Installation Guide for TD-A Rubber Fender

尊敬的用户，非常感谢选用本公司产品，为了更好地发挥橡胶护舷的作用，现将有关产品特点和安装、使用方法介绍给您，希望能对您使用本公司产品有所帮助。

The respect user, thank you to select our product, for better use this product, please read this user handbook before the use.

一、橡胶护舷特点：

橡胶护舷是码头或船舶上使用的一种缓冲防护装置，工作时通过其本身的结构变形和橡胶的弹性变形，来减缓船舶与码头或船舶与船舶在靠泊或系舶时的冲击，保护船舶和码头免受损失，保证船舶安全靠泊，顺利实施作业。

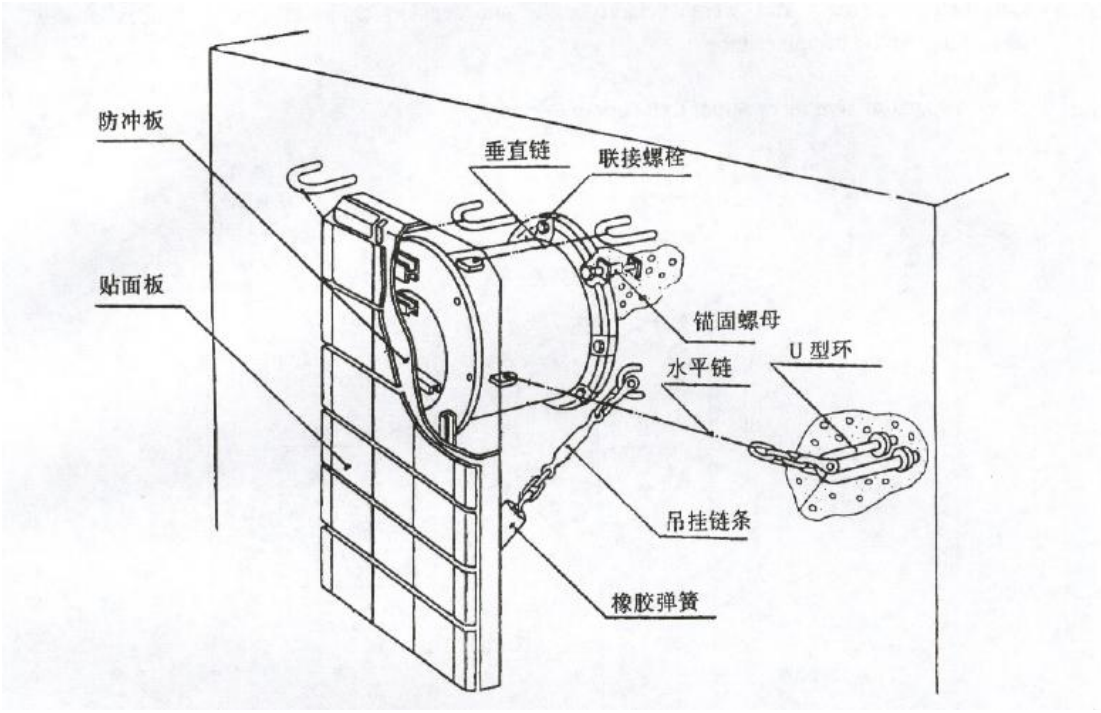
Ⅰ.Rubber Fender Characteristic：

Rubber Fender is a kind of cushion system which is used on quay or vessel.Better protection from damage for both ships and structures and insurance for safe and favorable berth are provided through itself deformation and elastic deformation of rubber.

TD-A超级鼓型护舷作为反力低、吸能量大的当今世界最先进的护舷品种之一，被广泛的应用，作为码头防冲装置，它由护舷本体、防冲板、贴面板、螺栓（包括预埋件）和链条等五部分组成，总成配件从数百件至数千件不等，在各类橡胶护舷中，是安装较为复杂的品种之一，因此，施工单位在安装前应制定安装施工方案，确保正确的安装方法并保证安装质量，使橡胶护舷充分发挥其防冲效力，下面以TD-A为例，将其安装要领说明如下：

As one of the most advanced fenders，**Super Cell Rubber Fender** is widely used for its high energy absorption and low reaction force. As dockside fender, it is composed of five parts: fender body, frontal frame, PE-pad, bolt(embedment included) and chains. Quantity of accessories is different from hundreds to thousands. Its installation is complex among all kinds of fenders, so construction organization should make assembly plan to ensure assembly method and quality so that rubber fender can work effectively. Installation essentials for TD-A are as follows：

Ⅱ.Rubber Fender Assembly：


防冲板
贴面板
垂直链
联接螺栓
锚固螺母
U 型环
水平链
吊挂链条
橡胶弹簧

Accessories		Purpose	Material
Pre-built Parts	U-Anchor	Holding chains	Upon Request
	Anchor Nut	Fasten the fender on a wharf or dolphin	
Frontal Frame		Reduce surface pressure in avoid of damage of the fender and vessel	
PE-Pad		Reducing friction coefficient and protecting hull	
Rubber Spring		Buffer chain stress	
Rubber Spring Chain	Weight Chain	Support of frontal frame in avoid of sagging	
	Shear Chain	Prevent fender system from shear deflection	
	Tension Chain	Limit fender deflection at partial compression under strain	
Bolt		Connecting fender and frontal frame and other parts	

III. Transporting and Storing:

1、护舷在装卸运输过程中，应保持清洁，不得摔、撞、拖、滚，不得以坚硬物品（工具）勾、吊、刺、划，不得与酸、碱、油类及有机溶剂等物质接触，并应距发热装置 1 米以外；

1、During transferring and transporting, fender should be kept clean and throwing, striking, dragging, rolling are all forbidden. No hooking, hanging, thrusting and scratching and without contact with acid, alkali, oil and organic solvent. No less than one meter away from heaters.

2、护舷贮存时，应避免阳光直射，雨雪浸淋，不得与酸、碱、油类及有机溶剂等物质接触，并距离发热装置1米以外，库房温度宜保持在-10℃～30℃，相对湿度在50～80%之间。

2、Fender should be stored at place where no sunshine and no rain and snow. No contact with acid, alkali, oil and organic solvent. And no less than one meter away from heaters. Product should be stored in storehouse with temperature of -10℃-30℃ and relative humidity of 50%-80%.

四、护舷安装程序（不含预埋件）：

Ⅳ.Installation Procedure of Rubber Fender (Pre-built Parts is not included)：

1、安装前请仔细查阅有关护舷安装图纸；

1.Please check fender installation drawing before installation;

2、护舷装配：护舷与防冲板组装宜在岸上进行，并使用岸吊（为保证吊装位置准确，不宜使用海吊）。

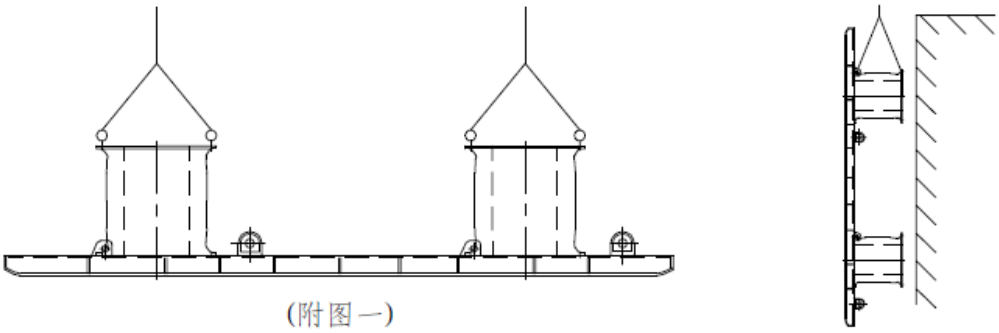
2.Fender Assembly：Fender and frontal frame assemble should adopt shore tackle(to ensure hoisting position, tackle at sea is inadvisable).

2.1 防冲板平放（贴面板向下），为保护防冲板不被划伤，贴面板下应铺垫木板等保护；

2.1 Keep frontal frame flat on the ground(PE-Pad downward), and PE-pad should be placed on timbers to protect frontal frame from scratching;

2.2 将橡胶护舷吊装在图纸位置（螺栓孔对正），吊装护舷时请使用吊装环（附图一）；

2.2 Hoist rubber fender by hoist rings on figured position(bolt hole for alignment); （Attached Figure1）



(附图一)

2.3 用联接螺栓紧固（防冲板与护舷）；

2.3 Fastening with Bolt (Frontal Frame and Rubber Fender)；

2.4 将组装后的防冲板（带护舷）用岸吊吊起，吊装时，应将防冲板与护舷一起吊起，并保持平衡（图2）；

2.4 Hoist the assembled frontal frame and rubber fender together by shore crane.（图2）；

2.5 与码头螺栓对接时，应逐个护舷进行，（先安装上部护舷为好），当第一护

舷安装后（螺栓不拧紧），再安装第二个护舷并找正，最后将螺栓紧固；

2.5 Fender should be installed one by one(upper fender first is better) when connecting with quay bolt.After the first installed(with bolt unlock down),install and align the second rubber fender,and at last lock down the bolt.

2.6 最后，将吊挂链条安装在码头预埋U型环与防冲吊环上，并必须将开式螺旋扣旋紧，此时，应将防冲板轻轻起吊，以保证链条达到受力状态。

2.6 At last, install the chains to U-Anchor and Ring of frontal frame,and then tighten the turn-buckle.Lift the frontal frame to insure the strained condition of chains.

3.Note：

3.1 护舷和防冲板安装时，应轻吊轻放，避免摔、撞、拖、滚，不得以坚硬物勾、吊、刺、划，避免碰伤；

3.1 Fender and frontal frame should be handled with care and throwing, striking, dragging, rolling are all forbidden. No hooking, hanging, thrusting and scratching to avoid handling mark.

3.2 护舷安装时，请将天盾醒目标志置于正上方，以帮助我们做好宣传，扩大天盾品牌的知名度，对于您的理解与合作，我们非常感谢。一致；

3.2 We will appreciate that if you can exposure of “Tiandun” sign right above when install rubber fender to publicize our product.

3.3 码头前沿护舷安装处（定位板）应平整，清除水泥等杂物；

3.3 Where fender installed on quayside(fixing plate)should level off,without cement and other sundries.

3.4 紧固螺栓（码头及防冲板）必须旋紧，保证紧固力

3.4 Fastening bolt(quay and frontal frame)must be tightened and insure attachment strength is coherent.

3.5 螺栓垫片放置规整，垫片下沿要与护舷法兰边沿吻合；

Lay bolt and washer neatly and foot lining of washer must hit off the fender flange.

3.7 当防冲板为封闭型时,因重量增大约30%，从而加大护舷负荷，要求吊挂链条

务必拉紧，否则护舷下垂，影响产品性能发挥；

3.7 If the frontal frame is enclosed type, its weight will increase the fender load. And the weight chain must be tightened,or the rubber fender will sag and influnce the product property.

3.8 组合安装最小距离：当护舷被压缩时，其筒体呈鼓型向外膨胀，所以护舷组合安装时，必须有适当间距，避免相互碰撞。

3.8 The minimum distance between combining installation: The main body expands outward as cell, so proper distance must be kept when install combining fender to avoid impact.

规格	630H	800H	1000H	1150H	1250H	1450H	1600H	1700H	2000H	2250H	2500H	3000H
最小间距H（m/m）	880	1120	1500	1730	1870	2180	2400	2550	2880	3360	3730	4500

Ⅴ.橡胶护舷的使用

Ⅴ.Applacation of Rubber Fender

1. 法向靠泊速度：有效地控制靠泊速度，可以降低靠泊能量，既可保证船舶和码头的安全，也可延长护舷的使用寿命。下表是各种条件下的靠泊速度：

1. Nomal mooring velocity:Controling the mooring velocicity effectively can reduce mooring energy ,which will not only guarantee the safty of vessel ,but also increase the service life of rubber fender. Mooring velocity under all kinds of conditions are as follows:

水域自然条件	靠岸条件	靠船速度（m/s）		
		总吨1000t 载重吨<1500t	总重5000t 载重吨<7500t	总重>10000t 载重吨<15000t
强风及涌浪	困难	0.75	0.55	0.40
	容易	0.60	0.45	0.30
一般风及涌浪		0.45	0.35	0.20
有掩护	困难	0.25	0.20	0.15
	容易	0.20	0.15	0.10

2. 靠泊角度Mooring Angular

靠船角度	船舶部位	船型位置	载重吨8000 货轮		载重吨11000 货轮		载重吨25000 货轮		载重吨35000 矿石船		载重吨5100 油轮		总吨7000 轮渡	
			载重线	上甲板	载重线	上甲板	载重线	上甲板	载重线	上甲板	载重线	上甲板	载重线	上甲板
1°	船首		200	120	210	160	220	180	240	360	240	240	170	150
	船尾		180	150	160	160	180	180	240	310	470	240	140	140
5°	船首		50	40	55	55	60	60	85	100	110	85	140	80
	船尾		60	60	95	65	90	90	100	130	110	145	160	55
10°	船首		40	40	45	40	45	45	70	55	75	60	340	50
	船尾		65	40	80	55	70	70	110	100	105	120	240	35

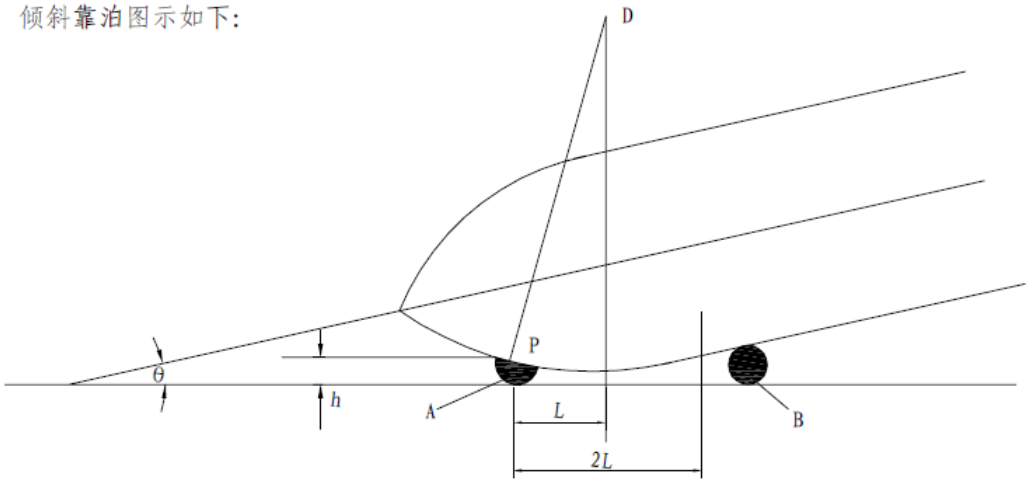
3.Angular Compression Performance

当船舶斜向靠泊时，由于船舶倾斜压缩橡胶护舷，将使护舷吸能量下降，选型时，应根据靠船角度，对护舷性能进行折减。当码头布置间距较少时，可以不考虑性能影响。在一般情况下，特别是当布置间距过大，或靠船角度大时，要考虑这一折减因素的影响，下表是以TD-A型护舷为例在不同倾斜压缩试验时反力及吸能量修正系数，供参考使用：

Oblique mooring will low absorption energy of rubber fender for oblique compression.Fender performance should be reducted according to mooring angular when select type.When the arrangement distance is decreased, the influence of performance can be counted out. In general conditions, especially arrangement distance is oversized or mooring angualr is larger, reduction factor should be considered. Take TD-A for example,Angular Compression Correction Coefficient of Energy Absorption &Reaction Force under different oblique compression test are as follows for reference:

修正系数 \ 角度（°）	3	4	5	6	8	10	15	备注
反力修正系数（CR）	0.96	0.94	0.93	0.93	0.92	0.92	0.90	
吸能量修正系数（CE）	0.94	0.92	0.87	0.87	0.84	0.80	0.72	

倾斜靠泊图示如下:



4.靠泊后，缆绳不要系在护舷或防冲板上，更不要系在防冲板的链条上，否则会造成护舷总成非正常损坏。

4.After mooring alongside , do not tie the mooring rope on fender or frontal frame, let alone on chains of frontal frame ,or abnormal spoilage will appear on fender.

5.靠泊位置：

5.Mooring Location:

船舶靠泊时，依靠护舷的结构变形和橡胶的弹性变形来吸收船舶靠岸的有效撞击能力，在可能的情况下，靠泊时最好选取护舷所在位置的正前面，避免直接撞击防冲板的顶端和底部等受力薄弱部位，以延长其使用寿命。

When moored,impact energy is absorpted by structural deformation of fender and elastic deformation of rubber.If possible,impact the forward of the fender when mooring and avoid impacting the frail part of frontal frame (top and bottom) directly to extend its life service.

6.日常维护：Daily Maintenance

护舷系统日常要进行适当的维护，要：

Fender system should have proper maintanence,

6.1 保持清洁；

6.1 Keep Clean;

6.2 及时补（更）换损坏的贴面板；

6.2 Change the damaged PE-pad in time;

6.3 护舷或防冲板上钢件有裸露的，要及时补漆维护，防止锈蚀。

Make up painting on exposed assecceories of fender and frontal frame to prevent corrosion.

ADINA Industries Co. Ltd.