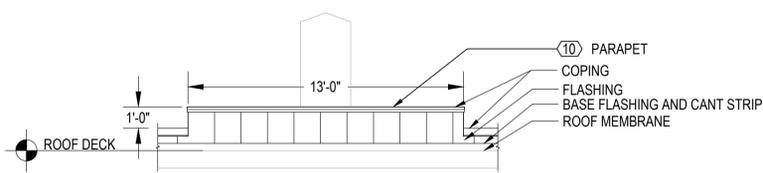
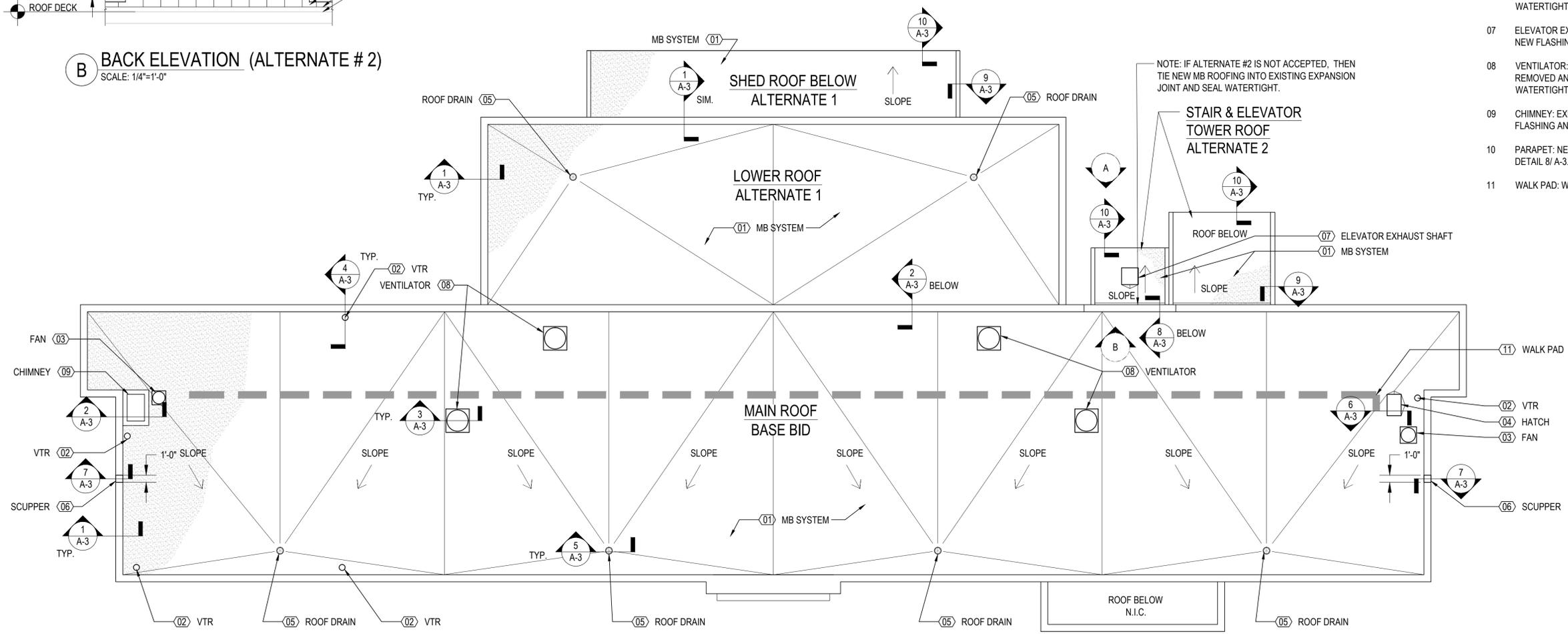


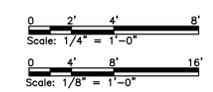
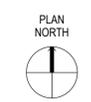
**A FRONT ELEVATION (ALTERNATE # 2)**  
SCALE: 1/4"=1'-0"



**B BACK ELEVATION (ALTERNATE # 2)**  
SCALE: 1/4"=1'-0"



**ROOF PLAN**  
SCALE: 1/8"=1'-0"



**GENERAL NOTES:**

1. ALL DIMENSIONS AND ROOF PENETRATIONS TO BE VERIFIED IN FIELD.
2. PROVIDE TAPERED INSULATION TO ACHIEVE 1/4" PER FOOT MINIMUM SLOPE.
3. TAPERED INSULATION SHALL ACHIEVE AN AVERAGE R-VALUE OF 25 MIN.

**KEYNOTES:**

- 01 MODIFIED BITUMEN MEMBRANE SYSTEM: REFER TO SPECIFICATION 07 52 00.
- 02 VTR: EXISTING VENT THRU ROOF TO REMAIN. PROVIDE NEW FLASHING AND COUNTER FLASHING.
- 03 FAN: EXISTING TO REMAIN. PROVIDE NEW FLASHING AND COUNTER FLASHING.
- 04 HATCH: EXISTING HATCH TO BE REMOVED AND REPLACED WITH NEW ALUMINUM INSULATED BILCO MODEL S-50T OR EQUAL. ROOF HATCH 30"X36"; SEE DETAIL 6/A3.
- 05 ROOF DRAIN: EXISTING ROOF DRAINS TO BE REPLACED, LOCATION TO BE VERIFIED IN FIELD. INSULATION TO BE TAPERED/SLOPED AS NEEDED TO ACCOMMODATE PROPER DRAINAGE. SEE DETAIL 5/A-3.
- 06 SCUPPER: SAW CUT MASONRY PARAPET DOWN TO TOP OF ROOF MEMBRANE; VERIFY HEIGHT IN FIELD. PROVIDE METAL LINED EMERGENCY OVERFLOW SCUPPER; SEAL ALL JOINTS WATERTIGHT. SEE DETAIL 7/A-3.
- 07 ELEVATOR EXHAUST SHAFT: EXISTING TO REMAIN. PROVIDE NEW FLASHING AND COUNTER FLASHING.
- 08 VENTILATOR: EXISTING TURBINE VENTILATOR TO BE REMOVED AND RE-INSTALLED ON NEW CURBS SEAL WATERTIGHT.
- 09 CHIMNEY: EXISTING CHIMNEY TO REMAIN. PROVIDE NEW FLASHING AND COUNTER FLASHING.
- 10 PARAPET: NEW PARAPET TO BE BUILT UP ON EXISTING; SEE DETAIL 8/A-3. ALTERNATE # 2
- 11 WALK PAD: WALK PAD PER SPECIFICATION 07 52 00.

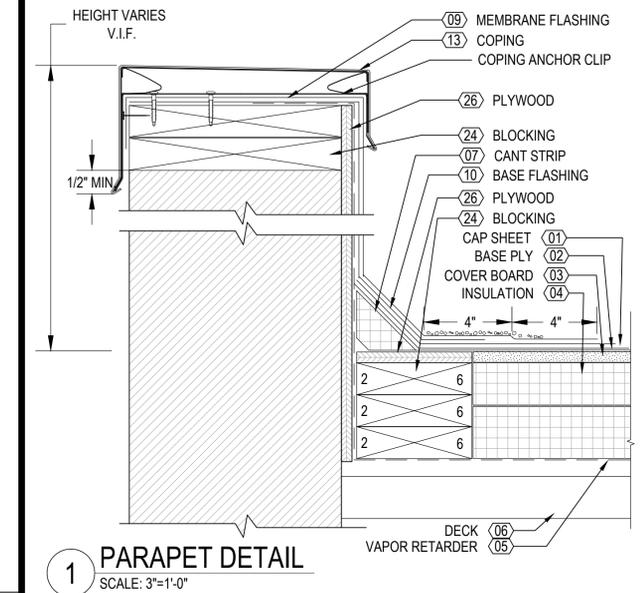
NOTE: IF ALTERNATE #2 IS NOT ACCEPTED, THEN TIE NEW MB ROOFING INTO EXISTING EXPANSION JOINT AND SEAL WATERTIGHT.

MARK	DATE	DESCRIPTION
A	07/30/14	ISSUED FOR BID

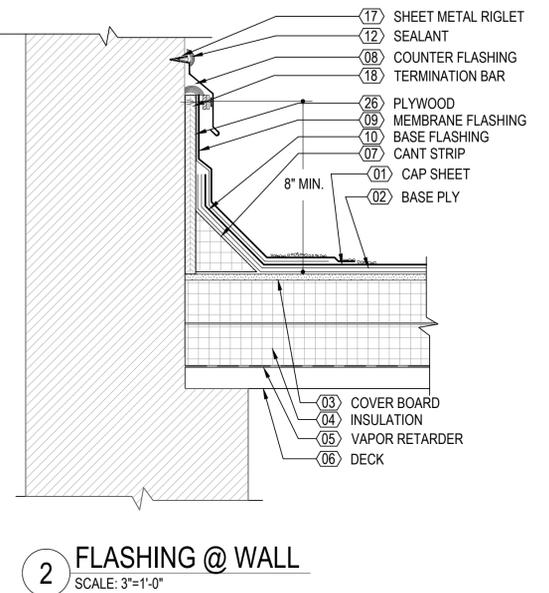
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MODEL FILE: A-2.dwg  
DRAWN BY: LSP  
CHKD BY: POB  
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SHEET TITLE  
**ROOF PLAN & DETAILS**

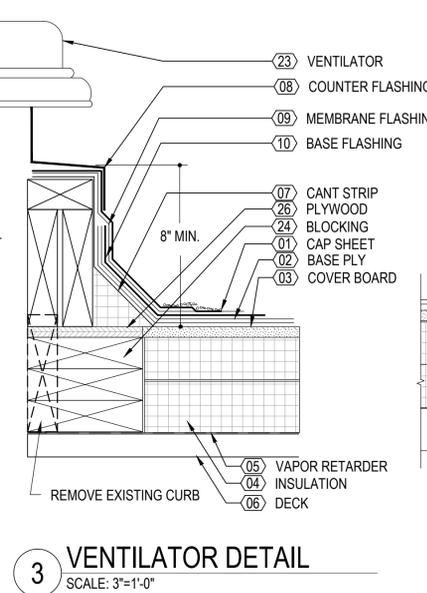
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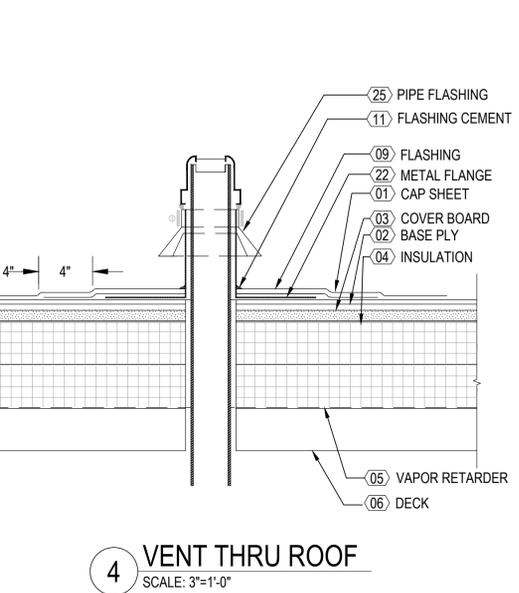
**1 PARAPET DETAIL**  
SCALE: 3"=1'-0"



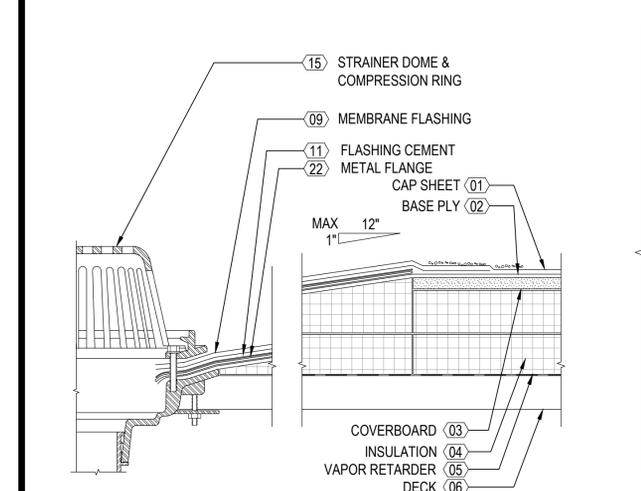
**2 FLASHING @ WALL**  
SCALE: 3"=1'-0"



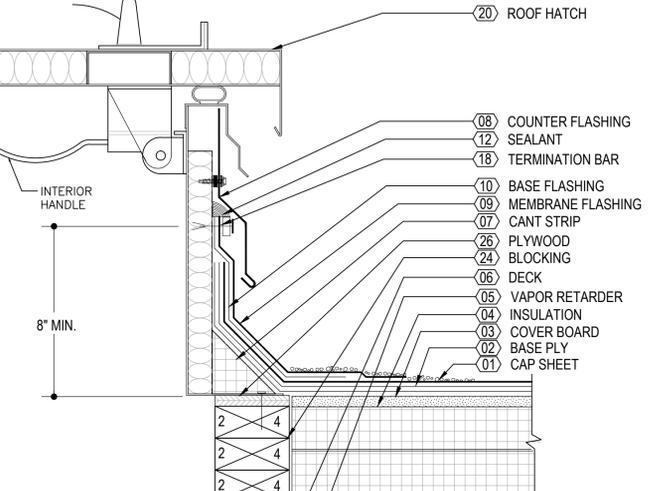
**3 VENTILATOR DETAIL**  
SCALE: 3"=1'-0"



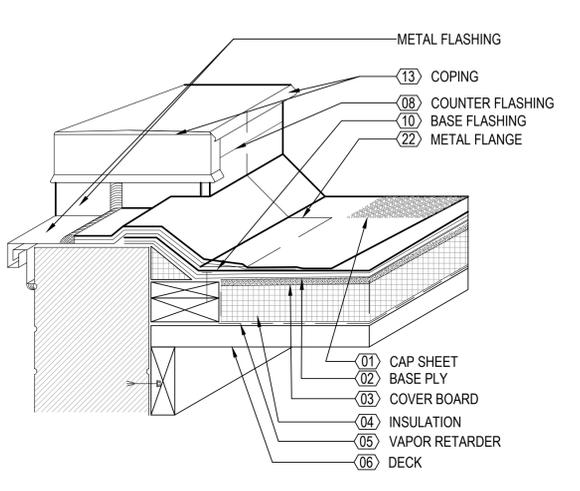
**4 VENT THRU ROOF**  
SCALE: 3"=1'-0"



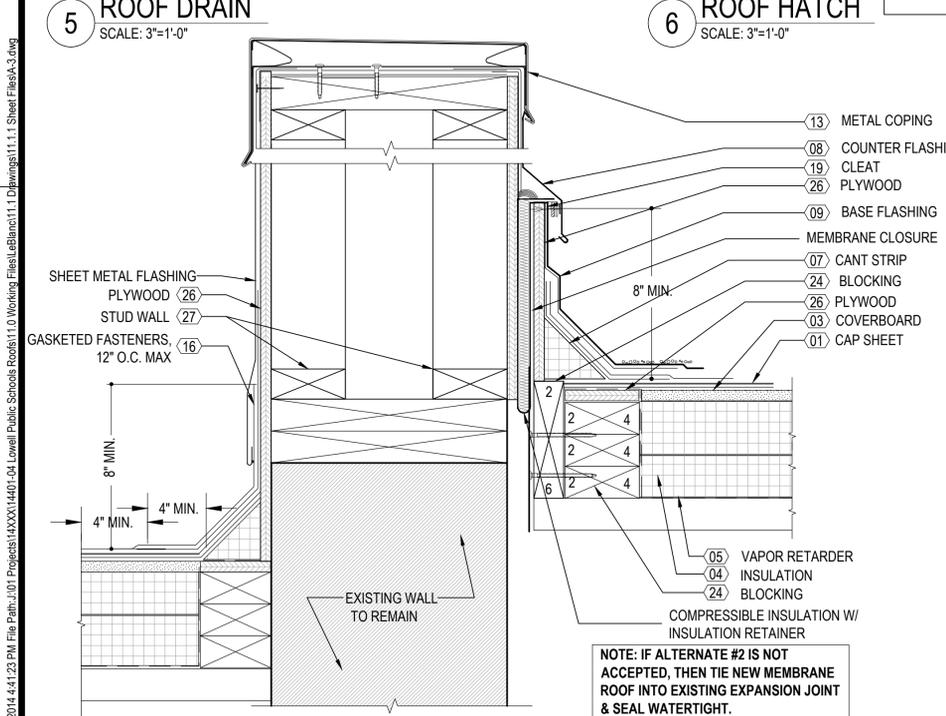
**5 ROOF DRAIN**  
SCALE: 3"=1'-0"



**6 ROOF HATCH**  
SCALE: 3"=1'-0"

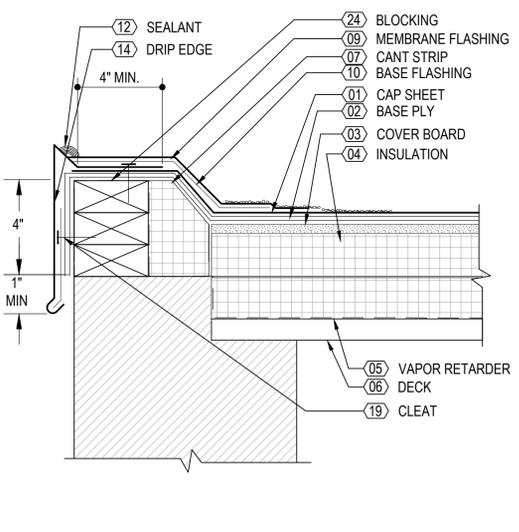


**7 OVERFLOW SCUPPER**  
SCALE: 1 1/2"=1'-0"

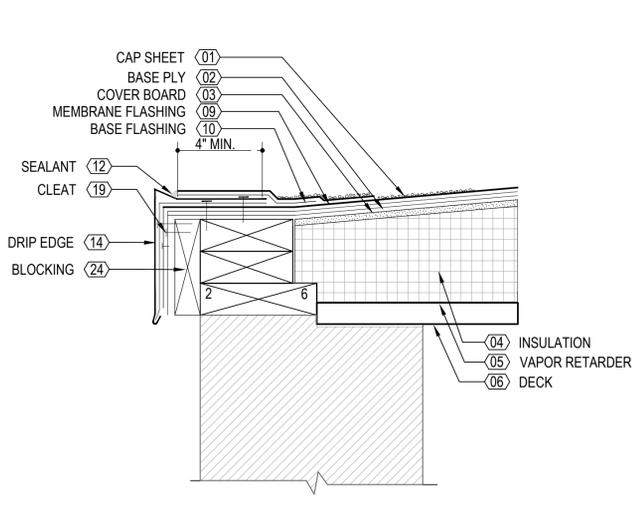


**8 PARAPET (ALTERNATE #2)**  
SCALE: 3"=1'-0"

NOTE: IF ALTERNATE #2 IS NOT ACCEPTED, THEN TIE NEW MEMBRANE ROOF INTO EXISTING EXPANSION JOINT & SEAL WATERTIGHT.



**9 CURB DETAIL**  
SCALE: 3"=1'-0"



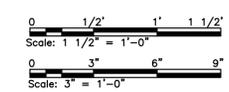
**10 DRIP EDGE**  
SCALE: 3"=1'-0"

**GENERAL NOTES:**

- ALL DIMENSIONS AND ROOF PENETRATIONS TO BE VERIFIED IN FIELD.
- BASE PLY: REFER TO SPECIFICATION 07 52 00.
- COVER BOARD: 1/2" GYPSUM ROOF COVER BOARD MECHANICALLY FASTENED TO DECK.
- INSULATION: 2 LAYERS, POLYISOCYANURATE TAPERED INSULATION BOARD WITH STAGGERED JOINTS. 4 1/2" TOTAL AVERAGE THICKNESS; REFER TO SPECIFICATION 07 52 00. AVERAGE R-VALUE SHALL BE R-25 MIN.
- VAPOR RETARDER: 6 MIL PLASTIC SHEET VAPOR RETARDER PLACED ON ASSEMBLY WARM SIDE. REFER TO SPECIFICATION 07 52 00.
- DECK: EXISTING WOOD DECK TO REMAIN, REPAIRED AS NEEDED.
- CANT STRIP: NOMINAL 4" HIGH FIBERBOARD, REFER TO SPECIFICATION 07 52 00.
- COUNTER FLASHING: METAL COUNTERFLASHING.
- MEMBRANE FLASHING: PER SPECIFICATION 07 52 00.
- BASE FLASHING: REFER TO SPECIFICATION 07 52 00.
- FLASHING CEMENT: REFER TO SPECIFICATION 07 52 00.
- SEALANT: RUBBER ASPHALT SEALANT; SILICONE OR POLYURETHANE.
- METAL COPING: PRE-FINISHED ALUMINUM COPING ATTACHED WITH METAL CLEATS.
- DRIP EDGE: PRE-FABRICATED ALUMINUM DRIP EDGE; SEE SPECIFICATION 07 60 00.
- STRAINER DOME: CAST IRON STRAINER DOME, SIZED TO MATCH EXISTING PIPING. WATTS MODEL RD-280 OR EQUAL.
- GASKETED FASTENER: STAINLESS STEEL SCREW WITH NEOPRENE WASHER.
- SHEET METAL RIGLET: INSTALL IN SAWCUT JOINT IN MASONRY; SEE SPECIFICATION 07 60 00.
- TERMINATION BAR: ALUMINUM OR STAINLESS STEEL WITH STAINLESS STEEL FASTENERS.
- CLEAT: CONTINUOUS METAL CLEAT.
- ROOF HATCH: NEW ALUMINUM INSULATED BILCO MODEL S-50T OR EQUAL ROOF HATCH 30"x36".
- NOT USED.
- METAL FLANGE: METAL FLANGE IN ROOFING CEMENT; SEE SPECIFICATION 07 60 00.
- VENTILATOR: EXISTING TURBINE VENTILATOR TO BE REMOVED AND RE-INSTALLED ON NEW CURB.
- BLOCKING: PRESSURE TREATED WOOD BLOCKING.
- PIPE FLASHING: METAL COUNTER FLASHING COLLAR ATTACHED WITH STAINLESS STEEL BAND AND SEALANT. SEE SPECIFICATION 07 62 00.
- PLYWOOD: 1/2" PRESSURE TREATED EXTERIOR GRADE PLYWOOD.
- STUD WALL: 2X4 PRESSURE TREATED WOOD; BUILT UP PARAPET ON EXISTING ROOF PARAPET (ALTERNATE 2).

XX

**KEYNOTES:**



MARK	DATE	DESCRIPTION
A	07/30/14	ISSUED FOR BID

PROJECT NO: 14401-04
MODEL FILE: A-3.dwg
DRAWN BY: LSP
CHKD BY: POB
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SHEET TITLE  
**ROOF DETAILS**

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SECTION 07 52 00  
MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.1 SYSTEM DESCRIPTION

- A. Two-ply Styrene Butadiene Styrene (SBS) modified bitumen roof membrane system (MB) consisting of modified bitumen base sheet and modified bitumen cap sheet set in cold-applied adhesive with pea stone top coating in a flood coat of adhesive. Provide a complete watertight system including, but not limited to vapor retarder, insulation, cover board, MB membrane, all flashing, cants, blocking, curbs, expansion joints, penetrations, drains, fasteners, adhesives, coating, and all accessories required for a complete system whether specified, shown or not.
- B. All work must follow the National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual guidelines and standards stated within this Section.
- C. The building shall remain occupied during construction. The contractor shall be responsible for any and all safety and scheduling required to accommodate the Owner's continued uninterrupted use of the facility at no additional cost.

1.2 ALTERNATES

- A. Alternate #1:
    1. Provide complete MB roofing system for Lower Roof and Shed Roof as shown on the drawings.
  - B. Alternate #2:
    1. Provide complete MB roofing system for Stair & Elevator Tower Roof as shown on the drawings.
2. Provide parapet at Elevator Tower as shown on the drawings.

1.3 REFERENCES

- A. AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
  1. ASCE 7 (2010) Minimum Design Loads for Buildings and Other Structures
- B. ASTM INTERNATIONAL (ASTM)
  1. ASTM C1289 (2011) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
  2. ASTM D1863/D1863M (2005e1; R 2011) Mineral Aggregate Used on Built-Up Roofs
  3. ASTM D4073 (2006) Standard Test Method for Tensile-Tear Strength of Bituminous Roofing Membranes
  4. ASTM D41/D41M (2011) Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
  5. ASTM D4586 (2007) Asphalt Roof Cement, Asbestos-Free
  6. ASTM D6163 (2000; R 2008) Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements
  7. ASTM D6162 (2011) Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a combination of Polyester and Glass Fiber Reinforcements
  8. ASTM E108 (2011) Fire Tests of Roof Coverings
- C. FM GLOBAL (FM)
  1. FM 4470 (2010) Single-Ply, Polymer-Modified Bitumen Sheet, Built-up Roof (BUR), and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction
  2. FM APP GUIDE (updated on-line) Approval Guide  
<http://www.approvalguide.com/>
- D. NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)
  1. NRCA Details (2003) NRCA Roof Perimeter Flashing Systems Construction Details for Class 1 Roof Construction
  2. The NRCA Roofing and Waterproofing Manual
- E. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)
  1. SMACNA 1793 (2003) Architectural Sheet Metal Manual, 6th Edition
- F. UNDERWRITERS LABORATORIES (UL)
  1. UL 790 (2004; Reprint Oct 2008) Standard Test Methods for Fire Tests of Roof Coverings
- G. Massachusetts State Building Code 780 CMR

1.4 DESIGN REQUIREMENTS

- A. Provide design wind load calculations in accordance with 780 CMR Massachusetts State Building Code and ASCE 7.
- B. Roof Assembly Classification: FM Class 1 Construction, wind uplift requirement of 1-90.
  1. Complete roof covering assembly, including insulation, must be rated Class 1-90 in accordance with FM APP GUIDE and ASTM D4073.
- C. Roof Assembly Fire Classification: Minimum Class A when tested in accordance with ASTM E108 or UL 790.

1.5 SUBMITTALS

- A. Shop Drawings:
  1. Roof plan drawing depicting wind loads and boundaries of enhanced perimeter and corner attachments of roof system components, as applicable. Include plan showing tapered insulation, if any.
  2. Show all details of roof construction including typical manufacturer's details and custom details required specifically for this project.
  3. Design data and calculations for wind load.
- B. Product Data: Submit manufacturer's product data for the following:
  1. Modified Bitumen Sheets
  2. Cold-Applied Membrane Adhesive
  3. Primer
  4. Roof Cement
  5. Pre-Manufactured Accessories
  6. Fasteners and Plates

- 7. Insulation
- 8. Cover Board
- 9. Flashing
- 10. Vapor Retarder
- 11. Roof Coating
- 12. Walkpads
- 13. Cant
- 14. Sample Warranty certificate

- C. Qualification of Applicator: Certify that the applicator meets requirements specified under paragraph entitled "Qualification of Applicator."
- D. Wind Uplift & Fire Resistance Classification: Submit certification from manufacturer that the roof system meets the required assembly wind uplift and fire rating classifications.
- E. Closeout Submittals
  1. Copies of all Manufacturer's Representative's Inspection Reports.
  2. Roof Drain Test Report.
  3. Warranties - specific to this project and executed.
  4. Information Card.
  5. Copies of Material Safety Data Sheets for maintenance/repair materials.
  6. Roofing Maintenance Instructions: Provide a manual of manufacturer's recommendations for maintenance of installed roofing systems.
  7. Demonstration and Training: Provide for instruction of Owner's personnel in the maintenance requirements for completed roofing work.

1.6 QUALITY ASSURANCE

- A. Qualification of Manufacturer: Modified bitumen sheet roofing system manufacturer must have a minimum of 5 years experience in manufacturing modified bitumen roofing products.
- B. Qualification of Applicator: Roofing system applicator must be approved, authorized, or licensed in writing by the modified bitumen sheet roofing system manufacturer and have a minimum of five years experience as an approved, authorized, or licensed applicator with that manufacturer and be approved at a level capable of providing the specified warranty.
- C. Manufacturer's Representative: Manufacturer's Roofing Inspector shall be qualified to provide on-site inspections of the roofing work to ensure that the installation is in conformance with all manufacturer's requirements for the specified warranty.
- D. 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.
- E. Maintain a copy of the Contract Documents in the possession of the Supervisor/Foreman and on the roof at all times.
- F. 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.
- G. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

1.7 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), Architect, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work. Objectives of conference include:
  1. Review special safety precautions for working in an occupied school building.
  2. Review methods and procedures related to roofing work, including set up and mobilization areas for stored material and work area.
  3. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work performed by others.
  4. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
  5. Review roofing system requirements (drawings, specifications and other contract documents).
  6. Review required submittals both completed and yet to be completed.
  7. 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.
  8. Review required inspection, testing, certifying and material usage accounting procedures.
  9. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing.
  10. Record discussions of conference including decisions and agreements (or disagreements) reached and furnish a 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.
  11. Review notification procedures for weather or non-working days.
- C. 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 the Owner and Architect or Engineer of Record. This shall not be construed as interference with the progress of Work on the part of the Owner or Architect or Engineer of Record.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not install roofing system when air temperature is below 40 degrees F, during any form of precipitation, including fog, or when there is ice, frost, moisture, or any other visible dampness on the roof deck. Follow manufacturer's printed instructions for Cold Weather Installation.

1.9 SEQUENCING

- A. Coordinate the work with other trades to ensure that components which are to

- be secured to or stripped into the roofing system are available and that permanent flashing and counter flashing, per NRCA Details, and are installed as the work progresses. Ensure temporary protection measures are in place to preclude moisture intrusion or damage to installed materials.
- B. Application of roofing must immediately follow application of insulation as a continuous operation. Coordinate roofing operations with insulation work so that all roof insulation applied each day is covered with roof membrane installation the same day. Do not phase construction.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Delivery
  1. Deliver materials in manufacturers' original unopened containers and rolls with labels intact and legible. Deliver materials in sufficient quantity to allow work to proceed without interruption.
- B. Storage
  1. Store material in area designated by the Owner. Contractor shall be responsible for the security of the stored materials.
  2. 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 rolled goods with a canvas tarpaulin or other breathable material (not polyethylene).
  3. 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.
  4. 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.
  5. Store all roofing adhesive in a heated area keeping the product above 50 degrees F min.
- C. Handling
  1. Prevent damage to edges and ends of roll materials. Do not install damaged materials in the work. Select and operate material handling equipment to prevent damage to materials or applied roofing.

1.11 WARRANTY

- A. Provide manufacturer's 20 year warranty to include coverage for the roof and building resulting from failure to resist penetration of water. Also covered: evidence of moisture intrusion within the assembly, blisters, splits, tears, delaminations, separations at the seams, or evidence of excessive weathering due to defective materials or installation workmanship. Items covered shall include all flashing, insulation, and accessories necessary for a watertight roof system construction.
- B. Provide installer's two year warranty that the roof system, as installed, is free from defects in installation workmanship, to include the roof membrane, flashing, insulation, accessories, attachments, and sheet metal installation integral to a complete watertight roof system assembly. Correction of defective workmanship and replacement of damaged or affected materials are the responsibility of the Contractor. All costs associated with the repair or replacement work are the responsibility of the Contractor.

PART 2 PRODUCTS

2.1 MODIFIED BITUMEN SHEET MATERIALS

- A. Modified bitumen sheets must be watertight and visually free of pinholes, particles of foreign matter, non-dispersed raw material, factory splices, or other conditions that might affect serviceability. Polymer modifier must be uniformly dispersed throughout the sheet. Edges of sheet must be straight and flat.
- B. Provide a combination of specified materials that comprise the modified bitumen manufacturer's standard system of the number and type of plies specified.
  1. Overall System thickness: 225 mils minimum not including pea stone coating.
- C. SBS Base Sheet: ASTM D6163 or D6162; Type II, Grade S
  1. Thickness: 80 to 120 mils
- D. SBS Cap Sheet: ASTM D6163 or D6162; Type II, Grade S and as required to provide specified fire rating.
  1. Thickness: 80 to 120 mils

2.2 BASE FLASHING MEMBRANE

- A. Membrane manufacturer's standard, minimum two-ply modified bitumen membrane flashing system compatible with the roof membrane specified and as recommended by membrane manufacturer. Flashing membranes must meet or exceed the properties of the material standards specified for the modified bitumen base and cap sheet, except that flashing membrane thickness shall be as recommended by the membrane manufacturer.
- B. Flashing cap sheet shall be Class A fire rated.

2.3 COLD-APPLIED MEMBRANE ADHESIVE

- A. Low volatile organic compound (VOC) cold process adhesive for application of the membrane plies.

2.4 ROOF COATING

- A. ASTM D1863, Pea Stone adhered in a flood coat of cold applied adhesive as recommended by the membrane manufacturer.

2.5 PRIMER

- A. ASTM D41/D41M, or other primer compatible with the application and as approved in writing by the membrane manufacturer.

2.6 MODIFIED BITUMEN ROOF CEMENT

- A. ASTM D4586, Type II for vertical surfaces, Type I for horizontal surfaces, compatible with the modified bitumen roof membrane and as recommended by the membrane manufacturer.

2.7 CANT AND TAPERED EDGE STRIPS

- A. Provide standard cants of continuous triangular cross section of inorganic

- fibrous glass. Fabricate to provide maximum 45 degree change in direction of membrane. Cant strips must be minimum 1-1/2 inch thick and provide for minimum 5 inch face and 3-1/2 inch vertical height when installed at 45 degree face angle.
- B. Provide tapered edge strips of inorganic fibrous glass or tapered insulation. Taper edge strips at a rate of one to 1-1/2 inch per foot to a minimum of 1/8 inch of thickness.
- C. Provide kiln-dried preservative-treated wood nailers and wood curbing and where otherwise indicated.

2.8 FASTENERS AND PLATES

- A. Provide coated, corrosion-resistant fasteners as recommended by the modified bitumen sheet manufacturer's printed instructions and meeting the requirements of FM 4470 and FM APP GUIDE for Class I roof deck construction and the wind uplift resistance specified.
- B. Masonry or Concrete Walls and Vertical Surfaces: Use hardened steel nails or screws with flat heads, diamond shaped points, and mechanically deformed shanks not less than 1 inch long for securing felts, modified bitumen sheets, metal items, and accessories to masonry or concrete walls and vertical surfaces.
- C. Metal Plates: Provide flat corrosion-resistant round stress plates as recommended by the modified bitumen sheet manufacturer's printed instructions and meeting the requirements of FM 4470; not less than 2 inch in diameter. Form discs to prevent dishing or cupping.

2.9 PRE-MANUFACTURED ACCESSORIES

- A. Pre-manufactured accessories shall be manufacturer's standard for intended purpose, compatible with the membrane roof system and approved for use by the modified bitumen membrane manufacturer.
- B. Pre-fabricated Curbs: Provide 14 gauge G90 galvanized curbs with minimum 4 inch flange for attachment to roof nailers. Curbs must be minimum height of 10 inches above the finished roof membrane surface.

2.10 WALKPADS

- A. Roof walkpads must be reinforced, granule-surfaced modified bitumen membrane material, minimum 197 mils thick, compatible with the modified bitumen sheet roofing and as recommended by the modified bitumen sheet roofing manufacturer. Panels must not exceed 4 foot in length.

2.11 ROOF INSULATION

- A. ASTM C1289, Faced polyisocyanurate insulation board compatible with the roof membrane, approved by the membrane manufacturer.
  1. Minimum R-Value: 6 per inch.
- 2. Thickness as shown on drawings, but not less than required by Stretch Code.

2.12 VAPOR RETARDER

- A. Provide 6 mil polyethylene vapor retarder over deck and seal edges tight to wall to form a continuous vapor barrier.

2.13 COVER BOARD

- A. Provide 1/2 inch fiberglass faced moisture resistant gypsum cover board with tapered seams over the insulation as shown: DensGlass or equal.

PART 3 EXECUTION

3.1 EXAMINATION

Ensure that the following conditions exist prior to application of the roofing materials:

- A. Drains, curbs, cants, expansion joints, perimeter walls, roof penetrating components, and equipment supports are in place.
- B. Surfaces are rigid, clean, dry, smooth, and free from cracks, holes, and sharp changes in elevation. Joints in the substrate are sealed to prevent dripping of bitumen into building or down exterior walls.
- C. The plane of the substrate does not vary more than 1/4 inch within an area 10 by 10 foot when checked with a 10 foot straight edge placed anywhere on the substrate.
- D. Substrate is sloped as indicated to provide positive drainage.
- E. Walls and vertical surfaces are constructed to receive counter flashing, and will permit mechanical fastening of the base flashing materials.
- F. Treated wood nailers are in place on non-naillable surfaces, to permit nailing of base flashing at minimum height of 8 inch above finished roofing surface.
- G. Protect all combustible materials and surfaces which may contain concealed combustible or flammable materials. All fire extinguishing equipment has been placed as specified.
- H. Treated wood nailers are fastened in place at, openings and intersections with vertical surfaces for securing of membrane, edging strips, attachment flanges of sheet metal, and roof fixtures. Surface-applied nailers are the same thickness as the roof insulation.
- I. Cants are securely fastened in place in the angles formed by walls and other vertical surfaces. The angle of the cant is 45 degrees and the height of the vertical leg is not less than 3-1/2 inches.
- J. Insulation boards are installed smoothly and evenly, and are not broken, cracked, or curled. There are no gaps in insulation board joints exceeding 1/4 inch in width. Insulation is being roofed over on the same day the insulation is installed.
- K. Cover boards are properly installed over insulation and joints are taped.
- L. Vapor retarder is installed continuous over deck and sealed along entire perimeter and all penetrations.

3.2 PREPARATION

- A. Protection of Property: Install protective coverings at paving and building walls adjacent to hoists and tankers prior to starting the work. Lap protective coverings not less than 6 inches, secure against wind, and vent to prevent collection of moisture on covered surfaces. Keep protective coverings in place for the duration of the roofing work.
- B. Mechanical Application Devices: Mount mechanical application devices on pneumatic-tired wheels. Use devices designed and maintained to operate without damaging the insulation, roofing membrane, or structural components.

- C. Electric Equipment: Provide adequate electrical service as required by manufacturer of electrical equipment to ensure against damage to equipment and property and to ensure proper application of roofing materials.
- D. Priming of Surfaces: Prime surfaces to be in contact with adhered membrane materials as required by membrane manufacturer. Apply primer at the rate of 0.75 gallon per 100 sq. ft. or as recommended by modified bitumen sheet manufacturer's printed instructions to promote adhesion of membrane materials. Allow primer to dry prior to application of membrane materials to primed surface. Use low VOC primers and avoid flammable primer materials if available.
- E. Priming of Metal Surfaces: Prime flanges of metal components to be embedded into the roof system prior to setting in bituminous materials or stripping into roofing system.
- F. Membrane Preparation: Unroll modified bitumen membrane materials and allow to relax a minimum of 30 minutes prior to installation. In cold weather, adhere to membrane manufacturer's additional recommendations for pre-installation membrane handling and preparation. Inspect for damage, pinholes, particles of foreign matter, non-dispersed raw material, factory splices, or other conditions that might affect serviceability. Edges of seams must be straight and flat so that they may be sealed to one another without forming fish mouths or wrinkles. Discard damaged or defective materials.
- G. Substrate Preparation: Apply membrane to clean, dry surfaces only. Do not apply membrane to surfaces that have been wet by rain or frozen precipitation within the previous 12 hours. Provide cleaning and artificial drying with electric heated blowers as necessary to ensure clean, dry surface prior to membrane application.

CONTINUE SHEET A-5



LEBLANC THERAPEUTIC DAY SCHOOL  
ROOF REPLACEMENT  
88 SYCAMORE STREET  
LOWELL, MA  
PREPARED FOR:  
LOWELL PUBLIC SCHOOLS

MARK	DATE	ISSUED FOR BID	DESCRIPTION
A	07/30/14		

PROJECT NO: 14401-04  
MODEL FILE: A-4.dwg  
DRAWN BY: LSP  
CHKD BY: POB  
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SHEET TITLE  
SPECIFICATION

Pcl Date: 7/28/2014 4:44:19 PM File Path: J:\01 Projects\1400X14401-04 Lowell Public Schools\Roofs\11.0 Working Files\Leblanc\11.1 Sheets\A-4.dwg

3.3 APPLICATION

- A. Apply roofing materials as specified herein unless approved otherwise by the Owner. Keep roofing materials dry before and during application. Complete application of roofing in a continuous operation. Begin and apply only as much roofing in one day as can be completed that same day.
- B. Phased Membrane Construction: Phased application of membrane plies is prohibited unless otherwise approved by the Owner and supported by the membrane manufacturer's written application instructions. If cap sheet installation is delayed, thoroughly clean the applied membrane material surface and dry immediately prior to cap sheet installation. Priming of the applied membrane surface may be required at the discretion of the Owner prior to cap sheet installation.
- C. Cold Adhesive Applied Modified Bitumen Membrane: Apply cold adhesive with airless sprayer or 1/4 inch saw-toothed rubber squeegee to prepared surfaces in accordance with membrane manufacturer's application instructions. Fully cover substrate with adhesive. Roll or lay membrane in adhesive in accordance with manufacturer's recommendations and within the time limitations of adhesive application. Broom the membrane to ensure full contact with adhesive. Seal laps with adhesive as required by membrane manufacturer. Minimize traffic on installed membrane during the adhesive cure and set time.
- D. Modified Bitumen Base Sheet: Fully adhere base sheets in accordance with membrane manufacturer's printed instructions. Roll and broom in the base sheet to ensure full contact with the adhesive application. Apply sheets in a continuous operation. Apply sheets with side laps at a minimum of 2 inches unless greater side lap is recommended by the manufacturer's standard written application instructions. Provide end laps of not less than 6 inches and staggered a minimum of 36 inches. Apply sheets at right angles to the roof slope so that the direction of water flow is over and not against the laps. Extend base sheets approximately 2 inches above the top of cant strips at vertical surfaces and to the top of cant strips elsewhere unless otherwise shown. Trim base sheet to a neat fit around vent pipes, roof drains, and other projections through the roof. Application must be free of ridges, wrinkles, and buckles.
- E. Cap Sheet: Underlying applied membrane must be inspected and repaired free of damage, holes, puncture, gouges, abrasions, and any other defects, and free of moisture, loose materials, debris, sediments, dust, and any other conditions required by the membrane manufacturer prior to cap sheet installation. Do not apply cap sheet if rain or frozen precipitation has occurred within the previous 24 hours. Align cap membrane and apply by the specified method with the proper side and end lap widths. Cut at a 45 degree angle across selvage edge of cap membrane to be overlapped in end lap areas prior to applying overlapping cap membrane. Minimize traffic on newly installed cap sheet membrane.
- F. Membrane Flashing: Apply two-ply modified bitumen strip flashing and sheet flashing in the angles formed where the roof deck abuts walls, curbs, ventilators, pipes, and other vertical surfaces, and where necessary to make the work watertight. Apply membrane flashing in accordance with the roof membrane manufacturer's printed instructions and as specified. Cut at a 45 degree angle across terminating end lap area of cap membrane prior to applying adjacent overlapping cap membrane. Press flashing into place to ensure full adhesion and avoid bridging. Ensure full lap seal in all lap areas. Mechanically fasten top edge of modified bituminous base flashing 6 inches on center through minimum 1 inch diameter metal caps with fasteners of sufficient length to embed minimum 1 inch into attachment substrate. Apply membrane liner over top of exposed nailers and blocking and to overlap top edge of base flashing installation at curbs, parapet walls, expansion joints and as otherwise indicated to serve as waterproof lining under sheet metal flashing components. Provide metal flashing in accordance with SMACNA 1793 guidelines and standards.
- G. Membrane Strip Flashing: Set primed flanges of metal flashing in full bed of modified bituminous cement material and securely fasten through to attachment substrate. Strip-in with membrane flashing so that strip extends not less than 4 inches beyond outer edge of flange. Where multiple membrane stripping plies are installed, extend each additional stripping ply minimum 4 inches beyond edge of previous ply.
- H. Membrane Flashing at Roof Drain: Extend membrane sheets to edge of drain bowl opening at the roof drain deck flange in accordance with membrane manufacturer's printed application instructions. Securely clamp membrane sheets and metal roof drain flashing and strip flashing in the flashing clamping ring. Secure clamps so that sheets and metal flashing are free from wrinkles and folds. Trim stripping must be flush with inside of clamping ring.
- I. Pre-fabricated Curbs: Securely anchor prefabricated curbs to nailer or other base substrate and flash with modified bitumen membrane.
- J. Set-On Accessories: Where pipe or conduit blocking, supports and similar roof accessories are set on the membrane, adhere walkpad material to bottom of accessories prior to setting on roofing membrane. Specific method of installing set-on accessories must permit normal movement due to expansion, contraction, vibration, and similar occurrences without damaging roofing membrane. Do not mechanically secure set-on accessories through roofing membrane into roof deck substrate.
- K. Roof Walkpads: Install walkpads at roof access points and where otherwise indicated for traffic areas and for access to mechanical equipment, in accordance with the modified bitumen sheet roofing manufacturer's printed instructions. Provide minimum 6 inch separation between adjacent walkpads to accommodate drainage.
- L. Aggregate Surfacing: Complete roof membrane and flashing installation; correction of tears, gouges, and other deficiencies in the installed work; and allow the membrane to cure as required by the manufacturer's instructions prior to applying surfacing. Apply roof aggregate of pea stone at a rate of 400 lbs. per square in a flood coat of adhesive in accordance with the manufacturer's instructions. Allow to cure then remove any excess loose stone.
- M. Correction of Deficiencies: Where any form of deficiency is found, additional measures will be taken as deemed necessary by the Owner to determine the extent of the deficiency and corrective actions must be performed as directed by the Owner.
- N. Clean Up: Remove debris, scraps, containers and other rubbish and trash resulting from installation of the roofing system from job site each day.

3.4 PROTECTION OF APPLIED ROOFING

- A. At the end of the day's work and when precipitation is imminent, protect applied modified bitumen roofing system from water intrusion.

- B. Water Cutoffs: Straighten insulation line using loose-laid cut insulation sheets and seal the terminated edge of modified bitumen roofing system in an effective manner. Seal off flutes in metal decking along the cutoff edge. Remove the water cut-offs to expose the insulation when resuming work, and remove the insulation sheets used for fill-in.
- C. Temporary Flashing for Permanent Roofing: Provide temporary flashing as needed at drains, curbs, walls and other penetrations and terminations of roofing sheets until permanent flashing can be applied. Remove temporary flashing before applying permanent flashing.
- D. Temporary Walkways, Runways, and Platforms: Do not permit storing, walking, wheeling, and trucking directly on applied roofing materials. Provide temporary walkways, runways, and platforms of smooth clean boards, mats or planks as necessary to avoid damage to applied roofing materials, and to distribute weight to conform to live load limits of roof construction. Use rubber-tired equipment for roofing work.

3.5 FIELD QUALITY CONTROL

- A. Perform field tests in the presence of the Owner. Notify the Owner one day before performing tests.
- B. Construction Monitoring: During progress of the roof work, Contractor must make visual inspections as necessary to ensure compliance with specified parameters. Additionally, verify the following:
  1. Materials comply with the specified requirements.
  2. Materials are not installed in adverse weather conditions.
  3. All materials are properly stored, handled and protected from moisture or other damages.
  4. Equipment is in working order. Metering devices are accurate.
  5. Substrates are in acceptable condition, in compliance with specification, prior to application of subsequent materials.
  6. Nailers and blocking are provided where and as needed.
  7. Insulation substrate is smooth, properly secured to its substrate, and without excessive gaps prior to membrane application.
  8. The proper number, type, and spacing of fasteners are installed.
  9. Adhesive application is provided uniformly and as necessary to ensure full adhesion of roll materials.
  10. The proper number and types of plies are installed, with the specified overlaps.
  11. Applied membrane surface is inspected, cleaned, dry, and repaired as necessary prior to cap sheet installation.
  12. Lap areas of all plies are completely sealed.
  13. Membrane is fully adhered without ridges, wrinkles, kinks, fishmouths, or other voids or delaminations.
  14. Installer adheres to specified and detailed application parameters.
  15. Associated flashing and sheet metal are installed in a timely manner in accord with the specified requirements.
  16. Temporary protection measures are in place at the end of each work shift.
- C. Manufacturer's Inspection Reports: Manufacturer's technical representative must visit the site a minimum of three times during the installation for purposes of reviewing materials installation practices and adequacy of work in place. Inspections must occur during the first 20 squares of membrane installation, at mid-point of the installation, and at substantial completion, at a minimum. Additional inspections must not exceed one for each 100 squares of total roof area with the exception that follow-up inspections of previously noted deficiencies or application errors must be performed as requested by the Owner. After each inspection, submit a report, signed by the manufacturer's technical representative to the Owner within 3 working days. Note in the report overall quality of work, deficiencies and any other concerns, and recommended corrective action.
- D. Roof Drain Test: After completing roofing, but prior to the Owner's acceptance, perform the following test for watertight integrity. Plug roof drains and fill with water to edge of drain sump for 8 hours. Do not plug secondary overflow drains at the same time as adjacent primary drain. To ensure some drainage from roof, do not test all drains at same time. Measure water at beginning and end of the test period. When precipitation occurs during test period, repeat test. When water level falls, remove water, thoroughly dry, and inspect installation; repair or replace roofing at drain to provide for a properly installed watertight flashing seal. Repeat test until there is no water leakage.

3.6 INSTRUCTIONS TO MAINTENANCE PERSONNEL

- A. Furnish written and verbal instructions on proper maintenance procedures to designated personnel. Furnish instructions by a competent representative of the modified bitumen membrane manufacturer and include maintenance and emergency repair of the membrane.
- B. Include a demonstration of membrane repair, and give sources of required special tools.
- C. Furnish information on safety requirements during maintenance and emergency repair operations.

3.7 INFORMATION CARD

- A. Furnish a typewritten information card for facility records and a card laminated in plastic and framed for interior display at roof access point, or a photoengraved 0.039 inch thick aluminum card for exterior display.
- B. Card must be 8 1/2 by 11 inches minimum. Information card must identify facility name and location; contract number; approximate roof area; detailed roof system description, including deck type, membrane, number of plies, method of application, manufacturer, insulation and cover board system and thickness; presence of tapered insulation for primary drainage, presence of vapor barrier material; date of completion; installing contractor identification and contact information; membrane manufacturer warranty expiration, warranty reference number, and contact information.
- C. Install card at roof top or access location as directed by the Owner and provide a paper copy to the Owner.

END OF SECTION

SECTION 07 62 00 FLASHING & SHEET METAL

PART 1 GENERAL

1.1 SUMMARY

- A. Provide all exposed and concealed sheet metal and flashing for the entire project as shown and specified including, but not limited to flashings and counterflashings, gutters and downspouts (if any), pre-fabricated fascia and copings, all roofing and mechanical & electrical penetrations, and fabricated sheet metal items.
- B. Finished sheet metal work shall form a weathertight construction without waves, warps, buckles, fastening stresses or distortion. Installation shall allow for expansion and contraction.
- C. All sheet metal work for roofing shall be acceptable to the roof membrane manufacturer and compatible with its warranty requirements.

1.2 REFERENCES

- A. ASTM INTERNATIONAL (ASTM)
  1. ASTM B209 (2010) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
  2. ASTM B370 (2011) Standard Specification for Copper Sheet and Strip for Building Construction
  3. ASTM D226/D226M (2009) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
  4. ASTM D4586 (2007) Asphalt Roof Cement, Asbestos-Free
  5. ASTM D4586 (2007) Asphalt Roof Cement, Asbestos-Free
- B. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)
  1. SMACNA 1793 (2003) Architectural Sheet Metal Manual, 6th Edition

1.3 SUBMITTALS

- A. Provide manufacturer's data for material and finish for exposed coping, fascia, and other exposed metal.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, termination, and installation details.
- C. Samples: Submit two samples of pre-fabricated or custom formed metal coping, fascia, or other exposed material illustrating color and finish as selected by Owner from manufacturer's standard color chart.

1.4 QUALITY ASSURANCE

- A. Sheet Metal System: Conform to criteria of SMACNA "Architectural Sheet Metal Manual."

1.5 WARRANTY

- A. Furnish manufacturer's standard warranty for finishes.

PART 2 PRODUCTS

2.1 SHEET METAL ITEMS

- A. Sheet metal item shall be copper or aluminum as specified and as shown on the drawings and in thicknesses and gages as specified below. Use pre-finished aluminum for all exposed gravel stops, fascias, and copings. Use copper for roof drain sump flashing. Do not use copper and aluminum in contact with each other or in close proximity where run off from one will drain onto the other.
- B. Copper
  1. Flashings:
    - a. Roof drain: 16 oz.
- C. Aluminum
  1. Building Expansion Joints:
    - a. Cover: 0.032 inch
  2. Covering on minor flat, pitched or curved surfaces: 0.040 inch
  3. Flashings:
    - a. Base: 0.040 inch
    - b. Counter-flashing: 0.032 inch
    - c. Coping: 0.032
  4. Gravel stops, Fascias, Copings:
    - a. Sheets, smooth: 0.050 inch
    - b. Edge strip: 0.050 inch
    - c. Joint Cover plates: 0.040 inch

2.2 EXPOSED SHEET METAL ITEMS

- A. All exposed items must be of the same material and finish. The following items are considered as exposed sheet metal:
  1. Gravel stops and fascias.
  2. Copings and caps.
  3. Gutters and Downspouts (if any).
- B. Exposed items shall be pre-fabricated to the maximum extent practicable with pre-fabricated corners. Aluminum item shall be factory pre-finished.

2.3 MATERIALS

- A. Aluminum Sheet: ASTM B209; alloy and temper as required for application and finish; mill finish.
- B. Pre-Finished Aluminum Sheet: ASTM B209; alloy and temper as required for application and finish; factory pre-finished with fluoropolymer; color as selected from manufacturer's standard.
  1. Fluoropolymer Coating: Multiple coat for sheet metal system, thermally cured.
  2. Washcoat: Finish concealed side of metal sheets with washcoat compatible with finish system, as recommended by finish system manufacturer.
- C. Copper: ASTM B370; H00 temper, natural finish.

2.4 ACCESSORIES

- A. Fasteners: All fasteners shall be non-corrosive. Use the same metal or a metal compatible with the item fastened. Use stainless steel fasteners to fasten dissimilar materials.
- B. Gutter and Downspout Anchorage Devices (if any): In accordance with SMACNA requirements.
- C. Protective Backing Paint: Bituminous.
- D. Sealant: Exterior metal lap joint butyl or polyisobutylene sealant, silicone, or as recommended by membrane manufacturer.
- E. Plastic Cement: ASTM D4586, Type I.

- F. Reglets, Termination Bars: Surface mounted or recessed as shown, aluminum or stainless steel; seal with polyurethane.
- G. Splash Blocks: Precast concrete type, minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

2.5 FABRICATION

- A. Form components to shape indicated on Drawings, accurate in size, square, and free from distortion or defects. Form pieces in longest practical lengths.
- B. Fabricate cleats and starter strips of same material as sheet, to interlock with sheet.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- D. Fabricate flashings to allow toe to extend 2 inches over roofing [gravel] [paver]. Return and brake edges.
- E. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Fabricate corners in one piece, 18 inch long legs; seam for rigidity, seal with sealant.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
- B. Verify membrane termination and membrane base flashings are in place, sealed, and secure.

3.2 PREPARATION

- A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to minimum dry film thickness of 15 mil.

3.3 INSTALLATION

- A. Workmanship: Make lines and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction. Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793, Architectural Sheet Metal Manual.
- B. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight whether shown or not.
- C. Nailing: Nail flashing on one edge only. Space nails evenly not over 3 inch on center and approximately 1/2 inch from edge unless otherwise specified or indicated. Exposed face nailing will not be permitted.
- D. Cleats: Provide cleats for sheet metal 18 inch and over in width. Provide cleats of 2 inches wide by 3 inches long and of the same material and thickness as the sheet metal being installed, spaced 12 inches on center unless otherwise noted. Secure one end of the cleat with two nails and fold the cleat back over the nail heads. Lock the other end into the seam. Where the fastening is to be made to concrete or masonry, use screws and expansion shields set in concrete or masonry.
- E. Bolts, Rivets, and Screws: Install bolts, rivets, and screws where indicated or required. Provide neoprene washers where required to protect surface of sheet metal and to provide a watertight connection.
- F. Seams: Straight and uniform in width and height.
  1. Flat-lock Seams: Finish not less than 3/4 inch wide.
  2. Lap Seams: Finish soldered seams not less than one inch wide. Overlap seams not soldered, not less than 3 inches.
  3. Loose-Lock Expansion Seams: Not less than 3 inches wide; provide minimum one inch movement within the joint. Completely fill the joints with silicon sealant, applied at not less than 1/8 inch thick bed.
- G. Dissimilar Surfaces: Paint surfaces in contact with wood, mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.
- H. Expansion and Contraction: Provide expansion and contraction joints at not more than 32 foot intervals for aluminum. Provide an additional joint where the distance between the last expansion joint and the end of the continuous run is more than half the required interval. Space joints evenly.
- I. Base Flashing: Extend up vertical surfaces of the flashing not less than 8 inch and not less than 4 inch under the roof covering.
- J. Counterflashing: Overlap vertical leg of base flashings not less than 3 inches. Provide end laps not less than 3 inches and seal weathertight with plastic cement. Maximum length shall be 10 feet. Provide pre-fabricated corners with not less than 12 inch legs. Fill termination bars or raked joints which receive counterflashing with sealant. For counterflashings built into masonry or concrete wall reglets, turn up the back edge 1/4 inch and install flashing a minimum of 2 inches into the joint. Install counterflashing to provide a spring action against base flashing. Where bituminous base flashings are provided, extend down the counter flashing as close as practicable to the top of the cant strip.
- K. Flashing for Roof Drains: Provide a minimum 30 inch square sheet or as shown on drawings. Taper insulation to drain from 24 inches out. Set flashing on finished membrane in a full bed of asphalt roof cement, ASTM D4586. Heavily coat the drain flashing ring with asphalt roof cement. Clamp the roof membrane, flashing sheet, and stripping felt in the drain clamping ring. Secure clamps so that membrane and drain flashing are free of wrinkles and folds.
- L. Sheet Metal Covering on Flat, Sloped, or Curved Surfaces: Whether shown or not, cover and flash all minor flat, sloped, or curved surfaces with metal sheets; maximum size of sheets, 16 by 18 inches. Fasten sheets to sheathing with metal cleats. Lock aluminum seams and seal with silicone or as recommended by aluminum manufacturer. Provide an underlayment of roofing felt for all sheet metal covering.

3.4 REPAIRS TO FINISH

- A. Repair damaged surfaces caused by scratches, abrasions, and minor surface defects in accordance with the manufacturer's printed instructions and as approved. Replace items which cannot be repaired to the satisfaction of the Owner.

3.5 CLEANING

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, handling marks, fittings and drilling debris, and scrub-clean. The exposed metal surfaces shall be free of dents, creases, waves, scratch marks, and solder or weld marks.

END OF SECTION



CONSULTANTS

LEBLANC THERAPEUTIC DAY SCHOOL ROOF REPLACEMENT

58 SYCAMORE STREET LOWELL, MA PREPARED FOR: LOWELL PUBLIC SCHOOLS

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SHEET TITLE SPECIFICATION

Plot Date: 7/28/2014 4:45:36 PM File Path: J:\01 Projects\1400X14401-04 Lowell Public Schools\Roofs\11.0 Working\Title\leblanc\11.1 Sheets\A-5.dwg