

D – TECHNICAL DATA SHEETS



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Drain-Cel™ Drainage

POLYFABRICS AUSTRALIA PTY LTD | ABN. 12 009 223 278 | W. www.polyfabrics.com.au
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VICTORIA: A. 144 Northbourne Rd CAMPBELLFIELD VIC 3061 | T. (03) 9305 0300 | F. (03) 9308 9288

Drain-Cel™ 30mm & 50mm Drainage Cell



Specifications	Standard Used	Drain-Cel™ 30mm	Drain-Cel™ LD 30mm	Drain-Cel™ 50mm
Width		500mm		
Length		600mm		
Height		30mm	30mm	50mm
Surface Void Area		68% void	68% void	>90% void
Internal Void Area		95%	95%	>95% void
Material		90% recycled polypropylene + 10% propriety mix	90% recycled polypropylene + 10% propriety mix	100% recycled polypropylene
Colour		Black		
Biological & Chemical Resistance		Unaffected by moulds and algae, soil-borne chemicals, bacteria and bitumen, oils and light acid, alkaline solutions	Unaffected by moulds and algae, soil-borne chemicals, bacteria and bitumen, oils and light acid, alkaline solutions	Unaffected by moulds and algae, soil-borne chemicals, bacteria and bitumen, oils and light acid, alkaline solutions
Service Temperature		-10°C to 85°C		
Compressive Strength/Ultimate Load	ASTM D1621	>150 t/m ²	>102 t/m ²	>225 t/m ²
Flow Rate	ASTM D4716	>18.95 L/m/s @ 1% gradient	>18.95 L/m/s @ 1% gradient	>23.5 L/m/s @ 1% gradient

Applications:

- Roof gardens
- Landscaped decks
- Planter boxes
- Retaining & basement walls

Advantages:

- Easy installation - panel size 1200x1000mm
- Light weight and High compressive strength
- Durable
- Enviromental - use of recycled material

The information presented herein is provided for reference purposes only. It is intended for use as a guide and will not apply to every circumstance. Suitability of products will vary as a result of site conditions and specific requirements. Final determination of the suitability of any information or material for the use contemplated, or its manner of use and whether the use is applicable, is the sole responsibility of the user. The brochure is subject to change arising from new developments and findings. All dimensions are nominal.

May 2013

VI-20™ GEOMEMBRANE

HIGH-PERFORMANCE VAPOR INTRUSION BARRIER

DESCRIPTION

VI-20™ is a 7-layer co-extruded geomembrane made using high quality virgin-grade polyethylene and EVOH resins that provide unmatched impact strength as well as superior resistance to VOC vapor transmission. EVOH technology serves as a highly resilient underslab and vertical wall barrier designed to restrict methane, radon and other harmful chemicals. Applications for EVOH originated in the manufacturing of automotive fuel systems to control emissions of hydrocarbons, whose use was mandated by the US EPA and the CA Air Resources Board (CARB) to reduce VOC emissions.

APPLICATION

VI-20™ is a 20-mil, high performance poly-ethylene-EVOH copolymer geomembrane, specially designed for use as a VOC barrier when used in conjunction with LIQUID BOOT® spray-applied vapor intrusion membrane to minimize vapor intrusion and nuisance water (non-hydrostatic conditions) migration into buildings. VI-20™ is ideal for applications with chlorinated solvents, BTEX and other PAHs.

BENEFITS

- Polyethylene layers provide excellent chemical resistance and physical properties
- EVOH barrier technology provides superior protection against diffusion of chemicals when compared to typical HDPE geomembranes
- Manufactured at ISO 9001:2008 certified plant

INSTALLATION

For use as a component of the LIQUID BOOT® Plus system, VI-20™ geomembrane is rolled out on prepared sub-grade, overlapping seams a minimum of six inches (6"). The geomembrane is cut around penetrations so that it lays flat on the sub-grade and tight at all inside corners. A thin (20 mil) tack coat of LIQUID BOOT® ("A" side without catalyst) is sprayed within the seam overlap. Once the VI-20™ geomembrane is installed, penetrations are then treated with VI-20™ Detailing Fabric prior to installation of the LIQUID BOOT® spray-applied vapor intrusion membrane and ULTRASHIELD™ G-1000 protection course.



EVOH technology provided in VI-20™ geomembrane has been shown to have VOC diffusion coefficients 20 times lower than an 80 mil (2 mm) HDPE geomembrane.

PACKAGING

VI-20™ Geomembrane is available in the following packaging option:

- 10 ft. x 150 ft. (3 m x 45 m) Rolls

VI-20™ CHEMICAL & PHYSICAL PROPERTIES

CHEMICAL PROPERTY	TEST METHOD	RESULT
Benzene Diffusion Coefficient	EPA Method 8260	$4.5 \times 10^{-15} \text{ m}^2/\text{s}$
Ethylbenzene Diffusion Coefficient	EPA Method 8260	$4.0 \times 10^{-15} \text{ m}^2/\text{s}$
m&p-Xylenes Diffusion Coefficient	EPA Method 8260	$3.7 \times 10^{-15} \text{ m}^2/\text{s}$
Methane Permeance	ASTM D1434	$< 1.7 \times 10^{-10} \text{ m}^2/\text{d} \cdot \text{atm}$
o-Xylene Diffusion Coefficient	EPA Method 8260	$3.7 \times 10^{-15} \text{ m}^2/\text{s}$
Radon Diffusion Coefficient	SP Test Method	$< 0.25 \times 10^{-12} \text{ m}^2/\text{s}$
Toluene Diffusion Coefficient	EPA Method 8260	$4.2 \times 10^{-15} \text{ m}^2/\text{s}$
PHYSICAL PROPERTY	TEST METHOD	RESULT
Membrane Composite Thickness	ASTM D5199	20 mil (0.5 mm)
Impact Resistance	ASTM D1709	2,600 g
Tensile Strength	ASTM E154 Section. 9	58 lbf/in (1.0 N/m)
Water Vapor Transmission	ASTM E154 & E96	0.004 grains/hr-ft ² (0.0028 g/hr-m ²)
Water Vapor Retarder Classification	ASTM E1745	Class A, B & C

Note: These are typical property values.

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UPDATED: FEBRUARY 2014

TDS_VI-20_AM_EN_201403_V1

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LIQUID BOOT®

SPRAY-APPLIED GAS VAPOR BARRIER

DESCRIPTION

LIQUID BOOT® is a seamless, spray-applied, water-based membrane containing no VOCs, which provides a barrier against vapor intrusion into structures. LIQUID BOOT® is installed under slab and on below grade vertical walls as a gas vapor barrier to minimize vapor and nuisance water migration into buildings. LIQUID BOOT® spray-application directly to penetrations, footings, grade beams, pile caps and other irregular surfaces, provides for a fully-adhered gas vapor barrier system.

APPLICATIONS

LIQUID BOOT® is used as an underslab and below-grade vertical wall gas vapor barrier, used to minimize vapor and nuisance water (non-hydrostatic conditions) migration into buildings. LIQUID BOOT® is ideal for methane migration control. LIQUID BOOT® is also NSF® certified for use as a potable water liner in concrete water reservoirs and tanks greater than 300,000 gallons to protect the concrete from water seepage.

BENEFITS

- Spray-application provides excellent sealing of penetrations, eliminating the need for mechanical fastening
- Seamless, monolithic membrane eliminates seaming-related membrane failures
- Unique formulation provides superior protection from methane gases and water vapor
- Fully adhered system reduces risk of gas migration
- Protection from methane gas, VOCs, chlorinated solvents and other contaminants

INSTALLATION

Protect all adjacent areas not to receive gas vapor barrier. Ambient temperature shall be within manufacturer's specifications. All plumbing, electrical, mechanical and structural items to be under or passing through the gas vapor barrier shall be secured in their proper positions and appropriately protected prior to membrane application. Gas vapor barrier shall be installed before placement of rein-forcing steel. Expansion joints must be filled with a conventional waterproof expansion joint material. Surface preparation shall be per manufacturer's specification. A minimum thickness of 60 dry mils, unless specified otherwise.

LIMITED WARRANTY

CETCO warrants its products to be free of defects. This warranty only applies when the product is applied by Approved Applicators trained by CETCO. As factors which affect the result obtained from this product, including weather, equipment, construction, workmanship and other variables are all beyond CETCO's control, we warrant only that the material herein conforms to our product specifications. Under this warranty we will replace at no charge any product proved to be defective within 12 months of manufacture, provided it has been applied in accordance with our written directions for uses we recommend as suitable for this product. This warranty is in lieu of any and all other warranties expressed or implied (including any implied warranty of merchantability or fitness for a particular use), and the Manufacturer shall have no further liability of any kind including liability for consequential or incidental damages resulting from any defects or any delays caused by replacement or otherwise. This warranty shall become valid only when the product has been paid for in full.



In addition to superior chemical resistance performance, LIQUID BOOT® spray-application effectively seals penetrations, footings, grade beams and other irregular surfaces that are considered critical vapor intrusion pathways.

EQUIPMENT

- COMPRESSOR: Minimum output of 155-185 cubic feet per minute (CFM)
- PUMPS: For "A" drum, an air-powered piston pump of 4:1 ratio (suggested model: Graco, 4:1 Bulldog). For "B" drum, an air-powered diaphragm pump (0-100 psi)
- HOSES: For "A" drum, ½" wire hose with a solvent resistant core (for diesel cleaning flush), hose rated for 500 psi minimum. For "B" drum, a 3/8" fluid hose rated at only 300 psi may be used.
- SPRAY WAND: Only the spray wand sold by CETCO is approved for the application of LIQUID BOOT®.
- SPRAY TIPS: Replacement tips can be purchased separately from CETCO.

PACKAGING

LIQUID BOOT® is available in the following packaging options:

- 55 Gallon Drum
- 275 Gallon Tote

TECHNICAL DATA

LIQUID BOOT[®] SPRAY-APPLIED GAS VAPOR BARRIER

TESTING DATA

CHEMICAL & PHYSICAL PROPERTIES		
CHEMICAL PROPERTY	TEST METHOD	RESULT
Acid Exposure (10% H ₂ SO ₄ for 90 days)	ASTM D543	Less than 1% weight change
Benzene Diffusion Test	Tested at 43,000 ppm	2.90 x 10 ⁻¹¹ m ² /day
Chemical Resistance: VOCs, BTEXs (tested at 20,000 ppm)	ASTM D543	Less than 1% weight change
Chromate Exposure (10% Chromium6+ salt for 31 days)	ASTM E96	Less than 1% weight change
Diesel (1000 mg/l), Ethylbenzene (1000 mg/l), Naphthalene (5000 mg/l) and Acetone (500 mg/l) Exposure for 7 days	ASTM D543	Less than 1% weight change; Less than 1% tensile strength change
Hydrogen Sulfide Gas Permeability	ASTM D1434	None Detected
Methane Permeability	ASTM 1434-82	Passed*
Microorganism Resistance	ASTM D4068-88	Passed*
Oil Resistance	ASTM D543-87	Passed*
PCE Diffusion Coefficient	Tested at 120 mg/L	1.32 x 10 ⁻¹³ m ² /sec
Radon Permeability	Tested by US Dept. of Energy	Zero permeability to Radon (222Rn)
TCE Diffusion Coefficient	Tested at 524 mg/L	9.07 x 10 ⁻¹³ m ² /sec

PHYSICAL PROPERTY	TEST METHOD	RESULT
Accelerated Weathering and Ultraviolet Exposure	ASTM D822	No adverse effect after 500 hours
Air Infiltration	ASTM E283-91	0 cfm/sq. ft.
Bonded Seam Strength Tests	ASTM D6392	Passed*
Coefficient of Friction (with geotextile both sides)	ASTM D5321	0.72
Cold Bend Test	ASTM D146	Passed. Ø cracking at -25 °F
Dead Load Seam Strength	City of Los Angeles	Passed*
Electric Volume Resistivity	ASTM D257	1.91 x 10 ¹⁰ ohms-cm
Elongation	ASTM D412	1,332% Ø reinforcement, 90% recovery
Elongation w/8 oz. non-woven geotextile both sides	ASTM D751	100% (same as geotextile tested separately)
Environmental Stress-Cracking	ASTM D1693-78	Passed*
Flame Spread	ASTM E108	Class A with top coat (comparable to UL790)
Freeze-Thaw Resistance (100 Cycles)	ASTM A742	Meets criteria. Ø spalling or disbondment
Heat Aging	ASTM D4068-88	Passed*
Hydrostatic Head Resistance	ASTM D751	Tested to 138 feet or 60 psi
Potable Water Containment	ANSI/NSF 61	NSF Certified for tanks >300,000 gal
Puncture Resistance w/8 oz. non-woven geotextile both sides	ASTM D4833	286 lbs. (travel of probe = 0.756 in)
Sodium Sulfate (2% water solution)	ASTM D543, D412, D1434	Less than 1% weight change
Soil Burial	ASTM E154-88	Passed
Tensile Bond Strength to Concrete	ASTM D413	2,556 lbs/ft ² uplift force
Tensile Strength	ASTM D412	58 psi without reinforcement
Tensile Strength w/8 oz. non-woven geotextile both sides	ASTM D751	196 psi (same as geotextile tested separately)
Toxicity Test	22 CCR 66696	Passed
Water Penetration Rate	ASTM D2434	<7.75 x 10 ⁻⁹ cm/sec
Water Vapor Permeance	ASTM E96	0.069 perms

*Passes all Los Angeles City and County Methane Criteria

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UPDATED: NOVEMBER 2013

TDS_LIQUIDBOOT_AM_EN_201311_v1



LIQUID BOOT® TROWEL GRADE

TROWEL-APPLIED GAS VAPOR BARRIER

DESCRIPTION

LIQUID BOOT® is a trowel-applied, water-based membrane containing no VOCs, which provides a barrier against vapor intrusion into structures. LIQUID BOOT® Trowel Grade is installed in conjunction with the LIQUID BOOT® gas vapor barrier to minimize vapor and nuisance water migration. LIQUID BOOT® Trowel Grade offers additional protection around penetrations, providing for a fully-adhered gas vapor barrier system.

APPLICATIONS

LIQUID BOOT® Trowel Grade is used for detailing around penetrations and for repairs in LIQUID BOOT® gas vapor barrier applications.

AVAILABILITY

LIQUID BOOT® Trowel Grade is available from the following CETCO plant locations:

- 1001 S Linwood Ave., Santa Ana, CA
- 218 NE Industrial Park Rd., Cartersville, GA

BENEFITS

- Trowel application provides excellent sealing of penetrations
- Seamless, monolithic membrane means no mechanical fastening required
- Protection from methane gas, VOCs, chlorinated solvents and other contaminants
- Also protects against water vapor

LIMITATIONS

- Do not allow materials to freeze in containers.
- Store LIQUID BOOT® Trowel
- Grade at site in strict compliance with manufacturer's instructions.
- When applying material below 45°F, contact your local technical sales manager.

PACKAGING

LIQUID BOOT® Trowel Grade is available in the following packaging options:

- 1 Gallon Bucket (8 oz. bottle of catalyst uncluded)



In addition to superior chemical resistance performance, LIQUID BOOT® Trowel Grade effectively seals penetrations, which are considered critical vapor intrusion pathways.

TESTING DATA

CHEMICAL & PHYSICAL PROPERTIES		
CHEMICAL PROPERTY	TEST METHOD	RESULT
Acid Exposure (10% H ₂ SO ₄ for 90 days)	ASTM D543	Less than 1% weight change
Benzene Diffusion Test	Tested at 43,000 ppm	2.90 x 10 ⁻¹¹ m ² /sec
Chemical Resistance: VOCs, BTEXs (tested at 20,000 ppm)	ASTM D543	Less than 1% weight change
Chromate Exposure (10% Chromium6+ salt for 31 days)	ASTM E96	Less than 1% weight change
Diesel (1000 mg/l), Ethylbenzene (1000 mg/l), Naphthalene (5000 mg/l) and Acetone (500 mg/l) Exposure for 7 days	ASTM D543	Less than 1% weight change; Less than 1% tensile strength change
Hydrogen Sulfide Gas Permeability	ASTM D1434	None Detected
Methane Permeability	ASTM 1434-82	Passed*
Microorganism Resistance	ASTM D4068-88	Passed*
Oil Resistance	ASTM D543-87	Passed*
PCE Diffusion Coefficient	Tested at 6,000 mg/m ³	2.74 x 10 ⁻¹⁴ m ² /sec
Radon Permeability	Tested by US Dept. of Energy	Zero permeability to Radon (222Rn)
TCE Diffusion Coefficient	Tested at 20,000 mg/m ³	8.04 x 10 ⁻¹⁴ m ² /sec

TECHNICAL DATA

LIQUID BOOT® TROWEL GRADE TROWEL-APPLIED GAS VAPOR BARRIER

TESTING DATA cont'd.

PHYSICAL PROPERTY	TEST METHOD	RESULT
Accelerated Weathering and Ultraviolet Exposure	ASTM D822	No adverse effect after 500 hours
Air Infiltration	ASTM E283-91	0 cfm/sq. ft.
Bonded Seam Strength Tests	ASTM D6392	Passed*
Coefficient of Friction (with geotextile both sides)	ASTM D5321	0.72
Cold Bend Test	ASTM D146	Passed. Ø cracking at -25 °F
Dead Load Seam Strength	City of Los Angeles	Passed*
Electric Volume Resistivity	ASTM D257	1.91 x 10 ¹⁰ ohms-cm
Elongation	ASTM D412	1,332% Ø reinforcement, 90% recovery
Elongation w/8 oz. non-woven geotextile both sides	ASTM D751	100% (same as geotextile tested separately)
Environmental Stress-Cracking	ASTM D1693-78	Passed*
Flame Spread	ASTM E108	Class A with top coat (comparable to UL790)
Freeze-Thaw Resistance (100 Cycles)	ASTM A742	Meets criteria. Ø spalling or disbondment
Heat Aging	ASTM D4068-88	Passed*
Hydrostatic Head Resistance	ASTM D751	Tested to 138 feet or 60 psi
Potable Water Containment	ANSI/NSF 61	NSF Certified for tanks >300,000 gal
Puncture Resistance w/8 oz. non-woven geotextile both sides	ASTM D4833	286 lbs. (travel of probe = 0.756 in)
Sodium Sulfate (2% water solution)	ASTM D543, D412, D1434	Less than 1% weight change
Soil Burial	ASTM E154-88	Passed
Tensile Bond Strength to Concrete	ASTM D413	2,556 lbs/ft ² uplift force
Tensile Strength	ASTM D412	58 psi without reinforcement
Tensile Strength w/8 oz. non-woven geotextile both sides	ASTM D751	196 psi (same as geotextile tested separately)
Toxicity Test	22 CCR 66696	Passed
Water Penetration Rate	ASTM D2434	<7.75 x 10 ⁻⁹ cm/sec
Water Vapor Permeability	ASTM E96	0.24 perms
Water Vapor Transmission	ASTM E96	0.10 grains/h-ft ²

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UPDATED: NOVEMBER 2013

TDS_LIQUIDBOOT-TROWELGRADE_AM_EN_201311_v1



TECHNICAL DATA

SMOKE TESTING

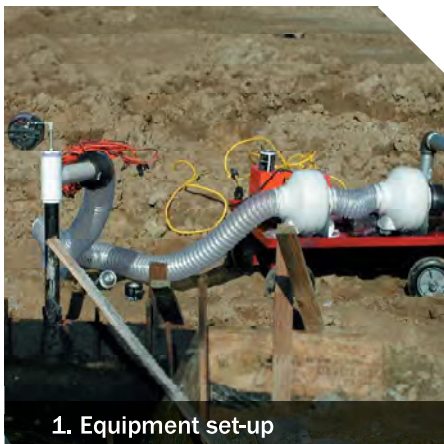
FOR LIQUID BOOT® GAS VAPOR BARRIER SYSTEMS

QUALITY ASSURANCE

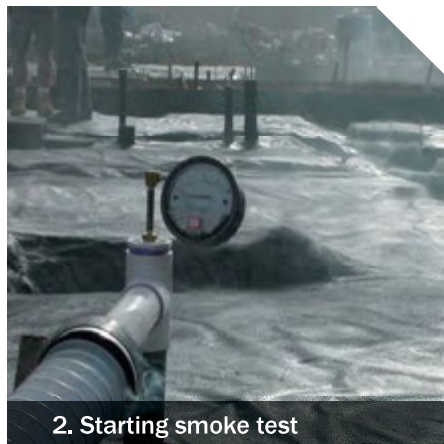
In any proper gas vapor barrier system installation, it is important to perform QA/QC measures to ensure successful installations. CETCO maintains a nationwide network of certified installers and inspectors that are trained in the proper installation and inspection procedures of a Liquid Boot® gas vapor barrier system. CETCO pioneered the use of a smoke test, which is currently recognized by top guidance organizations as a reliable quality control method performed on Liquid Boot® gas vapor barrier systems.

THE SMOKE TESTING PROCESS

A smoke test is a method of ensuring that a membrane is free of holes. Smoke is pumped under the membrane for a specified period of time while the surface of the membrane is observed for minute holes where the smoke is clearly visible. During the smoke test, any holes detected can immediately be repaired. This process has been completed under hundreds of structures and found to be highly successful. The smoke testing process assures engineers, developers, and owners alike that they are getting a fully tested, gas-tight membrane installation.



1. Equipment set-up



2. Starting smoke test



3. Punctured detected by smoke



4. Close-up of puncture



5. Repair by certified installer



6. Fully patched membrane

2870 Forbs Avenue, Hoffman Estates, IL 60192
800.527.9948 | <http://remediation.cetco.com>

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ULTRASHIELD™ G-1000

NON-WOVEN GEOTEXTILE FABRIC

DESCRIPTION

ULTRASHIELD™ G-1000 is a polypropylene, staple fiber, non-woven geotextile. The fibers are needled-punched, forming a stable network that retains dimensional stability relative to each other. The geotextile is resistant to ultraviolet degradation and biological and chemical environments found in soils. Manufacturing Quality Control tests have been performed and are accredited by the Geosynthetic Accreditation Institute's Laboratory Accreditation Program (GAI-LAP).

APPLICATION

ULTRASHIELD™ G-1000 is designed for use as a underslab adhesion protection course specially designed and required for underslab LIQUID BOOT® applications where the membrane must

remain attached to the underslab of the building. This is to ensure the membrane remains in place despite soil settlement, which is common when building is on a landfill.

BENEFITS

ULTRASHIELD™ G-1000 is installed directly over the finished LIQUID BOOT® vapor intrusion barrier, providing superior protection from other trades.

PACKAGING

- 15 ft. x 180 ft. (4.5 m x 55 m) Rolls



ULTRASHIELD™ G-1000 is a needle-punched, non-woven geotextile with superior tensile strength and puncture resistance.

TESTING DATA

PHYSICAL PROPERTIES			
PROPERTY	TEST METHOD	RESULT (ENGLISH)	RESULT (METRIC)
Tensile Bond Strength to Concrete ³	ASTM C 297-94	7 psi	
Mass/Unit Area	ASTM D 5261	10.0 oz/yd ²	339 g/m ²
Thickness	ASTM D 5199	105 mils	2.7 mm
Tensile Strength	ASTM D 4632	270 lbs.	1202 N
Elongation	ASTM D 4632	50%	50%
CBR Puncture Strength	ASTM D6241	725 lbs.	3226 N
Trapezoid Tear	ASTM D 4533	105 lbs.	467 N
UV Resistance	ASTM D 4355	70%	70%
A.O.S.	ASTM D 4751	100 U.S. Sieve	0.150 mm
Permittivity	ASTM D 4491	1.2 sec ⁻¹	1.2 sec ⁻¹
Permeability	ASTM D 4491	0.30 cm/sec	0.30 cm/sec
Water Flow Rate	ASTM D 4491	85 gal/min//ft ²	3463 l/min/m ²

Notes:

¹ The property values listed above are effective 04/2011 and are subject to change without notice.

² All values shown are in weaker principal direction and are Minimum average roll values (MARV), except for AOS, which is a Maximum average roll value.

³ Historical value, based on past testing.

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UPDATED: FEBRUARY 2014

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E – CQA FORMS



SURFACE PREPARATION & VENTING SYSTEM INSPECTION REPORT

(For CETCO CQA Personnel)

Project Name/Stage:	Date: / /
Applicator/Supervisor:	Inspection Time: AM/PM
System :	Revision:
Conditions: °C Wind <input type="checkbox"/> Sunny <input type="checkbox"/> Cloudy <input type="checkbox"/> Rain	
Notes:	

Substrate: <input type="checkbox"/> Concrete <input type="checkbox"/> Shotcrete <input type="checkbox"/> Masonry <input type="checkbox"/> Gravel Other:
Products applied: <input type="checkbox"/> GeoVent <input type="checkbox"/> Drainage Cell Other(s):






1. Job conditions: LIQUID BOOT GVB V4.0/10 1.05/3.02, LIQUID BOOT WP, V2.6/10 1.05/3.02, VI-20 geomembrane V5.0 1.08/3.01/3.02	Yes	N/A	CA
1.1. Sufficient access to the site, spray application and equipment set-up areas is provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2. Areas of concrete and rebar in need of protection from membrane application are appropriately masked.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3. Plumbing/electrical/mechanical/etc. items in application area are positively secured in appropriate positions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.4. Joints and tie holes prepared with recommended tape/grout/caulk product(s) as per relevant specification.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.5. Areas to be applied are free of standing water.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Surface preparation: LIQUID BOOT GVB V4.0/10 3.02 and LIQUID BOOT WP, V2.6/10 3.02, VI-20 geomembrane V5.0 3.01/3.02	Yes	N/A	CA
2.1. Concrete areas to be applied with membrane have been allowed to cure at least 7 days after pouring.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2. Surfaces to be applied are smooth, free of dirt, debris, loose material, release agents or curing compound.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3. Cracks >1.5mm and voids > 6 mm wide and deep in concrete are filled as per the relevant specification.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4. All penetrations in application area are prepared as per the relevant specification and standard details.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Gravel / Sand Layer: LIQUID BOOT Brownfield Membrane/Liner Standard Details and Design Specification	Yes	N/A	CA
3.1. Gravel free of fines, dirt and foreign material. Screen size: mm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2. Sand free of dirt, foreign material and sharp objects.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3. Installed to specified depth of mm. Refer to attachment 1A for sampling locations and results.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Venting System: LIQUID BOOT GeoVent V1.3 3.1 and Design Specification	Yes	N/A	CA
4.1. Venting layout meets design specification. If N/A, see remarks and attachment 1A for as-built plan.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2. GeoVent, sleeves and end outlets are installed correctly and secured with tape.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3. GeoVent inlets/outlets have been covered to protect from rain and debris prior to connection to risers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Additional requirements: As per the advice of a CETCO Authorised Representative	Yes	N/A	CA
5.1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Key []: Yes – Task is complete, N/A – Not Applicable, CA – Corrective Action recorded



DRAWN BY:

DATE ISSUED: / /

Legend:		Gravel Depth Test		Membrane Thickness Test		GeoVent Strip		Vent Outlet		Vent Inlet
SIZE	A4	TITLE	Attachment A	JOB NAME / STAGE						REVISION
SCALE	None	GeoVent As-Built		<input type="checkbox"/>	Gravel Sampling	<input type="checkbox"/>	Membrane Thickness	SHEET 1 OF 1		
DRAWN BY:		TITLE	 /						1.0



REMEDIATION TECHNOLOGIES

Attachment B Photographs (For CETCO CQA Personnel)

Project Name/Stage:		Date: / /	
Images taken by:		Revision:	
Purpose:	<input type="checkbox"/> General	<input type="checkbox"/> Marketing	<input type="checkbox"/> Gravel test
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1. Images:

<p>Figure I:</p> <p>.....</p>	<p>Figure II:</p> <p>.....</p>
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<p>Figure III:</p> <p>.....</p>	<p>Figure IV:</p> <p>.....</p>
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<p>Figure V:</p> <p>.....</p>	<p>Figure VI:</p> <p>.....</p>
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2. Additional Comments:



Form 2
MEMBRANE INSTALLATION INSPECTION FORM
 (For CETCO CQA Personnel)

Project Name/Stage:	Date: / /
Applicator/Supervisor:	Inspection Time: AM/PM
System :	Revision:
Conditions: °C Wind <input type="checkbox"/> Sunny <input type="checkbox"/> Cloudy <input type="checkbox"/> Rain	
Notes:	

NOTE: If membrane installation does not immediately follow the Form 1 inspection, ensure that all Form 1 requirements remain fulfilled before proceeding.

1. Preinstallation checks: LIQUID BOOT GVB V4.0/10 1.05/3.02/3.03, LIQUID BOOT WP, V2.6/10 1.05/3.02/3.03, VI-20 geomembrane V5.0 1.07/1.08/3.02	Yes	N/A	CA
1.1. Existing and forecast weather conditions are within the manufacturer's recommendations for each product.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2. Liquid Boot batch data recorded. See remarks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3. All liquid products have been stored, mixed and prepared correctly as per the manufacturer requirements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Membrane Installation : LIQUID BOOT GVB V4.0/10 3.02/3.03 and LIQUID BOOT WP, V2.6/10 3.02/3.03, VI-20 geomembrane V5.0 3.01/3.04	Yes	N/A	CA
2.1. Penetrations, corners < 120° and all vertical to horizontal transitions are applied with a 20mm cant of LB.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2. Geotextile/VI-20 is rolled out correct side up, ≥150 mm seam overlap, tight to corners and free of wrinkles.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3. Geotextile and VI-20 overlapped seams are filled with 0.25 mm tack coat of LB Part A.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4. LB applied at correct thickness shows correct curing without excessive stippling, shadowing or bleeding.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5. Tight and hard to reach areas (penetrations/overhangs) are detailed with LB RG and LB TG as necessary.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Post-application checks: LIQUID BOOT GVB V4.0/10 3.02/3.03 and LIQUID BOOT WP, V2.6/10 3.02/3.03, VI-20 geomembrane V5.0 3.04	Yes	N/A	CA
3.1. Membrane surface is swept free of ponding catalyst and is excluded from foot traffic, dirt and debris.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2. Membrane attachment to VI-20, concrete, PVC and metal surfaces exhibits sufficient adhesion.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3. Pipe penetrations are fitted with cable ties as per the manufacturer specifications and standard details.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Field Quality Control: LIQUID BOOT GVB V4.0/10 3.04 and LIQUID BOOT WP, V2.6/10 3.04, VI-20 geomembrane V5.0 3.06	Yes	N/A	CA
4.1. Membrane is cured, meets specified minimum thickness, is free of flaws and is of acceptable appearance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2. Smoke testing has been carried out to verify membrane integrity. If yes, see Form 2.1 for details.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3. G-1000 protection course has been laid in preparation for steel work installation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Additional requirements: As per the advice of a CETCO Authorised Representative	Yes	N/A	CA
5.1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Key []: Yes – Task is complete, N/A – Not Applicable, CA – Corrective Action Report attached

6. Remarks: Reference the specific item and provide a description

7. Additional Comments:

8. Attachments:

Attachments:	Content	Attached
A: Site Map	<input type="checkbox"/> General annotations <input type="checkbox"/> Smoke test results <input type="checkbox"/> Membrane thickness	<input type="checkbox"/>
B: Photographs	Membrane installation, test illustration and general photographs including captions	<input type="checkbox"/>
Corrective Action Report	Form Item References:	<input type="checkbox"/>

9. Inspection Acknowledgment:

This inspection has been carried out by an authorized CETCO representative, meets the requirements of the CETCO design specifications and standard details.

The membrane has been prepared to proceed with steel installation. Date: / /

Person	Name	Signed	Present
CETCO Representative:		<input type="checkbox"/>
Consultant/Auditor:		<input type="checkbox"/>
Site Foreman/Representative:		<input type="checkbox"/>



Form 2.1

PRE-STEEL SMOKE TEST REPORT
(For CETCO CQA Personnel)

Project Name/Stage:	Date: / /
Applicator/Supervisor:	Inspection Time: AM/PM
System :	Revision:
Conditions: °C Wind <input type="checkbox"/> Sunny <input type="checkbox"/> Cloudy <input type="checkbox"/> Rain	
Notes:	
Products applied: <input type="checkbox"/> LB TG <input type="checkbox"/> LB RG <input type="checkbox"/> LB SG	Other(s):

NOTE: If membrane installation does not immediately follow the Form 1 inspection, ensure that all Form 1 requirements remain fulfilled before proceeding.

1. Job conditions: LIQUID BOOT GVB V4.0/10, LIQUID BOOT WP, V2.6/10, VI-20 geomembrane V5.0	Yes	N/A	CA
1.1. The sprayed membrane has been allowed to cure for at least 24 hours, is dry and free of debris.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2. Current and forecast conditions for testing are in line with the manufacturer recommendations for testing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3. All required site and external representatives are present for duration of test.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Membrane: LIQUID BOOT GVB V4.0/10 and LIQUID BOOT WP, V2.6/10, VI-20 geomembrane V5.0	Yes	N/A	CA
2.1. Smoke test undertaken on all discrete areas of membrane. Refer to attachment 2A for locations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2. Smoke entry points central to test areas & allows free flow to edges of membrane.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3. Membrane does not pull away and remains fixed at attachment points during smoke injection.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4. Depth gauge or destructive testing of membrane carried out. See attachment 2A for location and results.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Venting System: LIQUID BOOT GVB V4.0/10 and LIQUID BOOT WP, V2.6/10, VI-20 geomembrane V5.0	Yes	N/A	CA
3.1. All connected inlets apart from smoke injection point are sealed and outlets are free of obstructions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2. Smoke is observed at outlets within expected timeframe based upon void space and injection rate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3. Smoke is not detected from service connection pipework, drainage system and sewer/storm-water vents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Identifying breaches: LIQUID BOOT GeoVent V1.3, LIQUID BOOT GVB V4.0/10 and LIQUID BOOT WP, V2.6/10	Yes	N/A	CA
4.1. Check over membrane surface for leaks from pin holes, stippled areas, shadowing and thin application.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2. Check for leaks at membrane attachments, horizontal to vertical transitions and all penetrations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Post-test Requirements: LIQUID BOOT GeoVent V1.3, LIQUID BOOT GVB V4.0/10 and LIQUID BOOT WP, V2.6/10	Yes	N/A	CA
5.1. Smoke entry points have been repaired with patch according to relevant specification and standard details.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Additional requirements: As per the advice of a CETCO Authorised Representative	Yes	N/A	CA
6.1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Key []: Yes – Task is complete, N/A – Not Applicable, CA – Corrective Action Report attached

7. Remarks: Reference the specific item and provide a description

8. Additional Comments:

9. Inspection Acknowledgment:

This inspection has been carried out by an authorized CETCO representative, meets the requirements of the CETCO specification and standard details.






The membrane and venting system have passed this smoke test. Date: / /

Person	Name	Signed	Present
CETCO Representative:		<input type="checkbox"/>
Consultant/Auditor:		<input type="checkbox"/>
Site Foreman/Representative:		<input type="checkbox"/>



DRAWN BY:

DATE ISSUED: / /

Legend:		Smoke Test Point		Membrane Thickness Test		GeoVent Strip		Vent Outlet		Vent Inlet
SIZE	A4	TITLE	Attachment A	JOB NAME / STAGE /	REVISION	1.0			
SCALE	None	Smoke Test Results	<input type="checkbox"/>	Membrane Thickness	<input type="checkbox"/>	SHEET	1 OF 1			



REMEDIATION TECHNOLOGIES

Attachment B
Photographs
(For CETCO CQA Personnel)

Project Name/Stage:		Date: / /	
Images taken by:		Revision:	
Purpose:	<input type="checkbox"/> General	<input checked="" type="checkbox"/> Membrane thickness	<input type="checkbox"/> Gravel test
			<input type="checkbox"/> Marketing

1. Images:

<p>Figure I:</p> <p>.....</p>	<p>Figure II:</p> <p>.....</p>
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<p>Figure III:</p> <p>.....</p>	<p>Figure IV:</p> <p>.....</p>
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<p>Figure V:</p> <p>.....</p>	<p>Figure VI:</p> <p>.....</p>
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2. Additional Comments:



Form 3
POST-STEEL INSPECTION FORM
 (For CETCO CQA Personnel)

Project Name/Stage:	Date: / /
Applicator/Supervisor:	Inspection Time: AM/PM
System:	Revision:
Conditions: °C Wind <input type="checkbox"/> Sunny <input type="checkbox"/> Cloudy <input type="checkbox"/> Rain	
Notes:	

NOTE: If membrane installation does not immediately follow the Form 1 inspection, ensure that all Form 1 requirements remain fulfilled before proceeding.

1. Job Conditions: LIQUID BOOT GVB V4.0/10, LIQUID BOOT WP, V2.6/10, VI-20 geomembrane V5.0	Yes	N/A	CA
1.1. G-1000 protection course was applied prior to installation of steel work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2. Membrane areas are free of dirt, debris, waste building materials and excessive standing water.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Inspection for Damage: LIQUID BOOT GVB V4.0/10, LIQUID BOOT WP, V2.6/10, VI-20 geomembrane V5.0	Yes	N/A	CA
2.1. The membrane attachment points are intact and membrane has not pulled away.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2. There are no visible holes, gashes and tears in membrane and protection layers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3. Steel work is raised off membrane surface and supported appropriately with bar chairs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4. No additional penetrations or disturbances are present from further plumbing, electrical or venting work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5. Additional smoke testing has been requested. Refer to Form 3.1 for details and results.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Additional requirements: As per the advice of a CETCO Authorised Representative	Yes	N/A	CA
3.1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Key []: Yes – Task is complete, N/A – Not Applicable, CA – Corrective Action Report attached

4. Remarks: Reference the specific item and provide a description



REMEDIATION TECHNOLOGIES

5. Additional Comments:

6. Attachments:

Attachments:	Content	Attached
A: Site Map	<input type="checkbox"/> General annotations <input type="checkbox"/> Smoke test results	<input type="checkbox"/>
B: Photographs	Membrane installation, test illustration and general photographs including captions	<input type="checkbox"/>
Corrective Action	Form Item References:	<input type="checkbox"/>

7. Inspection Acknowledgment:

This inspection has been carried out by an authorized CETCO representative and in accordance with the CETCO design specifications.

The membrane has been prepared to proceed with concrete application or backfilling. Date: / /

Person	Name	Signed	Present
CETCO Representative:		<input type="checkbox"/>
Consultant/Auditor:		<input type="checkbox"/>
Site Foreman/Representative:		<input type="checkbox"/>



**Form 3.1
POST-STEEL SMOKE TEST REPORT
(For CETCO CQA Personnel)**

Project Name/Stage:	Date: / /
Applicator/Supervisor:	Inspection Time: AM/PM
System :	Revision:
Conditions: °C Wind <input type="checkbox"/> Sunny <input type="checkbox"/> Cloudy <input type="checkbox"/> Rain	
Notes:	
Products applied: <input type="checkbox"/> LB TG <input type="checkbox"/> LB RG <input type="checkbox"/> LB SG	Other(s):

NOTE: If membrane installation does not immediately follow the Form 1 inspection, ensure that all Form 1 requirements remain fulfilled before proceeding.

1. Job conditions: LIQUID BOOT GVB V4.0/10, LIQUID BOOT WP, V2.6/10, VI-20 geomembrane V5.0	Yes	N/A	CA
1.1. The sprayed membrane has been allowed to cure for at least 24 hours, is dry and free of debris.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2. Current and forecast conditions for testing are in line with the manufacturer recommendations for testing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3. All required site and external representatives are present for duration of test.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Membrane: LIQUID BOOT GVB V4.0/10 and LIQUID BOOT WP, V2.6/10, VI-20 geomembrane V5.0	Yes	N/A	CA
2.1. Smoke test undertaken on all discrete areas of membrane. Refer to attachment 2A for locations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2. Smoke entry points central to test areas & allows free flow to edges of membrane.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3. Membrane does not pull away and remains fixed at attachment points during smoke injection.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4. Depth gauge or destructive testing of membrane carried out. See attachment 2A for location and results.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Venting System: LIQUID BOOT GVB V4.0/10 and LIQUID BOOT WP, V2.6/10, VI-20 geomembrane V5.0	Yes	N/A	CA
3.1. All connected inlets apart from smoke injection point are sealed and outlets are free of obstructions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2. Smoke is observed at outlets within expected timeframe based upon void space and injection rate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3. Smoke is not detected from service connection pipework, drainage system and sewer/storm-water vents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Identifying breaches: LIQUID BOOT GeoVent V1.3, LIQUID BOOT GVB V4.0/10 and LIQUID BOOT WP, V2.6/10	Yes	N/A	CA
4.1. Check over membrane surface for leaks from pin holes, stippled areas, shadowing and thin application.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2. Check for leaks at membrane attachments, horizontal to vertical transitions and all penetrations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Post-test Requirements: LIQUID BOOT GeoVent V1.3, LIQUID BOOT GVB V4.0/10 and LIQUID BOOT WP, V2.6/10	Yes	N/A	CA
5.1. Smoke entry points have been repaired with patch according to relevant specification and standard details.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Additional requirements: As per the advice of a CETCO Authorised Representative	Yes	N/A	CA
6.1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Key []: Yes – Task is complete, N/A – Not Applicable, CA – Corrective Action Report attached

7. Remarks: Reference the specific item and provide a description

8. Additional Comments:

9. Inspection Acknowledgment:

This inspection has been carried out by an authorized CETCO representative, meets the requirements of the CETCO specification and standard details.


The membrane and venting system have passed this smoke test. Date: / /


Person	Name	Signed	Present
CETCO Representative:		<input type="checkbox"/>
Consultant/Auditor:		<input type="checkbox"/>
Site Foreman/Representative:		<input type="checkbox"/>



Legend:  Smoke Test Point

 Smoke Test Point

 Membrane Thickness Test

 GeoVent Strip

 Vent Inlet

 Vent Outlet

DRAWN BY:

DATE ISSUED: / /

SIZE
A4

TITLE
Attachment A

JOB NAME / STAGE
..... /

SCALE None
 Smoke Test Results

REVISION
1.0

SHEET 1 OF 1



REMEDIATION TECHNOLOGIES

Attachment B Photographs (For CETCO CQA Personnel)

Project Name/Stage:		Date: / /
Images taken by:		Revision:
Purpose: <input type="checkbox"/> General <input checked="" type="checkbox"/> Membrane thickness <input type="checkbox"/> Gravel test <input type="checkbox"/> Marketing		

1. Images:

<p>Figure I:</p> <p>.....</p>	<p>Figure II:</p> <p>.....</p>
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<p>Figure III:</p> <p>.....</p>	<p>Figure IV:</p> <p>.....</p>
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<p>Figure V:</p> <p>.....</p>	<p>Figure VI:</p> <p>.....</p>
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2. Additional Comments: