

Part 1 General

1.1 REFERENCES

- .1 Canadian Urethane Foam Contractors' Association Inc. (CUFCA)
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101, Fire Endurance Tests of Building Construction and Materials.
 - .2 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.
 - .3 CAN/ULC-S705.1, Standard for Thermal Insulation Spray Applied Rigid Foam, Medium Density, Material Specification.
 - .4 CAN/ULC-S705.2, Standard for Thermal Insulation Spray Applied Rigid Foam, Medium Density, Installer's Responsibilities-Specification.

1.2 TEST REPORTS

- .1 Submit test reports, verifying qualities of foam sealant meet or exceed requirements of this specification.
- .2 Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.

1.3 QUALITY ASSURANCE

- .1 Applicators to conform to CUFCA Quality Assurance Program.

1.4 SAFETY REQUIREMENTS

- .1 Protect workers as recommended by CAN/ULC-S705.2 and manufacturer's recommendations:
 - .1 Workers must wear gloves, respirators, dust masks, eye protection, protective clothing when applying foam sealant.
 - .2 Workers must not eat, drink or smoke while applying foam sealant.

1.5 PROTECTION

- .1 Ventilate area in accordance with Section 01 51 00 - Temporary Utilities.
- .2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24 hours after application to maintain non-toxic, unpolluted, safe working conditions.
- .3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.
- .4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.
- .5 Dispose of waste foam sealant daily in location designated by Owner's Representative and decontaminate empty drums in accordance with foam sealant manufacturer's instructions.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Apply foam sealant only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Low expanding, one-component, polyurethane foam sealant, curing to a semi-rigid, closed cell urethane foam providing a RSI of 0.9 per 25.4 mm. To meet the following physical properties:
 - .1 Density: 25.7 kg/m³
 - .2 Compressive Strength Parallel @ 10%: 69-96 psi
 - .3 Tensile Strength: 103 psi
 - .4 Water Vapour Transmission: 5.97 perms
 - .5 Flame Spread: 20
 - .6 Smoke Development: 70

Part 3 EXECUTION

3.1 APPLICATION

- .1 Apply foam sealant to clean surfaces in accordance manufacturer's printed instructions. Surfaces to be free of dust, dirt, oil and other foreign materials.
- .2 Cover surfaces not intended to be foamed.
- .3 Apply foam sealant to perimeter of openings indicated and to thickness as recommended by manufacturer. Trim excess cured foam from finished area.
- .4 Cover exposed urethane foam sealants to protect from adverse affects from ultraviolet light (sunlight).

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation methods providing primary air/vapour barrier materials and assemblies.
- .2 Air/vapour barrier materials to provide continuous seal between components of building envelope and building penetrations.

1.2 RELATED SECTIONS

- .1 Section 01 45 00 - Quality Control.
- .2 Section 01 61 00 - Common Product Requirements.
- .3 Section 07 92 00 - Joint Sealants.

1.3 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.13M, Sealing Compound, One Component, Elastomeric Chemical Curing.
 - .2 CAN/CGSB-19.18M, Sealing Compound, One Component, Silicone Base Solvent Curing.
 - .3 CAN/CGSB-19.24M, Multi-Component, Chemical Curing Sealing Compound.
 - .4 CGSB 19-GP-14M, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
- .2 National Building Code of Canada (NBCC)
 - .1 NBCC, Part 5 - Environmental Separation
- .3 Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification.

1.4 QUALITY ASSURANCE

- .1 Perform Work in accordance with Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification requirements for materials and installation.
- .2 Perform Work in accordance with National Air Barrier Association - Professional Contractor Quality Assurance Program and requirements for materials and installation.

1.5 QUALIFICATIONS

- .1 Applicator: Company specializing in performing work of this section with minimum 5 years documented experience with installation of air/vapour barrier systems. Complete installation must be approved by the material manufacturer.
- .2 Applicator: Company who is currently licensed by certifying organization must maintain their license throughout the duration of the project.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions. Deliver membrane materials in factory wrapped packaging indicating name of manufacturer and product.
- .3 Avoid spillage. Immediately notify Owner's Representative if spillage occurs and start clean up procedures.
- .4 Clean spills and leave area as it was prior to spill.
- .5 Store roll materials on end in original packaging.
- .6 Store primers at temperatures of 5°C and above to facilitate handling. Keep solvent away from open flame and excessive heat.

1.7 PROJECT ENVIRONMENTAL REQUIREMENTS

- .1 Do not install solvent curing sealants or vapour release adhesive materials in enclosed spaces without ventilation.
- .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
- .3 Maintain temperature and humidity recommended by materials manufactures before, during and after installation.

1.8 WARRANTY

- .1 Provide a written warranty for work of this section from Manufacturer for failure due to defective materials and from contractor for failure due to defective installation workmanship for ten (10) years respectively from the date of Substantial Completion.
- .2 Include coverage of installed sealant and sheet materials which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion or do not cure.

Part 2 PRODUCTS

2.1 SHEET MEMBRANE AIR BARRIER (TYPE 1)

- .1 Sheet Seal: Self-Adhesive bitumen laminated to high-density polyethylene film, nominal total thickness of 1.0 mm.
 - .1 Membrane Physical Properties

.1	Application	min 5°C
.2	Service Temperature	-40°C to 70°
.3	Elongation	min 200%
.4	Tensile strength	min 2.4 Mpa
.5	Puncture Resistance	min 178 N
.6	Water vapour transmission	2.8mg/Pa.s.m ² (0.05 perms)
.7	Moisture Absorption	0.1%
.8	Air Leakage at 75 Pa	0.02L/Sm ²
.9	Air Leakage of the 3000 Pa test	No change
 - .2 Sheet Seal: Self-Adhered Elastomeric Film Air Vapour Barrier Membrane with high tack acrylic adhesive, nominal total thickness of 0.25 mm. Primer not required on most construction surfaces.
 - .1 Membrane Physical Properties

.1	Application	min -18° C
.2	Service Temperature	-40° C to 80° C
.3	Elongation	ASTM D882 – min 700%
.4	Tensile Strength	min 12 Mpa
.5	Water Vapour Transmission	8 ng/Pa.s.m ² (0.14 perms)
.6	Moisture Absorption	0.1%
.7	Air Leakage at 75 Pa	0.01 L/Sm ²
.8	Air Leakage of the 3000 Pa Test	No Change

2.2 LIQUID MEMBRANE AIR/VAPOUR BARRIER (TYPE 2)

- .1 Single component, liquid applied, water-based, polymer-modified air barrier providing a seamless, elastomeric membrane when cured, wet film thickness 1.53 mm, cured film thickness 1.15 mm.
- .2 Liquid membrane Air/Vapour physical properties:
 - .1 Application Temperature: min. 4° C
 - .2 Service Temperature: -29° C to 49° C
 - .3 Elongation: 1500%
 - .4 Tensile Strength: 0.10 MPa
 - .5 Water Vapour Permeance: 0.03 perms
 - .6 Air Leakage at 75 Pa: < 0.02 L/s/m²

2.3 LIQUID MEMBRANE VAPOUR PERMEABLE AIR BARRIER (TYPE 3)

- .1 Water-based air-barrier providing a tough, seamless, elastomeric membrane when cured, allowing moisture vapour to pass through it, wet film thickness 2.3 mm, cured film thickness 1.15 mm.
- .2 Liquid membrane vapour permeable air barrier physical properties:
 - .1 Application Temperature: min. 4° C
 - .2 Service Temperature: -29° C to 49° C
 - .3 Elongation: 1500%
 - .4 Water Vapour Permeance: 12 perms
 - .5 Air Leakage at 75 Pa: < 0.02 L/s/m²

2.4 SHEET MEMBRANE VAPOUR PERMEABLE AIR BARRIER (TYPE 4)

- .1 Self-adhering reinforced modified polyolefin tri-laminate water resistive, vapour permeable, air barrier membrane to the following properties:
 - .1 Weight: 160 g/m²
 - .2 Water Vapour Transmission: 202 g/m²
 - .3 Tensile Strength: 182N MD and 129N CD
 - .4 Water Vapour Permeance: 1658 ng/Pa.m².s
 - .5 Air Leakage: <0.02 L/s/m²
 - .6 Average Dry Breaking Force: 565N MD and 405N CD

2.5 EXTERIOR WALL SHEATHING PAPER

- .1 Spunbonded olefin type coated impregnated sheathing paper to CAN/CGSB-51.32 single ply, as indicated.

2.6 SEALANTS

- .1 Sealants in accordance with Section 07 92 00 - Joint Sealants.
- .2 Primer: recommended by sealant manufacturer.
- .3 Primer for type 4 Air Barrier: quick setting, synthetic rubber based adhesive aerosol.

2.7 SCHEDULE

- .1 Type 1 Air Barrier: for installation on any solid surface.
- .2 Type 2 Air Barrier: for installation on masonry or concrete surfaces.
- .3 Type 3 Air Barrier: for installation on wood/gypsum board surfaces.
- .4 Type 4 Air Barrier: for installation on any solid surface approved by manufacturer.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Verify that surfaces and conditions are ready to accept the Work of this section.
- .2 Ensure all surfaces are clean, dry, sound, smooth, continuous and comply with air barrier manufacturer's requirements.
- .3 Report any unsatisfactory conditions to the Owner's Representative in writing.
- .4 Do not start work until deficiencies have been corrected.

3.2 PREPARATION

- .1 Remove loose or foreign matter which might impair adhesion of materials.
- .2 Ensure all substrates are clean of oil or excess dust; all masonry joints struck flush, and open joints filled; and all concrete surfaces free of large voids, spalled areas or sharp protrusions.
- .3 Ensure all substrates are free of surface moisture prior to application of membrane and primer.
- .4 Ensure metal closures are free of sharp edges and burrs.
- .5 Prime substrate surfaces to receive adhesive and sealants in accordance with manufacturer's instructions.

3.3 INSTALLATION (SHEET MEMBRANE)

- .1 Install materials in accordance with manufacturer's instructions.
- .2 Over the properly prepared substrate surface apply primer, as per manufacturer's recommendations, with a roller and allow drying to a tacky surface. Prime only area to be covered in a working day. Re-prime area not covered with membrane within 24 hours.
- .3 After primer has dried, using a hand roller firmly press the entire membrane onto the primed surface, in strict accordance with membrane manufacturer's written instructions.

- .4 Ensure complete coverage of and adhesion of all substrates to receive membrane, including wall penetrations. Co-operate with other trades to ensure continuity of membrane.
- .5 Overlap membrane 50mm and carefully smooth out with a roller to ensure full continuous bond throughout overlaps without fissures or fishmouthing.
- .6 It is important that a complete air seal be achieved. Be responsible for the completeness of membrane wherever it is not specifically detailed. Consult with Owner's Representative if there is any doubt as to the integrity of membrane, whether detailed or not.
- .7 In order to ensure a complete seal, seal membrane to all penetrations in an approved manner.
- .8 Apply a trowelled bead of mastic to all terminations of the membrane at the end of a day's work.
- .9 Do not enclose membrane until it has been inspected and approved by Owner's Representative. Inform Owner's Representative two (2) working days prior to required inspection.

3.4 INSTALLATION (LIQUID MEMBRANE AIR/VAPOUR BARRIER)

- .1 Install materials in accordance with manufacturer's instructions.
- .2 Prepare surfaces ensuring they are clean, structurally sound and smooth. Patch all cracks, small voids, irregularities and small deformities with manufacturer approved patch material.
- .3 Apply minimum 150 mm wide self-adhering air barrier strip between joints of dissimilar building materials.
- .4 Apply liquid membrane to substrate by spraying or nap roller as per manufacturer's instructions.
- .5 Ensure complete coverage of and adhesion of all substrates to receive liquid membrane, including wall penetrations. Co-operate with other trades to ensure continuity of membrane.
- .6 It is important that a complete air seal be achieved. Be responsible for the completeness of liquid membrane wherever it is not specifically detailed. Consult with Owner's Representative if there is any doubt as to the integrity of the liquid membrane, whether detailed or not.
- .7 In order to ensure a complete seal, seal liquid membrane to all penetrations in an approved manner.
- .8 Do not enclose membrane until it has been inspected and approved by Owner's Representative. Inform Owner's Representative two (2) working days prior to required inspection.

3.5 INSTALLATION (LIQUID MEMBRANE VAPOUR PERMEABLE AIR BARRIER)

- .1 Install materials in accordance with manufacturer's instructions.
- .2 Prepare surfaces ensuring they are clean, structurally sound and smooth. Patch all cracks, small voids, irregularities and small deformities with manufacturer approved patch material.

- .3 Joints in exterior sheeting of 6.4 mm or greater to be covered with tape or filled with mastic caulking compound prior to application of liquid membrane as per manufacturer's recommendations.
- .4 Apply minimum 150 mm wide self-adhering air barrier strip between joints of dissimilar building materials.
- .5 Apply liquid membrane to substrate by spraying or roller as per manufacturer's instructions.
- .6 Ensure complete coverage of and adhesion of all substrates to receive liquid membrane, including wall penetrations. Co-operate with other trades to ensure continuity of membrane.
- .7 It is important that a complete air seal be achieved. Be responsible for the completeness of liquid membrane wherever it is not specifically detailed. Consult with Owner's Representative if there is any doubt as to the integrity of the liquid membrane, whether detailed or not.
- .8 In order to ensure a complete seal, seal liquid membrane to all penetrations in an approved manner.
- .9 Do not enclose membrane until it has been inspected and approved by Owner's Representative. Inform Owner's Representative two (2) working days prior to required inspection.

3.6 PROTECTION OF WORK

- .1 Protect finished Work in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Do not permit adjacent work to damage work of this section.
- .3 Ensure finished Work is protected from climatic conditions.

3.7 INSPECTION

- .1 Carefully inspect for continuity of air barrier prior to placement of insulation.
- .2 Repair all deficient membrane areas.
- .3 Misaligned or inadequately lapped seams, punctures or other damage must be repaired with a patch of air barrier membrane extending 50mm in all directions from edge of damaged areas.
- .4 Cover membrane immediately after Owner's Representative's inspection to protect from damage by other trades.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Removal of stone cover, membrane, membrane flashing, metal counter flashing, deck sheathing, and air/vapour barrier, exposing existing deck.
- .2 Provision of new deck sheathing, air/vapour barrier, insulation, membrane, membrane flashing and metal counter flashing.

1.2 REFERENCE STANDARDS

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C 1177/C1177M, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .2 Canadian General Standards Board (CGSB).
 - .1 CGSB 37-GP-19M, Cement, Plastic, Cutback Tar.
 - .2 CAN/CGSB-37.29, Rubber- Asphalt Sealing Compound.
 - .3 CAN/CGSB - 51.33 Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
- .3 Canadian Roofing Contractor's Association (CRCA)
 - .1 CRCA Specification Manual.
- .4 Underwriters Laboratories' of Canada (ULC)
 - .1 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S702.2, Standard for Mineral Fibre Thermal Insulation for Buildings.
 - .3 CAN/ULC-S704, Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.2 PERFORMANCE REQUIREMENTS

- .1 Perform two ply roof membrane work, and related metal flashing work, in accordance with the roofing membrane manufacturer's written recommendations as well as the requirements of the Canadian Roofing Contractors Association.
- .2 Where modifications to the Canadian Roofing Contractors Association requirements are included in this project specification, then such modifications shall govern in case of conflict.

1.3 STORAGE AND HANDLING

- .1 Store materials off-ground in weatherproof storage.
- .2 Store materials in upright position. Store membrane rolls with selvage edge up, store as per manufacturer's requirements to meet warranty.
- .3 Remove only in quantities required for same day use.
- .4 Place plywood runways over work to protect work and enable work flow.
- .5 Store sealants at +5°C minimum.

- .6 Store insulation protected from daylight, weather and deleterious materials.

1.4 ENVIRONMENTAL REQUIREMENTS

- .1 Do not install roofing when temperature remains below -18°C for torch application, or to manufacturers' recommendations for mop application.
- .2 Minimum temperature for solvent-based adhesive is -5°C.
- .3 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.5 PROTECTION

- .1 Fire Extinguishers: maintain one stored pressure rechargeable type with hose and shut-off nozzle, ULC labeled for A, B and C class protection. Size 9 kg on roof per torch applicator, within 10 m of torch applicator.
- .2 Contractor to provide safety person on site at all times during the roofing process and shall remain on site two (2) hours after work has ceased or after torching has stopped. Safety person shall scan the perimeter and roof penetration details with a hand held infrared gun.
- .3 Remove only as much existing roofing as can be replaced by the end of each working day.
- .4 Contractor to verify existing under deck mounted electrical conduits prior to installing mechanically fastened roof assembly.

1.6 WARRANTY

- .1 Provide a written guarantee signed and issued in the name of The Owner by the Roofing System Manufacturer stating that roofing membrane is free from manufacturing defects and that the system will stay in place and remain leak proof for a period of ten (10) years from date of Substantial Certificate of Completion, subject to the standard limitations and conditions of the manufacturer.
- .2 Provide a written guarantee, signed and issued in the name of the Owner by the Contractor, stating that the roofing application has been performed in compliance with the plans and specifications, and for two (2) years from the date of Substantial Certificate of Completion, the Contractor shall repair, at no expense to the Owner, any defects which result of a failure to comply with the plans and specifications.
- .3 Defective work shall include, but not limited to: leaking, wind uplift, delamination of roofing materials, reduction of thermal value due to moisture in insulation, crazing and ridging.
- .4 Warranty to be non-prorated.

1.7 COMPATIBILITY

- .1 Compatibility between components of roofing system is essential. Provide written declaration to Owner's Representative stating that materials and components, as assembled in system, meet this requirement.

1.8 QUALITY ASSURANCE

- .1 Membrane: applied by applicator acceptable to Owner's Representative and approved by manufacturer for application of its products.

- .2 Applicators: minimum 5 years proven experience.
- .3 Manufacturer's representative:
 - .1 Inspect roofing system at the start of construction, midway and as required for commissioning. Additional inspections may be carried out at the discretion of the Roofing System Manufacturer.
 - .2 Provide technical assistance where required to correct installation of roofing system.
- .4 Refer to Section 01 33 00 – Submittal Procedures and Section 01 45 00 - Quality Control for submission procedures.
- .5 Submit laboratory test reports certifying compliance of bitumens and membranes with specification requirements.

Part 2 PRODUCTS

2.1 THERMAL BARRIER AND AIR/VAPOUR BARRIER

Thermal Barrier: Pre-primed glass mat faced gypsum panel non-asphaltic, highly filled proprietary heat-cured coating on one side, to ASTM C1177, 12.7 mm thick.

- .1 Air/Vapour Barrier: Self adhering peel and stick air/vapour barrier composed of Styrene-Butadiene-Styrene (SBS) modified bitumen reinforced with high density polyethylene film, anti slip surface, minimum thickness 1.0 mm.

2.2 INSULATION AND COVER BOARD COMPONENTS

- .1 For flat roof decks or roof structures, provide custom designed tapered insulation with minimum slope of 2.0 mm in 100 mm (2%). Taper insulation to drain, minimum RSI value at drain to be 1.3.
- .2 Polyisocyanurate Insulation and Protection Board:
 - .1 Polyisocyanurate Insulation:
 - .1 To CAN/ULC-S704, glass reinforced felt facers, square edged and containing no CFC.
 - .2 Insulation value thickness per cm based on values listed in the latest edition of NRC - Evaluation Listings.
 - .3 Provide two layers of insulation installed with staggered joints.
 - .2 Protection Board: Cellulose fibreboard CAN/ULC-S706 or glass / mineral fibreboard CAN/ULC-S702. 12.7 mm thick, square edges.
- .3 Total assembly RSI value: Minimum average RSI value of assembly insulation components to be 4.0. Insulation assembly components to consist of thermal barrier, insulation and cover board.

2.3 BASE SHEET

- .2 Base Sheet: Base sheet: to CGSB-37.56-M, Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, non woven, polyester reinforcement, weighing 180 g/m².
 - .1 Type 2, fully adhered.
 - .2 Class P-plain surfaced.
 - .3 Grade 2.

- .4 Top and bottom surfaces:
 - .1 Polyethylene/polyethylene.
- .5 Base sheet membrane properties:
 - .1 Strain energy (longitudinal/transversal): 9.0/7.0 kN/m.
 - .2 Breaking strength (longitudinal/transversal): 17.0/12.5 N/5 cm.
 - .3 Ultimate elongation (longitudinal/transversal): 60/65 %.
 - .4 Tear resistance: 60 N.
 - .5 Cold bending at -30 degrees C : no cracking.
 - .6 Static puncture resistance: > 400.
 - .7 Dimensional Stability: -0.3 / 0.3 %.

1.9 CAP SHEET

- .1 Cap sheet: to CGSB-37.56-M, Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, glass, polyester reinforcement, weighing 250 g/m².
 - .1 Type 2, fully adhered.
 - .2 Class G-granule surfaced.
 - .3 Grade 2.
 - .4 Bottom surface polyethylene.
 - .5 Colour to be light grey unless otherwise indicated.
 - .6 Cap sheet membrane properties:
 - .1 Strain energy (longitudinal/transversal): 10.0/10.0 kN/m.
 - .2 Breaking strength (longitudinal/transversal): 18.0/10.0 kN/m.
 - .3 Ultimate elongation (longitudinal/transversal): 60/65 %.
 - .4 Tear resistance: 75 N.
 - .5 Cold bending at -30 degrees C: No cracking.
 - .6 Static puncture resistance: > 420.
 - .7 Dimensional Stability: -0.8 / -0.2 %.
- .2 Minimum total thickness if base sheet and cap sheet combined to be 5.8 mm. Cap sheet and base sheet to be of same manufacturer.
- .3 Install contrasting colour cap sheet, 2.0 m wide, along the entire perimeter of all roof sections. Contrasting colour cap sheet to be installed over cap sheet. Colour to be as per Owner's Representative selection from manufacturer's standard colour range.

1.10 BASE SHEET FLASHING

- .1 To CGSB-37.56-M, Type 2, Class C, Grade 2, non-woven polyester reinforced 180g/m², self-adhesive membrane with polyethylene top face and release film under face.

1.11 SEALERS

- .1 Mastic made of synthetic rubbers, plasticized with bitumen and solvents with aluminum pigments to provide greater resistance to U.V.

1.12 PRIMERS

- .1 For self-adhesive membranes: A blend of elastomeric bitumen, volatile solvents and adhesive enhancing resins used to prime porous and non-porous substrates such as

gypsum board, wood, concrete or metal to enhance the adhesion of self-adhesive membranes at temperatures above -10°C.

- .2 For heat welded membranes: A blend of elastomeric bitumen, volatile solvents and adhesive enhancing additives used to prime concrete or metal substrates to enhance the adhesion of torch-applied membranes.

1.13 FASTENERS

- .2 Fasteners: minimum #14 mechanical fasteners made of case-hardened carbon steel with corrosion resistance coating, complying with FM standards. 75 mm diameter round or hexagon stress plates complying with CSA B35.3 and FM 4470 approval standards, diameter and lengths as required to suit total assembly thickness. Ensure fasteners have the following deck penetration:
 - .1 For metal decks: minimum 19 mm and maximum 25 mm longer than assembly being secured. Fasteners to engage metal deck top flange. At gymnasium locations, fastener points of all fasteners to be removed.
- .2 Roofing adhesive: single-component, moisture cured, solvent free polyurethane adhesive, dispensed from a portable disposable pre-pressurized container.

Part 3 EXECUTION

3.1 ACCEPTABLE INSTALLERS

- .1 Installation of materials of this section shall be by the manufacturer's approved installers, in strict accordance with manufacturer's installation instructions, and in accordance with Section 01 70 00, Execution Requirements.

3.2 EXAMINATION

- .1 Examine work in accordance with Section 01 70 00, Execution Requirements.
- .2 Inspect roof deck to ensure deck is clean and smooth, free of depressions, waves or projections, properly sloped to drains.
- .3 Ensure all roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set.
- .4 Ensure deck is dry and free of all snow or ice.

3.3 PROTECTION

- .1 Schedule all work to minimize risk to existing building and finishes as a result of exposure to weather.
- .2 Do not remove areas of existing roofing membrane in quantities greater than that which can be re-roofed or protected with temporary measures during the same day.
- .3 Provide all necessary continuous weather protection of existing building and finishes for duration of the work. Provide all necessary temporary closures at end of each day's operation.
- .4 Provide all necessary drainage pumps required to remove water from roof areas. Maintain pumps on site continuously to eliminate water collection on roof areas.
- .5 Protect surrounding surfaces against damage from roofing work. Where hoisting is necessary, hang tarpaulins to protect walls.

- .6 Remove bituminous markings from finished surfaces. In all areas where finished surfaces are soiled by bitumen or any other source of soiling caused by the work of this section, consult manufacturer of surfaces as to recommended cleaning methods and conform to their advice.
- .7 Repair all damage to existing buildings, finishes, furnishings, fixtures and equipment damaged as a result of failure to provide above stated requirements, to the satisfaction of the Owner, at no additional cost to the Owner.
- .8 Employ on site safety person who shall be present at all times during the re-roofing process, and shall remain on site for a minimum of two (2) hours after completion of the work has ceased or after torching of membranes has stopped for the day.
- .9 During this time, the safety person shall scan the perimeter of all roof areas, and all roof penetration details with a hand held infrared gun.
- .10 Conduct cut tests at localized hot spots to investigate for potential fire hazard.
- .11 Take all necessary precautions and action to eliminate potential fire hazards.

3.4 PREPARATION

- .1 Apply roofing over clean, dry surfaces during fair weather, and in accordance with the manufacturer's recommendations and as amended herein.
- .2 Maintain roofing equipment in good working order. Heat bitumen in accordance with manufacturer's recommendation.

3.5 VAPOUR BARRIER EXTENSIONS

- .1 Apply primer to all surfaces at the rate of 0.30 litres/m².
- .2 Install vapour barrier extension membrane onto the primed surfaces. Remove small length of protective film and unroll exposed membrane for initial adherence. Continue removing protective film and advance roll onto substrate. Ensure surface remains smooth. Avoid wrinkling or warping.
- .3 If roll is not properly aligned, do not push to one side or another. Instead, cut roll and realign properly by peeling back the paper backing on the underside and adhering the membrane to the substrate.
- .4 Overlap end joints 150 mm minimum. Overlap adjacent rolls 80 mm by removing protective film from top face of side laps. Do not remove protective paper film before installation to avoid accumulation of any debris on exposed roll. Overlap all end joints 150 mm minimum. Stagger end laps 300 mm minimum.
- .5 Apply hand pressure over the surface of the membrane in order to remove any trapped air beneath the membrane.
- .6 Watch for air pockets beneath end joints. Do not lance, instead roll air towards edge of seams.
- .7 Torch weld all parts of overlaps not coated with self-adhesive bitumen.
- .8 Repair holes and tears in the membrane with the appropriate membrane material. Repair must exceed the affected surface area by at least 100 mm. The membrane piece applied for the repair must be sealed around its edges with mastic.

3.6 VAPOUR BARRIER MEMBRANE INSTALLATION

- .1 Apply primer to all surfaces at the rate of 0.30 litres/m².
- .2 Install vapour barrier membrane onto the primed surfaces. Remove small length of protective film and unroll exposed membrane for initial adherence. Continue removing protective film and advance roll onto substrate. Ensure surface remains smooth. Avoid wrinkling or warping.
- .3 If roll is not properly aligned, do not push to one side or another. Instead, cut roll and realign properly by peeling back the paper backing on the underside and adhering the membrane to the substrate.
- .4 Overlap end joints 150 mm minimum. Overlap adjacent rolls 80 mm by removing protective film from top face of side laps. Do not remove protective paper film before installation to avoid accumulation of any debris on exposed roll. Overlap all end joints 150 mm minimum. Stagger end laps 300 mm minimum.
- .5 Apply hand pressure over the surface of the membrane in order to remove any trapped air beneath the membrane. Complete vapour barrier application by rolling over the entire surface as it is installed with 34 kg (75-lb) rollers; roll along each centre and each overlap and finish along sides by aligning roller edge to lower part of overlap.
- .6 Watch for air pockets beneath end joints. Do not lance, instead roll air towards edge of seams.
- .7 Torch weld all parts of overlaps not coated with self-adhesive bitumen.
- .8 Repair holes and tears in the membrane with the appropriate membrane material. Repair must exceed the affected surface area by at least 100 mm. The membrane piece applied for the repair must be sealed around its edges with mastic.

3.7 TAPERED BASE INSULATION INSTALLATION

- .1 Tapered base insulation shall be laid in minimum 10 mm thickness at roof drains, with positive slope to ensure slope for drainage, in courses parallel to edges of roof areas.
- .2 Tapered base insulation shall be cut and fitted where roof deck intersects vertical surfaces.
- .3 Edges shall be butted to provide moderate contact, but not deformed.
- .4 Bond tapered base insulation to substrate with adhesive.
 - .1 Surfaces and substrates must be dry, properly prepared, free of dirt, dust debris, oils, loose and/or embedded gravel; un-adhered coatings, deteriorated existing membrane, and any other contaminates that may result in a surface that is not sound or un-even and affects adhesion.
 - .2 Apply adhesive in conformance with manufacturer's written recommendations. Increase the rate of adhesive application at perimeters, corners and large curb areas in conformance with FM 1-28.
 - .3 Allow adhesive to rise prior to placing the tapered base insulation into the wet adhesive (do not allow adhesive to skin over).
 - .4 Step in boards to ensure uniform contact to substrate. If required, score boards and break to lay flat to roof surface. All vertical joints between multiple layers of insulation boards shall be staggered.

3.8 PROTECTION BOARD

- .1 Protection board panels shall be perfectly abutted, as level to each other as possible, and perfectly adhered to the substrate. Vertical joints between the substrate and the panels shall be staggered vertically and horizontally.
- .2 Establish the location and extent of all existing mechanical and electrical services on underside of existing metal deck in the work area. Ensure services are not damaged by protection board anchors.
- .3 Apply protection board to substrate with specified adhesive, applied in accordance with shop drawings, and Factory Mutual (FM) requirements for Class I insulated steel deck construction (FM Bulletin 1-28), including Class I-60 wind resistance.
- .4 Supplement adhesive with fasteners, in accordance with shop drawings, and Factory Mutual (FM) requirements for Class I insulated steel deck construction (FM Bulletin 1-28), including Class I-60 wind resistance. Fasteners shall be attached to steel deck's upper flutes.
- .5 Apply only as many protection board panels as can be covered in the same day.
- .6 Around roof drains, cut out a slight slope of 0 to 10 mm in a 600-mm radius.
- .7 Install fire protection tape to all joints in protection board prior to the installation of the torch-applied membrane.

3.9 TWO PLY ROOF MEMBRANE BASE SHEET INSTALLATION

- .1 Prime substrate before installing base sheet membrane.
- .2 Re-prime substrate if installation of base sheet membrane does not proceed within 8 hours of initial priming.
- .3 Base sheet membrane shall be unrolled starting at the low point of the roof. Base sheet membrane shall be re-rolled from both ends prior to bonding with hot asphalt. Care shall be taken to ensure good alignment of the first roll (parallel with the edge of the roof).
- .4 This membrane shall be laid with side laps of 75 mm and 150 mm end laps, bonded and sealed with hot asphalt. End laps and side laps shall be torch welded.
- .5 Ensure the membrane is properly bonded, without air pockets, wrinkles, fishmouths or tears.
- .6 After installation, check all seams and correct any deficiencies.
- .7 Membrane shall be free of any wrinkles.

3.10 TWO PLY MEMBRANE CAP SHEET INSTALLATION

- .1 Lay cap sheet only after the base sheet and stripping have been applied and are free of all defects.
- .2 Cap sheet shall be unrolled starting from the low point of the roof. Cap sheet shall be re-rolled from both ends prior to torching. Care shall be taken to ensure alignment of the first roll (parallel with the edge of the roof).
- .3 Cap sheet shall be torch welded onto the base sheet membrane. During this application, both surfaces shall be simultaneously melted, forming an asphalt bead that shall be pushed out in front of the cap sheet. The asphalt bead shall be visible for 2 - 3 mm beyond the edge of the cap sheet membrane side and end laps.
- .4 Base sheet and cap sheet seams shall be staggered a minimum of 300 mm.

- .5 Cap sheet shall have side laps of 75 mm and end laps of 150 mm. End laps and side laps shall be torch welded.
- .6 Surface granules on end laps must be embedded prior to installation of following sheet.
- .7 For aesthetics, care shall be taken to avoid excessive asphalt seepage.
- .8 After installation of the cap sheet, check all seams and correct any deficiencies.
- .9 Membrane shall be free of any wrinkles.

3.11 TIE-IN AT EXISTING ROOF MEMBRANE

- .1 Make clean cut of existing 2 ply membrane at new tie-in. De-granulate existing 2 ply membrane to 600 mm up the slope. Butter the edge of the existing membrane at the tie-in to ensure a smooth transition.
- .2 Mop apply new base sheet membrane, with 150 mm overlap onto the de-granulated surface. Avoid excessive asphalt bleed-out onto the existing membrane. Ensure this edge is smooth and free of fishmouths or wrinkles.
- .3 Install a torch applied reinforcement membrane over the transition joint with a minimum 300 mm onto the existing de-granulated surface and a minimum 300 mm onto the new base sheet membrane. Make sure there are no voids or air pockets along the transition joint while installing this membrane. Butter the upper edge to provide a smooth transition.
- .4 Install the new cap sheet membrane onto the remaining 150 mm of existing de-granulated membrane, over the reinforcement strip, and down the slope onto the new base sheet membrane. At the upper edge, ensure there is a small amount of bitumen bleed-out along the lap and that the lap is smooth and free of wrinkles or fishmouths. Apply loose granules over the bleed-out prior to cooling.

3.12 SITE INSPECTION

- .1 Inspection is to be performed by the Consultant. Provide free access to all portions of work and co-operate with Consultant.
- .2 Inspection of roofing system is to be performed to ensure conformance with requirements specified herein.
- .3 Correct all defects and irregularities as advised by the Consultant. Pay for all costs incurred.
- .4 Roof Inspection:
 - .1 Inspection of roofing application and workmanship.
 - .2 Inspection of completed roof membrane before insulation applied. Complete deficiencies before application of rigid insulation.
 - .3 A final inspection shall be conducted with roofing and flashing fully completed.
 - .4 Warranty inspections shall be conducted one month prior to the expiration of the one and two year warranties.
 - .5 The inspection of completed roof membrane before insulation application, final inspection with roofing and flashing fully completed and the warranty inspections conducted one month prior to the expiration of the one and two year warranties shall be joint inspections, attended by the Owner, Consultant, Contractor, and Roofing Subcontractor.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A792/A792M, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .3 ASTM D523, Standard Test Method for Specular Gloss.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA B111, Wire Nails, Spikes and Staples.
- .3 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 CSSBI S8, Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products.
 - .2 CSSBI B17, Barrier Series Prefinished Steel Sheet: Product Performance & Applications.
 - .3 CSSBI Sheet Steel Facts #12, Fastener Guide for Sheet Steel Building Products.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Handle and store flashing materials to prevent creasing, buckling, scratching, or other damage.

Part 2 PRODUCTS

2.1 SHEET METAL MATERIALS

- .1 Provide sheet metal in base metal thickness specified. Where no thickness specified, provide base sheet metal in thickness recommended in SMACNA Architectural Sheet Metal Manual for type of item being fabricated, but not less than the thickness required by the authority having jurisdiction.
- .2 Aluminum-zinc alloy coated steel sheet: to ASTM A792/A792M, commercial quality, grade 33 with AZ150 coating, regular spangle surface, 0.60 mm base metal thickness. Pre-painted to CGSB –GP-71.

2.2 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.
- .3 Sealants: Section 07 92 00 – Joint Sealants.
- .4 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.

- .5 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.
- .6 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .7 Touch-up paint: as recommended by prefinished material manufacturer.

2.3 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details as indicated.
- .2 Fabricate aluminum flashings and other sheet aluminum work in accordance with Aluminum Association Aluminum Sheet Metal Work in Building Construction.
- .3 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.
- .4 Hem exposed edges on underside 12 mm. Mitre and seal corners with sealant.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.4 METAL FLASHINGS

- .1 Form flashings, copings and fascias to profiles indicated of 0.60 mm thick prefinished steel.

Part 3 EXECUTION

3.1 INSTALLATION

- .1 Install sheet metal work in accordance with CRCA FL series details and as detailed.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.
- .4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips, as detailed.
- .5 Lock end joints and caulk with sealant.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials, preparation and application for caulking and sealants.
- .2 Text to complete other various Sections containing sealant or caulking specifications, including Section 07 52 00 - Modified Bituminous Membrane Roofing.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 45 00 - Quality Control.
- .3 Section 01 61 00 - Common Product Requirements.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C321, Standard Test Method for Bond Strength of Chemical-Resistant Mortars.
 - .2 ASTM C834, Standard Specification for Latex Sealants.
 - .3 ASTM C882, Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
 - .4 ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications.
 - .5 ASTM C920, Standard Specification for Elastomeric Joint Sealants.
 - .6 ASTM C1330, Standard Specification for Cylindrical Sealant Backing for use with Cold Liquid Applied Sealants.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.21, Sealing and Bedding Compound Acoustical.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act (TDGA).

1.4 SUBMITTALS

- .1 Manufacturer's product to describe.
 - .1 Caulking compound.
 - .2 Primers.
 - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
 - .4 Installation instructions, surface preparation and product limitations.
- .2 Submit duplicate samples of each type of material and colour.

- .3 Cured samples of exposed sealants for each color where required to match adjacent material.
- .4 Manufacturers' instructions to include installation instructions for each product used.

1.5 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: company engaged in the manufacturing of products specified in this section with a minimum of ten (10) years documented experience.
- .2 Applicator Qualifications: Experienced installer equipped and trained for application of joint sealant required for this project with record of successful completion of projects of similar scope.
 - .1 Applicator to be approved by sealant manufacturer.
 - .2 Applicator to submit documentation of a minimum three (3) successfully completed projects of similar size, scope and complexity.

1.6 FIELD ADHESION/COHESION TESTS

- .1 Test Frequency:
 - .1 Perform a field test each type of sealant and substrate combination, for all interior and exterior sealants associated with the building envelope.
 - .2 Perform three (3) additional tests for each failed test.
- .2 Locate test joints as directed by Owner's Representative. Tests to be performed in the presence of the Owner's Representative and/or manufacturer's representative.
- .3 Notify Owner's Representative seven (7) days prior to dates tests are to be performed.
- .4 Test joint sealants by hand-pull methods #1 and # 2. Record test results in Field Adhesion/Cohesion Test Form.
 - .1 Test Method #1:
 - .1 Make a knife cut horizontally from one side of the joint to the other.
 - .2 Make two (2) vertical cuts (from the horizontal cut) approximately 75 mm long on each side of the joint.
 - .3 Pry out flap created from cuts.
 - .4 Firmly grasp flap and slowly pull at 90° from sealant plane.
 - .5 Pull flap until adhesive or cohesive failure occurs.
 - .1 Adhesive failure will be evidenced by the sealant pulling off clean from the substrate.
 - .2 Cohesion failure will be evidenced by the sealant ripping or failing within itself, leaving well-adhered sealant to the substrate.

(Cohesive failure is considered a positive result).
 - .2 Test Method # 2:
 - .1 Follow steps one (1) through four (4) of Test Method # 1.
 - .2 Mark a benchmark on the sealant 25 mm (1") from the plane of the installed sealant.
 - .3 Firmly grasp the flap and pull slowly, while holding a ruler parallel to the sealant flap. Note the position of the benchmark on the ruler.
 - .4 Refer to manufacturer's printed literature for each sealant tested for the required extension factor pass criteria; (i.e.: if the 25 mm (1") benchmark

on the sealant can be pulled to 100 mm (4") and held with no failure of sealant, 400% elongation is achieved.)

- .5 **If no failure occurs prior to the manufacturer's stated extension factor, the test is successful.** Extension factor should be three (3) times the movement capability of the sealant.

- .5 Inspect joints for:
 - .1 Complete fill,
 - .2 Absence of voids,
 - .3 Primer,
 - .4 Proper width/depth ratio, and
 - .5 Back up material.
- .6 Repair sealants pulled in test area by applying new sealants following same procedures used to original seal joints.
- .7 Contractor shall repair test areas at no additional cost to the Owner.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.
- .2 Condition products to approximately 16 to 20 degrees C for use in accordance with manufacturer's recommendations.
- .3 Handle all products with appropriate precautions and care as stated on the Material Safety Data Sheet.

1.8 PROJECT CONDITIONS

- .1 Environmental Limitations:
 - .1 Do not proceed with installation of joint sealants under following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4°C.
 - .2 When joint substrates are wet.
- .2 Joint-Width Conditions:
 - .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
 - .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

Part 2 Products

2.1 SEALANT MATERIALS

- .1 Sealants and Caulking compounds must:
 - .1 Meet or exceed all applicable governmental and industrial safety and performance standards; and

- .2 Be manufactured and transported in such a manner that all steps of the process, including the disposal of waste products arising therefrom, will meet the requirements of all applicable governmental acts, by laws and regulations including, for facilities located in Canada, the Fisheries Act and the Canadian Environmental Protection Act (CEPA).
- .2 Sealant and caulking compounds must not be formulated or manufactured with: aromatic solvents, fibrous talc or asbestos, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium, barium or their compounds, except barium sulphate.
- .3 Sealant and caulking compounds must not contain a total of volatile organic compound (VOC's) in excess of 100 grams per litre as calculated from records of the amounts of constituents used to make the product.
- .4 Sealant and caulking compounds must be accompanied by detailed instructions for proper application so as to minimize health concerns and maximize performance, and information describing proper disposal methods.
- .5 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .6 When low toxicity caulks are not possible, confine usage to areas which off-gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off-gas time.
- .7 Where sealants are qualified with primers use only these primers.
- .8 Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Board for Joint Sealants. Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Single component, low odor, moisture cure, medium modulus, low VOC sealant for use in sealing air/vapour barrier penetrations, to ASTM C920, Type S, Grade NS, Class 35.
 - .1 ASTM C719: $\pm 35\%$.
 - .2 Ultimate Elongation: 450 - 550%.
 - .3 Modulus, 100%: 275 - 345 kPa.
 - .4 Shore A Hardness: 25 ± 5 .
 - .5 Tensile Strength: 1034 – 1378 kPa.
 - .6 Maximum VOC: 5 g/L.
- .2 Single component, medium modulus, high-performance, neutral-cure silicone sealant for general purpose exterior use, to ASTM C920, Type S, Grade NS, Class 35, Use NT, M, A and O.
 - .1 ASTM C719: $\pm 25\%$.
 - .2 Ultimate Elongation: 550%.
 - .3 Modulus, 50% extension: 380 kPa.
 - .4 Shore A Hardness: 25 ± 5 .
 - .5 Tensile Strength: 1240 kPa.
 - .6 Maximum VOC: 35 g/L.
 - .7 Colour to be selected from manufacturer's standard range.

- .3 Single component, low modulus, neutral-cure silicone sealant for general purpose masonry use, to ASTM C920, Type S, Grade NS, Class 50, Use T, NT, M, G, A and O.
 - .1 ASTM C719: $\pm 50\%$.
 - .2 Ultimate Elongation: 1600%.
 - .3 Modulus, 50% extension: 193 kPa.
 - .4 Shore A Hardness: 15.
 - .5 Tensile Strength: 690 kPa.
 - .6 Maximum VOC: 22 g/L.
 - .7 Colour to be selected from manufacturer's standard range.
- .4 Single component, medium modulus, neutral-cure silicone sealant for general roofing applications, to ASTM C920, Type S, Grade NS, Class 50, Use NT, G, A and O.
 - .1 ASTM C719: $\pm 50\%$.
 - .2 Shore A Hardness: 35.
 - .3 Tensile Strength: 415 kPa.
 - .4 Maximum VOC: 28 g/L.
 - .5 Colour to be selected from manufacturer's standard range.
- .5 Single component, high-performance, elastomeric polyurethane sealant, paintable, for general purpose interior use, to ASTM C920, Type S, Grade NS, Class 35, Use NT, M, A, T, O and I.
 - .1 ASTM C719: 35%.
 - .2 Ultimate Elongation: 800%.
 - .3 Shore A Hardness: 25 - 30.
 - .4 Tensile Strength: 2400 kPa.
 - .5 Maximum VOC: 35 g/L.
 - .6 Colour to be selected from manufacturer's standard range.
- .6 Two-component, non-sag, tamper resistant, elastomeric polyurethane sealant, for use in interior joints, penetrations, doors, windows, perimeters of fixtures, where a flexible security sealant is required due to idle tampering or vandalism, to ASTM C920, type M, Grade NS, Class 12.5, Use T₁, M and O.
 - .1 Ultimate Elongation: 175 - 200%.
 - .2 Shore A Hardness: 40 - 45.
 - .3 Tensile Strength: 2000 to 2400 kPa.
 - .4 Maximum VOC: Activator - < 25 g/L, Base - < 100 g/L.
 - .5 Colour to be selected from manufacturer's standard range.

2.3 ACCESSORIES

- .1 Primer: Type as recommended by sealant manufacturer. Primer to be compatible with joint forming materials.
- .2 Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer and compatible with joint forming materials.
- .3 Preformed Compressible and Non-Compressible back-up materials.
 - .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
 - .1 Extruded closed cell foam backer rod.

- .2 Size: oversize 30 to 50 %.
- .2 Neoprene or Butyl Rubber.
 - .1 Round solid rod, Shore A hardness 70.
- .3 High Density Foam.
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
- .4 Bond Breaker Tape.
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

Part 3 Execution

3.1 PROTECTION

- .1 Protect installed Work of other trades from staining or contamination.

3.2 SURFACE PREPARATION

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 All joint forming materials to be primed prior to sealant installation.
- .6 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.4 BACKUP MATERIAL

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

- .1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.6 APPLICATION

- .1 Sealant.

- .1 Apply sealant in accordance with manufacturer's written instructions.
 - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
 - .3 Apply sealant in continuous beads.
 - .4 Apply sealant using gun with proper size nozzle.
 - .5 Use sufficient pressure to fill voids and joints solid.
 - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
 - .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
 - .8 Remove excess compound promptly as work progresses and upon completion.
- .2 Curing.
- .1 Cure sealants in accordance with sealant manufacturer's instructions.
 - .2 Do not cover up sealants until proper curing has taken place.
- .3 Cleanup.
- .1 Clean adjacent surfaces immediately and leave Work neat and clean.
 - .2 Remove excess and droppings, using recommended cleaners as work progresses.
 - .3 Remove masking tape after initial set of sealant.

3.7 CLEANING

- .1 Clean adjacent surfaces immediately and leave Work neat and clean.
- .2 Remove excess and droppings, using recommended cleaners as work progresses.
- .3 Remove masking tape after initial set of sealant.

END OF SECTION