Sections C303.1 or R303.1 [2009 – 303.1], as applicable.

5.7 The insulation is produced in Waukesha, Wisconsin, under a quality control program with inspections by Intertek Testing Services NA, Inc. (AA-647).

6.0 SUPPORTING EVIDENCE

6.1 Reports of tests in accordance with: ASTM C518, ASTM E84, ASTM E2178, ASTM E2357, ASTM E96, ASTM C411, NFPA 285, and NFPA 259.

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC 377), dated April 2016, including reports of test in accordance with Appendix X.

6.3 Research Reports for evaluation of data in accordance with ICC-ES Acceptance Criteria for Fire-protective Coatings Applied to Spray-applied Foam Plastic Insulation Installed without a Code-prescribed Thermal Barrier (AC456), dated October 2015.

6.4 Data in accordance with the ICC-ES Acceptance Criteria for Foam Plastic Sheathing Panels used as Water-Resistive Barriers (AC71), approved February 2003, editorially revised January 2016.

6.5 Intertek Listing Report "Gaco F1850 Spray-Applied Polyurethane Foam Insulation".

6.6 Priest & Associates Consulting Letter Report No. 10318B, dated July 22, 2015.

7.0 IDENTIFICATION

The A and B components of the insulation are identified with the manufacturer's name (Gaco Western, LLC), address and telephone number, the product name (Gaco F1850), use instructions, the flame spread and smoke-development indices, the lot number, the Intertek Mark, and the Code Compliance Research Report number (CCRR-1043).

8.0 OTHER CODES

This section does not apply.

9.0 CODE COMPLIANCE RESEARCH REPORT USE

9.1 Approval of building products and/or materials can only be granted by a building official having legal authority in the specific jurisdiction where approval is sought.

9.2 Code Compliance Research Reports shall not be used in any manner that implies an endorsement of the product by Intertek.

9.3 Reference to https://bpdirectory.intertek.com is recommended to ascertain the current version and status of this report.

TABLE 1 – PROPERTIES EVALUATED

PROPERTY	IBC SECTION[1]	IRC SECTION[1]	IECC SECTION[1]
Physical properties	Not required	Not required	Not required
Surface-burning characteristics	2603.3	R316.3	Not applicable
Thermal barrier/ignition barrier	2603.4	R316.4	Not applicable
Air permeability	1203.3 [1301]	R806.5 [2009 - R806.4]	C402.4 R402.4
Air Barrier	Not applicable	Not applicable	C402.4.1.2.1 [C402.4.1.2.1] C402.5.1.2.2 [C402.4.1.2.2]
Vapor retarder	202, 1405.3.1	202, R702.7.1 [R601.3]	Not applicable
Thermal resistance	1301	N1101.10 N1102 [N1101.1, N1101.12]	C303.1.1 C303.1.4 R303.1.1 R30301.4 [303.1.1 and 303.1.2]
Water-resistive Barrier	1404.2	R703.2	Not applicable
Duct Insulation	Not applicable	N1103.2.1 M1601.3	R403.2.1
Exterior walls of Types I – IV construction	2603.5	Not applicable	Not applicable

[1] Section numbers refer to 2015 Codes with 2012 and 2009 Codes in parentheses where different

TABLE 2 – THERMAL RESISTANCE (R Values)[1,2,3]

THICKNESSES (inches)	R-VALUE (°F.ft^2.h/Btu)
1	6.5
2	14
3	21
3.5	25
4	29
5.5	40
6	43
7.25	52
8	58
9.25	67
10	72
11.25	81

[1] R-values are calculated based on tested K-values at 1 inch and 3.5 inch thicknesses.
[2] R-values greater than 10 are rounded to the nearest whole number.
[3] To determine R values for thickness not listed:
a. Between 1 inch and 3.5 inch can be determined through linear interpolation; or,
b. Greater than 3.5 inches can be calculated based on R 7.2/inch

TABLE 3 – NFPA 285 COMPLYING WALLS WITH GACO F1850 ON EXTERIOR

WALL COMPONENTS	MATERIALS
Base wall system Use either 1, 2 or 3	1. Concrete Wall 2. Concrete Masonry wall 3. One layer of 5/8 in. thick Type X gypsum wallboard installed on the interior side of minimum 3-5/8 in. deep, minimum No. 20 gage steel studs spaced a maximum of 24 in. on center (OC) with lateral bracing every 4 ft. vertically.
Floorline Firestopping	Mineral wool (4.0 lb/ft^3 density) friction fit in each stud cavity and at each floorline.
Cavity Insulation Use wither 1, 2 or 3	1. None 2. Full cavity depth or less of Gaco F1850 applied using sheathing as substrate and covering the width of the cavity and inside of the stud flange. 3. Any noncombustible insulation (batts can be either faced or unfaced).
Exterior sheathing Use either 1 or 2	1. 1/2 in. thick exterior gypsum sheathing 2. 5/8 in. thick Type X exterior gypsum sheathing
Exterior insulation Use either 1 or 2	1. None 2. Gaco F1850 with a total maximum thickness of 4 in.
Exterior Veneer Use either 1, 2, 3, 4 or 5	1. Brick: Standard type brick veneer anchors installed a maximum of 24 in. OC vertically in each stud. Maximum 2 in. air gap between exterior insulation and standard nominal 4 in. thick clay brick. 2. Stucco: Minimum 3/4 in. thick, exterior cement plaster and lath. A secondary water resistive barrier can be installed between the exterior insulation and the lath. The secondary water resistive barrier shall not be full-coverage asphalt or butyl-based self-adhered membranes. 3. Minimum 2 in. thick natural stone (granite, limestone, marble and sandstone). Any standard non-open-jointed installation technique can be used. 4. Minimum 1-1/2 in. thick artificial cast stone. Any standard non-open-jointed installation technique can be used. 5. Minimum 1-1/4 in. thick Terra Cotta non-open jointed. Any standard non-open-jointed installation technique can be used.

TABLE 4 – NFPA 285 COMPLYING WALLS WITH GACO F1850 IN WALL CAVITY ONLY

WALL COMPONENTS	MATERIALS
Base wall system Use either 1, 2 or 3	1. Concrete wall 2. Concrete masonry wall 3. One layer of 5/8 in. thick Type X gypsum board installed on the interior side of minimum 3-5/8 in. deep, minimum No. 20 gage steel studs spaced at a maximum of 24 in. with lateral bracing every 4 ft. vertically.
Floorline Firestopping	Mineral wool (4.0 lb/ft^3 density) friction fit in each stud cavity and at each floorline.
Cavity Insulation	1. Full cavity depth or less of F1850 applied using sheathing as substrate and covering the width of the cavity and inside of the stud flange.
Exterior sheathing	5/8 in. thick Type X exterior gypsum sheathing
Exterior wall covering Use either 1 or 2	1. Any noncombustible exterior wall covering material 2. Any combustible exterior wall covering system that has successfully been tested in accordance with NFPA 285.