

APPLICATION INSTRUCTIONS

1. Purpose

- 1.1 The purpose of this document is to establish uniform procedures for installing Paraseal GM/LG-60 Mil membrane on backfilled walls, blindside walls and below slab-on-grade in submerged and/or gas membrane applications.
- 1.2 The techniques involved may require modifications to adjust to job site conditions. Tremco recognizes that site specific conditions, weather patterns, contractor preferences and membrane detailing may require deviation or alteration from these prescribed installation procedures. When such circumstances exist on a project, Tremco recommends that the local Tremco Sales Representative or Technical Services be contacted for assistance as required.
- 1.3 Tremco Technical Services and the local Tremco Sales Representative must approve all submerged and containment applications prior to installation. Design and specifications are subject to review and acceptance for compliance with Paraseal Warranty Guidelines.
- 1.4 If the Paraseal GM/LG-60 mil ParaPlatinum Warranty is desired, contact Tremco during the bidding phase for complete system requirements.

2. Scope

- 2.1 This document provides the basic and typical instructions for the installation of Paraseal GM/LG-60 mil membrane to qualify for the Paraseal Warranty. Jobsite specific details require the review and approval of a Tremco Sales Representative or Technical Services.

3. Possible System Components

- 3.1 Recommended materials and their use are as follows. For more information on the following materials, please contact your local Tremco Sales Representative or visit our website for product specific data sheet and application instructions at www.tremcosealants.com.
 - Paraseal GM/LG-60 mil membrane is a sheet waterproofing and methane-mitigating membrane consisting of 60 mils of HDPE, expandable granular bentonite and a protective layer of spun-bonded polyester. The bentonite is laminated to the HDPE, creating a dual waterproofing system. The HDPE extends beyond the bentonite on the perimeter edges to create a clean surface for extrusion weld installation or wedge welding the seams.
- 3.2 Other Accessories:
 - Dymonic® 100 Sealant
 - Para JT™ Tape
 - Paragranular™
 - Paramastic™
 - Paraprimer®
 - Parastick 'n' Dry®
 - Paraterm Bar™
 - Permanent Seam Tape™
 - Superstop
 - TREMDrain® Series Drainage Mat

- TREMproof® 250GC-T
- Paraseal® Paraboot

4. Limitations

- 4.1 Paraseal products require a minimum of 24 psf of compaction/confinement.
- 4.2 Paraseal products are not to be installed over ponding or standing water or snow.
- 4.3 Contact Tremco whenever conditions of acid, alkali, salt brine or gas vapor exist. If ground water is brackish, please contact your local Tremco Sales Representative four weeks prior to a pending application, and provide a water or soil sample for testing purposes in order to determine the correct bentonite formula for your project's application.
- 4.4 If backfill contains substantial amounts of either lava rock, basalt or any other coarse or highly abrasive materials, a protection course or drainage mat may be required. Contact your local Tremco Sales Representative or Technical Services at 866-209-2404 for details.

5. Storage

- 5.1 Protect from moisture. Store on a skid or pallet and cover with polyethylene or tarp. Do not double stack pallets. Prevent hydration of bentonite until the sheet is installed and under recommended compaction.

6. Substrate Preparation

- 6.1 BACKFILLED WALLS
 - 6.1.1 Remove all sharp protrusions as well as dirt, mud, debris, ice or any other materials which would potentially damage or interfere with Paraseal GM/LG-60 mil membrane performance.
 - 6.1.2 In the case of masonry walls, strike flush all joints scheduled to receive Paraseal GM/LG-60 mil membrane.
 - 6.1.3 Joint surfaces where Superstop is to be installed should be troweled smooth. Remove all debris, and sweep the surface prior to installation to remove dust and other contaminants.
 - 6.1.4 Parge coating is not required unless the substrate is extremely rough and irregular. Contact Tremco for recommendations on specific projects.
 - 6.1.5 Paraseal GM/LG 60 mil membrane may be installed over green or damp surfaces.
 - 6.1.6 All honeycombs or voids and irregularities which exceed 1/4" (6.4 mm) in depth shall be repaired with TREMproof 250GC-T, Paramastic or concrete mortar prior to installation of Paraseal GM/LG- 60 mil membrane.
- 6.2 BLINDSIDE WALL
 - 6.2.1 WOOD LAGGING WITH STEEL PILES: Be sure all lagging board nails are pounded flush or removed. Check for missing or damaged lagging boards, and repair using concrete grout, treated wood or both. Fill or cover any gaps between lagging boards exceeding 1/2" (12 mm) in width using concrete grout or treated plywood. Excavation contractor shall provide wood lagging shoring extending to the lowest level of the waterproofing installation with any voids or cavities exterior of the

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lagging filled with compacted soil or cementitious grout. For submerged conditions, only cementitious grout may be used.

6.2.1a Any lagging boards protruding/recessed over 1/2" (12 mm) in height or depth shall be filled with grout, treated plywood, galvanized sheet metal or other acceptable substrate material. Any splintered boards shall be trimmed down to solid wood. This includes, but is not limited to, gaps between the wood lagging boards, offset boards, and inside corners where wood lagging is placed behind the flange of the steel I-beam. If top of steel I-beams are to be removed, either pre-burn the front face and halfway through the webbing or cover the front face with a cement board. At all locations where water seepage is occurring through wood lagging, install a temporary dewatering system prior to installation of the waterproofing system.

6.2.3 AUGERED CAISSON: When the surfaces of the individual augered piles, which make up the caisson wall, are relatively smooth, the Paraseal GM/LG-60 mil HDPE membrane may be installed directly against the piles. However the "crotch" between each pile must first be filled in with a concrete grout, and all sharp projections must be removed from the caisson wall. When the surfaces of the augered piles are very rough and irregular, continuous minimum 3/4" (19 mm) or thicker as determined by engineer, pressure-treated plywood must be anchored every 12" (30 cm) O.C. to the caisson wall. The void created behind the plywood shall be filled with sand or aggregate. The final plywood thickness and anchor spacing shall be determined by a civil, structural or soil engineer at the site and depends on the height of the caisson wall, the span of the plywood between the piles and the resultant lateral pressure exerted by the sand/ aggregate fill. Concrete or shotcrete can be used as a fill between augered piles.

6.2.4 STEEL SHEET PILING: When the waterproofing is going to be in continuous contact with the profile of the steel piling, all sharp protrusions must be removed. When the waterproofing installation is going to span the sheet piling voids, sheets of minimum 3/4" (19 mm) thick, pressure-treated plywood should first be installed across the void and shot into place every 12" (30 cm) O.C. The void behind the plywood should be filled with sand and/or aggregate. The final plywood thickness and anchor spacing shall be determined by a civil, structural or soil engineer at the site and depend on the height of the piling, the span of the plywood and the resultant lateral pressure exerted by the sand/aggregate fill. Concrete or shotcrete can be used as fill between augered piles.

6.2.5 SHOTCRETE WITH CONCRETE PILES: Prior to the installation of Paraseal GM/LG-60 mil membrane against the shotcrete retaining wall, the shotcrete shall be trowel finished with no voids and/or protrusions more than 1/2" (12 mm) in height or depth. Fill voids which exceed 1/2" (12 mm) deep with concrete grout. Fill smaller voids with Paramastic, TREMproof 250 GC-T or concrete grout.

6.2.6 SLURRY WALL: Prior to the installation of the Paraseal GM/LG-60 mil membrane against the exposed slurry wall, clean off all mud and dirt. Remove all sharp protrusions and fill all voids which exceed 1/2" (12 mm) in height or depth with concrete grout. Fill smaller voids with Paramastic, TREMproof 250 GC-T or concrete grout.

6.3 BELOW SLAB-ON-GRADE

6.3.1 Paraseal GM/LG-60 mil membrane can be installed in conjunction with any typical slab-on-grade system. Contact Tremco for site-specific installation details and recommendations.

6.3.2 When Hydrostatic Conditions exist under the slab assembly, a 2" (5 cm) mud slab shall be installed across the entire project site with the membrane system being installed on top of the mud slab. A second 2"

(5 cm) protection slab shall be poured over the membrane to provide a working surface. A mat slab will be poured in appropriate sequencing.

6.3.3 The grade should be prepared by either compacting the original earth, compacting a granular base or by installing a mud slab meeting a minimum 85% proctor density per architect's design.

7. Jobsite Conditions

- 7.1 Do not install Paraseal GM/LG 60-mil HDPE membrane during rain, mist or heavy fog. If rain, mist or snow is anticipated before the membrane is compacted below-grade, cover any exposed bentonite or seams with 6-mil polyethylene sheet.
- 7.2 Do not weld membrane during rain, mist, heavy fog, or freezing temperatures. HDPE surfaces to be welded should be thoroughly dried prior to welding.

8. Installation Requirements

- 8.1 Shotcrete walls shall be placed in strict accordance with ACI 506.2-95 guidelines, which includes but is not limited to, minimizing the lift height (traditionally 4' high (1.2 M)) limiting overspray and rebound above and below, if applicable, the lift area. Shotcrete contractor shall utilize an ACI Committee C-660-certified nozzle man.
- 8.2 Paraseal GM/LG-60 mil membrane shall be installed by a Tremco approved installer.
 - 8.2a. All welding shall be done by a Certified Welder, certified by the manufacturer of the welding equipment used on the project.
 - 8.2b. Prior to the heat welding of the Paraseal GM/LG-60 mil membrane, the applicator must perform test welds to ensure the welding equipment heat welds the 60-mil membrane per ASTM D6392 requirements.
 - 8.2c. Furnish and install Superstop waterstops at all construction cold joints in all shotcrete lift joints. Also, provide Superstop waterstops for all cold joints - vertical and horizontal - in CMU block walls. One (1) strip of bentonite Superstop shall be installed at the cold joint between the structural wall and structural slab/footings. Superstop shall also be installed at all mat slab cold joints.

9. Detail Work

PENETRATIONS

- 9.1 All penetrations shall be secured prior to detailing.
- 9.2 All pipe penetrations shall receive a 60-mil HDPE boot with Para JT Tape, proper clamp, heat-welded seams, and Dymonic 100 Sealant on top of termination clamp. Wrap penetration with 3" Parastick 'n' Dry and secure with a stainless steel clamp. A 6" (15.25 cm) minimum space around the pipe penetration is required for detailing. If sealed or cored pipes are present, contact Tremco.
- 9.3 For multiple penetrations or link seal penetrations, contact Tremco for details.
- 9.4 Detail all rebar support anchors per detail drawings on the Tremco website at www.tremcosealants.com.

10. Membrane Application

BACKFILLED WALLS

10.1.1 Install a continuous 2" (5 cm) cant of Paragranular where wall meets footing and at all other vertical to horizontal junctures. Install a continuous 1" (2.5 cm) cant of TREMproof 250GC-T or Paramastic at all vertical inside corners.

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10.1.2 Expansion joints shall be treated with closed cell backer rod and sealed with Dymonic 100 or an approved Tremco sealant. Install a strip of Paraseal GM/LG-60 mil membrane lapping 12" (30 cm) on either side of the joint and fasten on one side only using nails with 1" (2.5 cm) washers every 24" (60 cm) O.C. Field sheet will be installed over detail strip. Do not fasten through detail strip. Refer to detail drawings on the Tremco website at www.tremcosealants.com.

10.1.3 Paraseal GM/LG-60 mil membrane shall be installed against backfilled walls with the granular side against the substrate and the black HDPE side facing the installer. Paraseal GM/LG-60 mil membrane may be tacked into place along the perimeter edges by fastening with nails and 1" (2.5 cm) washers every 36" (90 cm) O.C. All nails must be spot welded over the nail head using HDPE extrusion weld and tested for leaks in accordance with Section 10.3 of this document. Refer to detail drawings on the Tremco website at www.tremcosealants.com.

10.1.4 Paraseal GM/LG-60 mil membrane may be installed with seams running either vertically or horizontally or a combination with equal performance.

10.1.5 The following membrane preparation shall be carried out when using HDPE extrusion weld method to seal the overlap seams. Clean the edges of the bentonite in preparation for HDPE extrusion weld or wedge weld. The 60-mil HDPE shall be lightly abraded to ensure cleanliness. Overlap edges 5" (13 cm) at seams, hot air tack and insert copper wire for spark testing, followed by HDPE extrusion weld. (Refer to detail drawings on the Tremco website at www.tremcosealants.com.)

10.1.6 All membrane edges shall be overlapped a minimum 5" (13 cm) and sealed and tested for leaks as described in 10.3.

10.1.7. Terminate Paraseal GM/LG-60 mil membrane with a continuous strip of Paraterm Bar nailed every 8" (20 cm) O.C. Dymonic 100 or approved Tremco sealant is placed continuously along the top edge of the termination bar. Para JT Tape is placed between the Paraseal GM/LG-60 mil membrane and the wall at grade and then terminated with a Paraterm Bar. (Refer to detail drawings on the Tremco website at www.tremcosealants.com.) The 60-mil membrane must be cleaned to receive the Para JT Tape at this location. Make certain that the waterproofing/methane membrane termination occurs at or below the finish grade.

10.1.8 Paraseal GM/LG-60 mil seldom requires additional protection unless the backfill contains substantial amounts of either lava rock, basalt, or any other coarse or highly abrasive materials. Following good industry drainage practices, a TREMDrain Series drainage mat should be installed prior to backfilling. If drainage board is used, it must be fastened at grade with no nails through the waterproofing/gas membrane. Adhesives may be used to hold the drainage board in place until the backfilling operation. Even though the 60-mil HDPE side of Paraseal GM/LG protects it from weather and subsequent trades, it is still advisable to place and compact backfill as soon as possible after installation. Compact backfill to achieve 24 psf compaction/confinement on the membrane.

10.2 BLINDSIDE WALL

10.2.1 Expansion joints should be treated in accordance with Tremco Paraseal GM/LG 60 mil membrane standard details.

10.2.2 Nails should be removed from the lagging boards or pounded flush.

10.2.3 Wire screed pins shall not be allowed to penetrate the Paraseal GM/LG-60 mil membrane. Wire screed pins shall be attached to the Nelson Studs or 1/2" (12 mm) stainless steel all-thread rods on the face

of the soldier piles. Refer to detail drawings on the Tremco website at www.tremcosealants.com.

10.2.4 If the tieback assemblies are to be removed, tieback block-outs shall be formed using wood forms and/or Sonotube only to ensure their edges have the required smooth surface or the installation of the Superstop/Waterstop inside opening to be 24" x 24" (60 cm x 60 cm). No metal stay form and/or foam should be used in the construction of the block-outs, as the use of these materials will render them unwarrantable. Cover the face of the block-out with plastic sheeting to prevent shotcrete from entering the block-out voids.

10.2.5 If the tieback brackets are to be cut once de-tensioned then the Paraseal GM/LG-60 mil membrane must be protected with a wet fire blanket when using a cutting torch.

10.2.6 If a drainage mat is required, install the proper TREMDrain drainage mat. Contact Tremco Technical Services for recommendations.

10.2.7 Paraseal GM/LG-60 mil membrane shall be installed with the bentonite side facing the installer. Paraseal GM/LG-60 mil membrane may be installed with the long seams running either vertically or horizontally with equal performance.

10.2.8 When using extrusion welding, the 60-mil membrane shall be lightly abraded to ensure cleanliness. Overlap membrane 5" (13 cm) at seams, hot air tack and insert copper wire for spark testing, followed by HDPE extrusion weld. Refer to details on the Tremco website at www.tremcosealants.com. All seams shall be treated in accordance with Section 10.3 of this document.

10.2.9 All membrane edges shall be overlapped a minimum 5" (13 cm) and sealed with a HDPE extrusion weld or wedge weld. Every seam in the System must be tested for leaks in accordance with Section 10.3.

10.2.10 When the placement of the footings or a mat slab is scheduled prior to waterproofing installation, a horizontal starter strip of Paraseal GM/LG-60 mil membrane should be installed first.

10.2.11 Temporarily terminate Paraseal GM/LG-60 mil membrane at the top of earth retaining system by folding it over and tacking it into place. The temporary termination is to hold in place the membrane only during installation. Fasten at the top of the earth retaining system every 8" (20 cm) O.C. with a nail and 1" (2.5 cm) washer. All nails must be spot welded over the nail head using HDPE extrusion weld and tested for leaks in accordance with Section 10.3 of this document.

10.2.12 Prior to wall placement, repair any Paraseal GM/LG-60 mil membrane which has been damaged in accordance with Section 11 of this document.

10.2.13 If the structural wall is poured in place, the concrete should not be dropped from higher than 4' (1.2 M), and the concrete should be forced towards the form work and not the membrane. If the structural wall is shotcrete, the spray should be blown in at a direction opposite of the Paraseal GM/LG-60 mil membrane seam.

10.3 BELOW SLAB-ON-GRADE

10.3.1 Bentonite facing up is the preferred installation method. However, if for reasons of protection the bentonite is facing down, a 2" sand slurry mud slab followed by a 6-mil polyethylene sheet must first be installed on top of the earth or base.

10.3.2 When installed with bentonite facing up, clean the edges of the bentonite in preparation for HDPE extrusion weld or wedge weld. Treat all seams in accordance with written instructions.

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10.3.3 Temporarily terminate Paraseal GM/LG - 60 mil membrane around the perimeter, leaving enough material to tie into vertical wall system after slab has been poured. Refer to detail drawings on the Tremco website at www.tremcosealants.com.

10.3.4 For submerged conditions, the de-watering PVC pipes must be solid, non-perforated pipe both above the membrane and extending a minimum of 12" (30 cm) below the membrane to prevent water from infiltrating the slab. Additionally they must be blocked out with foam at the top of the mat slab so that they may be filled and capped (with hot glue) per Tremco's de-watering detail.

10.3.5 Following good concrete industry practices, a waterstop must be used at all construction cold joints. Install Superstop a minimum of 2" (5 cm) from outer face of wall. It is recommended to apply Paraprimer to clean surface prior to adhering Superstop. Remove release paper to expose adhesive. Butt ends together and fasten with nails and 1" (2.5 cm) washer every 12" (30 cm) O.C.

10.3.6 Repair any Paraseal GM/LG-60 mil membrane which has been damaged prior to concrete placement, after steel reinforcement is tied in place in accordance with Section 11 of this document.

10.3.7 Concrete placement should not be dropped over 4' (1.2 M) directly on Paraseal GM/LG-60 mil membrane. Best to flow in place.

10.4 TREATMENT OF SEAMS

10.4.1 Align all seam overlaps consistent with requirements of welding equipment being used, typically 5" to 6" (13 to 15 cm).

10.4.2 Clean the edges of the bentonite in preparation for HDPE extrusion weld by lightly grinding. All seams are extrusion welded or wedge welded to fuse and join sheets together.

10.4.3 If using extrusion weld, ensure that seam was hot air tacked and copper wire inserted prior to beginning extrusion weld.

10.4.4 Where seams occur with the bentonite in place on the HDPE, the bentonite must be scraped off the HDPE with a putty knife or flat trowel. The residue on the HDPE must be cleaned with a clean rag and xylene or acetone solvent. A double wipe is recommended to insure the HDPE is clean for heat welding.

10.4.5 After the welding and testing is complete, the exposed HDPE shall be covered with Parastick 'n' Dry. Apply Paraprimer or Para JT Tape to the exposed HDPE surface prior to the application of Parastick 'n' Dry.

11 Inspection, Testing and Repair

11.1 INSPECTION CRITERIA

11.1.1 The 60-mil membrane field material shall be 100% visually inspected by the installing applicator and Tremco approved independent inspection firm for holes, rips, cuts, heat burns, welding slag burns and other damages and tested in accordance with 11.1.2 prior to concrete placement.

11.1.2 Upon completion of the membrane liner installation, all seams and penetrations shall be tested in accordance with ASTM D5641 Geomembrane Seam Evaluation by Vacuum Chamber or ASTM D 5820 Pressurized Air Channel Evaluation of Dual Seamed Geomembranes or Spark Test.

11.1.3 Every seam and penetration in the System must be tested for leaks as listed above.

11.1.4 Testing shall be conducted with the consultant present, and seams and penetrations shall be confirmed leak-free in writing by both the contractor and consultant.

11.1.5 Upon completed tests on the exposed black HDPE seams, install a continuous layer of 3" (7.6 cm) or 6" (15 cm) wide Parastick 'n' Dry over or under the welded area to replace the bentonite to those areas.

11.2 REPAIR PROCEDURES

11.2.1 All patch or repair work must be numbered and logged.

11.2.2 Repair method shall be agreed upon between the Tremco approved independent inspection firm and manufacturer.

11.3 Repair methods may include:

11.3.1. Patching – Used to repair large holes, tears, undispersed raw materials and contamination by foreign matter.

11.3.2. Abrading/Re-welding – Used to repair short section of 60-mil seam.

11.3.3. Spot Welding – Used to repair pinholes or other minor, localized flaws or where Paraseal GM/LG-60 mil thickness has been reduced.

11.3.4. Capping – Used to repair long lengths of failed seams.

11.3.5. Flap Welding – Used to extrusion weld the flap (excess outer portion) of fusion weld in lieu of full cap.

11.4 Paraseal GM/LG-60 mil membrane surfaces shall be clean and dry at time of repair.

11.5 Surfaces of HDPE that are to be repaired by extrusion welds shall be lightly abraded to ensure cleanliness.

11.6 Extend patches or caps at least 6" (15 cm) for extrusion welds and 4" (10 cm) for wedge welds beyond edge of damage and around all corners of patch material.

11.7 Below-slab waterproofing system, vertical wall waterproofing system and above-grade air barrier system shall be connected. Contact Tremco for job specific recommendations.

11.8 All Paraseal membranes require 24 psf (117.2 kg/M²) of compression/compaction.

1116PARAGMLG60AI-BG

Please refer to our website at www.tremcosealants.com for the most up-to-date Product Data Sheets.

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