SPECIFICATIONS

PARTIAL ROOF REPLACEMENT AT
200 HIGH STREET
MIDDLETOWN, CT

FOR

WESLEYAN UNIVERSITY

DATE: MARCH 9, 2012
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UPPER ROOF REPLACEMENT

GENERAL, SUPPLEMENTARY AND OTHER CONDITIONS—Under Division 1
MM FY13 Specifications

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**RELATED INFORMATION**

Asbestos Reports
Negative Wind Pressure Report
Drawings and Details
SCOPE OF WORK:

THE SCOPE OF WORK, WITHOUT LIMITING THE GENERALITY THEREOF, CONSISTS OF FURNISHING ALL LABOR, MATERIALS, EQUIPMENT AND PERFORMING ALL OPERATIONS IN CONNECTIONS WITH ROOFING PER ATTACHED SPECIFICATIONS AND DRAWINGS.

BASE BID:

WORK SCOPE - ROOF REPLACEMENT

a. REMOVE EXISTING ROOF SYSTEM(S) DOWN TO EXPOSED DECKING. DISPOSE OF DEBRIS ACCORDING TO LOCAL, STATE AND FEDERAL REQUIREMENTS. NOTE: THE EXISTING FLASHING SYSTEM(S) HAVE TESTED POSITIVE FOR ASBESTOS CONTAINING MATERIAL. IT IS THE CONTRACTORS RESPONSIBILITY TO PROPERLY REMOVE AND DISPOSE OF THE MATERIALS ACCORDING TO ALL LOCAL, STATE AND FEDERAL STANDARDS.

b. EXAMINE EXPOSED ROOF DECK, SHEATHING AND NAILERS FOR DEFECTS AND STRUCTURAL DAMAGE. REPAIR OR REPLACE IN KIND WHERE NECESSARY FOLLOWING MANUFACTURER'S GUIDELINES.

c. INSTALL NEW ZURN OR EQUIVALENT INTERNAL DRAIN BOWL ASSEMBLIES AND RELATED INTERNAL PLUMBING IN PLACE OF EXISTING RAC DRAINS.

d. OVER EXPOSED DECKING NAIL ONE (1) PLY OF HEAVY DUTY DOUBLE COATED ASTM D 4601, TYPE II BASE USING APPROVED FASTENERS AND FASTENING PATTERN.

e. ATTACH ONE (1) BASE LAYER OF 2.0” POLYISOXYANURATE INSULATION (MINIMUM) DIRECTLY TO BASE SHEET USING APPROVED INSULOCK HR INSULATION ADHESIVE.

f. ATTACH SECOND LAYER OF 2.0” POLYISOXYANURATE INSULATION (MINIMUM) DIRECTLY TO BASE LAYER USING APPROVED INSULOCK HR INSULATION ADHESIVE. STAGGER ALL JOINTS.

g. ATTACH ONE (1) LAYER OF ½” SECUROCK DIRECTLY OVER POLYISOXYANURATE USING APPROVED INSULOCK HR INSULATION ADHESIVE. STAGGER ALL JOINTS.

h. INSTALL 1 PLY OF STRESSBASE 80 FIBERGLASS REINFORCED SBS MODIFIED UNDERLAYMENT ADHERED IN WEATHERKING PLUS WC MEMBRANE ADHESIVE AT A RATE OF 2.5 GALLONS PER 100 SQUARE FT.
h. INSTALL ONE PLY OF STRESSPLY PLUS FR MINERAL POLYESTER/FIBERGLASS REINFORCED SBS MODIFIED MEMBRANE SET IN WEATHERKING PLUS WC MEMBRANE ADHESIVE AT A RATE OF 2.5 GALLONS PER 100 SQUARE FT.

i. INSTALL TWO (2) PLY FLASHING SYSTEM CONSISTING OF ONE (1) BASE PLY OF STRESSBASE 80 AND ONE (1) FINISHED PLY OF STRESSPLY PLUS FR MINERAL MODIFIED CAP SHEET SET IN WEATHERKING FLASHING ADHESIVE AT A RATE OF 3 GALLONS PER PLY PER 100 SQUARE FT. TO ALL PERIMETER AREAS, ROOF TOP PROJECTIONS AND PENETRATIONS.

j. INSTALL NEW EDGE METAL SYSTEM AND COUNTERFLASHING IN DESIGNATED AREAS USING .040 ALUMINUM PER SPECIFICATION AND DETAIL DRAWINGS.

NOTE: IF FINISHED MEMBRANE IS DETERMINED TO BE DIRTY AFTER INSTALLATION THE CONTRACTOR WILL BE REQUIRED TO COAT THE ENTIRE ROOF SURFACE, INCLUDING EXPOSED FLASHING MEMBRANE, WITH ONE (1) COAT OF PYRAMIC COATING AT A RATE OF TWO (2) GALLONS PER 100 SQUARE FT.
SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, Including General and Supplementary Conditions apply to this section.

1.2 SUMMARY

B. Section includes roof framing; built-up structural members; beams; sheathing; roof curbs and cants; blocking in wall and roof openings; wood furring and grounds and concealed wood blocking.

C. Related Sections: The following sections contain requirements that relate to this section.

1. Section 07 52 00 Modified Bitumen Membrane Roofing
2. Section 07 62 00 Sheet Metal Flashing and Trim
3. Section 07 22 00 Roof Deck and Insulation

1.3 REFERENCES


B. United States Products Standards, PS.

1. PS-1, Construction and Industrial Plywood.
2. PS-20, American Softwood Lumber standard.

1.4 SUBMITTALS

A. Manufacturer’s literature describing products.

B. Shop Drawings: Indicate framing system, loads and cambers, bearing details, and framed openings.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the following agencies:
1. Lumber Grading Agency: Certified by ALSC.

B. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 LUMBER MATERIALS

A. Lumber Grading Rules: Comply with AWPA grading guidelines.

B. Joist Framing: Species shall be hemlock/doug. Fir, construction grade #2, minimum design timber stress 1000 psi. Average moisture content 17% in accordance with AWPA 20.

C. Rafter Framing: Species shall be hemlock/doug. Fir, construction grade #2, minimum design timber stress 1000 psi. Average moisture content 17% in accordance with AWPA 20.

D. Studding: Species shall be hemlock/doug. Fir, construction grade #2, minimum design timber stress 1000 psi. Average moisture content 17% in accordance with AWPA 20.

E. Non-structural Light Framing/Blocking Species shall be hemlock/douglas fir:, construction grade #2, Minimum design timber stress 1000 psi. Average moisture content 19% in accordance with AWPA 20.

F. Beam Framing: LVL Beams as manufactured by Truss-Joist MacMillian, Inc. Sizes and shapes as shown on the drawings.

2.2 SHEATHING MATERIALS

A. Plywood Wall Sheathing: APA Rated plywood Sheathing, Structural grade II; CDX plywood, minimum 5 plys; Exposure Durability 2; sanded.

B. Plywood Roof Sheathing: APA Rated plywood Sheathing, Structural grade II; CDX plywood, minimum 5 plys; Exposure Durability 2; sanded.

2.3 SHEATHING AND UNDERLAYMENT LOCATIONS

A. Wall Sheathing: 1/2 inch thick, 48 x 96 inch sized sheets, with tongue and groove edges
2.4 ACCESSORIES

A. Fasteners: Galvanized steel for exterior, high humidity, and treated wood locations, plain finish elsewhere.

B. Joist Hangers/Framing Connections: Galvanized steel, sized to suit framing conditions.

B. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.

C. Subfloor Glue: Conform to APA AFG-01, water base, and waterproof glue.

D. Building Paper: Conform to ASTM D226, No.15 Asphalt saturated inorganic roofing felt or Spun bonded polyethylene (Tyvek or equal).

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the surfaces and conditions under which work of this section will be performed. Do not proceed until unsatisfactory conditions detrimental to timely and proper completion of the work have been corrected.

B. Examine areas to receive rough carpentry work and verify the following:

1. Complete installation of building components to receive rough carpentry work.
2. That surfaces are satisfactory to receive work.
3. That spacing, direction, and details of supports are correct to accommodate installation of blocking, backing, furring, and nailers.

3.2 SHEATHING

A. Install roof sheathing with longer edge perpendicular to rafter framing with end joints staggered. Secure sheet edges over firm bearing. Attach sheathing with glue and screws.

3.3 SITE APPLIED WOOD TREATMENT
A. Treat site-sawn cuts. Brush apply two coats of preservative treatment on untreated wood in contact with roofing and related metal flashings.

B. Allow preservative to cure prior to erecting member

END OF SECTION
SECTION 07 52 00 - MODIFIED BITUMINOUS MEMBRANE ROOFING - COLD-APPLIED

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the Conditions of the Contract and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

A. Section includes modified bituminous roofing system.

B. Related Sections:
   1. Quality Assurance: Section 01 43 33.75 – Roofing Manufacturer’s Field Services.
   2. Rough Carpentry: Section 06 10 00 - Rough Carpentry.
   3. Roof Insulation: Section 07 22 00 - Roof Insulation.
   4. Sheet Metal Flashing and Trim: Section 07 62 00 - Sheet Metal Flashing and Trim.

1.3 REFERENCES

A. American Society of Civil Engineers (ASCE):

B. American Society for Testing and Materials (ASTM):
   1. ASTM D41 Standard Specification for Asphalt Primer Used in Roofing, Dampproofing and Waterproofing.


C. Factory Mutual Research (FM):

  1. Roof Assembly Classifications.

D. National Roofing Contractors Association (NRCA):


E. Underwriters Laboratories, Inc. (UL):

  1. Fire Hazard Classifications.

F. Warnock Hersey (WH):

  1. Fire Hazard Classifications.


  1. ANSI/SPRI ES-1 Testing and Certification Listing of Shop Fabricated Edge Metal
1.4 SUBMITTALS FOR REVIEW

A. Product Data: Provide manufacturer's technical product data for each type of roofing product specified. Include data substantiating that materials comply with specified requirements.

B. Samples: Submit two (2) samples of the following:

C. Specimen Warranty: Provide an unexecuted copy of the warranty specified for this Project, identifying the terms and conditions required of the Manufacturer and the Owner.

D. Any material submitted as equal to the specified material must be accompanied by a report signed and sealed by a professional engineer licensed in the state in which the installation is to take place. This report shall show that the submitted equal meets the Design and Performance criteria in this specification. Substitution requests submitted without licensed engineer approval will be rejected for non-conformance.

1.5 SUBMITTALS FOR INFORMATION

A. Manufacturer's Installation Instructions: Submit installation instructions and recommendations indicating special precautions required for installing the membrane.

B. Manufacturer's Certificate: Certify that roof system furnished is approved by Factory Mutual, Underwriters Laboratories, Warnock Hersey or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.

C. Manufacturer's Certificate: Certify that the roof system is adhered properly to meet or exceed the requirements of FM 1-90.

D. Manufacturer's Certificate: Certify that the roof system furnished is approved or accepted by Factory Mutual Approval Standard 4470.

E. Manufacturer's Certificate: Certify that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

F. Manufacturer's Certificate: Submit a certified copy of the roofing manufacturer's ISO 9001 compliance certificate.

G. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147.

H. Written certification from the roofing system manufacturer certifying the applicator is currently authorized for the installation of the specified roof system.
I. Design Loads: Submit copy of manufacturer's minimum design load calculations according to ASCE 7-05, Method 2 for Components and Cladding, sealed by a registered professional engineer. In no case shall the design loads be taken to be less than those detailed in Design and Performance Criteria article of this specification.

J. Qualification data for firms and individuals identified in Quality Assurance Article below.

K. Test Reports: Submit third party validation of environmental claims, prepared UL Environment, and for all modified bituminous sheet material containing recycled content and/or bio based content.

1.6 CONTRACT CLOSEOUT SUBMITTALS

A. General: Comply with Requirements of Division 01 Section - Closeout Submittals.

B. Special Project Warranty: Provide specified warranty for the Project, executed by the authorized agent of the Manufacturer.

C. Roofing Maintenance Instructions. Provide a manual of manufacturer's recommendations for maintenance of installed roofing systems.

D. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

E. Demonstration and Training Schedule: Provide a schedule of proposed dates and times for instruction of Owner's personnel in the maintenance requirements for completed roofing work. Refer to Part 3 for additional requirements.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with not less than 12 years documented experience and have ISO 9001 certification.

B. Installer Qualifications: Company specializing in modified bituminous roofing installation with not less than 10 years experience and authorized by roofing system manufacturer as qualified to install manufacturer's roofing materials.

C. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress. Maintain proper supervision of workmen.

D. Maintain a copy of the Contract Documents in the possession of the Supervisor/Foreman and on the roof at all times.
E. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer.

1. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

F. Source Quality Control: Manufacturer shall have in place a documented, standardized quality control program such as ISO-9001.

1.8 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Roofing Conference: Convene a pre-roofing conference approximately two (2) weeks before scheduled commencement of modified bituminous roofing system installation and associated work.

B. Require attendance of installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in and around roofing that must precede or follow roofing work (including mechanical work if any), Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) Owner's insurers, testing agencies and governing authorities. Objectives of conference include:

1. Review foreseeable methods and procedures related to roofing work, including set up and mobilization areas for stored material and work area.

2. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work performed by others.

3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.

4. Review roofing system requirements (drawings, specifications and other contract documents).

5. Review required submittals both completed and yet to be completed.

6. Review and finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.

7. Review required inspection, testing, certifying and material usage accounting procedures.
8. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not mandatory requirement).

9. Record discussion of conference including decisions and agreements (or disagreements) reached and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

10. Review notification procedures for weather or non-working days.

C. The Owner's Representative will designate one of the conference participants to record the proceedings and promptly distribute them to the participants for record.

D. The intent of the conference is to resolve issues affecting the installation and performance of roofing work. Do not proceed with roofing work until such issues are resolved the satisfaction of to the Owner. This shall not be construed as interference with the progress of Work on the part of the Owner.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.

B. Store and handle roofing sheets in a dry, well-ventilated, weather-tight place to prevent moisture exposure. Store rolls of felt and other sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover roll goods with a canvas tarpaulin or other breathable material (not polyethylene).

C. Do not leave unused materials on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.

D. Secure all material and equipment on the job site. If any material or equipment is stored on the roof, assure that the integrity of the deck is not compromised at any time. Damage to the deck caused by the Contractor's actions will be the sole responsibility of the Contractor, and the deck will be repaired or replaced at his expense.

1.10 MANUFACTURER'S INSPECTIONS

A. When the Project is in progress, the roofing system manufacturer will provide the following:

1. Report progress and quality of the work as observed.

2. Provide daily job site inspections.
3. Report to the Owner in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.

4. Confirm after completion that manufacturer has observed no application procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.11 PROJECT CONDITIONS

A. Proceed with roofing work only when existing and forecasted weather conditions will permit a unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.

B. Do not apply roofing insulation or membrane to damp deck surface.

C. Do not expose materials subject to water or solar damage in quantities greater than can be weatherproofed during same day.

1.12 SEQUENCING AND SCHEDULING

A. Sequence installation of roofing with related units of work specified in other Sections to ensure that roof assemblies, including roof accessories, flashing, trim and joint sealers, are protected against damage from effects of weather, corrosion and adjacent construction activity.

B. Complete all roofing field assembly work each day. Phased construction will not be accepted.

1.13 WARRANTY

A. Upon completion of installation, and acceptance by the Owner, the Manufacturer will supply to the Owner the appropriate 20 year warranty.

B. Installer will submit a two (2) year warranty to the membrane manufacturer with a copy directly to Owner.

1.14 DESIGN AND PERFORMANCE CRITERIA

A. Uniform Wind Uplift Load Capacity

1. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria. Attachment shall be installed exactly as given in Part 3.


   b. Category – See Attached Report
c. Wind Speed: See Attached Report

d. Ultimate Pullout Value: See Attached Report

e. Exposure Category: See Attached Report

f. Design Roof Height: See Attached Report.

g. Minimum Building Width: See Attached Report

h. Roof Pitch: See Attached Report

i. Topographic Factor: See Attached Report

Roof Area Design Uplift Pressure:

Zone 1 - Field of roof – See Attached Report

Zone 2 - Eaves, ridges, hips and rakes – See Attached Report

Zone 3 – Corners – See Attached Report

B. Snow Load: See Attached Report

C. Live Load: 20 psf, or not to exceed original building design.

PART 2 — PRODUCTS

2.1 PRODUCTS, GENERAL

A. Basis of Design: Materials, manufacturer's product designations, and/or manufacturer's names specified herein shall be regarded as the minimum standard of quality required for work of this Section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.

B. Substitutions: Products proposed as equal to the products specified in this Section shall be submitted in accordance with Bidding Requirements.

1. Proposals shall be accompanied by a copy of the manufacturer's standard specification section. That specification section shall be signed and sealed by a professional engineer licensed in the state in which the installation is to take place. Substitution requests containing specifications without licensed engineer certification shall be rejected for non-conformance.

2. Include a list of three (3) projects of similar type and extent, located within a one hundred mile radius from the location of the project. In addition, the three projects
must be at least five (5) years old and be available for inspection by the Architect, Owner or Owner's Representative.

3. Equivalency of performance criteria, warranty terms, submittal procedures, and contractual terms will constitute the basis of acceptance.

4. The Owner's decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.

2.2 ACCEPTABLE MANUFACTURERS

A. The design is based upon roofing systems engineered and manufactured by The Garland Company or approved equals:

The Garland Company
3800 East 91st Street
Cleveland, Ohio 44105
Telephone: (800) 762-8225
Website: www.garlandco.com

2.3 DESCRIPTION

A. Modified bituminous sheet roofing work including but not limited to:

1. One ply of Garland StressBase 80 base sheet bonded to the prepared substrate with bitumen.

2. Cold Applied Bitumen: Low V.O.C. compliant, non-asbestos containing cold applied adhesive for roof slopes up to 3:12.


4. Modified Membrane: STRESSPLY PLUS FR MINERAL - Environmentally Friendly; 145 mil SBS (Styrene-Butylene-Styrene) mineral surfaced, rubber modified roofing membrane incorporating recycled rubber, fire retardant characteristics and reinforced with a fiberglass and polyester composite scrim.

5. Surfacing: Apply white acrylic coating ASTM G26

2.4 BITUMINOUS MATERIALS

A. Asphalt Primer: V.O.C. compliant, ASTM D41.
B. Asphalt Roofing Mastic: V.O.C. compliant, ASTM D2822, Type II.

C. **Base Bid**

   Cold Applied Membrane Adhesive: Weatherking Plus WC V.O.C. compliant ASTM D3019. Performance Requirements:

   1. Non-Volatile Content ASTM D4479 78%
   2. Density ASTM D1475 9 lbs./gal. (0.9kg/l)
   4. Flash Point ASTM D93 100°F min. (37°C)
   5. Slope: up to 3:12

D. **Alternate Bid**

   Cold Applied Solvent Free Flood Coat: Green-Lock Membrane Adhesive; Zero VOC, polyether, cold process flood coat having the following characteristics:

   1. Non-Volatile Content ASTM D4586 100%
   2. Density ASTM D1475 11.2 lbs./gal. (1.11 g/m³)
   4. Flash Point ASTM D93 400 F min. (232 C)
   5. Slope: up to 3:12

E. **Brush Grade Flashing Adhesive**

   1. Performance Requirements:
   2. Non-Volatile Content ASTM D4479 70 min.
   3. Density ASTM D1475 8.6 lbs./gal. (1kg/l)
   4. Flash Point ASTM D93 100°F (37°C)

### 2.5 SHEET MATERIALS

A. Base Ply (StressBase 80 Sheet): Fiberglass scrim with the following minimum performance requirements according to ASTM D5147. Properties (Finished Membrane):
1. Tensile Strength (ASTM D2523)
   a. 2 in/min. @ 73.4 ± 3.6°F MD 100 lbf/in CMD 100 lbf/in
   b. 50mm/min. @ 23 ± 3°C MD 39 kN/m CMD 39 kN/m

2. Tear Strength (ASTM D4073)
   a. 2 in/min. @ 73.4 ± 3.6°F MD 110 lbf CMD 110 lbf
   b. 50mm/min. @ 23 ± 3°C MD 1335 N CMD 1335 N

3. Elongation at Maximum Tensile (ASTM D2523)
   a. 2 in/min. @ 73.4 ± 3.6°F MD 2.5 % CMD 2.5 %
   b. 50mm/min. @ 23 ± 3°C MD 2.5 % CMD 2.5 %

B. Modified Flashing Ply

1. STRESSPLY PLUS FR MINERAL

C. Modified Membrane Properties (Finished Membranes): STRESSPLY PLUS FR MINERAL; ASTM D6162, Type III Grade G

1. Tensile Strength (ASTM D5147)
   a. 2 in/min. @ 73.4 ± 3.6°F MD 310 lbf/in CMD 310 lbf/in
   b. 50 mm/min. @ 23 ± 3°C MD 54.2 kN/m CMD 54.2 kN/m

2. Tear Strength (ASTM D5147)
   a. 2 in/min. @ 73.4 ± 3.6°F MD 500 lbf CMD 500 lbf
   b. 50 mm/min. @ 23 ± 3°C MD 2224 N CMD 2224 N

3. Elongation at Maximum Tensile (ASTM D5147)
   a. 2 in/min. @ 73.4 ± 3.6°F MD 3.5% CMD 3.5%
   b. 50 mm/min. @ 23 ± 3°C MD 3.5% CMD 3.5%

4. Low Temperature Flexibility (ASTM D5147): Passes -30°F (-34°C)
2.6 SURFACINGS

A. White Elastomeric Roof Coating: Pyramic; Energy Star approved white acrylic roof coating: One coat to cover footprints and other housekeeping issues

1. Weight/Gallon 12 lbs./gal. (1.44 g/cm³)

2. Non-Volatile % (ASTM D 1644) 66 min

3. Reflectance 81%

3. Reflectance 90%

B. Mineral Surfaced Membranes - Roofing Granules shall meet requirements of ASTM D451 and/or be recommended by the membrane manufacturer. Loose granules for bleed out shall match size and color of granulated membrane sheet.

2.7 RELATED MATERIALS

A. Roof Insulation: In accordance with Section 07 22 00.

B. Roof Insulation Fasteners: In accordance with Section 07 22 00.

C. Base Sheet: ASTM D4601, Type II; as recommended and furnished by the coal tar modified membrane manufacturer.

D. Nails and Fasteners: Non-ferrous metal or galvanized steel, except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel, I addition plates should be used. Fasteners shall be self-clinching type of penetrating type as recommended by the manufacturer of the deck material. Nails and fasteners shall be flush-driven through flat metal discs of not less than one (1) inch diameter. Omit metal discs when one-piece composite nails or fasteners with heads not less than one (1) inch diameter are used.

E. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than twenty eight (28) gauge and not less than one (1) inch in diameter. Form discs to prevent dishing. Bell or cup shaped caps are not acceptable. Termination bar should be extruded aluminum .125 x 1"

F. Install Tuff-Flash to penetrations into and on existing copper box for existing wood fencing/wall.
G. Urethane Sealant: One part, non-sag sealant as approved and furnished by the membrane manufacturer for moving joints.

1. Tensile Strength (ASTM D412): 250 psi
2. Elongation (ASM D412): 950%
4. Adhesion-in-Peel (ASTM C920): 30 psi

H. Sealant: Single component, 100% solids structural adhesive as furnished and recommended by the membrane manufacturer.

1. Elongation (ASTM D412) 300%
2. Hardness, Shore A (ASTM C920) 50
3. Shear Strength (ASTM D1002) 300 psi

I. Non-Shrink Grout: Use an all weather fast setting chemical action concrete material to fill pitch pans.

1. Flexural Strength (ASTM C78 (modified)) 7 days 1100psi
2. High Strength (ASTM C109 (modified)) 24 days 8400lbs (3810kg)

J. Pitch Pocket Sealer: Two part, 100% solids, self leveling, polyurethane sealant for filling pitch pans as recommended and furnished by the membrane manufacturer.

1. Durometer (ASTM D2240) 40-50 Shore
2. Elongation (ASTM D412) 250%
3. Tensile Strength (ASTM D412) 200 @ 100 mil

K. Glass Fiber Cant: Continuous triangular cross Section made of inorganic fibrous glass used as a cant strip as recommended and furnished by the membrane manufacturer.

L. Roof Drains: Drain system as recommended and furnished by the membrane manufacturer.

M. Pitch pans, Rain Collar 24 gauge stainless or 20oz (567gram) copper. All joints should be welded/soldered watertight. See details for design.

N. Drain Flashings should be 4lb (1.8kg) sheet lead formed and rolled
O. Plumbing stacks should be 16 oz. copper sleeve with cap and screen – see detail.

PART 3 — EXECUTION

3.1 EXAMINATION

A. Verify that deck surfaces and project conditions are ready to receive work of this section.

B. Verify that deck is supported and secured to structural members.

C. Verify that deck is clean and smooth, free of depressions, projections or ripples, and is properly sloped to drains.

D. Verify that adjacent roof substrate components do not vary more than [1/4] inch in height.

E. Verify that deck surfaces are dry.

F. Verify that openings, curbs, pipes, conduit, sleeves, ducts, and other items which penetrate the roof are set solidly, and that [wood cant strips] [wood nailing strips] [and reglets] are set in place.

3.2 DECK PREPARATION

A. Wood Deck

1. Verify that wood decking is flat and has tight joints.

2. Seal plywood joints with tape.

3. Fill knot holes with latex filler.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing the roof system.

B. Insurance/Code Compliance: Where required by code, install and test the roofing system to comply with governing regulation and specified insurance requirements.

C. Protect other work from spillage of roofing materials and prevent materials from entering or clogging drains and conductors. Replace or restore other work damaged by installation of the coal tar modified bituminous roofing system.

D. Coordinate installation of roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut-offs at end of each day's work to cover exposed ply sheets and insulation with two (2) plies of an SBS
modified base sheets set in cold applied mastic with joints and edges sealed with roofing cement. Remove cut-offs immediately before resuming work.

E. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

F. Apply roofing materials as specified by manufacturer's instructions.

1. Keep roofing materials dry before and during application.

2. Do not permit phased construction.

3. Complete application of roofing plies, modified sheet and flashing in a continuous operation.

4. Begin and apply only as much roofing in one day as can be completed that same day.

5. Cut-Offs (Waterstops): At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of two (2) plies of #15 organic roofing felt set in roofing cement with joints and edges sealed.

3.4 INSULATION INSTALLATION

A. Deck type: Wood

B. Base Sheet attachment: Type II should be attached with [fastener type and pattern] according to specified wood.

C. Insulation: [2 layers of 2” poyisocyanurate and 1 layer of ½” Dens-Deck.

D. Insulation attachment: Insulock II insulation adhesive.

3.5 BASE PLY INSTALLATION

A. SBS Base Ply: Install (1) one ply of StressBase 80 in two (2) to two and one half (2 ½) gallons per square of bitumen. Prior to installation, cut sheets into 18' lengths and allow to relax.

B. Lap ply sheet ends eight inches. Stagger end laps twelve inches minimum.

C. Extend plies two inches beyond top edges of cants at wall and projection bases.

D. Install base flashing ply to all perimeter and projection details.
E. Allow the one ply of base sheet to cure at least thirty minutes before installing the modified membrane. However, the modified membrane must be installed the same day as the base plies.

3.6 MODIFIED MEMBRANE APPLICATION

A. Solidly bonded to the base layers with specified cold adhesive at the rate of two (2) to two and one half (2 ½) gallons per 100 square feet.

B. The roll must push a puddle of adhesive in front of it with adhesive slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane.

C. Subsequent rolls of modified shall be installed across the roof as above with a minimum of four (4) side laps and eight (8) end laps. The end laps shall be staggered. The modified membrane shall be laid in the same direction as the underlayers but the laps shall not coincide with the laps of the base layers.

D. For best results, allow the cold adhesive to set for five (5) to ten (10) minutes before installing the top layer of modified membrane.

E. Extend membrane two (2) beyond top edge of all cants in full moppings of the cold adhesive as shown on the drawings.

3.7 FLASHING MEMBRANE INSTALLATION

A. Seal all curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.

B. Prepare all walls, penetrations, expansion joints [and where shown on the drawings] to be flashed with asphalt primer at the rate of one hundred (100) square feet per gallon. Allow primer to dry tack free.

C. Use the modified membrane as the flashing membrane. Adhere to the underlying base flashing ply with specified asphalt unless otherwise noted in these specifications. Nail off at a minimum of eight (8) inches (203mm) o.c. from the finished roof at all vertical surfaces.

D. Solidly adhere the entire sheet of flashing membrane to the substrate. Tops of all flashings that are not run up and over curb shall be secured through termination bar 6 inches (152mm) and sealed at top.

E. Seal all vertical laps of flashing membrane with a three-course application of trowel-grade mastic and fiberglass mesh.

F. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified in other sections.
G. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work as specified in other sections. When using mineralized cap sheet all stripping shall be installed prior to cap sheet installation.

3.8 FLASHING MEMBRANE INSTALLATION

A. Metal Edge:

1. Inspect the nailer to assure proper attachment and configuration.

2. Run one ply over the edge. Assure coverage of all wood nailers. Fasten plies with ring shank nails at eight (8) inches (203mm) o.c.

3. Install continuous cleat and fasten at six (6) inches (152mm) o.c.

4. Install new metal edge hooked to continuous cleat and set in bed of roof cement. Fasten flange to wood nailer every three (3) inches (76mm) o.c. staggered.

5. Prime metal edge at a rate of 100 square feet per gallon and allow to dry.

6. Strip in flange with base flashing ply covering entire flange in bitumen with six (6) inches (152mm) on to the field of roof. Assure ply laps do not coincide with metal laps.

7. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches (228mm) on to the field of the roof. Seal outside edge with rubberized cement.

B. Reglet Mounted Counterflashing:

1. Minimum flashing height is eight (8) inches (203mm) above finished roof height. Maximum flashing height is 24 inches. Prime vertical wall at a rate of 100 square feet per gallon and allow to dry.

2. Set cant in bitumen. Run all field plies over cant a minimum of two (2) inches (50mm).

3. Install base flashing ply covering wall set in bitumen with six (6) inches (152mm) on to field of the roof.

4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches (228mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Apply butyl tape to wall behind flashing. Secure termination bar through flashing, butyl tape and into wall. Alternatively use caulk to replace the butyl tape.

6. Cut reglet in masonry one joint above flashing.

7. Secure reglet counterflashing with expansion fasteners and caulk reglet opening.

C. Curb Detail:

1. Minimum curb height is eight (8) inches (203mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.

2. Set cant in bitumen. Run all field plies over cant a minimum of two (2) inches (50mm).

3. Install base flashing ply covering curb set in bitumen with six (6) inches (152mm) on to field of the roof.

4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches (228mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.

5. Install pre-manufactured counterflashing with fasteners and neoprene washers or per manufacturer’s recommendations.

6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

D. Roof Drain: All drains to be replaced

1. Plug drain to prevent debris from entering plumbing.

2. Taper insulation to drain minimum of 24 inches (609mm) from center of drain.

3. Run roof system plies over drain. Cut out plies inside drain bowl.

4. Set lead/copper flashing (30 inch square minimum) in ¼ inch bed of mastic. Run lead/copper into drain a minimum of two (2) inches (50mm). Prime lead/copper at a rate of 100 square feet per gallon and allow to dry.

5. Install base flashing ply (40 inch square minimum) in bitumen.

6. Install modified membrane (48 inch square minimum) in bitumen.

7. Install clamping ring and assure that all plies are under the clamping ring.

8. Remove drain plug and install strainer.
E. Plumbing Stack:

1. Minimum stack height is 12 inches (609mm).

2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.

3. Prime flange of new sleeve. Install properly sized sleeves set in ¼ inch (6mm) bed of roof cement.

4. Install base flashing ply in bitumen.

5. Install membrane in bitumen.

6. Caulk the intersection of the membrane with elastomeric sealant.

7. Install cap.

F. Pitch Pocket:

1. Run all plies up to the penetration.

2. Place the pitch pocket over the penetration and prime all flanges.

3. Strip in flange of pitch pocket with one (1) ply of base flashing ply. Extend six (6) inches (152mm) onto field of roof.

4. Install second layer of modified membrane extending nine (9) inches (228mm) onto field of the roof.

5. Fill pitch pocket half full with non-shrink grout. Let this cure and top off with pourable sealant.

6. Caulk joint between roof system and pitch pocket with roof cement.

3.9 Application of Surfacing

A. Prior to installation of surface, obtain approval from manufacturer as to work completed. On average, at least 30 days are required prior to final surfacing.

B. Reflective Coating:

1. Allow all cold applied mastics and coating to properly dry and cure before installing the aluminum coating.
2. Paint all exposed roofing with manufacturer's Energy Star acrylic coating installed at a rate of one (1) gallon per square per coat. This is applied to cover any footprints and spillage.

C. Mineral Surfaced Membrane System: While bleed out from the side and end laps are still cold, hand broadcast minerals into asphalt bleed out for a monolithic appearance. Aluminize any areas of improper adherence of minerals and rebroadcast minerals while coating is still wet.

3.10 FIELD QUALITY CONTROL

A. Correct defects or irregularities discovered during field inspection.

C. Require attendance of roofing materials manufacturers' representatives at site during installation of the roofing system. A copy of the specification should also be on site at all times.

3.11 CLEANING

A. Remove bitumen adhesive drippings from all walls, windows, floors, ladders and finished surfaces.

B. In areas where finished surfaces are soiled by asphalt or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning instructions and conform to their instructions.

C. Repair or replace defaced or disfigured finishes caused by work of this section.

3.12 CONSTRUCTION WASTE MANAGEMENT

A. Remove and properly dispose of waste products generated during roofing procedures. Comply with requirements of authorities having jurisdiction.

3.13 FINAL INSPECTION

A. At completion of roofing installation and associated work, meet with Contractor, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of roofing system.

B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party in attendance.
C. The roofing system manufacturer reserves the right to request a thermo graphic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The thermo graphic scan shall be provided by the [Roofing] Contractor.

D. If core cuts verify the presence of damp or wet materials, the Roofing Contractor shall be required to replace the damaged areas at his own expense.

E. Repair or replace deteriorated or defective work found at time above inspection as required to a produce an installation which is free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

F. Notify the Owner upon completion of corrections.

G. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.

3.14 DEMONSTRATION AND TRAINING

A. At a time and date agreed to by the Owner, instruct the Owner's facility manager, or other representative designated by the Owner, on the following procedures:

1. Roof troubleshooting procedures.

2. Notification procedures for reporting leaks or other apparent roofing problems.

3. Roofing maintenance.

4. The Owner's obligations for maintaining the roofing warranty in effect and force.

5. The Manufacturer's obligations for maintaining the roofing warranty in effect and force.

END OF SECTION
SECTION 07 22 00 - ROOF DECK AND INSULATION

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including the Conditions of the Contract.

1.2 SUMMARY

A. Section includes roof insulation over the properly prepared deck substrate.

B. Related Sections:

1. Section 07 62 00 - Sheet Metal Flashing and Trim.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):


2. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.


15. ASTM D36 Standard Test Method for Softening Point of Bitumen (Ring and Ball Apparatus).

B. Cast Iron Soil Pipe Institute, Washington, D.C. (CISPI)

C. Factory Mutual Research (FM):
   1. Roof Assembly Classifications.

D. National Roofing Contractors Association (NRCA):

E. Underwriters Laboratories, Inc. (UL):
1. Fire Hazard Classifications.

F. Warnock Hersey (WH):

1. Fire Hazard Classifications.

G. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

H. Steel Deck Institute, St. Louis, Missouri (SDI)

I. Southern Pine Inspection Bureau, Pensacola, Florida (SPIB)

J. Insulation Board, Polyisocyanurate (FS HH-I-1972)

K. Insulation Board, Thermal (Fiberboard) (FS LLL-1-535B)

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's specification data sheets for each product.

B. Provide approval letters from insulation manufacturer for use of their insulation within this particular roofing system type.

C. Provide a sample of each insulation type.

D. Shop Drawings

1. Submit manufacturer's shop drawings indicating complete installation details of tapered insulation system, including identification of each insulation block, sequence of installation, layout, drain locations, roof slopes, thicknesses, crickets and saddles.

2. Shop drawing shall include: Outline of roof, location of drains, complete board layout of tapered insulation components, thickness and the average "R" value for the completed insulation system.

E. Certification

1. Submit roof manufacturer's certification that insulation fasteners furnished are acceptable to roof manufacturer.

2. Submit roof manufacturer's certification that insulation furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.
1.5 QUALITY ASSURANCE

A. Fire Classification, ASTM E-108.

B. Manufacturer's Certificate: Certify that roof system furnished is approved by Factory Mutual, Underwriters Laboratories, Warnock Hersey or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.

C. Manufacturer's Certificate: Certify that the roof system is adhered properly to meet or exceed the requirements of FM 1-90.

D. Pre-installation Meeting: Refer to Division 07 roofing specifications for pre-installation meeting requirements.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.

B. Store all insulation materials in a manner to protect them from the wind, sun and moisture damage prior to and during installation. Any insulation that has been exposed to any moisture shall be removed from the project site.

C. Keep materials enclosed in a watertight, ventilated enclosure (i.e. tarpaulins).

D. Store materials off the ground. Any warped, broken or wet insulation boards shall be removed from the site.

PART 2 — PRODUCTS

2.1 PRODUCTS, GENERAL

A. Basis of Design: Materials, manufacturer's product designations, and/or manufacturer's names specified herein shall be regarded as the minimum standard of quality required for work of this Section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.

C. Substitutions: Products proposed as equal to the products specified in this Section shall be submitted in accordance with Bidding Requirements.

1. Proposals shall be accompanied by a copy of the manufacturer's standard specification section. That specification section shall be signed and sealed by a professional engineer licensed in the state in which the installation is to take
place. Substitution requests containing specifications without licensed engineer certification shall be rejected for non-conformance.

2. Include a list of three (3) projects of similar type and extent, located within a one hundred mile radius from the location of the project. In addition, the three projects must be at least five (5) years old and be available for inspection by the Owner or Owner's Representative.

3. Equivalency of performance criteria, warranty terms, submittal procedures, and contractual terms will constitute the basis of acceptance.

4. The Owner's decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.

2.2 INSULATION MATERIALS

A. Thermal Insulation Properties and Approved Insulation Boards.

1. Rigid Polyisocyanurate Roof Insulation; ASTM C1289:
   a. Qualities: Rigid, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
   b. Thickness: Layer One (1) Minimum - 2”(inch)
      Layer Two (2) Minimum - 2”(inch)
   c. R-Value: Minimum 25
   e. Acceptable Products:
      1) ENRGY-3; Johns Manville
      2) Commercial Innovations
      3) Approved Equivalent

2. Securock Roof Board or Dens-deck
   a. Qualities: Nonstructural, noncombustible, homogenous composition panel.
   b. Board Size: Four by eight feet (4’x8’).
c. Thickness: One half (½) inch.

d. Compliances: UL, WH or FM listed under Roofing Systems.

2.3 RELATED MATERIALS

A. Fiber Cant and Tapered Edge Strips: Performed rigid insulation units of sizes/shapes indicated, matching insulation board or of perlite or organic fiberboard, as per the approved manufacturer.

1. Acceptable Manufacturers:

  b. Johns Manville
  c. Approved Equivalent

B. Protection Board: Premolded semi-rigid asphalt composition board one half (½) inch.

C. Roof Board Joint Tape: Six (6) inches wide glass fiber mat with adhesive compatible with insulation board facers.

D. Roof Deck Insulation Adhesive: Two component, foam adhesive as recommended by insulation manufacturer and approved by FM indicated ratings.

  1. Tensile Strength (ASTM D412)……..250 psi
  2. Density (ASTM D1875)……………..8.5 lbs./gal.
  3. Viscosity (ASTM D2556)…………..16,000 to 24,000 cP.
  4. Peel Strength (ASTM D903)…………….17 lb/in.
  5. Flexibility (ASTM D816)…………….Pass @ -70°F

PART 3 — EXECUTION

3.1 EXECUTION, GENERAL

A. Comply with requirements of Division 01 Section "Common Execution Requirements."

3.2 INSPECTION OF SURFACES

A. Roofing contractor shall be responsible for preparing an adequate substrate to receive insulation.
1. Verify that work which penetrates roof deck has been completed.

2. Verify that wood nailers are properly and securely installed.

3. Examine surfaces for defects, rough spots, ridges, depressions, foreign material, moisture, and unevenness.

4. Do not proceed until defects are corrected.

5. Do not apply insulation until substrate is sufficiently dry.

6. Broom clean substrate immediately prior to application.

7. Use additional insulation to fill depressions and low spots that would otherwise cause ponding water.

3.3 INSTALLATION

A. Attachment with Insulation Adhesive over Mechanically Attached Base Sheet:

1. Ensure all surfaces are clean, dry, free of dirt, debris, oils, loose ore embedded gravel, unadhered coatings, deteriorated membrane and other contaminants that may inhibit adhesion.

2. Apply insulation adhesive directly to the substrate using a ribbon pattern with one half (½) inch wide beads, using either the pail or an automatic applicator, at a rate of one (1) gallon per one hundred (150) square feet.

3. Immediately place insulation boards into wet adhesive. Do not slide boards into place. Do not allow the adhesive to skin over before installing insulation boards.

4. Briefly step each board into place to ensure contact with the adhesive. Substrates with irregular surfaces may prevent the insulation board from making positive contact with the adhesive. Relief cuts or temporary weights may be required to ensure proper contact.

5. All boards shall be cut and fitted where the roof deck intersects a vertical surface. The boards shall be cut to fit a minimum of one quarter (¼) inch away from the vertical surface.

3.4 CLEANING

A. Remove debris and cartons from roof deck. Leave insulation clean and dry, ready to receive roofing membrane.
3.5 CONSTRUCTION WASTE MANAGEMENT

A. Remove and properly dispose of waste products generated during installation. Comply with requirements of authorities having jurisdiction

END OF SECTION
SECTION 07 22 18 - PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Remove existing roofing system(s), base flashings, sheet metal, vent stack flashings and rigid insulation down to the deck, clean walls, conduits, and any remains of any types of roofing systems. Sweep or clean all debris off of the deck and walls.

1.2 PRE-INSTALLATION CONFERENCE

A. Review installation procedures and coordination required with related work.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Do not remove existing roofing system or damaged decking when weather conditions threaten the integrity of the building contents or intended continued occupancy. Maintain continued temporary protection prior to installation of the new roofing system.

1.4 PROTECTION

A. It shall be the Contractor’s responsibility to respond immediately to correction of roof leakage during construction. A four (4) hour time limit shall be given from the time of notification of emergency conditions. In the event of water penetration during rain or a storm, the Contractor shall provide for repair or protection of the building contents and interior. If the Contractor does not respond or cannot be contacted, the Owner will effect repairs or emergency action and the Contractor shall be back charged for all expenses and damages, if any.

B. Extra protection to be taken when work is being conducted over sensitive areas. Protection such as tarps or polyethylene sheathing shall be lined on surface.

1.5 SCHEDULING

A. Schedule work to coincide with commencement of installation of new roofing system.

PART 2 - PRODUCTS
2.1 MATERIALS

A. Temporary protection: Sheet Polyethylene. Provide weights or fasteners to retain sheeting in position.

B. Base Sheet: ASTM D-4601 Type II. Provide weights or fasteners to retain sheeting in position.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The Roofing Contractor is to verify existing site conditions, including roof dimensions.

B. The Roofing Contractor must verify that the existing roof surface is clear and ready for work of the section.

3.2 MATERIALS REMOVAL

A. Remove all gravel, membrane, cant strips, rigid insulation, expansion joints, base flashings, walls, and any other items shown on the drawings. In addition, complete removal of all nails and other debris is required to leave a smooth, even surface for re-roofing.

B. Under certain conditions, it will be necessary and desirable to incorporate one or more of the following methods for removal of dirt, silt, gravel, debris, roof membrane and insulation from the roof surface in order to preserve the ecology, eliminate unsightly conditions, and protect the building surfaces:

   1. Roof vacuum systems.
   2. Crane and hopper with dump truck system.
   3. Enclosed chutes with protective shrouds on the building and ground surfaces.

C. All non asbestos containing debris dumped from the roof shall be transported from the roof via chutes into dumpsters and this debris shall be removed from the premises when dumpsters are full at the Contractors cost. All asbestos containing debris shall be removed from the roof in accordance with all local, state and federal standards. No debris shall be transported from the area being worked on over a previously finished roof without an underlayment of ¾” plywood.
D. All roof equipment not in use or left filled will be parked on the column lines on ¾” plywood.

E. Building and/or ground damage caused by the removal or installation of the roof system will be the sole responsibility of the Contractor.

3.3 TEMPORARY PROTECTION

A. Provide temporary protective sheeting over uncovered deck surfaces.

B. Turn sheeting up and over parapets and curbing. Retain sheeting in position with weights or temporary fasteners.

C. Provide for surface drainage from sheeting to existing drainage facilities.

D. Do not permit traffic over unprotected deck surface.

3.4 INTERIOR TEMPORARY PROTECTION

A. Provide temporary protective where necessary.

B. Contractor responsible for cleaning all dust and any fallen debris from interior of the facility.

END OF SECTION
SECTION 07 62 00 - FLASHING AND SHEET METAL

PART 1 GENERAL

1.1 SECTION INCLUDES:

   A. Provide all labor, equipment, and materials fabricate and install the following.

      1. Edge strip and flashing.
      2. Fascia, scuppers, and trim.
      3. Counterflashings over bituminous base flashing.
      5. Counterflashings at roof mounted equipment and vent stacks.
      7. Fascia and edge metal.
      8. Counterflashings at walls and penetrations.
      9. Lead flashing for bituminous membranes.
     10. Other components.

1.2 RELATED SECTIONS

   A. Drawing and general provisions of the Contract, including General Supplementary Conditions and Division 1 Specification Sections, Apply to this Section.

   B. RELATED SECTIONS

      1. Section 06100 - Rough Carpentry
      2. Section 07550 - Modified Bitumen Roofing.

1.3 REFERENCES

   ASTM B-209 Specification for aluminum sheet
   ASTM B-221 Specification for aluminum extruded shape
   FS QQ-L-201 Specification for Lead Sheet
   ASTM A792-96 Steel Sheet, Aluminum-Zinc Alloy-Coated, by the Hot-Dip Process
   ASTM B32 Solder Metal
   ASTM B209 Aluminum and Alloy Sheet and Plate
   ASTM B486 Paste Solder
   ASTM D226 Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
   ASTM D486 Asphalt Roof Cement, Asbestos-free
1.4 SUBMITTALS

A. Product Data: Provide manufacturer's specification data sheets for each product.

C. Provide approval letters from metal manufacturer for use of their metal within this particular roofing system type.

D. Submit two samples, 12 x 12 inch in size illustrating typical external corner, internal corner, valley, junction to vertical dissimilar surface, material and finish.

E. Shop Drawings

1. For manufactured and shop fabricated gravel stops, fascia, scuppers, and all other sheet metal fabrications.

2. Shop drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashing, termination's, and installation details.

3. Indicate type, gauge and finish of metal.

F. Certification

1. Submit roof manufacturer's certification that metal fasteners furnished are acceptable to roof manufacturer.

2. Submit roof manufacturer's certification that metal furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.

3. Submit certification that metal and fastening system furnished is Tested and Approved by Factory Mutual for I-90 Wind Up-Lift Requirements.

G. Manufacturer's Product Data
1. Metal material characteristics and installation recommendations.

2. Submit color chart prior to material ordering and/or fabrication so that equivalent colors to those specified can be approved.

1.5 QUALITY ASSURANCE

A. Reference Standards

1. Comply with details and recommendations of SMACNA Manual for workmanship, methods of joining, anchorage, provisions for expansion, etc.

B. If required, fabricator/installer shall submit work experience and evidence of adequate financial Responsibility. The owner's representative reserves the right to inspect fabrication facilities in determining qualifications.

C. Successful contractor must obtain all components of roof system from a single manufacturer including any roll good materials if required. Any secondary products that are required which cannot be supplied by the specified manufacturer must be recommended and approved in writing by primary manufacturer prior to bidding.

D. Manufacturer shall have in place a documented, standardized method for maintaining quality control such as ISO-9001 approval.

E. The designer shall conduct all required periodic inspections of work in progress as described herein and shall furnish written documentation of all such inspections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.

B. Stack pre-formed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials which may cause discoloration or staining.

1.7 JOB CONDITIONS
A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for pre-formed metal roofing system.

B. Protection:

1. Provide protection or avoid traffic on completed roof surfaces.
2. Do not overload roof with stored materials.
3. Support no roof-mounted equipment directly on the roofing system.

C. Ascertain that work of other trades which penetrates the roof or is to be made watertight by the roof is in place an approved prior to installation of roofing.

1.8 DESIGN AND PERFORMANCE CRITERIA

A. Factory Mutual Loss Prevention Data Sheet 1-49 windstorm resistance 1-90.

1.9 WARRANTIES

A. Manufacturer's Warranty

1. Pre-finished metal material shall require a written 20-year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than 5 NBS color units per ASTM D-2244 or chalking excess of 8 units per ASTM D-659. If either occurs material shall be replaced per warranty, at no cost to the Owner.

B. Contractor's Warranty

1. The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be watertight and secure for a period of two years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.

PART 2 PRODUCTS
2.1 MATERIALS

A. Metal system is to be comprised of minimum Aluminum coated on both sides with an epoxy primer and on the weathering surface with a polyvinylidene fluoride or siliconized polyester baked organic coated finish.

1. Acceptable Manufacturers

a. The Garland Company

b. Approved equivalent.

2. Materials

a. Aluminum

Aluminum, ASTM B209, alloy 3105-H14, in thickness of .040” nom.

1. Minimum gauge of steel or thickness of Aluminum to be specified in accordance with Architectural Sheet Metal Manual, Sheet Metal and Air Conditioning Contractor's National Association, Inc. recommendations.

b. Steel Finishes: siliconized modified polyester finish. Epoxy primer baked both sides, .2-.25 mils thickness as approved by finish coat manufacturer. Weathering finish as referred by National Coil Coaters Association (NCCA).

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<td>Gloss</td>
<td>ASTM D-523</td>
<td>90 +/- 5%</td>
</tr>
</tbody>
</table>
(60° angle)

Reverse Impact  ASTM D-2794  no cracking
or loss
of adhesion

Nominal Thickness  ASTM D-1005
primer  0.2 mils
topcoat  0.8 mils
TOTAL  1.0 mils

*Subject to minimum quantity requirements

c.   Color to be determined.

B.  Miscellaneous Metals and Flashings:

1.  Zinc-Coated Steel Sheet: ASTM A526, 0.20% copper, 26 gage
(0.0179"); designation G90 hot-dip galvanized, mill phosphatized.

2.  Stainless Steel Sheet: Type 302/304, ASTM A167, 28 gage,
(0.015"), annealed except dead soft where fully concealed by other
work, 2D (dull) finish.

3.  Copper Sheet: ASTM B370, 16 oz. (0.0216), temper H00 (cold-
rolled).

4.  Lead-Coated Copper Sheet: ASTM B101. Type I, Class A (12-15 1
lb. of lead coating per 100 sq. ft.), 17.1 oz. (0.022").

5.  Zinc Alloy Sheet: Zinc with 0.6% copper and 0.14% titanium;
0.27" thick (21 gauge); standard (soft) temper, mil finish.

2.3  RELATED MATERIALS

A.  Metal Primer: Zinc chromate type.

B.  Plastic Cement: ASTM D 4586

C.  Sealant: Specified in Section 07900 or on drawings.

D.  Lead: Meets Federal Specification QQ-L-201, Grade B, four pounds per
square foot.

E.  Solder: ANSI/ASTM B32; 95/05 type.
F. Flux: FS O-F-506.

G. Underlayment: ASTM D2178, No15 asphalt saturated roofing felt.

H. Slip Sheet: Rosin sized building paper.

I. Fasteners:
   1. Corrosion resistant screw fastener as recommended by metal manufacturer. Finish exposed fasteners same as flashing metal.
   2. Fastening shall conform to Factory Mutual 1-90 requirements or as stated on section details, whichever is more stringent.

J. Termination Bars:
   1. Shall be aluminum unless otherwise recommended by membrane manufacturers.
   2. Material shall be .125” x 1” (minimum) aluminum conforming to ASTM B-221, mill finish. Bar shall have caulk cup as required.

PART 3 EXECUTION

3.1 PROTECTION

   A. Protect contact areas of dissimilar metals with heavy asphalt or other approved coating, specifically made to stop electrolytic action.

3.2 GENERAL

   A. Install work watertight, without waves, warps, buckles, fastening stress, or distortion, allowing for expansion and contraction.

   B. Fastening of metal to walls and wood blocking shall comply with SMACNA Architectural Sheet Metal Manual, Factory Mutual I-90 wind uplift specifications and/or manufacturer's recommendations whichever is of the highest standard.

   C. All accessories or other items essential to the completeness of sheet metal installation, whether specifically indicated or not, shall be provided and of the same material as item to which applied.
D. Metal fascia and copings shall be secured to wood nailers at the bottom edge with a continuous cleat. Cleats shall be at least one gauge heavier than the metal it secures.

3.3 INSPECTION

A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets are in place, and nailing strips located.

B. Verify membrane termination and base flashings are in place, sealed, and secure.

C. Beginning of installation means acceptance of existing conditions.

D. Field measure site conditions prior to fabricating work.

3.4 MANUFACTURED SHEET METAL SYSTEMS

A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations.

B. Furnish and install manufactured sheet metal systems in strict accordance with manufacturer's printed instructions.

C. Provide all factory-fabricated accessories including, but not limited to, fascia extenders, miters, scuppers, joint covers, etc.

3.5 SHOP FABRICATED SHEET METAL

A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations.

B. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.

C. Hem exposed edges.

D. Angle bottom edges of exposed vertical surfaces to form drip.
E. All corners for sheet metal shall be lapped with adjoining pieces fastened and set in sealant.

F. Joints for gravel stop fascia system, cap flashing, and surface-mount counterflashings shall be formed with a 1/4” opening between sections. The opening shall be covered by a cover plate or backed by an internal drainage plate formed to the profile of fascia piece. The cover plate shall be embedded in mastic, fastened through the opening between the sections and loose locked to the drip edges.

G. Install sheet metal to comply with Architectural Sheet Metal manual, Sheet Metal and Air Conditioning Contractor’s National Associations, Inc.

3.6 FLASHING MEMBRANE INSTALLATION

A. METAL EDGE DETAIL

1. See details for scuppers. For manufactured edge metal, scuppers shall be factory fabricated.

2. Accessories: Joint covers, corners, supports, strip flashing at joining, fastenings and other accessories shall be included.

3. Install continuous cleat fasten 6" O.C.

4. Install new metal edge hooked to continuous cleat.

5. Attach metal edge with approved fasteners with neoprene washers 8" O.C.

B. SURFACE MOUNTED COUNTERFLASHING

1. Counterflashings shall be provided with watertight accessories such as miters, transitions, end caps, etc. and finished to match counterflashings.

2. Accessories: Joint covers, corners, fasteners, strip flashing at joinings, fastening, and other accessories shall be included.

3. Apply butyl tape to wall behind flashing. Secure termination bar through flashing butyl tape and into wall.

4. Secure new counterflashings set on a butyl tape above flashing 8" O.C., caulk top of counterflashings.

C. CURB DETAIL/AIR HANDLING STATION

1. Counterflashings shall be provided with watertight accessories such as miters, transitions, end caps, etc. and finished to match.

2. Accessories: Joint covers, corners, fasteners, strip flashing at joinings, fastening, and other accessories shall be included.
3. Install pre-manufactured expansion joint cover. Fasten sides 8" O.C. with fasteners and neoprene washers.
4. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

D. ROOF DRAIN

1. Prime lead/copper at a rate of 100 square feet per gallon and allow to dry.
2. Set lead/copper flashing (30" square minimum) in a 1/4" bed of mastic.
3. Install new clamping ring and strainer assure all plies are under the clamping ring.

E. PLUMBING STACK

1. Prime flange and sleeve at a rate of 100 square feet per gallon and allow to dry.
2. Install properly sized sleeves in a 1/4" bed of elastomeric sealant.
3. Install copper cap over sleeve.
4. Caulk intersection of the membrane and flange with elastomeric sealant.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section includes installation the following insulation and accessories;
   1. Piping insulation
   2. Jackets and accessories

1.2 RELATED SECTIONS

A. Section 22 40 00 – Plumbing Fixtures

1.3 REFERENCES

A. ASTM C177 – Steady State Heat Flux Measurements and Thermal Transmission
   Properties by Means of the Guarded Hot Plate Apparatus


C. ASTM C335 – Steady State Heat Transfer Properties of Horizontal Pipe
   Insulation

E. ASTM C449 – Mineral Fiber Hydraulic Setting Thermal Insulating & Finish
   Cement

F. ASTM C518 – Steady State Heat Flux Measurements and Thermal
   Transmission
   Properties by Means of the Heat Flow Meter Apparatus

G. ASTM C533 – Calcium Silicate Block and Pipe Thermal Insulation

H. ASTM C585 – Inner and Outer Diameters of Rigid Thermal Insulation for
   Nominal Sizes of Pipe and Tubing (NPS System)


J. ASTM E84 – Surface Burning Characteristics of Building materials

K. ASTM E96 – Water vapor Transmission of Materials

Using a Radiant Heat Energy Source

1.4 SUBMITTALS
   A. Submit under provisions of Division 1.
   A. Product Data: Provide product description, list of materials and thickness for each service, and location.
   B. Manufacturer's Installation Instructions: Indicate assembly and support requirements.

1.5 QUALITY ASSURANCE
   A. Materials: Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84, NFPA 255, and UL 723.

1.6 QUALIFICATIONS
   A. Applicator: Company specializing in performing the work of this section with a minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING
   A. Deliver, store, protect and handle products to site in manufacturer's original unopened containers or packages with labels intact.
   B. Deliver materials to site in original factory packaging, labeled with manufacturer’s identification, including product density and thickness
   C. Protect insulation against dirt, water, chemical and mechanical damage.

1.8 ENVIRONMENTAL REQUIREMENTS
   A. Maintain ambient temperatures and conditions required by manufacturers adhesive, mastic, and insulation cements.
   B. Maintain temperature during and after installation for a minimum period of 24 hours.

PART 2 PRODUCTS

2.1 GLASS FIBER PIPING INSULATION
   A. Manufacturer:
      1. Johns/Manville Micro-Lok
      2. Other acceptable manufacturers offering equivalent products:
         a. Owens Corning
b. Certainteed Manson
c. Knauf

B. Insulation: ASTM C547 rigid molded, noncombustible.
1. ‘K’ value (SI ‘k’ value) ASTM C335, 0.25@ 75 deg F (0.036 @ 24 deg C)
2. Minimum Service Temperature: -20 degrees F (-28.9 degrees C)
3. Maximum Service Temperature: 850 degrees F (454 degree C)
4. Maximum Moisture Absorption: 0.2 percent by volume

C. Vapor Barrier Jacket:
1. White kraft paper reinforced with glass fiber yarn & bonded to aluminized film
2. Moisture vapor Permeability: ASTM E96; 0.02 perm-inches

D. Installation:
1. Secure seams with pressure sensitive tape closure and butt joints with minimum 3 inch wide tape of same material as vapor barrier jacket.

2.2 JACKETING

A. Polyvinyl Chloride (PCV) Plastic
1. Manufacturer: Johns/Manville, Zeston 2000 or approved equal.
2. Jacket: ASTM D1784, one-piece molded type fitting covers and sheets.
   a. Minimum Service Temperature: 0 deg F (-18 deg C)
   b. Maximum Service Temperature: 150 deg F (66 deg C)
   c. Thickness: 10 mil (.26 mm)
   d. Color: off-white
3. Installation:
   a. Fittings and Valves: Factory precut inserts
   b. Apply vapor retardant mastic to all seams and joints.
c. Secure all seams and joints with Zeston PVC Z-Tape.

B. Canvas jacket: UL listed
   1. fabric: ASTM C921, 6oz/sq yd (220 g/sq m), plain weave cotton treated with dilute fire retardant lagging adhesive compatible with insulation.

C. Insulating Cement
   1. Manufacturer: Rock Wool “One Shot” or approved equal.
      a. Maximum service temperature: 1200 deg F (649 deg C)
      b. “K” value (SI “k” value): 1.12 at 400 deg F
      c. Thickness: Same as adjoining piping.
   3. Installation:
      a. One monolithic layer directly applied
      b. Exterior finish shall be troweled for smooth paintable surface.

PART 3 INSTALLATION

3.1 EXAMINATION
   A. Verify that pipe has been tested before applying insulation.
   B. Verify that surfaces are clean and dry, with foreign materials removed.

3.2 INSTALLTION
   A. Install in accordance with manufacturers instructions.
   B. On exposed piping, locate insulation and cover seams in least visible locations
   C. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.

D. Inserts and Shields:
   1. Application: Piping 2 inches diameter or larger.
   2. Insert location: Between support shield and piping and under finish jacket.
   3. Insert Configuration: Minimum 6 inches long, of same thickness and
contour as adjoining insulation; may be factory fabricated.

4. Insert material: ASTM C640 cork, hydrous calcium silicate insulation or other heavy density insulating material suitable for planned temperature range.

E. Finish insulation at supports, protrusions, and interruptions.

3.3 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent normal conditions, as materials indicated.

3.4 GLASS FIBER INSULATION SCHEDULE

A. All insulation shall be 1-1/2 inch thickness with appropriate jacket.

END OF SECTION
SECTION 22 40 00  
PLUMBING FIXTURES

PART 1 GENERAL

1.1 SUMMARY
   A. Section includes installation the following plumbing specialties and accessories;
      1. Roof drains & overflow roof drains.
      2. Downspout

1.2 RELATED SECTIONS
   A. Drawing and general provisions of the Contract, including General Supplementary Conditions and Division 1 Specification Sections, Apply to this Section.
   B. Related Sections
      1. Section 07 22 18 – Preparation for Re-roofing
      2. Section 07 22 00 – Roof and Deck Insulation
      3. Section 07 52 00 – Modified Bituminous Roofing - Cold Applied

1.3 REFERENCES
   A. ANSI A112.21.2 - Roof Drains.

1.4 SUBMITTALS
   A. Submit under provisions of Division 1.
   B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
   C. Product Data: Provide component sizes, rough-in requirements, service sizes, capacities and finishes.
   D. Manufacturer's Installation Instructions: Indicate assembly and support requirements.

1.5 PROJECT RECORD DOCUMENTS
   A. Record actual locations of equipment, cleanouts, etc.
1.6 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.7 QUALITY ASSURANCE

A. All items of similar class shall be the products of the same manufacturer.

B. Roof Drainage System

1. Basis of design for this project is roof drains with downspout nozzles and parapet scupper sleeve as the secondary means of water drainage. This installation shall conform to all governing local and state codes.

2. Roof drain manufacturer shall provide documentation certifying the proper location and placement of primary and overflow drainage system.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

B. Installer: Company specializing in performing the work of this section with minimum five years documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site in manufacturer's original unopened containers or packages with labels intact.

B. Accept equipment on site in original factory packaging. Inspect for damage.

1.10 WARRANTY

A. Provide manufacturer's standard warranty roof drains, parapet roof drains, overflow nozzles and scupper sleeves.

PART 2 PRODUCTS

2.1 MANUFACTURERS

Specialties listed within this specification shall be as the manufactured by the following:

1. Josam
2. J R Smith
3. Zurn

2.2 ROOF DRAINS


PART 3 INSTALLATION

3.1 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Installation of Roof Drains, Parapet Roof Drains, Downspout Nozzles and Parapet Scupper Sleeves in accordance with manufacturer’s instructions.

C. All items of this section to be installed by a licensed plumber with a minimum five years experience in the installation of rooftop plumbing accessories.

END OF SECTION
FACSIMILE TELECOPY TRANSMISSION

To: Ricky Howard
Wesleyan University
Fax #: (860) 685-3101

From: David W. Roderick
AmeriSci Job #: 212022387
Subject: PLM 3 day Results
Client Project: 200 High St. - Electric House

Email: rhoward@wesleyan.edu

Date: Tuesday, February 14, 2012
Time: 05:14:19
Number of Pages: [ ] (including cover sheet)

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Boston • Los Angeles • New York • Richmond
# PLM Bulk Asbestos Report

**Wesleyan University**  
**Attn:** Ricky Howard  
**Wesleyan University-Env. Health&Safety**  
**William Street Highrise**  
**Middletown, CT 06459**

**Date Received:** 02/11/12  
**AmeriSci Job #:** 212022387  
**Date Examined:** 02/14/12  
**P.O. #:**  
**Page 1 of 5**  
**RE:** 200 High St. - Electric House

<table>
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<tr>
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<th>Lab No.</th>
<th>Asbestos Present</th>
<th>Total % Asbestos</th>
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**Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material  
**Asbestos Types:** Chrysotile 10.0 %  
**Other Material:** Non-fibrous 90 %

| 200-2A          | 212022387-02  | No               | NAD              |
| 2               | Location: Gote Rm., Roof Flashing (1) |

**Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material  
**Asbestos Types:**  
**Other Material:** Cellulose Trace, Fibrous glass 20 %, Non-fibrous 80 %

| 200-3A          | 212022387-03  | No               | NAD              |
| 3               | Location: Gote Rm., Roof Flashing (2) |

**Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material  
**Asbestos Types:**  
**Other Material:** Cellulose Trace, Fibrous glass 20 %, Non-fibrous 80 %

| 200-4A          | 212022387-04  | No               | NAD              |
| 4               | Location: Gote Rm., Roof Flashing (3) |

**Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material  
**Asbestos Types:**  
**Other Material:** Cellulose Trace, Fibrous glass 10 %, Non-fibrous 90 %

| 200-5A          | 212022387-05  | No               | NAD              |
| 5               | Location: Gote Rm., Roof Flashing Insulation Board (4) |

**Analyst Description:** Brown, Homogeneous, Fibrous, Bulk Material  
**Asbestos Types:**  
**Other Material:** Cellulose 99 %, Non-fibrous 1 %

See Reporting notes on last page
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<td>by David W. Roderick</td>
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See Reporting notes on last page
# PLM Bulk Asbestos Report

200 High St. - Electric House

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<td></td>
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</tbody>
</table>

See Reporting notes on last page
<table>
<thead>
<tr>
<th>Client No. / HGA</th>
<th>Lab No.</th>
<th>Asbestos Present</th>
<th>Total % Asbestos</th>
<th>Analyst Description</th>
<th>Location: Shower Rm. 2nd Fl., Gray Wall Tile</th>
<th>(by CVES) by David W. Roderick on 02/14/12</th>
</tr>
</thead>
<tbody>
<tr>
<td>200-14A</td>
<td>212022387-18</td>
<td>No</td>
<td>NAD</td>
<td>Grey/White, Homogeneous, Non-Fibrous, Bulk Material</td>
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<tr>
<td>200-15A</td>
<td>212022387-19</td>
<td>No</td>
<td>NAD</td>
<td>Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material</td>
<td>Other Material: Non-fibrous 100 %</td>
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<tr>
<td>200-16A</td>
<td>212022387-20L1</td>
<td>No</td>
<td>NAD</td>
<td>White, Homogeneous, Non-Fibrous, Bulk Material</td>
<td>Other Material: Non-fibrous 100 %</td>
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<tr>
<td>200-16B</td>
<td>212022387-20L2</td>
<td>No</td>
<td>NAD</td>
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<td>Other Material: Non-fibrous 100 %</td>
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<tr>
<td>200-17A</td>
<td>212022387-21L1</td>
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<td>NAD</td>
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<td>Other Material: Non-fibrous 100 %</td>
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<td>200-17B</td>
<td>212022387-21L2</td>
<td>No</td>
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<td>Other Material: Non-fibrous 100 %</td>
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See Reporting notes on last page
### PLM Bulk Asbestos Report

**200 High St. - Electric House**

<table>
<thead>
<tr>
<th>Client No. / HGA</th>
<th>Lab No.</th>
<th>Asbestos Present</th>
<th>Total % Asbestos</th>
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<tbody>
<tr>
<td>200-18A 18</td>
<td>212022387-22</td>
<td><strong>No</strong></td>
<td>NAD (by CVES)</td>
</tr>
<tr>
<td><strong>Location:</strong></td>
<td><strong>Toilet Rm.,</strong></td>
<td></td>
<td><strong>by David W. Roderick</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Green Ceramic Floor Tile</strong></td>
<td></td>
<td><strong>on 02/14/12</strong></td>
</tr>
</tbody>
</table>

**Analyst Description:** Green, Homogeneous, Non-Fibrous, Bulk Material

**Asbestos Types:**
- Non-fibrous 100%

| 200-18B 18       | 212022387-23   | **No**          | NAD               |
| **Location:**    | **Toilet Rm.,**|                 | **by David W. Roderick** |
|                  | **Green Ceramic Floor Tile** |               | **on 02/14/12** |

**Analyst Description:** Green, Homogeneous, Non-Fibrous, Bulk Material

**Asbestos Types:**
- Non-fibrous 100%

| 200-19A 19       | 212022387-24   | **No**          | NAD               |
| **Location:**    | **Toilet Rm.,**|                 | **by David W. Roderick** |
|                  | **Green Ceramic Floor Tile Mastic** |               | **on 02/14/12** |

**Analyst Description:** Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material

**Asbestos Types:**
- Non-fibrous 100%

| 200-19B 19       | 212022387-25   | **No**          | NAD               |
| **Location:**    | **Toilet Rm.,**|                 | **by David W. Roderick** |
|                  | **Green Ceramic Floor Tile Mastic** |               | **on 02/14/12** |

**Analyst Description:** Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material

**Asbestos Types:**
- Non-fibrous 100%

---

**Reporting Notes:**

- Analyzed by: David W. Roderick
- Reporting by: David W. Roderick

*Note:* PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-fibrous organically bound materials. NAD or Trace results by PLM are inconclusive. TEM is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94). National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab. This PLM report relates ONLY to the items tested. AIHA Lab # 102843, RI Cert#AAL-064, CT Cert#PH-0185, Mass Cert#MA000054.

Reviewed By: ________________________________

END OF REPORT__________________
# Asbestos Bulk Sample Form

**Client Name:** Wesleyan University  
**Date:** 2/9/12

### Wesleyan Inspector: Ricky Howard

<table>
<thead>
<tr>
<th>Accreditation No.</th>
<th>208</th>
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<tbody>
<tr>
<td>Survey Date:</td>
<td>2/9/2012</td>
</tr>
<tr>
<td>Signature:</td>
<td>Ricky Howard</td>
</tr>
<tr>
<td>Requested turnaround time (circle)</td>
<td>48 hrs. 3 days 7 days 10 days</td>
</tr>
<tr>
<td>Requested Completion Date:</td>
<td></td>
</tr>
<tr>
<td>Laboratory Name:</td>
<td>AmeriSci, NY</td>
</tr>
<tr>
<td>Building:</td>
<td>ELECTRIC HOUSE</td>
</tr>
<tr>
<td>Address:</td>
<td>200 HIGH ST.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material Description / Location</th>
<th>Type</th>
<th>Estimated Amt.</th>
<th>Friable</th>
<th>Condition</th>
<th>Possible Reason for Damage</th>
<th>Damage Potential</th>
<th>Sample of (homogeneous mats)</th>
<th>Field Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIP WALL MASTIC</td>
<td>M</td>
<td>75</td>
<td>Z</td>
<td>V (RENO)</td>
<td>PSD</td>
<td>1/1</td>
<td>200-1A</td>
<td></td>
</tr>
<tr>
<td>GUTE RM (1)</td>
<td>M</td>
<td>75</td>
<td>Z</td>
<td>Z</td>
<td>PSD</td>
<td>1/1</td>
<td>200-2A</td>
<td></td>
</tr>
<tr>
<td>GUTE RM (2)</td>
<td>M</td>
<td>75</td>
<td>Z</td>
<td>Z</td>
<td>PSD</td>
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<tr>
<td>ROOF FLASHING</td>
<td>M</td>
<td>75</td>
<td>Z</td>
<td>Z</td>
<td>PSD</td>
<td>1/1</td>
<td>200-4A</td>
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<tr>
<td>Roof Insulation Board (4)</td>
<td>M</td>
<td>75</td>
<td>Z</td>
<td>Z</td>
<td>PSD</td>
<td>1/1</td>
<td>200-5A</td>
<td></td>
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<tr>
<td>ROOF FIELD (5)</td>
<td>M</td>
<td>75</td>
<td>Z</td>
<td>Z</td>
<td>PSD</td>
<td>1/1</td>
<td>200-6A</td>
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</tr>
<tr>
<td>ROOF FIELD (5)</td>
<td>M</td>
<td>75</td>
<td>Z</td>
<td>Z</td>
<td>PSD</td>
<td>1/1</td>
<td>200-7A</td>
<td></td>
</tr>
</tbody>
</table>

**Comments (inaccessible areas, etc.):**

---

**Notes:**

- **Physical (vig dirg-dng-no drog)**
- **Proximity (+/- 1-5 ft. = V)**
- **Ventilation (yes-no; f yes, type)**
- **Deterioration (heavy-moderate-light-none)**
- **Vibrational (gym-musico-m-auditorium-mechanical-no-embryo-on)**
- **Fireability (yes-no; hard-mod-soft surface)**
- **Barriers (rim attic-enclosed-encapsulated)**
- **Texture (rough-filled-mod-slick)**

**Relinquished By/Date:** Ricky Howard 2/9/2012  
**Received By/Date:** [Signature] 1/11/12 08:37

---

C:/Users/rhoward/Documents/Ricky HR Forms/Wesleyan Asbestos Bulk Sample Form.doc
<table>
<thead>
<tr>
<th>Room</th>
<th>Material Description / Location</th>
<th>Type</th>
<th>Estimated Amt.</th>
<th>Friable yes/no</th>
<th>Condition (SD D ND)</th>
<th>Possible Reason for Damage</th>
<th>Damage Potential (NPD PD PSD)</th>
<th>Sample of (homogeneous mats)</th>
<th>Field Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAIN ROOF OVER</td>
<td>ROOF FIELD (3)</td>
<td>M</td>
<td>675</td>
<td>Z</td>
<td>D</td>
<td>REN0/ WATER</td>
<td>PSD</td>
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<td>200-8A</td>
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<tr>
<td>GATE RM</td>
<td>ROOF INSULATION BOARD (4)</td>
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<td>675</td>
<td>Z</td>
<td>D</td>
<td>PSD</td>
<td>PSD</td>
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<tr>
<td>Showmr RM 2nd Fl</td>
<td>Gray Floor Ceramic Tile</td>
<td>M</td>
<td>360</td>
<td>Z</td>
<td>D</td>
<td>PSD</td>
<td>1/2</td>
<td>2/2</td>
<td>200-10A, 10B</td>
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<tr>
<td></td>
<td>Gray Floor Ceramic Tile Mastic</td>
<td>M</td>
<td>360</td>
<td>Z</td>
<td>D</td>
<td>PSD</td>
<td>1/2</td>
<td>2/2</td>
<td>200-11A, 11B</td>
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<td></td>
<td>White Wall Tiles</td>
<td>M</td>
<td>300</td>
<td>Z</td>
<td>NO</td>
<td>PSD</td>
<td>1/2</td>
<td>3/2</td>
<td>200-12A, 12B</td>
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<tr>
<td></td>
<td>White Wall Tile Mastic (Gray)</td>
<td>M</td>
<td>300</td>
<td>Z</td>
<td>NO</td>
<td>PSD</td>
<td>1/2</td>
<td>3/2</td>
<td>200-13A, 13B</td>
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<td></td>
<td>Gray Wall Tile</td>
<td>M</td>
<td>100</td>
<td>Z</td>
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<tr>
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<td>PSD</td>
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<tr>
<td>Toilet RM</td>
<td>White Subway Ceramic Tile</td>
<td>M</td>
<td>300</td>
<td>Z</td>
<td>NO</td>
<td>PSD</td>
<td>1/2</td>
<td>3/2</td>
<td>200-16A</td>
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<tr>
<td></td>
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<td>Z</td>
<td>NO</td>
<td>PSD</td>
<td>1/2</td>
<td>3/2</td>
<td>200-17A</td>
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</table>

Comments (inaccessible areas, etc.):
<table>
<thead>
<tr>
<th>Room</th>
<th>Material/Description</th>
<th>Type of Material</th>
<th>Location</th>
<th>Estimated Material Amt.</th>
<th>Friable</th>
<th>Condition (SD/ND)</th>
<th>Color</th>
<th>Possible Reason for Damage</th>
<th>Damage Potential (FDP, P, PSO)</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>200-18A</td>
<td>Green Ceramic Floor</td>
<td>l</td>
<td>The Wash</td>
<td>300</td>
<td>V</td>
<td>Y</td>
<td>2</td>
<td>2</td>
<td>P</td>
<td>3/25/2012</td>
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<tr>
<td>200-18B</td>
<td>Green Ceramic Floor</td>
<td>l</td>
<td>The Wash</td>
<td>300</td>
<td>V</td>
<td>Y</td>
<td>2</td>
<td>2</td>
<td>P</td>
<td>3/25/2012</td>
</tr>
</tbody>
</table>

Notes:
- Friable: (1) yes, (0) no.
- Color: (1) yes, (0) no.
- Accessibility: (1) yes, (0) no.
- Damage Potential: (FDP) (1) very, (0) little; (P) (1) moderate, (0) slight; (PSO) (1) severe, (0) minimal.
The Garland Company, Inc.
Low Slope Roofing Wind Uplift Calculations
3800 East 91st Street
Cleveland, Ohio 44105-2197
Phone: (800) 321-9336  Fax (216) 883-2046

Project: Wesleyan University
Roof: Upper
Sales Rep.: Gordon Rossi
County / Parish: Middlesex, CT

Zone 1 psf 21.9
(mid roof)

Zone 2 psf 36.8
(eaves, ridge, hip)

Zone 3 psf 55.4
(corner)

Edge Zone Width "a" 3 ft. 9 in.

Fastener Safety Factor 4.00
Importance II
Importance Factor 1
Wind Speed (mph) 106
Ultimate Pullout Value 99
Exposure Category B
Design Roof Height 40.00
Minimum Building Width 37.00
Roof Pitch (X, Y) 1.05 : 12
Snow Load (psf) 30

System Type: Modified Bitumen
System Type: 2 Ply Modified Bitumen Cold

Surfacing: Mineral Surface Attachment Method: Nail Base Sheet
Zone 1 _9_ o.c. through _4_ lap, two equally spaced rows of _9_ o.c.
(mid roof)
Zone 2 _9_ o.c. through (eaves, ridge, _4_ lap, two equally spaced rows of _9_ o.c.
Zone 3 _9_ o.c. through _4_ lap, four equally spaced rows of _9_ o.c.

NOTES:

*Unless specifically stated otherwise, these calculations are based on ASCE 7-05 (American Society for Civil Engineers); if a specific building code is required, please specify.

*It is recommended to include the "Negative Uplift Pressures" in the specifications as well as the Safety Factor, Importance Factor, Building Category, Wind Speed, Ultimate Pullout Value, and Exposure.

*The Wind Speed is determined based upon geographical location.

*The Exposure and Importance Factors are needed to determine the uplift pressures.

If you have any questions, please call 800-321-9336 or respond to engineering@garlandind.com

3800 East 91st Street, Cleveland, Ohio 44105-2197  Phone: (800) 321-9336
## System & Attachment Data

<table>
<thead>
<tr>
<th>SYSTEM TYPE</th>
<th>Modified Bitumen</th>
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<tbody>
<tr>
<td>SYSTEM SCOPE</td>
<td>2 Ply Modified Bitumen Cold</td>
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<tr>
<td>SURFACING</td>
<td>Mineral Surface</td>
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<tr>
<td>ATTACHMENT METHOD</td>
<td>Nail Base Sheet</td>
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<tr>
<td>SUBSTRATE MATERIAL</td>
<td>Wood</td>
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<tr>
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<td>ULTIMATE FASTENER PULLOUT</td>
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<td>ALLOWABLE FASTENER PULLOUT</td>
<td>25 lbs/clip</td>
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## Building & Site Data

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<td>TOPOGRAPHY FACTOR</td>
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<td>BUILDING TYPE</td>
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<td>ROOF PITCH (X, Y)</td>
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<td>RUN TO RIDGE</td>
<td>18.5</td>
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<td>DESIGN ROOF HEIGHT</td>
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<td>IMPORTANCE CLASS / FACTOR</td>
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<td>MIN. BLDG WIDTH</td>
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<td>WIND-BORNE DEBRIS REGION</td>
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<td>PARAPET</td>
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<td>ROOF ANGLE</td>
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<td>PROTECTED OPENINGS</td>
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<td>ROOF TYPE</td>
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### Wind Pressure

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<th>ZONE 2</th>
<th>ZONE 3</th>
<th>ZONE 4</th>
<th>ZONE 5</th>
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<td>21.9</td>
<td>36.8</td>
<td>55.4</td>
<td>21.8</td>
<td>26.8</td>
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<td>31.61</td>
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<td>52.07</td>
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<tr>
<td>3.70 ft</td>
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</table>
HPR MINERAL SURFACE
MODIFIED MEMBRANE

MODIFIED COLD
ADHESIVE

BASE PLY

WOOD DECK

INSULATION
STAGGER ALL JOINTS
FASTEN ACCORDING TO SPECIFICATION

RECOVERY BOARD

TYPE II BASESHEET

ALL PLIES SET IN MODIFIED COLD ADHESIVE
SEE SPECIFICATION FOR SURFACING

THE GARLAND COMPANY, INC.
GARLAND CANADA, INC.
THE GARLAND COMPANY UK, LTD

MINERAL FINISH
COLD APPLIED

© 2006 Garland Industries, Inc.
PERIMETER EDGE FLASHING

HPR MODIFIED MEMBRANE FLASHING PLY 9" MIN [228mm] ON FIELD

BASE FLASHING PLY 6" MIN. [152mm] ON FIELD

TERMINATION BAR FASTENED 8" O.C. [203mm] THROUGH BUTYL TAPE

METAL EDGE PRIME

CONTINUOUS CLEAT FASTENED 8" O.C. [152mm]

HPR MODIFIED MEMBRANE FLASHING PLY 9" MIN [228mm] ON FIELD

BASE FLASHING PLY 6" MIN. [152mm] ON FIELD

HPR MODIFIED MEMBRANE

BASE PLY

INSULATION STAGGER ALL JOINTS, FASTEN PER SPECIFICATION

WOOD DECK

CANT STRIP

ALL PLYES SET IN MODIFIED COLD ADHESIVE SEE SPECIFICATIONS FOR SURFACING

TYPE II BASESHEET (NAILED)

THE GARLAND COMPANY, INC.
GARLAND CANADA, INC.
THE GARLAND COMPANY UK, LTD

2 PLY-COLD APPLIED

© 2006 Garland Industries, Inc.
POLYURETHANE SEALANT

HPR MODIFIED MEMBRANE FLASHING PLY
9" MIN [228mm] ON FIELD

BASE FLASHING PLY 6" MIN.
[152mm] ON FIELD

HPR MODIFIED MEMBRANE

BASE PLY

INSULATION STAGGER
ALL JOINTS, FASTEN
PER SPECIFICATION

WOOD DECK

METAL EDGE SET IN ROOF CEMENT
NAILED 3" O.C. [76mm] STAGGERED
PRIME METAL FLANGE PRIOR TO STRIPPING

EXTEND ONE PLY OVER BLOCKING
FASTEN 8" O.C. [203mm]

CONTINUOUS CLEAT FASTENED
6" O.C. [152mm]

ALL PLIES SET IN MODIFIED COLD
ADHESIVE SEE SPECIFICATIONS FOR SURFACING
ASSEMBLY:

1. Mask target area on roof membrane with tape
2. Clean all non-porous areas with isopropyl alcohol
3. Apply 32 wet mil base coat of Tuff-Flash over masked area
4. Embed grip polyester firm into base coat of Tuff-Flash
5. Apply 46–64 wet mil top coat of Tuff-Flash over fabric extending 2" past the scrim in all directions
6. Apply minerals immediately or allow Tuff-Flash to cure 15–30 days and then install reflective coating

NOTES:

A. Use this detail in conjunction with the Tuff-Flash reinforcement layout drawing.
B. Embed all pre-cut fabric into a 32 wet mil base coat of Tuff-Flash.
C. Ensure total target area of flashing is no less than 16"x 16".
D. Remove masking immediately after application of top coat.
E. Refer to Tuff-Flash application instructions for general guidelines regarding the Tuff-Flash system.
16 oz. copper sleeve with cap and protective screen

PLUMBING VENT STACK

POLYURETHANE SEALANT

HPR MODIFIED MEMBRANE FLASHING PLY 12" MIN. [305mm] ON FIELD

BASE FLASHING PLY 8" MIN. [203mm] ON FIELD

BASE PLY

HPR MODIFIED MEMBRANE

WOOD DECK with basesheet

SET LEAD FLANGE IN MASTIC, PRIME FLANGE BEFORE STRIPPING

INSULATION, STAGGER ALL JOINTS, FASTEN PER SPECIFICATION

ALL PLIES SET IN MODIFIED COLD ADHESIVE SEE SPECIFICATIONS FOR SURFACING
LEAD FLASHING 30" SQ. MIN. [762] SET IN MASTIC, WRAPPED DOWN 2" MIN. [51mm], PRIME TOP SURFACE BEFORE FLASHING

HPR MODIFIED MEMBRANE MIN. 48" [1219mm]

STRAINER

CLAMPING RING

BASE FLASHING PLY 40" [1016mm]

BASE PLY

HPR MODIFIED MEMBRANE

WOOD DECK with basesheet

DECK CLAMP

TAPER INSULATION 24" MIN. [610mm] FROM CENTER OF DRAIN, STAGGER ALL JOINTS, FASTEN PER SPECIFICATION

ALL PLIES SET IN MODIFIED COLD ADHESIVE
SEE SPECIFICATIONS FOR SURFACING

THE GARLAND COMPANY, INC.
GARLAND CANADA, INC.
THE GARLAND COMPANY UK, LTD

DETAILED:
ROOF DRAIN

2 PLY-COLD APPLIED

© 2006 Garland Industries, Inc.
CONTINUOUS THROUGH WALL FLASHING
COUNTERFLASHING ANCHORED 8" O.C. [203mm]
POLYURETHANE SEALANT
TERMINATION BAR FASTENED 8" O.C. [203mm] THROUGH BUTYL TAPE
HPR MODIFIED MEMBRANE FLASHING PLY 9" MIN [228mm] ON FIELD
BASE FLASHING PLY 6" MIN. [152mm] ON FIELD
HPR MODIFIED MEMBRANE
BASE PLY
INSULATION STAGGER ALL JOINTS, FASTEN PER SPECIFICATION
WOOD DECK
CANT STRIP

ALL PLIES SET IN MODIFIED COLD ADHESIVE
SEE SPECIFICATIONS FOR SURFACING

THE GARLAND COMPANY, INC.
GARLAND CANADA, INC.
THE GARLAND COMPANY UK, LTD

THROUGH WALL COUNTERFLASHING
2-PLY ICOLD APPLIED

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PRODUCT DESCRIPTION

Tuff-Flash is a multi-purpose, asphaltic polyurethane-based, low odor, liquid flashing membrane designed to create a watertight flashing on tough roofing details that are difficult to seal with a typical modified membrane. Tuff-Flash combined with Grip Polyester® Firm creates a watertight liquid flashing membrane that adheres to asphaltic membranes as well as a variety of metal surfaces.

PERFORMANCE ADVANTAGES

Low-Odor Application - Due to its asphaltic polyurethane chemistry, Tuff-Flash is a low-odor product, minimizing odor concerns in VOC sensitive areas like hospitals, schools, and food production plants.

Extended Life For Tough Details - Tuff-Flash is a very versatile liquid flashing mastic that allows tough flashing details to be watertight where a modified membrane, or pitch pocket would have trouble sealing. It can be used on SBS, APP, and smooth or mineral surfaced asphalt roofs as well as many types of metals (metal surfaces require different types of preparation depending on the type of metal).

Environmentally Safe - Tuff-Flash uses very little solvent which gives it VOC approval. When the Tuff-Flash cures, it initially looks like hot-applied rubberized asphalt. However, there is no need for a torch or hot kettle.

User Friendly/Saves Money - Tuff-Flash can be applied with a brush or trowel, making it easy for in-house maintenance use.

Cures Quickly - Tuff-Flash’s polyurethane chemistry undergoes a chemical curing reaction that builds strength over time unlike other solvent-based rubberized coatings that simply form films as the solvent flashes off. Tuff-Flash can be used for smooth roofs and a reflective coating can be applied within 15-30 days, compared to up to six months with standard emulsions and solvent-based coatings (considering normal weather conditions, i.e., typical 77°F (25°C)).

APPLICATION

Ensure that wet conditions do not exist. An infrared scan is highly recommended. Remove all wet insulation, dirt and debris from the existing roof to ensure proper adhesion. Perform an adhesion test on the surface to determine if a primer is necessary.

For Repair Material

Apply Tuff-Flash at a rate of approximately 1 gal. per 7 ft. at 8 in. wide x 1/4 in. over the affected area with GarMesh®, The Tuff-Flash must completely cover the GarMesh not allowing the reinforcement to be exposed. If granules are to be incorporated, apply them subsequent to the Tuff-Flash application. Care shall be exerted not to spread minerals over surfaces prior to product application. If granules are not being used, Tuff-Flash must be coated with either an aluminizer or white coating at least 15-30 days after application.

For Liquid Flashing Detail

Apply Tuff-Flash at a rate of approximately 5-6 gal. per 100 sq. ft. (2.0-2.4 l/m²) with Grip Polyester Firm embedded within the Tuff-Flash over the entire roof surface. Please refer to the application guide for coverage rates and specific application steps. If granules are to be incorporated, apply them subsequent to the Tuff-Flash application. Care shall be exerted not to spread minerals over surfaces prior to product application. If granules are not being used, Tuff-Flash must be coated with either an aluminizer or white coating at 15-30 days after application.

- Do not apply over wet surfaces
- Please read product label and MSDS
- Material should be kept indoors while not in use
- Do not keep on the roof overnight
Tuff-Flash

<table>
<thead>
<tr>
<th>Technical Data</th>
<th>Tuff-Flash</th>
<th>Eco-Facts</th>
<th>Tuff-Flash</th>
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<tbody>
<tr>
<td>Non Volatile (ASTM C 1250)</td>
<td>95%</td>
<td>VOC</td>
<td>0 g/l</td>
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<tr>
<td>Tensile Strength</td>
<td>400 psi</td>
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<tr>
<td>Density</td>
<td>8.5 lbs./gal.</td>
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<td>Viscosity @ 77°F (25°C) (ASTM D 2196-86)</td>
<td>600,000-1,500,000 cP</td>
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<tr>
<td>Flash Point (ASTM D 93)</td>
<td>Minimum 300°F (149°C)</td>
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<tr>
<td>Elongation @ 77°F (25°C) (ASTM D 412)</td>
<td>Typical 300%</td>
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<tr>
<td>Water Absorption</td>
<td>&lt;0.7%</td>
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<tr>
<td>Compound Stability</td>
<td>Passes at 220°F (104.4°C)</td>
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<tr>
<td>Flexibility (ASTM D 816-82)</td>
<td>Pass at -40°F (-40°C)</td>
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<tr>
<td>Packaging</td>
<td>3 gallon (11.3 l) pail</td>
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For specific recommendations and coverage rates, please contact your local Garland Representative or Garland Technical Service Department.

Tests verified by independent laboratories. Actual roof performance specifications will vary depending on test speed and temperature. Data reflects samples randomly collected. A ± 10% variation may be experienced. The above data supersedes all previously published information. Consult your local Garland Representative or Garland Corporate Office for more information.

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