



Transformer Pad Information



Transformer Pad (Before / After)

Lange Containment Systems, Inc.
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Denver, CO 80216
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Greetings,

I would like to take this opportunity to introduce you to our company.

Lange Containment Systems, Inc. (LCSI) is a premier fabricator of custom geosynthetic membrane products. We specialize in large panels, custom shapes and a full line of accessories. We utilize the highest quality materials including PVC, Hypalon, XR-5, Polypropylene, Urethanes and a variety of coated fabrics.

Our management team has over 50 years experience in all facets of the business and in all corners of the globe. We have had extensive experience with secondary containment of fuels and chemicals. Our applications range from temporary liners below a skid-mounted diesel tank to complex tank farms. At your direction we can provide all the components to do a containment kit and also offer the field installation services of a technician or complete crew to install the system.

LCSI is committed to providing the highest quality products, with the service and flexibility that sets the standard for our industry. This means that each bid, job, and person will get the quality individual attention of our team that is deserved. Our service will not be compromised.

With that said, please take your time reviewing our brochure and work. We welcome your calls and questions, and look forward to doing business with you in the future.

Sincerely,



Stuart Lange, President
Lange Containment Systems, Inc.



About LCSI

Centrally located in Denver Colorado, Lange Containment Systems Inc (LSCI) is a fabricator and installer of geomembranes and other geosynthetics. LSCI was founded in 1994 and has since fabricated and installed in excess of 100,000,000 F² of liner systems all over the world, including Antarctica.

LCSI received an [Industrial Fabrics Association International](#) (IFAI) award of Excellence for the Salt Lake City International Airport deicing fluid storage and recycling ponds.

Health & Safety Policy:

At Lange Containment Safety is our number one priority for our staff, our clients and the people with whom we interact. Our approach is based on individual behavior and we apply this behaviour-based safety approach to all aspects of our work.

Environmental Policy:

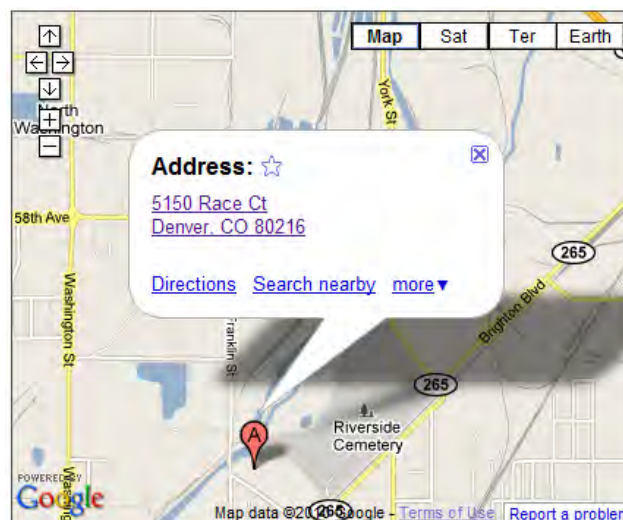
Lange Containment is committed to improving the environment through our own internal initiatives. Our key environmental objectives include:

- Conduct our business in an environmentally responsible manner;
- Minimise environmental risks by employing safe operating procedures; and
- Limiting our impact on the environment by reducing office waste and waste generated by our operations.



Locate LCSI

We are conveniently located the heart of Denver's Industrial center. Click on Map for further details.





XR-5 Geomembrane – Mechanical Properties

XR-5 [®] 8130 Reinforced	US Units	Metric Units
Base Fabric Type ASTM D3776	Polyester	
Base Fabric Weight (nominal) ASTM D3776	6.5 oz/yd ²	220 g/m ²
Thickness ASTM D751	30.0 mils (min.)	0.76 mm (min.)
Weight ASTM D751	30.0 ± 2 oz/yd ²	1017 ± 70 g/m ²
Tear Strength ASTM D4533, Trapezoid Tear	35/35 lb _f (min.)	155/155 N (min)
Breaking Strength ASTM D751, Grab Tensile	550/550 lb _f (min.)	2447/2447 N (min)
Low Temperature ASTM D2136, 4hr – 1/8" mandrel	Pass @ -30 °F	Pass @ -35 °C
Dimensional Stability ASTM D1204, 212°F / 100°C – 1 hr	1.5% max. each direction	
Adhesion – Heat Sealed Seam ASTM D751, Dielectric Weld	35 lb _f /2 in (min.)	15 daN/5 cm (min.)
Dead Load – Seam Shear Strength ASTM D751	2 in seam, 4 hr, 1 in strip 210 lb _f @ 70°F 105 lb _f @ 160°F	5 cm seam, 4 hr, 2.5 cm strip 934 N @ 21°C 467 N @ 70°C
Bursting Strength ASTM D751 Ball Tip	650 lb _f (min.) 800 lb _f (typical)	2892 N (min.) 3560 N (typical)
Hydrostatic Resistance ASTM D751, Method A	800 psi (min.)	5.51 MPa (min.)
Blocking Resistance ASTM D751 (180°F / 82°C)	#2 Rating (max.)	
Adhesion – Ply ASTM D413	15 lb _f /in (min.) or Film Tearing Bond	13 daN/5cm (min.) or Film Tearing Bond
Bonded Seam Strength ASTM D751 as modified by NSF 54	550 lbf (min.)	2447 N (min.)
Abrasion Resistance ASTM D3389 (H-18 Wheel, 1000 g load)	2,000 cycles (min.) before fabric exposure 50 mg/ 100 cycles max weight loss	
Weathering Resistance ASTM G23 (Carbon-Arc)	8,000 hrs (min.) – No appreciable changes or stiffening or cracking of coating	
Water Absorption ASTM D471, Section 12, 7 days	0.025 kg/m ² (max.) @ 70°F / 21°C 0.14 kg/m ² (max.) @ 212°F / 100°C	
Wicking Shelter-Rite [®] Procedure	1/8 in (max.)	0.3 cm (max.)
Puncture Resistance ASTM D4833	250 lb _f (min.)	1112 N (min.)
Coefficient of Thermal Expansion / Contraction ASTM D696	8 x 10 ⁻⁶ in/in/°F (max.)	1.4 x 10 ⁻⁵ cm/cm/°C (max.)



XR-5® Fluid Resistance Guidelines

The data below is the result of laboratory tests and is intended to serve only as a guide. No performance warranty is intended or implied. The degree of chemical attack on any material is governed by the conditions under which it is exposed. Exposure time, temperature, and size of the area of exposure usually varies considerably in application, therefore, this table is given and accepted at the user's risk. Confirmation of the validity and suitability in specific cases should be obtained.

When considering XR-5 for specific applications, it is suggested that a sample be tested in actual service before specification. Where impractical, tests should be devised which simulate actual service conditions as closely as possible.

Exposure	Resistance
AFFF	A
Acetic Acid (5%)	B
Acetic Acid (50%)	C
Ammonium Phosphate	T
Ammonium Sulfate	T
Antifreeze (ethylene glycol)	A
Animal Oil	A
Aqua Regia	X
ASTM Fuel A (100% Iso-octane)	A
ASTM Oil #2 (Flash pt. 240° C)	A
ASTM Oil #3	A
Benzene	X
Calcium Chloride Solutions	T
Calcium Hydroxide	T
20% Chlorine Solution	A
Clorox	A
Conc. Ammonium Hydroxide	A
Corn Oil	A
Crude Oil	A
Diesel Fuel	A
Ethanol	A
Ethyl Acetate	C
Ethyl Alcohol	A
Fertilizer Solution	A
#2 Fuel Oil	A
#6 Fuel Oil	A
Furfural	X
Gasoline	B
Glycerin	A
Hydraulic Fluid- Petroleum Based	A
Hydraulic Fluid- Phosphate (Ester Based)	C
Hydrocarbon Type II (40% Aromatic)	C
Hydrochloric Acid (50%)	A
Hydrofluoric Acid (5%)	A
Hydrofluoric Acid (50%)	A
Hydrofluosilicic Acid (30%)	A
Isopropyl Alcohol	T
Ivory Soap	A
Jet A	A

Exposure	Resistance
JP-4 Jet Fuel	A
JP-5 Jet Fuel	A
JP-8 Jet Fuel	A
Kerosene	A
Magnesium Chloride	T
Magnesium Hydroxide	T
Methanol	A
Methyl Alcohol	A
Methyl Ethyl Ketone	X
Mineral Spirits	A
Naphtha	A
Nitric Acid (5%)	B
Nitric Acid (50%)	C
Perchloroethylene	C
Phenol	X
Phenol Formaldehyde	B
Phosphoric Acid (50%)	A
Phosphoric Acid (100%)	C
Phthalate Plasticizer	C
Potassium Chloride	T
Potassium Sulphate	T
Raw Linseed Oil	A
SAE-30 Oil	A
Salt Water (25%)	B
Sea Water	A
Sodium Acetate Solutions	T
Sodium Bisulfite Solution	T
Sodium Hydroxide (60%)	A
Sodium Phosphate	T
Sulphuric Acid (50%)	A
Tanic Acid (50%)	A
Toluene	C
Transformer Oil	A
Turpentine	A
Urea Formaldehyde	A
UAN	A
Vegetable Oil	A
Water (200°F)	A
Xylene	X
Zinc Chloride	T

Rating Key:

- A** – Fluid has little or no effect
- B** – Fluid has minor to moderate effect
- C** – Fluid has severe effect
- T** – No data - likely to be acceptable
- X** – No data - not likely to be acceptable

Ratings are based on visual and physical examination of samples after removal from the test chemical after the samples of Black XR-5 were immersed for 28 days at room temperature. Results represent ability of material to retain its performance properties when in contact with the indicated chemical.



Geomembrane Chemical Resistance Comparison

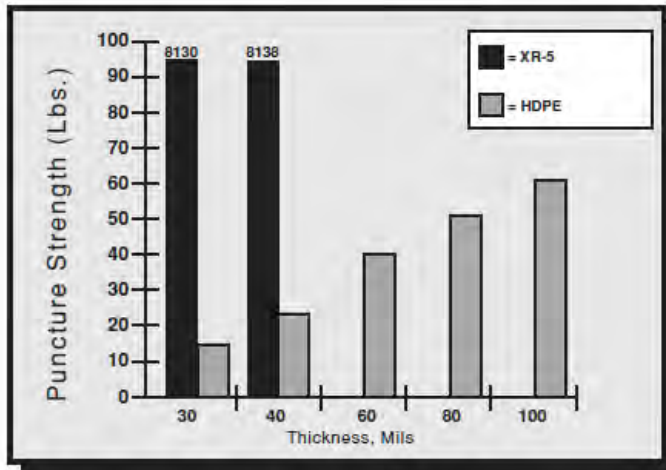
	XR-5®	HDPE	PVC	Hypalon	Polypropylene
Kerosene	A	B	C	C	C
Diesel Fuel	A	A	C	C	C
Acids (General)	A	A	A	B	A
Naphtha	A	A	C	B	C
Jet Fuels	A	A	C	B	C
Saltwater 160°F	A	A	C	B	A
Crude Oil	A	B	C	B	C
Gasoline	B	B	C	C	C

A = Excellent
 B = Moderate
 C = Poor
 NF = Not Found in Published Chart

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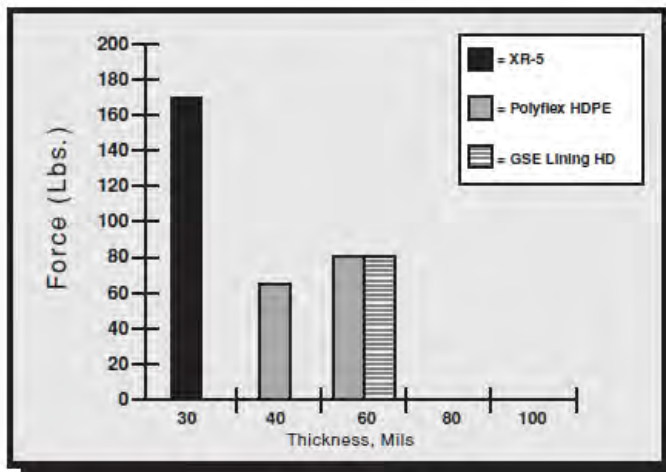


XR-5/HDPE Comparative Properties

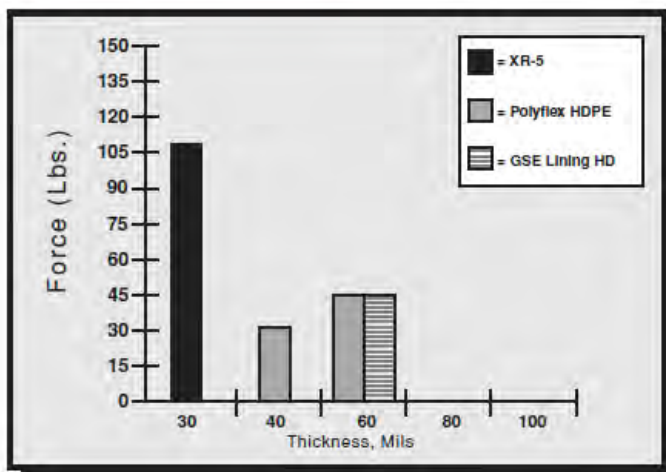


Puncture Resistance

1. ASTM D 751, Screwdriver Tip, 45° Angle (Room Temperature) Puncture Resistance, XR5 vs. HDPE



2. FED-STD-101C Method 2065 (Room Temperature)*



3. FED-STD-101C Method 2065 (70°C)*

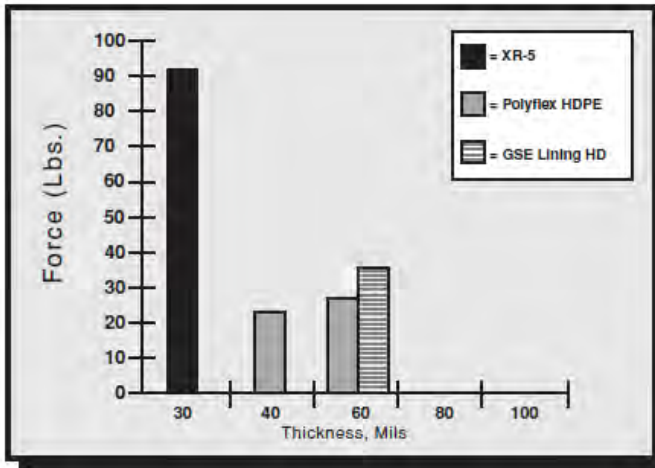
* Data provided by E.I. DuPont de Nemours & Co. Wilmington, Delaware

GSE is a registered trademark of GSE Lining Technology, Inc.

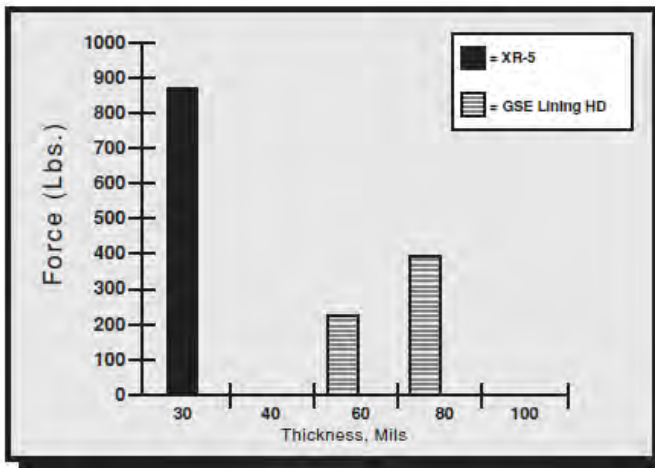
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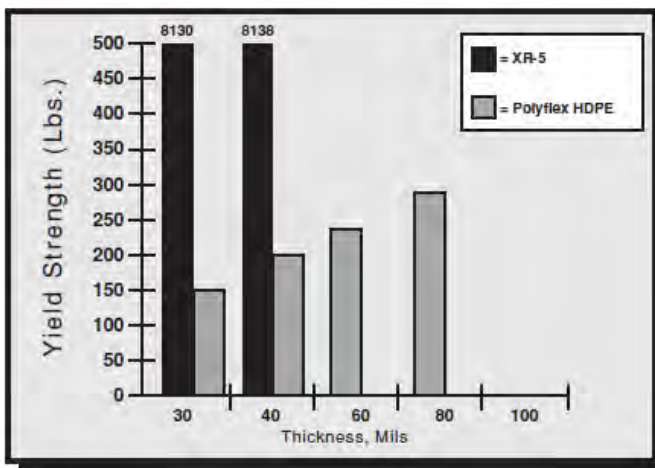
XR-5/HDPE Comparative Properties Continued



4. FED-STD-101C Method 2065 (100°C)*



5. ASTM D 751 Ball Burst Puncture



Yield Strength

1. Yield Strength, XR-5 vs. HDPE

Test Method: Grab Tensile, ASTM D 751, 70° C

* Data provided by E.I. DuPont de Nemours & Co. Wilmington, Delaware

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GT-180 Geotextile (8 oz)

GT-180 is a needle-punched nonwoven geotextile made of 100% polypropylene staple fibers, which are formed into a random network for dimensional stability. GT-180 resists ultraviolet deterioration, rotting, biological degradation, naturally encountered basics and acids. Polypropylene is stable within a pH range of 2 to 13. GT-180 conforms to the physical values listed below:

PROPERTY	TEST METHOD	UNIT	M.A.R.V. (Minimum Average Roll Value)
Weight (Typical)	ASTM D5261	oz/yd ² (g/m ²)	8.0 (271)
Grab Tensile	ASTM D4632	lbs (kN)	205 (.911)
Grab Elongation	ASTM D4632	%	50
Trapezoid Tear Strength	ASTM D4533	lbs (kN)	85 (.378)
Puncture Resistance	ASTM D4833	lbs (kN)	130 (.578)
Mullen Burst	ASTM D3786	psi (kPa)	400 (2756)
Permittivity*	ASTM D4491	sec ⁻¹	1.4
Water Flow*	ASTM D4491	gpm/ft ² (l/min/m ²)	90 (3657)
A.O.S.*	ASTM D4751	U.S. Sieve (mm)	80 (.180)
U.V. Resistance	ASTM D4355	%/hrs	70/500

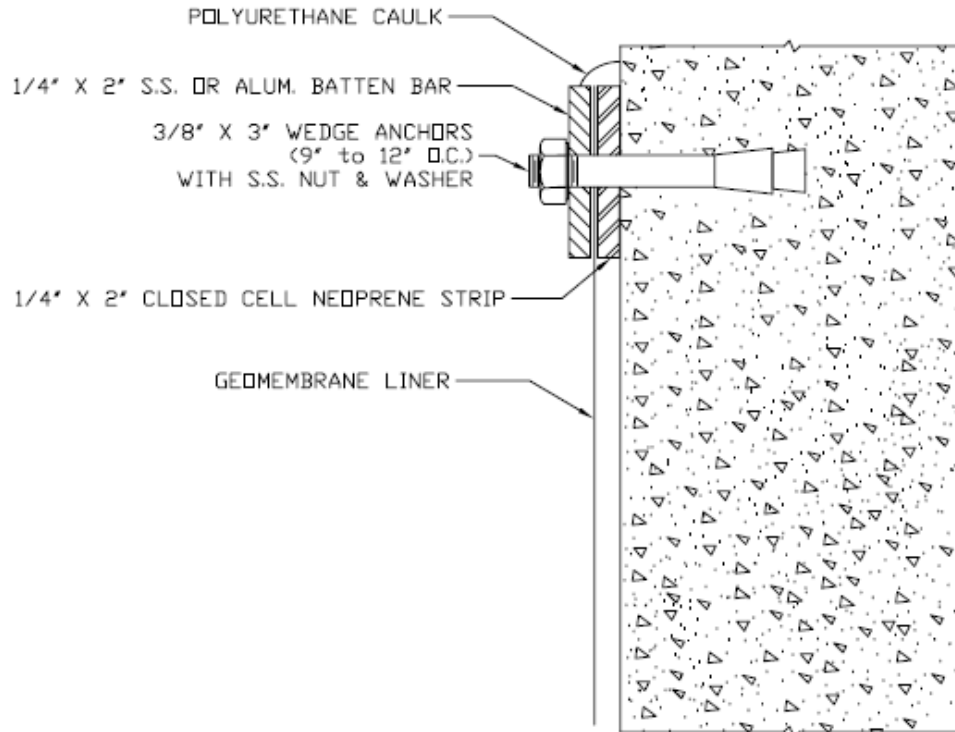
*Note: Properties at the time of manufacturing. Handling, storage, and shipping may change these properties.

PACKAGING	
Roll Dimension (W x L) - Ft	12.5 x 360 / 15 x 300
Square Yards per Roll	500
Estimated Roll Weight - lbs	250

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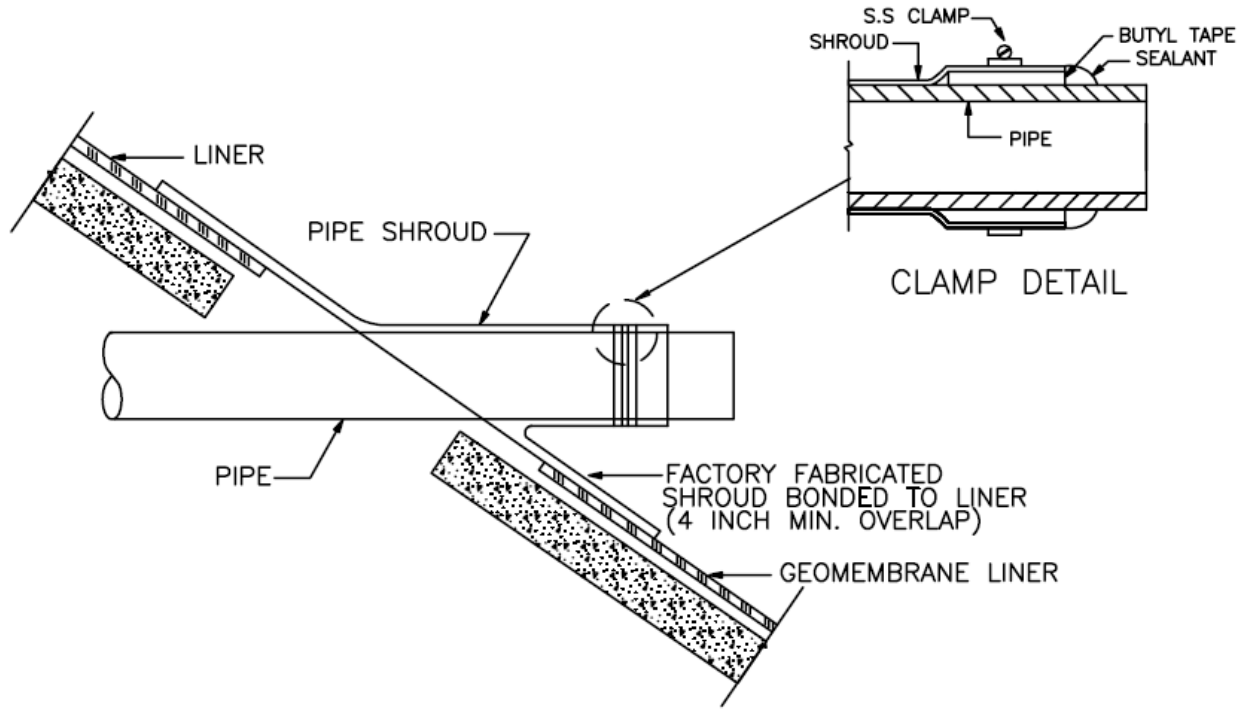
Typical Mechanical Attachment Detail



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Typical Pipe Boot Detail

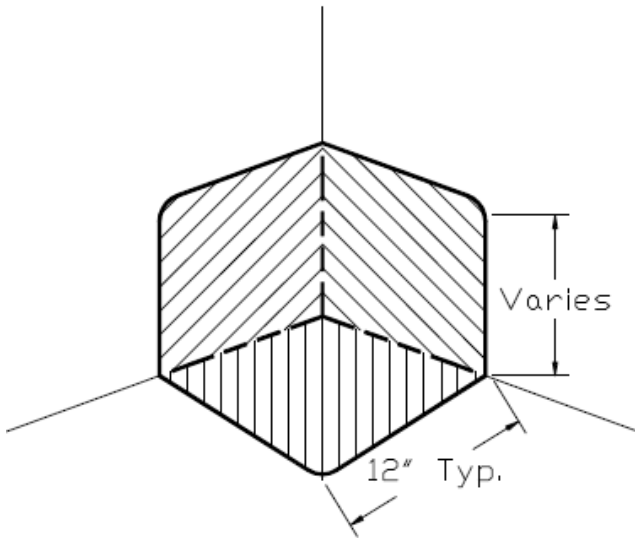


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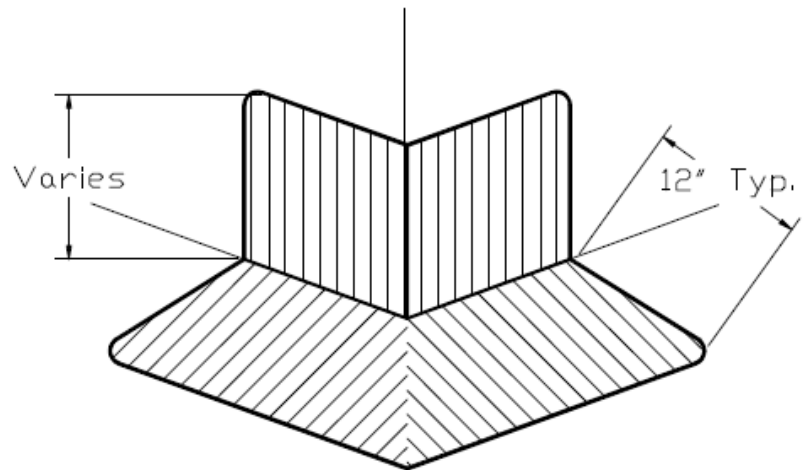


Typical Pipe Corner Detail

HEIGHT OF PRE-FABRICATED CORNER BOOTS VARIES PER APPLICATION
(TYPICALLY DETERMINED BY TOP ELEVATION OF LINER AT STRUCTURE)



INSIDE CORNER BOOT



OUTSIDE CORNER BOOT



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EZ Containment System



LCSI's EZ Containment™ system has many field applications:

- Tank Guardian. Use as a permanent or temporary system around tanks holding oil, fertilizer, water, etc...
- Secondary Containment
- Fire protection water storage
- Water clarity dams
- Truck washing station
- Creek diversions

EZ Containment™ system can usually be installed by one or two persons in just a few hours. The six foot triangular basket panels are easily assembled and disassembled for transportation to another location. We utilize the highest quality materials available in the industry to ensure a functional, durable and long-lasting containment system. And we offer a wide range of geomembrane liners suitable for the liquid material you are storing. Lange's product specialists can help you size and specify the containment system that best fits your needs.

Product Materials & Service

- Triangular baskets are constructed using nine gage galvanized steel with an interior strut
- Nonwoven geotextile underlayment
- Available geomembrane liner materials include:
 - PVC Film- available in 20, 30, 40, 50 and 60 mils
 - Polypropylene available in 45 mil
 - XR-5 available in 30 and 40 mil
 - High strength, High temperature liner available upon request
- Batten strips, anchor spikes and sand-filled ballast tubes
- Optional components:

• Ladder	• Boot kits
• Walk pads	• Rain water pump
• Oil absorbent sock	
- Collapsible panels for compact transportation
- Easy step-by-step instructions included
- "Next day emergency" shipping on some sizes
- Lange Containment Systems will help you select the correct containment system for your application:
 - Compatibility of geomembrane liner with stored material
 - Customized system for your site specific needs
 - Variety of configurations available





Project Photos—Rock Flats, CO 2010



Substation Before Liner Installation



Substation During Liner Installation



Substation After Liner Installation



Project Photos—Weslaco TX Substation 2008



Transformer Pad prior to Liner Installation



Transformer Pad after to Liner Installation



Project Photos—Mary's Lake Substation 2003



Manifold Boot Before Construction



Manifold Boot During Construction



Manifold Boot After Construction



Partial Project List: Secondary Containment Transformer Oil

Project Name Location	Contractor/Owner Phone #	Date	Size in F²	Material
Prairie Center Substation Secondary Oil Containment Brighton, CO	N-Line Electric Rodger Steinke (303) 702-1147	01/11	2,260	XR-5 8138
Plainview Substation Secondary Oil Containment Rocky Flats, CO	N-Line Electric Rodger Steinke (303) 702-1147	11/10	1,399	XR-5 8138
Lincoln Hills Substation Secondary Oil Containment Pinecliffe, CO	N-Line Electric Rodger Steinke (303) 702-1147	10/10	1,144	XR-5 8138
Horseshoe Substation Secondary Oil Containment Longmont, CO	Addison Construction Gary Bendert (307) 638-1538	08/10	7,394	XR-5 8138
Sioux Substation Secondary Oil Containment Donna, TX	TIC Energy & Chemical, Inc. James Heath (979) 233-5555	07/10	1,133	XR-5 8138
Fordham Substation Secondary Oil Containment Longmont, CO	Addison Construction Gary Bendert (307) 638-1538	07/10	7,232	XR-5 8138
Loveland East Substation Secondary Oil Containment Loveland, CO	Addison Construction Gary Bendert (307) 638-1538	05/10	3,873	XR-5 8138
Arlington Substation Secondary Oil Containment Arlington, WY	N-Line Electric Rodger Steinke (303) 702-1147	05/10	1,992	XR-5 8138
Carmel/Zinzer Substations Secondary Oil Containment Monte Vista, CO	Brink Constructors, Inc. Bob Oslund (605) 718-2126	01/10	8,883	XR-5 8130
Platte Valley Substation Secondary Oil Containment Brighton, CO	CCR Construction Calvin Rand (303) 709-1167	12/08	2,284	XR-5 8138
North Park Substation Secondary Containment Walden, CO	Interstate Electrical Judy Burtan (303) 420-6400	10/08	1,566	XR-5 8138



Project List Continued

Project Name Location	Contractor/Owner Phone #	Date	Size in F²	Material
Happy Jack Wind Farm Secondary Oil Containment Cheyenne, WY	Colstrip Electric Corey Sell (406) 748-4048	07/08	18,656	XR-5 8130
Mary's Lake Substation Secondary Containment Estes Park, CO	Addison Construction Co. Mike Kaiser (307) 421-3018	07/08	3,028	XR-5
Secondary Containment Wildwood, MO	Pangea Group Bob Thompson (314) 458-1591	03/08	1,714	XR-5 8130
Weslaco Substation Secondary Containment Edcouch, TX	Gulf States Rick Williams (361) 299-6239	03/08	1,085	XR-5 8138
Hacienda Substation Secondary Oil Containment Casa Grande, AZ	Brink Constructors, Inc. Clark Nelson (605) 484-7561	02/08	2,220	XR-5
Brick Center Substation Secondary Containment Bennett, CO	Interstate Electrical Leonard Warren (303) 420-6400	10/07	5,458	XR-5
Plainview Substation Julesburg, CO	Besler, Inc. Nathan Woods (605) 390-3369	10/07	4,397	XR-5 8130
County Line Substation Longmont, CO	Addison Construction Co. Mike Kaiser (307) 421-3018	06/07	2,102	XR-5 8138
Alton Substation Alton, TX	Gulf States, Inc. Gabriel Carrillo (979) 236-5564	05/07	2,495	XR-5 8138
Wyrulec RMPL #2 Substation Ft. Laramie, WY	Besler, Inc. Darrell Schumaker (605) 390-2823	04/07	937	XR-5 8130
Laureles Substation San Benito, TX	Interstate Electrical Paul Mikios (303) 419-5167	11/06	1,425	XR-5 8138



Project List Continued

Project Name Location	Contractor/Owner Phone #	Date	Size in F²	Material
Dixon Creek Substation Ft. Collins, CO	Addison Construction Mike Kaiser (307) 421-3018	10/06	9,836	XR-5 8138
Transformer Pad Billings, MT	Par Electric Greg Morris (861) 691-4241	07/06	2,146	XR-5 8138
Lyons Substation Lyons, PA	New River Electric Rob Reed (540) 229-1458	06/06	6,049	XR-5 8138
Fish Lake Substation Oasis, NV	Valley Electric Butch Caple (775) 727-2150	04/06	2,610	XR-5 8130
Del Lamino Substation Platteville, CO	United Power Chris Blessinger (970) 203-0450	02/06	851	XR-5 8138
North Denver Substation Hastings, NE	Kayton Electric Ron Tietze (308) 998-4462	02/06	3,105	XR-5 8138
Biosphere II Substation Oracle, AZ	Interstate Electrical Johnny Delmar (303) 961-0975	02/06	2,890	XR-5 8138
Magic Valley Electric Co-op Pharr, TX	Interstate Electrical Paul Miklos (303) 419-5167	02/06	1,348	XR-5 8138
Torrington Substation Torrington, WY	Sarmika Construction Douglas Haught (307) 532-4844	11/05	1,308	XR-5 8130
Elk River Substation Beaumont, KS	Par Electric Eric Burton (816) 691-4241	09/05	6,198	XR-5 8130
Mary's Lake Substation Estes Park, CO	Addison Construction Toby Krug (307) 638,1538	07/03	3,028	XR-5 8130



Project List Continued

Project Name Location	Contractor/Owner Phone #	Date	Size in F ²	Material
Grand Island Substation Grand Island, NE	City of Grand Island Jeff Mead (308) 385-5460	07/03	12,719	XR-5 8130
Transformer Pad Secondary Containment Burlington, CO	Tri-State G & T Assoc. Inc. Bob Coppin (303) 452-6111 x 6349	11/02	10,472	XR-5
Platte River Power Authority Boyd Lake Substation Loveland Colorado	Addison Construction Toby Krug (307) 638-1538	09/01	1,612	XR-5 8138
			<u>Total</u>	
			146,849	F ²



Thank You for your time in reviewing our
brochure and work.

We welcome your calls and questions, and
look forward to doing business with you in the
future.

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