Mooring Bollard

Mooring & Docking Equipment

www.glenengineering.com

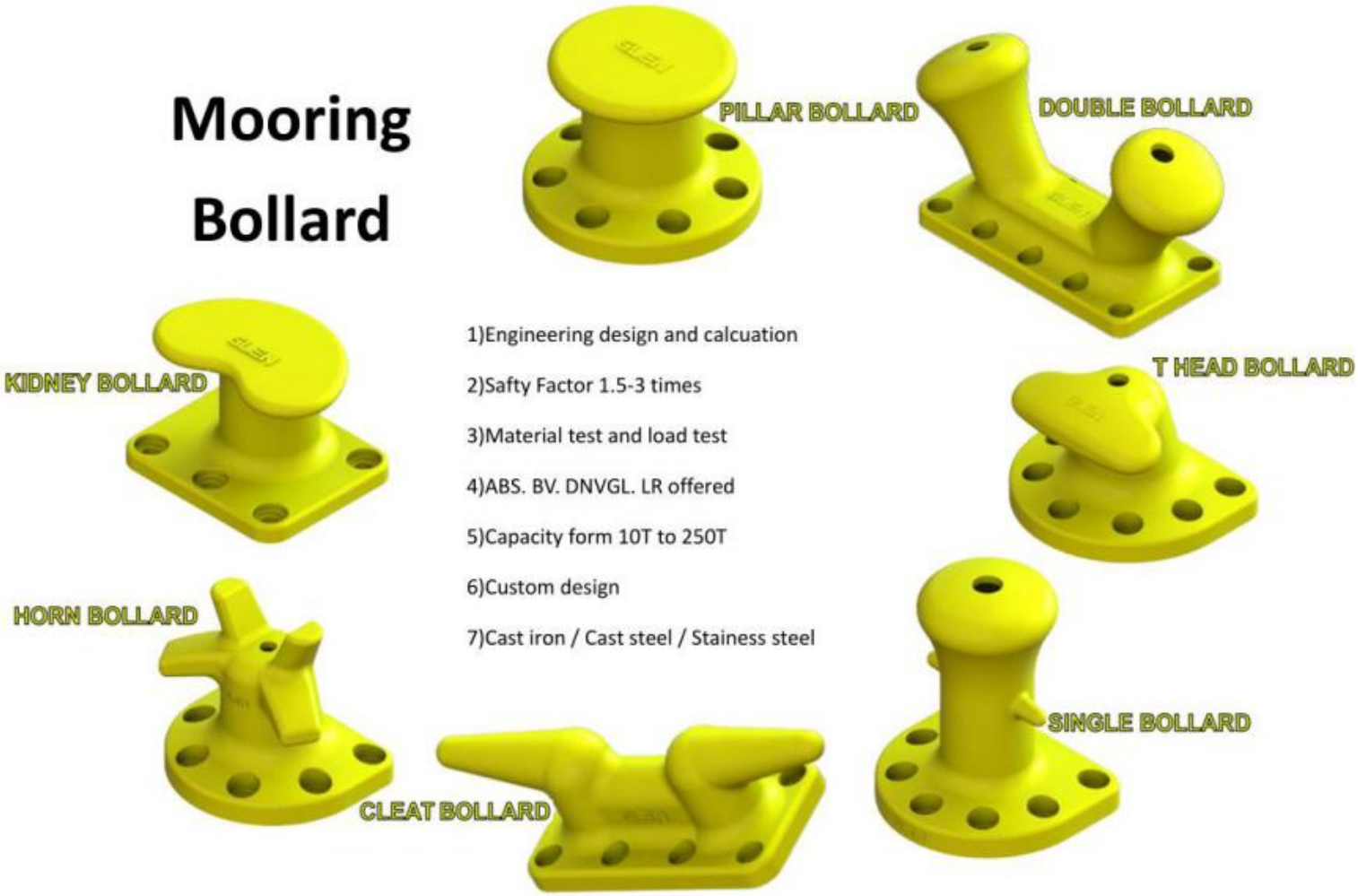
GLEN ENGINEERING limited

FOCUS ON MARINE AND OFFSHORE

INTRODUCTION

Glen is a leading designer, manufacturer and supplier of marine mooring bollards, who can provide bollards with different capacities, shapes and materials applied to different berths, shipyards, jetties, wharfs, and ports.

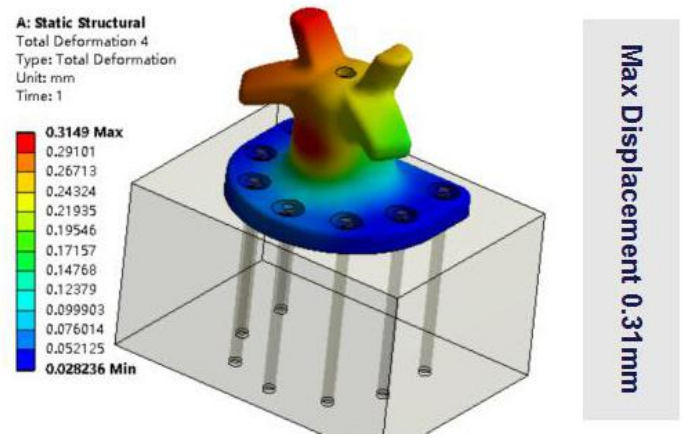
In the past decade, GLEN has rich experiences in helping client choose type, offer FEM and physical load test.



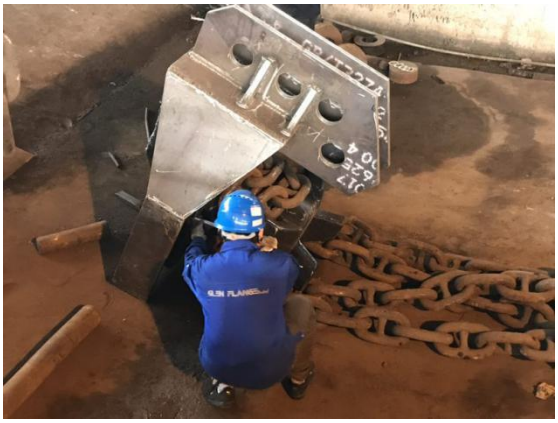
By many years of design, the bollards were kept finite elements and optimized geometrical shapes which ensure the safety and stability.

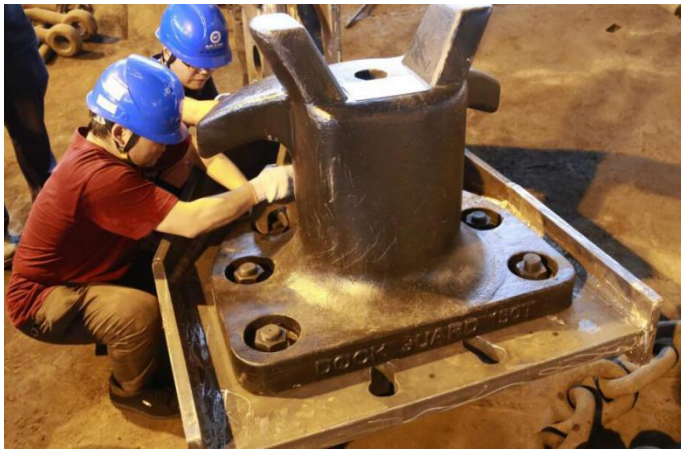
The normal used material is cast steel, ductile cast iron and stainless steel, but the ductile cast iron is our first choice for its high corrosion resistance and high tensile strength which can save much time and cost in maintaining.

The capacities and shapes on the table in this file are the normal used ones which do not mean we just can offer these! You can feel free to contact us for other capacities or shapes and we could offer custom design as well.



Max Displacement 0.31mm





MATERIAL PROPERTIES

The normal used material for mooring bollards are cast steel and ductile cast iron. Both of them have its advantages during applications.

However some applications and operational conditions necessitate the use of specific materials. For example in extreme temperature of -20℃ or below, regular cast iron becomes very brittle and easily cracked and is therefore not recommended.

Similarly in hot humid environment where the water has high saline content cast steel is not recommended as it has a poor rate of resistance to corrosion.

	Ductile Cast Iron			**Cast Steel**		
Properties	Quality	Equivalent standards		Quality	Equivalent standards	
	GB/T1348-2009 QT450-10	ISO 450-10	ASTM 65-45-12	GB/T11352 ZG230-450	ISO 23-450W	ASTM 65-35
Yield Strength	≥310（Mpa）	≥310（Mpa）	≥310（Mpa）	≥230（Mpa）	≥230(Mpa）	≥240（Mpa）
Tensile Strength	≥450(Mpa）	≥450(Mpa）	≥448(Mpa）	≥450(Mpa）	≥450(Mpa）	≥450(Mpa）
Elongation	≥10（%）	≥10（%）	≥12（%）	≥22（%）	≥22（%）	≥24（%）

Advantage of Ductile Cast Iron

More corrosion resistance than steel and can tolerate compromised coatings better than steel. Ductile cast iron is more fluid during casting stage which results in a smoother finish.

Advantage of Cast Steel

Available in a wide range of strength, this allows the bollard to be commercially competitive versus thicker cast iron bollards. The ductility of cast steel gives needed structural margin in the event of an overload situation.

MATERIAL TEST EQUIPMENT

According to GB/T1348-2009 QT450-10 and GB/T11352 ZG230-450, the required testing procedure of the mooring bollard consists of the following:

Material certification

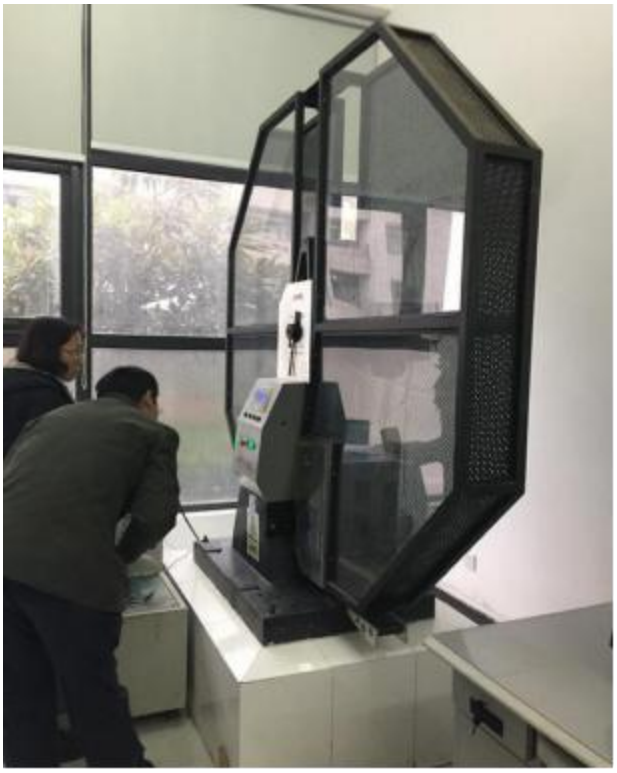
From each metal pour from the casting process a sample must be taken. The sample should then have its material properties checked and certified by an independent third party.

Dimensional accuracy

Once the bollard is cast it should be thoroughly checked for dimensional accuracy with its supplied drawings.

Design calculations

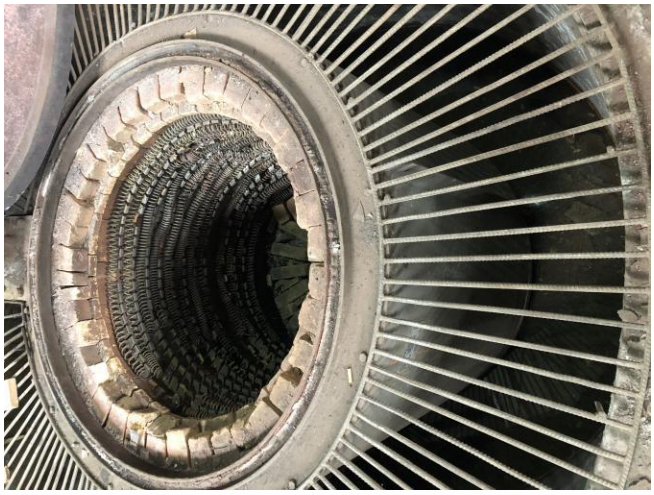
Cross referencing both the material and dimensional properties of the bollard the manufacturer should supply design calculations demonstrating the suitability of the proposed bollard for the required design load.



CASTING TECHNOLOGY

There are two types moulding we usually used. One is wood mould, the other is lost foam mould.

PRODUCTION EQUIPMENT

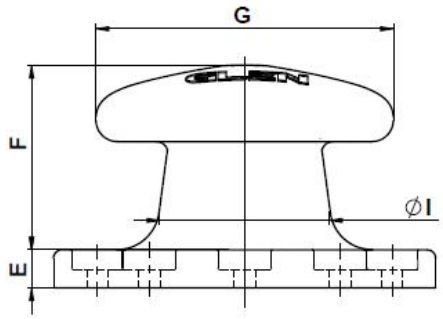


Painting

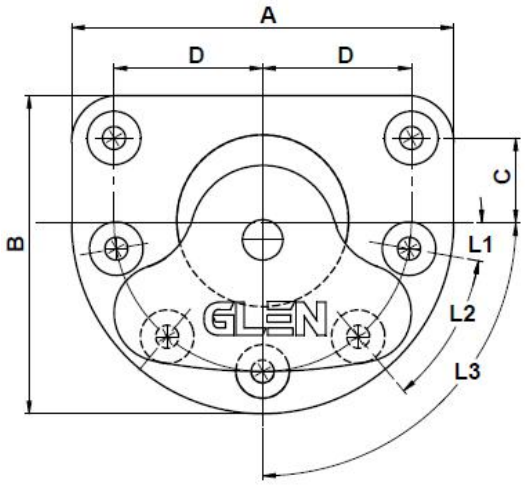
As the bollards are often used under marine environment, the good painting is most important.

GLEN takes strict procedure for each step of painting. Epoxy painting for 1st layer and the 2nd layer, bituminous painting or polyurethane painting for top coat. The total DFT is about 300-350μ.

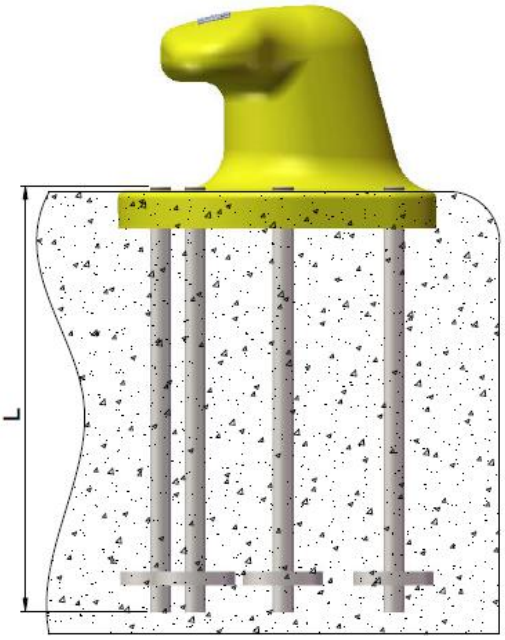
T - HEAD BOLLARD



FRONT VIEW

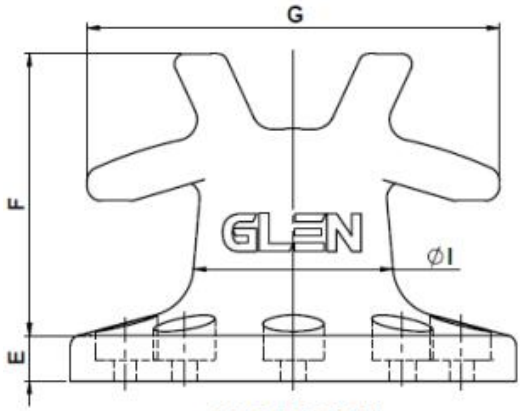


TOP VIEW



Capacity Ton	Dimension(mm)											Bolts (mm)		
	A	B	C	D	E	F	G	I	L1	L2	L3	Q'ty	L	
10	216	236	75	65	32	205	220	120	-	-	-	4	450	M20
15	410	335	80	155	40	235	340	160	30°	-	60°	5	500	M24
22.5	430	355	90	165	40	255	350	180	30°	-	60°	5	500	M30
30	450	375	100	175	40	255	350	200	30°	-	60°	5	500	M30
50	640	540	150	250	50	350	500	260	30°	-	60°	5	500	M36
80	640	550	160	250	70	380	550	280	15°	45°	-	6	800	M42
100	790	640	175	325	80	410	600	350	10°	40°	80°	7	800	M42
125	850	700	175	325	80	410	600	350	10°	40°	80°	7	900	M48
150	900	750	200	350	90	435	700	400	10°	40°	80°	7	1000	M48
200	1000	850	225	375	90	500	800	450	-	36°	72°	8	1000	M56
250	1090	915	250	425	120	610	930	500	5°	34°	68°	8	1375	M64

STAGHORN BOLLARD



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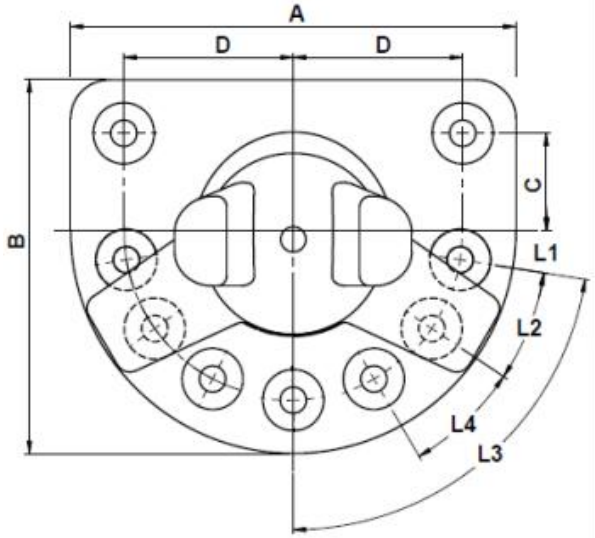
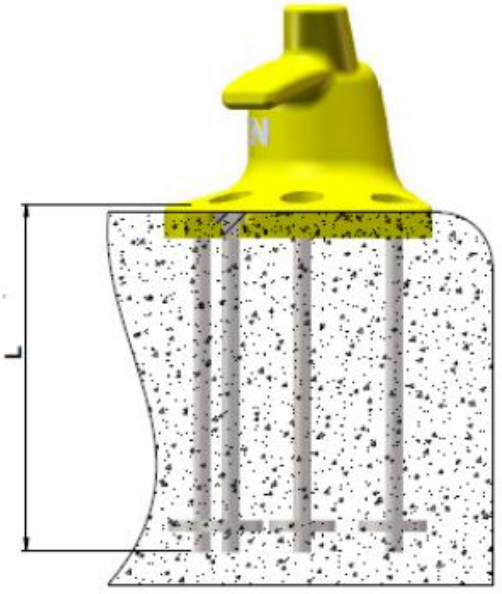
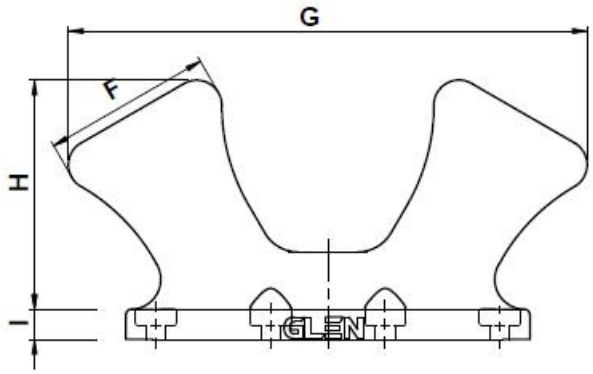


TOP VIEW



Capacity	Dimensions(mm)												Bolts(mm)		
Ton	A	B	C	D	E	F	G	I	L1	L2	L3	L4	Q'ty	L	S
15	410	335	80	155	40	370	400	160	30°	-	30°	-	5	500	M24
30	480	405	100	175	40	410	440	200	30°	-	60°	-	5	500	M30
50	640	540	150	250	50	500	600	260	30°	-	60°	-	5	500	M36
80	650	560	160	250	70	520	660	300	15°	45°	-	-	6	800	M42
100	800	650	175	325	80	570	750	350	10°	40°	80°	-	7	800	M42
125	820	670	175	325	80	595	775	375	10°	40°	80°	-	7	900	M48
150	920	770	200	350	90	585	850	400	10°	40°	80°	-	7	1000	M48
200	1000	850	225	375	90	660	930	450	-	36°	-	36°	8	1000	M56
250	1000	850	225	375	120	690	930	450	-	36°	-	36°	8	1375	M64

DOUBLE BITT BOLLARD



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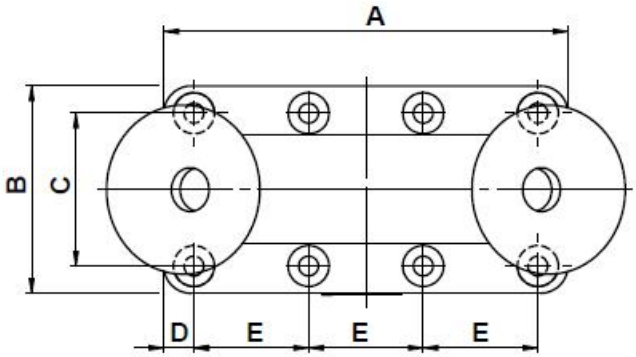
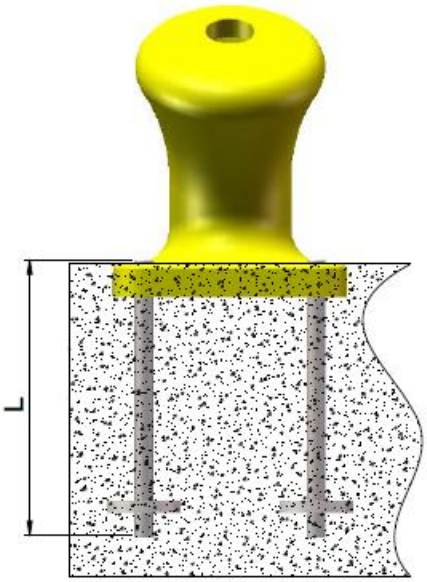
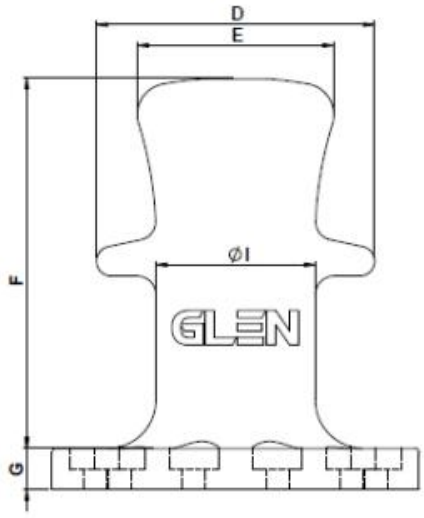


TOP VIEW



Capacity	Dimensions(mm)									Bolts(mm)		
Ton	A	B	C	D	E	F	G	H	I	Q'ty	L	S
20	540	280	190	45	150	210	680	300	20	8	300	M20
30	610	310	220	45	180	240	780	350	20	8	300	M22
50	720	360	270	45	210	310	950	420	25	8	450	M30
75	870	440	330	55	190	350	1140	510	40	10	500	M36
100	1020	520	390	65	222.5	410	1330	600	50	10	600	M42
125	1170	590	440	75	255	470	1535	700	60	10	750	M42
150	1270	640	490	75	280	510	1670	750	60	10	850	M48
200	1430	720	530	95	310	570	1860	840	60	10	1070	M56

SINGLE BITT BOLLARD



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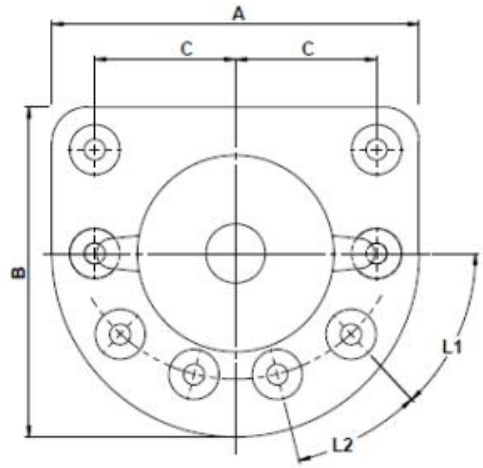

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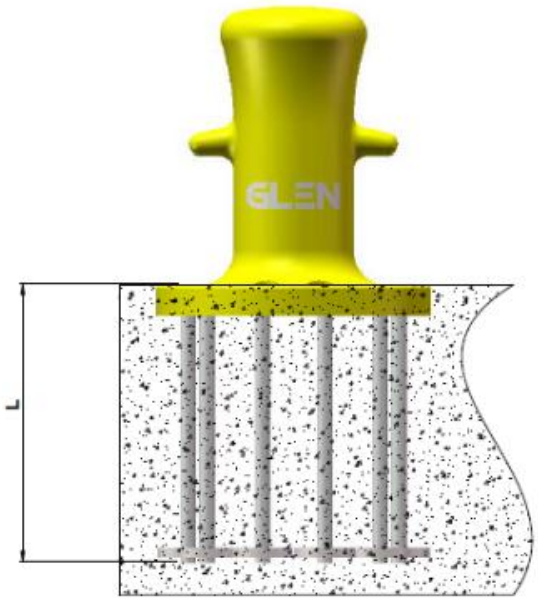
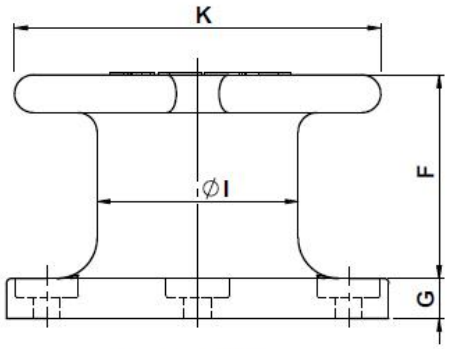


Capacity	Dimensions(mm)										Bolts(mm)		
Ton	A	B	C	D	E	F	G	I	L1	L2	Q'ty	L	S
15	360	315	130	260	220	370	45	160	45°	-	5	400	M24
30	420	380	160	340	260	490	60	200	24°	66°	5	500	M30
50	530	480	205	450	340	630	70	260	11°	51°	5	600	M36
75	650	580	250	500	390	740	80	290	11°	51°	6	600	M42
100	760	685	290	550	415	790	80	320	5°	43°	7	750	M48
150	900	810	345	650	460	900	100	370	5°	43°	7	1000	M56
200	990	890	380	750	530	1000	110	430	35°	36°	7	1000	M56

KIDNEY BOLLARD



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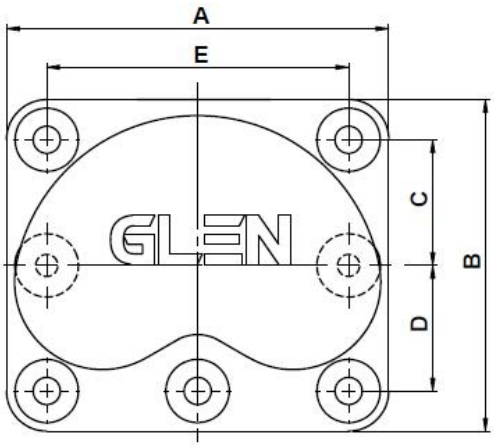
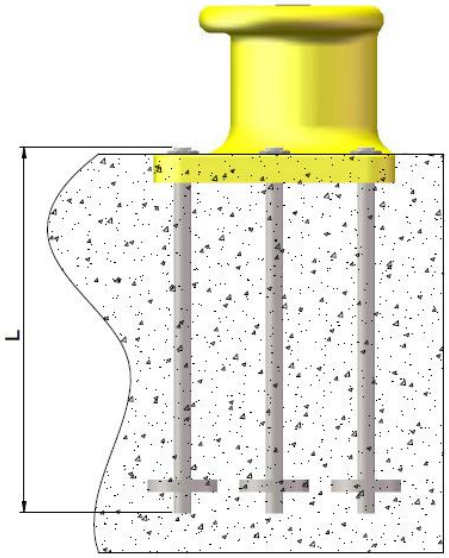
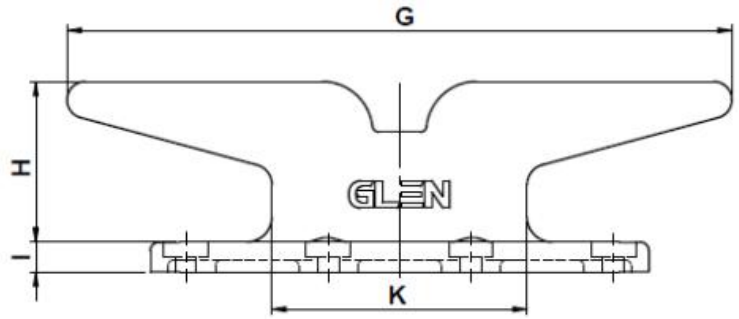


TOP VIEW



Capacity	Dimensions(mm)									Bolts(mm)		
Ton	A	B	C	D	E	F	G	I	K	Q'ty	L	S
15	320	320	-	-	220	260	40	160	320	4	500	M24
30	360	360	-	-	260	280	40	200	360	4	500	M30
50	540	540	-	-	400	320	50	260	540	4	500	M36
80	560	460	-	-	420	330	70	280	560	5	800	M42
100	590	490	175	175	450	350	70	300	590	7	800	M42
125	680	580	210	210	520	375	80	325	680	7	1000	M48
150	760	770	250	250	600	405	80	400	760	7	1000	M48
200	1000	850	300	300	750	435	90	450	1000	7	1000	M56

CLEAT BOLLARD



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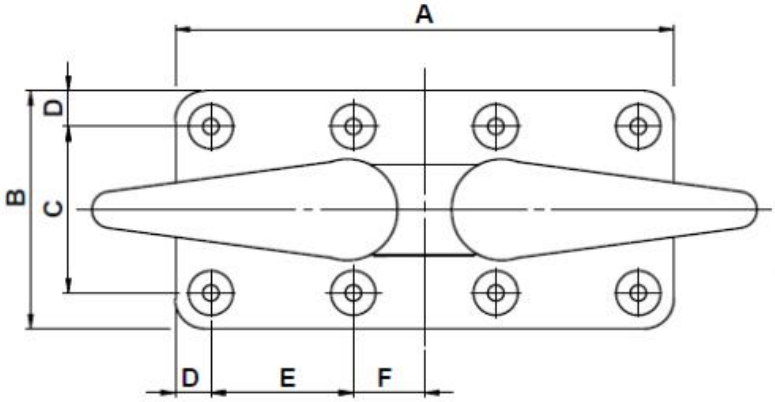

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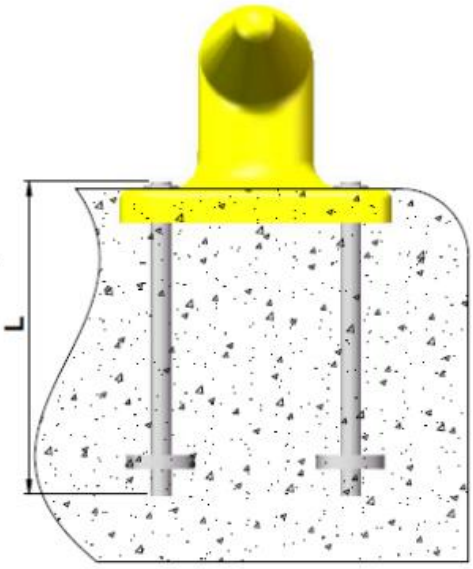
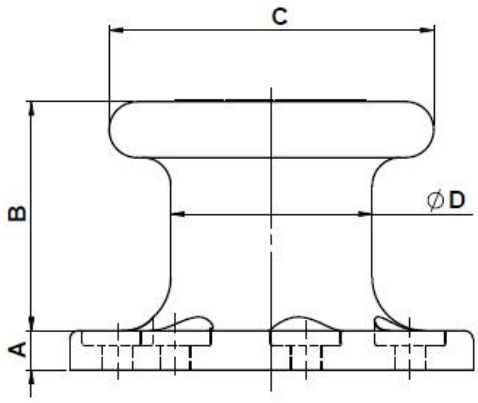
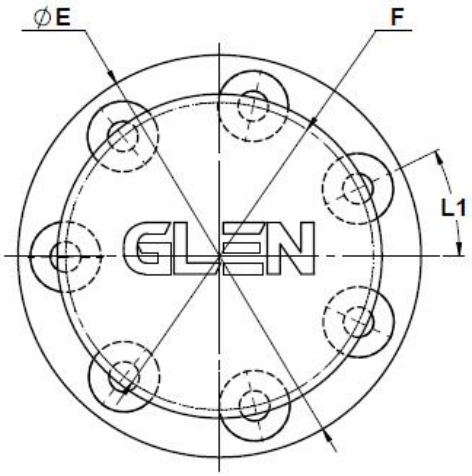


Capacity Ton	Dimensions(mm)										Bolts(mm)		
	A	B	C	D	E	F	G	H	I	K	Q'ty	L	S
15	410	220	140	40	165	82.5	510	165	30	235	6	350	M24
20	510	280	180	50	205	102.5	665	180	40	280	6	460	M30
25	610	310	210	50	255	127.5	810	210	45	325	6	460	M36
30	660	310	220	45	190	95	960	250	45	370	8	460	M42
35	840	400	280	60	240	120	1120	270	50	430	8	460	M42

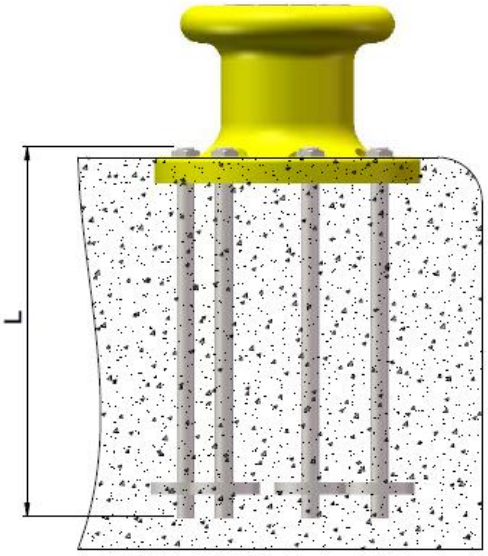
PILLAR BOLLARD



FRONT VIEW



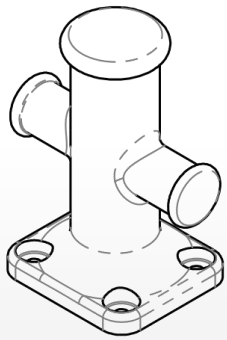
TOP VIEW

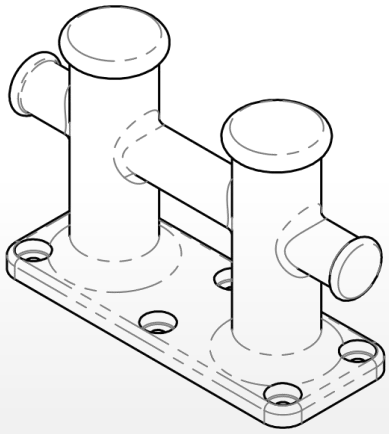


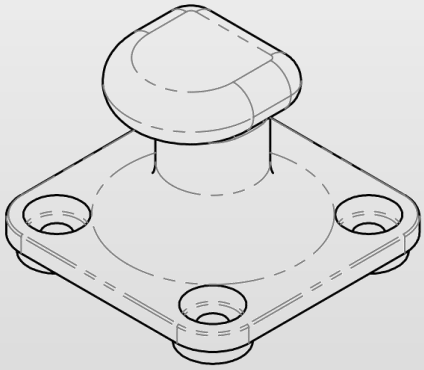
Capacity Ton	Dimensions(mm)							Bolts(mm)		
	A	B	C	D	E	F	L1	Q'ty	L	S
10	35	180	200	125	270	190	-	4	350	M20
15	40	280	300	200	420	300	-	4	400	M24
30	50	320	390	240	500	365	-	4	550	M36
50	60	350	430	280	580	450	13°	7	800	M36
75	70	380	500	320	630	490	13°	7	1000	M42
100	70	410	580	360	700	550	26°	7	1000	M48
150	80	450	680	400	800	600	-	8	1000	M56
200	90	480	740	450	900	700	-	8	1000	M64

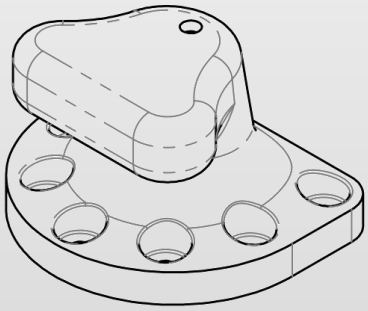
CUSTOM DESIGN

Glen designs and produces the most popular style bollards yet provides custom design according to clients' special requirements.









Inspection Standard

► People's Republic of China JTJ-98 Standard of Quality Inspection and Assessment for Port Engineering Construction.

DESIGN STANDARD

Glen designs bollards following the standard JTJ297-2001, People's Republic of China (2002) the technical code of subsidiary facilities for wharf.

The above standard is equivalent to the following international standard:

►Actions in the design of Maritime and Harbor works BS6349: part 4 (1994)

►Ministry of transport, Japan (1999) technical note No.911-ship dimension of design ships under given confidence limits.

►EAU(1996) recommendations of the committee for waterfront structures

► Criteria for movements of moored ships in harbors - a practical guide (1995)

PIANC report of PTC II-30 (1997) approach channels: a guide for design (appendix B - typical ship dimensions)

CAPACITY SELECTION

Mooring points loads for general cargo vessels and bulk carries	
Ship Displacement (T)	Mooring point load (T)
20,000 up to and including 50,000	80
Above 50,000 up to and including 100,000	100
Above 100,000 up to and including 200,000	150
Above 200,000	200

It must be noted that there is limit to how many mooring lines can be attached to a bollard. Each of these lines has a maximum breaking load and can be considered not to apply the same load on lines from a single vessel to a single bollard. This is why capacity over 200tons rarely make sense.

MOORING ANGLE

The height of the mooring points should be such that vertical angles of the mooring lines will be as small as practicable not greater than 25 ° . GLEN mooring bollards are designed with a recommend max. Angle 45°. However lines can be taken to 60°without danger of slippage on the GLEN's bollards.

ANCHORAGE

A variety of anchorage systems can be supplied and consideration should be given to the type most suitable for the deck and design and construction supporting the bollard.

The normal used anchor is steel 45# grade 8.8 with H.D.G.

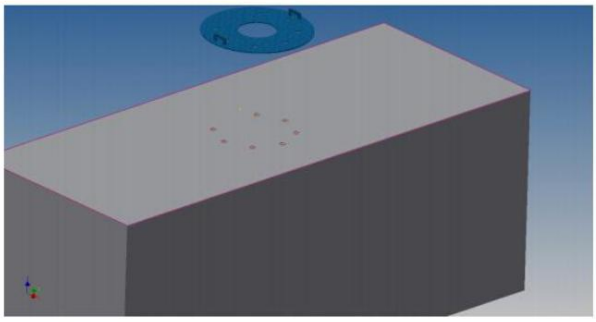
INSTALLATION

a)

A bolt locationg plate need to be prepared before installation

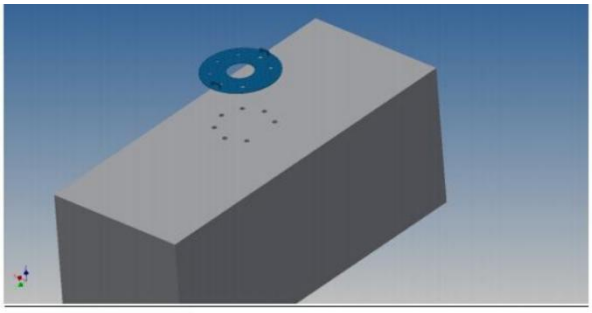
b)

Put the bolt location plate on the specified place and then mark the bolt holes.



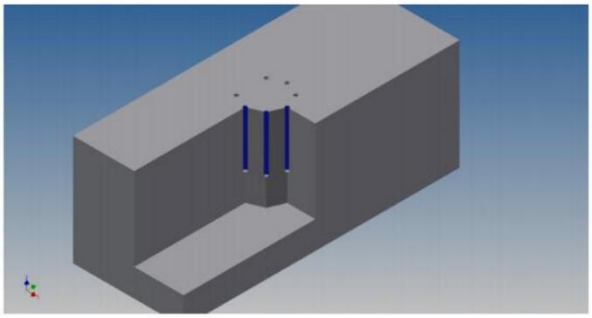
c)

Drill the holes on the marked place. The dia. of holes should be greater than the dia. of the bolts.

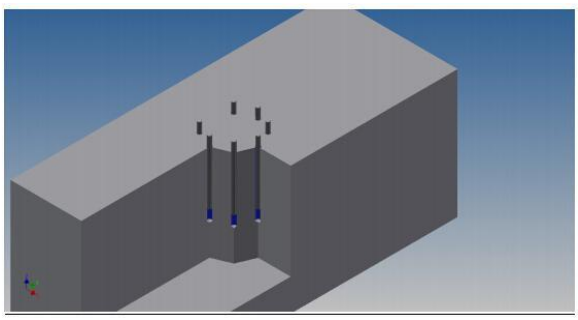


d)

The depth of the hole is greater than the depth of the screw buried.

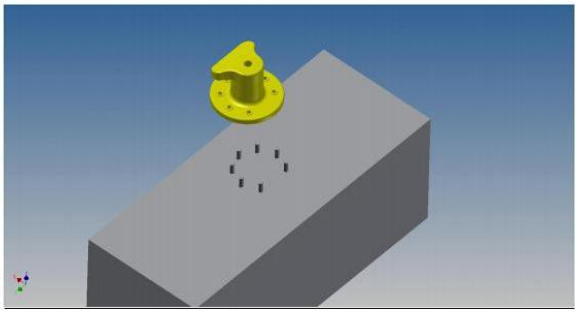


e) Filling resin adhesive in the bolts holes and then insert the bolt.
The bolt length out of the holes decided by the the contruction of the port.



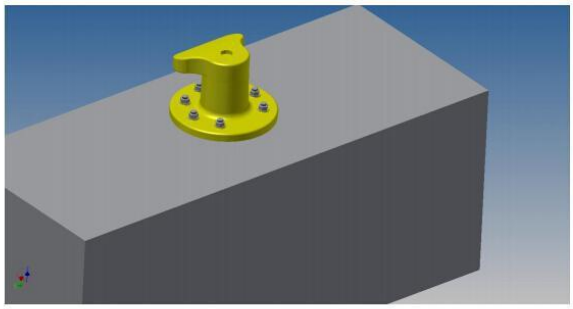
f)

Install the bollards after the resin adhesive solidified.



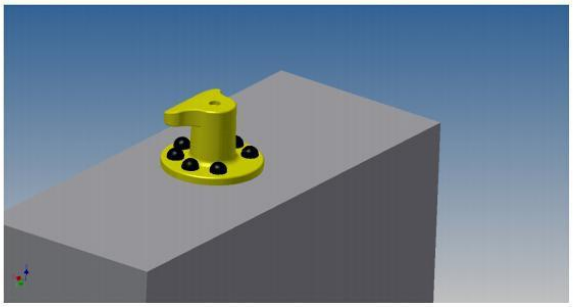
g)

Tighten the bolts and washers.



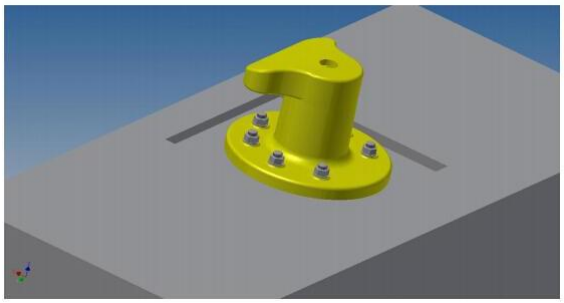
h)

Then cover the bolts and washer with the mixture of pitch and sand to protect from sea water corrosion.

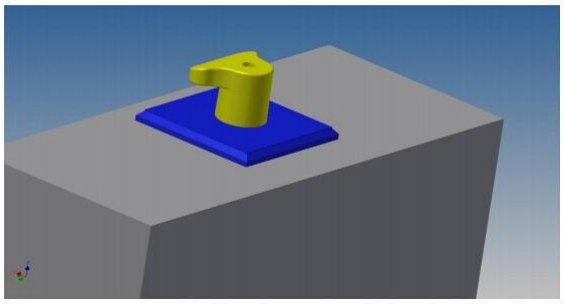


i)

The whole base of bollards could be covered with the concrete if



the installation place is lower than the port surface.



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FOCUS ON MARINE AND OFFSHORE

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