SECTION 33 47 13

POND, RESERVOIR, TANK, AND SECONDARY CONTAINMENT LINERS

Display hidden notes to specifier. (Don't know how? [Click Here](https://www.arcat.com/sd/display_hidden_notes.shtml))

*Copyright 2023 - 2023 ARCAT, Inc. - All rights reserved*

\*\* NOTE TO SPECIFIER \*\* Permalon, Div. of Reef Industries, Inc.; Polyethylene Membranes.  
This section is based on the products of Permalon, Div. of Reef Industries, Inc., which is located at:9209 Almeda-Genoa Rd.Houston, TX 77075Toll Free Tel: 800-231-6074Tel: 713-507-4200Fax: 713-507-4295Email: [request info (ri@reefindustries.com)](https://arcat.com/rfi?action=email&company=Permalon%252C%252BDiv.%252Bof%252BReef%252BIndustries%252C%252BInc.&message=RE%253A%2520Spec%2520Question%2520(02660pmn)%253A%2520&coid=39670&spec=02660pmn&rep=&fax=713-507-4295)  
Web: <http://www.reefindustries.com>   
 [ [Click Here](https://arcat.com/company/permalon-div-of-reef-industries-inc-39670) ] for additional information.  
Manufactured using a patented process, Permalon products are lightweight, highly flexible, and easy to handle, yet offer unmatched tear and puncture resistance in the most demanding applications. Permalon products are uniquely constructed, alloyed polyethylene membranes with the greatest tensile strength to weight ratio available.  
Permalon products can be custom configured to meet your project's specific demands and are available in a range of weights, thicknesses, and special composites. Large sheets and standard rolls are available in stock for immediate shipment.  
Permalon products are the ideal choice for a wide range of applications including pond liners, lagoon liners, tanks, secondary containment systems, contaminated soil liners/covers, custom fabricated box/container liners, odor and/or rainwater control covers, decontamination pads or a variety of other uses and applications.  
Permalon Features & Advantages  
 Alloyed polyethylene resists punctures and tears.  
 Lightweight.  
 Easy Installation.  
 UV Stabilized.

1. GENERAL
   1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Alloyed Polyethylene membranes.
    2. Alloyed Polyethylene membranes tape.
    3. Additional Accessories.
  1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 07 10 00 - Dampproofing and Waterproofing
    2. Section 32 05 19 - Geosynthetics for Exterior Improvements.
    3. Section 31 05 19 - Geosynthetics for Earthwork.
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. ASTM International (ASTM):
       1. ASYM D751 - Standard Test Methods for Coated Fabrics.
       2. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
       3. ASTM D1434 - Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting.
       4. ASTM D1204 - Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.
       5. ASTM D1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique.
       6. ASTM D1603 - Standard Test Method for Carbon Black Content in Olefin Plastics.
       7. ASTM D1709 - Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
       8. ASTM D1790 - Standard Test Method for Brittleness Temperature of Plastic Sheeting by Impact.
       9. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.
       10. ASTM D2261 - Standard Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine).
       11. ASTM D2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
       12. ASTM D3776 - Standard Test Methods for Mass Per Unit Area (Weight) of Fabric.
       13. ASTM D3895 - Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry.
       14. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
       15. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
       16. ASTM D5199 - Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
       17. ASTM D5261 - Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
       18. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
       19. ASTM E96 - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.
    2. National Fire Protection Association (NFPA):
       1. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
  1. SUBMITTALS
     1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
     2. Product Data:
        1. Manufacturer's data sheets on each product to be used.
        2. Preparation instructions and recommendations.
        3. Storage and handling requirements and recommendations.
        4. Typical installation methods.

\*\* NOTE TO SPECIFIER \*\* Delete if not applicable to product type.

* + 1. Verification Samples: Two representative units of each type, size, pattern, and color.
    2. Shop Drawings: Include details of materials, construction, and finish. Include relationship with adjacent construction.
  1. QUALITY ASSURANCE
     1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.
     2. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
     3. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

\*\* NOTE TO SPECIFIER \*\* Include mock-up if the project size or quality warrant the expense. The following is one example of how a mock-up might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the project.

* + 1. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
       1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
       2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
       3. Retain mock-up during construction as a standard for comparison with completed work.
       4. Do not alter or remove mock-up until work is completed or removal is authorized.
  1. PRE-INSTALLATION CONFERENCE
     1. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.
  2. DELIVERY, STORAGE, AND HANDLING
     1. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
     2. Protect from damage due to weather, excessive temperature, and construction operations.
  3. PROJECT CONDITIONS
     1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
  4. WARRANTY
     1. Manufacturer's standard limited warranty unless indicated otherwise.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: Permalon, Div. of Reef Industries, Inc., which is located at:9209 Almeda-Genoa Rd.Houston, TX 77075Toll Free Tel: 800-231-6074Tel: 713-507-4200Fax: 713-507-4295Email: [request info (ri@reefindustries.com)](https://arcat.com/rfi?action=email&company=Permalon%252C%252BDiv.%252Bof%252BReef%252BIndustries%252C%252BInc.&message=RE%253A%2520Spec%2520Question%2520(02660pmn)%253A%2520&coid=39670&spec=02660pmn&rep=&fax=713-507-4295);Web: <http://www.reefindustries.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
    2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

\*\* NOTE TO SPECIFIER \*\* The following Article displays the various applications of the alloyed polyethylene membranes specified in this specification. The article may be edited and kept as part of the specification, or the article can be used as a guide and deleted in its entirety once you have chosen membranes and accessories. Delete article if not required.

* 1. APPLICATIONS

\*\* NOTE TO SPECIFIER \*\* Delete paragraph options not required. Then delete products and accessories not required.

* + 1. Aquaculture Drop In Tank Liners: Section 33 56 93
       1. Products:
          1. Permalon L20 Black.
          2. Permalon L30 Black.
          3. Permalon Ply X 210.
       2. Product Features:
          1. Alloyed construction resists punctures and tears.
          2. Custom fabrication and custom sizes available.
          3. Lightweight and easy to handle for quick installation.
          4. UV stabilized for long life.
          5. Cold crack tested to assure continuous performance in extreme temperatures.
       3. Fabrication Accessories:
          1. Liner Grips.
          2. Bung Fittings.
          3. Bulkhead Fittings.
          4. Pipeboot.
    2. Industrial Shipping, Storage And Containment Bags: Section 01 66 00
       1. Product: Permalon Ply X 100 FR.
       2. Performance Characteristics:
          1. Fire retardant and fire rated to meet safety requirements around critical materials or work areas.
          2. VCI corrosion resistant additives to protect sensitive items.
          3. Heat-shrinkable materials are available for total containment.
          4. Antistatic, and other high performance features.
       3. Customization Options:
          1. Custom fabricated to meet your specific requirement.
          2. A custom logo or message can be printed on each bag.
          3. Available in lay flat designs and in a wide range of sizes.
    3. Ice Rink Liners and Tarps: Section 13 18 10
       1. Product:
          1. Permalon Ply X 150.
       2. Product Features:
          1. Custom sizes available.
    4. Pit and Lagoon Liners: Section 33 47 13
       1. Product:
          1. Permalon L20 Black.
          2. Permalon L30 Black.
          3. Permalon Ply X 210.
          4. Permalon Ply X 210 G.
       2. Product Features:
          1. Alloyed construction resists punctures and tears.
          2. Custom fabrication and custom sizes available.
          3. Lightweight and easy to handle for quick installation.
          4. UV stabilized for long life.
          5. Cold crack tested to assure continuous performance in extreme temperatures.
       3. Fabrication Accessories:
          1. Liner Grips.
          2. Bung Fittings.
          3. Bulkhead Fittings.
          4. Pipeboot.
    5. Pond Liners: Section 33 47 13
       1. Products:
          1. Permalon L20 Black.
          2. Permalon L30 Black.
          3. Permalon Ply X 210.
          4. Permalon Ply X 210 G.
       2. Benefits:
          1. Reef's polyethylene pond liners are weather-resistant, whether it's light rain or a torrential downpour, these liners are built to last and have a very high tolerance.
          2. Our polyethylene pond liners are plant and fish safe.
          3. Our polyethylene pond liners are built to withstand temperatures as high as 160 degrees Fahrenheit.
       3. Product Features:
          1. Alloyed polyethylene resists punctures and tears for a more secure system.
          2. Lightweight and easy to handle for quick and easy installation.
          3. UV stabilized for durability during extended exposure to the elements.
          4. Cold crack tested to assure continuous performance in extreme temperatures.
          5. Custom engineered fabrication and sizes up to an acre available to minimize in-field seaming.
          6. Available in black or white material.
       4. Fabrication Accessories:
          1. Liner Grips.
          2. Bung Fittings.
          3. Bulkhead Fittings.
          4. Pipeboot.
    6. Secondary Containment Liners: Section 33 47 13
       1. Products:
          1. Permalon L20 Black.
          2. Permalon L30 Black.
          3. Permalon Ply X 210.
    7. Tubing: Section 01 66 00
       1. Product:
          1. Permalon Ply X 150.
       2. Performance Characteristics:
          1. Fire retardant and fire rated to meet safety requirements around critical materials or work areas.
          2. VCI corrosion resistant additives to protect sensitive items.
          3. UV stabilized if needed for long-range outdoor applications.
          4. Heat-shrinkable materials are available for total containment.
          5. Antistatic grade if required for use around electronics and solid state equipment.
          6. Exceptionally strong materials manufactured from highly tear-resistant flexible plastic laminates.
          7. Rolls are available on cores to allow easy length separation.

\*\* NOTE TO SPECIFIER \*\* Delete customization paragraph is not required or delete option not required.

* + - 1. Customization:
         1. Custom logo or message printing for company or production identification.
         2. Available in lay flat. designs and in a wide range of sizes.
  1. ALLOYED POLYETHYLENE MEMBRANES

\*\* NOTE TO SPECIFIER \*\* Permalon, manufactured using a patented process, Permalon products are lightweight, highly flexible, and easy to handle, yet offer unmatched tear and puncture resistance in the most demanding applications. Permalon products are uniquely constructed, alloyed polyethylene membranes with the greatest tensile strength to weight ratio available.

* 1. Permalon products can be custom configured to meet your project's specific demands and are available in a range of weights, thicknesses, and special composites. Large sheets and standard rolls are available in stock for immediate shipment.
  2. Permalon products are the ideal choice for a wide range of applications including pond liners, lagoon liners, tanks, secondary containment systems, contaminated soil liners/covers, custom fabricated box/container liners, odor and/or rainwater control covers, decontamination pads or a variety of other uses and applications.
  3. Delete Product options not required.
     1. Product: Permalon L20 Black as manufactured by Reef Industries. A high strength and durable membrane engineered to work in many environments. It is specifically engineered for liner and vapor barrier applications.
        1. Weight in accordance with ASTM D2103: 96.0 lbs per 1000 sq ft (46.8 kg per 100 sq m).
        2. Thickness in accordance with ASTM D2103: 20 mil (0.51 mm).
        3. Density in accordance with ASTM D1505: 0.939 grams per cu cm.
        4. 3 inch Load at Break in accordance with ASTM D882:
           1. 260 lbsf (1156 N).
           2. 4300 psi (29.6 mPa).
        5. 3 inch Elongation at Break in accordance with ASTM D882: 600 percent.
        6. Tongue Tear in accordance with ASTM D2261: 25 lbsf (111 N).
        7. Trapezoidal Tear in accordance with ASTM D4533: 46 lbsf (205 N).
        8. Puncture Strength in accordance with ASTM D4833: 45 lbsf (200 N).
        9. Dart Impact Strength in accordance with ASTM D1709: 5.0 lbs (2220 gram).
        10. Water Vapor Permeance in accordance with ASTM E96: 0.013 Grain / hr x sq ft x inches Hg (0.72 NG / Pa x Sec x sq m).
        11. Methane Permeability in accordance with ASTM D1434, Method V: 3.15 x .0001 cu m / sq m / day.
        12. Carbon Black Content in accordance with ASTM D1603: 2 percent.
        13. Oxidative Induction Time in accordance with ASTM D3895: 100 Minutes.
     2. Product: Permalon L30 Black as manufactured by Reef Industries. A high strength and durable liner engineered to work in many environments. It is specifically engineered for liner applications.
        1. Weight in accordance with ASTM D2103: 148.0 lbs per 1000 sq ft (72.2 kg per 100 sq m).
        2. Thickness in accordance with ASTM D2103: 30 mil (0.76 mm).
        3. Density in accordance with ASTM D1505: 0.939 grams per cu cm.
        4. 3 inch Load at Break in accordance with ASTM D882:
           1. 350 lbsf (1557 N).
           2. 38000 psi (26.2 mPa).
        5. 3 inch Elongation at Break in accordance with ASTM D882: 225 percent.
        6. Tongue Tear in accordance with ASTM D2261: 50 lbsf (222 N).
        7. Trapezoidal Tear in accordance with ASTM D4533: 66 lbsf (294 N).
        8. Permeance in accordance with ASTM E96: 0.013 Grain / hr x sq ft x inches Hg (0.72 NG / Pa x Sec x sq m).
        9. Dart Impact Strength in accordance with ASTM D1709: Greater than 5.0 lbs (2220 gram).
        10. Puncture Strength in accordance with ASTM D4833: 65 lbsf (289 N).
        11. Carbon Black Content in accordance with ASTM D1603: 2 percent.
        12. Oxidative Induction Time in accordance with ASTM D3895: 100 Minutes.
     3. Product: Permalon PLY X-100 Black as manufactured by Reef Industries. Cross-laminated polyethylene resists punctures and tears. UV stabilized to withstand prolonged exposure to sunlight.
        1. Weight in accordance with ASTM D3776: 25.0 lbs per 1000 sq ft (12.2 kg per 100 sq m).
        2. Thickness in accordance with ASTM D408: 7.5 mil (0.19 mm).
        3. Density in accordance with ASTM D1505: 0.939 grams per cu cm.
        4. 1 inch Load at Break in accordance with ASTM D882:
           1. 29 lbsf (129 N).
           2. 3800 psi (26.2 mPa).
        5. 1 inch Elongation at Break in accordance with ASTM D882: 480 percent.
        6. Tongue Tear in accordance with ASTM D2261: 9 lbsf (40 N).
        7. Trapezoidal Tear in accordance with ASTM D4533: 14.0 lbsf (62.3 N).
        8. PPT Resistance in accordance with ASTM D2582: 26 lbsf (116 N).
        9. Dart Impact Strength in accordance with ASTM D1709: 2.3 lbsf (1.04 kg).
        10. Cold Impact Strength in accordance with ASTM D1790: Minus 40 degrees F (Minus 40 degrees C)
     4. Product: Permalon PLY X-100 FR Black as manufactured by Reef Industries. Fire-retardant cross-laminated polyethylene resists punctures and tears. UV stabilized to withstand prolonged exposure to sunlight.
        1. Alloyed construction resists punctures and tears.
        2. Custom fabrication and custom sizes available.
        3. Lightweight and easy to handle for quick installation.
        4. UV stabilized for long life.
        5. Cold crack tested to assure continuous performance in extreme temperatures.
        6. Fire Retardant: Passes NFPA 701 Test 2.
        7. Weight in accordance with ASTM D3776: 30 lbs per 1000 sq ft (14.6 kg per 100 sq m).
        8. Thickness in accordance with ASTM D408: 10.0 mil (0.25 mm).
        9. 1 inch Load at Break in accordance with ASTM D882:
           1. 32 lbsf (142 N).
           2. 3500 psi (24 mPa).
        10. 1 inch Elongation at Break in accordance with ASTM D882: 600 percent.
        11. Tongue Tear in accordance with ASTM D2261: 10 lbsf (47 N).
        12. Trapezoidal Tear in accordance with ASTM D4533: 13.0 lbsf (60 N).
        13. PPT Resistance in accordance with ASTM D2582: 24 lbsf (120 N).
        14. Dart Impact Strength in accordance with ASTM D1709: 5.0 lbsf (2.3 kg).
        15. Shrinkage (by area) in accordance with ASTM D1204: Minus 10 percent.
        16. Cold Crack Strength in accordance with ASTM D1790: Minus 40 degrees F (Minus 40 degrees C)
        17. Fire Retardancy in accordance with NFPA 701: Pass
        18. Puncture Strength in accordance with ASTM D4833: 19 lbs (85 N)
     5. Product: Permalon PLY X-150 Black as manufactured by Reef Industries. Cross-laminated polyethylene resists punctures and tears. UV stabilized to withstand prolonged exposure to sunlight. Not prone to environmental stress-cracking (ESC) so it can endure repeated thermal expansion and traction cycle.
        1. Color: Determined by the Architect from Manufacturer's standard range.
        2. Weight in accordance with ASTM D2103: 32 lbs per 1000 sq ft (15.6 kg per 100 sq m).
        3. Thickness in accordance with ASTM 2103: 10.5 mil (0.27 mm).
        4. 1 inch Load at Yield in accordance with ASTM D882: 16 lbsf (71 N)
        5. 1 inch Load at Break in accordance with ASTM D882:
           1. 35 lbsf (2156 N).
           2. 3300 psi (24.1 mPa).
        6. 1 inch Elongation at Break in accordance with ASTM D882: 575 percent.
        7. Tongue Tear in accordance with ASTM D2261: 10.5 lbsf (47 N).
        8. Trapezoidal Tear in accordance with ASTM D4533: 18.0 lbsf (80 N).
        9. PPT Resistance in accordance with ASTM D2582: 32 lbsf (142 N).
        10. Dart Impact Strength in accordance with ASTM D1709: 2.0 lbsf (91 kg).
        11. Shrinkage (by area) in accordance with ASTM D1204: Minus 10 percent.
        12. Cold Crack Strength in accordance with ASTM D1790: Minus 40 degrees F (Minus 40 degrees C)
        13. Permeance in accordance with ASTM E96: 0.019Grain / hr x sq ft x inches Hg
     6. Product: Permalon PLY X-200 FR Black. As manufactured by Reef Industries. Fire-retardant laminate with two layers of multi-axially oriented, linear low-density polyethylene. It is specifically engineered to provide high strength and durability in a lightweight material.
        1. Passes NFPA 701 Test 2 (Large Scale) - "Standard Methods of Fire Tests for Flame-Resistant Textiles and Films".
        2. Classified as Class 1, Class A according to UBC-42 and ASTM E84.
        3. Multiple polyethylene layers provide low permeability and resist punctures and tears.
        4. Flexibility and light weight allow for easy handling and quick installation.
        5. Custom fabrication is available to meet your exact specifications.
        6. Weight in accordance with ASTM D751: 57 lbs per 1000 sq ft (27.8 kg per 100 sq m).
        7. Thickness in accordance with ASTM D408: 14.0 mil (0.36 mm).
        8. 1 inch Load at Yield in accordance with ASTM D882: 19 lbsf (85 N)
        9. 1 inch Load at Break in accordance with ASTM D882:
           1. 38 lbsf (169 N).
           2. 2650 psi (18.3 mPa).
        10. 1 inch Elongation at Break in accordance with ASTM D882: 350 percent.
        11. Tongue Tear in accordance with ASTM D2261: 20 lbsf (89 N).
        12. Trapezoidal Tear in accordance with ASTM D4533: 29.0 lbsf (29 N).
        13. PPT Resistance in accordance with ASTM D2582: 40 lbsf (178 N).
        14. Dart Impact Strength in accordance with ASTM D1709: 4.0 lbsf (1.8 kg).
        15. Puncture Strength in accordance with ASTM D4833: 31 lbs (138 MPa).
        16. Permeance in accordance with ASTM E96: 0.028 Grain / hr x sq ft x inches Hg (1.606 NG / (PA x sec x sq m).
        17. Fire Retardancy in accordance with ASTYM E84: Flame Spread: 5. Smoke Developed: 100.
        18. Usable Temperature Range: Minus 40 to 170 degrees F (Minus 40 to 77 degrees C).
        19. Color: Natural. Not available in different colors.
     7. Product: Permalon PLY X-210 Black as manufactured by Reef Industries. Cross-laminated polyethylene resists punctures and tears. UV stabilized to withstand prolonged exposure to sunlight. The cross-laminate is not prone to environmental stress-cracking (ESC) so it can endure repeated thermal expansion and contraction cycle.
        1. Weight in accordance with ASTM D751: 81 lbs per 1000 sq ft (40 kg per 100 sq m).
        2. Thickness in accordance with ASTM D5199: 20.0 mil (0.508 mm).
        3. Load at Yield in accordance with ASTM D882: 37 lbsf (165 N)
        4. Load at Break in accordance with ASTM D882:
           1. 75 lbsf (334 N).
           2. 3900 psi (26.8 mPa).
        5. Elongation at Break in accordance with ASTM D882: 550 percent.
        6. Tongue Tear in accordance with ASTM D2261: 28 lbsf (125 N).
        7. Trapezoidal Tear in accordance with ASTM D4533: 44 lbsf (196 N).
        8. PPT Resistance in accordance with ASTM D2582: 50 lbsf (222 N).
        9. Dart Impact Strength in accordance with ASTM D1709: 3.5 lbsf (1.6 kg).
        10. Puncture Strength in accordance with ASTM D4833: 45 lbs (200 MPa).
        11. Permeance in accordance with ASTM E96: 0.0143 Grain / hr x sq ft x inches Hg.
     8. Product: Permalon PLY X-210 G as manufactured by Reef Industries. Cross-laminated polyethylene with a geotextile fabric reinforcement layer that resists punctures and tears. UV stabilized to withstand prolonged exposure to sunlight. The cross-laminate is not prone to environmental stress-cracking (ESC) so it can endure repeated thermal expansion and contraction cycle.
        1. Weight in accordance with ASTM D5261: 117 lbs per 1000 sq ft (57.1 kg per 100 sq m).
        2. Thickness in accordance with ASTM D5199: 48.0 mil (1.2 mm).
        3. Load at Yield in accordance with ASTM D882: 50 lbsf (222 N)
        4. Load at Break in accordance with ASTM D882:
           1. 65 lbsf (289 N).
           2. 1350psi (9.3 mPa).
        5. Elongation at Break in accordance with ASTM D882:575 percent.
        6. Tongue Tear in accordance with ASTM D2261: 50 lbsf (222 N).
        7. Trapezoidal Tear in accordance with ASTM D4533: 94 lbsf (418 N).
        8. PPT Resistance in accordance with ASTM D2582: 75 lbsf (334 N).
        9. Dart Impact Strength in accordance with ASTM D1709: 5.0 lbsf (2.3 kg).
        10. Puncture Strength in accordance with ASTM D4833: 97 lbs (431 MPa).
        11. Permeance in accordance with ASTM E96: 0.0143 Grain / hr x sq ft x inches Hg.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. ALLOYED POLYETHYLENE MEMBRANE TAPE
     1. Product: Permalon Pressure Sensitive Tape as manufactured by Reef Industries. Available in black. The tape consists of Permalon X-150 material, pressure sensitive adhesive and release paper.
        1. Standard Weight Roll: 4 inch x 50 ft: 3.0 lbsf (1.4 kg).
        2. Adhesive Thickness: 20 mil (0.51 mm).
        3. Peel Strength: 55 lbsf (244.6 N)
        4. Room Temperature; 20 hrs (180 degree Peel): 10.0 to 14.0 lbsf per inch (44.5 to 62.2 N)
        5. Room Temperature; Quick Set (180 degree Peel): 8.5 - 12.5 lbsf per inch (37.8 to 55.6 N)
        6. Softening Temperature (Ring and Ball): 245 to 270 degrees F (Minus 136 to 150 degrees C).

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete items not required.

* 1. ADDITIONAL ACCESSORIES
     1. Bulkhead Fittings: To add a drain/fill line to a container.

\*\* NOTE TO SPECIFIER \*\* Larger bulkhead fittings can be ordered if required. Contact Reef Industries today for more information. Delete size option not required.

* + - 1. Size: 3/4 inch NPT threaded.
      2. Size: \_\_\_ inch NPT Threaded.
    1. NPT/Hose Adapter: To connect an NPT fitting to a garden hose, Normally used with a bulkhead fitting.

\*\* NOTE TO SPECIFIER \*\* Provides an economical method to provide a drain for a container or drip collection system from roof leaks. Larger Hose Adapters can be ordered if required. Contact Reef Industries today for more information. Delete size option not required.

* + - 1. Size: 3/4 inch nylon fitting
      2. Size: \_\_\_ inch NPT Threaded.
    1. Pipe Boots:
       1. For sealing around plumbing or piping penetrations, Fabricated from Permalon products with a cylindrical sleeve welded to a flat flange.

\*\* NOTE TO SPECIFIER \*\* Pipe Diameters: 2 to 24 inches (51 to 610 mm). Up to 8 inches (203 mm) are stocked. Delete sleeve options not required.

* + - * 1. Sleeve Pipe Size: \_\_\_\_ inches.
        2. Sleeve Rectangular Columns: \_\_\_ x \_\_\_ inches (\_\_\_ x \_\_\_ mm)I
        3. Seals: Obtained with the use of Permalom Tape.
    1. Griff Clips: Plastic tarp fasteners.
       1. A fastener for use in securing the edge of your product as a temporary tie-down method. Designed for flexible materials with a thickness of up to 15 mils these clips are made of high-quality, long-lasting material, and come in packages of 50 clips, or they can be provided in bulk (2,000 clips).
    2. Polypropylene Griff Rope:
       1. A 3/16 inch polypropylene tightly wound single-braided white general purpose cord for short-term outdoor or longer-term indoor use. Can be fabricated in the hemmed edges of a cover (tight), placed in a pocket (loose), or laced through grommets.
          1. Lengths: 100 ft (304.8 m).
          2. Lengths: 1000 ft (30.480 m).

1. EXECUTION
   1. EXAMINATION
      1. Do not begin installation until the substrates have been properly constructed and prepared.
      2. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.
   2. PREPARATION
      1. Clean surfaces thoroughly prior to installation.
      2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
   3. INSTALLATION
      1. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.
         1. Alloyed Polyethylene Membrane Tape:
            1. Tape will not adhere if surfaces are not properly prepared. Surface to be taped should be clean and dry. Dirty or wet surfaces should be completely cleaned with water, paper towels, dry rags or other materials which will prepare the surface for the tape. Accumulations of dust should also be removed to insure a secure seam.
            2. The tape obtains optimum adhesion when surfaces to be bonded are warm. Surfaces should be above 50 to 60 degrees F (10 to 15.6 degrees C) to insure an acceptable bond. To obtain a bond at lower temperatures, external heat may be required. The use of an industrial style hot air blower is one recommended method. Extra care should be taken when attempting to install tape at temperatures below 32 degrees F (0 degrees C).
   4. FIELD QUALITY CONTROL
      1. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

\*\* NOTE TO SPECIFIER \*\* Include if manufacturer provides field quality control with onsite personnel for instruction or supervision of product installation, application, erection, or construction. Delete if not required.

* + 1. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.
  1. CLEANING AND PROTECTION
     1. Clean products in accordance with the manufacturers recommendations.
     2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION