Macalloy

BAR & CABLE SYSTEMS

November 2011

GROUNDWORK ENGINEERING

Macalloy Sheet Piling System:

Macalloy TB460
Macalloy TB520
Macalloy TB590
Macalloy TB700

EXPERIENCE INNOVATION QUALITY

Macalloy Sheet Piling System

Introduction

Macalloy has been the leader in the design, manufacture and supply of threaded bar systems since the 1940's. Offering various grades of threaded bar, its products go into applications as diverse as post tensioning and ground engineering, steelwork structures and glass façades.

Macalloy's manufacturing facility is based in Sheffield, England, where it employs state of the art machinery to provide consistent quality products. Since developing the world's first post tensioning bar system in 1948, Macalloy has used its unique skills in threading technology to lead the world in the development of new systems and in the introduction of new technology in this field.

Macalloy is well known for its Macalloy 17 MHS Tie Bar System, for sheet piling and other general threading applications.

This system has now been relaunched and extended with, the following systems forming part of Macalloy's new range:
- Macalloy TB460 System
- Macalloy TB520 System
- Macalloy TB590 System
- Macalloy TB700 System

Sea Commercial Port - Ust-Luga Russia
Image supplied by Pst Group, Russia

Quality

All our products and systems follow strict quality guidelines in accordance with BS EN ISO 9001

Macalloy also has its own in house testing facility where tensile testing and anchorage testing is carried out on the bar and threaded connections to ensure the system meets the specification.

Macalloy is proud of its quality and is a company with systems you can trust.

Thread Rolling

Roll threading is a process by which a steel bar is fed into a series of fixed thread rolls to form the male thread. In the cold forming process, the grain structure of the material is aligned with the peaks and troughs of the thread, providing a smooth running thread form and eliminating the potential for crack propagation. The process of thread rolling is faster than cut threading and the thread roll life is also extended. These advantages, combined with the ability to use smaller diameter bars, makes this manufacturing process a much more sustainable and efficient process than cut threading.

EXPERIENCE **INNOVATION** **QUALITY**

Macalloy TB460 and Macalloy TB520 System

Table 1 – Tendon Capacities for Macalloy TB460 System

Thread Diameter	Units	M42	M48	M56	M64	M76	M85	M90	M100	M105
Nominal Bar Diameter	mm	39	45	52	60	72	82	87	97	102
Yield Load	kN	501	660	912	1204	1756	2239	2533	3172	3519
Ultimate Load	kN	664	875	1209	1597	2329	2969	3359	4206	4667
Permanent Working Load (0.5*Py)	kN	251	330	456	602	878	1120	1267	1586	1760
Temporary Working Load (0.625*Py)	kN	313	413	570	753	1098	1399	1583	1983	2199
Tension Resistance to EC3	kN	319	420	580	766	1118	1443	1612	2019	2240
Tension Resistance to EAU2004	kN	454	604	807	1074	1547	2007	2260	2809	3106
Weight per Metre	kg/m	9.4	12.5	16.7	22.2	32	41.5	46.7	58	64.1

Macalloy TB460 System

Available in diameters M42 to M105, the system has a yield stress of 460 N/mm^2. This makes the system approximately 30% stronger than the more common S355 grade steel, allowing smaller diameters to take the same load.

The Macalloy TB460 bar has the following mechanical properties:

Minimum Yield Stress: 460 N/mm^2
Minimum Break Stress: 610 N/mm^2
Minimum Elongation: 19%

For diameters up to M90, the maximum standard length of bar is 11.80m. For larger diameters, the maximum length is 10m.

All fittings are designed to carry the full capacity of the bar.

The system may be considered a weldable steel. The maximum carbon equivalent is 0.55%, although typically the carbon equivalent of the steel comes in at less than 0.47%. Arc Welding may be carried out using standard techniques and low hydrogen rods.

Table 2 – Tendon Capacities for Macalloy TB520 System

Thread Diameter	Units	M42	M48	M56	M64	M76	M85	M90	M100	M105
Nominal Bar Diameter	mm	39	45	52	60	72	82	87	97	102
Yield Load	kN	566	746	1031	1361	1985	2531	2863	3586	3978
Ultimate Load	kN	719	947	1309	1727	2519	3212	3634	4551	5049
Permanent Working Load (0.5*Py)	kN	283	373	516	681	993	1266	1432	1793	1989
Temporary Working Load (0.625*Py)	kN	354	466	644	851	1241	1582	1789	2241	2486
Tension Resistance to EC3	kN	345	455	628	829	1210	1562	1744	2185	2424
Tension Resistance to EAU2004	kN	513	683	912	1215	1749	2269	2554	3175	3511
Weight per Metre	kg/m	9.4	12.5	16.7	22.2	32	41.5	46.7	58	64.1

Macalloy TB520 System

Available in diameters M42 to M105, the system has a yield stress of 520 N/mm^2, making the system 13% stronger than the Macalloy's TB460 grade system, allowing thereby the use of smaller diameters to take the same load.

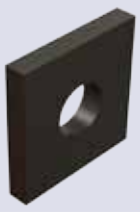
The Macalloy TB520 bar has the following mechanical properties:
Minimum Yield Stress: 520 N/mm^2
Minimum Break Stress: 660 N/mm^2
Minimum Elongation: 19%

For diameters up to M90, the maximum standard length of bar is 11.80m. For larger diameters, the maximum length is 10m.

All fittings are designed to carry the full capacity of the bar. The system may be considered a weldable steel. The maximum carbon equivalent is 0.55%, although typically the carbon equivalent of the steel comes in at less than 0.47%. Arc Welding may be carried out using standard techniques and low hydrogen rods.

Table 3: Plate Dimensions - Macalloy TB460 & Macalloy TB520

Bearing Plate	Units	BP42	BP48	BP56	BP64	BP76	BP85	BP90	BP100	BP105
Width x Length	mm	180 x 180	180 x 180	180 x 180	180 x 180	200 x 200	200 x 200	200 x 200	220 x 220	250 x 250
Thickness	mm	30	30	30	30	40	40	50	50	50
Anchor Plate	Units	AP42	AP48	AP56	AP64	AP76	AP85	AP90	AP100	AP105
Width x Length	mm	225 x 225	275 x 275	300 x 300	350 x 350	425 x 425	500 x 500	525 x 525	575 x 575	600 x 600
Thickness	mm	25	25	30	35	40	45	50	55	55



Above dimensions based on TB520 capacity

Macalloy TB590 and Macalloy TB700 System

Table 4 – Tendon Capacities for Macalloy TB590 System

Thread Diameter	Units	M42	M48	M56	M64	M76	M85	M90	M100	M105
Nominal Bar Diameter	mm	39	45	52	60	72	82	87	97	102
Yield Load	kN	643	847	1170	1544	2252	2872	3249	4068	4514
Ultimate Load	kN	871	1148	1586	2094	3054	3894	4405	5517	6120
Permanent Working Load (0.5*Py)	kN	322	424	585	772	1126	1436	1625	2034	2257
Temporary Working Load (0.625*Py)	kN	402	529	731	965	1408	1795	2031	2543	2821
Tension Resistance to EC3	kN	424	558	771	1018	1485	1917	2141	2681	2975
Tension Resistance to EAU2004	kN	582	775	1035	1378	1985	2575	2898	3603	3984
Weight per Metre	kg/m	9.4	12.5	16.7	22.2	32	41.5	46.7	58	64.1

Macalloy TB590 System

Available in diameters M42 to M105, the system has a yield stress of 590 N/mm^2, making the system 28% stronger than Macalloy's standard 460 grade system, allowing the use of smaller diameters to take the same load.

The Macalloy TB590 bar has the following mechanical properties:

Minimum Yield Stress: 590 N/mm^2
Minimum Break Stress: 800 N/mm^2
Minimum Elongation: 12%

The maximum standard length of bar is 10m.

All fittings are designed to carry the full capacity of the bar.

Table 5 – Tendon Capacities for Macalloy TB700 System

Thread Diameter	Units	M42	M48	M56	M64	M76	M85	M90	M100	M105
Nominal Bar Diameter	mm	39	45	52	60	72	82	87	97	102
Yield Load	kN	762	1004	1388	1832	2672	3407	3855	4827	5355
Ultimate Load	kN	871	1148	1586	2094	3054	3894	4405	5517	6120
Permanent Working Load (0.5*Py)	kN	381	502	694	916	1336	1704	1928	2414	2678
Temporary Working Load (0.625*Py)	kN	476	628	868	1145	1670	2129	2409	3017	3347
Tension Resistance to EC3	kN	471	620	856	1131	1649	2130	2378	2979	3305
Tension Resistance to EAU2004	kN	634	834	1153	1522	2221	2868	3203	4012	4451
Weight per Metre	kg/m	9.4	12.5	16.7	22.2	32	41.5	46.7	58	64.1

Macalloy TB700 System

Available in diameters M42 to M105, the system has a yield stress of 700 N/mm^2, making the system 52% stronger than Macalloy's standard 460 grade system, allowing the use of smaller diameters to take the same load.

The Macalloy TB700 bar has the following mechanical properties:

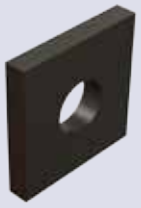
Minimum Yield Stress: 700 N/mm^2
Minimum Break Stress: 900 N/mm^2
Minimum Elongation: 12%

The maximum standard length of bar is 12m.

All fittings are designed to carry the full capacity of the bar.

Table 6: Plate Dimensions - Macalloy TB590 & Macalloy TB700

Bearing Plate	Units	BP42	BP48	BP56	BP64	BP76	BP85	BP90	BP100	BP105
Width x Length	mm	180 x 180	180 x 180	180 x 180	180 x 180	200 x 200	200 x 200	200 x 200	220 x 220	250 x 250
Thickness	mm	30	30	30	40	40	50	50	60	60
Anchor Plate	**Units**	**AP42**	**AP48**	**AP56**	**AP64**	**AP76**	**AP85**	**AP90**	**AP100**	**AP105**
Width x Length	mm	225 x 225	275 x 275	300 x 300	350 x 350	425 x 425	500 x 500	525 x 525	575 x 575	600 x 600
Thickness	mm	25	30	35	40	45	50	55	60	65



Above dimensions based on TB700 capacity.

Macalloy Corrosion Protection and Waling Bolts

Corrosion Protection

Steel sheet piling is used in many aggressive environments and consequently factors affecting the life of the tie bar must be considered.

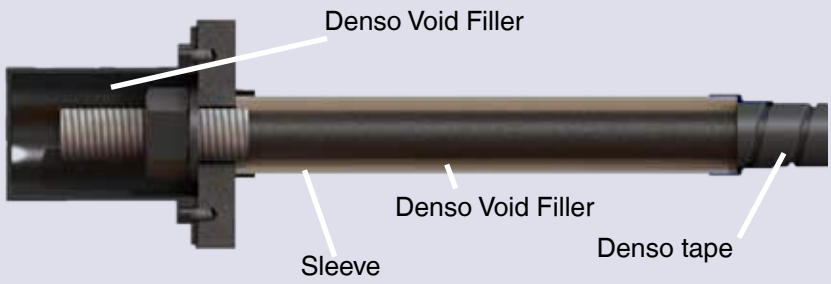
Several options are available, including painting and galvanising, but the most common form is to wrap the bar with a protective barrier containing oxygen scavengers, such as the Denso range of products. Please refer to table 7.

The exposed end can be protected with an anchor head cap, which is filled with Denso Void Filler.

The most common form of protection is denso tape with PVC. The Denso Tape is cold applied and remains plastic over a wide temperature range. It is non-hardening and non-cracking. It is highly resistant to mineral acids, alkalis, salts and micro-organisms and highly impermeable to water, water vapour and gases.

An outer layer of PVC Tape is then used to complete the corrosion protection. The tape is a plasticised PVC sheeting that is coated on one side with a rubber resin pressure sensitive adhesive.

Protection of Anchor Head



The process is carried out quickly and efficiently in the Macalloy factory using Macalloy's unique Denso Tape machine. The advantages of using the Macalloy Tape system are that:

1. It is a very quick and easy process
2. It does not affect the structural performance of the bar in any way
3. There is no loss in load during stressing as the friction generated is negligible
4. The corrosion protection life span is guaranteed.
5. There is no need for use of ducting and grouting
6. It saves cost and time on site as it reduces the installation time

Table 7: Recommended Levels of Tape Protection for a given environment

Type of Protection Recommended	Application
Denso tape with 15mm overlap	For non tidal area or to debond in concrete
Denso tape with 55% overlap	For marine environment
Denso tape with 55% overlap % pvc overlap	For marine environment: also provides for handling. For medium life structures
Denso tape with 55% overlap & Densotherm overwrap	For aggressive and marine environments, exposed to wave action. For medium to long life structures
Macalloy tape system	For aggressive and marine environments, especially for long life structures

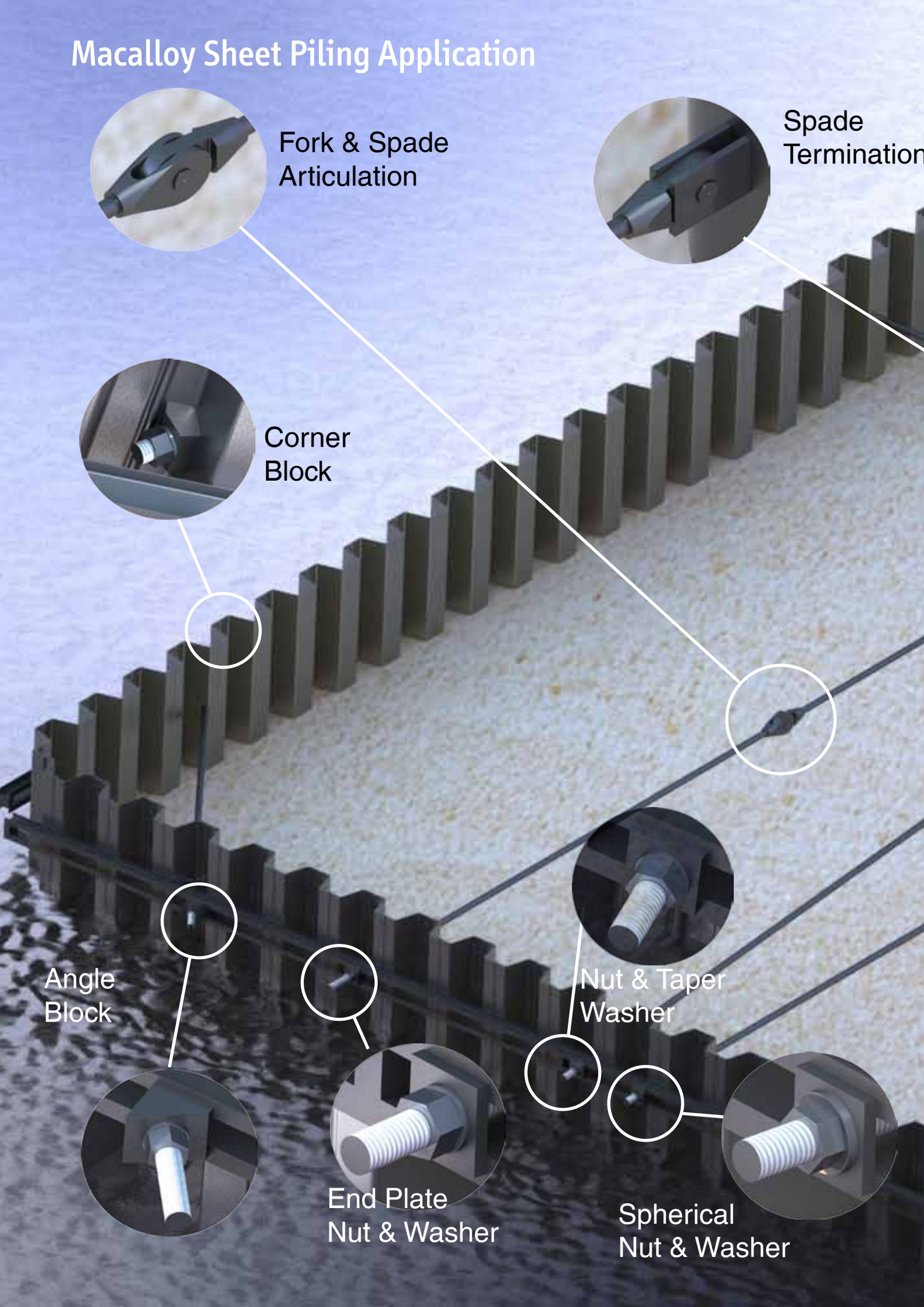
Sacrificial Protection

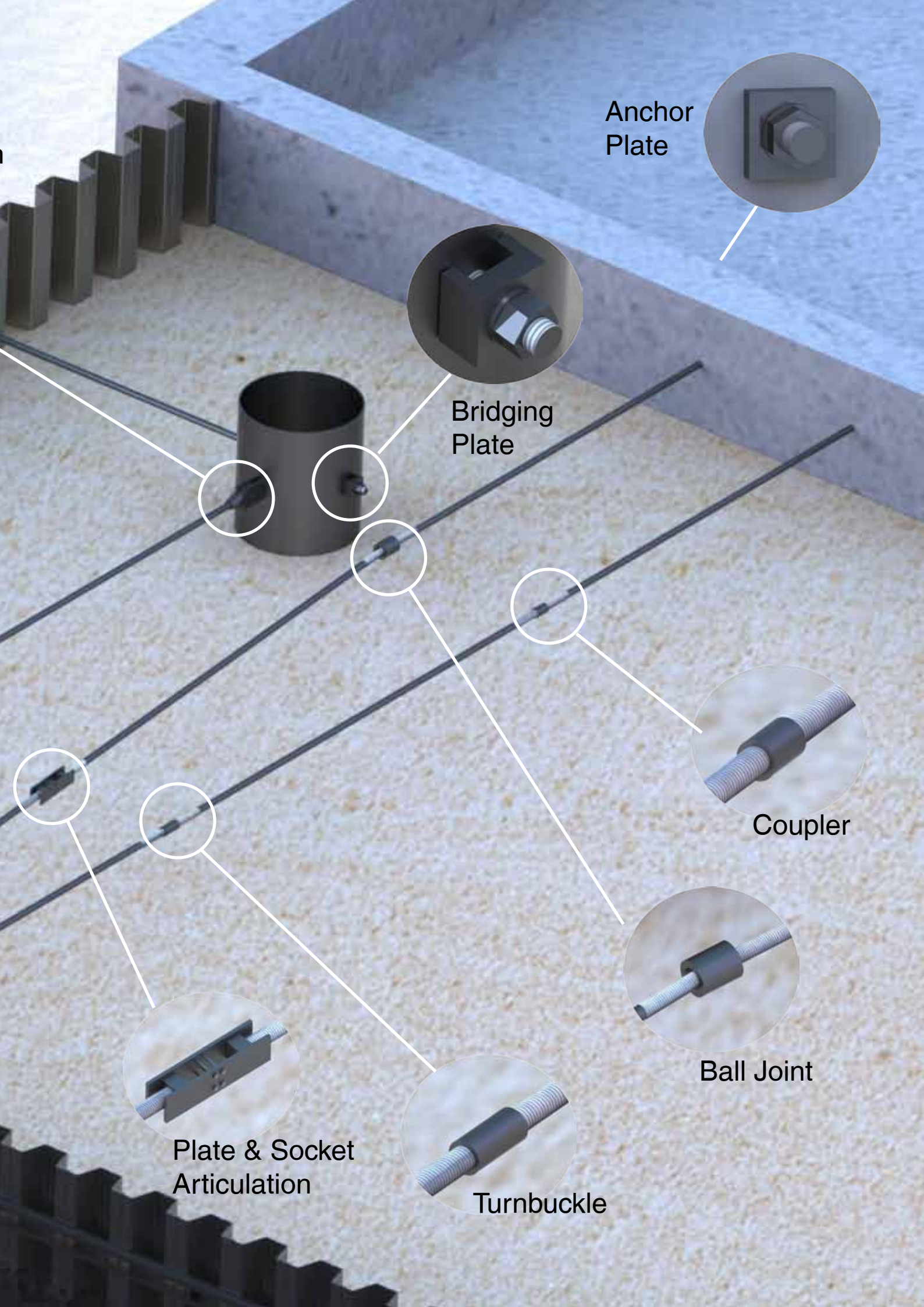
Alternatively, if design calculations are completed using stress levels appropriate to BS EN 10025 S355JR, by using the higher grade Macalloy 460, it is permissible to allow sacrificial corrosion to take place because of the superior mechanical properties of the steel.

Galvanising

Galvanising of tie bars to the Euro Norm BS EN ISO) 1461:1999 can be done by double dipping the bar and brushing the threaded ends.

Macalloy Sheet Piling Application




Anchor
Plate
Bridging
Plate
Coupler
Ball Joint
Plate & Socket
Articulation
Turnbuckle

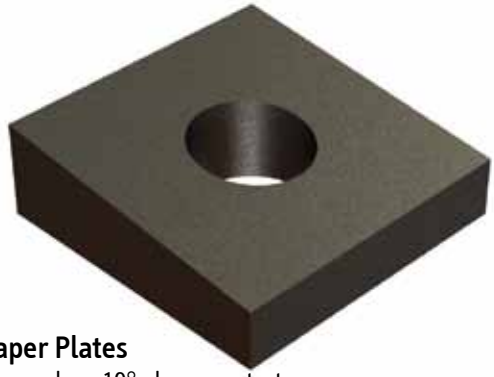
Macalloy Plates

Washer Plates (WP), Bearing Plates (BP) and Anchor Plates (AP)

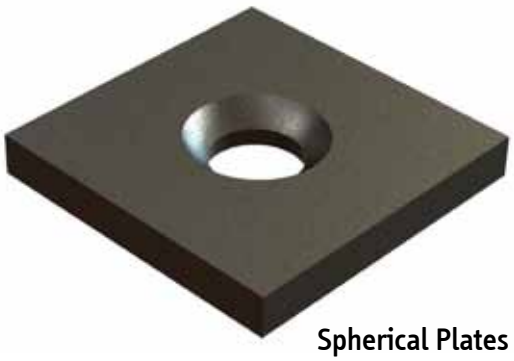
Twin Hole Plates
To suit individual requirements please contact Macalloy

Bridging Plates
To suit individual requirements please contact Macalloy

Rocker Plates
To suit individual requirements please contact Macalloy



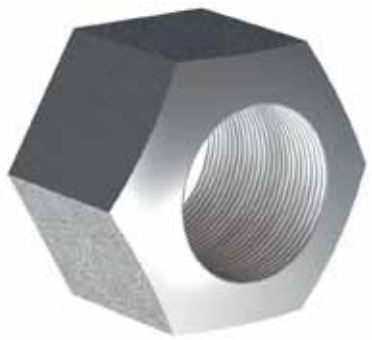
Taper Plates
For angles >10° please contact Macalloy



Spherical Plates
Offering misalignment of up to +/- 3° please contact Macalloy

Corner Block
To suit individual requirements please contact Macalloy

Macalloy End Termination

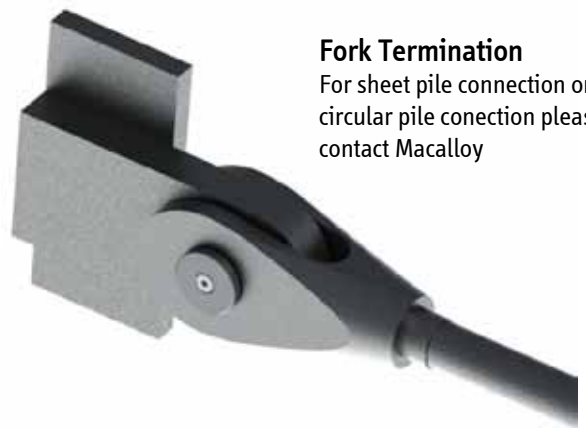


Spherical Nut

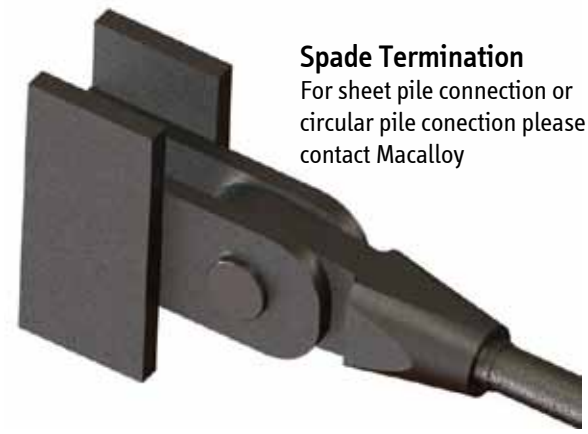
Nut

Spherical Washer
Offering misalignment of up to +/- 3° please contact Macalloy

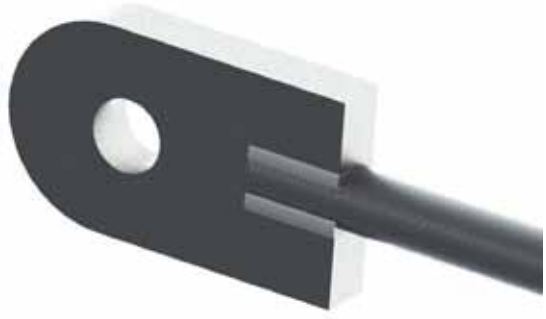
Taper Washer
For angles >10° please contact Macalloy



Fork Termination
For sheet pile connection or circular pile conection please contact Macalloy



Spade Termination
For sheet pile connection or circular pile conection please contact Macalloy



Paddle Connector
Welded to the bar not available in grade 700

Macalloy Joints

Fork and Spade Articulated Joint
Please contact Macalloy

Plate and Socket Articulated Joint
Please contact Macalloy

Ball Joint
Please contact Macalloy

Coupler
As standard with a RH-RH Thread. Can be offered with RH-LH Thread if requested.

Turnbuckle
Standard RH-LH Thread.

Table 8: Component Dimensions - Macalloy TB460 & Macalloy TB520

Thread	Units	M42	M48	M56	M64	M76	M85	M90	M100	M105
Nut Ref.		NM42	NM48	NM56	NM64	NM76	NM85	MNM90	NM100	NM105
A/F	mm	65	75	85	95	110	120	130	145	150
L	mm	34	38	45	51	61	68	72	80	85
Washer Ref.		WM42	WM48	WM56	WM64	WM76	WM85	WM90	WM100	WM105
O/D	mm	78	92	105	115	135	145	160	175	180
T	mm	7	8	9	9	10	12	12	14	15
Turnbuckle Ref.		TE42	TE48	TE56	TE64	TE76	TE85	TE90	TE100	TE105
O/D	mm	63	71	80	95	112	125	132	148	152
L	mm	184	196	212	228	252	270	280	300	310
K	mm	100	100	100	100	100	100	100	100	100
Coupler Ref.		CE42	CE48	CE56	CE64	CE76	CE85	CE90	CE100	CE105
O/D	mm	63	71	80	95	112	125	132	148	152
L	mm	89	101	117	133	157	175	185	205	215

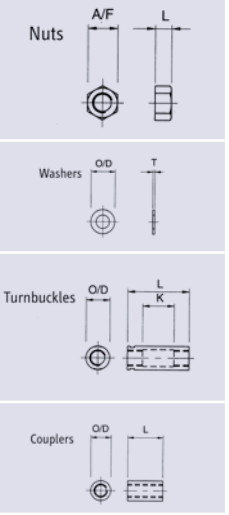
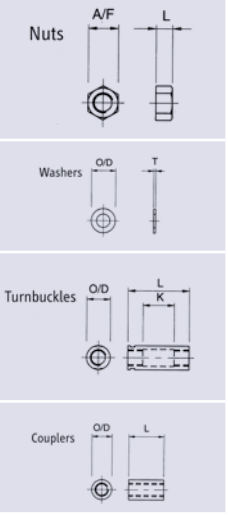


Table 9: Component Dimensions - Macalloy TB590 & Macalloy TB700

Thread	Units	M42	M48	M56	M64	M76	M85	M90	M100	M105
Nut Ref.		NM42	NM48	NM56	NM64	NM76	NM85	MNM90	NM100	NM105
A/F	mm	65	75	85	95	110	120	130	145	150
L	mm	34	38	45	51	61	68	72	80	85
Washer Ref.		WM42	WM48	WM56	WM64	WM76	WM85	WM90	WM100	WM105
O/D	mm	78	92	105	115	135	145	160	175	180
T	mm	7	8	9	9	10	12	12	14	15
Turnbuckle Ref.		TE42	TE48	TE56	TE64	TE76	TE85	TE90	TE100	TE105
O/D	mm	66	75	88	100	120	135	142	157	165
L	mm	184	196	212	228	252	270	280	300	310
K	mm	100	100	100	100	100	100	100	100	100
Coupler Ref.		CE42	CE48	CE56	CE64	CE76	CE85	CE90	CE100	CE105
O/D	mm	66	75	88	100	120	135	142	157	165
L	mm	89	101	117	133	157	175	185	205	215



Macalloy Waling Bolts

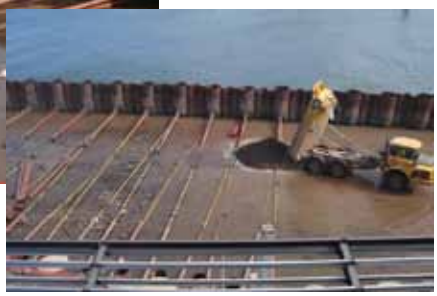
Macalloy can supply end threaded waling bolts to complement its tie bars in various grades. The most cost effective bolt is to use the standard 460-grade material.

Macalloy Sheet Piling Projects

Rejikvik Haven, Iceland

Uyeasound, Shetland United Kingdom

Belfast Harbor, United Kingdom



This publication provides the technical details currently used by Macalloy in the manufacture of its components.
The company reserves the right to amend technical details as and where necessary in line with its policy of continuous development.

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