STRESS ENGINEERING SERVICES INC.

13602 Westland East Blvd.
Houston, Texas 77041-1205
Phone: 281-469-2177
Texas Registered Engineering Firm F-195

Certificate of Test

Client:	DuraPlas, Inc. 16400 Midway Road Addison, TX 75001	**Date:**	6 November 2020
		SES Document No.:	1754744-TS-CT-01 (Rev 0)
		Project Manager:	Jason Bryan, PE
Client Contact:	Andrew Dulac	**Date of Testing:**	30 October 2020

Project/Test Description: 24" TuffStand – Compression load test to breakage
Test Conditions: Flat surface, longitudinal dunnage, or transverse dunnage

Test Sample Identification: DuraPlas, Inc. 24" TuffStand
Quantity: 10 samples
Material: Torzen T3000HSL Injection Molding Resin

Test Equipment: Load Cell, 100 kip [S/N: 3080]
SES Vertical Load Frame, 750-kip Configuration
Computerized Data Acquisition System
String Potentiometers

Procedure: A compressive load was applied to the pipe support sample through a client-provided 24" half-pipe fixture with the samples on a flat surface, with longitudinal dunnage, or with transverse dunnage until failure. All tested was performed at an ambient temperature between 60 °F – 70 °F.

Results:

Flat Surface, Seven Samples – Peak Load:	77,040 lbf (Average) / 1,290 lbf (Std. Dev)
Longitudinal Dunnage, Two Samples – Peak Load:	46,877 lbf and 44,865 lbf
Transverse Dunnage, One Sample – Peak Load:	72,721 lbf

Prepared by: _____
Jason Bryan, PE
Associate II

Reviewed by: _____
George Ross, PhD, PE
Principal

4. Results

4.1 Summary

Table 1: Summary of test results.

Sample ID#	Dunnage	Avg. Disp. Rate (mils/min)	Disp. to Peak Load (mils)	Peak Applied Load (lbf)	Breakage Description
1	-	-1,653	1,273	-76,449	Crumpling of top of side walls/corners at pipe saddle valley.
2	-	-1,012	1,469	-76,110	Crumpling of top of side walls/corners at pipe saddle valley.
3	-	-1,501	1,054	-74,656	Crumpling of top of side walls/corners at pipe saddle valley.
4	-	-1,949	1,112	-78,386	Crumpling of top of side walls/corners at pipe saddle valley.
5	-	-1,777	1,204	-77,290	Crumpling of side walls/top corners. Continued loading beyond peak caused additional crumpling.
6	-	-1,608	1,166	-77,862	Crumpling of side walls/top corners. Continued loading beyond peak caused additional crumpling.
7	Longitudinal	-2,103	1,446	-46,877	Crumpling of middle of side walls, crack on base flange at/near interface with dunnage corner.
8	Longitudinal	-2,328	1,167	-44,865	Crack on base flange at/near interface with dunnage corner.
9	Transverse	-1,641	1,425	-72,721	Catastrophic crack through base flange and up the side wall initiating at/near interface with dunnage corner.
10	-	-1,670	1,027	-78,524	Crumpling of top of side walls/corners at pipe saddle valley.

Note: 1 in = 1,000 mils