

SECTION 071354 THERMOPLASTIC HYBRID SHEET WATERPROOFING SYSTEM

This guide specification has been prepared according to the principles established in the Project Resource Manual published by the Construction Specification Institute. It is intended to assist the design professional in the preparation of a specification for the installation of Thermoplastic Hybrid Sheet Waterproofing. This guide specification may be modified by the design professional with the consent of Hydro-Gard to be tailored to a specific project. This guide specification was issued on December 2012 and may be superseded without notice at anytime.

HYDRO-GARD systems are engineered to waterproof various types of conditions including:

- Foundation Walls
- Matt Foundation Slabs
- Property Line Applications
- Earth-covered Structures including Subways and Tunnels
- Free Standing Wall applications
- Elevator Pits
- Fountains
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System Description

The HYDRO-GARD Hydro-Prufe® HWS (Hybrid Waterproofing System) is a complete membrane waterproofing system designed to protect below grade structures from the effects of water infiltration leading to structural deterioration and interior water damage.

All HYDRO-GARD waterproofing systems integrate various systems components into specific engineered waterproofing assemblies that address the individual needs of building design, budget, substrate conditions, climate and environment.

Each assembly integrates various components including geotextiles, thermal insulation, drainage layers, protection layers, expansion joints, and most importantly the HYDRO-GARD waterproofing membranes produce an engineered waterproofing solution for a specific waterproofing problem.

Hydro-Prufe® Waterproofing Membranes

The HYDRO-GARD Hydro-Prufe® HWS Hybrid Waterproofing System consists of Hydro-Gard's Hydro-Prufe® 80 Mil PVC sheet waterproofing membrane and Hydro-Gard's Hydro-Ultra Mat B series (bentonite) sheet waterproofing membrane. The Hydro-Prufe® waterproofing membranes are specially formulated thermoplastic sheets manufactured by a unique calendaring and laminating process. The PVC membrane is specially compounded to remain watertight in a sub-grade environment of constant dampness, high alkalinity, exposure to plant roots, fungi, and bacterial organisms, as well as varying levels of hydrostatic pressure. The membrane's resistance to ponding water along with its dimensional stability and elongation characteristics make it an excellent sub-grade membrane.

The HYDRO-GARD Hydro-Ultra Mat B series waterproofing membranes are specially manufactured of needle punched, non-woven and woven polypropylene matt filled with sodium bentonite granules encapsulated with in the polypropylene. The mat contains over 1 lb. per square foot of high swelling sodium bentonite. The Hydro-Ultra Mat B comes in a salt water version, or chemical resistant version, and can be manufactured with an HDPE layer laminated to one side of the Hydro-Ultra Mat.

Welding of Seams and Flashings: HYDRO-PRUFE PVC MEMBRANE

As a thermoplastic membrane Hydro-Prufe® seams and flashings are welded together with automatic and hand-held welding equipment. No sealants, adhesives, or tapes are used to complete the Hydro-Prufe® seams. When completed, the welded seam becomes one monolithic layer of material impervious to moisture infiltration, and as strong as the membrane itself. The welded seam is the most secure seaming method available in the thermoplastic market.

Intricate flashings such as pipes, multiple corner intersections, and transitions can be installed with confidence in performance. Ambient temperature, humidity, and other climatic conditions will not negatively influence the installation or performance of Hydro-Prufe® membrane flashing. Due to the dimensional stability and elongation characteristics of the membrane reflective substrate cracking or minor settlement of the structure can be accompanied by the waterproofing system. Flashing thickness remains constant at wall transitions and penetrations.

Welding can be monitored, inspected, and tested for continuity and quality. Seam samples are frequently taken and tested on-site for quality. The problems of adhesive seaming, reliance on liquids or dissimilar membrane materials or different coefficients of expansion and contraction - a major cause of waterproofing system failure - is eliminated. The welding process provides the best method of joining seams and flashings.

Typically, flashing membranes are of the same mil thickness as the primary waterproofing. However, intricate flashings may require a more pliable thickness (60 mil) when heavy thicknesses are used as the field membranes such as the Hydro-Prufe® 80 Mil systems is used. Contact the manufacturer for recommended flashing thickness when using the 80 Mil membrane.

System Advantages

1. A proven track record of in place performance. (PVC membranes have more than 30 years of in place performance)
2. All components are factory fabricated - no mixing, kettles, or contamination problem's on-site insuring product consistence and quality.
3. Ideal for new construction and renovation projects.
4. No variations in thickness. Thickness is controlled by the manufacture process and not the expertise of the installer.
5. Surface preparation is limited.
6. Easily installed over irregular surfaces.
7. Can be installed over damp surfaces in any temperature increasing contractor productivity and lowering installed costs.
8. Welded seams and flashings provide superior performance.
9. Loose-laid membrane can accommodate movement and minor settlement without affecting the performance of the waterproofing system.
10. Hydro-Prufe® membranes and flashings are unreinforced as a standard, but can be reinforced. See the manufacturer for additional information on reinforced.
11. Seams can be monitored, tested, and inspected for continuity and quality.
12. Complete waterproofing system inclusive of membrane, flashings, expansion joints, thermal insulation, drainage panels, geotextiles, protection layers, and fasteners.
13. Highest degree of quality control and system quality assurance.
14. Third party full time inspection is available. Contact the manufacturer for approved inspection firms.
15. Trained and authorized certified applicators.
16. Various Warranties available
17. Competitive installation costs.
18. Certification: Hydro-Prufe® PVC Thermoplastic Waterproofing system has successfully gone through a rigorous testing process through ICC Evaluation Service. ICC has issued to Hydro-Gard report number ESR-3465.

Substrate Preparation

Concrete Waste Slabs:

The substrate must be smooth, clean and preferably dry. All irregularities must be removed and repaired. Concrete must be cured and dry and clean prior to the application of Hydro-Prufe® HWS waterproofing system. Contact manufacturer for special conditions concerning substrates.

Concrete slab finishes shall be at a minimum smooth float finish. Surface profile shall not have excessive roughness or unevenness. Substrates shall be sound and even. Substrates may have moisture or be damp with the exception of ponding water. Sweep off all ponding water and let surfaces dry.

Wood Lagging:

Ensure that all lagging is clean and dry. If moisture or water is present ensure that electrical welding equipment is protected and does not come into contact with water. Gaps over 1" in lagging shall be filled with concrete, grout or other approved means as defined by HYDRO-GARD. Nails at pile flange shall be removed or hammered down to avoid the possibility of damaging or puncturing the membrane. (*Back lagging conditions should be avoided*). (*Contact HYDRO-GARD for back lagging conditions*)

If moisture or water is present ensure that the Hydro-Ultra Mat B series does not pre-hydrate.

If steel piles are scheduled to be removed at a later date ensure the removal will not damage the Hydro-Prufe® HWS system. This can be accomplished by covering the steel flange at the top of pile with a cement board or other suitable means.

When Hydro-Prufe® HWS is installed over wood lagging and is scheduled to terminate at footing carry membrane down onto footing a minimum of 12". Ensure the membrane is fully supported with backing material such as lagging. When the tops of steel piles are scheduled to be cut down, install a cement board for protection. Cement protection board should be installed beyond the flange of the pile to ensure that removal of the pile will not damage the Hydro-Prufe® HWS system. Contact the manufacturer for additional information.

Free Standing Concrete or CMU wall:

Cast in place concrete walls must be clean and dry. Mild irregular surfaces are acceptable when Hydro-Prufe® Hydro-Ultra Mat or Hydro-Ultra Mat B is used between the concrete wall and the Hydro-Prufe® PVC membrane. All snap tie holes must be filled with grout or other suitable means as determined by the manufacturer. Penetrations shall be in place prior to installation of Hydro-Prufe® PVC membrane. Penetrations not in place prior to waterproofing installation shall have sleeves' in wall. Sleeved penetrations shall have link seals installed prior to PVC flashing materials detailing penetrations. Hydro-Prufe® PVC membrane can be installed over green structural concrete. As soon as the forms are removed and the wall is prepared the installation can proceed.

Metal Sheet Piling:

When sheet piling is used as shoring it shall have a minimum of ½" plywood (12 mm) fastened to create a level and flush substrate for the Hydro-Prufe® PVC membrane system to be installed to. Plywood shall be installed with all seams of the plywood tightly butted together. Fastening of the plywood to the sheet piling shall be sufficient enough to hold the weight of the waterproofing system. Fasteners shall be installed so they are flush with the plywood and do not create a puncture concern. If water seepage exists at the sheet piling interlock seams install waterstop or weld seams solid or other suitable means to maintain the substrate in a dry state. All void spaces behind the plywood and between the sheet piling must be filled with compacted earth, sand, slurry or concrete. An alternate method is to shotcrete the interior surfaces of the sheet piling to flush out with the face of the piling. This method may require adding items like nelson studs, welded wire mesh or other means to securely keep the shotcrete fill stable.

Cut Rock Face or Auger Cast Caisson Shoring:

The substrate surface of a cut rock and concrete auger pile retention wall should be planar and

smooth. Irregular surface conditions, such as voids and sharp transitions that result in an irregular surface profile must be corrected. The substrate that will receive the Hydro-Prufe® PVC waterproofing system must be consistently smooth and provide a surface that can receive the Induction fastening plates. This may require that between the concrete caisson's shotcrete maybe needed to provide this substrate. The shotcrete substrate should provide a minimum thickness of 3". Contact the manufacturer for additional information.

Shoring Wall Bracing:

Interior bracing such as rakers and whalers shall be circular pipe type and not H-Pile beams or other irregular type. If interior bracing is not removed prior to waterproofing installation ensure that block outs are sufficient in size to provide access for detailing waterproofing once bracing is removed. When using circular pipe as wall bracing, ensure that end of pipes are closed off and have a welded plate at the end of pipe before welding to face of vertical steel pile. H-Pile beams used as rakers or whalers are not acceptable.

Tie Backs:

Non detentioned tie-backs: for tie backs that will not be detentioned or removed no block out is required. For this application install Hydro-Prufe® HWS field membrane tightly around head of tie-back. Secure by fasteners or install a fastening bar and install Manufacturer's tie -back boot. Weld PVC flange of tie-back boot to PVC field membrane and probe seams. Ensure that no voids exist around tie-back. If voids exist, fill void with concrete, grout or other approved method.

Post detentioned Tie-back block outs: for tie-backs that will be removed post waterproofing application. A block out will need to be provided. Form block outs from wood or other suitable means such as a Sonotube. If tie-back rods are angled then block out form shall follow same angle and degree. A screen type block out material like sta-form is not acceptable. Block out shall be a minimum 24" x 24" square or equal if round, and free of reinforcing steel. Reinforcing steel shall not be inside block out. Rebar collars can substitute rebar inside block out. Consult with structural engineer for additional information. Once tie-back is detentioned or removed ensure that the removal created no cavity or voids. If void exists, fill void with grout or concrete up to the surface of the steel flange to ensure a flat surface. During installation, block out to ensure that a fire proof protection board is installed inside block out. Cement board or other non-combustible protection can be used to cover and protect the Hydro-Prufe® PVC membrane. Ensure that no PVC membrane is exposed. (See execution portion of this specification for additional information)

Technical Assistance

At HYDRO-GARD we offer the technical assistance needed for the complex waterproofing project. Waterproofing whether it is subterranean, between slabs, or buried under landscape zones can cause problems within any building. For these reasons product selection, design, quality installations and quality control are essential for any successful waterproofing installation. Damage to in-place waterproofing systems are common and result in the greatest number of waterproofing failures. Even the best waterproofing installation can be damaged. This is why HYDRO-GARD has designed their systems with this in mind. We offer an array of protection products that decrease the possibility of damage. HYDRO-GARD also recommends that the owner or general contractor retain a certified and trained third-party inspection company. Contact HYDRO-GARD for more information regarding certified third-party inspection requirements.

HYDRO-GARD offers the following assistance:

1. Architectural detail and drawing review. When HYDRO-GARD is the specified product, we take care to ensure the design complies with our standards and warranty requirements.
2. Approved Contractors. HYDRO-GARD provides training to all its approved contractors to ensure they are well trained in all the HYDRO-GARD products they install.
3. HYDRO-GARD supports and encourages the use of shop drawings from its approved contractors. HYDRO-GARD will review these shop drawings prior to submission and approval.
4. HYDRO-GARD review and inspect substrates prior to installation of any of its products.
5. HYDRO-GARD will make on site periodic inspections.
6. HYDRO-GARD or its approved contractor will make photographic documentation of the installation.
7. Water Testing will be reviewed by the approved third-party inspection company. *(Water Testing applies when this specification is utilized on above grade horizontal areas)*
8. HYDRO-GARD recommends third party Inspection and acceptance of the installed waterproofing system prior to installation of protective layers.
9. HYDRO-GARD recommends third party Monitoring of back fill operation.

The HYDRO-GARD quality assurance program is designed to ensure that the waterproofing installation is installed in full compliance with HYDRO-GARD specifications and requirements. HYDRO-GARD is fully committed to provide the owner with a proven waterproofing system installed by an HYDRO-GARD approved contractor.

System Components: HYDRO-PRUFE® HWS (Hybrid Waterproofing System)

The Hydro-Prufe® system can be installed to: Shoring Systems, Split Slabs Applications, Free Standing walls, Under Foundation Slabs, Tunnel lining and Water Tank Linings. *(See specific specification for Fire water storage tanks)*

1. Induction Fastening Plates: These plates are used in vertical applications. They are used in shoring applications, vertical concrete or CMU wall applications or any application where they are fastened through an approved substrate to secure a leveling layer such as Hydro-Ultra Mat-G or Hydro-Ultra Mat B series.
2. Hydro-Ultra Mat-G: Hydro-Ultra Mat-G is a geotextile buffer layer. It is designed to overlay a substrate may it be concrete, CMU, shoring or other approved substrate. It can also be used as a protection layer over the Hydro-Prufe® PVC membrane. In vertical applications, it is secured in place with induction plates. In horizontal applications, it is loose laid over the substrate. Hydro-Ultra Mat G comes in weights from 8 oz. per square yard to 24 oz. per square yard. Hydro-Ultra Mat B is a needle punched woven and non-woven polypropylene matt filled with over 1 lb. per square foot of high swelling sodium bentonite granules encapsulated within the non-woven and woven polypropylene. Hydro-Ultra Mat B is used as an additional waterproofing layer when hydrostatic conditions exist. Contact Hydro-Gard for additional information. *(This specification is for HYDRO-GARDS HYBRID HWS waterproofing system)*
3. Hydro-Prufe® PVC Membrane: Hydro-Prufe® is a non-reinforced PVC membrane. It is the primary waterproofing product in the Hydro-Prufe® systems. It comes in 80 mil thicknesses. The roll standard width is 6.75 ft. by 65 ft.
4. Hydro-Ultra Mat-B series: Hydro-Ultra Mat-B series is a needle punched non-woven and woven polypropylene mat filled with over 1 lb. per square foot of high swelling sodium bentonite granules encapsulated within the non-woven and woven polypropylene. *(Hydro-Ultra Mat B series is used as the second layer of waterproofing protection in the Hydro-Prufe® HWS waterproofing system)*
The following versions are available:

Hydro-Ultra Mat-B	(Fresh water non-contaminated)
Hydro-Ultra Mat-B-PE	(Fresh water non-contaminated with HDPE facer)
Hydro-Ultra Mat-B-SW	(Salt water version without HDPE facer)
Hydro-Ultra Mat-B-PE-S	(Salt water version with HDPE facer)
5. HDPE protection layer: Hydro-Prufe® HDPE protection layer is the primary protection layer used in horizontal applications. It can also be used in vertical applications over the PVC membrane in lieu of the Hydro-Ultra Mat or Gard-Drain drainage composite. (Consult manufacturer for specific applications). It comes in thicknesses of 30 mils, 40 mils, 60 mils and 80 mils. For vertical applications, it is recommended that 30 mils or 40 mils be utilized. It can be spot welded or fully welded. It is not used in blindside applications.

6. Hydro-Prufe® PVC Waterstop: Hydro-Prufe® PVC Waterstop is an extruded PVC waterstop designed specifically by HYDRO-GARD to compartmentalize specific areas within blind side vertical applications. It has a swelling sealant tape installed along three sides of the PVC waterstop. When the waterstop comes into contact with water it swells and creates a segregated compartment. Hydro-Prufe® PVC Waterstop can also be used for termination details. It can be cast in the substrate and provide a solid point of termination for the Hydro-Prufe® PVC membrane to terminate against. (*Special consultation is required with HYDRO-GARD when this product is to be used*)
7. Hydro-Prufe® Flashing Membrane: Hydro-Prufe® PVC Flashing Membrane is made from the same membrane as the field membrane but comes in different roll sizes and is 60 mils thick. It is used to flash penetrations, drains, curbs, walls, corners and anywhere else detailing is needed.
8. Gard-Stop SK Tape: Gard-Stop SK Tape is a self adhesive bentonite swelling sealant tape. It has a release liner on one side. It is used as a conventional sealing tape for items such as pipe penetrations, Rebar anchors, form ties and other penetrations. When using the Hydro-Prufe® PVC Waterstop. Simply adhere the tape to the Hydro-Prufe® PVC Waterstop per Hydro-Gard details for compartmentalization. (See manufacturer for additional information)
9. Waterstop-B: Waterstop-B is a traditional bentonite joint sealing waterstop. It consists of bentonite embedded in a matrix of polyisobutylene and special fillers. Its primary use is for sealing concrete construction joints. It can be mechanically fastened or adhered in place. When Waterstop-B comes in contact with water it will expand and seal the construction joint. Waterstop-B comes in multiple sizes. (See data sheet for additional information)
10. HP Liquid Flashing 9800: HP Liquid Flashing is a flexible methyl methacrylate polyurethane resin. It is 100% reactive and is used with the Hydro-Prufe® PVC membrane. HP Liquid Flashing 9800 is used as a detail membrane for those difficult conditions where conventional flashings just can't conform to a particular shape. It can also be used as an embedment sealant to embed the Hydro-Prufe® Membrane into. (See Manufacturer's' details for additional applications.)
11. HP 9112 Primer: HP 9112 primer is the primer used in conjunction with the HP Liquid Flashing resin. It is a methyl methacrylate resin used to prepare all surfaces in which the HP 9800 Liquid Flashing is to be applied to.
12. Gard-Tape: Gard-Tape is a double-sided sealant tape with a release liner on each side. It is designed to adhere to most substrates. It is used as an accessory product to the Hydro-Prufe® PVC membrane. Its primary use is for termination points for the Hydro-Prufe® PVC membrane. It is used behind the membrane when the membrane is terminated at grade. (See manufacturer details for additional information.)

13. Adhesive U 410-D: Adhesive U 410-D is a urethane elastomeric adhesive which provides a high strength bond to substrates that are dry. It can be used over metal, plywood, masonry, concrete and Dens Deck Gypsum board. It is used to adhere the Hydro-Prufe® PVC membrane and Hydro-Prufe® PVC flashings.
14. Adhesive U 148-A: Adhesive U 148-A is a solvent based contact adhesive. It is used in similar applications as the Adhesive U 410-D but both surfaces the U 148-A is applied. It is applied to the PVC membrane and the mating substrate.
15. SAF-30 Adhesive: SAF-30 is a modified methacrylate liquid paste in tube form. It is primarily used as an adhesive to bond accessory products like the waterstop B to construction joints. It can also be used for termination points for the Hydro-Prufe® PVC membrane, and as a detail sealant. (Contact Hydro-Gard for additional applications)
16. Centrix Magnet: The Centrix magnet is used to secure the Hydro-Prufe® PVC membrane to the induction plates behind the membrane once the induction welding is completed. Immediately after the induction weld is performed, the Centrix magnet is placed over the membrane until full adhesion is achieved.
17. HG-Extrusion Welding Rod: HG-Extrusion Welding Rod is a 3-mm PVC welding coil used in extrusion welding. This 3-mm coil is placed in a conventional extrusion welding machine and melted through the machine and installed at the seam of the Hydro-Prufe® PVC membrane after the PVC membrane has been fully hot air welded. (See the installation portion of the specification for additional information.)
18. Alko-Injection 19: Alko-Injection 19 is a double-jacketed PVC base hose with offset openings and/or slots for the disbursement of compressed injection materials. This version is designed to be installed into the segmented compartments of the Hydro-Prufe® PVC waterproofing system created by the installation of the Hydro-Prufe® PVC Waterstops. If a breach in the system exists then injection materials can be injected from the injection box. It is then disbursed throughout the compartment filling the cavity space and sealing the leak. It can also be used in conventional construction joints for added protection.

Drainage Components

Gard-Drain: Hydro-Gard provides an array of different drainage products. Each has different properties, compression strengths and flow rates. Below is a list of the drainage products Hydro-Gard supplies. Contact manufacturer for data sheet and literature on any of the Gard-Drain products.

Gard-Drain 200, Gard-Drain 220, Gard-Drain 400, Gard-Drain 400 RB-T, Gard-Drain 400 RB-W, Gard-Drain 420, Gard-Drain 700, Gard-Drain 990, Gard-Drain 1000, Gard-Drain GRS, and Gard-Drain BCS.

INSTALLATION MANUAL FOR HYDRO-PRUFE® HWS (Hybrid Waterproofing System)

Part 1 - General Conditions

1.01 Description

A. Summary:

This installation manual is specific for the installation of Hydro-Prufe® HWS waterproofing system, with 80 Mil Unreinforced PVC waterproofing membrane and Hydro-Ultra Mat-B series system for subterranean structures (non-hydrostatic and hydrostatic).

The work includes, but is not necessarily limited to the following:

1. Substrate preparation (See above for different substrate conditions)
2. Buffer layer (Hydro-Ultra Mat-G)
3. Hybrid Layer (Hydro-Ultra Mat-B series)
4. Drainage layer (Gard-Drain Series)
5. Drainage Collection System (Gard-Drain BCS)
6. PVC Thermoplastic Membrane (Hydro-Prufe® 80 mil PVC)
7. Membrane Flashings (Hydro-Prufe® PVC flashings)
8. Protective Layers (HDPE protection layer or Hydro-Ultra Mat-G)
9. Liquid Flashing (HP Liquid Flashing 9800, SAF-30 Adhesive)
10. Fastening Plates (Induction Welding plates)
11. Waterstops (Hydro-Prufe® PVC extruded waterstop)
12. Swellable Sealant Tape (Gard-Stop SK, Hydro-Gard Swell Tape, Waterstop-B and Leakmaster swellable sealant)
13. Welding Rod (HG-Extrusion Welding Rod)
14. Injection hoses (Alko 19 Injection hoses and Injection Box)
15. Centrix Magnet, fastening bars, and fasteners as supplied or approved by Hydro-Gard.

B. Related Work under other sections:

1. Site work: Excavation, backfill operations, subsurface and geotechnical investigations.
2. Concrete: Forming and placement. Method of securing forms in blind side construction.
3. Shotcrete: Shotcrete placement
4. Plumbing: Piping and drainage system

1.02 Quality Assurance

- A. Applicator Qualifications: Applicator shall be approved to install the specified system if the Thermoplastic system is not installed by manufacturer. Applicator shall have a minimum of (3) years' experience in the work of the type required by this manual. Applicator shall have completed and passed the Manufacturer's training and guidelines.
- B. Product Manufacturer: Waterproofing system shall have approval by ICC Evaluation Service or other nationally recognized approval agency.
- C. Installation of waterproofing membrane, flashing, membrane protection layers, drainage layer and insulation shall be the responsibility of the membrane applicator to ensure undivided responsibility. Applicator shall ensure that all Manufacturer's' guidelines are followed at all times.
- D. Materials: Obtain waterproofing products and accessories from a single manufacturer to assure material compatibility or as approved by manufacturer.
- E. Independent Inspection: The owner or Architect may make arrangements to retain and approved inspection company. The inspection company shall provide full time inspection while all waterproofing work is underway. The inspector shall be provided all contract documents, waterproofing subcontractors shop drawings, Manufacturer's' details and specification. The inspection company must be approved by the manufacturer and had previously completed the manufacturer's inspection training. Inspection service shall provide reports, photos, documenting the installation of all waterproofing work. These reports shall be made available to owner, general contractor, waterproofing contractor and manufacturer. For applications that are under hydrostatic conditions this full-time inspection requirement continues while the concrete foundations are being placed. The inspector shall review, document, and photograph all work. A report shall be provided to the Architect, owner, contractor, installing contractor and manufacturer.
- F. Pre-Installation Conference: Conduct Conference at the project site to comply with the requirements of division 1 of the specifications. Review requirements of substrate preparation, penetrations, waterstop installation, Hydro-Prufe® PVC Waterstop locations, and all termination conditions. The attendees shall include a representative of the owner, Architect, inspection firm, general contractor, waterproofing contractor, concrete or shotcrete contractor, and any other contractors whose work will penetrate the waterproofing or may interface with the waterproofing.
- G. There shall be no deviation made from the contract specification or the approved shop drawings without prior written approval by the owner, the owner's representative, and membrane manufacturer.
- H. Seam sampling: At a minimum of three times per day sample seam. Sample seam strength by cutting a cross section a minimum of two inches wide from a completed and probed seam. Test sample shall be tested by inspection company

and documented on inspection report. Inspection company shall consult with manufacturer on level of acceptability. Shearing of membrane rather than separation of the weld will constitute an acceptable weld. Applicator shall repair test cut with a round target patch 4 in. minimum in diameter.

- I. Water sampling: Waterproofing contractor or General contractor shall supply a minimum of one gallon of site water for the review by manufacturer when Hydro-Ultra Mat-B is used. Manufacturer shall perform test on site water for analysis on swelling capability of Hydro-Ultra Mat-B series. Manufacturer shall confirm after water sample analysis is completed if the specified Hydro-Ultra Mat-B is suitable for application or if specified product needs to be substituted to other Hydro-Gard systems.

1.03 Submittals

- A. The Contractor shall submit to the owner's representative the following:
- B. Prepare and submit specified submittals in accordance with the contract documents and division 1 submittals.
- C. Submit Manufacturer's product literature, ICC Evaluation Service approval report and installation guidelines along with the Manufacturer's standard details.
- D. Submit representative samples of all products listed in this installation manual
- E. Submit Sample warranty certificate from manufacturer.

1.04 Product Delivery, Storage and Handling

- A. Delivery: Materials shall be delivered in their original packaging, clearly marked with Manufacturer's name, brand and type of material. Store materials to avoid damage from trade construction, weather damage, or UV over exposure
- B. Handle all materials to prevent damage. Place all materials on pallets and fully protect from moisture with canvas tarpaulins.
- C. Membrane rolls shall be stored lying down on pallets, and be fully protected from moisture with canvas tarpaulins.
- D. Adhesives shall be stored at temperatures above 40 degrees F and be covered. Do not store at a temperature greater than 80 degrees.
- E. All flammable materials shall be stored in a cool dry area away from sparks and open flames. Follow precautions outlined on the container or supplied by material manufacturer/supplier.
- F. Any materials which are determined damaged by the owner's representative are to be removed from the job site and replaced at no cost to the owner.

1.05 Job Conditions (SEE SUBSTRATE PREPARATION IN THIS MANUAL)

- A. Proceed with waterproofing membrane installation only after substrate preparation is complete. Obtain acceptance from the owner's representative and the membrane manufacturer's representative of substrate surfaces before proceeding with membrane installation. Waterproofing contractor is responsible to ensure substrate is adequately prepared to receive waterproofing system.
- B. The substrate must be clean and smooth. Do not work in rain or snow. Severe temperatures, moisture and humidity may affect the installation and performance of products during construction. Consult with the Manufacturer's and comply with applicable recommendations of all materials of workmanship and handling.
- C. This specification contemplates the use of a waterproofing system with structures designed to support the system, including the hydrostatic pressure and backfill. The adequacy of the structure support must be verified in writing by the owner, the owner's design professional, architect, or engineer.
- D. Ensure that blind side substrate is sound and dry. If water is seeping for blind side substrate, report this to owner representative for correction before proceeding.
- E. All new and temporary construction, including equipment and accessories, shall be secured in such a manner, at all times, as to preclude wind blow-off or damages.
- F. The contractor is cautioned that certain membranes are incompatible with asphalt and oil based and plastic based cements. Avoid contact with asphalt and oil based products with PVC membranes. Contact manufacturer when this occurs.
- G. Arrange work sequence to avoid damage to newly constructed waterproofing. Any damage which occurs to the waterproofing membrane and/or system is to be brought to the attention of the owner's representative, inspection firm and membrane manufacturer. All damage is to be repaired according to the membrane manufacturer's recommendations.
- H. Prior to and during application, all dirt, debris, and dust shall be removed from the surface either by vacuuming, sweeping, blowing with compressed air and/or similar methods.
- I. If any unusual or concealed condition is discovered, stop work and notify the owner's representative, inspection firm and membrane manufacturer immediately, in writing.
- J. Liquid materials such as solvents and adhesives shall be stored and used away from open flames, sparks and excessive heat.
- K. Contaminants, such as grease, fats, oils, and solvents, shall not be allowed to come into direct contact with the waterproofing membrane. Any such contact shall be reported to the manufacturer.

- L. The contractor should take necessary precautions when using adhesives around air intakes. The smell of the adhesives could be a disturbance to the building owner and occupants. It is the contractor's responsibility to coordinate equipment to be turned off and on with the owner if necessary.

1.06 Sequencing of the work

- A. Work in conjunction with other trades by the timely performance of the work, including installation of protection layer(s), drainage panels, and insulation. Coordinate with other trades to avoid damage to the waterproofing membrane.
- B. Complete sections of the waterproofing membrane shall be accepted by the inspection firm and manufacturer before proceeding with protection layers and/or backfill operations.

1.07 Warranties

- A. Special Installer Warranty:

The installer shall provide a 2-year installer warranty. This warranty shall ensure against leaks in the waterproofing system caused by defects in the installation of the waterproofing system. The installer warranty shall include defects in materials or workmanship. Upon notification of such defects or leaks within the warranty period the installer shall make all repairs necessary to remedy the leaks in the waterproofing system.

- B. Manufacturer's Warranty:

Hydro-Gard shall offer the Manufacturer's standard (5) year warranty upon request of a property executed warranty application form. The warranty shall be issued upon confirmation that the Hydro-Prufe® HWS system has complied with the Manufacturer's requirements. Manufacturer's warranty shall be independent from any other warranty made by Contractor under requirements of the Contract Documents and may run concurrent with the other warranties. The Manufacturer's warranty shall be conditioned upon the following; (1) a properly completed notice of award has been completed by the waterproofing applicator and received by the manufacturer; (2) all products and accessories have been supplied by Hydro-Gard; (3) all products supplied by Hydro-Gard have been installed in accordance with Hydro-Gard installation guidelines and details; (4) Waterstop B has been installed in all construction joints and shotcrete lift joints; (5) Alko-Injection hoses have been installed in all construction joints and shotcrete lift joints when these areas are within the water table; (6) all third-party inspection reports have been submitted to Hydro-Gard.

Part 2 - Products

2.01 PVC Waterproofing Membrane

A. Hydro-Prufe® 80 Mil Unreinforced Thermoplastic Sheeting

<u>Parameters</u>	<u>Test Method</u>	<u>Typical Physical Properties</u>
Tensile Strength	ASTM D638	1500 psi
Elongation	ASTM D638	400 %
Tear Resistance	ASTM D1004	10
Laminated Bond ST.	ASTM D413	24
Low Temp Bend	ASTM D2136	-40
Heat Aging	ASTM D4434	90
Water Absorption	ASTM D570	3.0
Flammability	ASTM D568	SE
Seam Strength	ASTM D751	75% of tensile strength
Dimensional Stability	ASTM D1204	0.01
Accelerated Weathering	ASTM D4434	No cracking
Hydrostatic Pressure Resistance	ASTM D751	241 psi
Thickness	ASTM D751	.080" /2.0mm

*Failure occurs through membrane rupture not seam failure

B. Hydro-Ultra Mat-B series Bentonite Waterproofing Membrane

<u>Parameters</u>	<u>Test Method</u>	<u>Typical Physical Properties</u>
Bentonite Mass	ASTM D5993	1.024 lb/sf
Tensile Strength	ASTM D6768	68.5 lbs/in
Swell Index	ASTM D5890	2 gal / 24ml
Hydrostatic Head Pressure	ASTM D751	228 ft
Fluid Loss	ASTM D5891	18 ml / max
Permeability	ASTM D5084	1x10 / m/s
Thickness	ASTM D751	0.26" / 6.5 mm

2.02 Manufacturer

- A. HYDRO-GARD LLC
18340 Yorba Linda Blvd., Suite 107, Box 304
Yorba Linda, CA 92886 Ph: 562-944-7030 Fax: 562-944-6402

2.03 Hydro-Prufe® HWS Products and Accessories

A. Accessories:

1. Induction Fastening Plates: These plates are used in vertical applications. They are used in shoring applications, vertical concrete or CMU wall applications or any application where they are fastened through an approved substrate to secure a leveling layer such as Hydro-Ultra Mat-G or Hydro-Ultra Mat B.
2. Hydro-Ultra Mat-G: Hydro-Ultra Mat-G is a geotextile buffer layer. It is designed to overlay a substrate may it be concrete, cmu, shoring or other approved substrate. In vertical applications, it is secured in place with induction plates. In horizontal applications, it is loose laid over the substrate. Hydro-Ultra Mat-G comes in weights from 8 oz. per square yard to 24 oz. per square yard.
3. Hydro-Prufe® PVC Membrane: Hydro-Prufe® is a non-reinforced PVC membrane. It is the primary waterproofing product in the Hydro-Prufe® HWS system. It comes in, 80 mil thickness. The roll standard width is 6.75 ft. by 65 ft. long.
4. HDPE protection layer: Hydro-Prufe® HDPE protection layer is the primary protection layer used in horizontal applications. It can also be used in vertical applications over the PVC membrane in positive side application in lieu of the Hydro-Ultra Mat-G or Gard-Drain (Consult manufacturer for specific applications). It comes in thicknesses of 30 mils, 40 mils, 60 mils and 80 mils. For vertical applications it is recommended that 30 mil or 40 mil be utilized. It can be spot welded or fully welded.
5. Hydro-Prufe® PVC Waterstop: Hydro-Prufe® PVC Waterstop is an extruded PVC waterstop designed specifically by HYDRO-GARD to compartmentalize specific areas within blind side vertical applications. It has a swelling sealant tape installed along three sides of the PVC Waterstop. When the waterstop comes into contact with water it swells and creates a segregated compartment. Hydro-Prufe® PVC Waterstop can also be used for termination details. It can be cast in the substrate and provide a solid point of termination for the Hydro-Prufe® PVC membrane to terminate against.
6. Hydro-Flashing: Hydro-Flashing is made from the same membrane as the field membrane but comes in different roll sizes and is 60 mils thick. It is used to flash penetrations, drains, curbs, walls, corners and anywhere else detailing is needed.
7. Gard-Stop SK Tape: Gard-Stop SK Tape is a self-adhesive bentonite swelling sealant tape. It has a release liner on one side. It is used with the Hydro-Prufe® PVC Waterstop. Simply adhere the tape to the Hydro-Prufe® PVC materstop per Hydro-Gard details for compartmentalization. It is also used as a conventional sealing tape such as around penetrations,

behind the PVC membrane where a termination bar can be placed and fastened through the PVC membrane and the tape. (See manufacturer for additional information)

8. HP Liquid Flashing 9800: HP Liquid Flashing is a flexible methyl methacrylate polyurethane resin. It is 100% reactive and is used with the Hydro-Prufe® PVC membrane. HP Liquid Flashing 9800 is used as a detail membrane for those difficult conditions where conventional flashings just can't conform to a particular shape. It can also be used as an embedment sealant to embed the Hydro-Prufe® membrane into. (See Manufacturer's details for additional applications.)
9. HP-9112 Primer: HP-9112 Primer is the primary primer used in conjunction with the HP 9800 Liquid Flashing resin. HP-9112 is a methyl methacrylate used as the substrate primer and the primer also applied to the Hydro-Prufe® PVC membranes. (See Manufacturer's details and data sheet for additional information.)
10. Gard-Tape: Gard-Tape is a double-sided sealant tape with a release liner on each side. It is designed to adhere to most substrates. It is used as an accessory product to the Hydro-Prufe® PVC membrane. Its primary use is for termination points for the Hydro-Prufe® PVC membrane. It is used behind the membrane when the membrane is terminated at grade. (See Manufacturer's details for additional information.)
11. Adhesive U 410-D: Adhesive U 410-D is a urethane elastomeric adhesive which provides a high strength bond to substrates that are dry. It can be used over metal, plywood, masonry, concrete, steel, and Dens Deck Gypsum board. It is used to adhere the Hydro-Prufe® PVC membrane and Hydro-Prufe® PVC flashings.
12. Adhesive U 148-A: Adhesive U 148-A is a solvent based contact adhesive. It is used in similar applications as the Adhesive U 410-D but both surfaces the U 148-A is applied. It is applied to the PVC membrane and the mating substrate.
13. Hydro-Ultra Mat B: Hydro-Ultra Mat B is a non-woven and woven polypropylene mat filled with sodium bentonite granules encapsulated within the non-woven polypropylene. When the Hydro-Prufe® PVC waterproofing system is being used under hydrostatic conditions Hydro-Ultra Mat B is a requirement. It can be used against shoring, free standing walls, cut and cover tunnels and anywhere a double layer is required.
15. Alko-Injection 19: Alko-Injection 19 is a double-jacketed PVC base hose with offset openings and/or slots for the disbursement of compressed injection materials. This version is designed to be installed into the segmented compartments of the Hydro-Prufe® PVC waterproofing system created by the installation of the Hydro-Prufe® PVC Waterstops. If a breach in the system exists then injection materials can be injected from the injection box and disbursed throughout the compartment filling the cavity space and sealing the leak. It can also be used in conventional

construction joints for added protection.

B. Drainage Components

1. Gard-Drain 200: Gard-Drain 200 is a prefabricated drainage medium intended for below grade vertical wall applications. It is a moderate duty drainage medium utilizing a dimple core. It has a single layer of non-woven filter fabric on one side. It has a compressive strength of 11,000 psf, Core flow rate of 12.5 gpm and is 0.25 inches thick.
2. Gard-Drain 220: Gard-Drain 220 is a prefabricated drainage medium intended for below grade vertical wall applications. It is a moderate duty drainage medium utilizing a dimple core. It has a single layer of non-woven filter fabric on one side and a thin film protection sheet on the other side. It has a compressive strength of 11,000 psf, Core flow rate of 12.5 gpm and is 0.25 inches thick.
3. Gard-Drain 400: Gard-Drain 400 is a prefabricated drainage medium designed to manage water around foundations by collecting surface and ground water and discharging it into the designed collection system. Its primary use is for below grade foundation walls. It has a spunbonded non-woven filter fabric on one side. It has a compressive strength of 15,000 psf, Core flow rate of 17 gpm and is 0.44 inches thick.
4. Gard-Drain 400 RB-T: Gard-Drain 400 RB-T is a prefabricated drainage medium intended for both vertical and horizontal applications. Its primary use is for landscape zones or other areas where a root resistant drainage medium is desirable. It has a spunbonded non-woven filter fabric on one side. It has a compressive strength of 15,000 psf, Core flow rate of 21 gpm and is 0.44 inches thick.
5. Gard-Drain 400 RB-W: Gard-Drain 400 RB-W is a prefabricated drainage medium intended for both vertical and horizontal applications. Its primary use is for landscape zones or other areas where a root resistant drainage medium is desirable. It is a high flow rate drainage medium. It has a root resistant woven monofilament filter fabric on one side. It has a compressive strength of 15,000 psf, Core flow rate of 21 gpm and is 0.44 inches thick.
6. Gard-Drain 420: Gard-Drain 420 is a prefabricated drainage medium intended for both vertical and horizontal applications. It is used for below grade vertical applications such as foundation walls (blind side or free standing) and can be used in landscape zones like the other Gard-Drain 400 series products. It is a high flow rate drainage medium. It has a non-woven filter fabric on one side and a thin film protection sheet on the other side. It has a compressive strength of 15,000 psf, Core flow rate of 17 gpm and is 0.44 inches thick.
7. Gard-Drain 700: Gard-Drain 700 is a prefabricated drainage medium intended for horizontal applications. It is primarily used under concrete toppings, plaza decks, and can also be used in landscape zones. Gard-

Drain 700 has a woven monofilament filter fabric on one side. It has a compressive strength of 18,000 psf, Core flow rate of 21 gpm and is 0.44 inches thick.

8. Gard-Drain 990: Gard-Drain 990 is a prefabricated drainage medium intended for horizontal applications when a high compressive strength drainage medium is needed. It's intended applications are under heavy concrete toppings, vehicle traffic areas and other high compressive strength applications. It has a single layer of woven monofilament filter fabric adhered to the chemically resistant core. It has a compressive strength of 30,000 psf, Core flow rate of 13 gpm and is 0.25 inches thick.
9. Gard-Drain 1000: Gard-Drain 1000 is prefabricated drainage medium intended for horizontal applications. It can be used under concrete toppings, plaza decks and other horizontal applications where a thin drainage medium is needed. It has a non-woven filter fabric on one side. It has a compressive strength of 45,000 psf, a flow rate of 13 gpm and is only 0.25 inches thick.
10. Gard-Drain GRS: Gard-Drain GRS (Green Roof System) is high flow rate core type prefabricated drainage medium used in Garden Roofing applications. The core is perforated and has a root resistant filter fabric bonded to the top side and protection fabric bonded to the bottom side for installation over the waterproofing membrane. The physical properties are, compressive strength 9,000 psf, core flow rate of 21 gpm, fabric flow rate of 70 gpm, water storage capacity 0.11 gal / per sf and is 1.0 inches thick.
11. Gard-Barrier RB: Gard-Barrier RB is a solid sheet of 20 mm (0.8") post industrial polystyrene. It is used to resist roots in landscape zones, planters, and green roofing applications.
12. Gard-Drain BCS: Gard-Drain BCS (Base drain collector system) is a prefabricated high flow rate collector system used in conjunction with the Gard-Drain drainage mediums. It is designed to collect the water that enters the Gard-Drain drainage composite collect it at the base of the foundation wall and discharge it into the plumbing system. It is used in lieu of a conventional pipe or (French drain). The physical properties are, compressive strength 9000 psf, core flow rate of 80 gpm and is 1.0 inches thick.

2.04 Related Materials

A. Sealants

The following sealants are accepted based on chemical compatibility with Hydro-Prufe® membrane.

1. Sonneborn NP-1 by Chemrex, Inc.
2. Vulkem 116 by Mameco International
3. Vulkem 921 by Mameco International
4. Tremseal-S by Tremco

B. Miscellaneous Fasteners and Anchors

All fasteners shall be of the same type as the metal being secured. In general, all fasteners, anchors, nails, straps, shall be of stainless steel. Fasteners are to be compatible with materials in contact with fasteners. All fasteners and anchors shall have a minimum embedment of 1-1/4 in. and shall be approved for such use by the fastener manufacturer. Fasteners for attachment of metal to wood expansion type fasteners. All fasteners shall meet factory mutual standard 4470 for corrosion resistance.

Part 3 - Execution

3.01 General

The waterproofing contractor shall coordinate the installation so that each area is made watertight at the end of each work period or onset of inclement weather whenever possible. Trapped water under the Hydro-Prufe® HWS waterproofing system must be removed prior to proceeding with the system.

3.02 Examination

- A. Examine all surfaces, substrates and conditions to receive the Hydro-Prufe® waterproofing system. Confirm conditions are acceptable for the application of the PVC waterproofing system. Do not proceed with work until all unsatisfactory conditions have been corrected in a manner acceptable to installer and manufacturer. Starting work within a particular area will be construed as applicators acceptance of all substrate conditions.
- B. Substrate surface shall comply with Manufacturer's requirements. See "Substrate Requirements" within this manual.
- C. Do not allow bitumen or oil in any form to contact the thermoplastic membrane or other system components. Ensure that foreign matter, debris is not in contact with Hydro-Prufe® PVC waterproofing membrane.
- D. Verify that all penetrations are in place and sealed with link seals or other suitable means approved by manufacturer. All penetrations installed after (post) PVC waterproofing system shall have waterstops installed. (See penetration details)

3.03 Substrates and Substrate Preparation

- A. Free Standing Foundation Walls:
 - 1. Concrete foundation walls shall be cured and free of fins, voids or sharp projections that could cause damage to the Hydro-Prufe® HWS waterproofing system.
 - 2. Form tie holes shall be sacked flush with concrete or grout.
 - 3. Curing compounds or form release agents shall be the type approved by the manufacturer.
 - 4. CMU walls shall have all joints struck flush. Tooling of joint is unacceptable. Gaps shall be grouted flush. Expansion joints in CMU walls shall be filled with an acceptable sealant. (Consult with manufacturer for any additional detailing on expansion joints.)

B. Wood Lagged Shored Walls:

1. Ensure that all lagging is clean and dry. If moisture or water is present ensure that electrical welding equipment is protected and does not come into contact with water. Gaps more than 1 inch in lagging shall be filled with concrete, grout or other approved means as defined by HYDRO-GARD. Nails at a pile flange shall be removed or hammered down to avoid the possibility of damaging or puncturing the membrane.
2. Wood lagging should extend down to the lowest level of the waterproofing installation. When Hydro-Prufe® HWS waterproofing system is not specified to be carried under footing and under slab then waterproofing system must be carried down into perimeter footing a minimum of 12". Hydro-Prufe® HWS waterproofing must be fully supported by lagging, ensure that lagging is fully supported and carried down into footing a minimum of 12". If lagging needs to extend beyond the minimum then continue to extend lagging until waterproofing system is fully supported.

C. Working Mud Slab:

Working mud slabs shall be dry and free of any debris. A mud slab should have a smooth wood float finish without sharp angular depressions, voids or sharp raised areas that could cause damage to the Hydro-Prufe® PVC waterproofing system.

D. Compacted Soil Substrates:

1. The sub-grade shall provide no less than 85% compaction factor or greater if specified by the engineer. The surface shall provide a smooth and uniform profile free of debris, standing water, ice or rocks. Sharp protrusions shall either be removed or rolled flat. Specific sub-grade preparation shall be designed by a licensed and qualified engineer. When compacted Soil substrates are used in lieu of working mud slabs Hydro-Ultra Mat-G 12 oz must be used as a buffer layer between the Hydro-Prufe® HWS waterproofing system. *Projects within the water table must provide a working mud slab. (See paragraph 3.05, B for additional information)*
2. Aggregate sub-grades shall consist of 3/4" (19 mm) stone or smaller and rolled flat and shall be free from any sharp or protruding edges. Sub base shall consist of highway type road base that contains sand and other fines that lend themselves to compaction. Hydro-Ultra Mat 12 oz must be used as a buffer layer between the Hydro-Prufe® HWS and the aggregate substrate.

E. Concrete Protection slab:

A concrete protection slab placed over the Hydro-Prufe® HWS waterproofing system is highly recommended. A concrete protection slab will ensure that the Hydro-Prufe® HWS waterproofing system is protected from damage from subsequent construction operations. When a concrete protection slab is not used then the Hydro-Prufe® HWS waterproofing system must have either Hydro-Ultra Mat-G 12 oz placed over the Hydro-Prufe® HWS system or 40 mil HDPE protection layer

F. Steel Solider Piles:

1. When steel H piles are used it is always the preference to have the lumber lagging front lagged. Hydro-Prufe® HWS waterproofing system should be installed over a flush and consistent surface. If front lagging is not possible then consult with manufacturer for additional detail requirements.
2. If steel piles are scheduled for removal, ensure that the removal will not damage the Hydro-Prufe® HWS waterproofing system. This can be accomplished by installing a protection layer of cement or other fire rated board at the top of the pile or positioned at the point that the pile will be cut off at a later date.
3. Lagging board nails shall either be removed or pounded down flush until they no longer are considered a possible protrusion that could puncture the Hydro-Prufe® HWS waterproofing system. If necessary a protection layer of Hydro-Ultra Mat-G or Gard-Drain can be used as a protection material.

3.04 Initial Installation over Wood Lagging

A. Drainage Board Installation:

1. When required by the construction documents install Gard-Drain BCS at base of wall just above footing. Start at the base of the lagged wall and install Gard-Drain BCS horizontally connecting each roll. Install discharge outlets as required by the construction documents.
2. Blindside Installation: Continue installation of Gard-Drain Prefabricated drainage board vertically up wall with geotextile fabric facing lagging in blind side installations. Attach Gard-Drain panel using washer head nails, construction adhesive, adhesive tapes or other means approved by manufacturer. Cut and fit Gard-Drain neatly around penetrations and seal off edges of drainage board.
3. Back Fill Wall Installation: When installing Gard-Drain over completed in place Hydro-Prufe® PVC membrane do not fasten Gard-Drain through the PVC membrane. Adhesives or spots of Adhesives can be used to

secure the Gard-Drain in place until backfill operations are complete.
(Contact Hydro-Gard for adhesive recommendations.)

B. Hydro-Ultra Mat-G Installation: (For non-hydrostatic conditions)

Install Hydro-Ultra Mat-G 12 oz leveling layer over Gard-Drain. Hang Hydro-Ultra Mat-G over drainboard and overlap a minimum of 4 inches. Fasten Hydro-Ultra Mat-G temporarily with washer head nails until induction discs are installed. Cut and trim Hydro-Ultra Mat-G leveling layer around tie-backs, rakers and other penetrations. *(Contact Hydro-Gard for elimination of Hydro-Ultra Mat-G when Gard-Drain is being used in blind side applications, additionally Hydro-Ultra Mat-G is not used when Hydro-Prufe® HWS system is used)*

C. Hydro-Ultra Mat B Installation: (Required for hydrostatic conditions)

(When hydrostatic conditions exist Hydro-Ultra Mat B replaces both Gard-drain and Hydro-Ultra Mat-G)

Install Hydro-Ultra Mat B over properly prepared lagging. Install overlapping seams a minimum of 4" and secure laps with washer head nails at 24" on center. Install Hydro-Ultra Mat B neatly and tightly around tie-back heads and other penetrations.

3.05 Installation of Hydro-Prufe® PVC Membrane:

A. Vertical Wall Installation:

1. On vertical surfaces layout location of disc and fasten disc through Gard-drain and Hydro-Ultra Mat-B series and properly secure disc with manufacturer approved fasteners. Ensure that discs are fastened flush and that fastener does not indent or warp disc. Fasten head must not protrude beyond flat portion of disc. *(See Tech Bulletin #001 for illustration)* This could cause a puncture condition. Fasteners must be recessed into recessed portion of disc. Disc must provide a consistent flat and even surface for induction welding. Disc shall be set approximately at 14" to 15" spacing horizontally and 46" to 48" vertically. Spacing of disc shall be determined by manufacturer. Sheet size, layers of materials that disc are penetrating, and other variations may affect spacing and increase quantity of induction discs. For estimating purposes approximately 30 discs per 100 square feet should be used plus overage or waste. *(Note: When hydrostatic conditions exist Gard-Drain may not be needed if water discharge locations have not been designed into the system)*
2. Hang Hydro-Prufe® PVC sheets vertically or horizontally and secure at top of vertical walls with Manufacturer's batten bars or other temporary measures. It is acceptable to install the initial sheet in a band form of Hydro-Prufe® PVC horizontally across the piles. Let sheets relax. Hydro-Prufe® PVC sheets shall drape down wall and terminate a minimum of

12" into perimeter footing. If Hydro-Prufe® PVC membrane was previously installed horizontally under the slab on grade then carry wall membrane down to overlap previously installed membrane and overlap a minimum of 6" and weld. If a termination bar was used to hold previously installed PVC membrane under slab then carry wall membrane beyond termination bar a minimum of 4". Trim PVC around tie-backs and penetrations.

3. Weld Hydro-Prufe® PVC membrane to induction disc utilizing the induction method of welding. Ensure that machine is calibrated for proper welding. Locate induction plates behind PVC sheet and set flat portion of induction welding handle flush and centered over plate and weld Hydro-Prufe® PVC sheet to plate. Welding should take one to four seconds. Set magnets over welds immediately until PVC sheet has cooled down and full adhesion has set. Induction welding time may vary depending on conditions during installation. Contact manufacturer for additional information.
4. Adjacent sheets shall be welded in accordance with Manufacturer's instructions. All side and end lap joints shall be hot-air welded. Lap area shall be a minimum of 4 inches wide. Standard hot air welding of seams or wedge welding is acceptable. (If wedge welding, increase overlap seam to 6") all welds shall be continuous and without defect.

B. Under Slab Installation:

1. **Mud / Waste Slab:** When installation is within the water table and under hydrostatic conditions a mud or waste slab must be provided. Mud or waste slab shall be a minimum of 3" thick and can be reinforced or non reinforced. Slabs shall be finished by smooth -wood float or trowel smooth. Slabs shall provide a surface without voids or sharp protrusions so as not to put pressure on the membrane. When de-watering wells are within the mud / waste slab contact manufacturer for additional details. Mud or Waste slab must provide a dry surface for installation of waterproofing system. A network of perforated piping under the mud / waste slab maybe needed to maintain a dry surface for the waterproofing system
2. **Hydro-Ultra Mat B series: (Required for hydrostatic conditions)**
Over properly prepared Mud / Waste slab layout Hydro-Ultra Mat B series over mud / waste slab. Ensure slab is dry and has no ponding water conditions. Dampness is acceptable. Ensure that light color side of sheet is facing down against mud / waste slab. Darker color geotextile should be facing up toward sky. Overlap all adjoining sheets a minimum of 4" and secure overlaps with washer head nails or staples. Fastening should be at a minimum of 24" on center or as needed to maintain position of sheet. Ensure sheets are staggered so end laps are a minimum of 12" apart.

Continue installation and carry Hydro-Ultra Mat B series up forms or lagging to ensure a proper tie-in with wall system. It is recommended that Hydro-Ultra Mat B series is installed up vertically a minimum of 24" above rebar dowels coming out of the structural slab. When vertical bulkhead forms are used to segment horizontal pours, extend Hydro-Ultra Mat B series beyond forms a minimum of 24" to ensure enough tie-in and overlap is provided.

3. Continue installation of Hydro-Ultra Mat B series up wall overlapping seams a minimum of 4" and secure laps with washer head nails at 24" on center. Install Hydro-Ultra Mat B series neatly and tight around tie-backs and other penetrations.
4. Install Hydro-Prufe® PVC sheets over previous layer of Hydro-Ultra Mat B series under mat slab. Unroll and position PVC sheets so seams of PVC are staggered from seams of the Hydro-Ultra Mat B Series. Let PVC sheets relax and overlap side laps 4" and end laps 4". When wedge welding increase overlaps to 6". Weld all laps with manufacturer approved automatic hot air welding equipment. Carry Hydro-Prufe® PVC sheets up forms or lagging to ensure a proper tie-in with the Hydro-Prufe® PVC sheets which will be installed on the wall. Ensure that PVC sheet does not cover up tie-in for the Hydro-Ultra Mat B Series. Stay 12" below the Hydro-Ultra Mat B Series tie-in and secure the terminating edge of the PVC with a fastening bar or other temporary fastening measure approved by manufacturer. Hydro-Prufe® PVC wall membrane will overlap termination bar by a minimum of 6". When vertical bulkhead forms are used to segment horizontal mat pours extend Hydro-Prufe® PVC beyond forms a minimum of 12" to ensure enough tie-in and overlap is provided. Do not cover up tie-in of horizontal Hydro-Ultra Mat B Series.

3.06 Welding of Hydro-Prufe®

A. General Welding

1. Welding equipment shall be approved by Hydro-Gard. Welding equipment shall be calibrated at the start of each day and checked throughout the installation day. Test welds should be run at the beginning of each day and after cool down and any re-start up during the installation day. The calibration readings and test welds should be documented by the third-party inspection company.
2. Seam sampling: At a minimum of three times per day sample seams. Sample seam strength by cutting a cross section a minimum of Two inches wide from a completed and probed seam. Test samples shall be tested by third-party inspection company and documented on an inspection report. Inspection company shall consult with manufacturer on level of acceptability. Shearing of the membrane rather than separation of the weld will constitute an acceptable weld. Applicator shall repair test cut with a

round target patch 6" in diameter.

3. When welding a three-way joint provide a round target piece of PVC approximately 6" inches in diameter center of Tee joint and weld in place. Tee joint patches must be probed with the seam testing blunt seam tool and confirmed by the third-party inspection company.
4. All surfaces to be welded shall be clean and dry. No adhesives, fluids or debris shall be present within the lap areas.
5. Welding equipment whether hand or automatic shall be allowed to warm up for at least one minute prior to the start of any welding.
6. In hand welding the lap shall be tack welded in every 3 feet to hold the seam in place. The back edge of the lap shall be welded with a thin, continuous weld to prevent heat loss during final welding.
7. The hot air nozzle shall be inserted into the lap keeping the welding equipment at a 45-degree angle to the side lap. Once the proper welding temperature has been reached and the material starts to flow, the hand roller shall be applied at a right angle to the welding gun and pressed lightly. The recommended nozzles are 1 ½" for straight laps and for corners and detail work a ¾" nozzle is recommended.
8. Machine welded seams are to be achieved by the use of various automatic welding equipment. When using this equipment, Hydro-Gard's instructions shall be followed. The automatic welding machines require 218 to 230 volts at 30 amps. Check with the Manufacturer's of the welding equipment for additional information. The use of portable generators are highly recommended.
9. T-Joints or (three-way overlaps) require increased attention by the installer. Since Hydro-Prufe® PVC membranes are thicker than most PVC membranes the intersection of these three-way Tee joints will require some trim work. At the top edge of the second membrane, shave down the membrane to create a smooth transition for the top membrane layer to conform to for positive welding. Chamfer the edge of the membrane using a hand-held grinder with a joint planer or shaving tool approved by Hydro-Gard. Target patches for Tee joints must be a minimum of 6" inches.

B Wedge Welding:

When using a double wedge welder, the following must be adhered to:

- 1 Membrane overlaps are increase to 6" inches. Overlaps shall be welded with an approved double wedge welder. Each seam shall be pressure tested in the presence of the third-party inspection

company.

- 2 The weld channel (air space area between the two welds) can be sealed up after the air pressure test by hand welding the ends of the weld. Weld target patch over ends of weld channel after air testing has passed.
- 3 Air testing weld channels can be tested by inserting pressure gauge tip into the weld channel. Test by applying internal air pressure into the weld channel. Test for 30 psi for ten minutes. Loss of pressure greater than 10% constitutes failure. If channel fails, weld an 8" in. minimum PVC cover strip and weld by hand.

C Extrusion Welding:

1. Extrusion welding is an option of the designer. Extrusion welding does not replace the requirement of hot air welding or the requirement of probing or test cuts. It is only another enhancement offered to the Hydro-Prufe® PVC waterproofing system. When extrusion welding is specified, ensure the completed hot air weld seam is clean and free of any debris.
2. Prior to extrusion welding clean surface of an overlap seam and lightly abrade with light sand paper or another approved method.
3. After abrading wipe surface with a clean cloth and proceed to weld a bead of extruded PVC rod from an approved extrusion welder.
4. Run extruded bead over edge of the seam in a continuous smooth and even consistency leaving a clean and smooth bead.
5. It is recommended that the PVC rod be a contrasting color to the Hydro-Prufe® PVC base membrane. There is no testing needed on the extrusion weld. A visual inspection is suitable for this application.

3.07 Segmentation/PVC Extruded Waterstop

Note to Specifier: This section of Segmentation is an added enhancement to the Hydro-Prufe® HWS waterproofing system. Segmentation with the PVC Extruded Waterstop allows for future injection into the segmentation compartments if a breach through the Hydro-Prufe® HWS system is encountered. Each segment shall have Alko-19 injection hoses installed within each segment for the possible injection of chemical grouting. Each Alko-19 injection hose shall have an injection box installed at each end of the Alko-19 injection hose per each segment. The injection box allows for easy access to the segmentation behind the foundation wall for future injection. Contact HYDRO-GARD when specifying HYDRO-PRUFE® LDS (Leak Detection System).

Segmentation and frequency is a design consideration based on project conditions. Consult with manufacturer for any additional information, and specific details

- A. Twenty feet wide by Twenty feet high is the standard spacing for segmentation.
- B. Injection hoses shall be installed vertically inside segmentation and should be spaced no greater than every 10 feet on center within segmentation.
- C. Alko injection boxes shall be installed at bottom and top of each injection hose.
- D. After all seam welding has been completed, inspected and passed, the installation of the Hydro-Prufe® PVC waterstop can be installed. Install Hydro-Prufe® PVC waterstop in locations as determined by Architect or as recommended by Hydro-Gard. Install vertically and horizontally and hot air weld to the Hydro-Prufe® PVC membrane.
- E. Segmented waterstop shall initially be welded to wall membrane horizontally just below top of footing and continuously around the perimeter.
- F. Continue installation of PVC waterstop vertically per segmentation elevation drawing. Horizontal applications of the waterstop on vertical walls will increase number of segmentation's. For layout and location of Hydro-Prufe® PVC Waterstops under mat slab see Manufacturer's details if not shown in construction documents.
- G. Install Gard-Stop SK Tape to waterstop per Manufacturer's details. Gard-Stop SK Tape will be installed to three sides of PVC waterstop.
- H. Check all welds on Hydro-Prufe® PVC waterstop with a blunt round tool prior to installation of Gard-Stop SK tape. Third-party inspection company shall review and inspect Hydro-Prufe® PVC waterstop installation and confirm installation complies with Manufacturer's'

guidelines.

3.08 Protection Layers

- A. Vertical Protection Layer: Install protection material over PVC field membrane. Protection material shall be installed directly over PVC field membrane and not over the Hydro-Prufe® PVC waterstop. Do not allow protection material to cover PVC waterstop or Hydro-Stop SK tape. When segmentation is used make sure protection material is installed inside segments. When segmentation / compartments are used it is recommended that Hydro-Ultra Mat-G 8 oz is used for the protection material. Protection material shall be Hydro-Ultra Mat-G 8 oz, not HDPE protection material. Protection material can be spot adhered using a manufacturer approved adhesive. Mechanically fastening through Hydro-Prufe® membrane is not allowed. Consult with manufacturer regarding product selection and installation requirements. When using Hydro-Ultra Mat-G as a vertically installed protection material over the Hydro-Prufe® PVC membrane the minimum weight of the Hydro-Ultra Mat-G is 8 oz per square yard.
- B. Horizontal Protection Layer: When Matt slab is thicker than 24" and a double rebar cage is used it is recommended that the Hydro-Prufe® PVC membrane is covered with the Manufacturer's 40 mil HDPE protection sheet. Loose lay 40 mil HDPE sheet over PVC membrane and overlap side and end laps 4" inches. Spot weld in place or tape seams to ensure placement is not disturbed. Carry 40 mil HDPE protection sheet up bulkhead forms or shoring a minimum of 6" above finish mat slab elevation. When protection layer on vertical wall is Hydro-Ultra Mat-G, ensure that Hydro-Ultra Mat-G overlaps HDPE protection material a minimum of 12" and that no Hydro-Prufe® PVC membrane is left exposed. (When a concrete protection slab is not provided and the matt slab will be poured directly over the Hydro-Prufe® membrane then cover the PVC membrane with either 40 mil HDPE or Hydro-Ultra Mat-G 12 oz. (See 3.03 E above for additional information.)
- C. When rebar is placed on or against Hydro-Prufe® PVC membrane or its protection layers, cement adobes shall be used. Other methods to suspend rebar shall comply with or be approved by the manufacturer.

3.09 Tie-Back Block Outs

- A. Prior to tie back removal applicators shall inspect block out to ensure no Hydro-Prufe® PVC membrane has been damaged. Applicator, contractor and Inspection company shall consult with contractor removing tie-back to ensure removal process proceeds without causing damage to the PVC membrane.
- B. Once block out and tie-back is removed, remove fire proof protection

material that was previously installed and inspect the PVC membrane along with inspection company and repair any damaged membrane exposed inside block-out.

- C. Install Hydro-Prufe® PVC Tie-Back Boot over removed or detentioned tie-back and weld tie-back boot flange to exposed Hydro-Prufe® PVC field membrane. Ensure all seams are probed and are tight.
- D. Install two rows of Hydro-Gard Gard-Stop SK Tape or Waterstop B inside clean block out. Block out surface shall provide a smooth surface for the installation of waterstops. The preferred method to fill bloc-out is cast in place concrete. Hand grouting (packing) is also acceptable. See manufacturer for additional details regarding tie-back. Pneumatically placed concrete, i.e., (Shotcrete) to fill tie-back is not acceptable. *(Alternate Method: When Alko-Injection hoses are installed inside block-out only one waterstop is required.)*
- E. Rakers and other block-out conditions shall be detailed in accordance with Manufacturer's guidelines. All block outs shall have waterstops or Alko-Injection hose installed within the block out prior to block-out being grouted.

3.10 Termination at Grade

Terminate Hydro-Prufe® PVC membrane at grade once pile removal work has been completed. Ensure removal process has not caused any damage to the Hydro-Prufe® PVC membrane. If damaged, repair as needed. See Manufacturer's details for Grade terminations or interfacing details with above grade membranes and between slab membranes.

3.11 Completion

Prior to demobilization from the site, the work shall be reviewed by the contractor, inspection company and manufacturer representative. All defects noted, noncompliance with the specifications or the recommendations of membrane manufacturer shall be itemized in a punch list. These items must be corrected immediately by the contractor prior to demobilization to the satisfaction of the membrane manufacturer.

END