REINFORCED CONCRETE FILL	Units	800 Series
Factored Moment Capacities with1, 2 and 4 rebar	See tables 1, 4 and 7 for data.	
Bending Stiffness with1, 2 and 4 rebar	See tables 2, 5 and 8 for data	
Factored Shear Capacities	See tables 3, 6 and 9 for data	

WITHOUT CONCRETE FILL		Units	800 Series
Allowable Moment	apparent*	ft · lbs/ft	4,427
Allowable Shear**		lb/ft	6,313
Section Modulus	theoretical apparent*	in^3/ft	34 16.6
Moment of Inertia	I^t theoretical I^a apparent*	in^4/ft	136 66

GENERAL SPECIFICATIONS	Units	800 Series
U-Channel Section Depth	in	8
U-Channel Section Width	in	12
Nominal Thickness****	in	0.27
Weight	lbs/ft	7.1
Modulus of Elasticity	psi	380,000
Tensile Strength	psi	6,300
Design Strength***	psi	3,200
Impact Strength	in · lbs	850.2

Material: Proven, durable co-extruded rigid vinyl material formulated for exterior weatherability and high impact resistance. The outer layer is a UV-resistant virgin vinyl compound. The inner layer is post-industrial recycled vinyl. See page 5 for recycled data.

No warranty of any kind is made as to the suitability of Truline for a particular application or the results obtained there from. Consult a professional engineer.

Notes:

The tables that follow are the recommended values for factored structural moment capacities and corresponding bending stiffnesses of Truline sections filled with reinforced concrete. The tabulated values were computed for a range of concrete compressive strengths and reinforcement options. The factored moment capacities were determined from nonlinear moment vs. curvature behavior computed using LPile 2012 software. The nominal moment capacities were determined when the maximum compressive strain in the concrete reached .003 in/in. **The reported ultimate (factored) moment capacities were computed by multiplying the nominal moment capacity by a strength reduction factor of 0.65.** The reported bending stiffnesses are for moment levels equal to the ultimate moment capacity and are for cracked sections. This method for determining moment capacities for the Truline/Reinforced Concrete sections was validated by the actual lab test (page 7).

Factored shear capacity is nominal shear capacity of the concrete and the Truline form **reduced by a strength reduction factor of 0.75.**

Per ACI 318-08 Section 11.4.6.1 shear reinforcing steel is not typically required by the Truline system since the section depth is less than 10 inches and the walls typically have shear loads well under 50% of the factored shear capacity without steel. If in the rare case the shear load exceeds this threshold, minimum shear reinforcing steel should be added per ACI 318-08 standard.

* Based on full scale performance test by Architectural Testing, Inc. Report #70174.01-122-44, not theoretical calculations (page 8).

Truline's allowable moment, for applications not filled with reinforced concrete, is based on section properties that were determined using full scale performance testing rather than theoretical calculations. This is a conservative approach that accounts for the viscoelastic behavior of the material that determines its mechanical properties. It results in a value that the design engineer can be confident in without applying excessive factors of safety.

** All pile sections must be filled with gravel or other material such as soil, sand, pebble, etc. to ensure the web is fully supported and the shear load is transferred from flange to flange by the fill material. Shear load must be applied by continuous beam or waler on the face of the wall.

t I (theoretical) is moment of inertia as calculated for the shape and adjusted to a per foot basis.

a I (apparent) is moment of inertia determined experimentally by a full scale test and measuring the deflection of the wall. This is the value for moment of inertia that would predict the deflections that were measured across a range of known loads. This number is also adjusted to a per foot basis.

*** Based on published data by US Army Corps of Engineers Report #ERDC/CRREL LR-03-19

**** For comparative purposes, the total material wall thickness listed should be doubled due to the Truline double wall design.

TABLE 1: 800 Series — Factored Moment Capacities* (in-lbs/ft width of wall) — Reinforced Sections 1 Rebar

Bar Size	Concrete Compressive Strength, f'c psi				
	3,000	3,500	4,000	4,500	5,000
No. 4	41,300	42,500	43,400	44,200	44,700
No. 5	43,100	44,600	45,600	46,400	47,100
No. 6	52,300	56,100	58,100	59,600	60,800
No. 7	56,900	63,500	69,100	73,400	75,800
No. 8	59,800	67,600	74,700	81,000	86,600
No. 9	62,300	70,500	78,300	85,600	92,400
No. 10	65,000	73,800	82,000	89,900	97,500
No. 11	67,500	76,800	85,300	93,600	101,600
No. 14	73,200	82,900	92,300	101,400	110,000

** As stated on page 1, the reported ultimate (factored) moment capacities were computed by multiplying the nominal moment capacity by a strength reduction factor of 0.65.*

TABLE 2: 800 Series — Bending Stiffness (lb-in^2/ ft width of wall) — Reinforced Sections 1 Rebar

Bar Size	Concrete Compressive Strength, f'c psi				
	3,000	3,500	4,000	4,500	5,000
No. 4	64,920,000	67,370,000	69,380,000	71,080,000	72,560,000
No. 5	68,430,000	71,100,000	73,310,000	75,170,000	76,790,000
No. 6	81,460,000	84,950,000	88,160,000	90,900,000	93,280,000
No. 7	96,350,000	100,210,000	103,770,000	107,100,000	110,350,000
No. 8	111,380,000	115,960,000	120,110,000	123,910,000	127,450,000
No. 9	125,280,000	130,780,000	135,620,000	140,090,000	144,140,000
No. 10	140,620,000	147,160,000	153,050,000	158,290,000	163,130,000
No. 11	154,500,000	162,020,000	168,900,000	175,050,000	180,630,000
No. 14	181,660,000	191,420,000	200,140,000	208,040,000	215,310,000

TABLE 3: 800 Series — Factored Shear Capacity/ft width* — Reinforced Sections 1 Rebar

$V_c + V_F$	Concrete Compressive Strength, f'c psi				
	3,000	3,500	4,000	4,500	5,000
lb/ft	8,000	8,260	8,510	8,740	8,950

**As stated on page 1, the reported factored shear capacities were computed by multiplying the nominal shear capacity by a strength reduction factor of 0.75.*

800 Series — Rebar Placement — Reinforced Sections 1 Rebar

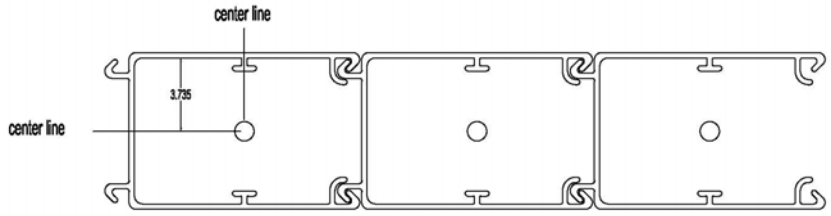


TABLE 4: 800 Series — Factored Moment Capacities* (in-lbs/ft width of wall) — Reinforced Sections 2 Rebar

Bar Size	Concrete Compressive Strength, f'c psi				
	3,000	3,500	4,000	4,500	5,000
No. 4	64,500	65,900	66,800	67,500	68,000
No. 5	86,100	88,900	91,000	92,600	93,900
No. 6	104,500	112,000	116,000	118,900	121,300
No. 7	113,800	127,000	138,200	146,600	151,500
No. 8	119,700	135,100	149,300	162,000	173,100
No. 9	124,600	141,100	156,700	171,300	184,900
No. 10	129,900	147,400	164,000	179,900	195,000
No. 11	135,000	153,100	170,600	187,200	203,200
No. 14	146,500	165,900	184,600	202,700	220,100

** As stated on page 1, the reported ultimate (factored) moment capacities were computed by multiplying the nominal moment capacity by a strength reduction factor of 0.65.*

TABLE 5: 800 Series — Bending Stiffness (lb-in^2/ ft width of wall) — Reinforced Sections 2 Rebar

Bar Size	Concrete Compressive Strength, f'c psi				
	3,000	3,500	4,000	4,500	5,000
No. 4	109,000,000	112,300,000	115,000,000	117,400,000	119,400,000
No. 5	136,700,000	142,000,000	146,400,000	150,100,000	153,300,000
No. 6	162,800,000	169,800,000	176,200,000	181,600,000	186,400,000
No. 7	192,600,000	200,300,000	207,400,000	214,100,000	220,600,000
No. 8	222,700,000	231,800,000	240,100,000	247,700,000	254,800,000
No. 9	250,500,000	261,500,000	271,200,000	280,100,000	288,200,000
No. 10	281,200,000	294,400,000	306,100,000	316,500,000	326,200,000
No. 11	309,000,000	324,200,000	337,800,000	350,100,000	361,200,000
No. 14	363,300,000	382,800,000	400,300,000	416,100,000	430,600,000

TABLE 6: 800 Series — Factored Shear Capacity/ft width* — Reinforced Sections 2 Rebar

$V_c + V_F$	Concrete Compressive Strength, f'c psi				
	3,000	3,500	4,000	4,500	5,000
lb/ft	8,000	8,260	8,510	8,740	8,950

**As stated on page 1, the reported factored shear capacities were computed by multiplying the nominal shear capacity by a strength reduction factor of 0.75.*

800 Series — Rebar Placement — Reinforced Sections 2 Rebar

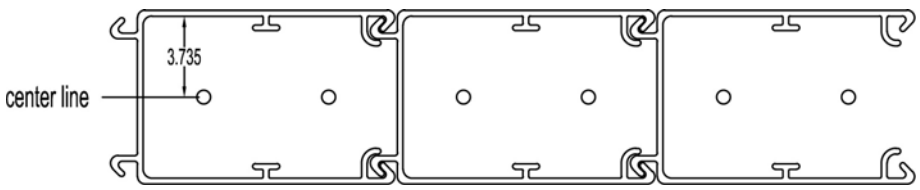


TABLE 7: 800 Series — Factored Moment Capacities* (in-lbs/ft width of wall) — Reinforced Sections 4 Rebar

Bar Size	Concrete Compressive Strength, f'c psi				
	3,000	**3,500**	**4,00**	**4,500**	**5,000**
No. 4	95,900	100,900	104,900	108,100	109,900
No. 5	127,100	132,800	138,100	143,100	147,700
No. 6	161,200	167,900	174,100	179,800	185,300
No. 7	201,600	209,100	216,200	222,800	229,000
No. 8	248,200	256,600	264,500	271,900	278,900

** As stated on page 1, the reported ultimate (factored) moment capacities were computed by multiplying the nominal moment capacity by a strength reduction factor of 0.65.*

TABLE 8: 800 Series — Bending Stiffness (lb-in^2/ ft width of wall) — Reinforced Sections 4 Rebar

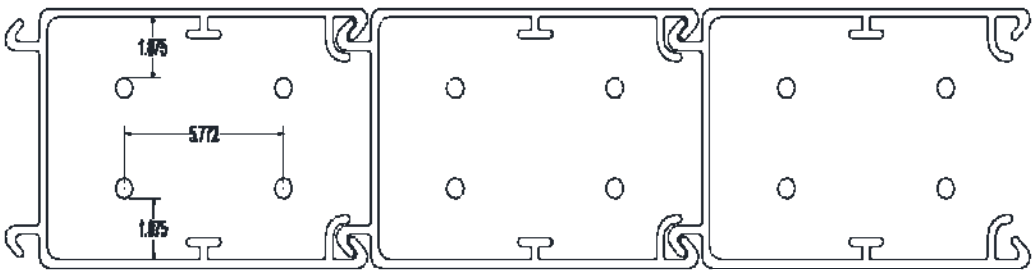
Bar Size	Concrete Compressive Strength, f'c psi				
	3,000	**3,500**	**4,000**	**4,500**	**5,000**
No. 4	234,820,000	239,000,000	242,900,000	246,235,000	249,500,000
No. 5	309,785,000	317,402,000	323,775,000	330,000,000	334,400,000
No. 6	383,022,000	394,125,000	404,646,000	413,000,000	420,000,000
No. 7	459,000,000	475,658,000	489,700,000	501,500,000	511,750,000
No. 8	537,000,000	558,815,000	576,993,000	592,869,000	606,500,000

TABLE 9: 800 Series — Factored Shear Capacity/ft width* — Reinforced Sections 4 Rebar

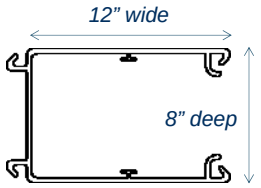
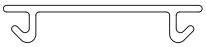
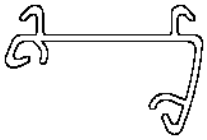
$V_c + V_F$	Concrete Compressive Strength, f'c psi				
	3,000	**3,500**	**4,000**	**4,500**	**5,000**
lb/ft	8,000	8,260	8,510	8,740	8,950

**As stated on page 1, the reported factored shear capacities were computed by multiplying the nominal shear capacity by a strength reduction factor of 0.75.*

800 Series — Rebar Placement — Reinforced Sections 4 Rebar



PARTS: 800 Series

Part	Part No.	Name	Recycled Content %
	800	**U-Channel** (12" wide x 8" deep) (304.8mm x 203.2mm)	92.5 %
	801	**Female End Cap** (Attaches to the last installed u-channel or radius.)	88.7 %
	802	**Male End Cap** (Attaches to the first u-channel prior to installation.)	89.8 %
	803	**22.5° Radius**	93.3 %
	804	**Cross Tie**	98.0 %
	805	**5° Radius**	93.5 %

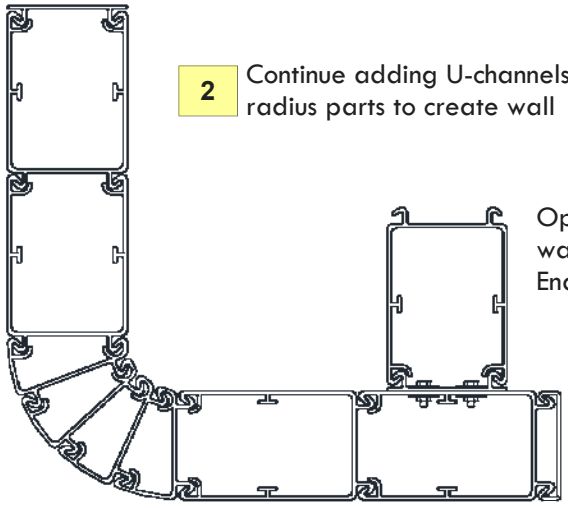
Post-Industrial Recycled Material Content % by Wt. — Installed Mix 92.5%

Note that since the u-channel accounts for the vast majority of pounds used for any given installation, assuming no cross ties are used, the recycled content for the mix of products used in a typical wall is essentially the same as the recycled content of the u-channel itself.

CONFIGURATIONS

(top view)

START 1 Attach Male End Cap with screws to 1st U-channel prior to driving



2 Continue adding U-channels or radius parts to create wall

Optional: Add a return wall by attaching a Male End Cap to the wall

END 3 Install Female End Cap onto the last U-channel

COLORS

Three standard colors (below) or a custom color. Colors shown provide only an example and are not exact matches. Sample chips are available upon request.

- Light Gray *(GR-01)*
- Sand *(SA-02)*
- Beige *(BE-03)*

Performed by: Architectural Testing, Inc.—130 Derry Court, York, PA 17406, (717) 764-7700

Report No.: C9598.02-106-31 **Report Date:** 11/10/14
Below is a summary. A full report is available at www.truline.us

Test Project: Perform a simulated seawater spray conditioning and post-exposure abrasion resistance evaluation on reinforced concrete piling specimens protected by Truline against a laboratory-conditioned control specimen and a fully-exposed control specimen consisting of the same reinforced concrete and subjected to the same seawater exposure without the benefit of Truline sheathing.

Test Methods: ASTM G 85-11, ASTM C 1141-98 (2013), and ASTM C 418-12

Test Results Summary: Truline-protected concrete, when exposed to accelerated saltwater testing performed as well as concrete that had no exposure. The test implies that Truline protection may nearly eliminate the damaging effects of saltwater on the surface of the concrete. The life expectancy of Truline-protected concrete is the same as the life expectancy of the same concrete in a non-marine environment. The typical life expectancy for reinforced concrete designed for the long term is 75+ years. Therefore, a properly designed and installed Truline cast-in-place reinforced concrete wall should perform at the same level.

ASTM C 418 - Post-1,000 Hour Salt Fog Exposure Abrasion Resistance

Summary of Results						
Exposure Condition			Abrasion Coefficient (cm^3/cm^2)	Volume Loss ($cm^3/50cm^2$) [1]	Mean Thickness Loss (mm)	Increased Abrasion Resistance Retention vs. Fully Exposed Specimen (%) [2]
Salt Fog	Truline Sheath	Sealed Joints				
Yes	No	N/A	0.20	10.13	2.03	N/A
No	No	N/A	0.16	7.90	1.58	**22.2**
Yes	Yes	No	0.16	7.99	1.60	**21.2**
		Yes	0.16	7.76	1.55	**23.6**

[1] *Volume Loss as presented is converted from the Abrasion Coefficient determined per ASTM C 418, Section 8.4*

[2] *Abrasion Resistance Retention Calculated as follows: ((Exposed Value - Protected Value)/ Exposed Value)*100*

PERFORMANCE TEST SUMMARY

Load Test with Reinforced Concrete

Performed by: Architectural Testing, Inc. — 130 Derry Court, York, PA 17406, (717) 764-7700
Results Analyzed by: Ensoft, Inc. — 3003 W. Howard Lane, Austin, TX 78728, (512) 244-6464

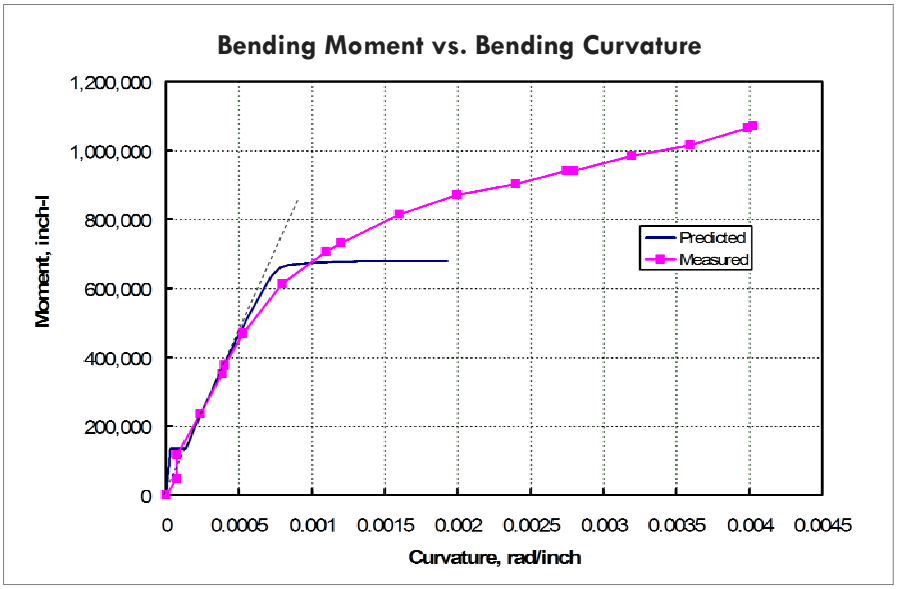
ATI Report No.: B7179.01-122-42 **Report Date:** 6/13/12
Ensoft Report: Interpretation of Testing Results on Truline Composite Sections **Report Date:** 6/6/12
Below is a summary. Full reports are available at www.truline.us

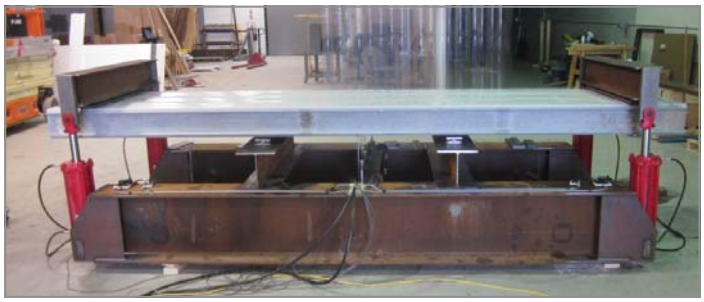
Test Project: Validate predicted performance of Truline filled with reinforced concrete through independent testing and analysis.

Test Procedure: Truline samples measuring 14 ft. long by 3 ft. wide filled with 3000 psi concrete and rebar were placed in 4 point loading ranging from 1000 to 40000 pounds while their center point deflections were measured for the given loads.

Predictions for the test performance for the as-built specimens were made using L-Pile software by computing moment curvature behavior for the material geometries and properties.

Test Results Summary: An analysis showed that the predicted moment-curvature behavior closely matched the observed results. With the computational method validated, it could then be used with confidence to determine the moment capacities for the sections under many variations of concrete strength and reinforcing steel design.





Test setup

8" thick specimen at full cylinder travel

PERFORMANCE TEST SUMMARY
Load Test without Concrete

Performed by: Architectural Testing, Inc. — 130 Derry Court, York, PA 17406, (717) 764-7700

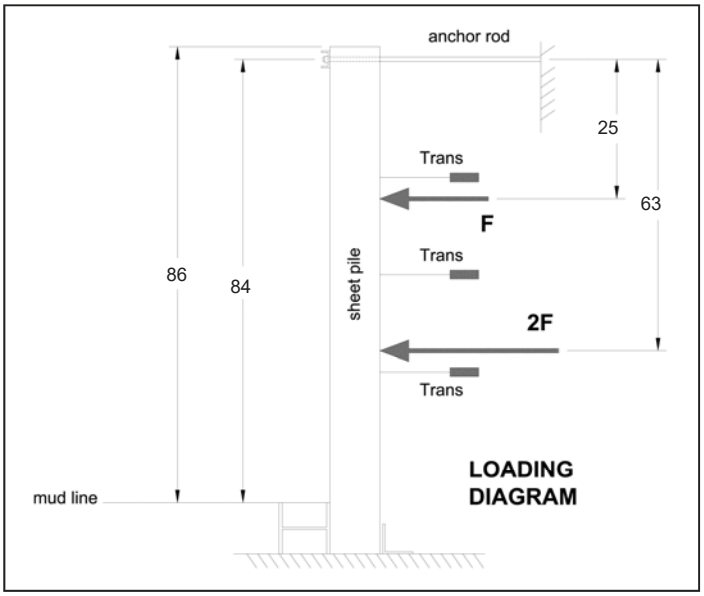
Report No.: 70174.01-122-44 **Report Date:** 2/07
Below is a summary. A full report is available at www.truline.us

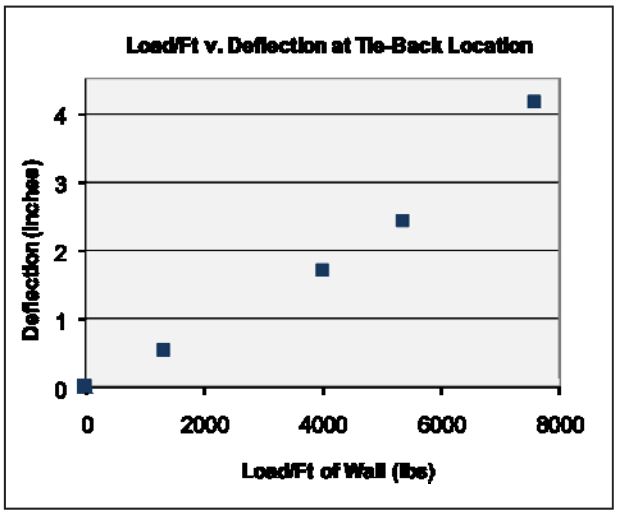

hydraulic cylinders and transducers

Test Project: Test the deflection and hydraulic pressure of Truline.

Test Setup: 8 ft. high Truline wall (7ft. above improvised mud line) with tie-backs, gravel fill and simulated concrete cap. Loading simulation was two rigid steel tubes placed 25in. and 63in. below the top edge. The top tube was loaded with two cylinders and the bottom tube was loaded with four so that the bottom load was always twice the top load. All cylinders were connected to a single manifold and pump so that they all generated equal force. (See Loading Diagram) The wall loaded to the desired level and held for one minute. The pressure was relieved and the wall was allowed to recover for one minute. After four loads were tested, the force on the wall was increased to levels that would exceed forces expected in real applications to observe and record performance data.

Test Results Summary:





Results Summary			
Applied Load per Foot of Wall (Distributed as shown in diagram above)	Max Deflection	Calculated Shear at Mud Line	Calculated Moment (max)
lbs / ft	in	lbs / ft	ft · lbs/ft
1325	0.53	775	1485
4027	1.70	2357	4515
5375	2.42	3146	6028
7599	4.16	4447	8517