Southern Connecticut
State University
Office of Facilities Operations and Planning
615 Fitch Street
Hamden, CT 06514-4803
Tel: (203)392-6051
Fax: (203)392-6058

Facilities Planning Department 615 Fitch Street, Hamden, CT 06514 Tel (203)392-6055 Fax (203)392-6058

Hickerson Hall & Neff Hall Roof Replacements
Project Number: CF-RS-365
Bid No.:RFQ-22-SCSU-02

ADDENDUM NO. 1
January 4, 2022

TO: Prospective Contractors of Record

FROM: Peter J. Visentin, Director of Architectural Services
Richard L. Glasson, Purchasing Assistant
Procurement, Southern Connecticut State University 501 Crescent Street, New Haven, CT 06515-1355
Tel 203-392-6702

REFERENCE: Proposal Documents For:
Hickerson Hall & Neff Hall Roof Replacements
Project Number: CF-RS-365
Bid No.: RFQ-22-SCSU-02

This Addendum forms a part of the contract documents and modifies the original proposal documents, Dated November 22, 2021.

Item 1 CLARIFICATION –PROJECT MANUAL FOR BIDDERS:

Refer to the 'Objective Criteria for Evaluating Qualifications of Bidders' for the bidders/contractor qualifications for bidding and for actually doing the work described in the documents. The University has very strict requirements that a contractor must have the experience and capability to do the work. Note that Section 07 53 23, EPDM Membrane Roofing, has stricter qualification requirements.

The Owner will consider requests for equals or substitutions if made prior to the Receipt of the Competitive Bid. The information on all materials shall be consistent with the information in the specifications.

Item 2 DIVISION 0, SECTION 00 40 13, BID PROPOSAL FORM:

The Bid Form has been revised. See attached Revised Bid Proposal Form
Lines have been added for listing the number & costs of Wind Uplift Tests.
A line has been added for listing the name of the Asbestos Abatement Subcontractor.
Supplemental Bid A has been added.

Item 3 DIVISION 1, 01 23 00, SUPPLEMENTAL BIDS

Supplemental Bids Section has been added. See attachment.

Hickerson Hall & Neff Hall Roof Replacements
Project Number: CF-RS-365

Bid No.: RFQ-22-SCSU-02

ADDENDUM NO. 1
January 4, 2022

Item 4 DIVISION 1, SECTION 01 35 16, ALTERATION PROJECT PROCEDURES

D. Inspection:

Paragraph 3.3.2
Delete the last paragraph that begins with “”Under no circumstances ….”

Add Paragraph 3.3.2a:

Testing for asbestos has been conducted at the roofs scheduled for replacement. The testing results are in a separate document that is attached to this Addendum #1. The test results are for informational purposes only. Under no circumstances shall this information be the sole means used by the Contractor for determining the extent of Asbestos. The Contractor shall be responsible for verification of all field conditions affecting performance of the Work.

The contractor is responsible for removing the asbestos listed on the Hickerson Hall report, using a qualified asbestos abatement contractor that must be named on the bid form.

Item 5 DIVISION 7, SECTION 07 53 23, EPDM MEMBRANE ROOFING

Paragraph 1.7, Quality Assurance:

Delete item D – Technical Field Monitor - from Base Contract

Paragraph 2.4, Roof Insulation:

Note:
Roof insulation to be R-30 minimum.

Paragraph 3.10, Field Quality Control:

Note:
For Wind Uplift Testing the Contractor is to follow the requirements and procedures noted in the FM Global Data Sheet 1-52 (Attached) for testing and overall number of required wind uplift tests. Based on the 1-52 document, the bidder is to indicate the number of wind uplift tests and cost on the Bid Form. All repairs are to be performed by the contractor as part of their base scope of work.

Item 6 DRAWINGS 1.2, NEFF HALL DETAILS and 2.2, HICKERSON HALL DETAILS

See attached Revised Neff Hall Door Sill Detail (S-1) Drawing SKA-01
See attached Revised Hickerson Hall Door Sill Detail (S-1) Drawing SKA-02

See attached Hickerson Hall – Existing Louvers Drawing SKA-03 [New Drawing]

Item 7 EXISTING ROOF PHOTOS

See attached Hickerson Photos Zip - Ctrl+Click on link & download photos.
See attached Neff Photos Zip – Ctrl+Click on link & download photos.

Hickerson Hall & Neff Hall Roof Replacements
Project Number: CF-RS-365

Bid No.: RFQ-22-SCSU-02

ADDENDUM NO. 1
January 4, 2022

Item 8 PRE-BID CONFERENCE ATTENDEES
See sign in sheet, attached, from the Mandatory Pre-Bid Conference, December 16, 2021

ATTACHMENTS:
Revised Bid Proposal Form (15 Pages)
Section 01 23 00 Supplemental Bids (1 Page)
438192 Signed Survey Report_rs - Hickerson.pdf (Ctrl+Click on this link)
438192 Signed Survey Report_rs - Neff.pdf (Ctrl+Click on this link)
FM Global Data Sheet 1-52 (28 Pages)
Revised Neff Hall Door Sill Detail (S-1) Drawing SKA-01
Revised Hickerson Hall Door Sill Detail (S-1) Drawing SKA-02
Hickerson Hall – Existing Louvers Drawing SKA-03
Hickerson Photos.zip (Ctrl+Click on this link & download photos)
Neff Photos.zip (Ctrl+Click on this link & download photos)
Mandatory Pre-Bid Conference (December 16, 2021) Sign-In Sheets – 2 pages

CONTRACTOR SHALL ACKNOWLEDGE RECEIPT OF THIS ADDENDUM ON THE BID FORM

END OF ADDENDUM NO. 1

Sincerely yours,

Peter J. Visentin

Peter J. Visentin, AIA
Director of Architectural Services

Richard L. Glasson

Richard L. Glasson
Purchasing Assistant

STATE OF CONNECTICUT
SOUTHERN CONNECTICUT STATE UNIVERSITY
BID PROPOSAL FORM

BID NUMBER: RFQ-22-SCSU-02
PROJECT TITLE: HICKERSON HALL AND NEFF HALL ROOF REPLACEMENTS
PROJECT NUMBER: CF-RS-365
DATE: January 12, 2022

Bid Packages should be sent electronically to procurement @southernct.edu

DATE: _____

PROPOSAL OF _____
BIDDER'S NAME

_____

_____
BIDDER'S ADDRESS

1.0 In accordance with Chapter 60 Part II of the Connecticut General Statutes, as amended, and pursuant to, and in compliance with your Invitation to Bid, the Notice to Bidders, the Contract, including the conditions thereto, the Bid Security, I (we) propose to furnish the labor and/or materials, installed as required for the project named and numbered on this Bid Proposal Form, submitted herein, furnishing all necessary equipment, machinery, tools, labor and other means of construction, and all materials specified in the manner and at the time prescribed strictly in accordance with the provisions of the Contract including, but not limited to, the specifications and/or drawings together with all addenda issued by our authority and received prior to the scheduled closing time for the receipt of the bids, and in conformity with requirements of the Awarding Authority and any laws or Departmental regulations of the State of Connecticut or of the United States which may affect the same, for and in consideration of the price(s) stated on the said Bid Proposal Form, hereof.

2.0 The Lump Sum Base Bid by me (us) on the Bid Proposal Form includes all work indicated on the drawings and/or described in the specifications, except:

2.1 Unit Prices - NOT APPLICABLE FOR THIS PROJECT.
2.2 Special Unit Prices - NOT APPLICABLE FOR THIS PROJECT.
2.3 Work covered by Supplemental Bids as may be listed on the Bid Proposal Form and General Requirements.

3.0 I (we) acknowledge and agree to the following:

3.1 Unit Prices - NOT APPLICABLE FOR THIS PROJECT
3.2 Special Unit Prices - NOT APPLICABLE FOR THIS PROJECT.
3.3 Allowances NOT APPLICABLE FOR THIS PROJECT
3.4 To use and accept the Supplemental Bids in Section 01 23 13, Division 1, as provided by the Contractor, when authorized by the Owner as scheduled in Section 7.6 of this Bid Proposal Form

4.0 This Bid Proposal Form is submitted to and in compliance with the foregoing and following conditions and/or information:

4.1 AWARD

4.1.1 All proposals shall be subject to provisions of the Notice to Bidders and for purpose of award, consideration shall be given only to Proposals submitted by qualified and responsible bidders.

4.1.2 The award shall be evaluated using the lowest Total Lump Sum Bid as stated in Section 7.3 of this Bid Proposal Form, and any or all Supplemental Bids as stated in Section 7.5 of this Bid Proposal Form, taken sequentially, as applicable, provided funds are available. The award will also be made based on the "Objective Criteria for Evaluation of Qualifications of Bidders"

4.1.3 In the event of any discrepancy between the amount written in words and the amount written in numerical figures, the amount written in words shall be controlling.

4.2 COMMENCEMENT AND FINAL COMPLETION OF WORK:(ARTICLE 4 GENERAL CONDITIONS)

4.2.1 The General Contractor shall commence Work, (Including any or all Supplemental Bids, if accepted) within five calendar (5) days, after issuance of Purchase Order.

4.2.2 The work is to be completed in **the following order** as noted in the drawings.

Neff Hall Roof Replacement – Begin Work – Monday May 16, 2022 –
Substantial Completion by Friday August 16, 2022

Hickerson Hall Roof Replacement – Begin Work – Monday May 16, 2022 –
Substantial Completion by Friday August 16, 2022

A Purchase Order will be issued soon after the winning bid is accepted, and the contract signed. It is expected that the **contract will be awarded soon after the bid is accepted.**

(See 7.3.1 for opportunity to clarify supply chain issues.)

4.3 LIQUIDATED DAMAGES: (ARTICLE 8, GENERAL CONDITIONS)

4.3.1 The General Contractor shall be assessed **($300.00) Three Hundred Dollars in Liquidated Damages, per day for each calendar day** beyond the Date given for Final Completion of the Contract according to the two Contract Times given above.

4.4 CONTRACTORS INSURANCE REQUIRED:

4.4.1 The limits of liability for the Insurance required for this project shall be those listed in Section 00300, Certificate of Insurance, for projects under $500,000.000.

4.4.2 SPECIAL HAZARDS INSURANCE REQUIRED:
Type "C" – Collapse
Type "X" – Explosion
Type "U" – Underground

4.4.3 BUILDERS RISK INSURANCE REQUIRED: Fire and Extended Coverage on a percent basis (Completed Value Form) on the insurable portion of the entire project. The policy or policies shall specifically state that they are for the benefit of and payable to, Southern Connecticut State University, the contractor, and all persons furnishing labor or labor and materials for the contract work, as their interests may appear.

4.5 The General Contractor on this project shall be required to perform not less than **25%** of the completed Contract Sum of the Work with its own forces.

4.5.1 The General Contractor on this project shall be required to award not less than **25 %** of the total Contract Sum to contractors who are certified and eligible to participate under The State of Connecticut Set-Aside Program for small contractors. Participating contractor list may be obtained by going to www.das.state.ct.us/purchase/setaside.

4.5.1.1 This requirement must be met even if the General Contractor is certified and eligible to participate in the Small Business Set-Aside Program. The apparent low bidder will have to submit, as part of his bid, a list of certified set aside contractors to be used on this project along with the dollar amounts to be paid to each, on the form provided, and a copy of their current certification must be attached. This information will be considered as part of your Bid Proposal Form and failure to comply with any portion of this requirement including but not limited to failure to list or meet the necessary dollar amount or percentage of the bid price will be cause to reject your bid.

4.5.2 Of the amount awarded for the set-aside program noted in paragraph 4.5.1 above, 25% of that 25%, or **6.25% of the Total Contract Value** must be awarded to woman or minority owned, in accordance with Connecticut General Statutes Section 4a-60g.

4.5.2.1 The apparent low bidder will have to submit, as part of the bid, a list of certified women or minority contractors to be used on this project along with the dollar amounts to be paid to each, on the form provided, and a copy of their current certification must be attached. See Schedules 4.5.3 & 4.5.4 below. This information will be considered as part of your Bid Proposal Form and failure to comply with any portion of this requirement, including but not limited, to failure to list or meet the necessary dollar amount or percentage of the bid price will be cause to reject your bid.

4.5.3 Schedule 4.5.3 & 4.5.4

Certified and Eligible Minority Business Enterprise Subcontractor

NOTE: THIS INFORMATION DOES HAVE TO BE SUBMITTED NOW AS PART OF THE BID FORM. .

SCHEDULE 4.5.3 – LISTED WOMEN OR MINORITY BUSINESS ENTERPRISES

1. _____

Name of Subcontractor

Address .

Contact Person **Phone No**

FEIN No. **Fax No.**

Amount Dollars **$** ☐☐☐ **,** ☐☐☐ **,** ☐☐☐ **.** ☐☐

(Place figures in appropriate boxes.)

DOLLARS

_____

Certification Exp. Date::

2. _____

Name of Subcontractor

Address .

Contact Person **Phone No**

FEIN No. **Fax No.**

Amount Dollars **$** ☐☐☐ **,** ☐☐☐ **,** ☐☐☐ **.** ☐☐

(Place figures in appropriate boxes.)

DOLLARS

_____

Certification Exp. Date::

3. _____
Name of Subcontractor

Address .

Contact Person **Phone No**

FEIN No. **Fax No.**

Amount Dollars $ | | | , | | | , | | | . | |
(Place figures in appropriate boxes.)
DOLLARS

Certification Exp. Date::

4. _____
Name of Subcontractor

Address .

Contact Person **Phone No**

FEIN No. **Fax No.**

Amount Dollars $ | | | , | | | , | | | . | |
(Place figures in appropriate boxes.)
DOLLARS

Certification Exp. Date::

SCHEDULE 4.5.4 – SET-ASIDE WORKSHEET

	Subcontractor Name	Class of Work	SBE	MBE/WBE	General Contractor Self-Preforming $$	Subcontract
1					$	
2						**$**
3						**$**
4						**$**
5						**$**
6						**$**
7						**$**
8						**$**
9	Prime Contractor Total				0	
10	SBE Subtotal	Add SBE subcontract amounts from above list and enter at right.				**$**
11	MBE/WBE Subtotal	Add MBE/WBE subcontract amounts from the list and enter total to the right				**$**
12	Contract Value	Enter total lump sum base bid and accepted supplemental bids from bid submittal form.				**$**
13	Prime Contractor % and $$$$ **Must be minimum 25% of line 12**					**%**
14	SBE Percentage	Divide line 10 by line 12. Enter % to the right **Must be minimum 25% of line 12**				**%**
15	MBE/WBE Percentage	Divide line 11 by line 14. Enter % to the right. **Must be minimum 6.25% of line 12**				**%**

Vendor Company Name _____

Authorized signature_____ Date_____

4.6 BIDDERS' QUALIFICATIONS STATEMENT AND OBJECTIVE CRITERIA FOR EVALUATING QUALIFICATIONS OF BIDDERS:

4.6.1 Information in regards to the General Contractors and the Named Subcontractors Bidders Qualification Statements is submitted and is made part of this Bid Proposal Form.

4.6.1.1 The General Contractor is required to complete the CHRO Contract Compliance Regulations & Bidder Qualification Statement (SCSU-4F).

4.6.1.2 Any Named Subcontractor as listed in schedule 7.5.1 of this Bid Proposal Form is required to complete the CHRO Contract Compliance Regulations & Bidder Qualification Statement (SCSU-4F. This information will be considered as part of your Bid Proposal Form and failure to comply with any portion of this requirement will be cause to reject your bid.

4.6.2 The Objective Criteria for Evaluating Bidders, that are included in the Contract Documents of this project, is to assure that State of Connecticut will secure the "lowest responsible and qualified bidder" who has the ability and capacity to successfully complete the Bid Proposal Form and the Work.

4.7 NONDISCRIMINATION AND LABOR RECRUITMENT:

4.7.1 I (we) agree that the Contract awarded for this project shall be subject to Executive Orders No. Three & Seventeen, promulgated June 16, 1971 and February 15, 1973 respectively and to the Guidelines and Rules of the State Labor Commissioner implementing Executive Order No. Three and further agree to submit reports of Compliance Staffing on Labor Department Form E.O. 3-1, when and as requested.

4.8 FEDERAL & STATE WAGE DETERMINATIONS:

4.8.1 The U. S. Secretary of Labor's latest decision, and the State of Connecticut Wage Schedule are all incorporated in the documents. The higher rate (Federal or State) for any given occupation shall prevail if the bid price exceeds $100,000. At the time of bidding, if the bid price exceeds $100,000, the bidder agrees to accept the current prevailing wage scale as provided by the Connecticut Department of Labor for work performed at the site.

4.9 CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY & NON-SEGREGATED FACILITIES:

4.9.1 The General Contractor and Subcontractors are hereby advised that upon acceptance of their bids they are obligated to fill out within 7 Calendar days the certification required pursuant to Executive Order No. 11246, and agree to certify to the compliance of non-segregated facilities.

4.10 EQUALS AND SUBSTITUTIONS:

4.10.1 All submissions requesting "Equal" and or Substitutions" shall be made by the Contractor in accordance with Article 15 of the General Conditions and Section 01 25 00 of the General Requirements. Bidders must submit requests for equals or substitutions prior to the receipt of the competitive bid. Substitutions will be allowed where the proposed substitute is approved as an equal material or products by the University Representative. All submissions shall contain all the information necessary for the Owner to evaluate the submission and the request. Failure to submit sufficient information to make a proper evaluation, including submittal of data for the first manufacturer listed as well as the data for the Equal and or Substitution proposed, shall result in a rejection of the submission and request.

4.11 DAS Prequalification Certificate: The General Contractor is advised that for any proposal price estimated to be in excess of $500,000.00, a valid Department of Administration Services Prequalification Certificate and Update Statement must accompany this proposal. Application for this program can be accessed by going to www.das.state.ct.us/BusinessSvs/PreQual/Prequal.asp

5.0 ACCOMPANYING THIS PROPOSAL IS:

5.1 A CERTIFIED CHECK drawn to the order of the "Controller, Southern Connecticut State University" in the amount of:

$ ☐☐☐ , ☐☐☐ . ☐☐

(Place figures in appropriate boxes.)

_____ DOLLARS

(Written amount)

_____

(A State Bank & Trust Co.) (A National Banking Assoc.)

Located in _____

Address, City & State

which it is understood shall be cashed and the proceeds thereof used so far as may be necessary to reimburse Southern Connecticut State University for losses and damages arising by virtue of my (our) failure to file the required Bonds and execute the required contract in this proposal is accepted by the Awarding Authority.

OR

5.2 A BID BOND having as surety thereto a Surety Company or Companies authorized to transact business in the State of Connecticut and made out in the penal sum of 10% of the TOTAL bid, or in the amount of:

$ ☐☐☐ , ☐☐☐ . ☐☐

(Place figures in appropriate boxes.)

_____ DOLLARS

(Written amount)

6.0 I (we), the undersigned, hereby declare that I am (we are) the only person(s) interested in the Bid Proposal and that it is made without any connection with any other person making any Bid Proposal for the same work. No person acting for, or employed by, the State of Connecticut is directly or indirectly interested in this Bid Proposal, or in any Contract which may be made under it, or in expected profits to arise therefrom. This Bid Proposal is made without directly or indirectly influencing or attempting to influence any other person or corporation to bid or refrain from bidding or to influence the amount of the Bid Proposal of any other person or corporation. This Bid Proposal is made in good faith without collusion or connection with any other person bidding for the same work and this proposal is made with distinct reference and relation to the plans and specifications prepared for this Contract. I (we) further declare that in regard to the conditions affecting the Work to be done and the labor and materials needed, this Bid Proposal is reliance upon any representations of any employee, officer or agent of the State.

7.0 Each class of Work set forth in a separate section of the specifications pursuant to this Section shall be a subtrade designated in Schedule 7.5.1 of this Bid Proposal Form and shall be the matter of a subcontract made in accordance with the procedure set forth in this chapter.

7.1 The undersigned proposes to furnish all labor and materials required for

Project Numbers: CF-RS-365

Project Title: Hickerson Hall and Neff Hall Roof Replacements

In accordance with the accompanying Plans and Specifications.

Prepared by: Quisenberry Arcari Malik, LLC
And
Office of Facilities Planning and Architectural Services
Southern Connecticut State University

for the Contract Sums specified in Section 7.3 subject to additions and deductions according to the terms of the specifications.

7.2 This Bid Proposal includes Addenda numbered _____**.**

7.2.1 The **Contractor is to fill in item 7.2 above**, acknowledging the number of Addenda that the Contractor is including in the Bid Proposal Form.

7.3 THE PROPOSED CONTRACT SUMS ARE AS FOLLOWS:

Hickerson Hall and Neff Hall Roof Replacements – Project No. CF-RS-365

$ ☐☐ , ☐☐☐ , ☐☐☐ . ☐☐

(Place figures in appropriate boxes.)

DOLLARS

_____

(Written Amount)

The Contract Sum must include but not limited to:

1. Removal / Replacement at Neff Hall of existing EPDM roof systems including edge metal. Installation of new .090 thick black EPDM roof assembly, coverboard, insulation (tapered & flat) and edge metal. Replacement of existing drains and raising of existing brick through wall flashing. Raising of existing mechanical units.

2. Removal / Replacement at Hickerson Hall of existing EPDM roof systems including edge metal and removal of existing tapered light weight gypsum slab. Installation of new .090 thick black EPDM roof assembly, coverboard, insulation (tapered & flat) and edge metal. Replacement of existing drains and raising of existing brick through wall flashing. Raising of existing mechanical units.

3. Number of Wind Uplift Tests for each Roof_____

4. Cost of Wind Uplift Tests for each Roof_____

7.3.1 _____Manufacturer of .090 Thick EPDM

_____Date of EPDM Delivery

_____Manufacturer of Insulation

_____Date of Insulation Delivery

7.3.2 _____Asbestos Abatement Subcontractor

7.3.3 In accordance with Section 4.5 of this Bid Proposal Form, the amount of Work performed by the General Contractor must be at least **Twenty-Five percent (25%)** of the **TOTAL** Proposal Contract Sum.

7.3.4 Bid Prices to be held for ninety (90) days from bid opening.

7.3.5 UNIT PRICES – NOT APPLICABLE FOR THIS PROJECT

7.4 The work to be performed by the General Contractor, with his own forces, for the TOTAL project, is as follows:

$ ☐☐ **,** ☐☐☐ **,** ☐☐☐ **.** ☐☐

(Place figures in appropriate boxes.)

7.4.1 By submitting this bid, the contractor accepts and meets the Drawings & Specifications in their entirety. Any exceptions and/or deviations must be listed below.

EXCEPTIONS/DEVIATIONS

_____

_____

_____

7.5 Subcontractors and their price must be listed for the major trades identified in Schedule 7.5.1 below. (As per C. G. S. 4b-95)

NOTE;
THIS INFORMATION IS TO BE SUBMITTED NOW AS PART OF THE BID FORM

SCHEDULE 7.5.1 – NAMED SUBCONTRACTORS

1. General Trades _____
Name of Subcontractor

Address _____ .

Contact Person **Phone No**

FEIN No. **Fax No.**

Amount Dollars **$** ☐☐☐ **,** ☐☐☐ **,** ☐☐☐ **.** ☐☐
(Place figures in appropriate boxes.)
_____ DOLLARS

Labor & Material Payment Bond: ☐☐☐ **%**

Performance Bond: ☐☐☐ **%**

2. Roofing _____

Name of Subcontractor

Address .

Contact Person **Phone No**

FEIN No. **Fax No.**

Amount Dollars **$** ☐☐☐ , ☐☐☐ , ☐☐☐ . ☐☐

(Place figures in appropriate boxes.)

_____ DOLLARS

Labor & Material Payment Bond: ☐☐☐ **%**

Performance Bond: ☐☐☐ **%**

3. HVAC _____

Name of Subcontractor

Address .

Contact Person **Phone No**

FEIN No. **Fax No.**

Amount Dollars **$** ☐☐☐ , ☐☐☐ , ☐☐☐ . ☐☐

(Place figures in appropriate boxes.)

_____ DOLLARS

Labor & Material Payment Bond: ☐☐☐ **%**

Performance Bond: ☐☐☐ **%**

4. Plumbing _____
Name of Subcontractor

Address .

Contact Person **Phone No**

FEIN No. **Fax No.**

Amount Dollars **$** ☐☐☐ , ☐☐☐ , ☐☐☐ . ☐☐
(Place figures in appropriate boxes.)
_____ DOLLARS

Labor & Material Payment Bond: ☐☐☐ **%**

Performance Bond: ☐☐☐ **%**

5. Electrical _____
Name of Subcontractor

Address .

Contact Person **Phone No**

FEIN No. **Fax No.**

Amount Dollars **$** ☐☐☐ , ☐☐☐ , ☐☐☐ . ☐☐
(Place figures in appropriate boxes.)
_____ DOLLARS

Labor & Material Payment Bond: ☐☐☐ **%**

Performance Bond: ☐☐☐ **%**

7.6 Any Supplemental Bids listed in schedule 7.6.1, if accepted by the Owner, will be taken cumulatively and in alphabetical order as scheduled. No Supplemental Bid will be skipped or taken out of as scheduled. Supplemental Bids: Division 1, Section 01 23 00 of the General Requirements identifies and describes the Supplemental Bids as shown in Schedule 7.6.1.

SCHEDULE 7.6.1 – SUPPLEMENTAL BIDS	
Supplemental Bid No. A	Provide all labor, material, and equipment to complete the work noted below in accordance with the specifications and drawings. **Delete the cost of the Uplift Tests from the Base Contract.** **Add Full Time Technical Field Monitoring to the Base Contract.** **See Section 01 23 00, Supplemental Bids**
ADD:	Add to the Contract Sum, the lump sum of: …… _____ Dollars $ _____ . (Written Amount)

7.7 The undersigned agrees that, if selected as General Contractor, the General Contractor shall, within five (5) calendar days, legal State holidays excluded, after presentation thereof by the awarding authority, execute a Construction Contract, as outlined in the Project Manual, and in accordance with the terms of this Bid Proposal Form.

7.8 The undersigned agrees and warrants that they has made good faith efforts to employ minority business enterprises as Subcontractors and suppliers of materials under such Contract and shall provide the Commission on Human Rights and Opportunities with such information as is requested by the Commission concerning their employment practices and procedures as they relate to the current provisions of the Connecticut General Statutes governing Contract requirements.

8.0 A duly authorized representative of the Bidder or Bidder's partnership, firm, corporation or business organization must sign all Bid Proposals Forms.

(NO FACSIMILE SIGNATURE IS PERMITTED).
ALL INFORMATION BELOW IS TO BE FILLED IN BY THE BIDDER.

Project Number _____

Signed this _____ **day of** _____ **19** _____

Firm Name _____

Complete Legal Name

Address _____
Street City State

Telephone Number _____

Bidders Signature _____ _____
Duly Authorized Title

END OF SECTION

01 23 00 SUPPLEMENTAL BIDS

A. Related Documents

1. The drawings and General Provisions of the Contract, including the General and Supplementary Conditions and other Division 01 Specifications Sections, apply to this Section

B. Definitions

1. A Supplemental Bid is an amount proposed by bidders and stated on the Bid Proposal Form for certain work defined in the Bidding Documents that may be added to the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
    a. The cost for each supplemental bid is the net addition to the Contract Sum to incorporate the Supplemental Bid into the Work. Supplemental Bids are only accepted in the alphabetical order that they are listed on the Bid Proposal Form and never accepted out of numerical sequence. No other adjustments are made to the Contract Sum.

C. Procedures:

1. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate that Work into the Project.
    a. Include as part of each Supplemental Bid, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Supplemental Bid.
2. Execute accepted Supplemental Bids under the same conditions as other Work of this Contract.
3. Schedule: A "Schedule of Supplemental Bids" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials necessary to achieve the Work described under each Supplemental Bid.

D. Schedule of Supplemental Bids:

Supplemental Bid No. A

Delete the cost of the Uplift Tests from the Base Contract.

Add the Full Time Technical Field Monitoring to the contract:

1. Technical Field Monitor: Arrange with an independent roofing consultant to provide the services of an on-site, full-time technical field monitor to observe the total roofing system installation, and to provide the following in addition to the requirements for a Visual Construction Observation (VSO) set forth in FM Global Data Sheet 1-52 Field Verification of Roof Wind Uplift Resistance, Section 2.5 Visual Construction Observation & Appendix F:
    a. Confirm that the Roofing Contractor’s applicators have completed the membrane manufacturer’s training program.
    b. Monitor quality control over the total roofing operation, including but not limited to, wood blocking installation, roofing installation, metal work, flashing, and manufacturer supplied roofing system components and accessories required for the complete installation of the roofing system.
        1. Confirm that all work is in compliance with the Contract Documents and installed as required to obtain warranty.
    c. Monitor the quality of the seams by taking a minimum of three cross seam cuts, measuring 2 by 6 inches, each day the membrane is installed. Patch test cuts with same material at no additional cost to Owner.
        1. Include field samples with weekly reports.
    d. Inspect roof installation daily and prepare daily punch list for corrective action by the Installer.
    e. Provide a written daily report to the Architect and Installer.

This work is not to be included in the Base Bid.

FIELD VERIFICATION OF ROOF WIND UPLIFT RESISTANCE

FM Global clients must contact the local FM Global office before beginning uplift testing or any roofing work.

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1.0 SCOPE

This data sheet describes two methods of field testing new installations of above-deck roofing assemblies to determine if there is adequate wind resistance. It also provides alternative visual construction observation guidelines. Confirmation of acceptable wind uplift resistance on completed roof systems is critical in tropical cyclone-prone regions.

Field tests can be used to assess existing roofs for adequate wind resistance, but not to determine the cause of wind uplift damage after a storm event. Field tests are not applicable to metal panel roofs (standing seam and through fastened), ballasted roofs, or mechanically fastened covers with fasteners spaced more than 2 ft (0.6 m) apart in either direction.

1.1 Changes

July 2021. Interim revision. Updated the scope of this data sheet to clarify the intent of the document for existing situations. Also removed references to an incorrect FM Global form.

2.0 LOSS PREVENTION RECOMMENDATIONS

2.1 Introduction

2.1.1 At locations that are **both** (a) within a tropical cyclone-prone region as defined in Data Sheet 1-28, and (b) in areas where design wind-speeds are greater than or equal to 100 mph (45 m/s), ensure one of the following is performed for new, recovered, or reroofed above-deck roof assemblies:

A. Satisfactory completion of uplift tests in accordance with both Section 2.2 and Section 2.3, or with Section 2.4.

B. Visual construction observation (VCO) in accordance with Section 2.5.

Exception: New roof covers (single-ply, or multi-ply with a mechanically fastened base sheet) mechanically fastened directly to one of the deck types listed below do not require field uplift testing provided the roof cover fastener spacing is verified to be adequate:

- Steel deck minimum 22 ga. (0.295 in. [0.75 mm])
- Wood deck
- Cementitious panel roof deck
- Structural concrete with a minimum ultimate compressive strength (f'c) of 2500 psi (17.4 mPa)
- Lightweight insulating concrete (LWIC) in which roof cover fasteners completely penetrate the LWIC and fully engage minimum 22 ga. (0.0295 in., 0.75 mm) steel form deck

Note: Verification of roof cover fastener spacing may be accomplished by visual identification or nondestructive examination (e.g., metal detection).

2.1.2 If uplift tests are performed, ensure testing requirements are included in the building contract, and roofing contracts/subcontracts when applicable, to determine that the wind uplift performance for the test areas meets the specifications in this data sheet.

2.1.3 Have testing witnessed by the owner's representative.

2.1.4 Record the results of uplift tests or visual construction observation (VCO) and forward to the FM Global local servicing office. See Appendix C for a copy and suggested contract wording.

2.1.5 Have a roofing professional present to repair the test areas and return the roof area to a watertight condition should any of the tests fail.

2.2 General

2.2.1 Prior to any testing, ensure adequate curing of roof adhesives in accordance with the manufacturer's instructions.

2.2.2 Select the appropriate field uplift test based on roof system per Table 2.2.2-1.

Table 2.2.2-1.. Recommended Tests for Various Roof Systems

Type of Test or Analysis/ Roof Type	*MF SP, MF BUR[2] or MF Mod Bit[2] to deck other than LWIC*	*MF SP[1],MF BUR[2] or Mod Bit[2] to LWIC*	*FA SP, BUR or Mod Bit w/MF insulation*	*FA BUR or Mod Bit w/FA insul.*	*FA SP w/FA insul.*	*Metal Roofs*	*Ballasted See DS 1-29*
Negative Pressure Test	DNA	R[1]	R	R	R	DNA	DNA
Bonded Uplift Test	DNA	NR	NR	R	R	DNA	DNA

1. Fastener spacing does not exceed 2 ft (0.6 m)in both directions.
2. Base sheet is mechanically attached and upper plies are adhered.

MF – mechanically fastened
FA – fully adhered
SP – single-ply membrane
Mod Bit – modified bitumen roof cover
R – recommended
NR – not recommended
BUR – built-up roof
DNA – does not apply
Metal Roofs – standing seam (concealed clip securement) or lap seam (through fastened)

2.2.3 Determine the design wind pressure (p_i) for roof zones using RoofNav Ratings Calculator or Data Sheet 1-28.

2.2.4 Determine the required passing uplift test pressures (U_i) for roof zones 1, 1', 2, and 3 per Equation 1:

$$U_i = \Omega_{test} \times p_i \qquad \text{(Equation 1)}$$

Where the uplift testing factor, Ω_{test}, is defined as follows:

$$\Omega_{test} = 1.25 \text{ for zones 1', 1, 2, and 3}$$

Equation 1 results in the following required passing uplift test pressures for the respective roof zones:

$$U_{Zone1} = 1.25 \times p_{Zone1}$$

$$U_{Zone1'} = 1.25 \times p_{Zone1'}$$

$$U_{Zone2} = 1.25 \times p_{Zone2}$$

$$U_{Zone3} = 1.25 \times p_{Zone3}$$

2.2.5 As an alternative to Section 2.2.4, Ui can be determined per Table 2.2.5-1. Note that Table 2.2.5-1 was created for ease of application. In some cases the table is conservative (see footnote 1).

Table 2.2.5-1. Required Passing Uplift Test Pressures as a Function of Required Rated Resistance for Enclosed Low-Slope Buildings[1]

Required FM Global Rated Resistance[3, 4] (Zone 1)	*Required Passing Uplift Test Pressure (Ui)*						
	Zone 1'	Zone 1		Zone 2		Zone 3	
	See Notes 2, 3	lbf/ft^2	kPa	lbf/ft^2	kPa	lbf/ft^2	kPa
60		38	1.8	49	2.3	67	3.2
75		47	2.3	62	3.0	84	4.0
90		56	2.7	74	3.5	101	4.8
105		66	3.2	87	4.2	118	5.6
120		75	3.6	99	4.7	135	6.5
135		84	4	111	5.3	152	7.3
150		94	4.5	124	5.9	169	8.1
165		103	4.9	136	6.5	185	8.9
180		113	5.4	148	7.1	202	9.7
195		122	5.8	161	7.7	219	10.5
210		131	6.3	173	8.3	236	11.3
225		141	6.8	186	8.9	253	12.1
240		150	7.2	198	9.5	270	12.9
255		159	7.6	210	10.1	287	13.7
270		169	8.1	223	10.7	303	14.5
285		178	8.5	235	11.3	320	15.3
300		188	9	247	11.8	337	16.1

1 For design pressures that fall between or above the ratings in the table, the required passing uplift test pressure is equal to 125% of the specific design wind pressure for Zones 1', 1, 2, and 3 as calculated using Data Sheet 1-28. The required passing uplift test pressures for Zone 2 and Zone 3 shown in the table are for enclosed buildings with gable roofs (without overhangs) with low slopes (<7 degrees [1.5 in 12]) and eave roof heights less than or equal to 60 ft (27.4 m).
2 For roofs that include a Zone 1', the required passing uplift test pressure is equal to 125% of the design wind pressure for zone 1' as calculated using Data Sheet 1-28.
3 Treat Zone 1' independently of all other roof zones. Do not determine Zone 2 and Zone 3 passing uplift test pressures based on Zone 1'. The values for Zone 2 and Zone 3 are correlated with Zone 1 values only.
4 The rated resistance is based upon a Safety Factor of 2.0.

Example No. 1: Determination of required passing uplift test pressures for each roof zone.

Note: Negative signs in Table 2.2.5-2 indicate uplift in accordance with typical convention.

Building dimensions: 200 ft x 300 ft x 30 ft
Building type: enclosed building
Roof slope: low-slope roof
Velocity pressure: q_h = 25.8 psf.
Importance factor: I = 1.15

The required passing uplift test pressures, ($P_{test,req}$), for each roof zone are calculated as follows:

$$U_i = \Omega_{test} * p_i = \Omega_{test} * q_h (GC_p - GC_{pi}) * I$$

Table 2.2.5-2. Required Passing Uplift Test Pressures

Roof Zone	*Velocity Pressure, q_h [psf]*	*Pressure Coeff Sum (GC_p — GC_{pi})*	*Design Wind Pressure, p [psf]*	*Minimum FM Approved Rating[2] [psf]*	*Uplift Testing Factor, Ω_{test}* (see 2.2.4)	*Required Passing Uplift Test Pressure[2] [psf]*
3	25.8	-3.38	-100.3	1-210	1.25	-125
2		-2.48	-73.6	1-150	1.25	-92
1		-1.88	-55.8	1-120	1.25	-70
1'		-1.08	-32.0	1-751	1.25	-40

1 Due to the lower end limit (1-60) and 15 psf increments for FM Approved roof assembly ratings, in some cases the rating of the installed roof assembly may be significantly higher than both the design wind pressure and required passing uplift test pressure. The likelihood of this scenario is particularly true for zone 1'.
2 The minimum FM Approved roof assembly rating is based upon a factor of safety of 2 over the design wind pressure. The required passing uplift test pressure is lower than the minimum FM Approved rating in all scenarios.

2.2.6 Except where otherwise noted, evaluation of uplift tests resulting in a passing designation is based on withstanding the required passing uplift test pressure (U_i) or equivalent for its respective roof zone for a period of 1 minute without experiencing any defined mode of failure.

2.2.7 To prevent water damage to insulation, promptly patch and make watertight all damaged/failed test areas.

2.2.8 Perform repairs in accordance with Data Sheets 1-30, *Repair of Wind Damaged Single- and Multi-Ply Roof Systems*; 1-28, *Wind Design*; and 1-29, *Roof Deck Securement and Above-Deck Roof Components*.

2.3 Negative Pressure Test

2.3.1 The negative pressure uplift test is generally preferrable to the bonded uplift test. It is not to be used directly on porous surfaces because the test requires an airtight seal between the test apparatus and the roof covering.

2.3.2 Negative pressure uplift tests may be conducted on totally adhered built-up roofs (BUR), modified bitumen (mod bit), or single-ply membranes. This test can also be performed on mechanically attached base sheets, or mechanically attached/plate-bonded/induction-welded reinforced single-ply membranes if fasteners are spaced no more than 2 ft (0.6 m) on center in both orthogonal directions.

2.3.3 For the fastened base sheets or reinforced single-ply membranes described in Section 2.3.2, the negative pressure apparatus may be used provided a minimum of one fastener is tested at its full fastener-to-fastener span in both orthogonal directions.

2.3.4 Conduct negative pressure uplift tests in accordance with Appendix D, *Negative Pressure Test Procedure*.

2.3.5 Determine the minimum number of individual negative pressure tests per roof area **(NOT** per building) in accordance with Table 2.3.12-1.

2.3.6 Divide roof areas A > 60,000 ft^2 (5,600 m^2) into sub-areas A_i with 10,000 ft^2 (930 m^2) < $A_i \leq$ 60,000 ft^2 (5,600 m^2) (see Figure 2.3.6-1).

2.3.7 Refer to Data Sheet 1-28, *Wind Design*, to determine the roof zone geometric parameters and dimensions.

2.3.8 When determining roof zones for adjacent roof areas (A_i), a height differential of h ≤ 9.8 ft (3 m) can be neglected (see Fig 2.3.6-2).

2.3.9 Test perimeters (Zone 2) and corners (Zone 3) only when roof area Ai terminates along an outside edge (see Figure 2.3.12-1).

2.3.10 Only two tests are required for every interior roof area (see Figure 2.3.12-1).

2.3.11 If a roof area includes Zone 1', **and** the construction of the above-deck roofing assembly **does** differ between Zone 1 and Zone 1', test Zone 1' using the appropriate Zone 1' test pressure.

2.3.12 If a roof area includes Zone 1 and Zone 1', **and** the construction of the above-deck roofing assembly **does not** differ between Zone 1 and Zone 1', testing of Zone 1 is sufficient.

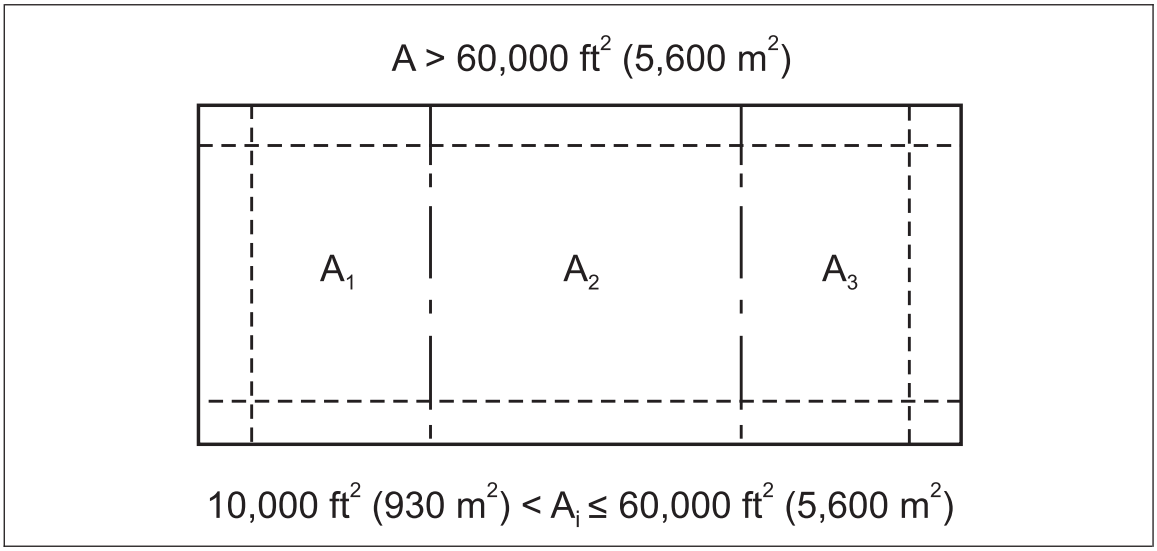


Fig. 2.3.6-1. Roof area divided into sub-areas

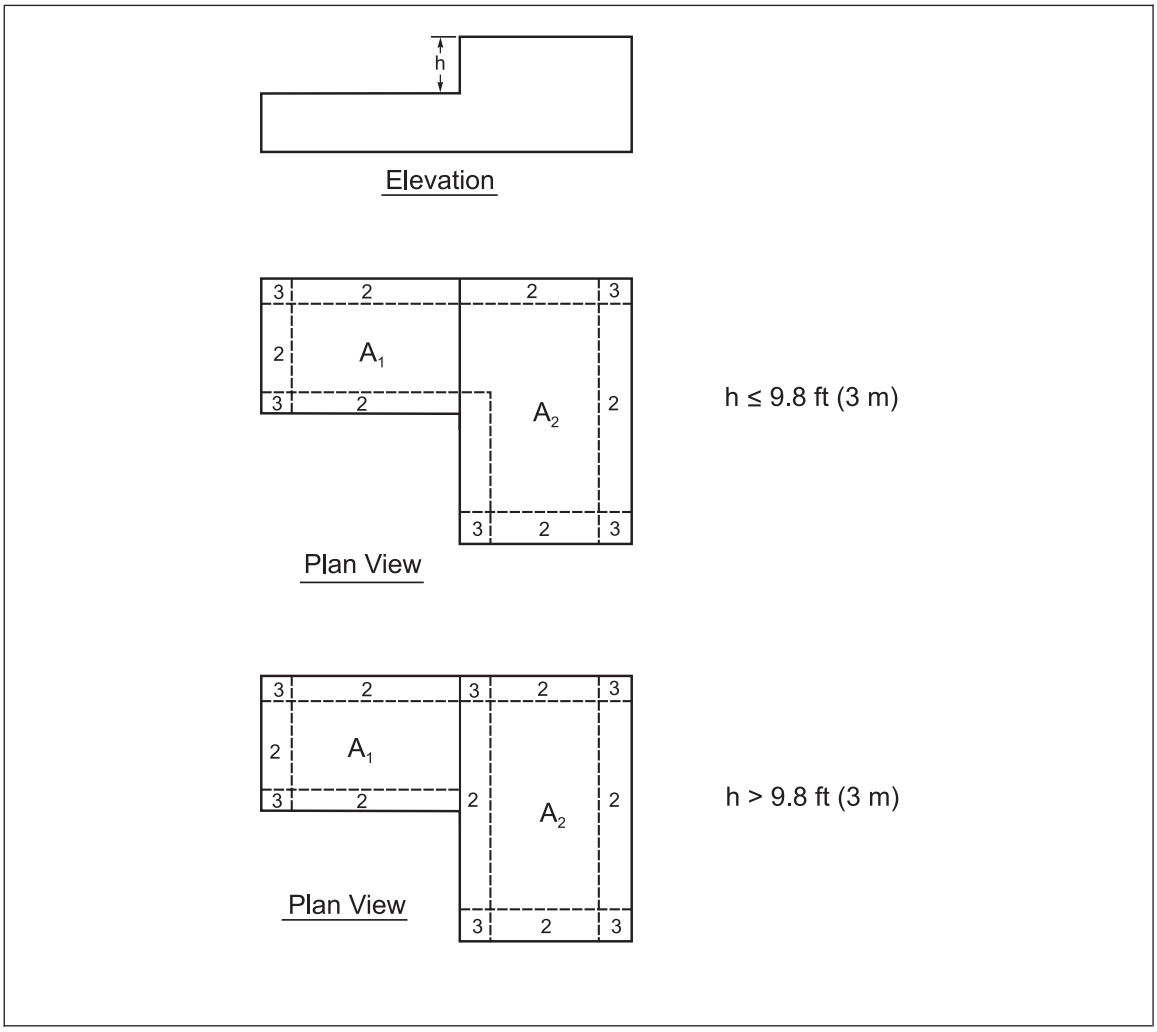


Fig. 2.3.6-2. Roof zone designations for a roof with a height differential

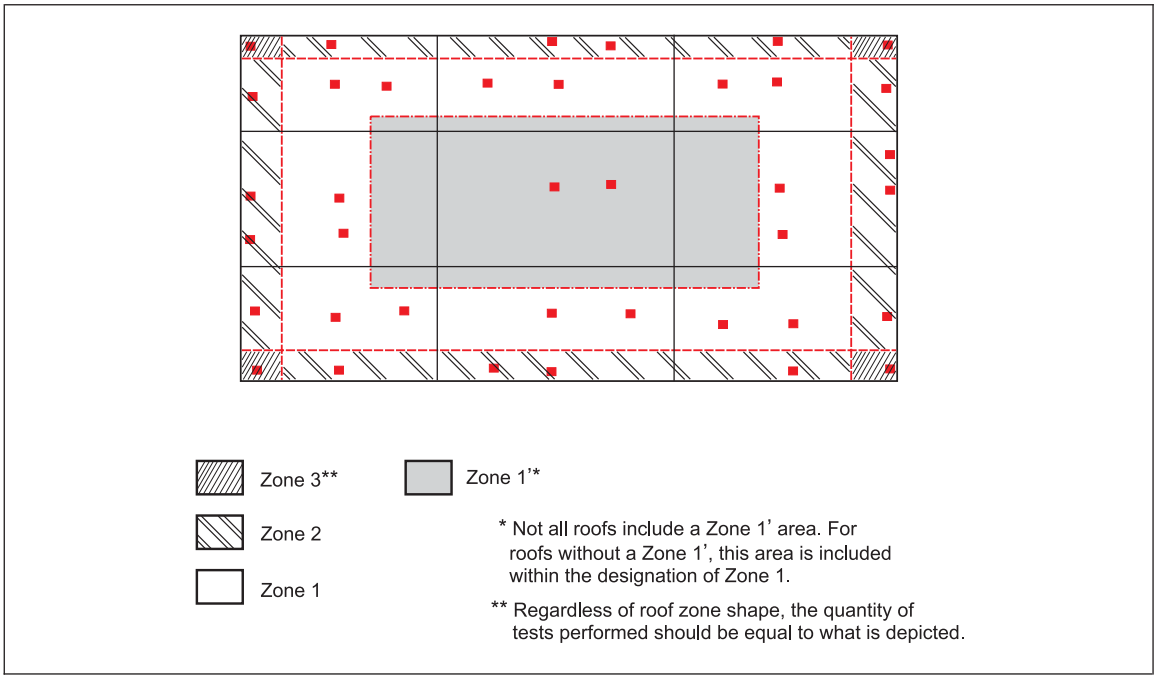


Fig. 2.3.12-1. Uplift test location example: Nine sections Ai with individual roof areas up to 60,000 ft^2 (5,600 m^2) and no change in above-deck roofing assembly for Zones 1 and 1'

Table 2.3.12-1. Minimum Number of Negative Pressure Tests

Roof Area (A) [ft^2 or m^2]	*Minimum Number of Individual Tests(per Roof Zone)*			
	Zone 1'	Zone 1	Zone 2	Zone 3
A < 10,000 (930)	See Note 1.	1	1	1
10,000 (930) < A < 60,000 (5,600)		2	2	1
A > 60,000 (5,600) or multiple adjoining roof areas	See Note 1.			

1 See Sections 2.3.6 to 2.3.12 and Figures 2.3.6-1, 2.3.6-2 and 2.3.12-1.

2.4 Bonded Uplift Test

2.4.1 Bonded uplift testing is not valid if the insulation, base sheet, or membrane is secured with mechanical fasteners.

2.4.2 Do not perform bonded uplift test when the roof slope exceeds 1.2° (1/4 in 12).

2.4.3 Conduct four times as many bonded uplift tests (BPT) as recommended by Table 2.3.12-1, Figure 2.3.12-1, and Sections 2.3.5 through 2.3.12 than that recommended for the negative pressure test (NPT) to account for the smaller test sample area.

2.4.4 Prepare the four BPT samples in close proximity to each other, taking into consideration that a complete cut needs to be made down to the top of the deck around the entire perimeter of the sample, and the required bearing points for the tripod legs.

2.4.5 Determine the required passing scale reading (Freq) for the required passing uplift test pressure (Ui) per Equation 2.

$$F_{req}\ [lb] = U_i\ [psf] \times A_{Testsample}\ [ft^2] + Weight_{Testpanel}\ [lb]$$

$$F_{req}\ [kN] = U_i\ [kPa] \times A_{Testsample}\ [m^2] + Weight_{Testpanel}\ [kN] \qquad \text{(Eq. 2)}$$

2.4.6 Conduct bonded uplift tests and record data in accordance with Appendix E, *Bonded Uplift Test Procedure.*

2.5 Visual Construction Observation (VCO)

2.5.1 Use full-time visual construction observation (VCO) during roof system installations as an alternative to performing field wind uplift testing for verification of adequate wind resistance.

2.5.2 Ensure the construction observer (CO) has the following minimum qualifications:

A. A thorough knowledge of the roofing system being installed, relevant industry accepted-practices, contract documents, blueprint reading, and FM Approval requirements and relevant FM Global data sheets.

B. A thorough knowledge of the specified roofing system and the manufacturer's requirements.

C. Is listed as one or more of the following:

1. Registered roof consultant (RRC) by IIEBEC.

2. Registered roof observer (RRO) by IIEBEC.

3. For locations outside the United States where individuals with the above qualifications are not available, completion of specialized training or certification as a rooftop quality assurance observer from an industry-recognized organization.

2.5.3 Follow guidelines and requirements in Appendix F, *Visual Construction Observation (VC0)*.

3.0 SUPPORT FOR RECOMMENDATIONS

3.1 Background Information

Performing these tests can identify inferior roofs that might be damaged by wind, resulting in water damage to building contents and possible interruption to business. Do not substitute uplift testing for built-in quality. Ensure the roof system is designed to be wind-resistant, and the construction work is performed by a professional roofing contractor who employs quality-control measures that guarantee the system is installed as intended.

Whether tests are to be run on new roofs, or simply because the construction is unknown, passing criteria is based on 125% (Zones 1', 1, 2, and 3) of the design wind pressure (e.g., for a design wind pressure of 45 psf in Zone 1, the minimum test pressure, U1, to pass is 56 lbf/ft^2 [2.7 kPa], with higher pressures for Zone 2 and Zone 3 due to the higher uplift pressures experienced in those areas. Note for this example the minimum required FM Approved roof assembly in Zone 1 would be a 1-90).

The ability of the roof deck and edge conditions to resist wind uplift are also critical but uplift testing does not accurately evaluate the uplift resistance of the roof deck or edge securement, such as flashing, coping, etc. Lifting of metal edge flashing and coping and subsequent lifting and progressive membrane peeling is the most common cause of membrane loss. See Data Sheet 1-29, *Roof Deck Securement and Above-Deck Roof Components*, for proper deck securement, the *Approval Guide*, an online resource of FM Approvals, and Data Sheet 1-49, *Perimeter Flashing*, for proper flashing securement.

3.1.1 Commentary

Table 3.1.1-1 contains explanatory material related to some of the loss prevention recommendations in Section 2.0. The specific section number to which the commentary applies is identified in the table.

Table 3.1.1-1. Commentary for Section 2.0 Loss Prevention Recommendations

Section Number	*Commentary*
2.2.1	Cold adhesives normally require 28 days to cure to the strength obtained during FM Approvals testing, which allows a maximum 28-day cure time. These may acquire additional strength after 28 days and it is acceptable to conduct uplift testing after 28 days. Note: Where time permits (such as prior to the hurricane season), it is preferred to allow a 2-month cure time for cold process, bituminous adhesives.
2.2.2	Neither the negative pressure test nor the bonded uplift test can be used on ballasted roofs or metal-panel roofs. The bonded pull test is not recommended where any type of mechanically fastened cover or insulation is used.
2.2.3	Data Sheet 1-28 is used to determine the roof Zone 1 design wind pressure.
2.2.4	For low roof slopes and a minimum 3 ft (0.9 m) parapet around the entire outside edge of the roof, the required passing uplift test pressure used for Zone 3 is the same as that for Zone 2. Zone 1' is present for certain building configurations only. In addition, the external pressure coefficient difference between Zone 1' and Zone 2 and Zone 3 is high.
2.2.5	Table 2 is based on reference to the Zone 1 FM Global roof wind rating, in which the Zone 2 and Zone 3 values were calculated using Zone 3:Zone 1 and Zone 2:Zone 1 pressure coefficient ratios. Zone 1' must be treated as a zone independent of Zones 1, 2, and 3. This is intended to avoid confusion and potential errors.
2.3	The bonded uplift test is a destructive test. The negative pressure test is more desirable due to its potential to be nondestructive and closer to true wind uplift conditions.
2.3.2	When the membrane is mechanically attached using fastener spacings greater than 2 ft (0.6 m) on center in either direction, a conventional field test is not possible. See Section 3.3.1, Mechanically Fastened Single-Ply Coverings, for more details.
2.3.3	Full fastener-to-fastener span tests are possible only when spacing in both directions is 2 ft (600 mm) or less due to test apparatus dimensions. This arrangement allows one fastener to be centered beneath the apparatus with the entire membrane span contributing to the uplift in normal fashion.
2.3.11	Interior roof areas, including portions categorized as Zone 1', may include differing construction of the above-deck roofing assembly compared to Zone 1. The differing construction is economical for large Zone 1' areas only. Because the uplift pressure for Zone 1' is considerably lower than Zone 1, testing of Zone 1' is only critical when the construction differs.

3.2 Loss History

An extensive loss history exists on failures of roof systems due to wind forces. Since the majority of roof deficiencies leading to wind uplift failures are not readily visible on completed roofs, uplift testing and visual construction observation (VCO) are offered as tools to aid in ensuring adequate wind resistance.

3.3 Negative Pressure Test

Observers not directly involved in operating the test equipment should not stand immediately adjacent to the test area. Also, it is imperative that there be no walking near the test area between the time the deflection gauge has been zeroed out and completion of the test. For example, if someone stands immediately adjacent to the center of the test area while the gauge is being zeroed out, then moves away from that area before the test is complete, the deflection gauge reading may be unrealistically high. In contrast, if someone is initially standing away from the test area, but later walks immediately adjacent to the center of the test area after the gauge was zeroed out, it can cause the deflection gauge reading to be unrealistically low.

Additives to the manometer water solution may cause changes to the specific gravity. Any change to the specific gravity will alter the manometer readings.

The manometer, when used, acts as a safety device to prevent negative pressure that could cause the dome to collapse.

Loose surfacing material can cause pump damage and will prevent a proper seal between the apparatus and the roof.

Laboratory tests have revealed that some improperly adhered roof assemblies may not show obvious signs of ballooning and failure, but will experience considerable deflection (see Section 3.3.1). Field testing of successful roof samples typically results in negligible deflection.

ASTM E-907, *Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems*, was frequently referenced by contractors conducting uplift tests. This standard allowed a 1 in. (25.4 mm) deflection.

3.3.1 Mechanically Attached/Plate Bonded/Induction Welded Roof Coverings

Mechanically attached, plate bonded, and induction-welded single-ply membranes normally will balloon between supports when subjected to uplift pressures. Consequently, it is impractical to use a deflection gauge with such assemblies. The only applicable method of examination for such systems is visual observation of the test specimen for failure throughout testing.

If fasteners are located in rows and only at laps in the membrane, with or without a batten-type strip, neither type of conventional uplift test will yield satisfactory results. Proper uplift can be simulated only by testing the full membrane freespan on both sides of the fastener row. Row spacing is normally too wide to accommodate this criterion.

3.4 Bonded Uplift Test

Arrangement of the BPT test samples in close proximity allows testing of the same approximate sample area as in the NPT, and minimizes the area requiring post-test repair.

Determination of the required passing scale reading (lb [kN]) for the respective required passing uplift test pressure (Ui) are calculated as the following:

$$U_i \text{ (psf[kPa])* AREA (ft}^2 \text{ [m}^2\text{])} + \text{Weight of test panel (lb[kN])}$$

An example is depicted in Table 3.4-1 based on a 4 ft^2 (0.37 m^2) panel that weighs 15 lb (6.8 kg; 66.7 N).

Conversely, determination of the pressure achieved (psf [kPa]) is calculated as follows:

$$\frac{\text{[Scale Reading (lb [kN]) - Weight of test panel (lb [kN])]}}{\text{AREA (ft}^2 \text{ [m}^2\text{])}}$$

For example, if the highest scale reading was 375 lb (170 kg) and the panel weighed 15 lb (6.8 kg) and was 4 ft2 (0.37 m^2) in area, the pressure held was (375-15) lb/4 ft^2 = 90 psf. In SI units, (170-6.8) kg/0.37 m^2 x (9.81/1000) = 4.3 kPa.

Table 3.4-1. Typical Scale Readings for 4 ft^2 (1.2 m^2) Test Panel That Weighs 15 lbs (6.8 kg)

Uplift Test Pressure		*Scale Reading*	
lbf/ft^2	(kPa)	lb	(kg)
15.0	(0.7)	75	(34)
22.5	(1.1)	105	(48)
30.0	(1.4)	135	(61)
37.5	(1.8)	165	(75)
45.0	(2.2)	195	(88)
52.5	2.5	225	102
60.0	2.9	255	116
67.5	3.2	285	129
75.0	3.6	315	143
82.5	4.0	345	156
90.0	4.3	375	170
97.5	4.7	405	184
105.0	5.0	435	197
112.5	5.4	465	211
120.0	5.7	495	225
127.5	6.1	525	238
135.0	6.5	555	252
142.5.	6.8	585	265
150.0	7.2	615	279
157.5	7.5	645	293
165.0	7.9	675	306
172.5	8.3	705	320
180.0	8.6	735	333
187.5	9.0	765	347
195.0	9.3	795	361
202.5	9.7	825	374
210.0	10.1	855	388
217.5	10.4	885	401
225.0	10.8	915	415
232.5	11.1	945	429
240.0	11.5	975	442
247.5	11.9	1005	456
255.0	12.2	1035	469
262.5	12.6	1065	483
270.0	12.9	1095	497
277.5	13.3	1125	510
285.0	13.6	1155	524
292.5	14.0	1185	538
300.0	14.4	1215	551
307.5	14.7	1245	565
315.0	15.1	1275	578
322.5	15.4	1305	592
330.0	15.8	1335	606
337.5	16.2	1365	619
345.0	16.5	1395	633
352.5	16.9	1425	646
360.0	17.2	1455	660
367.5	17.6	1485	674
375.0	18.0	1515	687
382.5	18.3	1545	701
390.0	18.7	1575	714
397.5	19.0	1605	728
405.0	19.4	1635	742

3.5 Visual Construction Observation (VCO)

3.5.1 Visual construction observation (VCO) is an alternative to performing field wind uplift testing for verification of adequate wind resistance.

4.0 REFERENCES

4.1 FM Global

Data Sheet 1-28, *Wind Design*

Data Sheet 1-29, *Roof Deck Securement and Above-Deck Roof Components*

Data Sheet 1-30, *Repair of Wind Damaged Single- and multli-Ply Roof Systems*

Roof*Nav*, an online resource of FM Approvals for roofing professionals

4.2 Other

American Society for Testing and Materials (ASTM) International. ASTM E-907, *Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems*.

APPENDIX A GLOSSARY OF TERMS

Construction observer (CO): A properly qualified, unbiased consultant who conducts a visual construction observation (VCO).

FM Approved: Products and services that have satisfied the criteria for Approval by FM Approvals. Refer to RoofNav or the *Approval Guide*, online resources of FM Approvals, for a complete listing of products and services that are FM Approved.

Hurricane-prone region: See the definition of “tropical cyclone-prone region” in Data Sheet 1-28.

Negative pressure: Pressure less than that of atmosphere.

Roof area: A single roof area for uplift testing is a section of roof (single composition including the same substrate that was installed at the same time) up to its termination point, which is the roof outside edge, an expansion joint, or a roof area divider.

Tropical cyclone-prone region: See Data Sheet 1-28 for definition.

Visual construction observation (VCO): The practice of using a properly qualified consultant to continuously observe the installation of roofing components.

APPENDIX B DOCUMENT REVISION HISTORY

The purpose of this appendix is to capture the changes that were made to this document each time it was published. Please note that section numbers refer specifically to those in the version published on the date shown (i.e., the section numbers are not always the same from version to version).

July 2021. Interim revision. Updated the scope of this data sheet to clarify the intent of the document for existing situations. Also removed references to an incorrect FM Global form.

October 2020. Interim revision. Scope of this data sheet was updated to clarify the intent of the document and clarification was made to recommendation D.4.1.8.

February 2020. This data sheet has been completely revised. The following significant changes were made:

A. Reformatted the document to simplify implementation of testing. Moved procedures for field testing and visual construction observation (VCO) to appendices to facilitate their use.

B. Renamed the “safety factor” for testing to “uplift testing” factor (Ω_{test}).

C. Updated the roof zone nomenclature.

D. Added testing parameters to accommodate a new interior roof zone (Zone 1’).

E. Moved supporting information from Section 2.0 to Section 3.0 (Table 3.1 Commentary).

July 2012. The following changes were made:

A. The option to provide visual construction observation (VCO) in lieu of conducting field uplift tests was added. The title of this document was revised to reflect this change.

B. The number of tests recommended when using the bonded pull test was increased to account for the smaller sample area.

C. The recommended field test safety factor was reduced from 1.5 to 1.25.

D. The deflection limit for thin, mechanically fastened cover boards was increased.

E. Additional pass/fail criteria were provided.

April 2009. The following was done for this revision:

- Changed wind uplift testing recommendations to exempt new roof covers that are mechanically fastened to minimum 22 ga (0.295 in.; 0.75 mm) steel, wood, or cementitious wood fiber deck or structural concrete.
- Added guidance for evaluating tests in which deflection seems excessive, but failure of the assembly is not obvious.

Februuary 2007. This revision of the document changes the test pressure (to include perimeter and corner pressure coefficients and a safety factor = 1.5), the number of uplift tests required, and requires uplift tests for new above-deck roofing assemblies in regions that are prone to hurricanes, typhoons and tropical cyclones and where design wind speeds are at least 100 mph (45 m/s).

May 2000. The document was reorganized to provide a consistent format.

September 1999. A conversion table was added to convert psf to in. of water. Discussion on roof cuts was added for situation s where testing is not practical.

February 1986. Information was added regarded the maximum fastener spacing for mechanically fastened covers for which the negative pressure test is applicable. Also, research test data was added regarding negative pressure tests with unadhered rigid insulation boards that showed excessive deflection.

August 1980. Information was added regarding the negative pressure test apparatus.

January 1978. Details for fastening existing deficient roofs were moved from this document to another data sheet.

March 1975. Examples were added.

August 1970. Document first published.

APPENDIX C CONTRACTOR'S MATERIALS

C.1 Proposed Contract Wording for Uplift Testing:

"ABC Roofing Company agrees to satisfy an uplift test of the completed roofing installation in accordance with FM Global Property Loss Prevention Data Sheet 1-52, Field Verification of Roof Wind Uplift Resistance. ABC Roofing Company is responsible for obtaining the most recent edition of Data Sheet 1-52 from FM Global and for supplying all labor, materials, and test equipment. Results of the tests shall be recorded and made available to FM Global. Acceptance and final payment shall be contingent upon favorable interpretation of the test results (as measured by the specifications) by FM Global."

APPENDIX D NEGATIVE PRESSURE TEST PROCEDURE

D.1 General Information

D.1.1 Scope

D.1.1.1 The Negative Pressure Test is used as a method of field testing above-deck roofing assemblies to evaluate for the following conditions:

- Wind resistance
- Suspected inferior construction

- Partial blow-off

D.1.1.2 The Negative Pressure Test is not applicable to metal panel roofs (standing seam and through-fastened), ballasted roofs, or mechanically fastened covers with fasteners spaced more than 2 ft (0.6 m) apart in either direction.

D.1.2 Test Equipment

D.1.2.1 Test Apparatus: General

The test apparatus (see Figures D.1.2.1-1 and D.1.2.1-2) includes a chamber 5 ft by 5 ft (1.5 m by 1.5 m) sufficiently strong to withstand the necessary negative pressure without collapsing. The chamber is dome-shaped and of rigid acrylic plastic, fiberglass-reinforced plastic (FRP), or aluminum construction with polycarbonate view windows. The type of material and thickness will vary depending on the intended capacity of the apparatus. It is generally manufactured in two or four equal segments for ease in transporting it to and from the roof. The segments are provided with flanges so the units can be secured together. The flanges also act as structural ribs. A rubber gasket is provided to seal between the segments. One segment of the dome has a hole, usually 1.6 in. (41 mm) in diameter, to accommodate the vacuum pump, and another hole to accommodate a water or electric manometer. The dome has a bottom flange to set on the roof surface, and this flange is equipped with a flexible foam strip to seal the dome to the roof surface. Maximum pressure of the test apparatus varies depending on the exact make, but may vary from 340 lbf/ft^2 (16.28 kPa) to 410 lbf/ft^2 (19.63 kPa).

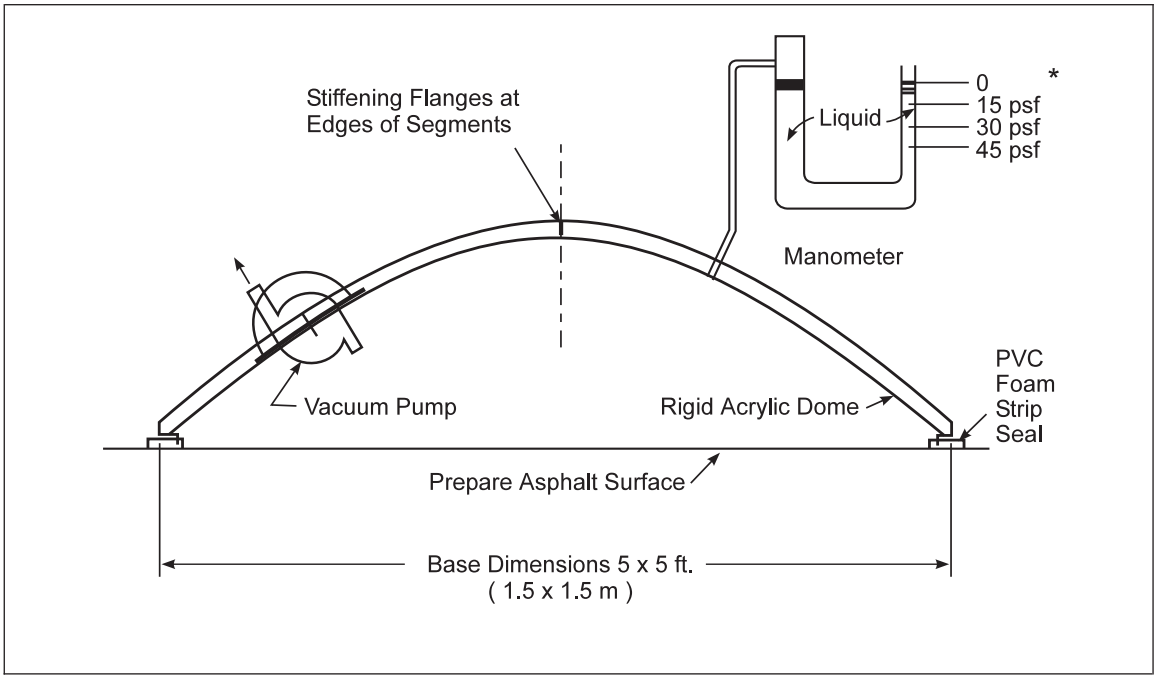


Fig. D.1.2.1-1. Schematic of negative pressure test apparatus with water manometer

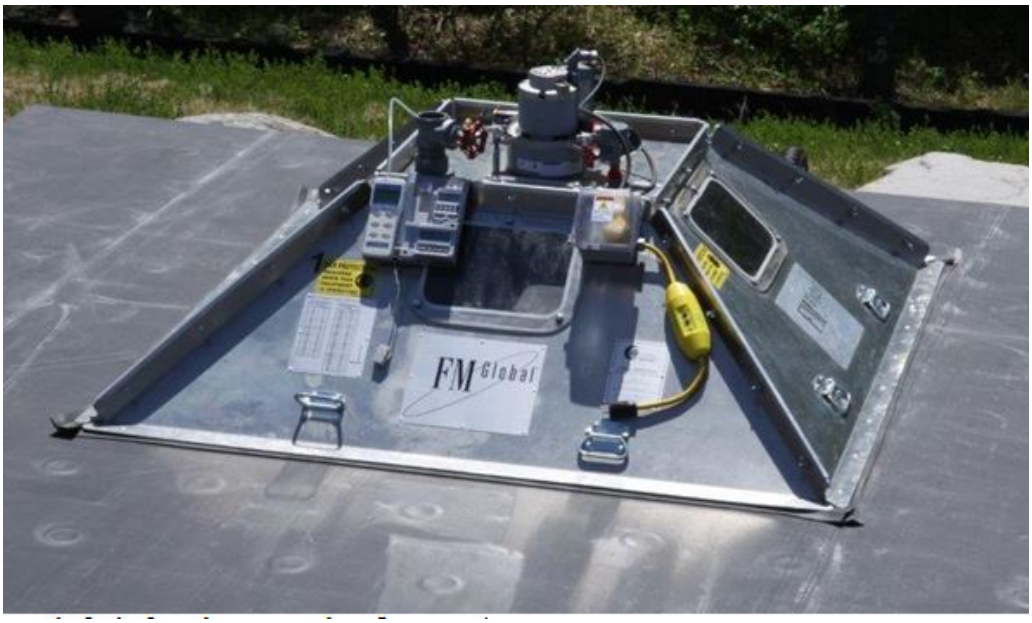


Fig. D.1.2.1-2. Photograph of negative pressure test apparatus

D.1.2.2 Test Apparatus: ManometertextA manometer is a liquid-filled instrument used to measure differential pressure between two fluids (i.e., the inside of the test apparatus versus atmosphere).

NOTE: Various manometer arrangements and calibrations are available. When provided, water manometers are made of clear plastic and generally calibrated to indicate negative pressures of 15 lbf/ft2 (0.72 kPa), 22.5 lbf/ft2 (1.08 kPa), 30 lbf/ft2 (1.44 kPa), 45 lbf/ft2 (2.16 kPa), etc. The manometer is equipped with a flexible tube to connect to the plastic dome. When the liquid is water, each 30 lbf/ft2 (1.44 kPa) of negative pressure is equivalent to a vertical distance on the manometer water column of 5.77 in. (147 mm). (Inches of water required to pass equals lbf/ft2 required to pass multiplied by 0.1924)

The vertical distance of the water column is the difference between the elevation of the two water columns and not the distance of one column from the original 0 set point. To convert other levels of water in a manometer, refer to Table D.1.2.2-1.

Table D.1.2.2-1. Conversion From Pressure to Depth of Water

WIND UPLIFT CALCULATIONS			
1 $lbf/in.^2$ = 144 lbf/ft^2			
1 in. water = 25.4 mm water = 5.2 lbf/ft^2 = 0.25 kPa			
0.1924 in. of water = 1 lbs/ft^2			
lbf/ft^2	**kPa**	**in. H_2O**	**mm H_2O**
15.0	0.7	2.9	73.7
22.5	1.1	4.3	109.2
30.0	1.4	5.8	147.3
37.5	1.8	7.2	182.9
45.0	2.2	8.7	221.0
52.5	2.5	10.1	256.5
60.0	2.9	11.5	292.1
67.5	3.2	13.0	330.2
75.0	3.6	14.4	365.8
82.5	4.0	15.9	403.9
90.0	4.3	17.3	439.4
97.5	4.7	18.8	477.5
105.0	5.0	20.2	513.1
112.5	5.4	21.6	548.6
120.0	5.7	23.1	586.7
127.5	6.1	24.5	622.3
135.0	6.5	26.0	660.4
142.5	6.8	27.4	696.0
150.0	7.2	28.9	734.1
157.5	7.5	30.3	769.6
165.0	7.9	31.7	805.2
172.5	8.3	33.2	843.3
180.0	8.6	34.6	878.8
187.5	9.0	36.1	916.9
195.0	9.3	37.5	952.5
202.5	9.7	39.0	990.6
210.0	10.1	40.4	1026.2
217.5	10.4	41.8	1061.7
225.0	10.8	43.3	1099.8
232.5	11.1	44.7	1135.4
240.0	11.5	46.2	1173.5
247.5	11.9	47.6	1209.0
255.0	12.2	49.1	1247.1
262.5	12.6	50.5	1282.7
270.0	12.9	51.9	1318.3
277.5	13.3	53.4	1356.4
285.0	13.6	54.8	1391.9
292.5	14.0	56.3	1430.0
300.0	14.4	57.7	1465.6
307.5	14.7	59.2	1503.7
315.0	15.1	60.6	1539.2
322.5	15.4	62.0	1574.8
330.0	15.8	63.5	1612.9
337.5	16.2	64.9	1648.5
345.0	16.5	66.4	1686.6
352.5	16.9	67.8	1722.1
360.0	17.2	69.3	1760.2
367.5	17.6	70.7	1795.8
375.0	18.0	72.2	1833.9
382.5	18.3	73.6	1869.4
390.0	18.7	75.0	1905.0

WIND UPLIFT CALCULATIONS			
1 lbf/in.^{2} = 144 lbf/ft^2			
1 in. water = 25.4 mm water = 5.2 lbf/ft^2 = 0.25 kPa			
0.1924 in. of water = 1 lbs/ft^2			
lbf/ft^2	**kPa**	**in. H_2O**	**mm H_2O**
397.5	19.0	76.5	1943.1
405.0	19.4	77.9	1978.7

D.1.2.3 Test Apparatus: Deflection Bar and Deflection Gauge

A deflection bar and gauge are placed on the roof surface prior to assembly of the dome to measure deflection of the roof assembly during the entirety of the uplift pressure test.

Deflection gauges should preferably be capable of measuring up to 2 in. (50 mm) of deflection. Some deflection gauges show a maximum of 1 in. (25.4 mm) deflection, and in those cases, when the gauge indicates a 1 in. (25.4 mm) deflection, the potential deflection may be greater.

NOTE: Do no use the deflection bar and deflection gauge on mechanically fastened, plate-bonded, or induction-welded roof assemblies.

D.2 Test Preparation

D.2.1 Test Sample

D.2.1.1 Ensure the vacuum pump and dome have sufficient capacity to create the negative pressures required for the test. It must be equipped with controls to maintain a constant negative pressure at each test increment.

D.2.1.2 Locate test sites as follows:

A. Between supporting beams or joists where practical.

B. For pre-cast concrete roof decks, locate the test site over the joints in the pre-cast concrete deck.

C. Wholly within the roof zone under analysis.

D. Include at least one lap joint in the test site.

D.2.1.3 For **mechanically fastened, plate-bonded, or induction-welded systems** determined suitable for testing, do the following:

A. Locate the test site such that a minimum of one (1) fastener is tested at full fastener-to-fastener span in both primary orthogonal directions.

B. Sweep and clean away material (including dust, dirt, and loose granules) from the entire test area.

C. Ensure the removal of any sand or small granules adhered to the top surface in the area of the seal.

D. The test apparatus will cross over lap joints or splice edges, creating void areas at the edge of the lap that must be sealed by the foam strip.

D.2.1.4 For adhered single-ply membranes, do the following:

A. Sweep and clean away material (including dust, dirt, and loose granules) from the entire test area.

B. Ensure the removal of any sand or small granules adhered to the top surface in the area of the seal.

C. The test apparatus will cross over lap joints or splice edges, creating void areas at the edge of the lap that must be sealed by the foam strip.

D.2.1.5 For **built-up roof coverings**, when tests are to be made on a granule, gravel, or slag-covered roof, do the following:

A. The first step is to sweep away any loose surfacing material from the test area and from a 1 ft (0.3 m) wide area around the perimeter of the test area.

B. Pour a compatible sealant such as asphalt or coal tar pitch (whichever is on the existing roof), not to exceed 0.5 in. (13 mm) in thickness, over the perimeter of the test area to make a smooth surface that will allow contact between the apparatus and roof. When the roof is smooth, the existing surface usually is tight enough to draw a vacuum without the pouring. However, if the surface is alligatored, blistered, or otherwise rough, the bitumen layer will be necessary.

D.2.1.6 Prevent observers not directly involved in operating the test equipment from standing immediately adjacent to the test area.

D.2.1.7 Prevent anyone from walking near the test area between the time the deflection gauge has been zeroed out and test completion.

D.3 Test Operation

D.3.1 Test Conditions

Conduct tests only when the roof surface temperature is between 40°F and 100°F (5°C and 38°C).

D.3.2 Test Procedure

D.3.2.1 Place the deflection bar in the center of the dome (not applicable for mechanically fastened or spot-attached roof covers, deflection need not be monitored).

D.3.2.2 Place the assembled dome on top of the prepared roof surface located between supporting beams or joists, when practical. Ensure the apparatus encompasses at least one lap joint.

D.3.2.3 Ensure the dome is in complete contact with the surface to allow the necessary negative pressure to be drawn. Application of water under the foam strip will facilitate sealing.

D.3.2.4 When using a water manometer, attach the flexible hose to the dome and fill the manometer with water to the zero calibration level or to a plus or minus calibration level.

NOTE: Do not add anti-freeze to the manometer water solution on cold weather days nor food coloring to facilitate level reading.

D.3.2.5 Place the vacuum pump over the hole provided in the dome. Check that the bypass valve on the pump is open, then start the pump. NOTE: When a vacuum is drawn on the covering, most roof decks will exhibit a very small upward deflection that will increase with each load increment.

D.3.2.6 Raise the pressure level to 15 lbf/ft2 (0.72 kPa) and hold for 1 minute.

D.3.2.7 Raise the pressure level in increments of 7.5 lbf/ft^2 (0.36 kPa) and hold for 1 minute (see D.3.2.14 for specific criteria) at the end of each increment.

D.3.2.8 In the event of failure, record the previous pressure that was successfully held for 1 minute (this represents the actual uplift strength of the roof covering).

D.3.2.9 If localized deflection is excessive (see D.4.1.8 for specific criteria), continue the test until the needed test pressures are held for one minute or obvious failure has occurred.

D.3.2.10 When the passing uplift test pressure (U1) is reached, do the following:

A. Hold the test pressure for 1 minute (see D.3.2.14 for specific criteria).

B. Carefully observe the deflection test gauge, then slowly release the pressure simultaneously counting deflection test gauge revolutions until the pressure returns to zero.

D.3.2.11 Test is completed. Refer to D.4 for evaluation procedure.

D.3.2.12 Upon completion of Post Test Evaluation, ensure proper repair if applicable, see D.4.2, Roof Repair.

D.3.2.13 Record the results of tests and forward to the FM Global local servicing office.

D.3.2.14 The roof passes a test pressure if held for 1 entire minute with no separation within the roof covering, or separation of the roof covering from the roof deck or insulation, and deflection is within the required parameters.

D.4 Acceptance Criteria, Test Interpretation, and Reporting

D.4.1 Post-Test Evaluation and Results

D.4.1.1 If all test results indicate that all measured deflections are within the maximum recommended in this data sheet, the roof is acceptable from a wind uplift performance perspective provided no other failure modes occur.

D.4.1.2 During testing, if the cover suddenly balloons or a crease forms on the roof cover surface (see Figures D.4.2.2-1 and D.4.2.2-2):

A. The roof area tested does not pass the test.

B. Carefully cut out the above-deck assembly down to the deck to identify the mode of failure (see D.4.1.9 for specific criteria).

D.4.1.3 If measured deflections exceed the maximum recommended per D.4.1.8 (NOTE: these areas are sometimes accompanied by a noise at the time of failure):

A. Deflection is considered suspect.

B. Carefully cut out the above-deck assembly down to the deck to determine if failure did occur (see D.4.1.9 for specific criteria).

C. If no failure is evident, the roof is acceptable from a wind uplift performance perspective.

D.4.1.4 If failure is verified from a roof cut visual inspection per D.4.1.2 or D.4.1.3:

A. The roof area tested does not pass the test.

B. Identify the mode of failure including any construction details that are not in accordance with FM Approvals or FM Global data sheets, and other obvious defects.

D.4.1.5 For mechanically fastened/plate bonded/induction welded, failure modes are the following:

A. Fastener pull-out

B. Plate pull over fastener

C. Membrane tear from around plates/batten bars

D. Membrane seam tear

D.4.1.6 If some tests passed and others failed, additional tests may be conducted to limit the areas needing added securement.

D.4.1.7 For single-ply membranes adhered to mechanically fastened insulation in which Zone 1/Zone 1' areas exhibit both pass and failure of some areas: If test results vary within the same test pressure requirement, do the following:

A. Attempt to visually identify different insulation fastener densities and/or patterns between the two areas which exhibit different uplift performance.

B. Areas that are clearly similar to the areas that passed are acceptable from a wind uplift performance perspective.

C. Areas that are clearly similar to the areas that failed are not acceptable from a wind uplift performance perspective.

Example: The north and south sections of a new roof were installed on two different days by two different crews. All tests conducted on the north section passed, while all those conducted on the south section failed. Close inspection reveals that the area per insulation fastener was adequate for the north side, but was 50% greater on the south side.

Conclusion: The north section is acceptable and the south section must be repaired.

D.4.1.8 Determination of Allowable Deflection

D.4.1.8.1 Maximum allowable deflection is limited to 0.25 in. (6.5 mm), except as otherwise noted in this section.

A. For roofs comprised of wide rib steel deck (see Data Sheet 1-29), the maximum allowable deflection is determined in accordance with Table D.4.1.8.1-1.

B. For roofs comprised of intermediate or narrow rib steel deck, the allowable deflection shown in Table D.4.1.8.1-1 may be doubled, up to a maximum of 2 in. (50 mm).

Table D.4.1.8.1-1. Maximum Recommended Deflection for Adhered Covers on Wide Rib Steel Deck Roofs Before the Sample is Considered Suspect

Test Pressure, psf (kPa)	*Maximum Deflection, in. (mm)*
P ≤ 60 (2.88)	1/4 or 0.25 (6.5)
60 < P ≤ 120 (5.76)	1/2 or 0.50 (13)
120 < P ≤ 180 (8.64)	3/4 or 0.75 (19)
180 < P ≤ 225 (10.8)	15/16 or 0.94 (24)

C. For roof assemblies in which thin (e.g., 1/2 in. (12.7 mm) cover boards or flexible (e.g., glass fiber), mechanically attached insulations are used, use a maximum deflection of 2 in. (50 mm) to determine suspect test samples.

D. For roof assemblies in which thin topping boards are adhered to a substrate immediately below using ribbons of adhesive, use a maximum deflection of 1 in. (25 mm) to determine suspect test samples.

D.4.1.9 Careful Removal of Roof Assembly Components

Care must be taken during this process to ensure the roof assembly is not damaged in a manner that makes identification of failure modes during the field uplift test impossible.

A. Take steps to minimize damage to surrounding areas when using reciprocating tools (e.g., applying a ballasting load on either side of the tool).

B. Use of prying tools should include a block under the pry bar or other means to distribute applied loads and minimize unintended damage to the roof area.

D.4.2 Test Interpretation

D.4.2.1 Possible Reasons for Failure

A. The inadequately adhered roof covering separated from lower cover layers (if applicable) or from the insulation, or any other subsequent adhered intersection.

B. The top facing of the insulation or cover board delaminated, or the core of the board separated.

C. The insulation board separated from the deck (possibly breaking the insulation).

D. One or more fasteners pulled out of the deck, or the insulation board fracture around the stress plate.

D.4.2.2 Visual Aids: Failures

Fig. D.4.2.2-1. Crease in single-ply roof cover while subjected to uplift pressure

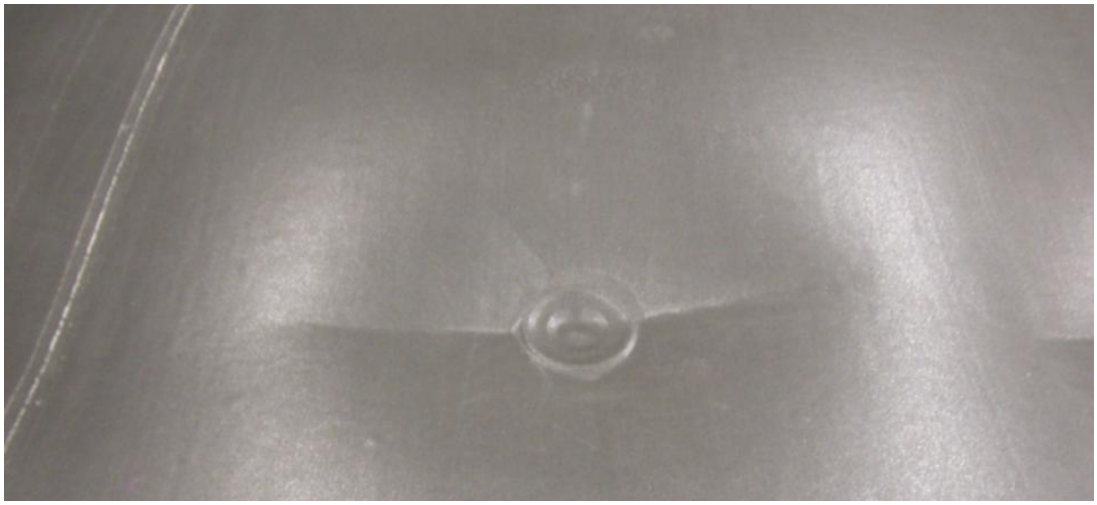


Fig. D.4.2.2-2. Crease in single-ply roof cover while subjected to uplift pressure

Fig. D.4.2.2-3. Crack in underside of cover board at fasterner and beneath where crease was visible in the single-ply roof cover

D.4.3 Roof Repair

D.4.3.1 Ensure repair procedures are in accordance with the following:

- Data Sheet 1-28, *Wind Design*
- Data Sheet 1-29, *Roof Deck Securement and Above-Deck Roof Components*
- Data Sheet 1-30, *Repair of Wind Damaged Single- and Multi-Ply Roof Systems*

D.4.3.2 To prevent water damage to insulation, promptly patch and make watertight all failed test areas.

D.4.3.3 Provide retrofit securement enhancements for areas that failed the test.

D.4.4 Reporting

D.4.4.1 Describe all details about testing and results in a report in accordance with ASTM E907. Copies of the report should be provided to the building owner or owner's representative, roof contractor, representative of the local FM Global office, and others as required within contract documents or local jurisdiction, if applicable.

APPENDIX E BONDED UPLIFT TEST PROCEDURE

E.1 General Information

E.1.1 Scope

E.1.1.1 The Bonded Uplift Test is used as a method of field testing above-deck roofing assemblies to evaluate for the following conditions:

- Wind resistance
- Suspected inferior construction
- Partial blow-off

E.1.1.2 The Bonded Uplift Test is not applicable to metal panel roofs (standing seam and through fastened), ballasted roofs, or mechanically fastened insulations, base sheets, or roof membranes. This test should not be performed on roof slopes exceeding 1.2° (1/4 in 12).

E.1.2 Test Equipment (Sufficient for Four Tests)

E.1.2.1 Test Equipment and Tools (General)

- Calibrated spring scale or other measurement device with suitable force capacity
- Block and tackle, hand chain hoist or hydraulic lift device
- Tripod (or equivalent support system)
- Patching kettle with heating torch (for bituminous roofs)
- Class B fire extinguisher
- Electric drill with 5/8 and 1/8 in. (16 and 3 mm) bits
- Electric sabre saw with blades
- Crosscut hand saw
- Screwdriver
- Adjustable open-end wrench, 8 or 10 in. (200 or 250 mm)
- Ruler and linoleum knife
- Broom, shovel (square-end, preferably for gravel-surfaced covers), and asphalt mop (if applicable)

E.1.2.2 Additional Materials

- One sheet of plywood, 4 ft x 8 ft x 3/4 in. (1.2 m x 2.4 m x 18 mm), 5 ply, APA Rated Exposure 1, Grade A-D
- 48 wood screws, 1-1/4 in. (32 mm) long, No. 12 round head
- 4 eyebolts, 1/2 in. (13 mm), 3 in. (75 mm) of thread, with nuts and washers
- Adhesive: 1 keg (100 lb [45 kg]) of steep asphalt, or coal tar pitch, or appropriate adhesive
- Insulation and roofing covering for repairs

E.2 Test Preparation

E.2.1 Test Sample

E.2.1.1 Cut the piece of plywood into 2 x 2 ft (0.6 x 0.6 m) squares.

E.2.1.2 Fasten two squares together to form one 2 ft x 2 ft x 1 1/2 in. (0.6 m x 0.6 m x 38 mm) panel by drilling twelve 1/8 in. (3 mm) holes and using wood screws. Figure E.2.1.2-1 shows suggested screw locations.

E.2.1.3 Drill a 5/8 in. (16 mm) hole in the center of the test panel through both pieces of plywood

E.2.1.4 Connect one of the eyebolts to the test panel with a nut and washer.

E.2.1.5 Suspend the test panel with an eyebolt from the calibrated spring scale and record the weight (W). The weight may vary from about 15 lb (6.8 kg) to 18 lb (8.2 kg).

E.2.1.6 For built-up roof coverings, when tests are to be made on a granule, gravel, or slag-covered roof, do the following:

A. Sweep away any loose surfacing material from the entire test area.

B. Pour a compatible sealant such as asphalt or coal tar pitch (whichever is on the existing roof), not to exceed 0.5 in. (13 mm) in thickness, over the test panel area to make a smooth surface that will ensure contact between the test panel locations and roof.

E.2.1.7 For single-ply membranes, do the following:

A. Remove any sand or small granules adhered to the top surface in the area of the test panel locations.

B. Sweep away loose material from the entire test area.

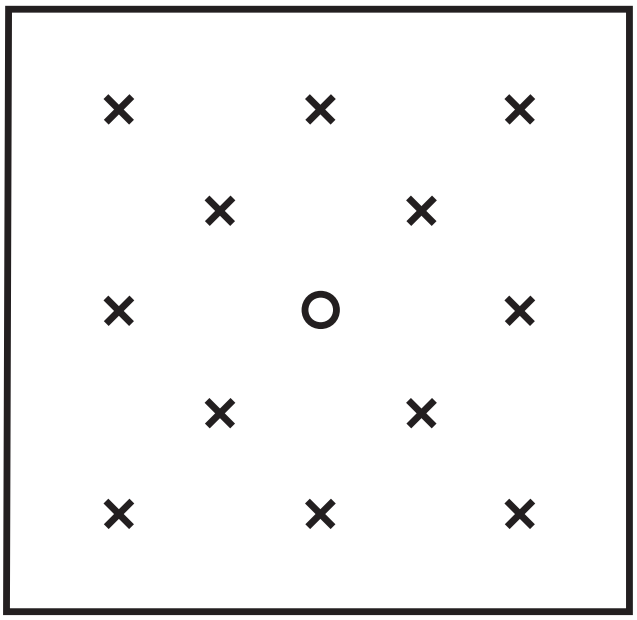


Fig. E.2.1.2-1. Suggested screw locations

Fig. E.2.1.2-2. Bonded uplift test

E.3 Test Operation

E.3.1 Test Conditions

Conduct tests only when the roof surface temperature is between 40 and 100°F (5 and 38°C).

E.3.2 Test Procedure

E.3.2.1 Cut an indentation in the center of the roof covering of the test area to accommodate the nut and washer of the eyebolt.

E.3.2.2 Place adhesive on top of the test surface. Apply a flood coat of hot steep asphalt to the test surface when roofing bitumen is asphalt (coal tar pitch when that material is used), or other compatible adhesive for single-ply covers.

E.3.2.3 Place the test panel in the hot bitumen to ensure complete contact.

E.3.2.4 Allow a curing period for the test panel, dependent on the type of adhesive used. (Two hours for hot asphalt; 48 hours for coal tar pitch.)

E.3.2.5 Cut a 2 to 3 in. (51 to 76 mm) wide strip through the roof covering and insulation (if applicable) around the test panel, all the way down to the top of the roof deck. Do not stand on the panel while cutting, and avoid walking on it.

E.3.2.6 Set up the tripod with attached block and tackle over the test panel. The lift must be perpendicular to the plane of the roof deck.

E.3.2.7 Connect one end of the scale to the test panel, the other to the block and tackle. The scale also may be connected to the top of the tripod.

E.3.2.8 Apply uplift force to the test panel equivalent to 15 lbf/ft2 (0.72 kPa) and hold for 1 minute.

E.3.2.9 Increase the load in increments equivalent to a pressure of 7.5 lbf/ft2 (0.36 kPa) and hold for 1 minute at the end of each increment (see E.3.2.15 for specific criteria).

E.3.2.10 In the event of failure, record the previous scale reading that was successfully held for 1 minute (this represents the actual uplift strength of the roof covering).

E.3.2.11 If the plywood test panel separates from the roof covering, re-adhere the panel and increase the curing period of the adhesive.

E.3.2.12 When the passing scale reading is reached,

A. Hold the test load for 1 minute. (see E.3.2.15 for specific criteria)

B. Release the uplift force.

C. Test is completed.

E.3.2.13 Ensure proper repair if applicable, see E4.2 Roof Repair.

E.3.2.14 Record the results of tests and forward to the FM Global local servicing office.

E.3.2.15 The roof passes a test increment if held for 1 entire minute with no separation within the roof covering, or separation of the roof covering from the roof deck or insulation.

E.4 Acceptance Criteria and Test Interpretation

E.4.1 Post-Test Evaluation and Results

E.4.1.1 Calculate the equivalent uplift pressure:

A. Uplift pressure = (scale reading - W)/test panel area). For example, scale reading minus 15 lb ([6.8kg] divided by 4 (for a 4 ft2 panel weighing 15 lb [6.8kg]).

B. This value is the uplift strength of the roof and should be recorded on the Contractor's Material & Uplift Test Certificate for Roof Systems Form.

E.4.2 Roof Repair

E.4.2.1 Ensure repair procedures are in accordance with the following:

- Data Sheet 1-28, *Wind Design*
- Data Sheet 1-29, *Roof Deck Securement and Above-Deck Roof Components*
- Data Sheet 1-30, *Repair of Wind Damaged Single- and Multi-Ply Roof Systems*

E.4.2.2 After the test is complete, remove all insulation and adhesive in the test area. Cut a new insulation square of the same material and thickness as that removed and secure it to the deck with compatible adhesive. Replace the covering with a similar type, providing appropriate laps.

APPENDIX F VISUAL CONSTRUCTION OBSERVATION (VCO)

F.1 General Guidelines

Terminate the use of all noncompliant material or workmanship practices immediately, and replace or repair all noncompliant installation areas as needed. Document all noncompliance issues as well as related corrective measures in the daily construction report.

F.1.1 The following are the minimum guidelines for visual construction observation (VCO) when used as an alternative to field uplift testing.

A. The presence of, or opinions expressed by, the construction observer (CO) in no way relieve the design professional, roofing contractor, manufacturer, owner, or any other responsible party of their contractual obligations.

B. The information provided by the CO is for the benefit of the owner, roofing contractor, and FM Global, and no warranty of roof performance (including wind uplift resistance), expressed or implied, is offered.

C. The design professional, roofing contractor, manufacturer, or owner provide the CO with the approved RoofNav assembly number, FM Approval report, contract documents, shop drawings, and other submittals or documentation as required to delineate the proposed roofing system and application parameters.

D. The contract documents become the basis of design and are to be used by the CO as the standard for construction.

E. The CO provides full-time onsite visual construction observation during roof system installation and will report on the roof construction process in an accurate and objective manner.

F. The CO is not a direct employee of the owner, design professional, or installing roof contractor of record, to avoid any conflict of interest.

G. The CO verifies the following:

1. All materials used on the project conform to those listed in the FM Approved/accepted assembly, contain the appropriate FM Approvals labeling and meet installation guidelines of relevant FM Global Data Sheets (see Section 4.0).

2. All materials used on the project are installed in new and undamaged condition.

H. The CO observes and records the following (observations should be made each day any of the following work is accomplished):

1. Condition of the substrate; substrate preparation, repair, replacement, or supplemental attachment

2. Installation and attachment of any base sheet, thermal barrier or vapor barrier, including the type of fasteners or adhesive used and patterns and spacing

3. Installation and attachment of any insulation and/or cover board, including the type of fasteners or adhesive used and fastening patterns and spacing

4. Installation and attachment of any roof covering or materials that comprise the finished roof membrane, including the type of fasteners or adhesive used, fastening patterns and spacing, as well as specified material quantities, temperatures and any other measurement relative to the type of roof membrane being installed

5. Installation and detailing of roof system perimeter and penetration flashings

6. Installation, detailing, and attachment of roof-related sheet metal components

7. Installation of roof-surfacing materials

I. A report will be provided by the CO that includes both a written and photographic record of the construction project. The report will be made available to the owner, FM Global, the manufacturer, and the roofing contractor within 24 hours after each day's site visit. Documentation will include a plan that clearly identifies the location of the activities covered by the particular daily report. Documents will accurately describe the sequence of work, materials used, installation methods, condition of existing components, workmanship and noncompliance issues as well as related corrective measures.

J. The CO will provide non-biased visual construction observation services.

K. The CO will identify and disclose all relationships with any of the project entities that may create a conflict of interest.

L. The CO will have the following minimum qualifications:

1. The CO will have a thorough knowledge of the roofing system being installed, relevant industry accepted-practices, contract documents, blueprint reading, and FM Approval requirements and relevant FM Global data sheets.

2. The CO will have a thorough knowledge of the roofing system specified and the manufacturer's requirements.

3. The CO will have completed one or more of the following:

a. Certification as a registered roof consultant (RRC) by IIEBEC.

b. Certification as a registered roof observer (RRO) by IIEBEC.

c. For locations outside the United States where individuals with the above qualifications are not available, completion of specialized training or certification as a rooftop quality assurance observer from an industry-recognized organization

REMOVE EXISTING DOOR & FRAME, PREPARE OPENING TO RECEIVE NEW

PROVIDE & INSTALL NEW INSULATED HOLLOW METAL DOOR & FRAME (SEE SCHEDULE). FIELD VERIFY WIDTH & HEIGHT, (DEPENDANT ON LOCATION). SEE PLANS & DOOR SCHEDULE FOR MORE INFORMATION

PROVIDE 0.040 METAL PROTECTION SHIELD OVER EXPOSED BLOCKING IN THE STAIRWELL AT DOOR, SECURE UNDER THRESHOLD AND WITH CONTINUOUS CLIP AT BOTTOM EDGE

NEW FULL WIDTH ALUMINUM DOOR THRESHOLD, FIELD VERIFY

.040 METAL ERA 1 PIECE ALUMINUM COUNTER FLASHING, INSTALL UNDER NEW DOOR SILL, METAL TO EXTEND DOWN 3"

INSTALL NEW 2x8 P.T. BLOCKING TO RAISE NEW DOOR SILL UP TO COMPLY WITH THE ROOFING WARRANTY. FIELD VERIFY ACTUAL NUMBER OF PLATES REQUIRED. SECURE TO EXISTING BLOCKING

PROVIDE DOUBLE LAYER OF EPDM ROOFING AT TOE KICK AREA OF DOOR. TO EXTEND TO 6" PAST DOOR JAMB WIDTH IN EACH DIRECTION

EXISTING BLOCKING TO REMAIN. EVALUATE EXISTING BLOCKING DURING DEMOLITION

FULLY ADHERED EPDM ROOFING SYSTEM

RECOVERY BOARD

TAPERED INSULATION (¼" PER FT), 1.5" MIN.

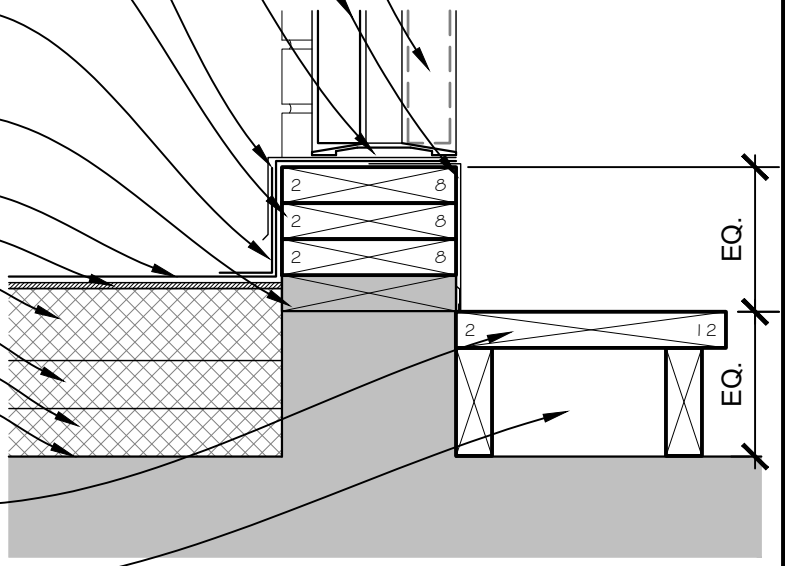
INSULATION 2" LAYER

INSULATION 2" LAYER

EXISTING ROOF DECK

P.T. 2x12 TREAD, TREAD & SUPPORT BOX TO BE 6" WIDER AT EACH END THAN DOOR OPENING

P.T. 2x SUPPORT ENCLOSURE (4 SIDED), SECURE TO EXISTING ADJACENT BEFORE ATTACHING TREAD



TYPICAL DOOR SILL DETAIL (S-1)

SCALE: 1½" = 1'-0"

NEFF HALL - DOOR SILL DETAIL

QA+M architecture

ROOF REPLACEMENT AT:

NEFF HALL

SOUTHERN CONNECTICUT STATE UNIVERSITY

NEW HAVEN, CONNECTICUT

Issue Date:	
JANUARY 3, 2022	
Sheet #:	
SKA-01	
Project #:	**Drawn By:**
QAM 2134	**AMT**

REMOVE EXISTING DOOR & FRAME, PREPARE OPENING TO RECEIVE NEW

PROVIDE & INSTALL NEW INSULATED HOLLOW METAL DOOR & FRAME (SEE SCHEDULE). FIELD VERIFY WIDTH & HEIGHT, (DEPENDANT ON LOCATION). SEE PLANS & DOOR SCHEDULE FOR MORE INFORMATION

PROVIDE 0.040 METAL PROTECTION SHIELD OVER EXPOSED BLOCKING IN THE STAIRWELL AT DOOR, SECURE UNDER THRESHOLD AND WITH CONTINUOUS CLIP AT BOTTOM EDGE

NEW FULL WIDTH ALUMINUM DOOR THRESHOLD, FIELD VERIFY

.040 METAL ERA 1 PIECE ALUMINUM COUNTER FLASHING, INSTALL UNDER NEW DOOR SILL, METAL TO EXTEND DOWN 3"

INSTALL NEW 2x8 P.T. BLOCKING TO RAISE NEW DOOR SILL UP TO COMPLY WITH THE ROOFING WARRANTY. FIELD VERIFY ACTUAL NUMBER OF PLATES REQUIRED. SECURE TO EXISTING BLOCKING

PROVIDE DOUBLE LAYER OF EPDM ROOFING AT TOE KICK AREA OF DOOR. TO EXTEND TO 6" PAST DOOR JAMB WIDTH IN EACH DIRECTION

EXISTING BLOCKING TO REMAIN. EVALUATE EXISTING BLOCKING DURING DEMOLITION

FULLY ADHERED EPDM ROOFING SYSTEM

RECOVERY BOARD

TAPERED INSULATION (1/4" PER FT), 1.5" MIN.

REMOVE EXISTING LIGHT WEIGHT GYPSUM SLAB DOWN TO EXISTING DECK, TYPICAL

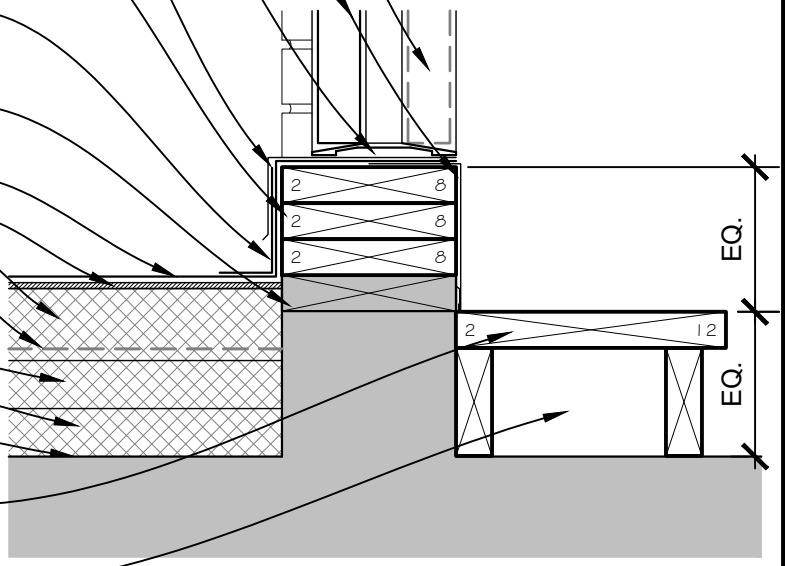
INSULATION 2" LAYER

INSULATION 2" LAYER

EXISTING ROOF DECK

P.T. 2x12 TREAD, TREAD & SUPPORT BOX TO BE 6" WIDER AT EACH END THAN DOOR OPENING

P.T. 2x SUPPORT ENCLOSURE (4 SIDED), SECURE TO EXISTING ADJACENT BEFORE ATTACHING TREAD



TYPICAL DOOR SILL DETAIL (S-1)

SCALE: 1½" = 1'-0"

HICKERSON HALL - DOOR SILL DETAIL

QA+M architecture

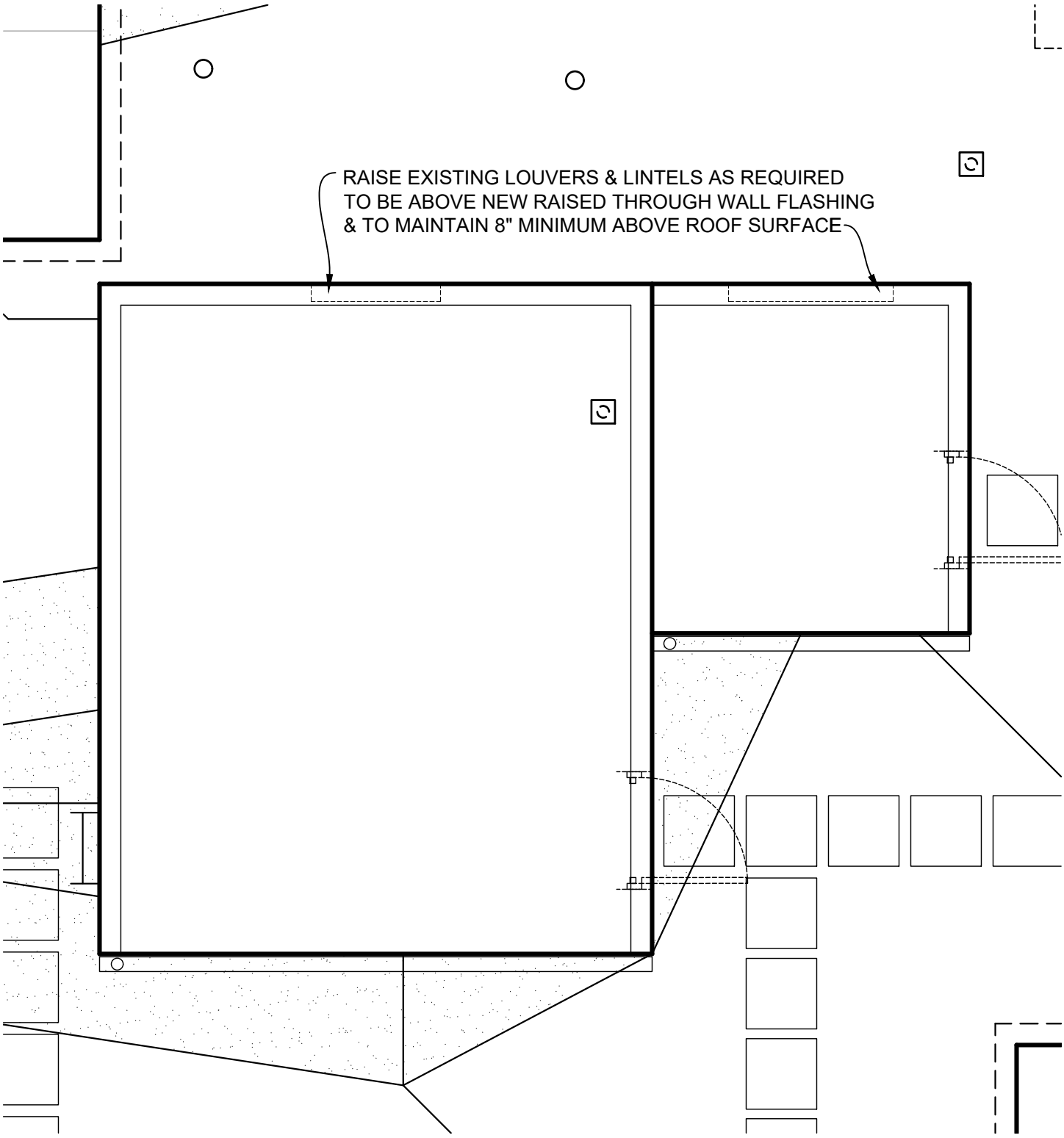
ROOF REPLACEMENT AT:

HICKERSON HALL

SOUTHERN CONNECTICUT STATE UNIVERSITY

NEW HAVEN, CONNECTICUT

Issue Date:	
JANUARY 3, 2022	
Sheet #:	
SKA-02	
Project #:	**Drawn By:**
QAM 2134	**AMT**



HICKERSON HALL - EXISTING LOUVERS

QA+M architecture

ROOF REPLACEMENT AT:

HICKERSON HALL

SOUTHERN CONNECTICUT STATE UNIVERSITY

NEW HAVEN, CONNECTICUT

Issue Date:	
JANUARY 3, 2022	
Sheet #:	
SKA-03	
Project #:	**Drawn By:**
QAM 2134	**AMT**

Mandatory Pre-Bid Attendance Sheet

Project No. CF-RS-365
Bid No. RFQ-22-SCSU-02
Project Name: Hickerson Hall and Neff Hall Roof Replacements

Company Name & Address	Signature	Printed Name	Phone No.	E-Mail Address	DAS Certified Y/N	ID
The Imperial Company / 06416 261 Main ST Cromwell CT		Bruce Raulkaitis	860 632 2258	amyc@theimperialco.com	Y	✓
SILKTOWN ROOFING, INC 151 WATER ST. DERBY CT		MIKE GERANE	203- 735-0550	mike@silktownroofing.com	Y	✓
Barrett Inc. 106 Mill Plain Road, Danbury, CT 06811		Kurt Ryker	203- 648- 3802	Krykere@barrettroofing.com	Y	✓
NEW ENGLAND MASONRY 146 SHERIDAN DR NAUGATUCK CT		GARY BELLEMARE	203 707 3840	garyb@newengmasonry.com	Y	✓
Young Developers LLC 9 Hamden Park Drive, Hamden CT 06517	Edward Pedone	Edward Pedone	860 770 9340	Bogdanr@ydroofing.com	Y	✓
Greenwood Industries Inc 30A Leonardo Drive North Haven, CT 06473	Dan Kerr	Dan Kerr	508-326- 3835	dkerr@greenwood-industries.com	Y	
A Secondino and Son		David Secondino	203 481 3416	dave@secondinoandson.com	✓	✓

Mandatory Pre-bid Attendance Sheet

Company Name & Address	Signature	Printed Name	Phone No.	E-Mail Address	DAS Certified Y/N	ID
Commercial Roofing & Contracting 348 Kennedy Dr Putnam, CT	[signature]	Paul A. Lebeau [illegible]	860 928 9197	eric @ commroofing.com		