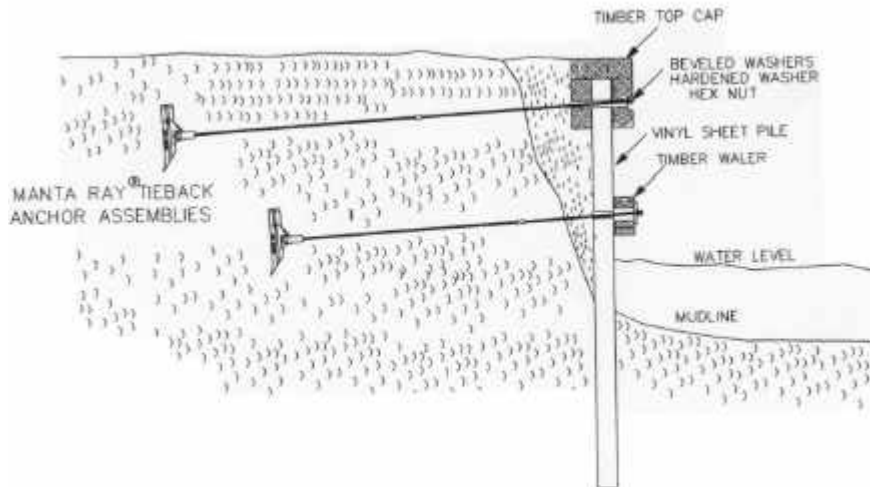
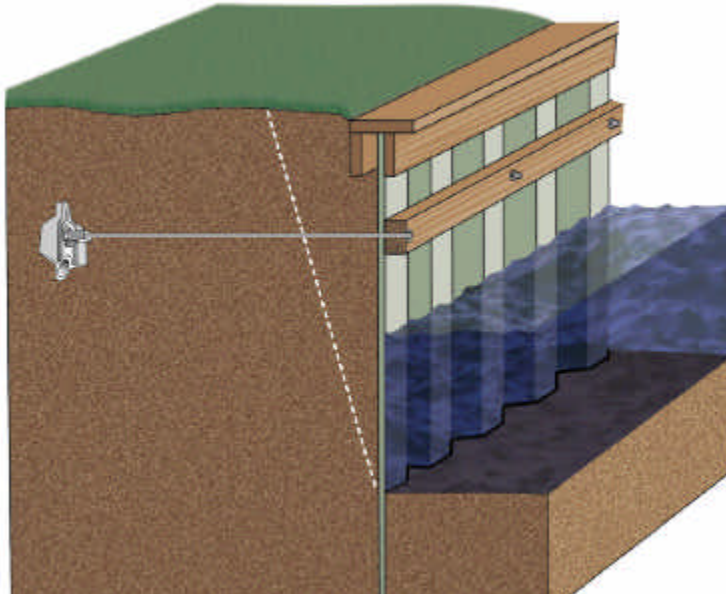




TIEBACK ANCHORS FOR BULKHEADS



“The Unfair Advantage”



6430 East 49th Drive
Commerce City, CO 80022
800-325-5360 or 303-286-8955
FAX 303-287-3866

SECTION 1: MANTA RAY – THE UNFAIR ADVANTAGE

The tieback anchor is a key element of any seawall. **IF THE ANCHOR FAILS, THE SEAWALL FAILS.** This is the reason Manta Rays are the tieback anchor of choice for the best seawalls.

Manta Ray tieback anchors are driven into the soil; with no excavation of the waterfront property thus no holes, no digging, nor expensive restoration is required. Manta Ray tieback anchors can also be installed through old seawalls, under foundations, and around prized trees or other landscaping.

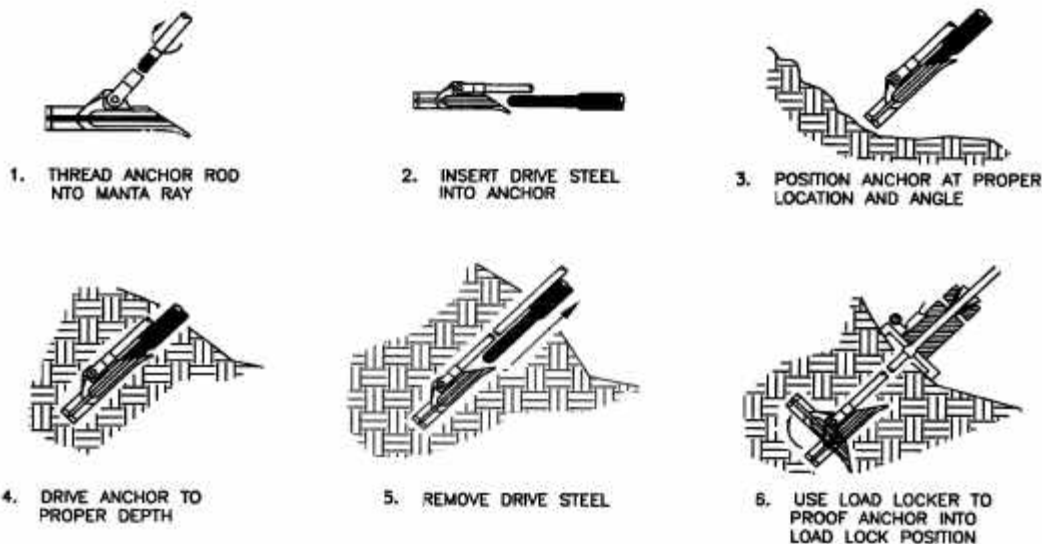
With the superior Manta Ray tieback anchor system there is no reason to ever have a seawall anchor failure because each anchor is individually tested during the installation process and proof loaded to ensure that the required capacity is met. **INSTALLATION AND TESTING ARE SIMULTANEOUS.**

THE MANTA RAY TIEBACK ADVANTAGE:

- *Environmentally friendly
- *No excavation
- *Easy Installation
- *Fast, simple installation saves money
- *Simultaneous installation and proof testing ensures capacity
- *Anchors for mid- wall / multiple walers are easily installed

HOW THEY WORK:

- *Drive the anchor to the proper depth
- *Remove the Drive steel
- *Use the Hydraulic Load Locker to proof test the anchor



1.2: Manta Ray photo gallery



SECTION 2: ANCHOR SELECTION

Anchor selection is a very important consideration for a successful retaining wall. Any anchored retaining wall design should be reviewed and approved by a registered professional engineer who is familiar with the local conditions and codes. Sheet pile manufacturers usually provide anchoring guidelines for their products. Be sure that your design meets or exceeds those guidelines.

Anchor capacity is soil dependant. Some soft soils will require the contractor to choose an anchor model that is larger than what is suggested in the chart to achieve the required proof test values. Sometimes anchors must be installed to greater lengths behind the wall or depths below the ground level to achieve the required capacity. Refer to the Anchor Holding capacity chart in section 4.

The following estimating chart is provided as a guideline. It will not necessarily apply to your project, and is not to be construed as a professionally engineered design. If in doubt, consult with the manufacturer of the sheet pile or a local professional engineer. Please refer to Foresight's Drawing #520390.

MANTA RAY ANCHOR SELECTION CHART

Exposed Height HE (ft.)	Minimum Sheet Embedment LE (ft.)	Minimum Long Term Moment Capacity (ft. – lbs.)	Maximum Manta Ray Spacing (ft.)	Suggested Manta Ray Tie Rod Length (ft.)	Minimum Manta Ray Proof Test (lbs.)	Minimum Manta Ray Length Behind Bulkhead - LF (ft.)
2' – 4'	3.5	800	6	12.0	5000 lbs.	8.5
4' – 6'	5.5	3000	5	13.0	9000 lbs.	10.0
6' – 8'	7.5	7500	5	15.0	15000 lbs.	12.0
Above 8'	Consult Local Professional Engineer					

All Manta Ray tie back anchors must be proof tested to verify the capacity meets or exceeds the requirement for your project.



MR-SR



MR-1



MR-2



MR-3

SECTION 3: MANTA RAY CTB ANCHORS

All Manta Ray CTB Anchors listed in the Bulkhead Estimating Chart are 100 percent hot dip galvanized. The ultimate strength of the MR-3 anchor is 20000 lbs and is typically used at or below 10000 lbs working load. The MR-2, MR-1, and MR-SR all have ultimate strengths of 40000 lbs and are typically used at or below 20000 lbs working load.

Manta Ray CTB anchors utilize a continuously threaded tie rod, which is very forgiving in a construction environment. The coarse thread is very easily cut to length with very little thread damage to make final installation easy and fast. The tie rod is high-grade steel with ultimate strength in excess of 40000 lbs and it is also 100 percent hot dip galvanized. Each Manta Ray CTB Anchor is composed of the following components:

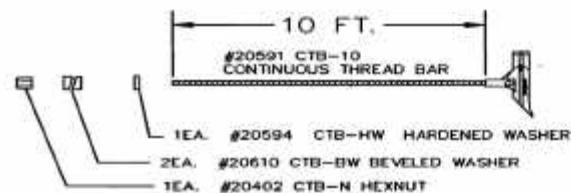
- MR-SR, MR-1, MR-2, or MR-3 CTB Anchor head
- Appropriate number of CTB-10 anchor rods
- CTB-C stop coupling nut (where necessary)
- 2 CTB-BW Beveled washers
- 1 CTB-HW Hardened washer
- 1 CTB-HN Hex nut

Manta Ray tieback anchors must be installed such that the minimum overburden above the anchor head is 4'. This usually requires installation of the Manta Ray anchors on a slight angle below the horizontal. Two beveled washers are included with each CTB anchor to accommodate angles between the waler and the tie rod up to 20 degrees. If a greater angle is required, then a shim between the beveled washers and the waler structure will be required.

All of the components of the CTB anchors (Anchor heads, continuous thread bar, coupling nuts, hardened washers, beveled washers, and hex nuts) are available as spare parts. Galvanized steel spreader plates are also available if necessary. The continuous thread bar is available in 10 ft. lengths, which is easily field cut.



CTB Spare Parts



CTB Anchors

Manta Ray Anchors can also be provided with threads for other tie rods. Please consult with Foresight to determine availability.

SECTION 4: MANTA RAY HOLDING CAPACITY CHART

ULTIMATE HOLDING CAPACITIES IN KIPS (1kip = 1000 lbs)
(Numbers in parentheses refer to notes at bottom of chart)

Soil Description	Blow count (N)	MR-3 Ultimate= 20 kips	MR-2 Ultimate= 40 kips	MR-1 Ultimate= 40 kips	MR-SR Ultimate= 40 kips
Dense fine compacted sands, very hard silts or clays	45-60	17 - 20 (2,3,4)	21 - 28 (2,4)	36 - 40 (1,3,4)	40 (1,3)
Dense Clays, Sands and gravels, hard silts and clays	35-50	12 - 18 (2,4)	15-22 (2,4)	24 - 36 (2,4)	32 - 40 (2,3,4)
Medium dense sandy gravel, stiff to hard silts and clays	24-40	9 -14 (4)	12-18 (4)	18-20 (2,4)	24 - 34 (2,4)
Medium Dense Coarse sand and sandy gravel, Stiff to Very stiff silts and Clays	14-25	7-9 (4)	9-12 (4)	15-20 (4)	18-24 (4)
Loose to Medium Dense Fine to Coarse Sand: Firm to Stiff Clays and Silts	7-14	5-8 (4)	7-10 (4)	10-15 (4)	14-18 (4)
Loose Fine Sand, Alluvium, Soft Clays, Fine saturated Silty Sand	4-8	3-5 (4,6)	5-8 (4,6)	8-12 (4,6)	9-14 (4,6)

- Notes:**
- 1) Drilled pilot hole required for efficient installation
 - 2) Ease of installation may be improved by drilling a pilot hole
 - 3) Holding capacity limited by ultimate strength of anchors
 - 4) Holding capacity limited by soil failure
 - 5) Not recommended in these soils
 - 6) Wide variation in soil properties reduces prediction accuracy. Pre construction field test is highly recommended.



MR-SR



MR-1



MR-2



MR-3

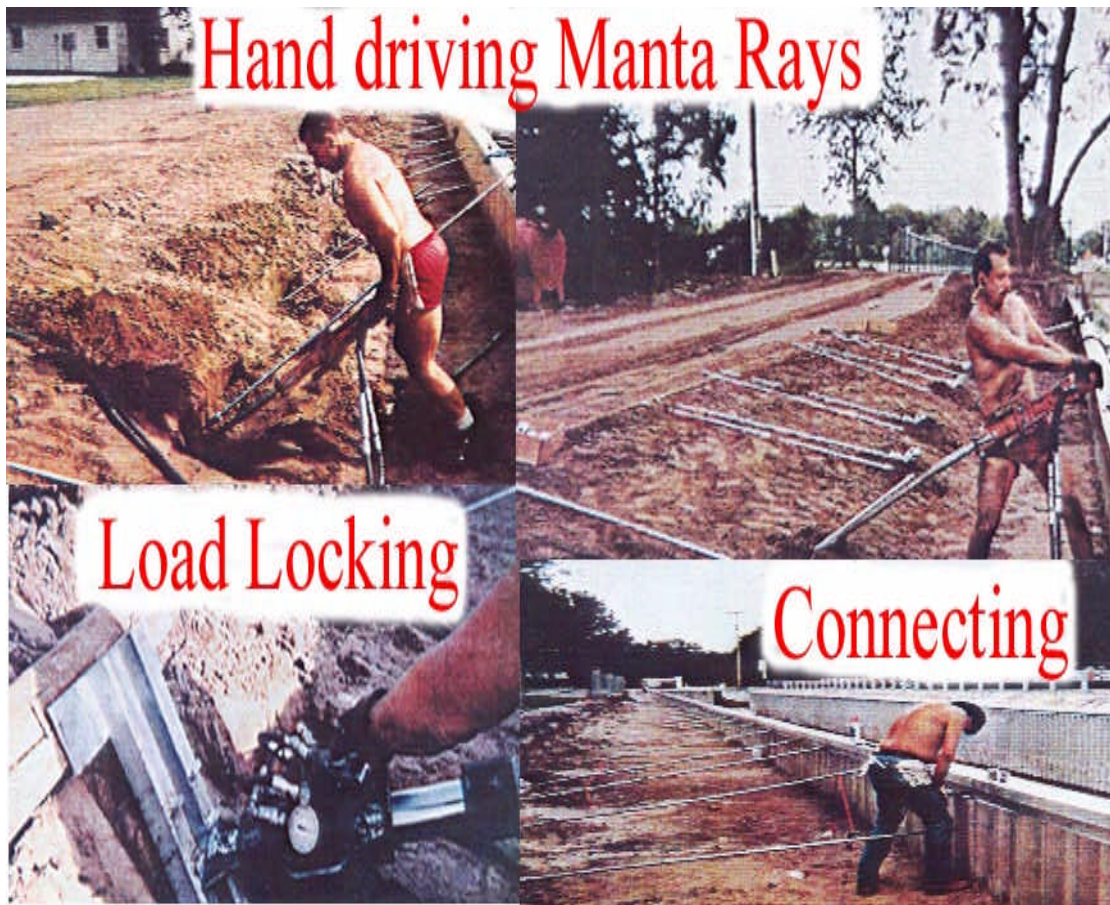
SECTION 5: CONSTRUCTION SEQUENCES

5.1 New walls - Anchors Installed Prior to Sheet Pile

Typical sequence: Drive anchors into the bank
 Proof test anchors against bank with Load Locker
 Install sheet pile, walers and connect Tie rods to walers
 Back fill space between bank and sheet pile

Advantages: Shorter actual drive depth
 Easier Load Locking
 Easier Access
 No excavation

This construction sequence is usually easiest from the point of view of anchor installation, but requires a bit more careful measurement to ensure that the anchors are located properly and that they are installed to the minimum finished length.

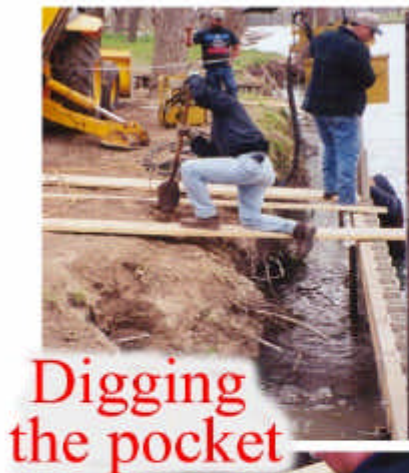


5.2 New walls - Sheet Pile Installed Prior to Anchors

Typical sequence: Install sheet pile, walers
 Drive anchors into the bank
 Proof test anchors against bank with Load Locker
 Connect anchors to waler
 Back fill space between bank and sheet pile

Depending upon the size of the space between the wall and the bank, several options are available:

- 1) If the space is large (greater than 15 ft.) then installation may be no different than that of section 5.1
- 2) If the space is medium (6ft. – 15ft.) then anchor driving with a hand held Pavement Breaker can be accomplished behind and the wall. Mechanized installation can be accomplished from the front side of the wall reaching over the wall or working through the wall. Load Locking the anchors can be accomplished against the bank.
- 3) If the space is small (3ft. to 6ft.) then either mechanized or hand driving of the anchors must be accomplished from in front of the wall, but Load locking can still be performed behind the wall against the bank. See also Manta Ray photo gallery #2, #5 on page 3.
- 4) If the space is very small (less than 3 ft.) then driving the anchors is typically done from the front side of the wall. Load Locking can be done against the bank if a pocket is dug into the bank to provide enough room for the load locker. Sometimes load locking is done against the sheet pile by supporting the sheets with cribbing, blocking and back filling.



5.3 New Wall in front of Old Failing wall

Manta Ray anchors are very commonly used to stabilize failing walls, and it is very common for new vinyl walls to be placed directly in front of old failing walls without removing the old wall. The anchors are usually driven right through the face of the old wall.

Failing Timber wall: If the timbers are severely deteriorated, sometimes Manta Rays can be driven right through the old timbers. If the timbers are still reasonably sound, then it is usually best to cut a clearance hole for the anchors to pass through. The required hole sizes are listed in the chart below:

Anchor size	Clearance Hole Size
MR-3	3.75" round or square
MR-2	4" round or square
MR-1	4" tall x 7" wide rectangular
MR-SR	4" tall x 12.5" rectangular

Other Failing walls (Concrete, Masonry, Steel sheet pile, etc.): This type of wall usually requires cutting a clearance hole for the Manta Ray anchor as described above. See also Manta Ray photo gallery #7, #8, and #9 page 3.

If a clearance hole in the old wall is not practical the following procedure can be used:

- 1) Cut a hole in the old wall large enough for the Manta Ray drive steel and the tie rod. The smallest size for this hole would be a 2" x 4" rectangular shape with the 2" dimension horizontal and the 4" dimension vertical, but a 4" circular hole is probably most practical.
- 2) Dig a small hole behind the sheet pile just large enough to fit the Manta Ray tieback anchor head. Pass the tie rod through the hole in the sheet pile then thread it into the Manta Ray shackle. Pass the Manta Ray Drive steel through the hole in the sheet pile and into the back of the anchor. Install the anchors normally.



SECTION 6: MANTA RAY INSTALLATION EQUIPMENT AND TIPS

For Hand Installation the following equipment is required:

1	#50364	BR87130C Anchor Hammer	(90 lb. Pavement Breaker)
1	#50382	GPU18-8 CE Power Unit	(8gpm / 2000 psi hyd power)
2	#50087	HC-16-25 Hydraulic hoses (25')	
1	#50231	SG-14 Drive steel shank	
1	#50238	SG-3-72 Radius tip drive steel (6')	
2	#50235	SG-2-72 Drive steel extension (6')	
3	#50240	SG-4 Drive steel coupler	
1	#50242	SG-X Drive steel extractor bar	
1	#50127	LL-1 Anchor locker kit	

Notes:

- 1) The distance from the Power unit to the Hammer can be extended up to 50 ft. maximum by the addition of 2 more #50087 HC-16-25 hoses.
- 2) If anchor depths greater than 18' are required, then additional #50235 SG-2-72 drive steel extensions and #50240 SG-4 drive steel couplers can be added.
- 3) If clearance is an issue, then the following shorter pieces of drive steel should be used:

1	#50231	SG-14 drive steel shank
1	#50236	SG-3 drive steel radius tip (30")
6	#50233	SG-2 drive steel extension (33")
6	#50240	SG-4 drive steel couplers
- 4) Drive steel is available in 8 ft. lengths. These are sometimes too long to be practical, but sometimes they are just right:

#50239	SG-3-96 Drive steel radius tip (8')
#50235	SG-2-96 Drive steel extension (8')
- 5) In general, use the fewest pieces of drive steel as practically possible. This typically results in a faster installation time.



6.1 Hand driving tips:

- 1) Remember that Manta Ray drive steel has left hand threads. Be sure to completely thread the steel into the couplers or premature coupler failure will occur. Lubricate the ID of the couplers and the OD of the threaded ends of the drive steel prior to assembly. Spray lubricants such as WD-40 (or equivalent) work well and can significantly prolong the life of the drive steel. CAUTION: Manta Ray drive steel, especially couplers can become quite hot on long drives through hard soil. Wear gloves when unthreading couplers and adding extensions.
- 2) Care must be taken to maintain proper alignment during driving and to support the weight of the hammer so it does not side load and bind the SG-4 couplers. If proper alignment is not maintained, then premature coupler failure will occur. A Support Slide made of a 1 x 6 lumber can be a great help.
- 3) Digging a pocket or shelf into the bank at each anchor location helps a lot. The shelf should be wide enough to accommodate the Load Locker base.
- 4) Remember that Manta ray anchors pull back approximately 1 – 2 lengths of the anchor during load locking. Be sure to drive the anchors deep enough to account for this pull back. In very soft soils with larger anchors this pull back may be as much as 3 – 4 feet.
- 5) In some hard soils anchor driving can be very slow. In these cases pre drilling a 4” diameter pilot hole with Foresight’s LB-1 Earth Auger (#50093) can reduce installation time significantly without loss of holding power. The LB-1 Earth Auger is powered by the same hydraulic power unit as the Hydraulic Hammer and the Load Locker. It comes with one 3ft. x 4” diameter auger tip and two 3ft. extensions. Extra extensions are available.
- 6) It is recommended that the drive steel be uncoupled, cleaned and lubricated after each anchor drive. Sticky, wet clay soils have a tendency to fill all of the space inside the couplers and if it is allowed to dry in place, uncoupling the steel will be very difficult. If this happens, flush the couplers with water and work the steel “back and forth” while rotating to break the pieces free. Remember that the drive steel uses left-handed threads.

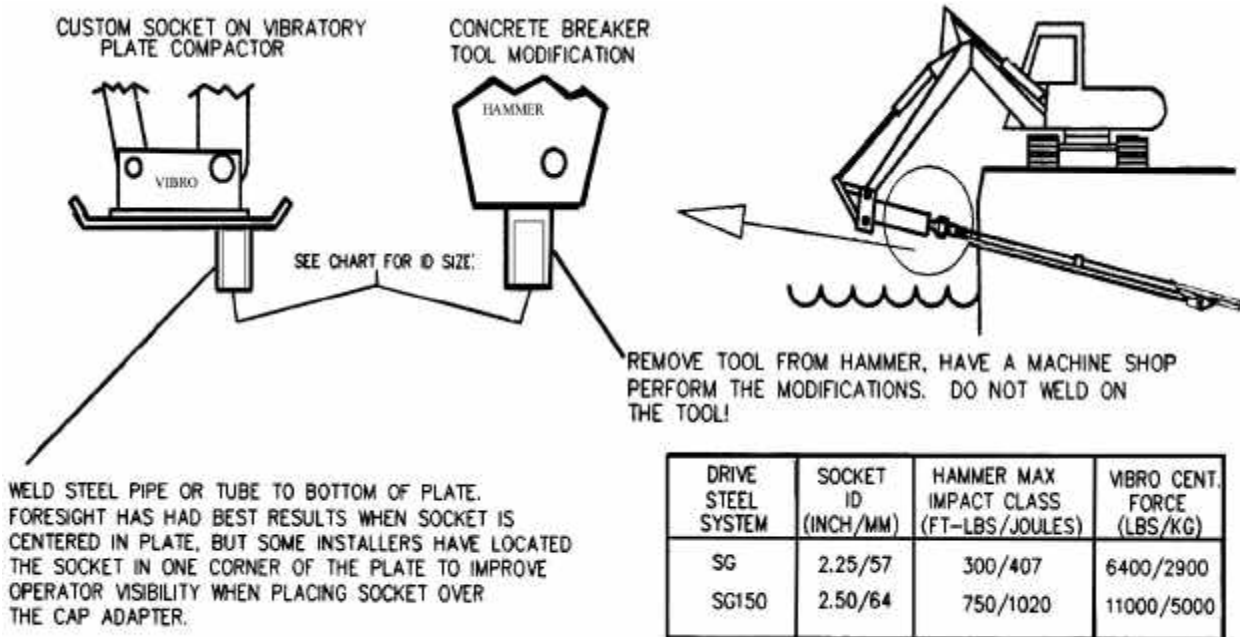
6.2 Load locking tips:

- 1) Set the Load Locker bypass valve to limit the proof test force to the requirement for your project. Instructions for setting the bypass valve are included with each Load Locker.
- 2) Fully Shift the control valve handle toward the cylinder to extend the cylinder. Extend the cylinder until it reaches the top of its stroke or until the required proof test load is achieved. Usually it takes 3 to 4 cycles of the cylinder to achieve the required proof test load. In some very competent soils it takes one stroke or less.
- 3) In some very soft soils as much as 3- 4 feet of pullback will be required. In general, if the anchor has pulled back 3 – 4 feet without achieving the required load, then the soil is too soft and a larger anchor should be used, or a different installation angle or length should be used to get the anchor into more competent soil.
- 4) If the required proof test load is not achieved, use the load locker to determine the actual holding capacity of the anchor. Do this by partially shifting the control valve and “feathering” it to determine the maximum the anchor will hold without movement, and contact the project engineer. Use this tested capacity and the holding capacity chart to choose a larger anchor size, or to adjust the spacing between anchors to achieve the required capacity for the entire wall.

6.3 Mechanized Driving Tips:

- 1) Vehicle mounted pavement breakers and vibratory plate compactors are very effective tools for driving Manta ray anchors, but a bit more care is required to maintain alignment of the drive steel during installation. It is easy to be misaligned which causes premature drive steel failure and difficult drive steel removal.
- 2) When using vehicle-mounted tools, a Socket adapter is used. The socket adapter threads onto the drive steel and makes a socket to accept a blunt tool. Contact Foresight for socket adapter sizes.
- 3) Some contractors remove the concrete Breaking tool from the hammer and have it “bored out” to a loose slip fit over the Drive Steel or a Cap Adapter. Do not weld on the concrete breaking tool this will damage the heat treat and the welds will break. See sketch below for details.
- 4) The maximum recommended size for pavement breakers and Manta Ray SG series drive steel is the 300 ft-lb. Class. If larger sizes are used then the Manta Ray SG150 series of drive steel should be used. Please consult directly with Foresight Products or your Manta Ray Distributor. Contact for socket adapter sizes.
- 5) When using a Vibratory plate compactor, a socket is welded onto the bottom of the vibro. This socket “captures” the Cap Adapter to keep it from sliding off the plate. See sketch below for details.
- 6) In general a rubber tired Backhoe loader or a tracked small excavator provides the most versatility for mechanized installation.

A Pavement Breaker attachment on a skid steer loader is a very effective method of Manta Ray installation, but requires access to the front side of the wall, and is not as versatile as the backhoe loaders or excavators.

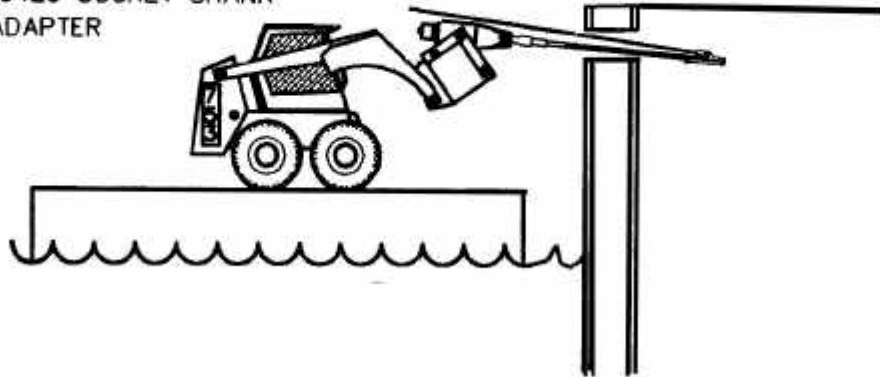


EXCAVATOR WITH MOUNTED BREAKER OR COMPACTOR

6.3 Mechanized Driving Tips Continued:

PAVEMENT BREAKER ON SKID STEER ON BARGE

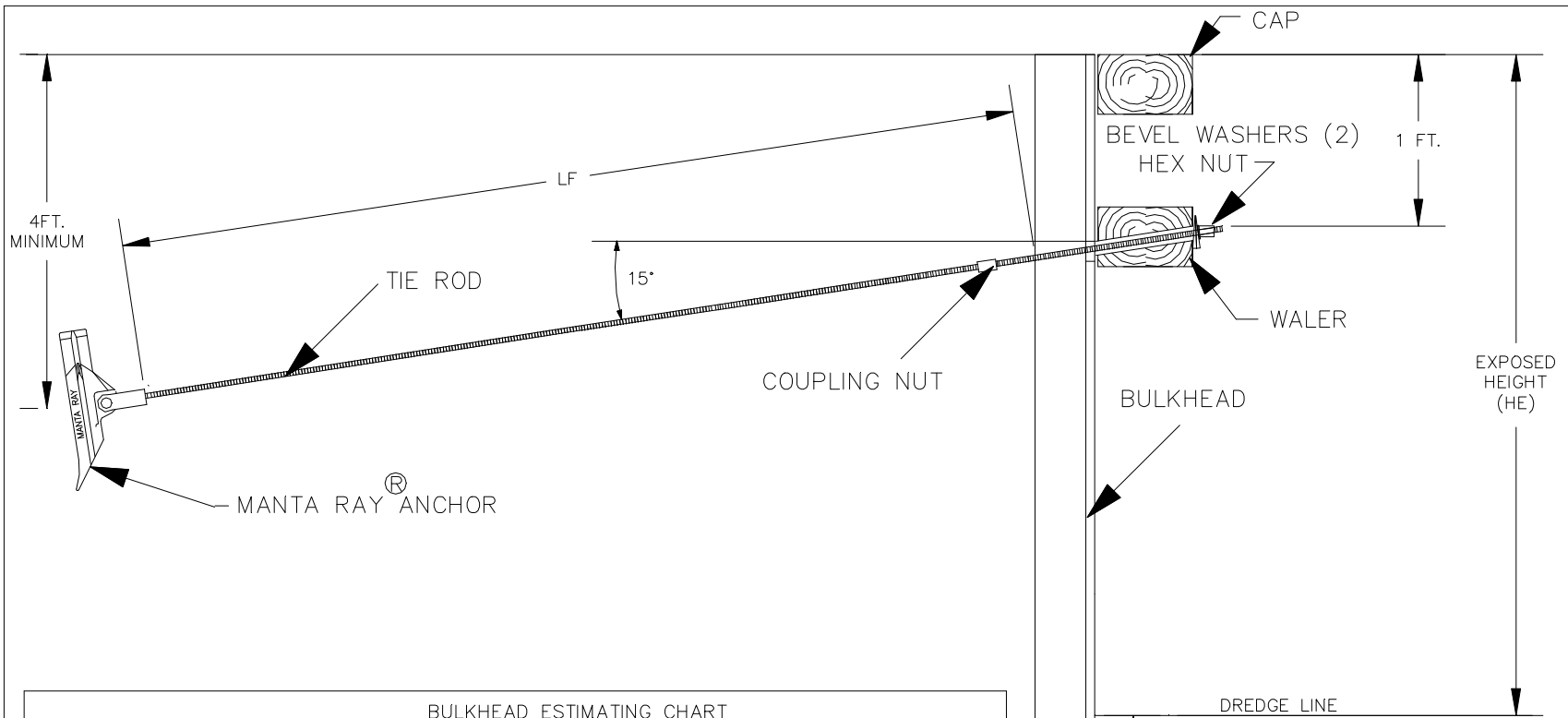
BOBCAT #2560 HYDRAULIC PAVEMENT BREAKER ATTACHMENT
WITH FORESIGHT #50426 SOCKET SHANK
AND #50464 CAP ADAPTER



SECTION 7 FOR MORE INFORMATION:

Contact: Foresight Products, LLC
6430 E. 49th Drive
Commerce City, Colorado 80022 USA
303 286-8955 Phone
303 287-3866 Fax
www.earthanchor.com World Wide Web
foresight@earthanchor.com E-mail

Please visit the Manta Ray web site and click on the Manta Ray Engineering and Technical Data for much more detailed information.



BULKHEAD ESTIMATING CHART						
EXPOSED HEIGHT HE (FT.)	MINIMUM SHEET EMBEDMENT LE (FT.)	MINIMUM LONG TERM MOMENT CAPACITY (FT.-LBS.)	MAXIMUM MANTA RAY SPACING (FT.)	SUGGESTED MANTA RAY TIE ROD LENGTH (FT.)	MINIMUM MANTA RAY PROOF TEST (LBS.)	MINIMUM FINISHED MANTA RAY LENGTH BEHIND BULKHEAD - LF (FT.)
2' - 4'	3.5	800	6	12.0	5000 LBS	8.5
4' - 6'	5.5	3000	5	13.0	9000 LBS	10.0
6' - 8'	7.5	7500	5	15.0	15000 LBS	12.0
ABOVE 8'	CONSULT LOCAL PROFESSIONAL ENGINEER					

THIS IS NOT A DESIGN CHART. YOU MUST CONSULT A REGISTERED PROFESSIONAL ENGINEER FOR APPROVED PLANS.

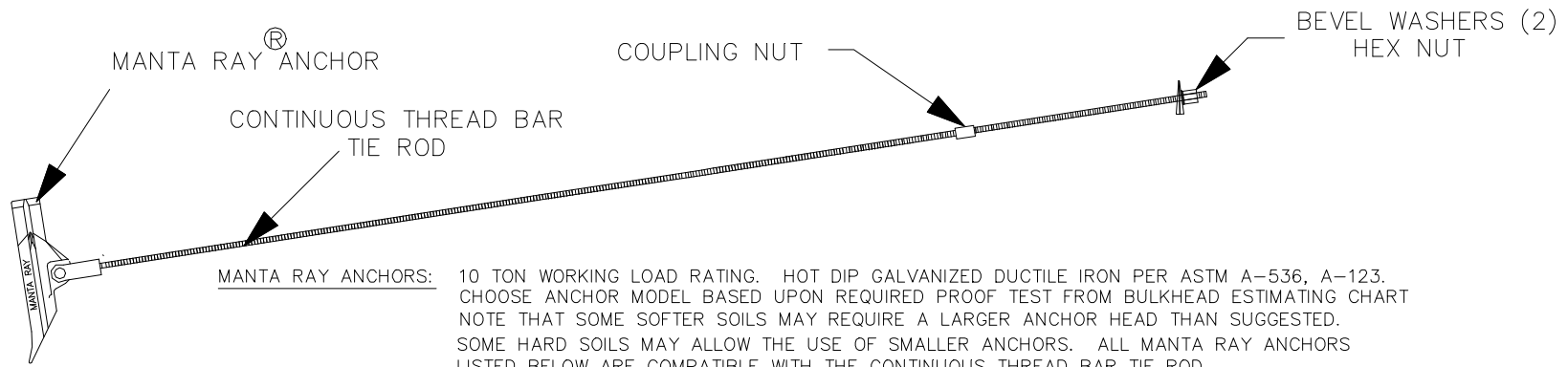
SEE SHEET 2 FOR COMPONENT SPECIFICATIONS
SEE SHEET 3 FOR INSTALLATION AND TESTING GUIDELINES



FORESIGHT PRODUCTS LLC
(303) 286-8955

MANTA RAY TIE BACKS FOR BULKHEADS

title	
S20390 SHEET 1	
number	rev



MANTA RAY ANCHORS: 10 TON WORKING LOAD RATING. HOT DIP GALVANIZED DUCTILE IRON PER ASTM A-536, A-123. CHOOSE ANCHOR MODEL BASED UPON REQUIRED PROOF TEST FROM BULKHEAD ESTIMATING CHART. NOTE THAT SOME SOFTER SOILS MAY REQUIRE A LARGER ANCHOR HEAD THAN SUGGESTED. SOME HARD SOILS MAY ALLOW THE USE OF SMALLER ANCHORS. ALL MANTA RAY ANCHORS LISTED BELOW ARE COMPATIBLE WITH THE CONTINUOUS THREAD BAR TIE ROD

EXPOSED HEIGHT HE (FT.)	SUGGESTED MANTA RAY MODEL	LENGTH (IN.)	WIDTH (IN.)	BEARING AREA (SQ. IN.)
2' - 4'	MR-2-CTB	14.5	3.5	41
4' - 6'	MR-1-CTB	14.5	7	71
6' - 8'	MR-SR-CTB	17.2	12.5	142

CONTINUOUS THREAD BAR TIE ROD (CTB): 10 TON WORKING LOAD RATING. HOT DIP GALVANIZED STEEL PER ASTM A-615 GRADE 75 , A-153. .80" DIAMETER X 5 THREADS PER INCH LEFT HAND COARSE SPEED THREAD
10 FOOT LENGTH (CTB-10) IS STANDARD OTHER LENGTHS MAY BE AVAILABALE ON A SPECIAL ORDER BASIS

CONTINUOUS THREAD BAR (CTB) HARDWARE : 10 TON WORKING LOAD RATING. HOT DIP GALVANIZED STEEL PER ASTM A-153.
STOP COUPLING : 1.25" DIAMETER X 4.5" LONG WITH MIDDLE STOP
BEVEL WASHER : 2.0" SQUARE X 9° BEVEL
HEX NUT : 1.25" HEX X 1.5" LONG

CAP AND WALER : PROJECT SPECIFIC. CONSULT BULKHEAD MANUFACTURER FOR SUGGESTIONS, MUST BE APPROVED BY REGISTERED PROFESSIONAL ENGINEER

ANALYTICAL PARAMETERS: LEVEL BACKSLOPE, 0 SURCHARGE, GOOD DRAINAGE
GRANULAR SOILS - 120 PCF, ϕ MIN 25°
COHESIVE SOILS - 120 PCF, C= 0 ABOVE DREDGE LINE
CMIN BELOW DREDGE LINE = .25 X DENSITY X HE
COHESIVE SOIL ANALYSIS CONTROLS DESIGN, HOLDING CAPACITY SAFETY FACTOR = 1.5

DESIGN LIFE : SOIL AND SITE SPECIFIC. MANTA RAY ANCHORS AND CONTINUOUS THREAD BAR HARDWARE ARE DESIGNED FOR A 50 YEAR LIFE BASED UPON AVERAGE SOIL CONDITIONS IN A MARINE ENVIRONMENT PROVIDED GOOD CONSTRUCTION PRACTICES ARE FOLLOWED.

TECHNICAL ASSISTANCE: LIMITED TECHNICAL ASSISTANCE IS AVAILABLE TO SELECT PROPER ANCHOR. USCS SOIL CLASSIFICATION AND SPT BLOW COUNT REQUIRED TO ESTIMATE ANCHOR PERFORMANCE.

STRONGLY SUGGESTED REFERENCE DOCUMENT: INTRODUCTION TO MANTA RAY AND STINGRAY EARTH ANCHORS

SEE SHEET 1 FOR BULKHEAD ESTIMATING CHART
SEE SHEET 3 FOR INSTALLATION AND TESTING GUIDELINES



COMPONENT SPECIFICAIONS
MANTA RAY TIE BACKS
FOR BULKHEADS

title

S20390 SHEET 2

number

rev

3C:\FORSIGHT\SKETCHES\S20390

STRONGLY SUGGESTED REFERENCE DOCUMENT: MANTA RAY TIEBACK ANCHORS FOR VINYL SEAWALLS

MANTA RAY DRIVING TOOLS: RADIUS TIP DRIVE STEEL: SG-3-72 - 6FT. LONG ONE END FITS ANCHOR OTHER END THREADED FOR COUPLERS
DRIVE STEEL COUPLERS : SG-4 9" LONG X 1.75" OD LEFT HAND PARTIAL THREAD FITS ALL SG STYLE DRIVE STEEL
SUGGESTED QUANTITY: 3
DRIVE STEEL EXTENSIONS : SG-2-72 6' LONG BOTH ENDS THREADED FOR COUPLERS OR DRIVE SHANKS
SUGGESTED QUANTITY: 2
DRIVE STEEL SHANKS : FOR HAND DRIVING WITH 90 LB. PNEUMATIC OR HYDRAULIC PAVEMENT BREAKER:
OR ON MANTA RAY DRIVE MAST.
SG-14 1 1/4" X 6" HEX SHANK
SUGGESTED QUANTITY: 1
FOR DRIVING WITH BOOM MOUNTED PAVEMENT BREAKER WITH 2.5" - 3.5" BLUNT TOOL:
SOCKET ADAPTER-SG - SIZE TO FIT TOOL DIAMETER IN MOUNTED BREAKER.
SUGGESTED QUANTITY: 1
FOR DRIVING WITH BOOM MOUNTED COMPACTOR:
CAP ADAPTER-SG - 1.75" DIAMETER CAP THREADED TO MATCH SG DRIVE STEEL
VIBRO SOCKET - SG 2.25" ID SOCKET TO WELD TO BOTTOM OF PLATE COMPACTOR
SUGGESTED QUANTITY: 1 OF EACH

SUGGESTED DRIVE DEPTH: 3FT. BEYOND MINIMUM FINISHED LENGTH ALLOWS FOR MANTA RAY PULL BACK DURING PROOF TESTING. THIS IS A GENERAL RULE.
ACTUAL DRIVE DEPTHS AND PULL BACK DISTANCES MUST BE FIELD DETERMINED.

MANTA RAY PROOF TEST TOOLS: LL-1-CTB LOAD LOCKER: 10 TON HYDRAULIC JACK WITH REACTION BASE AND CTB ADAPTER SETTING BAR - 1 REQUIRED
HC-16-25 : 25' X 1/2" HYDRAULIC HOSE WITH COUPLERS - 2 REQUIRED
GPU18-8 : 18 HP / 2000 PSI/ 8GPM GASOLINE POWERED HYDRAULIC POWER UNIT - 1 REQUIRED
OPTIONAL: FLOW CONTROL KIT 30-0-16 TO POWER LOAD LOCKER FROM EXCAVATOR OR BACKHOE
WITH THIS OPTION GPU18-8 IS NOT NECESSARY

USE OF PILOT HOLE: IN SOME HARD SOILS THE USE OF A 4" DIAMETER PILOT HOLE CAN SIGNIFICANTLY
DECREASE INSTALLATION TIME WITHOUT LOSS OF HOLDING CAPACITY. USE LB-1
FOR 4" DIAM. X 9' DEEP PILOT HOLES. LB-1 IS POWERED BY GPU18-8
HYDRAULIC POWER UNIT - 8GPM / 2000PSI. SOME SEVERELY HARD SOILS WILL
REQUIRE DRILLING TO FULL DEPTH, SOME WILL NOT. THIS MUST BE FIELD DETERMINED.
3' AUGER EXTENSIONS ARE AVAILABLE. BACKFILL PILOT HOLE PRIOR TO LOAD LOCKING.

PROOF TEST METHOD: AFTER LOCKING MANTA RAY WITH 1- 4 CYCLES OF LOAD LOCKER,
HOLD MINIMUM PROOF TEST FOR 1 MINUTE. IF MOVEMENT DURING 1 MINUTE HOLD IS LESS
THAN 1/2" ANCHOR IS ACCEPTABLE. IF ANCHOR FAILS CONSULT PROJECT ENGINEER.

POSSIBLE REMEDIES FOR A FAILED PROOF TEST ARE:
1) DRIVE ANCHOR DEEPER TO GET INTO MORE COMPETENT SOIL.
2) SWITCH TO LARGER ANCHOR HEAD.
3) DECREASE ANCHOR SPACING.

FINAL TORQUE: AFTER BACKFILLING, TORQUE NUTS TO 20 FT. LBS

SEE SHEET 1 FOR BULKHEAD ESTIMATING CHART
SEE SHEET 2 FOR COMPONENT SPECIFICATIONS

 FORESIGHT PRODUCTS LLC (303) 286-8955	
INSTALLATION AND TESTING MANTA RAY TIE BACKS FOR BULKHEADS	
title	
S20390 SHEET 3	
number	rev

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Don't forget to visit the Manta Ray
website at www.earthanchor.com