SECTION 07 13 16 - CTEM SHEET MEMBRANE WATERPROOFING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Coal tar elastomeric (CTEM) sheet membrane waterproofing system
2. Work shall include, but is not limited to:
   a. Vertical below grade waterproofing
   b. Horizontal waterproofing
   c. Membrane Flashing
   d. Substrate Preparation
   e. Geotextile leveling layer
   f. Protective layer(s)
   g. Drainage layer
   h. Insulation board

B. Related Sections:
1. Section 03 30 00 Cast-In-Place Concrete
2. Section 04 20 00 Unit Masonry
3. Section 07 21 00 Thermal Insulation
4. Section 31 23 00 Excavation and Fill

1.02 REFERENCES

A. Publications listed herein are part of this specification to extent referenced.

B. American Society for Testing and Materials:
1. ASTM C272 Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions
2. ASTM C518 Test method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
3. ASTM C578 Specification for Preformed, Cellular Polystyrene Thermal Insulation
4. ASTM D1621 Test for Compressive Properties of Rigid Cellular Plastics
5. ASTM D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
6. ASTM D4491 Test Methods for Water Permeability of Geotextiles by Permittivity
7. ASTM D4716 Test Method for Constant Head Hydraulic Transmissivity (In-Place Flow) of Geotextiles and Geotextile Related Products
8. ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
9. ASTM D5957 Guide for Flood Testing Horizontal Waterproofing Installations
10. ASTM E96 Tests for Water Vapor Transmission of Materials in Sheet Form

1.03 SYSTEM DESCRIPTION

A. Design Requirements:
1. Two-ply application of self-adhered waterproofing membrane sheets shall be bonded together with hot air welds or structural sealant.

2. System shall be designed to limit lateral movement of water in event of membrane damage without use of additional installed components.
3. Membranes shall be highly resistant to acids, bases, oils, greases, petroleum products, and organic growth such as molds and algae. They shall be UV stable, impervious to standing water, and not effected by contact with asphalt or coal tar.

1.04 SUBMITTALS

A. Product Data:
1. Submit manufacturer's literature describing sheet membrane waterproofing products and components to be provided.

B. Shop Drawings:
1. Submit shop drawings showing general layout, seaming, anchoring sizes and types, membrane thickness, and other similar detailed information necessary to fully describe application.
2. Shop drawing submittal shall include:
   a. Location of penetrations
   b. Perimeter and penetration details
   c. Sheet layout and size
   d. Number of flashing rolls by width
3. Show adjacent or related portions of Work in a complete manner.
4. Coordinate shop drawings submittal with submittals of related portions of Work:
   a. Refer to work specified in plumbing specification sections for other requirements and limitations applicable to installation, including, but not limited to drains.

C. Samples:
1. Submit not less than 3 samples of membrane material, preformed three-dimensional shapes, insulation board, and drainage boards.
2. Sample Size: 12" in length, 6" x 6", or full size as appropriate to material

D. Quality Assurance Submittals:
1. Test Reports:
   a. Submit test reports prepared by an independent testing laboratory indicating full compliance with specified requirements.
2. Certificates:
   a. Provide a letter of certification from membrane manufacturer that applicator utilized for application of sheet membrane waterproofing system is an approved applicator in good standing.
   b. Submit listing of not less than 5 of applicator's most recent applications representing similar scope and complexity to Project requirements. List shall include information as follows:
      1) Project name and address
      2) Name of owner
      3) Name of contractor
      4) Name of architect
      5) Date of completion
   c. Provide manufacturer's certification that products to be used comply with specified requirements and are suitable for intended application.

d. Prior to flood testing, provide certification from structural engineer that structure will withstand dead load of water.

3. Manufacturer's Instructions:
   a. Submit manufacturer's printed application procedures that shall be basis for accepting or rejecting actual application procedures.
   b. Maintain one copy of manufacturer's instructions on-site.
4. Warranties:
   a. Submit specimen copy of manufacturer's warranty for Owner's review.
   b. Submit specimen copy of Contractor's warranty for Owner's review.

1.05 QUALITY ASSURANCE

A. Qualifications:
   1. Provide products from a company specializing in manufacture of sheet membrane waterproofing system with not less than 10 years experience.
   2. Materials shall be products of a single manufacturer or items standard with manufacturer of sheet membrane waterproofing system.
      b. Provide primers and other secondary materials that are produced or are specifically recommended by manufacturer of membrane waterproofing system to ensure compatibility.
   3. Applicator shall be an approved applicator authorized by manufacturer, trained in application techniques and procedures of membrane waterproofing components.
      a. Application of waterproofing membrane, flashing, membrane expansion joints, membrane protection layers, and drainage layer shall be responsibility of a single applicator to ensure undivided responsibility.
      b. Application of waterproofing membrane shall be performed by trained and authorized personnel.

B. Pre-Application Conference:
   1. Schedule a conference to be held on-site well in advance of ordering materials and beginning application of waterproofing, but in no case less than 30 days before application of waterproofing. Provide not less than 72 hours advance notification to attendees, Owner, and Architect.
   2. Conference attendees shall include Owner, Architect, Contractor, waterproofing applicator, a representative of waterproofing manufacturer, and representatives of other trades whose wok may interface with or affect waterproofing application.
   3. Topics to be discussed at conference shall include:
      a. A review of Contract Documents and accepted shop drawings shall be made. If conflicts exist between manufacturer's specifications and Contract Documents, these differences shall be defined and resolved. Consult waterproofing manufacturer's representative to assist in resolving issues.
      b. Establish trade-related work schedules and appropriate trade sequencing, including timely installation of equipment and penetrations to avoid or limit traffic on membrane waterproofing.
      c. Review areas to receive different waterproofing systems and transition between various systems to be used.
      d. Construction schedules and work methods shall be reviewed to prevent damage to waterproofing, including provisions for installation of

temporary traffic paths or walkways for protection of finished waterproofing system.

e. Weather conditions and working temperature criteria shall be reviewed.

f. Establish and review provisions for on-site monitoring after waterproofing application is complete to assure that finished waterproofing application is not damaged by other trades. Establish provisions for payment for repairs in event that damage does occur.

4. Pre-construction conference and inspection shall serve to clarify Contract Documents, application requirements and what work shall be completed before application can begin.

a. If waterproofing applicator or representative of waterproofing manufacturer discovers problems during inspection of substrates, a second pre-application shall be held to verify that corrective measures have been taken.

5. Prepare and submit to parties in attendance, Architect, and Owner a written report of pre-installation conference. Report shall be submitted within 3 days following conference.

C. Manufacturer's Field Service:

1. Arrange with membrane manufacturer to have services of a competent field representative on-site to accept substrate surface before application of waterproofing materials and provide on-site technical assistance and application guidance for application of waterproofing system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:

1. Deliver prepackaged materials in manufacturer's original unopened packaging with labels intact. Packaging or containers shall fully identify brand, type, grade, class, and other qualifying information used to describe contents.

B. Storage and Protection:

1. Materials that are susceptible to retaining moisture or that may be damaged by moisture shall be stored in a dry location before application. Moisture-sensitive materials shall be stored in enclosed areas protected from moisture or elevated humidity.
2. Membrane rolls shall be stored lying down.
3. Stack materials on pallets or platforms that are raised off ground or substrate.
4. Cover materials in a manner to provide air circulation and to prevent damage to surfaces.
5. Sealants, adhesives, and mastics shall be stored at temperatures above 40°F.
6. Flammable materials shall be stored in a cool dry area away from sparks and open flames. Follow precautions outlined on container or supplied by material manufacturer/supplier.
7. Materials determined by Owner, Architect, and/or manufacturer's field representative to be damaged shall be removed from Site and replaced at no cost to Owner.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:

1. Waterproofing materials and components shall not be applied unless correct solvent, adhesive, heat welding, or application temperature can be maintained. If proper application temperatures cannot be maintained, application shall cease.
2. Do not apply waterproofing if precipitation of any kind is occurring or is imminent. Materials shall not be applied if liquid moisture, snow, or ice is present on substrate.

1.08 SEQUENCING

A. Apply waterproofing in a timely manner, including installation of protection layer(s), drainage panels, and insulation in conjunction with work of other trades. Coordinate with other trades to avoid traffic over completed membrane surfaces.
1. Coordinate with installation of drains as shown on Drawings, including flashing, and associated waterproofing work.
2. Water tests of completed sections of waterproofing membrane shall be successfully completed before proceeding with protection layers and overburden. Schedule water tests promptly to allow timely installation of protection layers.

1.09 SPECIAL WARRANTY

A. Manufacturer's Warranty:
1. Provide a manufacturer's membrane only warranty at successful completion of Project. Warranty shall be limited to performance of waterproofing membrane for a period of 20 years commencing from Date of Substantial Completion.

OR

1. Provide a manufacturer's labor and material warranty at successful completion of Project. Waterproofing membrane manufacturer shall warrant to repair leaks in waterproofing membrane resulting from defects in membrane or workmanship for a period of 20 years commencing from Date of Substantial Completion.

B. Contractor's Warranty:
1. Provide a workmanship warranty for not less than two-years commencing from Date of Substantial Completion. Work related to waterproofing membrane, flashing, or metal work found to be defective or not in compliance with contract documents shall removed and replaced at no cost to Owner. Obligation of warranty shall run directly to Owner with a copy to membrane manufacturer.

C. Warranty shall not deprive Owner of other rights Owner may have under other provisions of Contract Documents and will be in addition to and run concurrent with other warranties made by Contractor under requirements of Contract Documents.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide Coal Tar Elastomeric (CTEM) membrane waterproofing with applicable components and accessories as manufactured by Hyload, Inc. 9976 Rittman Road, Wadsworth, Ohio 44281. Phone 800-457-4056; Fax 330-336-5512; Website www.hyload.com

B. Concrete Preparation Materials:
1. Sika Concrete Restoration Systems, Lyndhurst, NJ; 201-933-8800
2. Subject to compliance with requirements, equivalent products by other manufacturers listed below may be provided.
a. Conproco Coatings, Hookset, NH; 800-258-3500
b. Silpro Masonry Systems, Inc., Ayer, MA; 800-343-1501
c. W. R. Bonsai Company, Charlotte, NC; 800-334-0784

2.02 MEMBRANE MATERIALS

A. Membrane Waterproofing - Base Ply:
1. Description: Self adhered, fully adhered Elvaloy modified coal tar elastomeric sheet
a. Bottom of sheet shall be coated with 15 mils of SBS-modified asphalt with a dry selvedge edge for hot air welds
2. Thickness: [60 mils membrane/15 mils adhesive/75 mils total] OR [75 mils membrane/15 mils adhesive/90 mils total]
3. Properties:
a. Tensile Strength: ASTM D 638; 1000 psi minimum
b. Elongation at Break: ASTM D 638; 150% minimum
c. Seam Strength (minimum % of tensile strength): ASTM D 638; 95%
d. Retention of Properties after Heat Aging: ASTM D 3045
e. Tensile Strength (minimum % of original): ASTM D 638; 95%
f. Elongation (minimum % of original): ASTM D 638; 90%
g. Tear Resistance: ASTM D 1004; 250 lb/in minimum
h. Low Temperature bend (-40°F): ASTM D 2136; Pass
i. Linear Dimensional Change: ASTM D 1204; 9.0% maximum
j. Weight Change after Immersion in Water: ASTM D 570; 2.8% maximum
k. Water Vapor Permeance: ASTM E 96; 0.375 perms maximum
l. Puncture Resistance: Federal Method 2065; 44.0 pounds, minimum
4. Product: Hyload - Hyproof SA

OR

A. Membrane Waterproofing - Base Ply:
1. Description: Uncoated Elvaloy modified coal tar elastomeric sheet
2. Thickness: [60 mils] OR [75 mils]
3. Properties:
a. Tensile Strength: ASTM D 638; 1000 psi minimum
b. Elongation at Break: ASTM D 638; 150% minimum
c. Seam Strength (minimum % of tensile strength): ASTM D 638; 95%
d. Retention of Properties after Heat Aging: ASTM D 3045
e. Tensile Strength (minimum % of original): ASTM D 638; 95%
f. Elongation (minimum % of original): ASTM D 638; 90%
g. Tear Resistance: ASTM D 1004; 250 lb/in minimum
h. Low Temperature bend (-40°F): ASTM D 2136; Pass
i. Linear Dimensional Change: ASTM D 1204; 9.0% maximum
j. Weight Change after Immersion in Water: ASTM D 570; 2.8% maximum
k. Water Vapor Permeance: ASTM E 96; 0.375 perms maximum
l. Puncture Resistance: Federal Method 2065; 44.0 pounds, minimum
4. Product: Hyload - Hyproof GL

B. Membrane Waterproofing - Top Ply:
1. Description: Self adhered Elvaloy modified coal tar elastomeric sheet with adhesive applied over 50% of bottom of sheet
a. Bottom of sheet shall be coated with SBS-modified asphalt with a dry selvedge edge for hot air welds
2. Thickness: [60 mils membrane/15 mils adhesive/75 mils total] OR [75 mils membrane/15 mils adhesive/90 mils total]
3. Properties:
a. Tensile Strength: ASTM D 638; 1000 psi minimum
b. Elongation at Break: ASTM D 638; 150% minimum
c. Seam Strength (minimum % of tensile strength): ASTM D 638; 95%
d. Retention of Properties after Heat Aging: ASTM D 3045
e. Tensile Strength (minimum % of original): ASTM D 638; 95%
f. Elongation (minimum % of original): ASTM D 638; 90%
g. Tear Resistance: ASTM D 1004; 250 lb/in minimum
h. Low Temperature bend (-40°F): ASTM D 2136; Pass
i. Linear Dimensional Change: ASTM D 1204; 9.0% maximum
j. Weight Change after Immersion in Water: ASTM D 570; 2.8% maximum
k. Water Vapor Permeance: ASTM E 96; 0.375 perms maximum
l. Puncture Resistance: Federal Method 2065; 44.0 pounds, minimum
4. Product: Hyload - Hyproof SA-2

C. Membrane Flashing: Elvaloy modified coal tar. elastomeric sheet
1. Thickness: Not less than 60 mils
2. Sheet Width: 4", 6", 9", and/or 12" as needed

2.03 COMPONENTS

A. Preformed Three Dimensional Shapes:
1. Shapes: As needed to meet Project requirements including, but not limited to detail corners, level changes, stop ends, and other similar special applications
2. Product: Hyload - Cloaks

B. Drainage Board: Three-dimensional, two-part prefabricated soil sheet drain
1. Thickness: 7/16" nominal
2. Core: Polystyrene
a. Flow Rate: Not less than 18 GPM per foot of width; ASTM D4716
b. Compressive Strength: 21,000 lbs/ft^2; ASTM D1621
3. Fabric Face: Woven geotextile fabric
a. Fiber: Polypropylene
b. Permeability: 0.003 in/sec; ASTM D4491
c. Permittivity: 1.36 sec; ASTM D4491
d. Apparent Opening Size: U.S. Standard sieve 40
e. Puncture Strength: 105 lbs; ASTM D4833
4. Product: Hyload - Hydrain 650

OR

B. Drainage Board: Three-dimensional, two-part prefabricated soil sheet drain
1. Thickness: 1/4" nominal

2. Core: Polystyrene
   a. Flow Rate: Not less than 9 GPM per foot of width; ASTM D4716
   b. Compressive Strength: 30,000 lbs/ft^2; ASTM D1621
3. Fabric Face: Woven geotextile fabric
   a. Fiber: Polypropylene
   b. Permeability: 0.003 in/sec; ASTM D4491
   c. Permittivity: 1.36 sec; ASTM D4491
   d. Apparent Opening Size: U.S. Standard sieve 40
   e. Puncture Strength: 105 lbs; ASTM D4833
4. Product: Hyload - Hydrain 350

OR

B. Drainage Board: Three-dimensional, two-part prefabricated soil sheet drain
1. Thickness: 1/4" nominal
2. Core: Polystyrene
   a. Flow Rate: Not less than 9 GPM per foot of width; ASTM D4716
   b. Compressive Strength: 10,800 lbs/ft^2; ASTM D1621
3. Fabric Face: Non-woven geotextile fabric
   a. Fiber: Polypropylene
   b. Permeability: 0.12 in/sec; ASTM D4491
   c. Permittivity: 1.6 sec; ASTM D4491
   d. Apparent Opening Size: U.S. Standard sieve 100
   e. Puncture Strength: 65 lbs; ASTM D4833
4. Product: Hyload - Hydrain 200

OR

B. Drainage Board: Three-dimensional, two-part prefabricated soil sheet drain
1. Thickness: 1/4" nominal
2. Core: Polystyrene
   a. Flow Rate: Not less than 9 GPM per foot of width; ASTM D4716
   b. Compressive Strength: 30,000 lbs/ft^2; ASTM D1621
3. Fabric Face: Non-Woven geotextile fabric
   a. Fiber: Polypropylene
   b. Permeability: 0.27 in/sec; ASTM D4491
   c. Permittivity: 1.8 sec; ASTM D4491
   d. Apparent Opening Size: U.S. Standard sieve 100
   e. Puncture Strength: 130 lbs; ASTM D4833
4. Product: Hyload - Hydrain 352

2.04 INSULATION MATERIALS

A. Insulation Board: Extruded polystyrene; ASTM C578, Type VII
1. Thermal Resistance: Refer to schedule below
2. Thickness: As indicated on Drawings
3. Properties:
   a. Compressive Strength; ASTM D1621: 60 psi minimum
   b. Water Absorption; ASTM C272: 0.1% by volume maximum
   c. Water Vapor Permeance; ASTM E96: 1.0 perm for 1" maximum
4. Products: Owens Corning - FoamulaR 604

2.05 ACCESSORIES

A. Protection Board: Asphaltic core protection board
   1. Core: Mineral filled high melt point asphalt
   2. Top and Bottom Surfaces: Inert non-woven glass reinforcing mat
   3. Thickness: 1/4"
   1. Product: Hyload - Hyglass

B. Primer:
   1. Product: Hyload - Hyprime

C. Sealant: Moisture cure, moisture insensitive, high performance polyether sealant
   1. Product: Hyload - Structural Sealant

D. Adhesive: Moisture cure, moisture insensitive, high performance polyether adhesive
   1. Product: Hyload - Membrane Adhesive

E. Mastic: Waterproofing mastic that can be applied in beads from a 28 oz caulking tube or trowel-applied from 2 or 5 gallon pails
   1. Product: Hyload - Trowel-On Membrane (TOM)

F. Metal Termination Bars: Extruded aluminum pre-punched at 6" on center
   1. Size: 1" wide x 1/8" thick

G. Concrete Preparation Materials:
   1. Bonding Bridge. Bonding Agent:
      a. Product: Sika - Sikadur 32, Hi-Mod
   3. Polymer Modified Patching Mortar:
      a. Horizontal Application Product: Sika - SikaTop 122
      v. Vertical and Over Head Application Product: Sika - SikaTop 123
   4. Crack Filler:
      a. Product: Sika - SikaTop 111

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions:
   1. Examine areas and conditions under which installation of membrane waterproofing shall be performed.
      a. Concrete substrate shall be cured not less than 7 days and be clean, dry, and frost free before application of waterproofing system.
      b. Concrete block or brick substrates shall have smooth trowel-cut mortar joints or shall be treated with a parge coat.
      c. Substrates shall be inspected and repaired as needed to provide a proper surface to receive waterproofing system.
      d. Identify incompatible substrates, if any.
   2. Do not proceed until unsatisfactory conditions have been corrected.
   3. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Protection:
1. Take care during application that overloading of structure does not occur.
2. Install temporary waterstops at end of each day's work and remove before proceeding with next day's work. Waterstops shall be compatible with materials and shall not emit dangerous or incompatible fumes.
3. Liquid materials such as solvents and adhesives shall be stored and used away from open flames, sparks and excessive heat.
4. Verify that drain lines are un-blocked before starting work.
5. Take necessary precautions when using volatile materials around air in-takes. Coordinate equipment to be turned off and on with Owner if necessary.

B. Surface Preparation:
1. Provide a smooth, clean substrate suitable for adhesion of waterproofing system. Remove substances that could inhibit bonding of membrane and waterproofing system. Substantially clean substrate to provide a smooth, even surface to greatest extent practical.
2. Remove concrete form release coatings and curing compounds. Contaminants such as dirt, debris, loose materials, moisture, or surface irregularities shall be removed.
3. Grind down projections greater than 1/8". Grind, round off, and smooth sharp corners and edges. Patch and fill voids and holes greater than 1/2" with patching mortar.
4. New concrete shall be sufficiently dry before application of membrane sheets. Perform plastic sheet test (ASTM D4263) successfully prior to application of membrane sheets.
5. If covering over a previously existing waterproofing system, substantially remove such that a solid, undisturbed substrate is achieved. Contact Hyload representative for specific applications.

C. Surface Priming(Hyproof SA only):
1. Apply Hyload Hyprime primer at minimum rate of 1 gallon per 100 square feet. Allow primer to dry completely.
2. Application of primer shall be limited to what can be covered with membrane in a given workday. Primed areas not covered by membrane during workday shall be re-primed.
3. Re-prime areas contaminated with dirt or dust.
4. Mask adjacent areas to control application of primer. Remove spilled and misapplied primer.

D. Joint and Crack Treatment:
1. Cracks in concrete less than 1/16" wide shall be pre-treated with a 1/16" (60 mil) coating of liquid membrane 2" wide centered on crack.
2. Apply 6" flashing membrane centered over cracks wider than 1/16" set in 2 continuous 1/4" beads of Hyload Structural Sealant, one on each side of crack.

E. Detailing:
1. Apply 6" flashing membrane centered over vertical corners and horizontal to vertical transitions set in 2 continuous 1/4" beads of Hyload Structural Sealant, one on each side of corner.

2. Make flashing membrane strips continuous. Overlap end joints by a minimum of 3″ and either hot air weld or set in continuous 1/4″ bead of Hyload Structural Sealant inside lap.
3. Seal joints in substrates.
4. Provide a minimum of 3/4″ Hyload Structural Sealant fillet at inside corners.
5. Provide flashings at changes of plane and around penetrations.
6. Apply a liberal bead of Hyload Structural Sealant at obstructions to continuous sheet waterproofing.

3.03 SHEET MEMBRANE APPLICATION

A. General Requirements:
1. Proceed with waterproofing application only after substrate preparation is complete. Obtain acceptance of concrete surface from membrane manufacturer's field representative before proceeding with membrane application.
2. Apply and detail waterproofing system in compliance with manufacturer's instructions, recommendations, standard details, and project specific details. Use only proprietary membrane components and materials, as supplied by membrane manufacturer.
3. Form terminations to match manufacturer's standard details including sealed termination bars.
4. Continuously seal terminations including temporary terminations with Hyload Structural Sealant.
5. Flash sheet waterproofing system into drains, if any. Make installation 100% waterproof.
6. Ensure waterproofing system is concealed from view in completed work.
7. Coordinate installation of counter flashings and covering construction.
8. Apply only as much waterproofing membrane as can be made weathertight each day including flashing work.
9. Do not permit water to penetrate under sheet waterproofing.

B. Self-Adhered Base-Ply Membrane:
1. Exercise care to not trap air pockets under membrane during application.
2. Roll entire membrane firmly and completely as soon as possible. For horizontal applications, roller shall be a minimum of 30″ wide and 70 pounds. Roller shall be cushioned with a resilient material such as foam or carpet. For vertical applications, a hand-held roller with rubber or neoprene wheels shall be firmly used.

C. Grid Lock Base-Ply Membrane:
1. Apply 1/2″ beads of Hyload Membrane Adhesive in a 12″ intersecting grid pattern.
2. Lay Hyload sheets over adhesive grid and broom membrane into place over entire area. Exercise care to not flatten beads out paper-thin, maintain a 1/16″ to 1/8″ bead profile.

D. Self-Adhered Top-Ply Membrane:
1. Apply Hyload sheets beginning at low point of roof or center of drain to base sheet following manufacturer's printed instructions.
2. Exercise care to not trap air pockets under membrane during application.
3. Roll entire membrane firmly and completely as soon as possible. For horizontal applications, roller shall be a minimum of 30″ wide and 70 pounds. Roller shall

be cushioned with a resilient material such as foam or carpet. For vertical applications, a hand-held roller with rubber or neoprene wheels shall be firmly used.

E. For Horizontal or Low-Slope Applications:
   1. For horizontal, or low-slope applications, apply Hyload sheets from low point to high point so that laps shed water. Perimeters and penetrations shall be picture framed with sheets that run parallel to perimeter or penetration opening.
   2. To greatest extent possible, form minimum 8″ high bathtubs at horizontal applications.

F. For Vertical Applications:
   1. For vertical applications, apply Hyload sheets in lengths up to 8 feet. On higher walls install sheets in two or more lifts. Hyload sheets may also be installed horizontally in shingle fashion.
   2. Terminate membrane a minimum of 12″ above grade level secured by a termination bar fastened every 6″. Cover termination with a membrane counter-flashing.
   3. Where a vertical membrane meets a horizontal substrate extend vertical membrane onto horizontal by a minimum of 6″.
   4. Terminate a vertical membrane at base of a wall only if bottom elevation of an interior floor slab is a minimum of 12″ above footing. Terminate Hyload sheets on top of footing if vertical waterproofing ties into mud slab waterproofing or if bottom elevation of interior floor slab is less than 12″ above footing. Extend membrane a minimum of 12″ onto mud slab waterproofing and dress terminating edge with a bead of Hyload Structural Sealant.
   5. Seal or terminate upper lift by end of each day.

G. Lapping and Joining Sheets:
   1. Follow lap guidelines printed on sheet waterproofing.
   2. Adjacent sheets of membrane shall be securely and completely joined together by either hot air welding or by application of Hyload Structural Sealant.
   3. Side laps shall be a minimum of 3″ end laps a minimum of 9″. Stagger end laps by a minimum of 12″. Exercise care to avoid stretching sheets as they are applied. If stretched, sheets will recover overnight to their original dimensions.
   4. Hot air weld side laps. Dress end laps with a 1/2″ bead of Hyload Structural Sealant. Dress T-joints with 1/2″ beads of Hyload Structural Sealant.
   5. In situations where hot air welding of side laps is restricted or otherwise impractical, a finished lap shall be achieved by placing a continuous 1/2″ bead of Hyload Structural Sealant positioned 3/4″ from edge under overlying membrane. Set lap by applying sufficient pressure over bead such that it just starts to bleed out from under overlying membrane.
   6. Make minimum 4″ laps at patches, repairs, and penetrations.

H. Membrane Flashing:
   1. For Horizontal or Low-Slope Applications:
      a. Flashing sheet shall lap over onto field membrane by a minimum of 6″.
      b. Flashing membrane shall extend vertically a minimum of 9″ above finished wear surface or grade. Secure top of flashing sheet with a termination bar fastened every 6″.

c. Junction of flashing to substrate, termination bar, and fasteners shall be covered and sealed with Hyload Waterproofing Mastic applied a minimum of 1/8" thick.

d. Cover termination with a membrane counter-flashing.

2. For Vertical Applications:

a. Terminate membrane a minimum of 12" above grade level secured by a termination bar fastened every 6". Junction of flashing to substrate, termination bar, and fasteners shall be covered and sealed with Hyload Waterproofing Mastic applied a minimum of 1/8" thick. Cover termination with a counter-flashing.

b. Where a vertical membrane meets a horizontal substrate, extend vertical membrane onto horizontal by a minimum of 6". Terminate a vertical membrane at base of a wall only if bottom elevation of an interior floor slab is a minimum of 12" above footing. Seal termination with Hyload Waterproofing Mastic applied a minimum of 1/8" thick.

c. Terminate membrane on top of footing if vertical waterproofing ties into mud slab waterproofing or if bottom elevation of interior floor slab is less than 12" above footing. Extend membrane a minimum of 12" onto mud slab waterproofing and seal termination with Hyload Waterproofing Mastic applied a minimum of 1/8" thick.

I. Corners and Intersections:

1. At intersections of one horizontal and one vertical plane forming a 2-way inside corner, or two vertical planes forming a 2-way inside corner, treat inside corner by creating a minimum 3/4" fillet, or cant, using Hyload Waterproofing Mastic. Extend mastic onto both horizontal and vertical planes a minimum of 6" by 1/8" thick. Apply membrane snugly into corner over mastic.

2. At intersections of one horizontal and one vertical plane forming an outside corner, grind off sharp edges such that a minimum 1/8" beveled corner is created. Apply a full sheet of membrane snugly over treated corner during installation.

3. At intersections of one horizontal and two vertical planes forming a 3-way inside or outside corner, set appropriate pre-formed cloak into a 1/8" continuous bed of Hyload Waterproofing Mastic that extends a minimum of 6" in all directions out from corner. Extend vertical and horizontal field sheet of membrane onto cloak by a minimum of 3" in each direction.

4. Field membranes shall be secured to cloak by either hot air welding or by setting field membranes into a 1/8" bed of Hyload Structural Sealant that has been applied to cloak. Whether hot air welding to cloak or setting membranes in sealant onto cloak, edges of membrane on cloak shall be dressed with a 1/2" bead of Hyload Structural Sealant.

J. Penetrations:

1. Apply Hyload sheets to within 1" of base of penetration. Dress edge of Hyload sheet with a 1/2" bead of Hyload Structural Sealant.

2. Apply a minimum 1/8" of Hyload TOM around penetration a minimum of 6" onto Hyload membrane and up penetration to just below height of completed overlay.

K. Protection Board:

1. Waterproofing membrane is not designed for permanent exposure. Protect membrane from abuse as soon as possible following membrane application.

2. Apply protection board promptly following application of membrane waterproofing. Boards shall be adhered to membrane using an adhesive acceptable to manufacturer of membrane products.
3. Adhesive shall be applied in compliance with manufacturer's instructions.
4. Boards shall be butted together with no gaps larger than 1/4".

3.04 DRAINAGE BOARDS

A. Vertical Application:
1. Apply drainage board promptly following application of membrane waterproofing and protection board in compliance with manufacturer's recommendations.
2. Starting at base of wall place base-drain horizontally oriented with open core side up and 2" flap of fabric side against wall. Install base-drain over protection board applied over waterproofing membrane, using methods approved by waterproofing material manufacturer.
   a. Typical attachment methods include general construction adhesive or two-sided tape.
   b. Fabric flap along top edge should be secured.
   c. Use couplers and corner fittings as needed to form a continuous installation.
   d. Install discharge outlet fittings to connect with discharge pipes.
3. Install drainage board with plastic core side toward wall where bottom core edge overlaps 2" fabric flap of base-drain and abuts base-drain plastic core. Apply drainage board over protection board applied over waterproofing membrane using a method approved by waterproofing material manufacturer.
   a. Typical attachment methods include construction adhesive or two-sided tape.
   b. Place extra fabric flap of drainage board over front of base-drain to cover open top edge and then secure extra fabric flap with general construction adhesive or duct tape.
4. Install subsequent drainage boards to finished grade or as indicated on Drawings.
   a. Connect adjacent panels at end by pulling filter fabric back to expose two rows of core dimples and interlocking core dimples with installed panel. With next course, flangeless panel edge shall be placed over top flange edge of panel below and butted dimple to dimple.
   b. Connections shall be completed in shingle fashion so that water will flow with overlap and not against it.
   c. Overlap extra fabric in direction of water flow and secure with construction adhesive or duct tape. Wrap panel termination edges with filter fabric flap by tucking fabric behind core.
5. For inside and outside corners abut adjoining drainage composite at corner. Cover open core with extra filter fabric to prevent intrusion of soil into core.
6. Around protrusions, cut drainage composite to fit and wrap extra filter fabric around open edge of core to prevent soil intrusion into core.
7. Secure drainage boards to wall at grade with termination bar mechanically fastened 12" on center with fabric wrapped behind exposed core to prevent intrusion of soil into the core.
8. Tears or punctures in fabric shall be covered with new filter fabric.

B. Horizontal Application:

1. Filter fabric shall face direction from which water will come..
2. It is not necessary to anchor drainage panels in most applications; follow panel manufacturer's recommendations.
3. Tuck filter fabric behind core to cover exposed edges. Tears or punctures in fabric shall be covered with new filter fabric.
4. For drainage below cast-in-place concrete wearing surfaces, do not place concrete directly on filter fabric. Place a sacrificial layer of 3 to 4 ounce, non-woven filter fabric over filter fabric integral with drainage panels to prevent primary filter fabric from clogging.
5 Rebar chairs shall be placed on metal or plastic plates to distribute load to prevent primary filter fabric from clogging.

3.05 INSULATION BOARDS

A. General Requirements:
1. Place insulation boards, unadhered, over membrane with drain channels down. End joints shall be staggered.
2. Boards shall be tightly butted together with no gaps greater 3/8".
3. Insulation shall be neatly fitted to within 3/4" of roof penetrations, projections, cant strips, etc.
4. When multi-layer insulation applications are involved bottom layer of insulation shall be thickest layer and shall be not less than 2" thick. Layers shall be installed unadhered to each other and joints in relation to underlying layers staggered.
5. No more insulation shall be installed than can be covered and completed before end of day's work, or before onset of inclement weather.

3.06 REPAIR/RESTORATION

A. Inspect membrane before covering and make repairs immediately. Patch tears, punctures, seams, or other deficiencies with a membrane patch that extends a minimum of 6" in every direction beyond defect. Dress edges of patch with not less than 1/2" bead of Hyload Structural Sealant.

3.07 SITE QUALITY CONTROL

A. Employ and pay for services of an independent commercial inspection agency to monitor waterproofing material installation for compliance with Contract Documents and manufacturer's published literature, perform professional consultation, inspections, tests, and other services specified.
1. Inspection service shall be acceptable to waterproofing manufacturer, Owner, and Architect and shall be qualified to conduct inspections indicated.

B. Inspections:
1. Inspection service shall perform continuous inspection of installation.
2. Inspections shall include substrate examination, beginning of waterproofing installation, interim inspection, and final inspection prior to back-filling or pouring of concrete against waterproofing.
3. Inspection service shall report inspection results in writing to Contractor, waterproofing installer, waterproofing material manufacturer, Owner, and Architect on same day that inspections are made. Reports indicating non-compliance shall be faxed immediately to parties on distribution list, Architect, Owner, and Contractor. Reports shall give observations and indicate compliance or non-compliance with Contract Documents. Each report shall include:

a. Date issued
b. Project title and number
c. Testing agency name, address, and telephone number
d. Name and signature of certifying agency personnel
e. Date and time of inspection
f. Record of temperature and weather conditions
g. Identification of product and Specification Section
h. Location of inspection in Project
i. Indication of satisfactory compliance with Contract Documents
j. Report unsatisfactory conditions or failure to comply with requirements of Contract Documents and shop drawings.

4. Testing and inspection agency personnel are not authorized to:
   a. Revoke, alter, enlarge on, or release requirements of Contract Documents
   b. Approve or accept any portion of Work
   c. Perform duties of Contractor
5. Materials and workmanship not meeting specified standard of performance shall be removed and replaced at Contractor's expense, including subsequent tests and inspections.

C. Flood Testing: ASTM D5957
1. Prior to flood testing, ascertain from structural engineer that structure will withstand dead load of water.
2. Flood testing of horizontal waterproofing shall be done prior to placement of protection board. Not less than 2" of water shall be placed over finished membrane for at least 24 hours.
3. Mark leaks and make repairs when membrane is dry. Membrane shall be re-tested following corrections.
4. Prepare a written report of flood testing, and submit to Architect within 7 days following test. Report results of tests, both successful and unsuccessful. In addition to results, report shall include date of test, project name, list of products being applied and tested, name of applicator, name of Contractor, and conditions causing failure of waterproofing in event of an unsuccessful test.
5. Alternatively, employ EFVM (Electric Field Vector Mapping) leak detection method.

D. Electric Field Vector Mapping:
1. Leak detection of horizontal waterproofing shall be done prior to placement of protection board utilizing electrical conduction method as provided by International Leak Detection, phone 866-282-5325.
2. Provide testing to verify membrane is free of holes, open seams and capillary defects that will allow water to pass.
3. For areas to receive EFVM testing provide following:
   a. Thoroughly wet waterproofing membrane in area of test. Wetting can be accomplished by hand or mechanical spray devises. Membrane shall be wet during testing procedures. Ponded water shall not be necessary.
   b. Place conductor wire on wetted, bare membrane. Secure wire with small strips of waterproofing or other compatible membrane or tape. Overburden, insulation, drainage composites and filter fabric shall not be installed prior to initial test.
   c. Allow testing technician to locate membrane breaches, if any. Technician shall mark on waterproofing membrane or surface exact location of defect and assign an identification number to each location.

d. Visually inspect entire membrane area and repair breaches found. An EFVM retest shall be performed to confirm integrity of repair(s).

4. Technician shall prepare a report of each day's test results containing a written description and photograph of defect(s) located and a schematic CAD drawing indicating location of conductor wire and of defect(s) located in testing field to within 1" of accuracy. This report shall be made available in hard copy.

5. Submit written report of EFVM tests to Architect within 7 days following testing. Report results of tests, both successful and unsuccessful. In addition to results, report shall include date of test, project name, list of products being applied and tested, name of applicator, name of Contractor, and conditions causing failure of waterproofing in event of an unsuccessful test.

E. Manufacturer's Field Service:

1. Manufacturer's field representative shall inspect waterproofing installation periodically during installation to verify that installation is in compliance with manufacturer's current guidelines and recommendations.

2. Manufacturer's field representative shall check and test heat-welded seams before water test, and prior to installation of separation and protection layers.

3.08 CLEANING

A. Waterproofing materials, components and accessories shall be removed from Site and taken to a legal dumping area authorized to receive such materials.

3.09 PROTECTION

A. Protect horizontal and vertical membranes after installation and testing with a protection course or drainage mat. Install protection course or drainage mat within 24 hours after completion of testing.

1. Eliminate construction traffic on newly tested membrane systems. Do not store construction materials on unprotected membrane surfaces.

2. Trafficking or storing materials on tested membrane can introduce additional damage to waterproofing system and will nullify testing procedures.

3. Membrane areas that are observed to be trafficked or used as a storage/working platform shall be retested and immediately repaired and covered with insulation and drainage composite.

3.10 SCHEDULE

A. Thermal Resistance Properties: ASTM C518 test method at 75°F

1. Rigid Insulation Board:

Thickness (nominal)	Thermal Resistance (nominal R-value)
1 1/2"	R 7.5
2"	R 10
21/2"	R 12.5
3"	R 15
31/2"	R 17.5
4"	R 20

END OF SECTION