

# Bollard Pull Test Results & Comparisons

(Open Propeller) (NautiCAN Nozzle) (Kort Nozzle)

Vessel	Propeller type	Screws Dia. (in)	Power BHP	Trial Speed (kn)	Bollard Pull (lb)	Specific Pull (lb/BHP)	Bollard Efficiency	Tested by	Astern Pull (lb)	Astern Efficiency	Designed for
Lorain	Open 3-Bld	120.00	1 x 1221	12.45	32900	26.95	1.00	BC Research*	-	-	DC Electric
Lorain	NautiCAN 3-bld	112.00	1 x 1221	12.90	55540	45.49	1.77	BC Research*	-	-	DC Electric
Rivtow Princess	Open 4-bld	91.00	2 x 988	11.95	43000	21.76	0.91	Wier-Johnes Certified*	-	-	8 kn towing
Rivtow Princess	NautiCAN 4-bld	76.00	2 x 988	12.46	61000	30.87	1.45	Wier-Johnes Certified*	-	-	9 kn towing
Harmac Pine	Kort 19a 3-bld	70.25	1 x 835	10.89	20000	23.95	1.12	Owner & NautiCAN	-	-	2 kn towing
Harmac Pine	NautiCAN 3-bld	76.00	1 x 835	11.65	23000	27.54	1.23	Owner & NautiCAN	-	-	2 kn towing
Barbara Foss	Open 5-bld	110.00	2 x 2150	13.95	89900	20.91	1.00	PTL & ABS Certified*	64900	0.72	9 kn towing
Barbara Foss	NautiCAN 3-bld	108.00	2 x 2150	13.48	142600	33.16	1.60	PTL & ABS Certified*	103600	1.16	Ship berthing
Gail Bernice	Open 4-bld	79.00	1 x 950	-	23685	24.93	1.13	Owner & NautiCAN	-	-	3 kn dragging
Gail Bernice	NautiCAN 4-bld	74.00	1 x 950	-	31750	33.42	1.58	Owner & NautiCAN	-	-	3 kn dragging
Pacific Charmer	NautiCAN CP 4-bld	72.00	1 x 850	10.70	26880	31.62	1.47	Polar Offshore Design*	19800	1.08	Fishing
Pacific Harvester	Open 3-bld	68.00	1 x 565	-	14100	24.96	1.05	Owner	-	-	3 kn dragging
Pacific Harvester	NautiCAN 3-bld	58.00	1 x 565	-	18000	31.86	1.49	Owner	-	-	3 kn dragging
Marwood	Open 4-bld	81.00	1 x 660	-	18000	27.27	1.08	Owner & NautiCAN	-	-	3 kn dragging
Marwood	NautiCAN 4-bld	80.00	1 x 660	-	25000	37.88	1.51	Owner & NautiCAN	-	-	3 kn dragging
San Pedro	NautiCAN 3-bld	112.00	1 x 2150	-	77200	35.91	1.69	LA Harbour Safety*	-	-	6 kn towing
TS-40 Uzmar	NautiCAN 3-bld	80.70	2 x 1360	12.20	97000	35.66	1.79	Uzmar	-	-	Ship Berthing
Phillips Foss	NautiCAN 3-bld	104.00	2 x 2150	13.50	142000	33.02	1.63	Emerald*	-	-	Ship berthing
Jeffrey Foss	NautiCAN 3-bld	104.00	2 x 2150	13.50	140090	32.58	1.61	Diehl Eng-ABS Certified*	-	-	Ship berthing
Daniel Foss	Ulstein HP 4-bld	72.00	2 x 1650	-	90000	27.27	1.58	Weir-Jones-ABS Certified*	-	-	Ship berthing
Peter Foss	Ulstein HP 4-bld+St	72.00	2 x 1650	-	93000	28.18	1.63	Weir Jones*	-	-	Ship berthing
Delta Linda	Aquam Kort 4-bld	94.50	2 x 2200	12.50	120000	27.27	1.45	ABS Certified*	-	-	Ship berthing
New Delta Linda	Ulstein HP 4-bld+St	94.50	2 x 2200	13.60	133000	30.23	1.61	ABS Certified*	120500	1.46	Ship berthing
Western Titan	Ulstein NH 3-bld+St	100.00	2 x 2260	13.40	141500	31.31	1.62	Diehl Engineering*	-	-	9 kn towing
Lynn Marie	Ulstein 19a 4-bld+St	106.30	2 x 3125	-	169400	27.10	1.50	-	155000	1.37	Ship berthing
C/S Agile	Open CP 4-bld	98.42	2 x 3166	10.50	-	-	-	John Lochhead NA, owner*	-	-	Cable Ship
C/S Agile	NautiCAN CP 4-bld	100.00	2 x 3166	12.50	-	-	-	John Lochhead NA, owner*	-	-	Cable Ship
Phyllis Dunlap	NautiCAN 3-bld+St	120.00	2 x 2303	15.30	168000	36.47	1.68	ABS Certified*	-	-	10 kn towing
Phyllis Dunlap	NautiCAN 3-bld+St	120.00	2 x 2440	15.30	178000	36.48	1.71	800 RPM overload	-	-	10 kn towing
Joeseph Sause	NautiCAN 4-bld	96.00	2 x 1700	-	114120	33.56	1.62	TNT Laboratories	82190	1.17	Ship berthing
Cape Pasley	NautiCAN 4-bld	94.48	2 x 2750	12.70	145500	26.45	1.51	110% rating	-	-	Ship berthing
Rampant 2400	Aquam Kort 4-bld	94.49	2 x 2500	12.50	132276	26.46	1.47	Harbour & Shipping Nov 02	-	-	Ship berthing
Moana Halo (Foss)	Open 5-bld	110.00	2 x 1305	12.50	64400	24.67	1.00	Owner	-	-	6.5 kn towing
Moana Halo (Foss)	NautiCAN 3-bld	108.00	2 x 1314	13.00	101500	38.62	1.58	Owner	-	-	7 kn towing

\* Independently verified

R=Propeller Radii ft

Bollard efficiency is defined as a Measured Thrust / Theoretical Ideal Propeller Thrust where Ideal Thrust =  $T_I = \sqrt[3]{0.5 \cdot \rho \cdot R^2 \cdot \Pi \cdot (550 \cdot BHP)^2}$