

- 2.1 MANUFACTURERS
- A. IN OTHER PART 2 ARTICLES WHERE TITLES BELOW INTRODUCE LISTS, THE FOLLOWING REQUIREMENTS APPLY FOR PRODUCT SELECTION:
1. AVAILABLE MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE MANUFACTURERS SPECIFIED.
2. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY THE MANUFACTURERS SPECIFIED.

- 2.2 PVC ROOFING MEMBRANE
- A. PVC SHEET: ASTM D 4434, TYPE IV, FABRIC REINFORCED.
1. MANUFACTURERS:
- a. DURO-LAST ROOFING, INC.
2. THICKNESS: 50 MILS, NOMINAL.
3. EXPOSED FACE COLOR: WHITE.

- 2.3 AUXILIARY MATERIALS
- A. GENERAL: AUXILIARY MATERIALS RECOMMENDED BY ROOFING SYSTEM MANUFACTURER FOR INTENDED USE AND COMPATIBLE WITH MEMBRANE ROOFING.
1. ADHESIVES AND SEALANTS THAT ARE USED INSIDE OF THE WEATHERPROOFING SYSTEM SHALL COMPLY WITH THE FOLLOWING LIMITS FOR VOC CONTENT WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24):
- a. PLASTIC FOAM ADHESIVES: 50 G/L.
- b. GYPSUM BOARD AND PANEL ADHESIVES: 50 G/L.
- c. MULTIPURPOSE CONSTRUCTION ADHESIVES: 70 G/L.
- d. FIBERGLASS ADHESIVES: 80 G/L.
- e. CONTACT ADHESIVES: 80 G/L.
- f. PLASTIC CEMENT WELDING COMPOUNDS: 350 G/L.
- g. PVC WELDING COMPOUNDS: 510 G/L.
- h. OTHER ADHESIVES: 250 G/L.
- i. SINGLE-PLY ROOF MEMBRANE SEALANTS: 450 G/L.
- j. NONMEMBRANE ROOF SEALANTS: 300 G/L.
- k. SEALANT PRIMERS FOR NONPOROUS SUBSTRATES: 250 G/L.
- l. SEALANT PRIMERS FOR POROUS SUBSTRATES: 775 G/L.

- B. SHEET FLASHING: MANUFACTURER'S STANDARD SHEET FLASHING OF SAME MATERIAL, TYPE, REINFORCEMENT, THICKNESS, AND COLOR AS PVC SHEET MEMBRANE.
- C. BONDING ADHESIVE: MANUFACTURER'S STANDARD SOLVENT-BASED BONDING ADHESIVE FOR MEMBRANE, AND SOLVENT-BASED BONDING ADHESIVE FOR BASE FLASHINGS.
- D. METAL TERMINATION BARS: MANUFACTURER'S STANDARD PREDRILLED STAINLESS-STEEL OR ALUMINUM BARS, APPROXIMATELY 1 BY 1/8 INCH (25 BY 3 MM) THICK; WITH ANCHORS.
- E. METAL BATTENS: MANUFACTURER'S STANDARD ALUMINUM-ZINC-ALLOY-COATED OR ZINC-COATED STEEL SHEET, APPROXIMATELY 1 INCH (25 MM) WIDE BY 0.05 INCH (1.3 MM) THICK, PREPUNCHED.
- F. FASTENERS: FACTORY-COATED STEEL FASTENERS AND METAL OR PLASTIC PLATES MEETING CORROSION-RESISTANCE PROVISIONS IN FMG 4470, DESIGNED FOR FASTENING MEMBRANE TO SUBSTRATE, AND ACCEPTABLE TO MEMBRANE ROOFING SYSTEM MANUFACTURER.
- G. MISCELLANEOUS ACCESSORIES: PROVIDE POURABLE SEALERS, PREFORMED CONE AND VENT SHEET FLASHINGS, PREFORMED INSIDE AND OUTSIDE CORNER SHEET FLASHINGS, T-JOINT COVERS, TERMINATION REGLETS, COVER STRIPS, SLIP SHEET, AND OTHER ACCESSORIES.

- 2.4 ROOF INSULATION
- A. EXTRUDED-POLYSTYRENE BOARD INSULATION: ASTM C 578, TYPE IV, 1.6-LB/CU. FT. (26-KG/CU. M) MINIMUM DENSITY, SQUARE EDGED.
- B. TAPERED INSULATION: PROVIDE FACTORY-TAPERED INSULATION BOARDS FABRICATED TO SLOPE OF 1/4 INCH PER 12 INCHES (1:48), UNLESS OTHERWISE INDICATED.
- C. PROVIDE PREFORMED SADDLES, CRICKETS, TAPERED EDGE STRIPS, AND OTHER INSULATION SHAPES WHERE INDICATED FOR SLOPING TO DRAIN. FABRICATE TO SLOPES INDICATED.

- 2.5 INSULATION ACCESSORIES
- A. FASTENERS: FACTORY-COATED STEEL FASTENERS AND METAL OR PLASTIC PLATES MEETING CORROSION-RESISTANCE PROVISIONS IN FMG 4470, DESIGNED FOR FASTENING ROOF INSULATION TO SUBSTRATE, AND ACCEPTABLE TO ROOFING SYSTEM MANUFACTURER.
- B. COLD FLUID-APPLIED ADHESIVE: MANUFACTURER'S STANDARD COLD FLUID-APPLIED ADHESIVE FORMULATED TO ADHERE ROOF INSULATION TO SUBSTRATE.
- C. COVER BOARD: ASTM C 208, TYPE II, GRADE 2, CELLULOSIC-FIBER INSULATION BOARD, 1/2 INCH (13 MM) THICK.

- 2.6 WALKWAYS
- A. FLEXIBLE WALKWAYS: FACTORY-FORMED, NONPOROUS, HEAVY-DUTY, SOLID-RUBBER, SLIP-RESISTING, SURFACE-TEXTURED WALKWAY PADS OR ROLLS, APPROXIMATELY 3/16 INCH (5 MM) THICK, AND ACCEPTABLE TO MEMBRANE ROOFING SYSTEM MANUFACTURER.

PART 3 - EXECUTION

1. SUBSTRATE BOARD INSTALLATION
- A. INSTALL SUBSTRATE BOARD WITH LONG JOINTS IN CONTINUOUS STRAIGHT LINES, PERPENDICULAR TO ROOF SLOPES WITH END JOINTS STAGGERED BETWEEN ROWS. TIGHTLY BUTT SUBSTRATE BOARDS TOGETHER.
1. FASTEN SUBSTRATE BOARD TO TOP FLANGES OF STEEL DECK ACCORDING TO MEMBRANE ROOFING SYSTEM MANUFACTURER'S WRITTEN INSTRUCTIONS.

- 3.2 INSULATION INSTALLATION
- A. COORDINATE INSTALLING MEMBRANE ROOFING SYSTEM COMPONENTS SO INSULATION IS NOT EXPOSED TO PRECIPITATION OR LEFT EXPOSED AT THE END OF THE WORKDAY.
- B. COMPLY WITH MEMBRANE ROOFING SYSTEM MANUFACTURER'S WRITTEN INSTRUCTIONS FOR INSTALLING ROOF INSULATION.
- C. INSTALL TAPERED INSULATION UNDER AREA OF ROOFING TO CONFORM TO SLOPES INDICATED.
- D. INSTALL ONE OR MORE LAYERS OF INSULATION UNDER AREA OF ROOFING TO ACHIEVE REQUIRED THICKNESS. WHERE OVERALL INSULATION THICKNESS IS 2 INCHES (50 MM) OR GREATER, INSTALL 2 OR MORE LAYERS WITH JOINTS OF EACH SUCCEEDING LAYER STAGGERED FROM JOINTS OF PREVIOUS LAYER A MINIMUM OF 6 INCHES (150 MM) IN EACH DIRECTION.
- E. MECHANICALLY FASTENED INSULATION: INSTALL EACH LAYER OF INSULATION AND SECURE TO DECK USING MECHANICAL FASTENERS SPECIFICALLY DESIGNED AND SIZED FOR FASTENING SPECIFIED BOARD-TYPE ROOF INSULATION TO DECK TYPE.
1. FASTEN INSULATION TO RESIST UPLIFT PRESSURE AT CORNERS, PERIMETER, AND FIELD OF ROOF.
- F. INSTALL COVER BOARDS OVER INSULATION WITH LONG JOINTS IN CONTINUOUS STRAIGHT LINES WITH END JOINTS STAGGERED BETWEEN ROWS. LOOSELY BUTT COVER BOARDS TOGETHER AND FASTEN TO ROOF DECK.
1. FASTEN TO RESIST UPLIFT PRESSURE AT CORNERS, PERIMETER, AND FIELD OF ROOF.

- 3.3 MECHANICALLY FASTENED ROOFING MEMBRANE INSTALLATION
- A. INSTALL ROOFING MEMBRANE OVER AREA TO RECEIVE ROOFING ACCORDING TO ROOFING SYSTEM MANUFACTURER'S WRITTEN INSTRUCTIONS. UNROLL ROOFING MEMBRANE AND ALLOW TO RELAX BEFORE INSTALLING.
1. INSTALL SHEET ACCORDING TO ASTM D 5082.
- B. MECHANICALLY OR ADHESIVELY FASTEN ROOFING MEMBRANE SECURELY AT TERMINATIONS, PENETRATIONS, AND PERIMETER OF ROOFING.
- C. SEAMS: CLEAN SEAM AREAS, OVERLAP ROOFING MEMBRANE, AND HOT-AIR WELD SIDE AND END LAPS OF ROOFING MEMBRANE ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS TO ENSURE A WATERTIGHT SEAM INSTALLATION.
1. REPAIR TEARS, VOIDS, AND LAPPED SEAMS IN ROOFING MEMBRANE THAT DOES NOT MEET REQUIREMENTS.
- D. IN-SPUCE ATTACHMENT: SECURE ONE EDGE OF ROOFING MEMBRANE USING FASTENING PLATES OR METAL BATTENS CENTERED WITHIN MEMBRANE SPICE AND MECHANICALLY FASTEN ROOFING MEMBRANE TO ROOF DECK. FIELD-SPICE SEAM.
- E. THROUGH-MEMBRANE ATTACHMENT: SECURE ROOFING MEMBRANE USING FASTENING PLATES OR METAL BATTENS AND MECHANICALLY FASTEN ROOFING MEMBRANE TO ROOF DECK. COVER BATTENS AND FASTENERS WITH A CONTINUOUS COVER STRIP.

- 3.4 BASE FLASHING INSTALLATION
- A. INSTALL SHEET FLASHINGS AND PREFORMED FLASHING ACCESSORIES AND ADHERE TO SUBSTRATES ACCORDING TO MEMBRANE ROOFING SYSTEM MANUFACTURER'S WRITTEN INSTRUCTIONS.
- B. APPLY SOLVENT-BASED BONDING ADHESIVE TO SUBSTRATE AND UNDERSIDE OF SHEET FLASHING AT REQUIRED RATE AND ALLOW TO PARTIALLY DRY. DO NOT APPLY BONDING ADHESIVE TO SEAM AREA OF FLASHING.
- C. FLASH PENETRATIONS AND FIELD-FORMED INSIDE AND OUTSIDE CORNERS WITH SHEET FLASHING.
- D. CLEAN SEAM AREAS AND OVERLAP AND FIRMLY ROLL SHEET FLASHINGS INTO THE ADHESIVE. WELD SIDE AND END LAPS TO ENSURE A WATERTIGHT SEAM INSTALLATION.
- E. TERMINATE AND SEAL TOP OF SHEET FLASHINGS AND MECHANICALLY ANCHOR TO SUBSTRATE THROUGH TERMINATION BARS.

- 3.5 WALKWAY INSTALLATION
- A. FLEXIBLE WALKWAYS: INSTALL WALKWAY PRODUCTS IN LOCATIONS INDICATED. ADHERE WALKWAY PRODUCTS TO SUBSTRATE WITH COMPATIBLE ADHESIVE ACCORDING TO ROOFING SYSTEM MANUFACTURER'S WRITTEN INSTRUCTIONS.

- 3.6 FIELD QUALITY CONTROL
- A. TESTING AGENCY: OWNER WILL ENGAGE A QUALIFIED INDEPENDENT TESTING AND INSPECTING AGENCY TO PERFORM ROOF TESTS AND INSPECTIONS AND TO PREPARE TEST REPORTS.
- B. FINAL ROOF INSPECTION: ARRANGE FOR ROOFING SYSTEM MANUFACTURER'S TECHNICAL PERSONNEL TO INSPECT ROOFING INSTALLATION ON COMPLETION AND SUBMIT REPORT TO ARCHITECT.
- C. REPAIR OR REMOVE AND REPLACE COMPONENTS OF MEMBRANE ROOFING SYSTEM WHERE TEST RESULTS OR INSPECTIONS INDICATE THAT THEY DO NOT COMPLY WITH SPECIFIED REQUIREMENTS.

SECTION 076100 - SHEET METAL ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. SECTION INCLUDES:
1. STANDING-SEAM METAL ROOFING.

1.2 PERFORMANCE REQUIREMENTS

- A. WIND-UPLIFT RESISTANCE: CAPABLE OF PRODUCING SHEET METAL ROOFING ASSEMBLIES THAT COMPLY WITH UL S80 FOR CLASS 90 WIND-UPLIFT RESISTANCE.

1.3 SUBMITTALS

- A. SHOP DRAWINGS: SHOW INSTALLATION LAYOUT OF SHEET METAL ROOFING, INCLUDING PLANS, ELEVATIONS, EXPANSION JOINT LOCATIONS, AND KEYED DETAILS. DISTINGUISH BETWEEN SHOP- AND FIELD-ASSEMBLED WORK.
1. INCLUDE DETAILS FOR FORMING, JOINING, AND SECURING SHEET METAL ROOFING, INCLUDING PATTERN OF SEAMS, TERMINATION POINTS, FIXED POINTS, EXPANSION JOINTS, ROOF PENETRATIONS, EDGE CONDITIONS, SPECIAL CONDITIONS, CONNECTIONS TO ADJOINING WORK, AND DETAILS OF ACCESSORY ITEMS.
- B. SAMPLES: FOR EACH EXPOSED PRODUCT AND FOR EACH FINISH SPECIFIED.
- C. PORTABLE ROLL-FORMING EQUIPMENT CERTIFICATE: ISSUED BY UL FOR EQUIPMENT MANUFACTURER'S PORTABLE ROLL-FORMING EQUIPMENT CAPABLE OF PRODUCING PANELS THAT COMPLY WITH UL REQUIREMENTS.

1.4 QUALITY ASSURANCE

- A. INSTALLER QUALIFICATIONS: FABRICATOR OF SHEET METAL ROOFING.
- B. ROLL-FORMED SHEET METAL ROOFING FABRICATOR QUALIFICATIONS: AN AUTHORIZED REPRESENTATIVE OF ROLL-FORMED SHEET METAL ROOFING MANUFACTURER FOR FABRICATION AND INSTALLATION OF UNITS.
- C. SHEET METAL ROOFING STANDARD: COMPLY WITH SMACNA'S "ARCHITECTURAL SHEET METAL MANUAL".

1.5 WARRANTY

- A. SPECIAL WARRANTY ON FINISHES: MANUFACTURER'S STANDARD FORM IN WHICH MANUFACTURER AGREES TO REPAIR FINISH OR REPLACE SHEET METAL ROOFING THAT SHOWS EVIDENCE OF DETERIORATION OF FACTORY-APPLIED FINISHES WITHIN SPECIFIED WARRANTY PERIOD.
1. FLUOROPOLYME FINISH WARRANTY PERIOD: 20 YEARS FROM DATE OF SUBSTANTIAL COMPLETION.
- B. SPECIAL INSTALLER'S WARRANTY: SPECIFIED FORM IN WHICH ROOFING INSTALLER AGREES TO REPAIR OR REPLACE COMPONENTS OF CUSTOM- FABRICATED SHEET METAL ROOFING THAT FAIL IN MATERIALS OR WORKMANSHIP WITHIN TWO YEARS FROM DATE OF SUBSTANTIAL COMPLETION.

PART 2 - PRODUCTS

- 2.1 ROOFING SHEET METALS
- A. MANUFACTURERS AND PRODUCTS:
1. BERRIDGE MANUFACTURING CO.
- B. METALLIC-COATED STEEL SHEET: RESTRICTED FLATNESS STEEL SHEET, METALLIC COATED BY THE HOT-DIP PROCESS AND PREPAINTED BY THE COIL-COATING PROCESS TO COMPLY WITH ASTM A 755/A 755M.
1. ZINC-COATED (GALVANIZED) STEEL SHEET: ASTM A 653/A 653M, G90 (Z275) COATING DESIGNATION; STRUCTURAL QUALITY.
2. SURFACE: SMOOTH, FLAT FINISH.
3. THICKNESS: 24 GAUGE, UNLESS OTHERWISE INDICATED.
4. EXPOSED FINISHES:
- a. HIGH-PERFORMANCE ORGANIC FINISH: THREE-COAT WITH FLUOROPOLYMER COATS CONTAINING NOT LESS THAN 70 PERCENT POLYVINYLIDENE FLUORIDE RESIN BY WEIGHT; COMPLYING WITH PHYSICAL PROPERTIES AND COATING PERFORMANCE REQUIREMENTS OF AAMA 2604, EXCEPT AS MODIFIED BELOW:
- 1) HUMIDITY RESISTANCE: 2000 HOURS.
- 2) WATER RESISTANCE: 2000 HOURS.
- 3) COLOR: AS INDICATED ON DRAWINGS.

2.2 UNDERLAYMENT MATERIALS

- A. POLYETHYLENE SHEET: 6-MIL- (0.15-MM-) THICK POLYETHYLENE SHEET COMPLYING WITH ASTM D 4397.
- B. FELTS: ASTM D 226, TYPE II (NO. 30), ASPHALT-SATURATED ORGANIC FELTS.
1. SELF-ADHERING, HIGH-TEMPERATURE SHEET: MINIMUM 30 TO 40 MILS (0.76 TO 1.0 MM) THICK, CONSISTING OF SLIP-RESISTING POLYETHYLENE-FILM TOP SURFACE LAMINATED TO LAYER OF BUTYL OR SBS-MODIFIED ASPHALT ADHESIVE, WITH RELEASE-PAPER BACKING; COLD APPLIED.
- C. SLIP SHEET: BUILDING PAPER, 3-LB/100 SQ. FT. (0.16-KG./SQ. M) MINIMUM, ROSIN SIZED.

- 2.3 MISCELLANEOUS MATERIALS
- A. FASTENERS: SELF-TAPPING SCREWS, SELF-LOCKING RIVETS AND BOLTS AND OTHER SUITABLE

FASTENERS DESIGNED TO WITHSTAND DESIGN LOADS.

1. EXPOSED FASTENERS: HEADS MATCHING COLOR OF SHEET METAL ROOFING USING PLASTIC CAPS OR FACTORY-APPLIED COATING.
2. FASTENERS FOR FLASHING AND TRIM: BLIND FASTENERS OR SELF- DRILLING SCREWS WITH HEX- WASHER HEAD.
3. BLIND FASTENERS: HIGH-STRENGTH ALUMINUM OR STAINLESS- STEEL RIVETS.
- B. SEALING TAPE: PRESSURE-SENSITIVE, 100 PERCENT SOLIDS, POLYISOBUTYLENE COMPOUND SEALING TAPE WITH RELEASE-PAPER BACKING. PROVIDE PERMANENTLY ELASTIC, NONSAG, NONTXIC, NONSTAINING TAPE.
- C. ELASTOMERIC JOINT SEALANT: ASTM C 920, OF BASE POLYMER, TYPE, GRADE, CLASS, AND USE CLASSIFICATIONS REQUIRED TO PRODUCE JOINTS IN SHEET METAL ROOFING AND REMAIN WATERTIGHT.
- D. EXPANSION JOINT SEALANT: FOR HOOKED-TYPE EXPANSION JOINTS, WHICH MUST BE FREE TO MOVE, PROVIDE NONSETTING, NONHARDENING, NONMIGRATING, HEAVY-BODIED POLYISOBUTYLENE SEALANT.
- E. BITUMINOUS COATING: COLD-APPLIED ASPHALT MASTIC, SSPC-PAINT 12, COMPOUNDED FOR 15-MIL (0.4-MM) DRY FILM THICKNESS PER COAT.

2.4 ACCESSORIES

- A. SHEET METAL ACCESSORIES: PROVIDE COMPONENTS REQUIRED FOR A COMPLETE SHEET METAL ROOFING ASSEMBLY INCLUDING TRIM, COPINGS, FASCIAE, CORNER UNITS, CLIPS, FLASHINGS, SEALANTS, GASKETS, FILLERS, METAL CLOSURES, CLOSURE STRIPS, AND SIMILAR ITEMS. MATCH MATERIAL AND FINISH OF SHEET METAL ROOFING UNLESS OTHERWISE INDICATED.
1. CLEATS: FOR MECHANICALLY SEAMING INTO JOINTS AND FORMED FROM THE FOLLOWING MATERIALS:
- a. METALLIC-COATED STEEL ROOFING: 0.0250-INCH- (0.65-MM-) THICK STAINLESS STEEL OR NYLON-COATED ALUMINUM SHEET.
2. CLIPS: MINIMUM 0.0625-INCH- (1.6-MM-) THICK, STAINLESS-STEEL PANEL CLIPS DESIGNED TO WITHSTAND NEGATIVE-LOAD REQUIREMENTS.
3. CLOSURES: CLOSED-CELL, EXPANDED, CELLULAR, RUBBER OR CROSSLINKED, POLYOLEFIN FOAM OR CLOSED-CELL LAMINATED POLYETHYLENE; MINIMUM 1-INCH- (25-MM-) THICK, FLEXIBLE-CLOSURE STRIPS; CUT OR PREMOLED TO MATCH SHEET METAL ROOFING PROFILE. PROVIDE CLOSURE STRIPS WHERE INDICATED OR NECESSARY TO ENSURE WEATERTIGHT CONSTRUCTION.
4. FLASHING AND TRIM: FORMED FROM 0.0179 INCH (0.45 MM) THICK, METALLIC COATED STEEL SHEET. PROVIDE FLASHING AND TRIM AS REQUIRED TO SEAL AGAINST WEATHER AND TO PROVIDE FINISHED APPEARANCE. LOCATIONS INCLUDE, BUT ARE NOT LIMITED TO, EAVES, RAKES, CORNERS, BASES, FRAMED OPENINGS, RIDGES, FASCIAE, AND FILLERS. FINISH FLASHING AND TRIM WITH SAME FINISH SYSTEM AS ADJACENT SHEET METAL ROOFING.

2.5 FABRICATION

- A. GENERAL: CUSTOM FABRICATE SHEET METAL ROOFING TO COMPLY WITH DETAILS SHOWN AND RECOMMENDATIONS IN SMACNA'S "ARCHITECTURAL SHEET METAL MANUAL" THAT APPLY TO THE DESIGN, DIMENSIONS (PANEL WIDTH AND SEAM HEIGHT), GEOMETRY, METAL THICKNESS, AND OTHER CHARACTERISTICS OF INSTALLATION INDICATED. FABRICATE SHEET METAL ROOFING AND ACCESSORIES AT THE SHOP TO GREATEST EXTENT POSSIBLE.
1. STANDING-SEAM ROOFING: FORM STANDING-SEAM PANELS WITH FINISHED SEAM HEIGHT OF 1-1/2 INCHES (38 MM).
- B. GENERAL: FABRICATE ROLL-FORMED SHEET METAL ROOFING PANELS TO COMPLY WITH DETAILS SHOWN AND ROLL-FORMED SHEET METAL ROOFING MANUFACTURER'S WRITTEN INSTRUCTIONS.
- C. FABRICATE SHEET METAL ROOFING TO ALLOW FOR EXPANSION IN RUNNING WORK SUFFICIENT TO PREVENT LEAKAGE, DAMAGE, AND DETERIORATION OF THE WORK. FORM EXPOSED SHEET METAL WORK TO FIT SUBSTRATES WITHOUT EXCESSIVE OIL CANNING, BUCKLING, AND TOOL MARKS, TRUE TO LINE AND LEVELS INDICATED, AND WITH EXPOSED EDGES FOLDED BACK TO FORM HEMS.
1. LAY OUT SHEET METAL ROOFING SO CROSS SEAMS, WHEN REQUIRED, ARE MADE IN DIRECTION OF FLOW WITH HIGHER PANS OVERLAPPING LOWER PANS. STAGGER CROSS SEAMS.
2. FOLD AND CLEAT EAVES AND TRANSVERSE SEAMS IN THE SHOP.
3. FORM AND FABRICATE SHEETS, SEAMS, STRIPS, CLEATS, VALLEYS, RIDGES, EDGE TREATMENTS, INTEGRAL FLASHINGS, AND OTHER COMPONENTS OF METAL ROOFING TO PROFILES, PATTERNS, AND DRAINAGE ARRANGEMENTS SHOWN AND AS REQUIRED FOR LEAKPROOF CONSTRUCTION.
- D. METAL PROTECTION: WHERE DISSIMILAR METALS WILL CONTACT EACH OTHER, PROTECT AGAINST GALVANIC ACTION BY PAINTING CONTACT SURFACES WITH BITUMINOUS COATING, BY APPLYING SELF-ADHERING SHEET UNDERLAYMENT TO EACH CONTACT SURFACE, OR BY OTHER PERMANENT SEPARATION AS RECOMMENDED BY FABRICATOR OF SHEET METAL ROOFING OR MANUFACTURERS OF THE METALS IN CONTACT.
- E. SHEET METAL ACCESSORIES: CUSTOM FABRICATE FLASHINGS AND TRIM TO COMPLY WITH RECOMMENDATIONS IN SMACNA'S "ARCHITECTURAL SHEET METAL MANUAL" THAT APPLY TO DESIGN, DIMENSIONS, METAL, AND OTHER CHARACTERISTICS OF ITEM INDICATED. OBTAIN FIELD MEASUREMENTS FOR ACCURATE FIT BEFORE SHOP FABRICATION.

PART 3 - EXECUTION

3.1 PREPARATION

- A. INSTALL FLASHINGS AND OTHER SHEET METAL TO COMPLY WITH REQUIREMENTS SPECIFIED IN DIVISION 7 SECTION "SHEET METAL FLASHING AND TRIM."

3.2 UNDERLAYMENT INSTALLATION

- A. FELT UNDERLAYMENT: INSTALL FELT UNDERLAYMENT ON ROOF SHEATHING UNDER SHEET METAL ROOFING. USE ADHESIVE FOR TEMPORARY ANCHORAGE. APPLY AT LOCATIONS INDICATED ON DRAWINGS, IN SHINGLE FASHION TO SHED WATER, WITH LAPPED JOINTS OF NOT LESS THAN 2 INCHES (50 MM).
- B. SELF-ADHERING SHEET UNDERLAYMENT: INSTALL SELF-ADHERING SHEET UNDERLAYMENT, WRINKLE FREE, ON ROOF SHEATHING UNDER SHEET METAL ROOFING. COMPLY WITH TEMPERATURE RESTRICTIONS OF UNDERLAYMENT MANUFACTURER FOR INSTALLATION; USE PRIMER RATHER THAN NAILS FOR INSTALLING UNDERLAYMENT AT LOW TEMPERATURES. APPLY OVER ENTIRE ROOF, IN SHINGLE FASHION TO SHED WATER, WITH END LAPS OF NOT LESS THAN 6 INCHES (150 MM) STAGGERED 24 INCHES (600 MM) BETWEEN COURSES. OVERLAP SIDE EDGES NOT LESS THAN 3-1/2 INCHES (90 MM). ROLL LAPS WITH ROLLER. COVER UNDERLAYMENT WITHIN 14 DAYS.
1. INSTALL FOR A MINIMUM OF 36" AT PERIMETER AND WHERE INDICATED ON DRAWINGS.
- C. APPLY SLIP SHEET BEFORE INSTALLING SHEET METAL ROOFING.

3.3 INSTALLATION, GENERAL

- A. GENERAL: ANCHOR SHEET METAL ROOFING AND OTHER COMPONENTS OF THE WORK SECURELY IN PLACE, WITH PROVISIONS FOR THERMAL AND STRUCTURAL MOVEMENT. INSTALL FASTENERS, SOLDER, WELDING RODS, PROTECTIVE COATINGS, SEPARATORS, SEALANTS, AND OTHER MISCELLANEOUS ITEMS AS REQUIRED FOR A COMPLETE ROOFING SYSTEM AND AS RECOMMENDED BY FABRICATOR FOR SHEET METAL ROOFING.
1. FIELD CUTTING OF SHEET METAL ROOFING BY TORCH IS NOT PERMITTED.
2. RIGIDLY FASTEN EAVE END OF SHEET METAL ROOFING AND ALLOW RIDGE AND FREE MOVEMENT DUE TO THERMAL EXPANSION AND CONTRACTION. PREDRILL ROOFING.
3. PROVIDE METAL CLOSURES AT PEAKS AND EACH SIDE OF RIDGE CAPS.
4. FLASH AND SEAL SHEET METAL ROOFING WITH WEATHER CLOSURES AT EAVES, RAKES, AND PERIMETER OF ALL OPENINGS. FASTEN WITH SELF-TAPPING SCREWS.
5. LOCATE ROOFING SPLICES OVER, BUT NOT ATTACHED TO, STRUCTURAL SUPPORTS. STAGGER ROOFING SPLICES AND END LAPS TO AVOID A FOUR-PANEL LAP SPLICE CONDITION.
6. LAP METAL FLASHING OVER SHEET METAL ROOFING TO ALLOW MOISTURE TO RUN OVER AND OFF THE MATERIAL.
- B. FASTENERS: USE FASTENERS OF SIZES THAT WILL NOT PENETRATE COMPLETELY THROUGH SUBSTRATE.
1. STEEL ROOFING: USE STAINLESS-STEEL FASTENERS.
- C. METAL PROTECTION: WHERE DISSIMILAR METALS WILL CONTACT EACH OTHER OR CORROSIVE SUBSTRATES, PROTECT AGAINST GALVANIC ACTION BY PAINTING CONTACT SURFACES WITH BITUMINOUS COATING, BY APPLYING RUBBERIZED-ASPHALT UNDERLAYMENT TO EACH CONTACT SURFACE, OR BY OTHER PERMANENT SEPARATION AS RECOMMENDED BY FABRICATOR OF SHEET METAL ROOFING OR MANUFACTURERS OF DISSIMILAR METALS.
- D. CONCEAL FASTENERS AND EXPANSION PROVISIONS WHERE POSSIBLE IN EXPOSED WORK AND LOCATE TO MINIMIZE POSSIBILITY OF LEAKAGE. COVER AND SEAL FASTENERS AND

ANCHORS AS REQUIRED FOR A TIGHT INSTALLATION.

3.4 ON-SITE, ROLL-FORMED SHEET METAL ROOFING INSTALLATION

- A. GENERAL: INSTALL ON-SITE, ROLL-FORMED SHEET METAL ROOFING FABRICATED FROM UL-CERTIFIED EQUIPMENT TO COMPLY WITH EQUIPMENT MANUFACTURER'S WRITTEN INSTRUCTIONS FOR UL WIND-UPLIFT RESISTANCE CLASS INDICATED. PROVIDE SHEET METAL ROOFING OF FULL LENGTH FROM EAVE TO RIDGE UNLESS OTHERWISE RESTRICTED BY ON-SITE OR SHIPPING LIMITATIONS.
- B. STANDING-SEAM SHEET METAL ROOFING: FASTEN SHEET METAL ROOFING TO SUPPORTS WITH CONCEALED CLIPS AT EACH STANDING-SEAM JOINT AT LOCATION, AT SPACING, AND WITH FASTENERS RECOMMENDED BY MANUFACTURER OF PORTABLE ROLL-FORMING EQUIPMENT.
1. INSTALL CLIPS TO SUBSTRATE WITH SELF-TAPPING FASTENERS.
2. BEFORE PANELS ARE JOINED, APPLY CONTINUOUS BEAD OF SEALANT TO TOP OF FLANGE OF LOWER PANEL.
3. SEAMED JOINT: CRIMP STANDING SEAMS WITH MANUFACTURER-APPROVED MOTORIZED SEAMER TOOL SO CLEAT, SHEET METAL ROOFING, AND FIELD-APPLIED SEALANT ARE COMPLETELY ENGAGED.

3.5 ACCESSORY INSTALLATION

- A. GENERAL: INSTALL ACCESSORIES WITH POSITIVE ANCHORAGE TO BUILDING AND WEATERTIGHT MOUNTING AND PROVIDE FOR THERMAL EXPANSION. COORDINATE INSTALLATION WITH FLASHINGS AND OTHER COMPONENTS.
1. INSTALL COMPONENTS REQUIRED FOR A COMPLETE SHEET METAL ROOFING ASSEMBLY INCLUDING TRIM, COPINGS, SEAM COVERS, FLASHINGS, SEALANTS, GASKETS, FILLERS, METAL CLOSURES, CLOSURE STRIPS, AND SIMILAR ITEMS.
2. COMPLY WITH PERFORMANCE REQUIREMENTS, MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS, AND SMACNA'S "ARCHITECTURAL SHEET METAL MANUAL." PROVIDE CONCEALED FASTENERS WHERE POSSIBLE AND SET UNITS TRUE TO LINE AND LEVEL AS INDICATED. INSTALL WORK WITH LAPS, JOINTS, AND SEAMS THAT WILL BE PERMANENTLY WATERTIGHT AND WEATHER RESISTANT.
- 3.6 CLEANING AND PROTECTION
- A. REMOVE TEMPORARY PROTECTIVE COVERINGS AND STRIPPABLE FILMS, IF ANY, AS SHEET METAL ROOFING IS INSTALLED. ON COMPLETION OF SHEET METAL ROOFING INSTALLATION, CLEAN FINISHED SURFACES, INCLUDING REMOVING UNUSED FASTENERS, METAL FILINGS, POP RIVET STEMS, AND PIECES OF FLASHING. MAINTAIN IN A CLEAN CONDITION DURING CONSTRUCTION.

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. SECTION INCLUDES:
1. FORMED LOW-SLOPE ROOF SHEET METAL FABRICATIONS.
2. FORMED WALL SHEET METAL FABRICATIONS.

1.2 SUBMITTALS

- A. SHOP DRAWINGS: SHOW INSTALLATION LAYOUTS OF SHEET METAL FLASHING AND TRIM, INCLUDING PLANS, ELEVATIONS, EXPANSION JOINT LOCATIONS, AND KEYED DETAILS. DISTINGUISH BETWEEN SHOP- AND FIELD-ASSEMBLED WORK.
1. INCLUDE DETAILS FOR FORMING, JOINING, SUPPORTING, AND SECURING SHEET METAL FLASHING AND TRIM, INCLUDING PATTERN OF SEAMS, TERMINATION POINTS, FIXED POINTS, EXPANSION JOINTS, EXPANSION-JOINT COVERS, EDGE CONDITIONS, SPECIAL CONDITIONS, AND CONNECTIONS TO ADJOINING WORK.
- B. SAMPLES: FOR EACH EXPOSED PRODUCT AND FOR EACH FINISH SPECIFIED.
- 1.3 QUALITY ASSURANCE
- A. SHEET METAL FLASHING AND TRIM STANDARD: COMPLY WITH SMACNA'S "ARCHITECTURAL SHEET METAL MANUAL" UNLESS MORE STRINGENT REQUIREMENTS ARE SPECIFIED OR SHOWN ON DRAWINGS.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. ZINC-COATED (GALVANIZED) STEEL SHEET: ASTM A 653 G90 COATING DESIGNATION; STRUCTURAL QUALITY, MILL PHOSPHATIZED FOR FIELD PAINTING.
1. ZINC-COATED (GALVANIZED) STEEL SHEET: ASTM A 653 G90 COATING DESIGNATION; STRUCTURAL QUALITY.
2. EXPOSED FINISHES: APPLY THE FOLLOWING COIL COATINGS:
- a. HIGH-PERFORMANCE ORGANIC FINISH: THREE-COAT THERMOCURRED SYSTEM CONTAINING NOT LESS THAN 70 PERCENT POLYVINYLIDENE FLUORIDE RESIN BY WEIGHT; COMPLYING WITH PHYSICAL PROPERTIES AND COATING PERFORMANCE REQUIREMENTS OF AAMA 2604, EXCEPT AS MODIFIED FOR BELOW:
- 1) HUMIDITY AND SALT SPRAY RESISTANCE: 2000 HOURS
- 2) COLOR: AS SELECTED BY OWNER'S REPRESENTATIVE FROM MANUFACTURER'S FULL RANGE.
- B. LEAD SHEET: ASTM B 749, TYPE L51121, COPPER-BEARING LEAD SHEET.

2.2 MISCELLANEOUS MATERIALS

- A. GENERAL: PROVIDE MATERIALS AND TYPES OF FASTENERS, SOLDER, WELDING RODS, PROTECTIVE COATINGS, SEPARATORS, SEALANTS, AND OTHER MISCELLANEOUS ITEMS AS REQUIRED FOR COMPLETE SHEET METAL FLASHING AND TRIM INSTALLATION.
- B. FELT UNDERLAYMENT: ASTM D 226, TYPE II (NO. 30), ASPHALT-SATURATED ORGANIC FELT, NONPERFORATED.
1. SLIP SHEET: ROSIN-SIZED PAPER, MINIMUM 5 LB/100 SQ.FT.
- C. FASTENERS: WOOD SCREWS, ANNULAR THREADED NAILS, SELF-LOCKING RIVETS AND BOLTS, AND OTHER SUITABLE FASTENERS DESIGNED TO WITHSTAND DESIGN LOADS.
- a. EXPOSED FASTENERS: HEADS MATCHING COLOR OF SHEET METAL USING PLASTIC CAPS OR FACTORY-APPLIED COATING.
- b. FASTENERS FOR FLASHING AND TRIM: BLIND FASTENERS OR SELF-DRILLING SCREWS, GASKETED, WITH HEX WASHER HEAD.
- c. BLIND FASTENERS: HIGH-STRENGTH STAINLESS-STEEL RIVETS.
- d. MATCH FINISH OF MATERIAL BEING FASTENED.
- D. SEALING TAPE: PRESSURE-SENSITIVE, 100 PERCENT SOLIDS, POLYISOBUTYLENE COMPOUND SEALING TAPE WITH RELEASE-PAPER BACKING. PROVIDE PERMANENTLY ELASTIC, NONSAG, NONTXIC, NONSTAINING TAPE.
- E. ELASTOMERIC SEALANT: ASTM C 920, ELASTOMERIC POLYMER SEALANT AS RECOMMENDED BY SHEET METAL MANUFACTURER AND FABRICATOR OF COMPONENTS BEING SEALED, COMPLYING WITH DIVISION 7 SECTION "JOINT SEALANTS", OF TYPE, GRADE, CLASS, AND USE CLASSIFICATIONS REQUIRED TO SEAL JOINTS IN SHEET METAL FLASHING AND TRIM AND REMAIN WATERTIGHT.
- F. BUTYL SEALANT: ASTM C 1311, SINGLE-COMPONENT, SOLVENT-RELEASE BUTYL RUBBER SEALANT; POLYISOBUTYLENE PLASTICIZED; HEAVY BODIED FOR HOOKED-TYPE EXPANSION JOINTS WITH LIMITED MOVEMENT.
- G. BITUMINOUS COATING: COLD-APPLIED ASPHALT MASTIC, SSPC-PAINT 12, COMPOUNDED FOR 15-MIL DRY FILM THICKNESS PER COAT.
- 2.3 REGLETS
- A. REGLETS: UNITS OF TYPE, MATERIAL, AND PROFILE INDICATED, FORMED TO PROVIDE SECURE INTERLOCKING OF SEPARATE REGLET AND COUNTERFLASHING PIECES, AND COMPATIBLE WITH FLASHING INDICATED WITH FACTORY-MITERED AND -WELDED CORNERS AND JUNCTIONS.
1. MATERIAL: GALVANIZED STEEL, 0.217 INCH THICK.

2.4 FABRICATION, GENERAL

- A. GENERAL: CUSTOM FABRICATE SHEET METAL FLASHING AND TRIM TO COMPLY WITH RECOMMENDATIONS IN SMACNA'S "ARCHITECTURAL SHEET METAL MANUAL" THAT APPLY TO DESIGN, DIMENSIONS, METAL AND OTHER CHARACTERISTICS OF ITEM INDICATED. SHOP FABRICATE ITEMS WHERE PRACTICABLE. OBTAIN FIELD MEASUREMENTS FOR ACCURATE FIT BEFORE SHOP FABRICATION.
- B. FABRICATE SHEET METAL FLASHING AND TRIM WITHOUT EXCESSIVE OIL CANNING, BUCKLING, AND TOOL MARKS AND TRUE TO LINE AND LEVELS INDICATED, WITH EXPOSED EDGES FOLDED BACK TO FORM HEMS.
1. SEAMS: FABRICATE NONMOVING SEAMS IN ACCESSORIES WITH FLAT-LOCK SEAMS. TIN EDGES TO BE SEAMED, FORM SEAMS, AND SOLDER.
- C. SEALED JOINTS: FORM NONEXPANSION BUT MOVABLE JOINTS IN METAL TO ACCOMMODATE ELASTOMERIC SEALANT TO COMPLY WITH SMACNA RECOMMENDATIONS.
- D. EXPANSION PROVISIONS: WHERE LAPPED OR BAYONET-TYPE EXPANSION PROVISIONS IN THE WORK CANNOT BE USED, FORM EXPANSION JOINTS OF INTERMESHING HOOKED FLANGES, NOT LESS THAN 1 INCH (25 MM) DEEP, FILLED WITH ELASTOMERIC SEALANT CONCEALED WITHIN JOINTS.
- E. CONCEALED FASTENERS AND EXPANSION PROVISIONS WHERE POSSIBLE ON EXPOSED-TO-VIEW SHEET METAL FLASHING AND TRIM, UNLESS OTHERWISE INDICATED.
- F. FABRICATE CLEATS AND ATTACHMENT DEVICES FROM SAME MATERIAL AS ACCESSORY BEING ANCHORED OR FROM COMPATIBLE, NONCORROSIVE METAL, AND IN THICKNESS NOT LESS THAN THAT OF METAL BEING SECURED.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. PARAPET SCUPPERS: FABRICATE SCUPPERS OF DIMENSIONS REQUIRED WITH CLOSURE FLANGE TRIM TO EXTERIOR, 4-INCH- (100-MM-) WIDE WALL FLANGES TO INTERIOR, AND BASE EXTENDING 4 INCHES (100 MM) BEYOND CANT OR TAPERED STRIP INTO FIELD OF ROOF. FASTEN GRAVEL GUARD ANGLES TO BASE OF SCUPPER.
- 2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS
- A. ROOF-EDGE FLASHING (GRAVEL STOP) AND FASCIA CAP: FABRICATE IN MINIMUM 96-INCH- (2400-MM-) LONG, BUT NOT EXCEEDING 10-FOOT- (3-M-) LONG, SECTIONS. FURNISH WITH 6-INCH- (150-MM-) WIDE, JOINT COVER PLATES.
1. FABRICATE SCUPPERS FROM PREPAINTED, METALLIC-COATED STEEL: 0.0276 INCH THICK..
- B. BASE FLASHING: FABRICATE FROM THE FOLLOWING MATERIAL:
1. GALVANIZED STEEL: 0.0276 INCH THICK.
- C. COUNTERFLASHING AND FLASHING RECEIVERS: FABRICATE FROM THE FOLLOWING MATERIAL:
1. PREPAINTED, METALLIC-COATED STEEL: 0.0217 INCH THICK.
- D. ROOF-PENETRATION FLASHING: FABRICATE FROM THE FOLLOWING MATERIAL:
1. LEAD: 4.0 LB/SQ.FT., HARD TEMPERED.
- E. ROOF-DRAIN FLASHING: FABRICATE FROM THE FOLLOWING MATERIAL:
1. LEAD: 4.0 LB./SQ.FT., HARD TEMPERED.

PART 3 - EXECUTION

- 3.1 INSTALLATION, GENERAL
- A. GENERAL: ANCHOR SHEET METAL FLASHING AND TRIM AND OTHER COMPONENTS OF THE WORK SECURELY IN PLACE, WITH PROVISIONS FOR THERMAL AND STRUCTURAL MOVEMENT. USE FASTENERS, SOLDER, WELDING RODS, PROTECTIVE COATINGS, SEPARATORS, SEALANTS, AND OTHER MISCELLANEOUS ITEMS AS REQUIRED TO COMPLETE SHEET METAL FLASHING AND TRIM SYSTEM.
1. TORCH CUTTING OF SHEET METAL FLASHING AND TRIM IS NOT PERMITTED.
- B. METAL PROTECTION: WHERE DISSIMILAR METALS WILL CONTACT EACH OTHER OR CORROSIVE SUBSTRATES, PROTECT AGAINST GALVANIC ACTION BY PAINTING CONTACT SURFACES WITH BITUMINOUS COATING OR BY OTHER PERMANENT SEPARATION AS RECOMMENDED BY FABRICATOR MANUFACTURERS OF DISSIMILAR METALS.
- C. INSTALL EXPOSED SHEET METAL FLASHING AND TRIM WITHOUT EXCESSIVE OIL CANNING, BUCKLING, AND TOOL MARKS.
- D. INSTALL SHEET METAL FLASHING AND TRIM TRUE TO LINE AND LEVELS INDICATED. PROVIDE UNIFORM, NEAT SEAMS WITH MINIMUM EXPOSURE OF SOLDER, WELDS, AND ELASTOMERIC SEALANT.
- E. INSTALL SHEET METAL FLASHING AND TRIM TO FIT SUBSTRATES AND TO RESULT IN WATERTIGHT PERFORMANCE. VERIFY SHAPES AND DIMENSIONS OF SURFACES TO BE COVERED BEFORE FABRICATING SHEET METAL.
1. SPACE CLEATS NOT MORE THAN 12 INCHES APART. ANCHOR EACH CLEAT WITH TWO FASTENERS.
- F. EXPANSION PROVISIONS: PROVIDE FOR THERMAL EXPANSION OF EXPOSED FLASHING AND TRIM. SPACE MOVEMENT JOINTS AT A MAXIMUM OF 10 FEET (3 M) WITH NO JOINTS ALLOWED WITHIN 24 INCHES (600 MM) OF CORNER OR INTERSECTION. WHERE LAPPED OR BAYONET-TYPE EXPANSION PROVISIONS CANNOT BE USED OR WOULD NOT BE SUFFICIENTLY WATERTIGHT, FORM EXPANSION JOINTS OF INTERMESHING HOOKED FLANGES, NOT LESS THAN 1 INCH (25 MM) DEEP, FILLED WITH ELASTOMERIC SEALANT CONCEALED WITHIN JOINTS.
- G. FASTENERS: USE FASTENERS OF SIZES THAT WILL PENETRATE SUBSTRATE NOT LESS THAN 1-1/4 INCHES (32 MM) FOR NAILS AND NOT LESS THAN 3/4 INCH (19 MM) FOR WOOD SCREWS.
1. GALVANIZED OR PREPAINTED, METALLIC-COATED STEEL: USE STAINLESS-STEEL FASTENERS.
- H. SEAL JOINTS WITH ELASTOMERIC SEALANT AS REQUIRED FOR WATERTIGHT CONSTRUCTION.
- I. SOLDERED JOINTS: CLEAN SURFACES TO BE SOLDERED, REMOVING OIL