IRM EUROPE BV

IRM OFFSHORE AND MARINE ENGINEERS PVT. LTD.

BOLLARDS

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IRM BOLLARDS

IRM is one of the pioneer and largest manufacturers of Bollards in India, supplying to more than 80 countries. We have manufactured the world's largest Bollards of 500T capacity which included the entire designing, manufacture and inspection.

IRM Bollards are manufactured under stringent quality norms conforming to various International standards with a variety of design like T-Head, Staghorn, Kidney etc. The Bollards are designed and optimized using FEA analysis to have a cost effective products for our esteemed clients.

Our catalogue includes the standard range of Bollards which is generally used worldwide by all the ports and Harbors. Customized Bollards can also be developed on specific request for any unique mooring solution. This catalogue contains all the general technical information which will be useful to our clients for their preliminary selection. For any further details they can contact IRM technical team.

CONTENTS.

BOLLARDS TYPES & SIZES

Mooring Bollards are manufactured in different shapes and sizes ranging from capacity 2 Tons to 500 Tons.

Types of Bollards:

STAGHORN BOLLARD

TEE HEAD BOLLARD

KIDNEY BOLLARD

TRICON BOLLARD

CLEAT BOLLARD

BITT BOLLARD

MATERIAL SPECIFICATION

The Bollards are typically manufactured either from Cast Steel and Cast iron. Cast iron usually refers to Gray Iron, Ductile Iron /SG Iron, and Malleable Iron having more than 2% carbon content. Cast steel usually refers to standard carbon steel or alloy steel having maximum carbon content lower than 2%. The material of the Bollard is generally the preference of the client. Both the material have their pros and cons. However, for Bollard, both the material Cast iron and Cast Steel are suitable.

General Characteristics of Ductile Iron/SG Iron:

1. Available in a wide range of mechanical/physical properties.
2. Many iron castings can be used without heat treatment.
3. Excellent damping capacity, especially in Gray Irons.
4. Reduced tendency toward residual stresses.
5. Having better corrosion resistance, wear resistance compared to Cast Steel.
6. Cast iron typically has better compressive strength.

General Characteristics of Cast Steel:

1. Better mechanical strength than Cast Iron.
2. Lower castability than Cast Iron.
3. Wear resistance is less in comparison to Cast Iron.
4. Higher shock resistance than cast iron.
5. Lower corrosion resistance compared to Cast Iron.
6. Heat Treatment is generally required.

PAINTING

Bollards are painted as per ISO 12944 standards. Painting is more significant for Cast Steel Bollards which has less corrosion resistance than Cast Iron Bollards. The Bollards can be painted in any shades as per client's requirement. Generally the Bollards are painted with black or yellow color with high build epoxy paint. During mooring the paint is susceptible to wear, due to the high abrasion forces of the mooring ropes. Hence it is advisable that the coating should be re applied at site by the client as and when required for proper maintenance of Bollards.

PROCEDURE

- The Bollards is sand blasted as per SA 2.5
- Primer: 50 to 60 microns.
- Two Coats of High Build Epoxy Paint: 325 microns.
- Total DFT 375 microns. approx.

TORQUE CHART

SR. NO.	BOLT	TORQUE N.M.
1	M 24	407-441
2	M 27	441-475
3	M 30	475-508
4	M 36	542-610
5	M 42	610-678
6	M 48	746-813
7	M 56	813-881
8	M 64	881-949

STANDARD GRADES OF GREY IRON

Country	Standard	EQUIVALENT GRADES OF GREY IRON (GREY CAST IRON)						
ISO	ISO 185	100	150	200	250	300	350	—
China	GB 9439	HT100	HT150	HT200	HT250	HT300	HT350	—
USA	ASTM A48	—	NO.20 NO.25	NO.30	NO.35	NO.40 NO.45	NO.50	NO.55 NO.60
Germany Austria	DIN 1691	GG10	GG15	GG20	GG25	GG30	GG35	GG40
European	EN 1561	EN-GJL-100	EN-GJL-150	EN-GJL-200	EN-GJL-250	EN-GJL-300	EN-GJL-350	—
Japan	JIS G5501	FC100	FC150	FC200	FC250	FC300	FC350	—
Italy	UNI 5007	G10	G15	G20	G25	G30	G35	—
France	NF A32-101	—	FGL150	FGL200	FGL250	FGL300	FGL350	FGL400
UK	BS 1452	100	150	200	250	300	350	—
India	IS 210	—	FG150	FG200	FG260	FG300	FG350	FG400
Spain	UNF	—	FG15	FG20	FG25	FG30	FG35	—
Belgium	NBN 830-01	FGG10	FGG15	FGG20	FGG25	FGG30	FGG35	FGG40
Australia	AS 1830	—	T150	T220	T260	T300	T350	T400
Sweden	SS 14 01	0110	0115	0120	0125	0130	0135	0140
Norway	NS11 100	SJG100	SJG150	SJG200	SJG250	SJG300	SJG350	—

STANDARD GRADES OF DUCTILE IRON / SG IRON

Country	Standard	EQUIVALENT GRADES OF DUCTILE IRON (SG IRON, NODULAR GRAPHITE IRON)						
ISO	ISO 1083	400-15 40018	450-10	500-7	600-3	700-2	800-2	900-2
China	GB1348	QT400-18	QT450-10	QT500-7	QT600-3	QT700-2	QT800-2	QT900-2
USA	ASTM A536	60-40-18	60-42-10 65-45-12	70-50-05	80-55-06 80-60-03	100-70-03	120-90-02	—
Germany Austria	DIN 1693	GGG40	—	GGG50	GGG60	GGG70	GGG80	—
European	EN 1563	EN-GJS-400-15 EN-GJS-400-18	EN-GJS- 450-10	EN-GJS- 500-7	EN-GJS- 600-3	EN-GJS- 700-2	EN-GJS- 800-2	EN-GJS- 900-2
Japan	JIS G5502	FCD400	FCD450	FCD500	FCD600	FCD700	FCD800	—
Italy	UNI 4544	GS370-17	GS40012	GS500-7	GS600-2	GS700-2	GS800-2	—
France	NF A32-201	FGS370-17	FGS400-12	FGS500-7	FGS600-2	FGS700-2	FGS800-2	—
UK	BS 2789	400/17	420/12	500/7	600/7	700/2	800/2	900/2
India	IS 1865	SG370/17	SG400/12	SG500/7	SG600/3	SG700/2	SG800/2	—
Spain	UNF	FGE38-17	FGE42-12	FGE50-7	FGE60-2	FGE70-2	FGE80-2	—
Belgium	NBN 830-02	FNG38-17	FNG42-12	FNG50-7	FNG60-2	FNG70-2	FNG80-2	—
Australia	AS 1831	300-17 400-12	—	500-7	600-3	700-2	800-2	—
Sweden	SS 14 07	0717-02	—	0727-02	0732-03	0737-01	0864-03	—
Norway	NS11 301	SJK-400.3 SJK-400	—	SJK-500	SJK-600	SJK-700	SJK-800	—

STANDARD GRADES OF CAST STEEL

ISO SPECIFICATIONS:

Grade	Tensile Strength, Min. ksi [Mpa]	Yield Strength, Min. ksi [Mpa]	Elongation, Min. %	Reduction of Area, Min. %
3755 Gr. 230-450	65 [450]	33 [230]	22	31
3755 Gr. 270-480	70 [480]	39 [270]	18	25
3755 Gr. 340-550	80 [550]	49 [340]	15	21

ASTM SPECIFICATIONS:

Grade	Tensile Strength, Min. ksi [Mpa]	Yield Strength, Min. ksi [Mpa]	Elongation in 2 in. or 50mm, Min %	Reduction of Area, Min. %
A27 Gr. 65-35	65 [450]	35 [240]	24	35
A27 Gr. 70-36	70 [485]	36 [250]	22	30
A27 Gr. 70-40	70 [485]	40 [275]	22	30
A148 Gr. 80-50	80 [550]	50 [345]	22	35

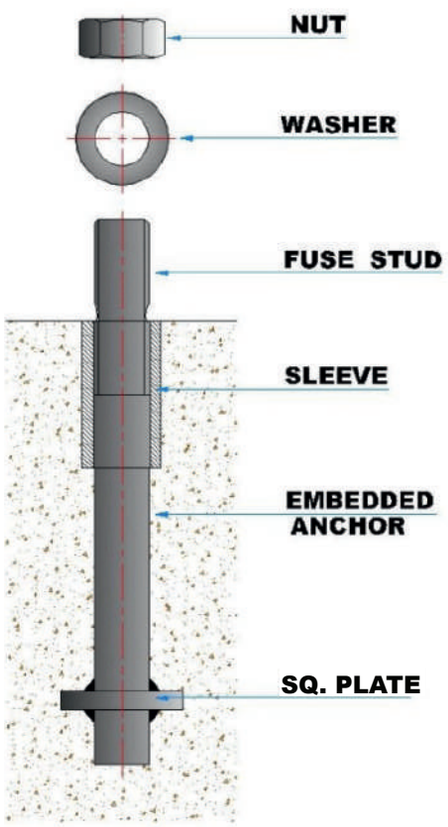
IS 1030:1998 SPECIFICATIONS:

Grade	Tensile Strength, Min. [Mpa]	Yield Strength Min. [MPa]	Elongation Min. %	Reduction of Area Min. %	Impact Strength J [Min]	Angle of Bend Degrees
200-400N	400	200	25	40	30	90
200-400W	400	200	25	40	45	90
230-450N	450	230	22	31	25	90
230-450W	450	230	22	31	45	90
280-520N	520	280	18	25	22	60
280-520W	520	280	18	25	22	60
340-570N	570	340	15	21	20	60
340-570W	570	340	15	21	20	60

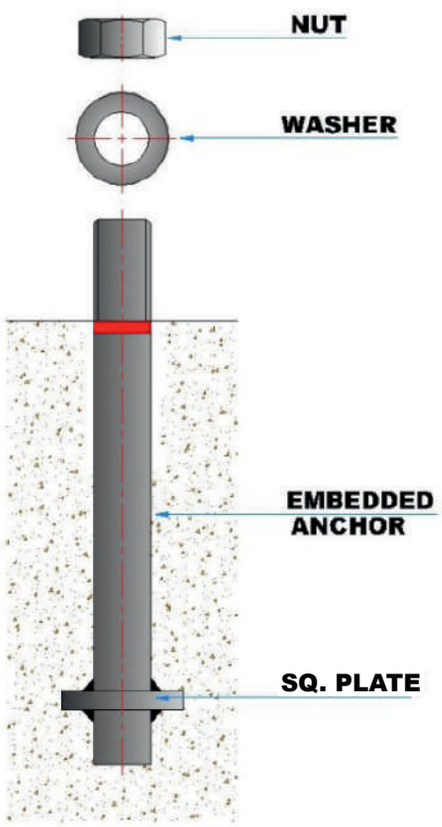
FIXTURES

Bollards are usually supplied with anchor bolts. The anchor bolts are designed for pulling the capacity of the Bollard. An anchor bolt is generally a partial threaded rod having welded anchor plate at the other end, which is embedded into the concrete.

The anchor bolts are of 2 types: 1. Fuse type anchors 2. Standard anchors



Fuse type anchors



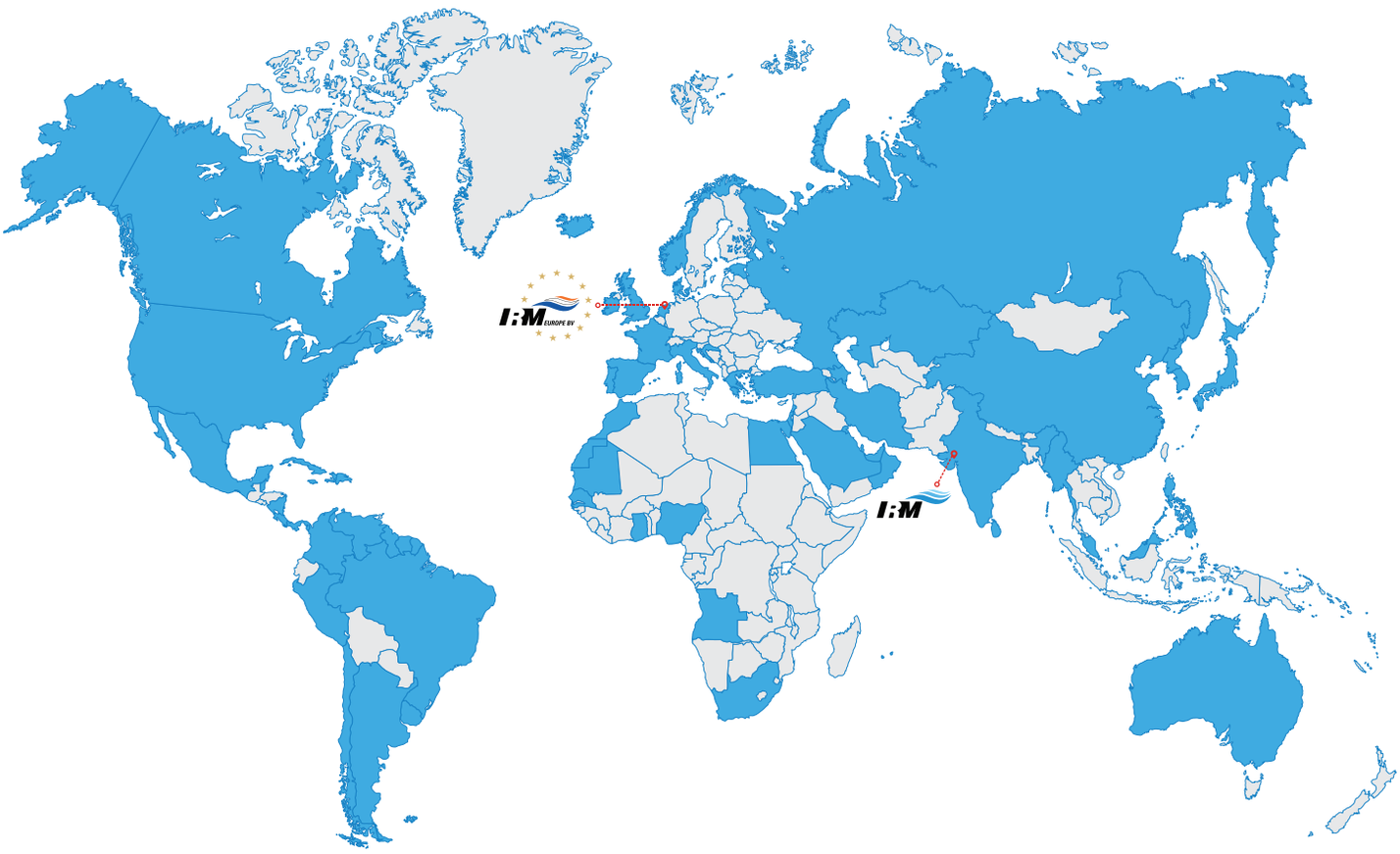
Standard Anchors

All carbon steel anchors and associated nuts and plate washers are supplied hot dip galvanized to ASTM A123 or A153 standards as required.

ITEM	STANDARD GRADES	ISO GRADES
Bolts	ASTM F1554 Gr. 105	ISO 898 Gr. 8.8
Nuts (Heavy Hex)	ASTM A563 Gr. DH	ISO 898 Gr. 8
Washers	ASTM F436	ISO 887
Plate Washers	ASTM A36	ISO 630

PHOTO GALLERY

IRM PRODUCTS WORLD WIDE



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