

The URESTRUCT™ range of pipe supports is manufactured by Navarro Chemicals Pty Ltd in their Perth, Western Australia facility. Navarro Chemicals, established in 1989, as a specialist chemical supply company, has grown and diversified to become a multi-disciplined, technology based company offering a broad range of products and services.

Navarro Chemicals has the ability to handle pipe support projects of any size, ranging from routine maintenance contracts to the construction of entire process plants and refineries. The URESTRUCT™ range of pipe supports is very flexible and our personnel are able to design, manufacture and install pipe supporting systems to meet your needs and quality requirements. The design specifications in this catalogue are intended to outline the typical uses and applications of the URESTRUCT™ pipe support systems. Our engineering staff can be utilised to help you with any design requirements.

Navarro Chemicals' personnel have extensive experience in the manufacture of pipe support systems. The company employs professional mechanical and chemical engineers with over 35 years experience in the petrochemical industry.

Principals of Navarro Chemicals have recently been responsible for the design and manufacture of high density polyurethane foam shear keys and primary guides for use at the Malaysia LNG (MLNG) plant in Bintulu, Malaysia, as well as the design and operation of the pre-insulation plant at the above project. Additionally, Navarro Chemicals was responsible for the pre-insulation of the rundown lines at the Bonny Island LNG Project in Nigeria, as well as the manufacture of shear keys for said project. Furthermore, the design and manufacture of specialised plant and equipment for the production of HDPUF pipe supports for Woodside's LPG extraction facility in Karratha was undertaken.

Navarro Chemicals applies stringent quality control measures to ensure customer satisfaction. High density polyurethane is manufactured from raw materials supplied by Aerial Industries PTY LTD who supply full test results and product information sheets to ensure consistent quality in line with the requirements of ISO 9001 and Shell DEP specifications.

URESTRUCT™ insulated pipe supports offer several technical and cost saving advantages to your process. These include;

- a lowering of heat loss or gain with a subsequent saving of energy and increased process efficiency
- a reduction of scale build-up caused by localised temperature changes in process pipework
- elimination of all steel to steel contact
- elimination of field welding of pipe supports and the subsequent need for field stress relieving.
- the process line can be supported prior to final line insulation
- the pipe supports can be moulded or cut to any thickness and layering configuration to fit with any process line insulation specification.

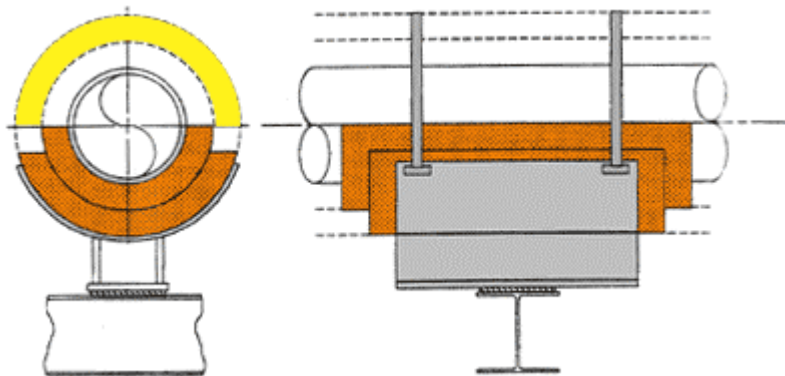


# COLD SERVICE PIPE SUPPORT ARRANGEMENTS

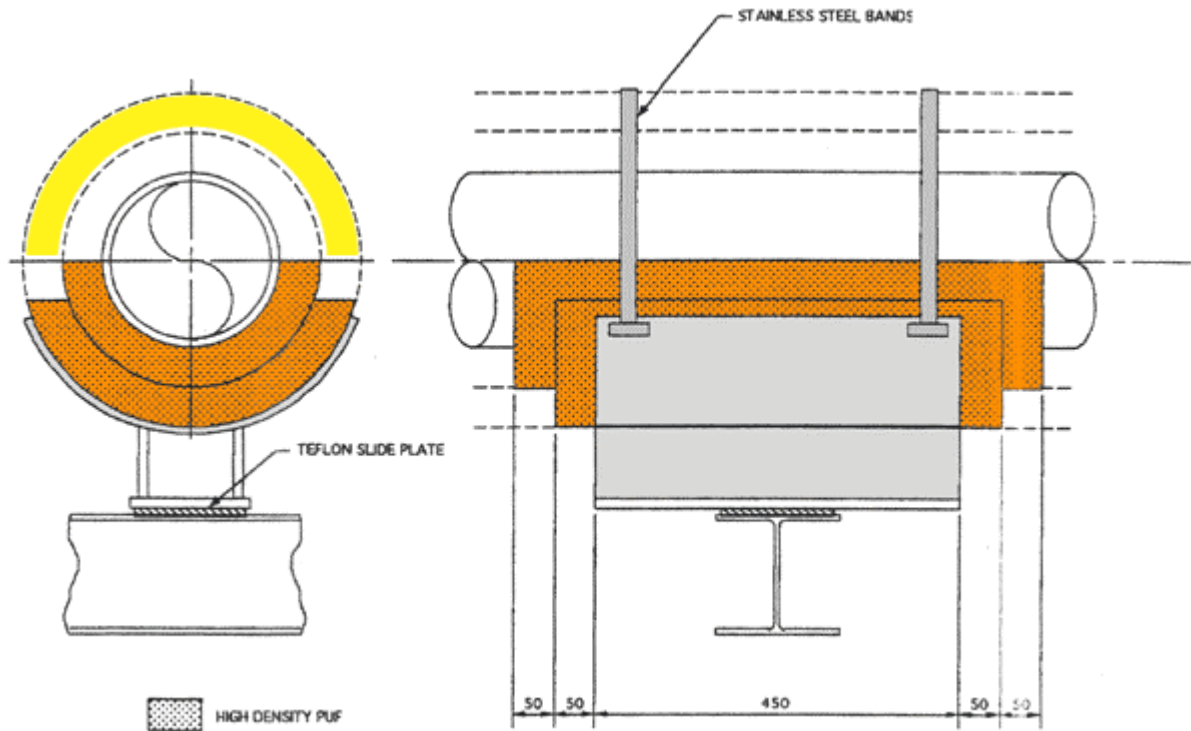
# A GUIDE TO URESTRUCT™ PIPE SUPPORTS

FROM

NAVARRO CHEMICALS



# URESTRUCT COLD SERVICE, HALF CRADLE PIPE SUPPORT

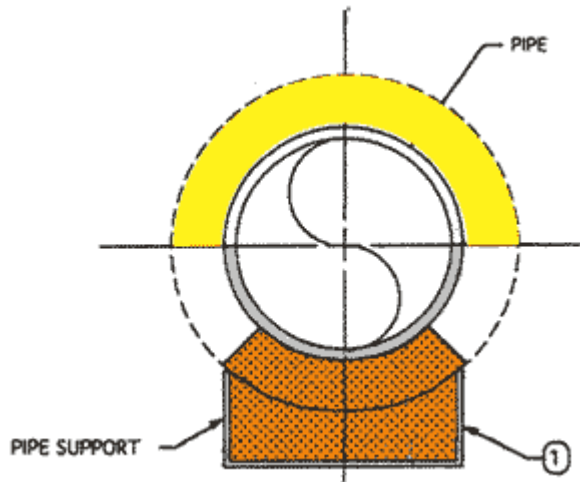


## APPLICATION NOTES:

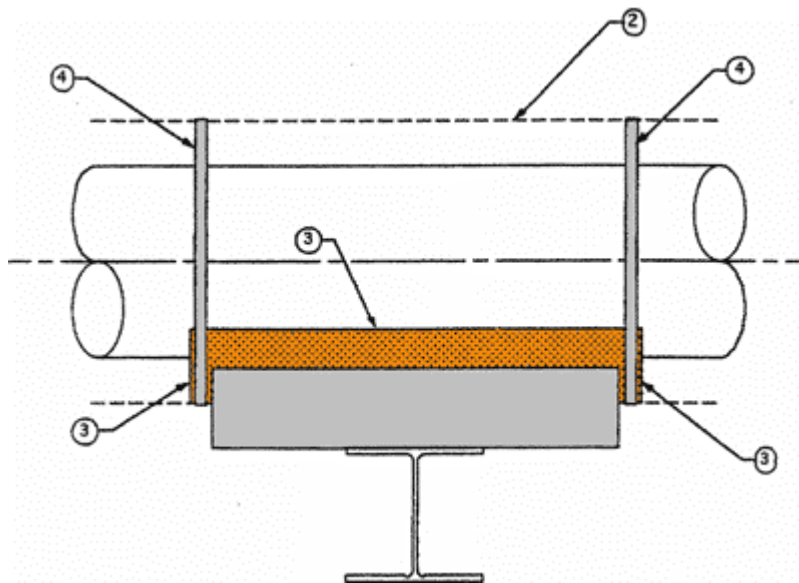
- 1) Service temperature range: -200°C TO 110°C
- 2) Metal base: Plain or galvanised carbon steel
- 3) Insulating material: High Density Polyurethane 160 – 500kg / m<sup>3</sup>

# URESTRUCT™ PIPE SUPPORTS – TYPICAL INSTALLATION PROCEDURES

## COLD SERVICE, SINGLE LAYER 90° PIPE SUPPORT



STEP 1. Position pipe support under pipe

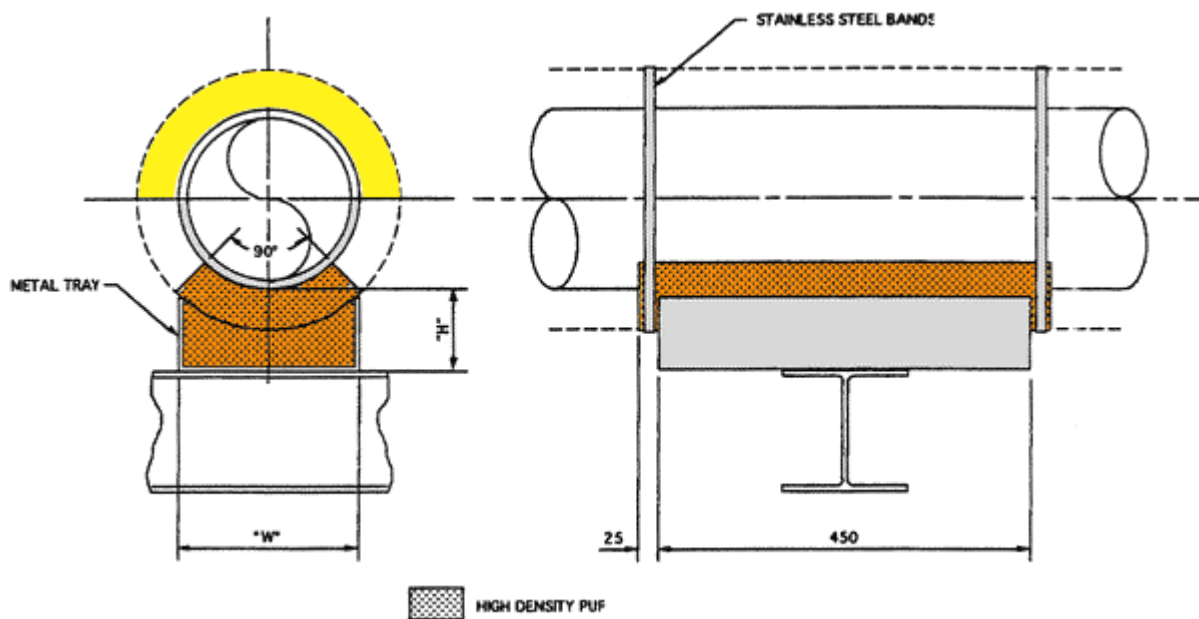


STEP 2. Install line insulation segment

STEP 3. Apply specific vapour barrier/adhesive to seal/bond all joint lines.

STEP 4. Secure pipe support using stainless steel straps

# URESTRUCT COLD SERVICE, SINGLE LAYER 90° PIPE SUPPORT



## APPLICATION NOTES

- 1) Service temperature range:  $-200^{\circ}\text{C}$  to  $+110^{\circ}\text{C}$
- 2) Metal tray: Plain or galvanised carbon steel
- 3) Insulating material: High Density Polyurethane  $160 - 500\text{kg/m}^3$

**COLD SERVICE / CRYOGENIC HIGH DENSITY POLYURETHANE PIPE SUPPORTS  
TYPICAL BASE WIDTH DIMENSIONS - COLD SERVICE, SINGLE LAYER 90° PIPE SUPPORT**

PIPE NB (inch)	SIZE O. D. (mm)	INSULATION THICKNESS (mm)								
		30	40	50	60	70	80	90	100	110
0.50	23.1	59	73	87	101	115	129	144	158	172
0.75	26.7	61	75	90	104	118	132	146	160	174
1.00	33.4	66	80	94	108	123	137	151	165	179
1.50	48.3	77	91	105	119	133	147	161	176	190
2.00	60.3	85	99	113	127	142	156	170	184	198
2.50	73.0	94	108	122	136	151	165	179	193	207
3.00	88.9	105	119	134	148	162	176	190	204	218
4.00	114.3	123	137	152	166	180	194	208	222	236
5.00	141.3	142	156	171	185	199	213	227	241	255
6.00	168.3	161	176	190	204	218	232	246	260	275
8.00	219.1	197	211	226	240	254	268	282	296	310
10.00	273.1	236	250	264	278	292	306	320	335	349
12.00	323.9	271	286	300	314	328	342	356	370	385
14.00	355.6	294	308	322	336	350	365	379	393	407
16.00	406.4	330	344	358	372	386	401	415	429	443
18.00	457.2	366	380	394	408	422	436	451	465	479
20.00	508.0	402	416	430	444	458	472	486	501	515
22.00	559.0	438	452	466	480	494	508	523	537	551
24.00	610.0	474	488	502	516	530	544	559	573	587
26.00	660.0	509	523	537	552	566	580	594	608	622
28.00	711.0	545	559	573	588	602	616	630	644	658
30.00	762.0	581	595	610	624	638	652	666	680	694
36.00	914.0	689	703	717	731	745	759	774	788	802
40.00	1016.0	761	775	789	803	817	832	846	860	874
42.00	1067.0	797	811	825	839	853	868	882	896	910
48.00	1219.0	904	919	933	947	961	975	989	1,003	1,018
54.00	1372.0	1,013	1,027	1,041	1,055	1,069	1,083	1,097	1,112	1,126
60.00	1524.0	1,120	1,134	1,148	1,162	1,177	1,191	1,205	1,219	1,233
72.00	1829.0	1,336	1,350	1,364	1,378	1,392	1,406	1,421	1,435	1,449



HIGH DENSITY POLYURETHANE  
FOAM (HDPUF) PRODUCT  
INFORMATION

**PRODUCT INFORMATION**  
**160 kg/m<sup>3</sup> HDPUF**

<b>PROPERTY</b>	<b>TEST METHOD</b>	<b>RESULT</b>
Density:	ASTM D1622:	160 kg/m <sup>3</sup>
Compressive Strength	ASTM D1621	2.1 mpa
K-value :	ASTM C518:	0.0292 w/mk
Closed cell content:	ASTM D2856:	95%
Leachable halides:	ASTM D871 :	Less than 20 ppm
Flammability	ASTM D1692:	10/10 S.E. Extent of burn: 10.5 mm Extinguishing time: 0 sec Burn rate: 0 mm/sec
Compressive Strength: (at -196° C)	ASTM D1621	2.75 mpa
Tensile Strength (at 22° C)	ASTM D1623:	6.69 mpa
Tensile Strength (at -196° C)	ASTM D1623:	8.73 mpa
Tensile Modulus: (at 22° C)	ASTM D1623:	16.86 mpa
Tensile Modulus- (at -196° C)	ASTM D1623:	32.89 mpa
Water absorption	ASTM D2842:	0.17% Vol.
Thermal conductivity: (at -196° C)	ASTM C518:	0.0253 w/mk

**SUSTAINABLE LOADS (kg) OF PUF INSULATED PIPE SUPPORTS**  
**POLYURETHANE DENSITY: 160 kg/m<sup>3</sup>**  
**DESIGN SAFETY FACTOR 5:1**  
**(AT CRYOGENIC AVERAGE TEMPERATURE)**

PIPE SIZE		CRADLE LENGTH		LENGTH (mm)	
		800	1000	1200	1400
inch	mm				
0.50	23.1	641	801	962	1,122
0.75	26.7	741	926	1,112	1,297
1.00	33.4	927	1,159	1,390	1,622
1.50	48.3	1,341	1,676	2,011	2,346
2.00	60.3	1,674	2,092	2,510	2,929
2.50	73.0	2,026	2,533	3,039	3,546
3.00	88.9	2,467	3,084	3,701	4,318
4.00	114.3	3,172	3,965	4,759	5,552
5.00	141.3	3,922	4,902	5,883	6,863
6.00	168.3	4,671	5,839	7,007	8,174
8.00	219.1	6,081	7,601	9,122	10,642
10.00	273.1	7,580	9,475	11,370	13,265
12.00	323.9	8,990	11,237	13,485	15,732
14.00	355.6	9,869	12,337	14,804	17,272
16.00	406.4	11,279	14,099	16,919	19,739
18.00	457.0	12,684	15,855	19,026	22,197
20.00	508.0	14,099	17,624	21,149	24,674
22.00	559.0	15,515	19,393	23,272	27,151
24.00	610.0	16,930	21,163	25,395	29,628
26.00	660.0	18,318	22,897	27,477	32,056
28.00	711.0	19,733	24,667	29,600	34,534
30.00	762.0	21,149	26,436	31,723	37,011
36.00	914.0	25,368	31,709	38,051	44,393
40.00	1016.0	28,199	35,248	42,298	49,347
42.00	1067.0	29,614	37,018	44,421	51,825
48.00	1219.0	33,833	42,291	50,749	59,207
54.00	1372.0	38,079	47,599	57,119	66,638
60.00	1524.0	42,298	52,872	63,447	74,021
72.00	1829.0	50,763	63,454	76,144	88,835

**PRODUCT INFORMATION**  
**224 kg/m<sup>3</sup> HDPUF**

<b>PROPERTY</b>	<b>TEST METHOD</b>	<b>RESULT</b>
Density:	ASTM D1622:	224 kg/m <sup>3</sup>
Compressive Strength	ASTM D1621	4.015 mpa
K-value :	ASTM C518:	0.0345 w/mk
Closed cell content:	ASTM D2856:	95%
Leachable halides:	ASTM D871 :	Less than 20 ppm
Flammability	ASTM D1692:	10/10 S.E. Extent of burn: 9.5 mm Extinguishing time: 0 sec Burn rate: 0 mm/sec
Compressive Strength: (at -196° C)	ASTM D1621	5.34 mpa
Tensile Strength (at 22° C)	ASTM D1623:	9.42 mpa
Tensile Strength (at -196° C)	ASTM D1623:	12.27 mpa
Tensile Modulus: (at 22° C)	ASTM D1623:	23.72 mpa
Tensile Modulus- (at -196° C)	ASTM D1623:	46.28 mpa
Water absorption	ASTM D2842:	0.15% Vol.
Thermal conductivity: (at -196° C)	ASTM C518:	0.0316 w/mk

**SUSTAINABLE LOADS (kg) OF PUF INSULATED PIPE SUPPORTS**  
**POLYURETHANE DENSITY: 224 kg/m<sup>3</sup>**  
**DESIGN SAFETY FACTOR 5:1**  
**(AT CRYOGENIC AVERAGE TEMPERATURE)**

PIPE	SIZE	CRADLE				LENGTH (mm)
		150	300	450	600	
inch	mm					
0.50	23.1	213	425	638	851	
0.75	26.7	246	492	737	983	
1.00	33.4	308	615	923	1,230	
1.50	48.3	445	889	1,334	1,779	
2.00	60.3	555	1,110	1,666	2,221	
2.50	73.0	672	1,344	2,016	2,688	
3.00	88.9	819	1,637	2,456	3,274	
4.00	114.3	1,052	2,105	3,157	4,209	
5.00	141.3	1,301	2,602	3,903	5,204	
6.00	168.3	1,550	3,099	4,649	6,198	
8.00	219.1	2,017	4,035	6,052	8,069	
10.00	273.1	2,514	5,029	7,543	10,058	
12.00	323.9	2,982	5,964	8,946	11,929	
14.00	355.6	3,274	6,548	9,822	13,096	
16.00	406.4	3,742	7,483	11,225	14,967	
18.00	457.0	4,208	8,415	12,623	16,830	
20.00	508.0	4,677	9,354	14,031	18,709	
22.00	559.0	5,147	10,293	15,440	20,587	
24.00	610.0	5,616	11,233	16,849	22,465	
26.00	660.0	6,077	12,153	18,230	24,307	
28.00	711.0	6,546	13,092	19,639	26,185	
30.00	762.0	7,016	14,031	21,047	28,063	
36.00	914.0	8,415	16,830	25,246	33,661	
40.00	1016.0	9,354	18,709	28,063	37,417	
42.00	1067.0	9,824	19,648	29,472	39,296	
48.00	1219.0	11,223	22,447	33,670	44,893	
54.00	1372.0	12,632	25,264	37,896	50,528	
60.00	1524.0	14,031	28,063	42,094	56,126	
72.00	1829.0	16,840	33,679	50,519	67,359	

**PRODUCT INFORMATION**  
**320 kg/ m<sup>3</sup> HDPUF**

<b>PROPERTY</b>	<b>TEST METHOD</b>	<b>RESULT</b>
Density:	ASTM D1622:	320 kg/m <sup>3</sup>
Compressive Strength	ASTM D1621	7.8 mpa
K-value :	ASTM C518:	0.0407 w/mk
Closed cell content:	ASTM D2856:	95%
Leachable halides:	ASTM D871	Less than 20 ppm
Flammability	ASTM D1692:	10/10 S.E. Extent of burn: 8.0 mm Extinguishing time: 0 sec Burn rate: 0 mm/sec
Compressive Strength: (at -196° C)	ASTM D1621	9.76 mpa
Tensile Strength (at 22° C)	ASTM D1623:	15.11 mpa
Tensile Strength (at -196° C)	ASTM D1623:	19.69 mpa
Tensile Modulus: (at 22° C)	ASTM D1623	38.06 mpa
Tensile Modulus: (at -196° C)	ASTM D1623:	72.24 mpa
Water absorption	ASTM D2842:	0.12% Vol.
Thermal conductivity: (at -196° C)	ASTM C518:	0.0373 w/mk

**SUSTAINABLE LOADS (kg) OF PUF INSULATED PIPE SUPPORTS**  
**POLYURETHANE DENSITY: 320 kg/ m<sup>3</sup>**  
**DESIGN SAFETY FACTOR 5:1**  
**(AT CRYOGENIC AVERAGE TEMPERATURE)**

PIPE SIZE		CRADLE		LENGTH (mm)	
inch	mm	150	300	450	600
0.50	23.1	377	755	1,132	1,509
0.75	26.7	436	872	1,308	1,744
1.00	33.4	546	1,091	1,637	2,182
1.50	48.3	789	1,578	2,367	3,155
2.00	60.3	985	1,970	2,955	3,939
2.50	73.0	1,192	2,385	3,577	4,769
3.00	88.9	1,452	2,904	4,356	5,808
4.00	114.3	1,867	3,734	5,600	7,467
5.00	141.3	2,308	4,616	6,923	9,231
6.00	168.3	2,749	5,497	8,246	10,995
8.00	219.1	3,578	7,157	10,735	14,314
10.00	273.1	4,460	8,921	13,381	17,842
12.00	323.9	5,290	10,580	15,870	21,160
14.00	355.6	5,808	11,616	17,423	23,231
16.00	406.4	6,638	13,275	19,913	26,550
18.00	457.0	7,464	14,928	22,392	29,856
20.00	508.0	8,297	16,594	24,891	33,188
22.00	559.0	9,130	18,260	27,389	36,519
24.00	610.0	9,963	19,926	29,888	39,851
26.00	660.0	10,779	21,559	32,338	43,118
28.00	711.0	11,612	23,225	34,837	46,449
30.00	762.0	12,445	24,891	37,336	49,781
36.00	914.0	14,928	29,856	44,784	59,711
40.00	1016.0	16,594	33,188	49,781	66,375
42.00	1067.0	17,427	34,853	52,280	69,707
48.00	1219.0	19,909	39,818	59,728	79,637
54.00	1372.0	22,408	44,816	67,224	89,632
60.00	1524.0	24,891	49,781	74,672	99,563
72.00	1829.0	29,872	59,744	89,616	119,488

**PRODUCT INFORMATION**

<b>PROPERTY</b>	<b>TEST METHOD</b>	<b>RESULT</b>
Density:	ASTM D1622:	520 kg/m <sup>3</sup>
Compressive Strength	ASTM D1621	12.78 mpa
K-value :	ASTM C518:	0.0425 w/mk
Closed cell content:	ASTM D2856:	96%
Leachable halides:	ASTM D871	Less than 20 ppm
Flammability	ASTM D1692:	10/10 S.E. Extent of burn: 7.0 mm Extinguishing time: 0 sec Burn rate: 0 mm/sec
Compressive Strength: (at -196° C)	ASTM D1621	16.614 mpa
Tensile Strength (at 22° C) (At -196° C)	ASTM D1623:	21.76 mpa 28.36 mpa
Tensile Modulus: (at 22° C) (at -196° C)	ASTM D1623:	54.8 mpa 106.9 mpa
Water absorption	ASTM D2842:	0.1% Vol.
Thermal conductivity: (at -196° C)	ASTM C518:	0.039 w/mk

**SUSTAINABLE LOADS (kg) OF PUF INSULATED PIPE SUPPORTS**  
**POLYURETHANE DENSITY. 500 kg/ m<sup>3</sup>**  
**DESIGN SAFETY FACTOR 5:1**  
**(AT CRYOGENIC AVERAGE TEMPERATURE)**

PIPE inch	SIZE mm	CRADLE		LENGTH (mm)	
		150	300	450	600
0.50	23.1	615	1,229	1,844	2,458
0.75	26.7	710	1,421	2,131	2,841
1.00	33.4	889	1,777	2,666	3,554
1.50	48.3	1,285	2,570	3,855	5,140
2.00	60.3	1,604	3,208	4,812	6,417
2.50	73.0	1,942	3,884	5,826	7,768
3.00	88.9	2,365	4,730	7,095	9,460
4.00	114.3	3,041	6,081	9,122	12,163
5.00	141.3	3,759	7,518	11,277	15,036
6.00	168.3	4,477	8,954	13,432	17,909
8.00	219.1	5,829	11,657	17,486	23,315
10.00	273.1	7,265	14,530	21,796	29,061
12.00	323.9	8,617	17,233	25,850	34,466
14.00	355.6	9,460	18,920	28,380	37,840
16.00	406.4	10,811	21,623	32,434	43,245
18.00	457.0	12,157	24,315	36,472	48,630
20.00	508.0	13,514	27,028	40,542	54,057
22.00	559.0	14,871	29,742	44,613	59,484
24.00	610.0	16,228	32,455	48,683	64,910
26.00	660.0	17,558	35,116	52,673	70,231
28.00	711.0	18,914	37,829	56,743	75,658
30.00	762.0	20,271	40,542	60,814	81,085
36.00	914.0	24,315	48,630	72,944	97,259
40.00	1016.0	27,028	54,057	81,085	108,113
42.00	1067.0	28,385	56,770	85,155	113,540
48.00	1219.0	32,429	64,857	97,286	129,715
54.00	1372.0	36,499	72,998	109,497	145,995
60.00	1524.0	40,542	81,085	121,627	162,170
72.00	1829.0	48,656	97,313	145,969	194,625