

SPECIFICATION: GUIDE SPECIFICATIONS

ADHERED FLEECE-BACKED MEMBRANE – RAM SYSTEM

PART 1 -- GENERAL

1.01 DESCRIPTION

- A. This guide specification describes typical application methods for an adhered (Tri-Polymer Alloy) single-ply roof system. Contact the Technical Service Department of Republic Powdered Metals, Inc. (Republic) for information not contained in this document. All C3 roof systems are eligible for a warranty provided they are inspected by an authorized Republic agent and meet all the requirements of Republic in accordance with current Republic publications, specifications, pre-installation information form and drawings.
- B. This system is designed for commercial/industrial applications in new roofing, replacement, and recovering on substrates that have been accepted by Republic. C3 roofs are not to be installed on residential construction.
- C. Applications that involve known, severe exposures require a complete review by Republic Powdered Metals, Inc., before their acceptance. This includes, but is not limited to, unusual building exposure to wind, unusual roof slope, unusual roof use, unusual exposure to contaminants, openings in the structure (greater than 10% of the wall surface), which could be left open in a storm, roofs subject to positive pressure conditions and roofs greater than 45' in height. For roofs subject to special job conditions, contact the Republic Technical Service Department.
- D. Related Work
 - 1. Sheet Metal
 - 2. Concrete
 - 3. Sealants and Caulking
 - 4. Plumbing
 - 5. Masonry
 - 6. Carpentry
 - 7. Curtain Wall
 - 8. HVAC
 - 9. Electrical

1.02 SCOPE OF WORK

- A. The roofing contractor shall furnish and install fully adhered C3 RAM system roofing membrane as described in this guide specification and in accordance with the Republic drawings.

1.03 QUALITY ASSURANCE

- A. The roofing system shall be installed by a commercial roofing contractor that has been trained by Republic or has previously installed a warranted C3 Roofing System.
- B. There shall be no deviations made from those specifications or the Republic drawings without the prior written approval of the Republic Technical Department.
- C. Application code or insurance requirements shall be identified by the owner or his representative.
- D. Upon completion of the installation, the Technical Department of Republic shall inspect the completed roof to verify that the visible elements of the installation have been installed in accordance with Republic specifications, detail drawings and approved changes.

*At a minimum, projects must be installed as per Republic specifications. Projects with written specification, which are more stringent than Republic must be adhered to.

1.04 SUBMITTALS

- A. The contractor shall complete and submit the project notice of award form to the Republic Technical Department for approval. No material will be shipped to the contractor until this information is received and approved. Projects installed without prior acceptance of a Republic notice of award form are not eligible for a Republic warranty.
- B. At the time of bidding, the roofing contractor shall submit to the Owner's representative the following:
 - 1. Copies of specifications and details.
 - 2. Samples of each material to be used in the roof system including each component manufacturer's literature.
 - 3. Written approval by insulation manufacturer (as required) for use and performance of the product in the proposed system.
 - 4. Dimensioned shop drawings required by the project specifications shall be accepted by the Republic Technical Department prior to submittal.
 - 5. Written verification from Republic that the contractor is an authorized applicator.
 - 6. Submit certification that the system to be installed meets specified code/insurance requirements. Information can be obtained from Republic Powdered Metals, Inc.
 - 7. Submit results of pull-out tests to confirm the ability of the deck to retain mechanical fasteners.

8. Submit, for approval, any necessary items not furnished by Republic. Only items that have written approval from the Republic Technical Department will be accepted.
9. Certificates of Compliance from insulation and roofing component manufacturers that all material to be supplied comply with all industry standards.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

- A. Materials shall be delivered in their original, unopened containers.
- B. All products shall be delivered to the job site with the manufacturers' labels on each roll or container. When required, the label shall also indicate the specified code/insurance approvals.
- C. All materials shall be stored flat, elevated from the roof or deck, protected with water-proof covers as necessary to keep the materials dry. The plastic wrap on the C3 RAM rolls is not intended for use as a waterproof cover.
- D. C3 contact bonding adhesive shall be stored at temperatures above 40°F. All flammable materials shall be stored in a cool, dry area away from sparks and open flames.
- E. All materials shall be protected from damage.
- F. Materials damaged in handling or storage shall not be used without authorization by Republic. Unsalvageable materials shall be replaced at the contractor's expense.
- G. Material Safety Data Sheets, available from Republic, shall be reviewed.

1.06 JOB CONDITIONS

- A. This specification is acceptable for use with structures designed to support lightweight roof assemblies. However, the adequacy of the structural support must be verified by the owner or the owner's representative and is his sole responsibility to determine.
- B. C3 RAM System shall not be installed during periods of precipitation, but may be installed under certain adverse weather conditions (temperature and humidity). Contact the Republic Technical Service Department for precautions that should be followed.
- C. Only as much of the new roofing as can be made weathertight each day shall be completed in accordance with the Republic specifications, including all field flashings.
- D. All work shall be scheduled and executed without exposing the interior building area(s) to the effect of inclement weather. The existing building and its content shall be protected against all risks associated with the installation of the roof system.
- E. All surface areas to receive new insulation, membrane or flashings shall be thoroughly dry. Should surface moisture occur, contractor shall provide necessary materials and equipment to dry the surface area affected prior to installation.

- F. All areas contaminated by dirt, debris and dust shall be cleaned from surfaces by vacuuming, sweeping or power blowing.
- G. The roofing contractor shall take measures necessary to avoid damage to the C3 RAM System during construction. When the roofing contractor is a subcontractor, he shall advise the general contractor concerning potential damage to the C3 RAM System and the measures to be taken to avoid such damage during construction.
- H. When storing material on the roof and during application, the roofing contractor shall ensure that overloading of the deck and structure does not occur.
- I. Temporary waterstops shall be installed at the end of each day's work, and shall be removed before proceeding with the next day's work. Waterstops shall be compatible with all materials and shall not emit dangerous or incompatible fumes.
 *Water tightness of the waterstops is the contractor's responsibility.
- J. Any deteriorated deck or flashing substrate, which is discovered, shall be promptly reported to the owner or his designated representative.
- K. The roofing contractor shall investigate all existing roof drain lines. Nonfunctioning drains shall be reported to the owner's representative prior to job start. It is the responsibility of the roofing contractor and Owner to ensure adequate connection of the drain to the drain lines.
- L. The roofing contractor shall investigate the structural deck on the building to determine the type and length of fastener required. Gypsum, cement-based, and wood fiber decks require fastener pull-out tests, contact Republic for additional information.
- M. If waste products, petroleum, grease, oil, solvents, mineral oil and other contaminants come into contact with the C3 RAM roofing membrane, contact Republic for precautions and cleaning procedures.
- N. Site cleanup, including both interior and exterior building areas that have been affected by the roof installation, shall be completed to the Owner's satisfaction. All landscaped areas affected shall be raked clean and seeded, as required.
- O. All roofing, insulation, flashings and metal work removed during construction shall be immediately removed from the site to a regulated legal dumping area authorized to receive such materials.
- P. Certain project conditions may require some modifications to this specification. Contact the Republic Technical Service Department if any of the following conditions exist.
 - 1. Roof heights greater than 45 feet.
 - 2. Geographical location in a 100 mph or greater wind zone, per FM's Loss Prevention Data Sheet 1-28S.

1.07 HAZARDOUS MATERIALS HANDLING

- A. It shall be the responsibility of the contractor and Owner to identify, test and isolate all areas of existing roof membrane and base flashings containing possible hazardous materials (Asbestos type).
- B. The roofing contractor shall remove and dispose all such materials in accordance with all Federal (EPA & OSHA), State and local regulatory agencies under an approved certified abatement program. All contractor's employees shall be instructed and follow OSHA guidelines for handling such materials under the provisions of HCS (Hazardous Communications Standard) as required to conform to OSHA and other safety requirements.

1.08 WARRANTY

- A. Upon completion of the roof system, and after passing a final inspection performed by the Republic Technical Department, a warranty shall be issued, effective from the date of substantial completion. Any project which was eligible for warranty, but was not warranted within one year of completion, must be reinspected by Republic prior to issuance of the warranty.*

*Only those materials supplied by Republic will be warranted.

*Projects which have exceeded this one year period may not automatically qualify for a warranty.

1.09 BIDDING REQUIREMENTS

- A. Prebid conference: A prebid conference shall be held with a representative of the Owner and all parties and trades involved to discuss all aspects of the project. The contractor's field representative and/or foreman for the project shall be in attendance.
- B. All bidders shall visit the site and carefully examine the areas in question as to conditions that may affect the proper execution of the work. All dimensions and quantities shall be determined or verified by the contractor. No claims for extra costs shall be allowed for lack of full knowledge of existing conditions.

PART II -- PRODUCTS

2.01 GENERAL

- A. All components of the C3 RAM System shall be either manufactured, supplied, or accepted in writing by Republic's Technical Department.

2.02 ADHERED TRI-POLYMER ALLOY MEMBRANE

- A. The membrane shall be C3 RAM, a tri-polymer Alloy, polyester reinforced roofing system as distributed by Republic Powdered Metals, Inc., 3735 Green Road, Beachwood, Ohio. The sheet shall conform to the following properties listed below. NOTE: The physical properties listed below are typical values achieved in the manufacture of the C3 RAM membrane. For minimum specification values, contact Republic Powdered Metals, Inc.

1. Color White : (top)/Grey/(bottom)
2. Roll Size: 76" wide x 90' long
3. Weight: 4.8 oz./ft² (nominal)

4. Thickness ASTM D-751: 55 mil (nominal)
5. Breaking Strength ASTM D-751: 350 x 325 lbs.
6. Seam Strength : ASTM D-638: 90%
7. Elongation @ Break ASTM D-751: 40% x 30%
8. Heat Aging ASTM D-3045: 80% x 80%
9. Tear Strength ASTM D-751: 100lbs. x 100 lbs.
10. Low Temperature Bend ASTM D-2136: PASS (-40°)
11. Permeance ASTM E-96: 0.003 Perms
12. Dimensional Change ASTM D-1204: 03%
13. Hydrostatic Resistance ASTM D-751: 400 psi
14. Ozone Resistance ASTM D-1149: PASS
15. EMMAQUA Test, DSET ASTM E-838 : PASS (2.7 million Langleys)

- B. The C3 RAM membrane may be mopped in hot asphalt directly to compatible insulation or substrates that exhibit sufficient tensile and peel resistance.

2.03 RELATED MATERIALS

- A. When asphalt is used as the adhesive, it shall conform to ASTM D 312 Type III or IV. The asphalt packages shall be marked with the following information:

Softening point range per ASTM D 312 and ASTM D 36.

Flash Point per ASTM D 92.

Equiviscous temperature range.

Finished blowing temperature.

The asphalt shall not be heated to the flashpoint or above nor hotter than 525 degrees F. Do not heat and hold the asphalt above the finished blowing temperature for more than four (4) hours. The asphalt shall be applied at its equiviscous temperature plus or minus 25 degrees Fahrenheit at the point of application.

Insulation:

1. Where specified or required, insulation shall be installed as a separation layer over the existing substrate and/or to obtain the desired thermal value.

- a) Insulation for use with C3 RAM System shall be a Factory Mutual Class I Fire Rated, I-90 Uplift approved board.
 - b) Insulation shall meet the identified code/insurance requirements.
 - c) Insulation shall be compatible with C3 RAM membrane and hot asphalt application.
 - d) Insulation must exhibit adequate transverse tensile strength, in the direction of the normal to the surface (with an average tensile strength of 4 psi when tested according to ASTM C209 method), and adequate peel strength (with an average resistance against peeling of 1 ply or more when tested according to ASTM D-3167 method) when C3 RAM membrane is adhered to it.
 - e) Insulation shall be accepted by Republic in writing.
2. The following insulation boards are acceptable for use with C3 RAM System:
 - a) Isocyanurate insulation with organic facers (minimum thickness 1 inch).
 3. Insulation manufacturer's warranty.
 - a) The insulation manufacturer shall send in writing to the building owner and Republic a copy of its recommendations for the use of the product, including:
 - Name of specified project.
 - The tested values for tensile strength in the normal direction and for the peel strength when C3 RAM, or equivalent, membrane is adhered to it.
 - Statements that express the warranty conditions, including fastening recommendation for the successful performance of their insulation for the duration of the Republic warranty.

B. Air Barrier and Vapor Retarder

1. Air barriers and vapor retarders for use with the C3 RAM System shall meet identified code and/or insurance requirements.
2. Air barriers and vapor retarders are to be approved by the air barrier manufacturer for the intended use.
3. Air barriers and vapor retarders are to be compatible with insulation and other accessories.
4. Reinforced air barriers shall be used on metal decks where the surface is not flat.
5. A C3 RAM Roofing System is not to be used on buildings that have or can develop positive pressure.

C. Insulation Attachment

1. Fasteners

- a) Use C3 RAM 3" diameter corrosion-resistant, metal plates.
- b) Use metal plates and screws in steel and wood decks, and anchors for concrete, gypsum, and tectum decks.
- c) Fasteners and plates shall be Factory Mutual approved and meet FM Standard 4470 for corrosion resistance.
- d) The fastener manufacturer shall warrant the performance of the fasteners and plates for the duration of the Republic warranty.
- e) Fasteners and plates shall be approved in writing by the fastener manufacturer for intended use and for use with the C3 RAM System.
- f) Fasteners and plates are to be accepted by Republic.

2. Adhesive

- a) Adhesive shall meet identified code and/or insurance requirements.
- b) Adhesive shall be approved by the insulation and air barrier manufacturers.
- c) Adhesive shall be Factory Mutual approved and provide adequate uplift resistance.
- d) Adhesive shall be accepted by Republic.

- 3. Steep asphalt, ASTM D-312, Type III may be used with insulations that accept asphalt attachment.

D. Flashing

- 1. C3 RAM Membrane Flashing: C3 membrane and/or CRSI RAM membrane.
- 2. C3 RAM Coated Metal: .020" thick membrane laminated to 24 gauge G-90 galvanized steel with acrylic backwash coating.
- 3. C3 RAM Prefabricated Flashing: VTR pipe boots, inside corners, outside corners.

E. Membrane Flashing Adhesive: C3 Bonding Adhesive

- 1. C3 Bonding Adhesive must be used as contact adhesive on all flashings. Both the surface of the substrate and the back surface of the flashing membrane must have C3 Bonding Adhesive applied to them. Application rates for flashings using C3 Bonding Adhesive, as a contact adhesive, are listed below:
 - a) Organic Facer (insulation) – 50-60 square feet / gallon.
 - b) Plywood (smooth CDX). - 50-60 square feet / gallon.
 - c) Sheathing – 50-60 square feet / gallon.

- d) Structural Concrete (smooth) – 50-60 square feet / gallon.
 - e) Metal – 50-60 square feet / gallon.
 - f) Rate of application may vary due to substrate finish.
2. Allow for additional ½ gal./square to substrates above when temperature is below 40°F during application.
- F. Sealants: Contact CRSI Technical Department.
 - G. Night Seal: Roofing cement or asphalt (ASTM D-312, Type III – Steep).
 - H. Mechanical Termination: CRSI metal plates and screws or CRSI coated metal.
 - I. Surface Mounted Reglet: CRSI extruded aluminum reglet and joint covers.
 - J. Foam Rod Stock: Polyethylene or Neoprene in shapes and sizes as needed.
 - K. Sheet Metal Fasteners: Galvanized ring shank nails, min. 1” penetration into wood.
 - L. Plywood Deck:
 - 1. Minimum 5/8” smooth surface cdx (exterior glue) sheathing conforming to standard PS 1-74 and bearing APA, PTL and/or Teco trademark(s).
 - 2. Plywood shall have a maximum moisture content of 19% by weight on a dry weight basis.
 - M. Wood Nailers:
 - 1. Minimum #2 lumber, “wolmanized” or pressure treated for not resistance with a salt-based preservative. No cresote or asphaltic type preservations shall be allowed.
 - 2. Wood nailers shall conform to Factory Mutual's Loss Prevention Data Sheet 1-49.
 - 3. All wood shall have a maximum moisture content of 19% by weight on a dry weight basis.
 - N. Roof Traffic Pads: Tuff Trac Walkpads shall be adhered using C3 RAM bonding adhesive or heat welded.

PART III – EXECUTION

3.01 PRE-JOB

- A. The primary contractor, the owner or the owner’s representative shall conduct a pre-roofing conference before any work begins, so all parties involved in the installation of the roofing system construction, or who may work on or through the roofing system, understand their obligations with respect to the roofing system.

3.02 “NEW ROOFING” DECK PREPARATION

- A. The roof deck and existing roof construction must be structurally sound to provide support for the new roof system. The roofing contractor shall notify the owner or architect in writing of any defects in the structural deck. Work shall not proceed until the structural deck has been repaired or replaced. It is the responsibility of the owner or owner’s representative to ensure the structural integrity of the roof deck.
- B. Remove all loose debris from the deck surface.
- C. The deck surface shall be free of standing water, ice, or snow.
- D. Fastener pullout tests shall be required to certify deck conditions and pullout values prior to installation of roofing system.
- E. New Deck Requirements STEEL DECK. The roof deck construction shall conform to Factory Mutual’s recommendations outlined in their Loss Prevention Data Sheet 1-28.

WOOD DECK. The roof deck shall be minimum nominal 2” for lumber and 5/8” for plywood. The decks shall conform to Factory Mutual’s requirements Class I impregnated decks. Decking shall be installed according to Factory Mutual and/or Local code requirements.

POURED STRUCTURAL, LIGHTWEIGHT STRUCTURAL, or PRECAST, PRESTRESSED CONCRETE DECK. The roof deck shall be cured and dry to industry standards and the surface shall be smooth, level, and free from moisture or frost. Sharp ridges or other projections above the surface shall be removed before roofing. On precast, pre-stressed concrete decks, all joints shall be grouted. Differentials in deck elevation must be corrected by applying an approved lightweight fill over the entire deck or a grout applied over the joints and feathering out to create a smooth transition. The fill material must be cured and dry.

CEMENTITIOUS WOOD-FIBER DECK. Voids and joints over bulb-tees shall be grouted. Grouting shall be done with materials supplied or recommended by the deck manufacturer. Deck planks shall be secured to structural support as recommended by the deck manufacturer.

GYPHUM CONCRETE DECK. The roof deck shall be cured and dry to the deck manufacturer’s and/or industry standards. The surface of the deck shall be smooth and free from ridges and depressions.

INSULATING CONCRETE DECKS and FILLS. The roof deck shall be cured and dry to the manufacturer’s and/or industry standards. The deck shall be smooth and free from ridges and depressions. Proper venting as recommended by the roof deck manufacturer shall be provided. Adhered RAM membrane shall not be used with vermiculite, perlite, or other lightweight concrete forms that retain moisture, unless specifically approved by Republic. When installing the CRSI RAM System on the following deck types – cementitious, gypsum concrete, insulating concrete, and fills – a 28lb. base sheet may be required between the deck and membrane. Contact Republic for further information.

3.03 “REROOFING” DECK PREPARATION

- A. All existing roofing, base flashing, deteriorated wood blocking, or deteriorated metal flashings shall be removed. Remove only that amount of roofing and flashing that can be made watertight with new materials during a one day period before the onset of inclement weather.
- B. STEEL DECK. All rusted or deteriorated decking shall be brought to the attention of the owner's representative to determine acceptance and treatment or replacement. All rusted metal shall be treated with rust-inhibiting paint, and sections that have rusted through shall be completely removed and replaced. The use and type of steel roof deck construction shall conform to Factory Mutual's recommendations are outlined in their Loss Prevention Data Sheet 1-28.

WOOD DECK. All rotted and deteriorated wood shall be completely removed and replaced. The deck thickness shall be a minimum nominal 2" for lumber and ½" for plywood. The deck shall conform to Factory Mutual's requirements for Class I impregnated lumber decks. The deck shall be installed according to Factory Mutual and/or Local code requirements.

POURED STRUCTURAL, LIGHTWEIGHT STRUCTURAL, or PRECAST, PRESTRESSED CONCRETE DECK. The roof deck shall be cured and dry and the surface shall be level and free from moisture or frost. Sharp ridges, other projections and accumulations of bitumen above the surface shall be removed to ensure a smooth surface before roofing. Any deterioration decking shall be cut out and patched. On pre-cast, prestressed concrete deck, all joints shall be grouted. Differentials in the deck elevation of more than ¼" must be corrected by applying a lightweight fill over the entire deck, or a grout applied over the joints and feathered out to create a smooth transition.

CEMENTITIOUS WOOD-FIBER DECK. Voids and joints over bulb-tees shall be grouted. Grouting shall be done with materials supplied or recommended by the deck manufacturer. All wet and deteriorated sections of decking shall be completely removed and replaced. Deck planks shall be secured to structural supports as recommended by the manufacturer.

GYPSUM CONCRETE DECK. All saturated and deteriorated gypsum shall be completely removed and replaced. All accumulations of bitumen shall be removed and the surface of the deck shall be smooth and free from ridges and depressions.

INSULATING CONCRETE DECKS AND FILLS. All saturated and deteriorated insulation fill shall be removed and replaced. All accumulations of bitumen shall be removed and the surface of the deck shall be smooth and free from ridges and depressions. The roof deck shall be cured and dry to the manufacturer's and/or industry standards. The deck surface shall be smooth and free from ridges and depressions. Proper venting as recommended by the roof deck manufacturer shall be provided. Adhered RAM membrane shall not be used with vermiculite, perlite, and other lightweight concrete that retain moisture, unless specifically approved by Republic. Proper venting as recommended by the roof deck manufacturer shall be provided.

DECK REQUIREMENT IN REROOFING OVER EXISTING ROOFING. Specifier and/or roofing contractor shall determine the condition of the existing roof deck and roofing. All areas with deteriorated decking or wet materials are to be removed and replaced.

3.04 SUBSTRATE PREPARATION

- A. A proper substrate shall be provided to receive the C3 RAM System.
- B. Building codes may require a thermal barrier between the roof deck and some roof insulations.

- C. Surfaces on which the C3 RAM System is to be applied shall be compatible, clean, smooth, free of fins, sharp edges, loose and foreign material, oil, grease and other contaminants that affect adhesion.
- D. When possible, work shall begin at the lowest point of the roofing project area and proceed to the highest point. All seams should be shingled with, or run parallel to, the flow of water.
- E. All loose gravel shall be removed or leveled. If necessary, accumulations of bitumen, adhered gravel, or other irregularities shall be scratched and removed so as to produce a flat, smooth surface. Insulation boards shall lay flat from one board to another. Cut and repair all blisters.
- F. All areas of wet insulation shall be removed and replaced.
- G. All substrates shall be free of water, ice, or snow.

3.05 VAPOR BARRIER AND VAPOR RETARDER

- A. Republic requires the use of an acceptable air barrier over non-monolithic decks (steel, wood, precast, etc.) and wherever air can flow underneath the membrane. In addition, the roofing system may require a vapor retarder to prevent moisture accumulation and condensation. The design professional shall determine the necessity for any additional vapor retarder within the roofing system assembly. Note that positive pressure inside the building, caused by mechanical pressurization by HVAC equipment and large openings as in hangars and loading docks, can increase the rate of air flow underneath the membrane, further increasing the need for an air barrier between the deck and the membrane.
- B. New Construction
 - 1. An air barrier shall be installed over suitable substrate (deck or insulation) with all side laps, end laps, and penetrations sealed in accordance with the manufacturer's instructions. The vapor retarder may be loosely laid, fastened, or adhered with an adhesive supplied by the manufacturer.
- C. Reroofing with Removal of Existing Roofing
 - 1. An air barrier shall be installed over suitable substrate (deck or insulation) with all side laps, end laps, and penetrations sealed in accordance with the manufacturer's instructions. The air barrier may be loosely laid, fastened, or adhered with an adhesive supplied by the same manufacturer.
- D. Reroofing over Existing Roofing
 - 1. Under normal conditions, the existing built-up roofing may be considered an adequate air barrier.

3.06 WOOD NAILERS

- A. Treated wood nailers shall be installed at the perimeter of the roof and around other projections and penetrations that are to be flashed with C3 coated metal.
- B. Nailers, new or existing, shall be securely anchored to the deck to resist 200 lbs. per foot applied in any direction.

- C. The thickness of the nailer shall be provided such that the top of the nailer is flush with the surface to which the C3 RAM membrane is to be applied.

3.07 INSULATION

- A. The insulation manufacturer shall agree that the use of its product below the adhered C3 RAM System is appropriate and that the insulation has the necessary strengths. It is the responsibility of the roofing contractor to ensure appropriate selection of the specific brand of insulation for use under the C3 RAM System. Consult Republic for information concerning generic insulations which are appropriate for use under the C3 RAM System.
- B. Insulation shall be installed according to the insulation manufacturer's instructions and Factory Mutual Technical Bulletin 1-28 recommendations. This includes board layout, number of fasteners required to attach the insulation board and the pattern of these fasteners. Pullout tests shall be required to determine deck condition, type of fastener utilized, and pullout values. When an air barrier is provided, the insulation must be fastened to resist the anticipated loads.
- C. Insulation shall be adequately supported to sustain normal traffic without damage. Insulation shall be laid on acceptable substrate or air barrier with tight joints in parallel courses with end joints staggered. When more than one layer is used, the second layer of insulation shall be laid transverse to the first layer with joint staggered.
- D. Field-trimmed insulation shall be fitted tightly around roof protrusions and terminations.
- E. Insulation attachment:
 - 1. Mechanical Attachment: Insulation boards shall be secured to the roof deck, using Republic approved insulation plates and coated screws. Each board shall be fastened with the number of fasteners and with the pattern required by the insulation manufacturer, building insurance codes, or Republic requirements, whichever is greater.
 - 2. All insulation boards must be mechanically attached to "standard" decks unless specifically approved for hot asphalt securement for the particular application by Republic and the insulation manufacturer.
 - 3. "Standard" decks shall be defined as 24 gauge or heavier steel decks, poured structural concrete, 5/8" or greater plywood, and 2" minimum wood. Other deck types may be accepted by Republic for mechanical attachment in certain, specific applications. Contact the Republic Technical Department.
 - 4. Hot Asphalt: Insulation boards shall be secured to the roof deck and/or properly secured air barrier or vapor/retarder/base ply by setting into a continuous coat of hot steep asphalt (TYPE III, ASTM D-312) at a minimum rate of 30 to 50 lbs./square. Insulation shall be fully bonded to substrate. Promptly remove all asphalt pools on insulation surfaces, to ensure smooth surface for the application of the roofing membrane.
- F. Tapered insulation boards shall be installed in heavy and continuous mopping of steep asphalt in accordance with the insulation manufacturer's shop drawings, especially around drains to create a drain sump.

- G. No more insulation shall be applied than can be covered with the finished C3 RAM membrane by the end of the day or the onset of inclement weather.
- H. Republic Powdered Metals, Inc. assumes no responsibility for the performance of the roof insulation(s) board.
- I. Maximum insulation board size for hot asphalt attachment shall be 4'x4'.
- J. Republic will not accept hot asphalt attachment of insulation on slopes greater than 1" : 12" without Republics prior approval.
- K. When attached roof insulation boards with hot asphalt, the roof insulation boards must be carefully set and then stepped into place in a manner to promote maximum adhesion and to prevent asphalt contamination of nearby C3 RAM membrane. Do not slide the roof insulation into the hot asphalt.
- L. Insulation must be attached in accordance with the guidelines established by FM, NRCA, and specific insulation and deck manufacturers, as minimum requirements.

3.08 FASTENERS

- A. Use only approved fasteners or a substitute approved in writing by Republic.
- B. Fasteners shall be driven perpendicular to the work surface.
- C. The following guidelines provide the appropriate uses for approved fasteners:
 1. FM approved fastener: Steel decks 24 gauge, or heavier, plywood ½" minimum.
 2. FM approved fastener: (coated screw): Structural concrete 2,500 psi compressive strength minimum, brick masonry, or wood.
 3. FM approved fastener (NTB Type): Gypsum or cementitious wood fiber plank fastener pullout test must be submitted for approval and spacing requirements.
- D. Lightweight Cementitious Decks
 1. In certain specific applications, Republic may permit insulation and/or 40 lb. coated base sheet attachment to certain deck types with the appropriate fasteners. The specific deck manufacturer must recommend the application in writing for consideration.
 2. Certified pull tests must be performed in accordance with the pull test worksheet and submitted to the Republic Technical Department for evaluation. Republic's acceptance will be based on actual project conditions and pull test results. For all other deck types not included in this specification, contact the Republic Technical Department.
- E. The length of the fasteners shall be sufficient to penetrate the structural deck as required by Republic.
- F. Concrete, gypsum, and cementitious fiber decks require pilot holes before driving the fastener into the deck. Contact Republic for recommendations and installation procedures.

3.09 C3 RAM COATED METAL FLASHINGS

- A. All flashing other than C3 membrane or C3 RAM membrane shall be fabricated out of C3 Roofing Systems coated metal. Metal used other than C3 coated metal is not covered under the provisions of the warranty.
- B. Fabricated and install C3 RAM coated metal flashing to comply with details and project drawings and the recommendations of SMACNA Sheet Metal Manuals for fabrication and Factory Mutual's Loss Prevention Data Sheet 1-49.
- C. All metal work shall be completed in conjunction with the roofing and flashing operation so as to provide a daily watertight condition.
- D. Metal shall be installed to provide adequate resistance to bending and to allow for normal thermal expansion and contraction. Allow for minimum ¼" space between metal joints.
- E. Metal flashing shall have a 5" nailing flange and hemmed metal edge. Metal flashing shall be fastened to solid wood blocking with annular ring nails, 4" o.c. Fasteners shall penetrate the wood a minimum of 1-1/4".
- F. Continuous metal hook strips are required on all metal fascia that exceeds 4". Each hook strip shall be fastened 12" o.c. into wood blocking or masonry wall. Hook strips should be continuous and at least 22-gauge. They should be secured with annular threaded nails long enough to penetrate the wood 1-1/4". The nail head should be 3/16" minimum. When screws are used, they should be No. 8 minimum long enough to penetrate wood ¾" or metal 3/8". Screws should be 24" apart in Zone 1 and 16" apart in Zone 2 (refer to FM 1-49). Screws should be either corrosion-resistant steel or treated to resist corrosion. When an existing metal panel wall has no hook strip, the fascia metal should be fastened directly to the wall with No. 8 galvanized sheet metal screws, through neoprene washers, spaced 24" in Zone 1 and 16" in Zone 2.
- G. All gravel stops and drip edges with a face larger than 4" shall be installed using a continuous 22 gauge hook strip fastened 12" o.c. using galvanized annular ring nails.
- H. Fasten C3 RAM coated metal flashings 4" o.c. to treated wood nailers using galvanized annular ring nails.
- I. Install C3 RAM coated metal flashings prior to the installation of the C3 RAM membrane. Flange of flashing component shall be at the same level as the insulation or other substrate to which the membrane will be applied.
- J. Install adjacent pieces of coated metal flashing with ¼" gap. Apply a 2" wide continuous strip of foil tape over the gap to act as a bond breaker. Hot air weld a 6" strip of C3 membrane, over the foil tape, to each piece of flashing to form a watertight splice.
- K. Fasten the top of C3 RAM coated metal base flashing 8" o.c. using fasteners appropriate for the underlying substrate.

3.10 MEMBRANE INSTALLATION

- A. Placement:

1. The C3 RAM membrane shall be fully adhered to properly installed and prepared substrate surface. The surface shall be clean, dry, smooth, and free from contamination.
2. The roof perimeters and corners may require additional design to develop the necessary resistance for wind conditions in excess of gale force winds. Contact the Technical Department of Republic for additional information if the building is located where winds may exceed standard warranty conditions or special code provisions are required.
3. The membrane shall be cut to fit neatly around all penetrations and roof projections.
4. The roofing membrane shall be unrolled and positioned with a minimum 3" overlap. Laps shall be shingled with, or run parallel to, the slope of the roof.

B. Attachment:

1. Over the properly installed and prepared surface, approved bonding adhesives shall be applied using approved solvent-resistant roller, or sprayed. The adhesive shall be applied at a rate of approximately 100-120 square feet per gallon, dependent upon substrate material. The adhesive shall be applied to the substrate only, in a smooth even coating with no globs, puddles, voids or similar irregularities. Only areas that can be completely covered in the same day shall be coated with adhesive. The surface with adhesive coating shall be allowed to become tacky prior to installing the roof membrane.

NOTE: Drying time of the adhesive increases with the presence of higher humidity or cooler temperatures.

2. When the surface is ready, C3 RAM membrane (field and perimeter sheets) shall be unrolled and set in proper position. Adjacent sheets shall be overlapped a minimum of 3".
3. No bonding adhesive shall be applied to lap (seam) areas that are to be welded to flashings or adjacent membrane sheets by means of hot-air and/or solvent welding procedures.
4. C3 RAM membrane can also be mopped in hot asphalt to the prepared substrate or insulation. Apply membrane embedded in a 30 lb. for every 100 square feet hot mopping of steep asphalt. ASTM D-312, TYPE III. Apply membrane across the continuous joints in layer of insulation where feasible. Do not allow membrane laps directly over insulation joints. Start application of membrane at low points. Insure full and continuous seal and contact between asphalt and membrane including ends, edges, and laps by mopping uniformly and by fully and continuously bonded. Test cuts shall be made at least daily to ensure 30 lb. mopping. Cut a one square foot sample and weigh.

All containers used to heat or hold asphalt shall have attached covers in good condition, operating accurate thermometers, checked at least hourly, to maintain the following temperatures: Kettle temp -525°F; Mopping temp -450-500°F. EVT temperatures may be used if approved by the architect upon submittal of current, complete data. All asphalt delivered to the site is to have EVT data on packages of a certified delivery ticket for each bulk delivery.

3.11 MEMBRANE FLASHING

- A. All flashings shall be installed as shown on the detail drawings. All C3 membrane or C3 RAM flashings shall be installed concurrently with the roof membrane as the project progresses. No

temporary flashings shall be allowed without prior written approval of the Republic Technical Department. If any water is allowed to enter under the new roofing due to incomplete flashings, the affected area shall be removed and replaced at contractor's expense.

B. Flashings shall not be applied over existing thru-wall flashings or weep holes. All flashings shall extend a minimum of 8-inches above roof level unless previously accepted by Owner's representative and the Republic Technical Department.

C. Membrane base flashings can be C3 RAM membrane.

1. The C3 RAM membrane shall be fully-adhered to a dry, smooth solvent-resistant and compatible substrate using approved Bonding Adhesive.
2. Over the properly installed and prepared substrate, approved Bonding Adhesive shall be applied using approved solvent resistant rollers, squeegee or sprayed. The adhesive shall be applied at a rate of approximately 50-60 square feet / gallon, depending upon substrate material. The adhesive shall be applied in a smooth even coat with no globs, puddles, or voids. The substrate with the adhesive coating shall be allowed to become tacky, before installing the C3 RAM membrane.

NOTE: Drying time of adhesive increases with presence of humidity or cooler temperatures.

3. When the C3 RAM membrane has been cut to correct width and length, embed the flashing into the substrate adhesive, taking care of avoid wrinkles.
 4. Care should be taken to ensure that the flashing does not bridge where there is a change of direction.
 5. The top of the installed flashing shall be fastened under metal counterflashing, coping cap, or through metal reglet. The maximum distance between fasteners for C3 flashings shall be 8" through flat bar or 12" through metal reglet.
- D. All C3 Roofing Systems have passed Factory Mutual's I-60, I-90 wind uplift test and are in compliance with I29S. However, the wind conditions in your particular geographic area may exceed the requirements of these tests. It is the building owner's responsibility or that of its architect, engineer, or contractor to determine if the Factory Mutual criteria is sufficient for the winds expected to be encountered in the particular geographic area where the building is located.
- E. The C3 membrane, as with all white membranes incorporating titanium dioxide, can be expected to exhibit chalking. This chalking does not affect the longevity of the membrane or the functional integrity of the roof system. However, in certain applications, depending upon the drainage of roof, chalking may be a design consideration to review.