NAVAL FACILITIES ENGINEERING SERVICE CENTER
Port Hueneme, California 93043-4370

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MOORING DESIGN PHYSICAL AND EMPIRICAL DATA

by

NFESC Staff

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The Naval Facilities Engineering Command Criteria Office tasked the Naval Facilities Engineering Service Center (NFESC) to compile a database of mooring hardware information to support MIL-HDBK-1026/4 'Mooring Design', which is in preparation. This report provides selected physical and empirical data useful for mooring design.

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EXECUTIVE SUMMARY

The Naval Facilities Engineering Command Criteria Office tasked the Naval Facilities Engineering Service Center (NFESC) to compile a database of mooring hardware information to support MIL-HDBK-1026/4 'Mooring Design', which is in preparation. This report provides selected physical and empirical data useful for mooring design.

This report consists of a directory that lists the type of information provided, its subdirectory, the name and type of the file. In some cases the same information is provided in various forms (for example, as both a spread sheet and a picture of the spread sheet in image form), because engineers may wish to use the files in various ways.

DIRECTORY

This table lists the types of information provided, its directory, file name and file type.

Table. Listing of Empirical Information

ITEM	*FILENAME*	*DESCRIPTION*
A1	a1.xls	Capacity of Standard Navy Fleet Moorings
A2	a2.dxf	Types of Drag - Embedment Anchors
A2	a2.pcx	Types of Drag - Embedment Anchors
A3	a3.dxf	Types of Pile Anchors
A3	a3.pcx	Types of Pile Anchors
A4	a4.dxf	Types of Deadweight Anchors
A4	a4.pcx	Types of Deadweight Anchors
A5	a5.dxf	Concrete Sinker Used in Standard Navy Moorings
A5	a5.pcx	Concrete Sinker Used in Standard Navy Moorings
A6	a6.dxf	Riser-Type Buoys
A6	a6.pcx	Riser-Type Buoys
A7	a7.dxf	Marker Buoy
A7	a7.pox	Marker Buoy
B1	b1.dxf	Large Double Bitt With Lip
B1	b1.pcx	Large Double Bitt With Lip
B2	b2.dxf	Low Double Bitt w/ Lip
B2	b2.pcx	Low Double Bitt w/ Lip
B3	b3.dxf	Special Mooring Bollard "A"
B3	b3.pcx	Special Mooring Bollard "A"
B4	b4.dxf	Special Mooring Bollard "B"
B4	b4.pcx	Special Mooring Bollard "B"
B5	b5.dxf	Large Bollard With Horn
B5	b5.pcx	Large Bollard With Horn
B6	b6.dxf	42" Cleat
B6	b6.pcx	42" Cleat
B7	b7.dxf	30" Cleat
B7	b7.pcx	30" Cleat
C1	c1.dxf	Common Stud Link Chain
C1	c1.pcx	Common Stud Link Chain
C2	c2.dxf	Chain Joining Link
C2	c2.pcx	Chain Joining Link
C3	c3.dxf	Anchor Joining Link
C3	c3.pcx	Anchor Joining Link
C4	c4.dxf	Ground Ring
C4	c4.pcx	Ground Ring

C5	c5a.dxf	Swivel Shackle (Page 1 of 2)
C5	c5a.pcx	Swivel Shackle (Page 1 of 2)
C5	c5b.dxf	Swivel Shackle (Page 2 of 2)
C5	c5b.pcx	Swivel Shackle (Page 2 of 2)
C6	c6.dxf	Spider Plate
C6	c6.pcx	Spider Plate
C7	c7.dxf	Plate Sinker Shackle
C7	c7.pcx	Plate Sinker Shackle
C8	c8.dxf	Pear Link
C8	c8.pcx	Pear Link
C9	c9.dxf	End Link
C9	c9.pcx	End Link
C10	c10.dxf	Joining Shackle
C10	c10.pcx	Joining Shackle
C11	c11.dxf	Anchor Shackle
C11	c11.pcx	Anchor Shackle
C12	c12.dxf	Buoy Shackle
C12	c12.pcx	Buoy Shackle
C13	c13.xls	Mechanical Properties
C14	c14.xls	Physical Properties of Finished Chain and Accessories
C15	c15a.dxf	Buoy, Mooring, Foam Filled, Polyurethane, 8 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15a.pcx	Buoy, Mooring, Foam Filled, Polyurethane, 8 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15b.dxf	Buoy, Mooring, Foam Filled, Polyurethane, 11.5 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15b.pcx	Buoy, Mooring, Foam Filled, Polyurethane, 11.5 Ft Dia, Class AA, General Arrangement & Parts List
D1	d1e6.xls	Predicted Single Anchor Drag Distances - Stockless Anchor, Stabilizers & Flukes at 45 degrees, Seafloor Type = Mud
D1	d1e7.xls	Predicted Single Anchor Drag Distances - Stockless Anchor, Stabilizers & Flukes at 36 degrees, Seafloor Type = Sand
D1	d1e8.xls	Predicted Single Anchor Drag Distances - Stato Anchor, Stabilizers & Flukes at 50 degrees, Seafloor Type = Mud
D1	d1e9.xls	Predicted Single Anchor Drag Distances - Stato Anchor, Stabilizers & Flukes at 30 degrees, Seafloor Type = Sand
D2	d2e10.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 45 degrees, Seafloor Type = Mud
D2	d2e11.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 36 degrees, Seafloor Type = Sand
D2	d2e12.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 50 degrees, Seafloor Type = Mud
D2	d2e13.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 30 degrees, Seafloor Type = Sand
E1	e154.dxf	Spherical Marker or Mooring Buoy
E1	e154.pcx	Spherical Marker or Mooring Buoy
E1	e155.dxf	Spherical Marker or Mooring Buoy
E1	e155.pcx	Spherical Marker or Mooring Buoy
E1	e156.dxf	Spherical Marker or Mooring Buoy
E1	e156.pcx	Spherical Marker or Mooring Buoy

E1	e157.dxf	Tension Bar Mooring Buoys
E1	e157.pcx	Tension Bar Mooring Buoys
E1	e158.dxf	Tension Bar Mooring Buoys
E1	e158.pcx	Tension Bar Mooring Buoys
E1	e159.dxf	Hawsepipe and Tension Bar Buoys
E1	e159.pcx	Hawsepipe and Tension Bar Buoys
E1	e160.dxf	Hawsepipe and Tension Bar Mooring Buoys
E1	e160.pcx	Hawsepipe and Tension Bar Mooring Buoys
E1	e162.dxf	Concrete Sinkers
E1	e162.pcx	Concrete Sinkers
E1	e165.xls	Holding Power to Weight Ratio of Various Anchors
E1	e169a.xls	Moorings Without Sinkers Bills of Materials
E1	e170.xls	Moorings Without Sinkers Chain Set Assembly for Basic Depth
E1	e171.xls	Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths
E1	e172.dxf	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e172.pcx	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e174.xls	Moorings Without Sinkers Bills of Materials
E1	e175.xls	Moorings Without Sinkers Chain Set Assembly for Basic Depth
E1	e176.xls	Moorings Without Sinkers Maximum Mooring Depths With Various Buoys
E1	e178.dxf	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e178.pcx	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e177.xls	Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths
E1	e181.xls	Moorings With Sinkers - Bills of Materials
E1	e182.xls	Moorings With Sinkers - Chain Set Assembly for Basic Depth
E1	e183.xls	Moorings With Sinkers - Maximum Mooring Depths With Various Buoys
E1	e184.xls	Moorings With Sinkers - Lengths of Ground Chain Required for Various Water Depths
E1	e185.xls	Moorings With Sinkers - Chain Set Assemblies for Various Depths
E2	e2_1.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)
E2	e2_1.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)
E2	e2_2.dxf	Free-Swinging, Riser Type Mooring Without Sinkers - Class AA, BB, and CC
E2	e2_2.pcx	Free-Swinging, Riser Type Mooring Without Sinkers - Class AA, BB, and CC
E2	e2_3.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD
E2	e2_3.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD
E2	e2_4.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Class A, B, C, D, E, F, and G
E2	e2_4.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Class

		A, B, C, D, E, F, and G
E2	e2_5.dxf	Free-Swinging, Riser-Type Mooring With Sinkers - Classes A, B, C, D, and E
E2	e2_5.pcx	Free-Swinging, Riser-Type Mooring With Sinkers - Classes A, B, C, D, and E
E3	e3_10.dxf	Tension Bar Mooring Buoy
E3	e3_10.pcx	Tension Bar Mooring Buoy
E3	e3_11.dxf	Hawsepipe Mooring Buoy
E3	e3_11.pcx	Hawsepipe Mooring Buoy
E3	e3_12.dxf	Tension Bar Mooring Buoy
E3	e3_12.pcx	Tension Bar Mooring Buoy
E3	e3_9.dxf	Standard Marker or Mooring Buoy
E3	e3_9.pcx	Standard Marker or Mooring Buoy
F1	f1.dxf	Recommended NAVMOOR Anchor Size for Navy Fleet Moorings
F1	f1.pcx	Recommended NAVMOOR Anchor Size for Navy Fleet Moorings
F	f10000.dxf	Plan View - 10K navmoor Anchor
F	f10000.pcx	Plan View - 10K navmoor Anchor
F	f12000.dxf	Anchor Assembly, Mooring NAVMOOR-10, 12000 Pounds
F	f12000.pcx	Anchor Assembly, Mooring NAVMOOR-10, 12000 Pounds
F	f18000.dxf	Anchor Assembly, Mooring NAVMOOR-15, 18000 Pounds
F	f18000.pcx	Anchor Assembly, Mooring NAVMOOR-15, 18000 Pounds
F	f2400.dxf	NAVMOOR-2 Mooring Anchor 2,400 lbs. (wt.) General Assembly
F	f2400.pcx	NAVMOOR-2 Mooring Anchor 2,400 lbs. (wt.) General Assembly
F	f2700.dxf	NAVMOOR-6 Salvage Anchor 7,200 lbs. (wt.) General Assembly
F	f2700.pcx	NAVMOOR-6 Salvage Anchor 7,200 lbs. (wt.) General Assembly
G1	g1.dxf	Common Wire Rope Construction Examples
G1	g1.pcx	Common Wire Rope Construction Examples
G2	g2.xls	Fiber Rope Specification
G3	g3.xls	Plain-Laid Rope Construction
G4	g4a.xls	Braided Rope Construction
G4	g4b.xls	Braided Rope Construction - Continued
H1	h1b.dxf	Driven Plate Anchor Configuration
H1	h1b.pcx	Driven Plate Anchor Configuration
H2	h2.dxf	Anchor-Follower Assembly
H2	h2.pcx	Anchor-Follower Assembly
I1	i1.dxf	Variation of Bollard Pull with Shaft Speed for ARS-38 Class Ships
I1	i1.pcx	Variation of Bollard Pull with Shaft Speed for ARS-38 Class Ships
I2	i2.dxf	Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships
I2	i2.pcx	Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships
I3	i3.dxf	Bollard Pull vs. Shaft Speed and Propeller Pitch For T-ATF-169 Class Ship Without Kort Nozzle
I3	i3.pcx	Bollard Pull vs. Shaft Speed and Propeller Pitch For T-ATF-169 Class Ship Without Kort Nozzle
J1	j1.dxf	Chocks for Nylon Rope
J1	j1.pcx	Chocks for Nylon Rope
J2	j2.dxf	Bitts for Nylon Rope
J2	j2.pcx	Bitts for Nylon Rope
J3	j3.dxf	Vertical Howser Reels
J3	j3.pcx	Vertical Howser Reels
J4	j4.dxf	Horizontal Hawser Reels

J4	j4.pcx	Horizontal Hawser Reels
J5	j5.dxf	Capstan Head Sizes for Nylon Ropes
J5	j5.pcx	Capstan Head Sizes for Nylon Ropes
J6	j6_54.xls	Three-Strand Nylon Rope
J6	j6_55.xls	Plaited Nylon
J6	j6_56.xls	Double Braided Nylon Rope
J6	j6_57.xls	Plaited Continuous Polyester Filament with Staple Wrap & Three-Strand Polyester
J6	j6_58.xls	Three-Strand Polypropylene & Double Braided Polyester Filament With Staple Wrap
J6	j6_59.xls	Three-Strand Dual Fiber & Plaited Dual Fiber
J7	j7.xls	Minimum Number of Lines Used in Preliminary Mooring Analysis
K1	k1.dxf	U.S. Navy Stockless Anchor
K1	k1.pcx	U.S. Navy Stockless Anchor
L1	L1.WK1	NAVSEASYSCOM allhulls listing of ship information
L2	L2.xls	NAVSEASYSCOM ship chain specification data
L3	L3.xls	NAVSEASYSCOM fiber rope specification data
L4	L4.xls	NAVSEASYSCOM shackle specification data
L5	L5.xls	NAVSEASYSCOM wire rope specification data

APPENDIX A

MOORING DESIGN PHYSICAL AND EMPIRICAL DATA

APPENDIX A
MOORING DESIGN PHYSICAL AND EMPIRICAL DATA

This appendix includes various supporting figures, tables and drawings in digital form that support the handbook. Table A-1 lists the file names and gives a description of each data file.

Table A-1. Listing of Empirical Information

ITEM	*FILENAME*	*DESCRIPTION*
A1	a1.xls	Capacity of Standard Navy Fleet Moorings
A2	a2.dxf	Types of Drag - Embedment Anchors
A2	a2.pcx	Types of Drag - Embedment Anchors
A3	a3.dxf	Types of Pile Anchors
A3	a3.pcx	Types of Pile Anchors
A4	a4.dxf	Types of Deadweight Anchors
A4	a4.pcx	Types of Deadweight Anchors
A5	a5.dxf	Concrete Sinker Used in Standard Navy Moorings
A5	a5.pcx	Concrete Sinker Used in Standard Navy Moorings
A6	a6.dxf	Riser-Type Buoys
A6	a6.pcx	Riser-Type Buoys
A7	a7.dxf	Marker Buoy
A7	a7.pcx	Marker Buoy
B1	b1.dxf	Large Double Bitt With Lip
B1	b1.pcx	Large Double Bitt With Lip
B2	b2.dxf	Low Double Bitt w/ Lip
B2	b2.pcx	Low Double Bitt w/ Lip
B3	b3.dxf	Special Mooring Bollard "A"
B3	b3.pcx	Special Mooring Bollard "A"
B4	b4.dxf	Special Mooring Bollard "B"
B4	b4.pcx	Special Mooring Bollard "B"
B5	b5.dxf	Large Bollard With Horn
B5	b5.pcx	Large Bollard With Horn
B6	b6.dxf	42" Cleat
B6	b6.pcx	42" Cleat
B7	b7.dxf	30" Cleat
B7	b7.pcx	30" Cleat
C1	c1.dxf	Common Stud Link Chain
C1	c1.pcx	Common Stud Link Chain
C2	c2.dxf	Chain Joining Link
C2	c2.pcx	Chain Joining Link
C3	c3.dxf	Anchor Joining Link

C3	c3.pcx	Anchor Joining Link
C4	c4.dxf	Ground Ring
C4	c4.pcx	Ground Ring
C5	c5a.dxf	Swivel Shackle (Page 1 of 2)
C5	c5a.pcx	Swivel Shackle (Page 1 of 2)
C5	c5b.dxf	Swivel Shackle (Page 2 of 2)
C5	c5b.pcx	Swivel Shackle (Page 2 of 2)
C6	c6.dxf	Spider Plate
C6	c6.pcx	Spider Plate
C7	c7.dxf	Plate Sinker Shackle
C7	c7.pcx	Plate Sinker Shackle
C8	c8.dxf	Pear Link
C8	c8.pcx	Pear Link
C9	c9.dxf	End Link
C9	c9.pcx	End Link
C10	c10.dxf	Joining Shackle
C10	c10.pcx	Joining Shackle
C11	c11.dxf	Anchor Shackle
C11	c11.pcx	Anchor Shackle
C12	c12.dxf	Buoy Shackle
C12	c12.pcx	Buoy Shackle
C13	c13.xls	Mechanical Properties
C14	c14.xls	Physical Properties of Finished Chain and Accessories
C15	c15a.dxf	Buoy, Mooring, Foam Filled, Polyurethane, 8 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15a.pcx	Buoy, Mooring, Foam Filled, Polyurethane, 8 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15b.dxf	Buoy, Mooring, Foam Filled, Polyurethane, 11.5 Ft Dia, Class AA, General Arrangement & Parts List
C15	c15b.pcx	Buoy, Mooring, Foam Filled, Polyurethane, 11.5 Ft Dia, Class AA, General Arrangement & Parts List
D1	d1e6.xls	Predicted Single Anchor Drag Distances - Stockless Anchor, Stabilizers & Flukes at 45 degrees, Seafloor Type = Mud
D1	d1e7.xls	Predicted Single Anchor Drag Distances - Stockless Anchor, Stabilizers & Flukes at 36 degrees, Seafloor Type = Sand
D1	d1e8.xls	Predicted Single Anchor Drag Distances - Stato Anchor, Stabilizers & Flukes at 50 degrees, Seafloor Type = Mud
D1	d1e9.xls	Predicted Single Anchor Drag Distances - Stato Anchor, Stabilizers & Flukes at 30 degrees, Seafloor Type = Sand
D2	d2e10.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 45 degrees, Seafloor Type = Mud
D2	d2e11.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 36 degrees, Seafloor Type = Sand
D2	d2e12.xls	Predicted Single Anchor Drag Distances - Tandem Stockless Anchor, Stabilizers & Flukes at 50 degrees, Seafloor Type = Mud
D2	d2e13.xls	Predicted Single Anchor Drag Distances - Tandem Stockless

		Anchor, Stabilizers & Flukes at 30 degrees, Seafloor Type = Sand
E1	e154.dxf	Spherical Marker or Mooring Buoy
E1	e154.pcx	Spherical Marker or Mooring Buoy
E1	e155.dxf	Spherical Marker or Mooring Buoy
E1	e155.pcx	Spherical Marker or Mooring Buoy
E1	e156.dxf	Spherical Marker or Mooring Buoy
E1	e156.pcx	Spherical Marker or Mooring Buoy
E1	e157.dxf	Tension Bar Mooring Buoys
E1	e157.pcx	Tension Bar Mooring Buoys
E1	e158.dxf	Tension Bar Mooring Buoys
E1	e158.pcx	Tension Bar Mooring Buoys
E1	e159.dxf	Hawsepipe and Tension Bar Buoys
E1	e159.pcx	Hawsepipe and Tension Bar Buoys
E1	e160.dxf	Hawsepipe and Tension Bar Mooring Buoys
E1	e160.pcx	Hawsepipe and Tension Bar Mooring Buoys
E1	e162.dxf	Concrete Sinkers
E1	e162.pcx	Concrete Sinkers
E1	e165.xls	Holding Power to Weight Ratio of Various Anchors
E1	e169a.xls	Moorings Without Sinkers Bills of Materials
E1	e170.xls	Moorings Without Sinkers Chain Set Assembly for Basic Depth
E1	e171.xls	Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths
E1	e172.dxf	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e172.pcx	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e174.xls	Moorings Without Sinkers Bills of Materials
E1	e175.xls	Moorings Without Sinkers Chain Set Assembly for Basic Depth
E1	e176.xls	Moorings Without Sinkers Maximum Mooring Depths With Various Buoys
E1	e178.dxf	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e178.pcx	Moorings Without Sinkers Chain Set Assemblies for Various Water Depths
E1	e177.xls	Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths
E1	e181.xls	Moorings With Sinkers - Bills of Materials
E1	e182.xls	Moorings With Sinkers - Chain Set Assembly for Basic Depth
E1	e183.xls	Moorings With Sinkers - Maximum Mooring Depths With Various Buoys
E1	e184.xls	Moorings With Sinkers - Lengths of Ground Chain Required for Various Water Depths
E1	e185.xls	Moorings With Sinkers - Chain Set Assemblies for Various Depths
E2	e2_1.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)

E2	e2_1.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)
E2	e2_2.dxf	Free-Swinging, Riser Type Mooring Without Sinkers - Class AA, BB, and CC
E2	e2_2.pcx	Free-Swinging, Riser Type Mooring Without Sinkers - Class AA, BB, and CC
E2	e2_3.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD
E2	e2_3.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD
E2	e2_4.dxf	Free-Swinging, Riser-Type Mooring Without Sinkers - Class A, B, C, D, E, F, and G
E2	e2_4.pcx	Free-Swinging, Riser-Type Mooring Without Sinkers - Class A, B, C, D, E, F, and G
E2	e2_5.dxf	Free-Swinging, Riser-Type Mooring With Sinkers - Classes A, B, C, D, and E
E2	e2_5.pcx	Free-Swinging, Riser-Type Mooring With Sinkers - Classes A, B, C, D, and E
E3	e3_10.dxf	Tension Bar Mooring Buoy
E3	e3_10.pcx	Tension Bar Mooring Buoy
E3	e3_11.dxf	Hawsepipe Mooring Buoy
E3	e3_11.pcx	Hawsepipe Mooring Buoy
E3	e3_12.dxf	Tension Bar Mooring Buoy
E3	e3_12.pcx	Tension Bar Mooring Buoy
E3	e3_9.dxf	Standard Marker or Mooring Buoy
E3	e3_9.pcx	Standard Marker or Mooring Buoy
F1	f1.dxf	Recommended NAVMOOR Anchor Size for Navy Fleet Moorings
F1	f1.pcx	Recommended NAVMOOR Anchor Size for Navy Fleet Moorings
F	f10000.dxf	Plan View - 10K navmoor Anchor
F	f10000.pcx	Plan View - 10K navmoor Anchor
F	f12000.dxf	Anchor Assembly, Mooring NAVMOOR-10, 12000 Pounds
F	f12000.pcx	Anchor Assembly, Mooring NAVMOOR-10, 12000 Pounds
F	f18000.dxf	Anchor Assembly, Mooring NAVMOOR-15, 18000 Pounds
F	f18000.pcx	Anchor Assembly, Mooring NAVMOOR-15, 18000 Pounds
F	f2400.dxf	NAVMOOR-2 Mooring Anchor 2,400 lbs. (wt.) General Assembly
F	f2400.pcx	NAVMOOR-2 Mooring Anchor 2,400 lbs. (wt.) General Assembly
F	f2700.dxf	NAVMOOR-6 Salvage Anchor 7,200 lbs. (wt.) General Assembly
F	f2700.pcx	NAVMOOR-6 Salvage Anchor 7,200 lbs. (wt.) General Assembly
G1	g1.dxf	Common Wire Rope Construction Examples
G1	g1.pcx	Common Wire Rope Construction Examples
G2	g2.xls	Fiber Rope Specification
G3	g3.xls	Plain-Laid Rope Construction
G4	g4a.xls	Braided Rope Construction
G4	g4b.xls	Braided Rope Construction - Continued
H1	h1b.dxf	Driven Plate Anchor Configuration
H1	h1b.pcx	Driven Plate Anchor Configuration
H2	h2.dxf	Anchor-Follower Assembly
H2	h2.pcx	Anchor-Follower Assembly
I1	i1.dxf	Variation of Bollard Pull with Shaft Speed for ARS-38

		Class Ships
I1	i1.pcx	Variation of Bollard Pull with Shaft Speed for ARS-38 Class Ships
I2	i2.dxf	Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships
I2	i2.pcx	Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships
I3	i3.dxf	Bollard Pull vs. Shaft Speed and Propeller Pitch For T-ATF-169 Class Ship Without Kort Nozzle
I3	i3.pcx	Bollard Pull vs. Shaft Speed and Propeller Pitch For T-ATF-169 Class Ship Without Kort Nozzle
J1	j1.dxf	Chocks for Nylon Rope
J1	j1.pcx	Chocks for Nylon Rope
J2	j2.dxf	Bitts for Nylon Rope
J2	j2.pcx	Bitts for Nylon Rope
J3	j3.dxf	Vertical Howser Reels
J3	j3.pcx	Vertical Howser Reels
J4	j4.dxf	Horizontal Hawser Reels
J4	j4.pcx	Horizontal Hawser Reels
J5	j5.dxf	Capstan Head Sizes for Nylon Ropes
J5	j5.pcx	Capstan Head Sizes for Nylon Ropes
J6	j6_54.xls	Three-Strand Nylon Rope
J6	j6_55.xls	Plaited Nylon
J6	j6_56.xls	Double Braided Nylon Rope
J6	j6_57.xls	Plaited Continuous Polyester Filament with Staple Wrap & Three-Strand Polyester
J6	j6_58.xls	Three-Strand Polypropylene & Double Braided Polyester Filament With Staple Wrap
J6	j6_59.xls	Three-Strand Dual Fiber & Plaited Dual Fiber
J7	j7.xls	Minimum Number of Lines Used in Preliminary Mooring Analysis
K1	k1.dxf	U.S. Navy Stockless Anchor
K1	k1.pcx	U.S. Navy Stockless Anchor

TABLE 2
Capacity of Standard Navy Fleet Moorings
(Riser-Type)

Class	Previous Class	Mooring Capacity (pounds)	Number of Ground Legs	Riser Chain Diameter (inches)	Type of Chain Throughout
AA	A-A	300,000	3 (Twin chain)	4	U.S. Navy Common A-Link
BB	B-B	250,000	3 (Twin chain)	3-1/2	U.S. Navy Common A-Link
CC	C-C	200,000	3 (Twin chain)	3-1/2	U.S. Navy Common A-Link
DD	D-D	175,000	3 (Single chain)	3	U.S. Navy Common A-Link
A	A	150,000	3 (Single chain)	2-3/4	U.S. Navy Common A-Link
B	B	125,000	3 (Single chain)	2-1/2	U.S. Navy Common A-Link
C	C	100,000	3 (Single chain)	2-1/4	U.S. Navy Common A-Link
D	D	75,000	3 (Single chain)	2	U.S. Navy Common A-Link
E	E	50,000	3 (Single chain)	1-3/4	U.S. Navy Common A-Link
F	F	25,000	3 (Single chain)	1-1/4	U.S. Navy Common A-Link
G	G	5,000	3 (Single chain)	3/4	U.S. Navy Common A-Link

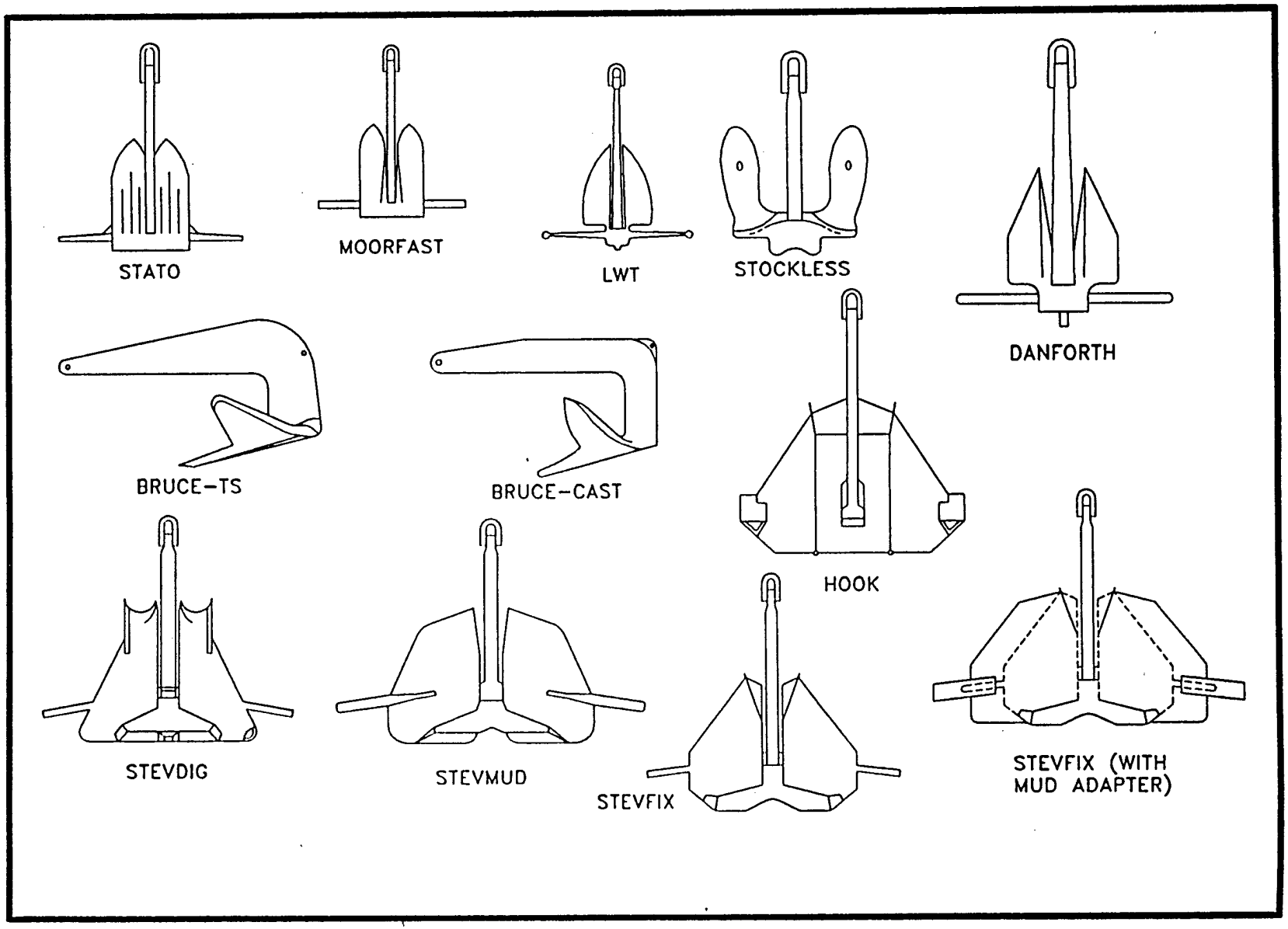


FIGURE 14
Types of Drag–Embedment Anchors

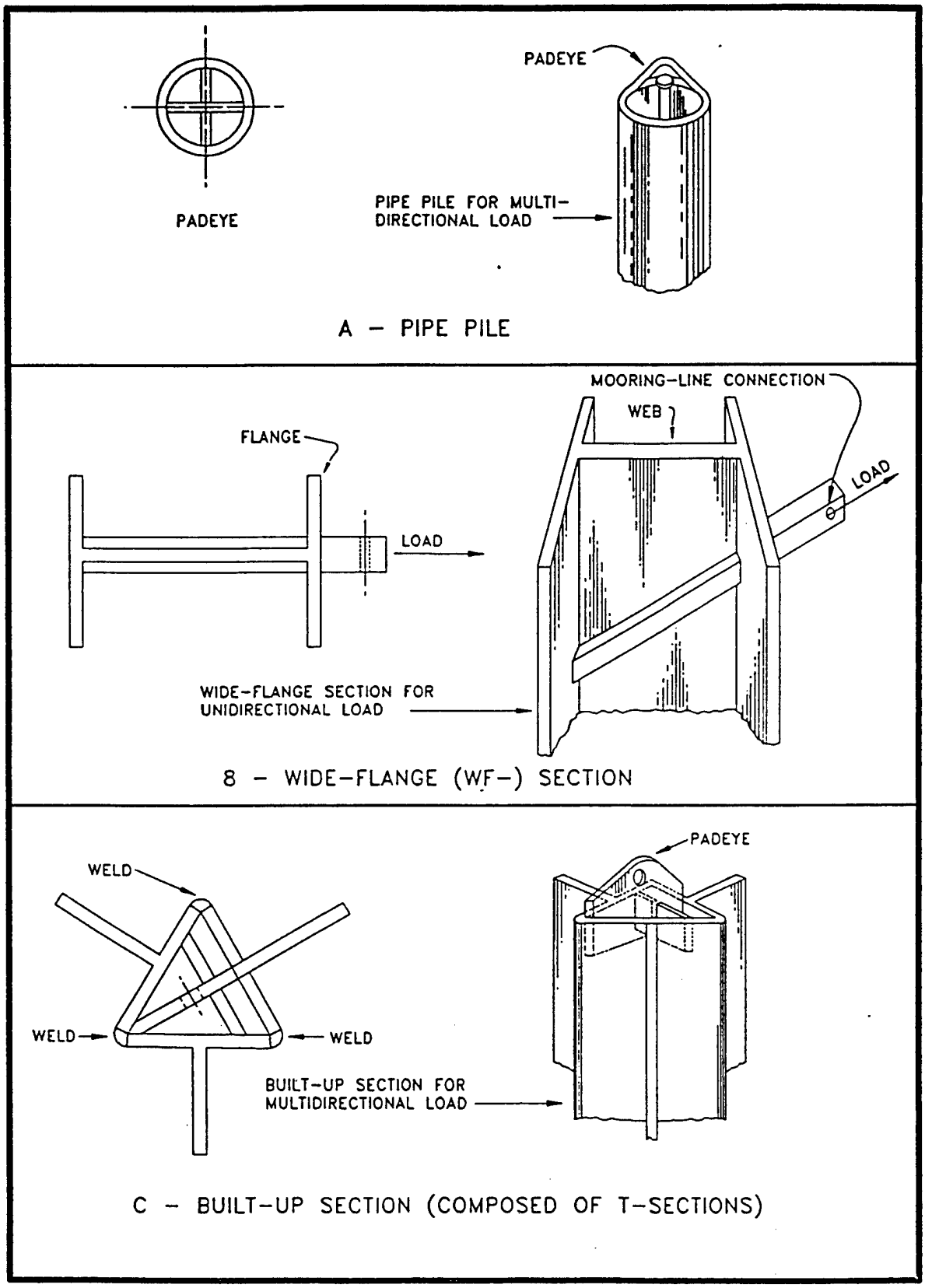


FIGURE 16
Types of Pile Anchors

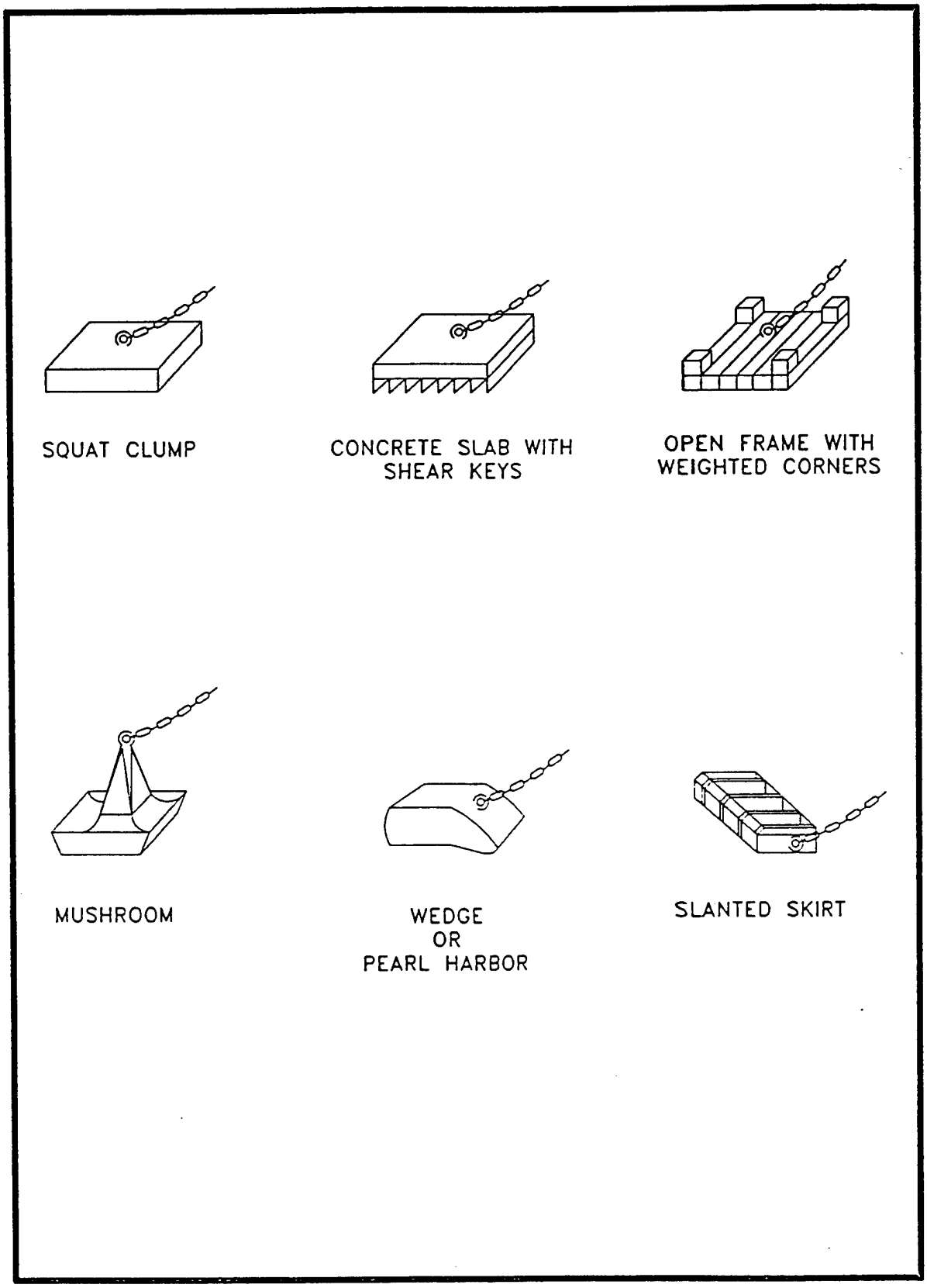


FIGURE 16

Types of Deadweight Anchors

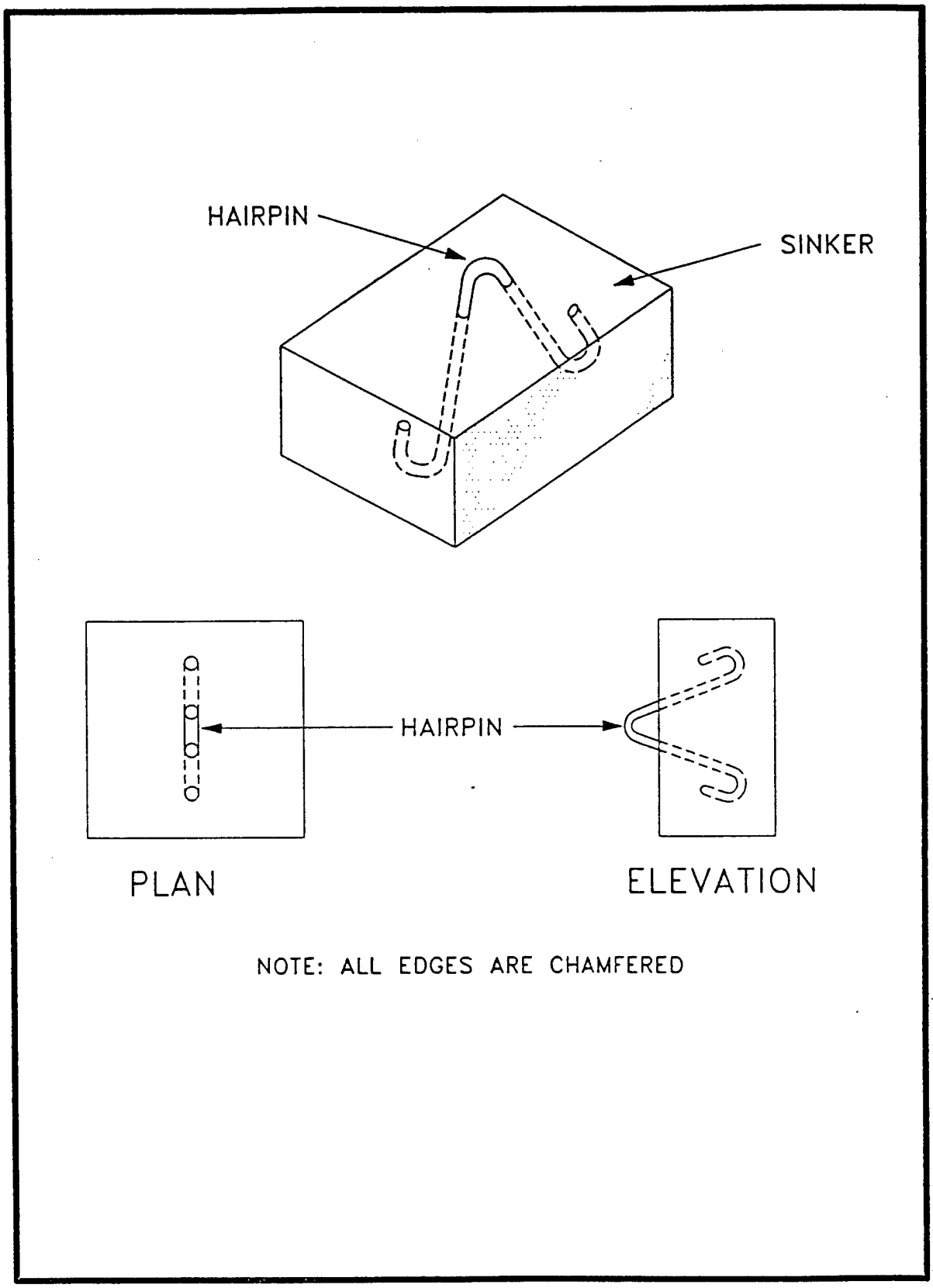


FIGURE 24
Concrete Sinker Used in Standard Navy Moorings

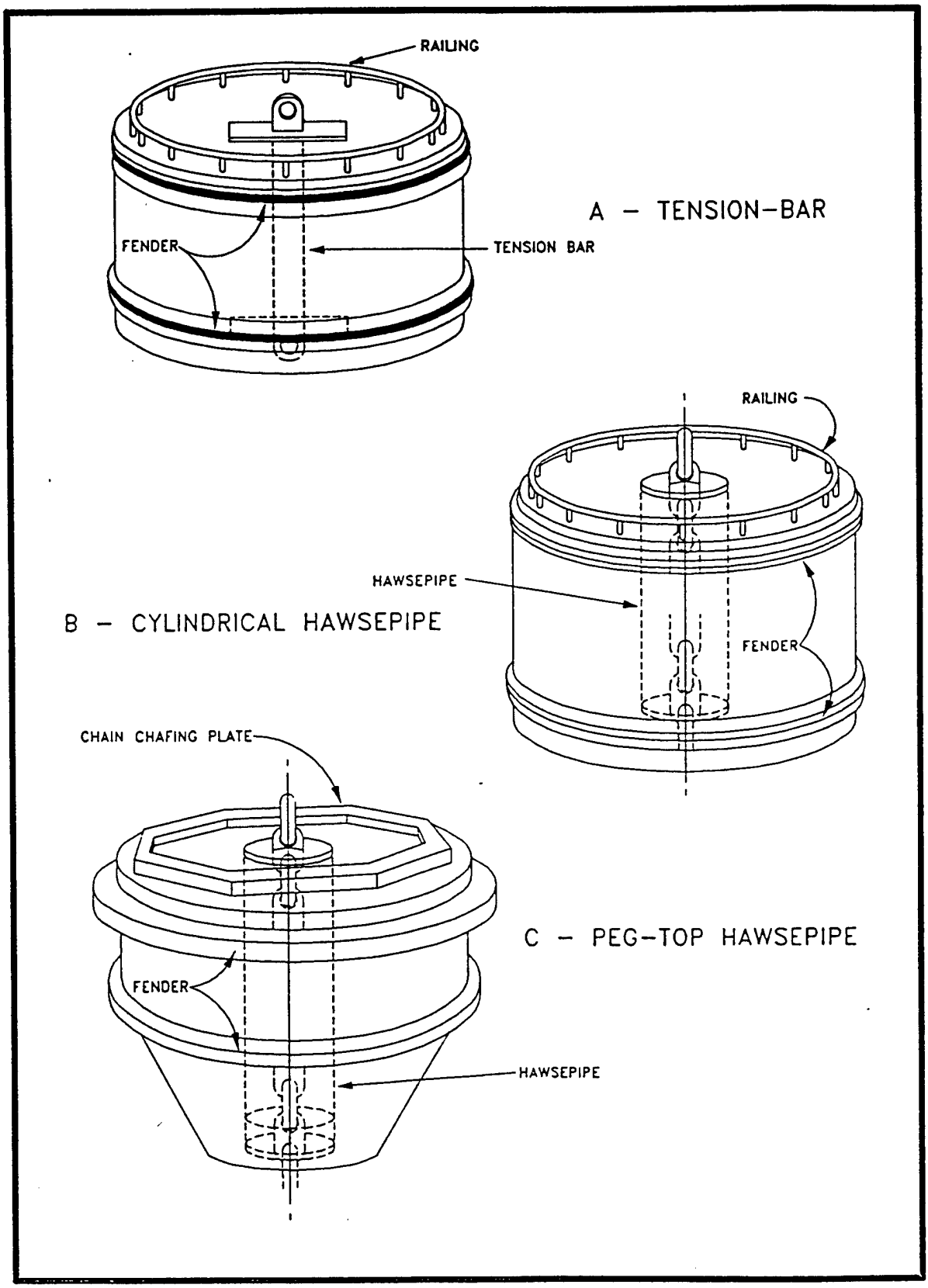


FIGURE 36
Riser–Type Buoys

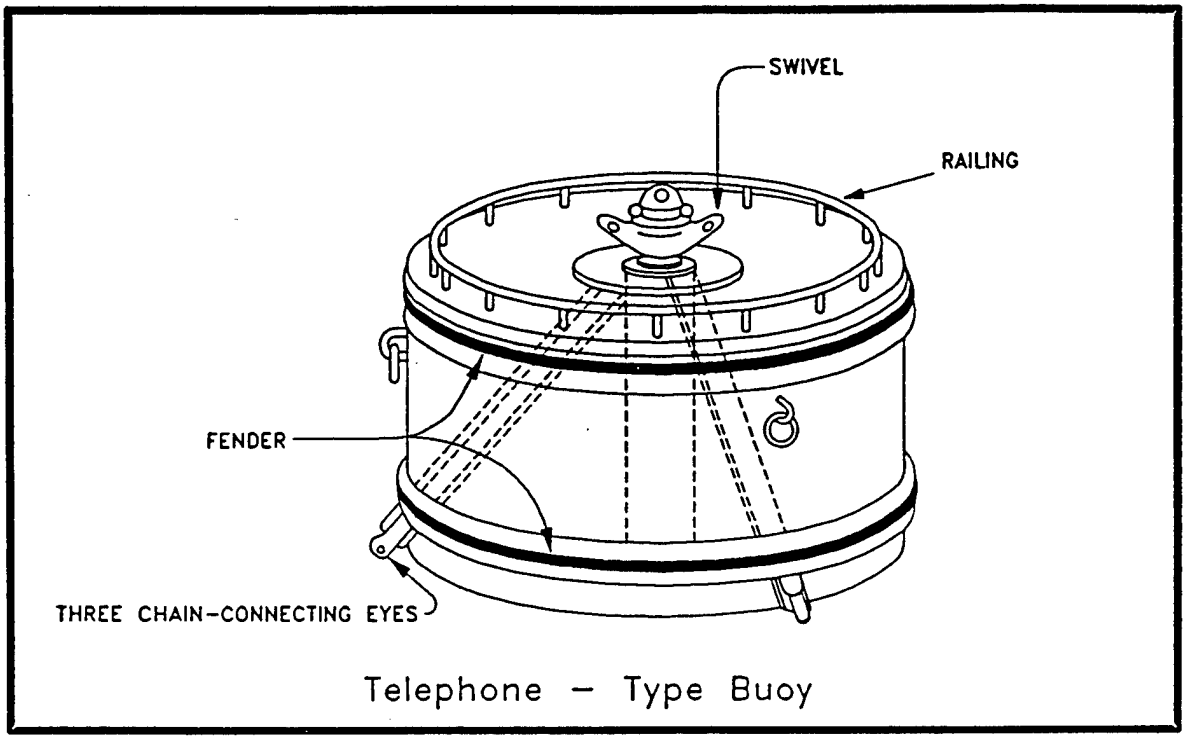


FIGURE 37
Telephone-Type Buoy

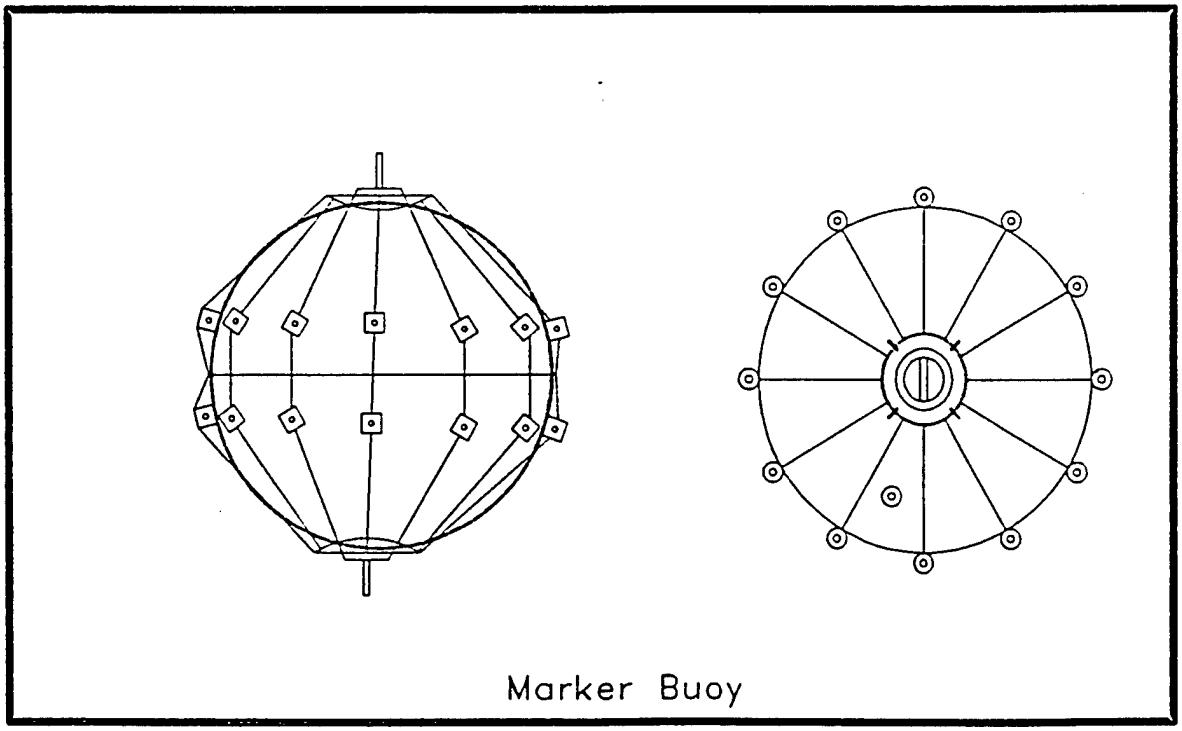
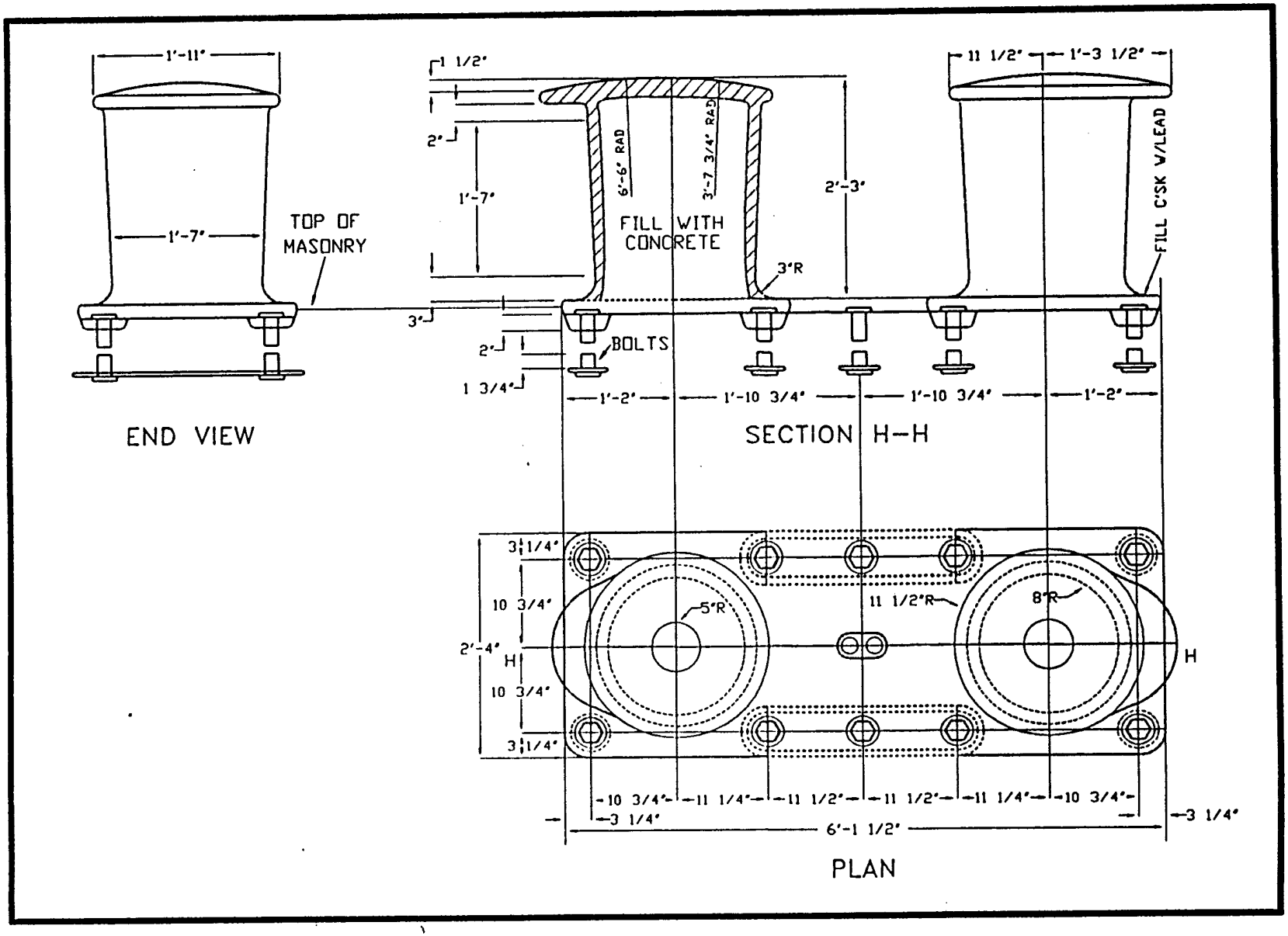


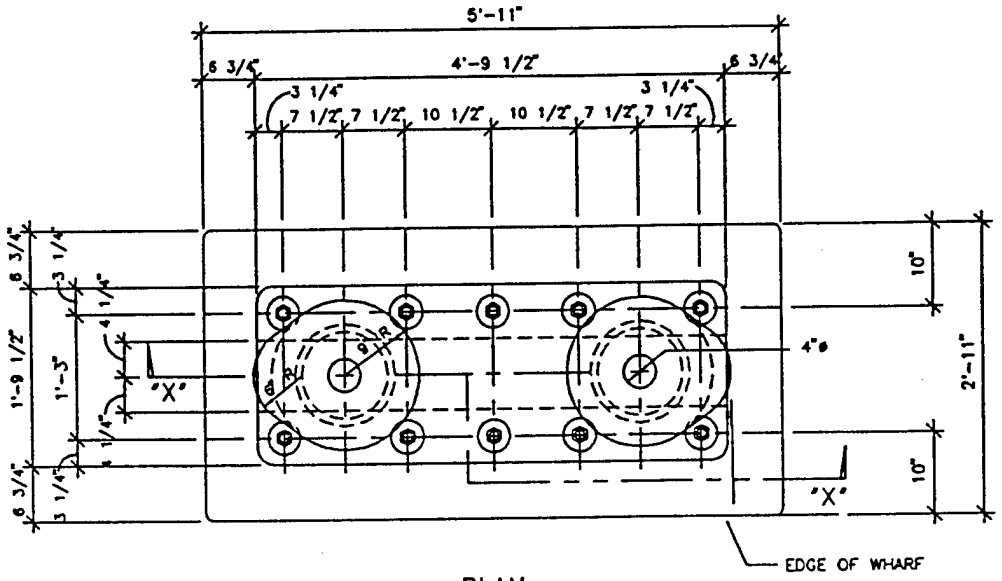
FIGURE 38
Marker Buoy



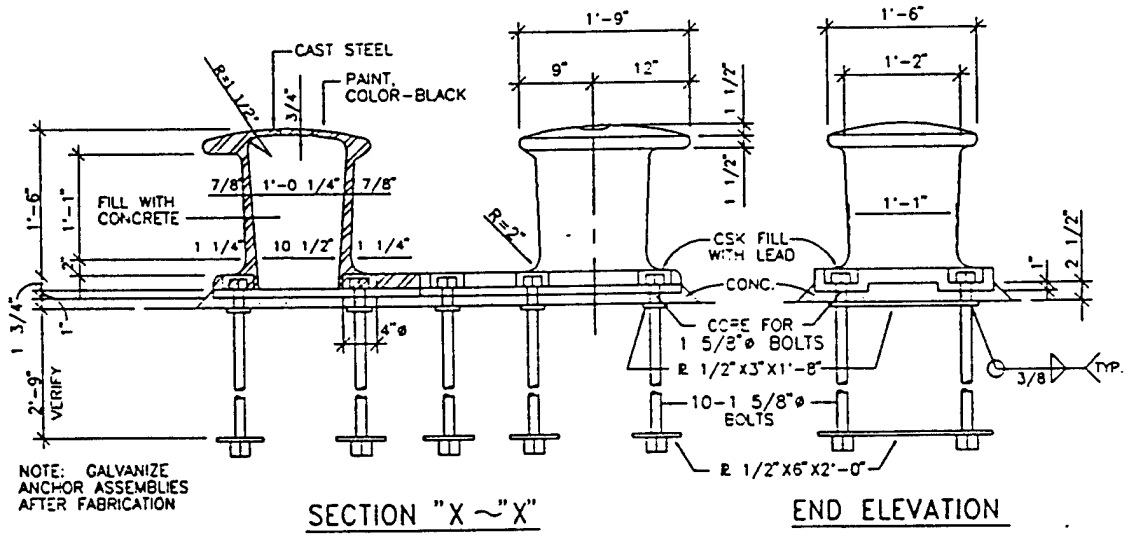
Large Double Bitt With Lip

CAPACITY 200,000 LB (NOM)

WEIGHT 2552 LB



PLAN



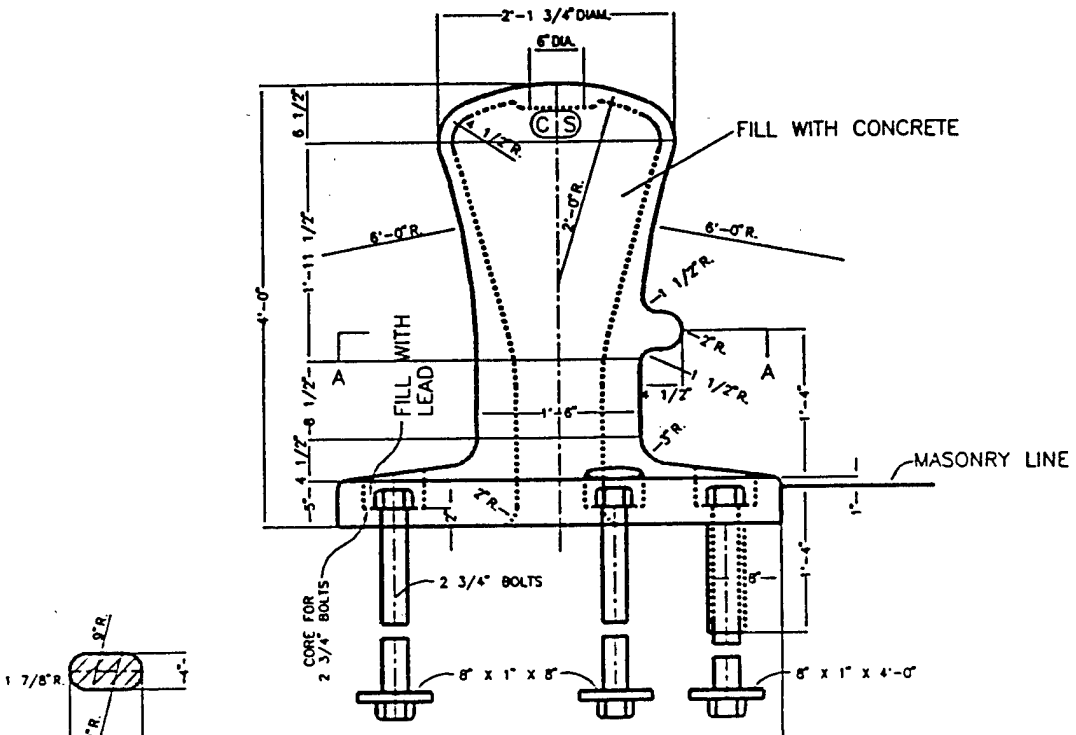
SECTION "X ~ "X"

END ELEVATION

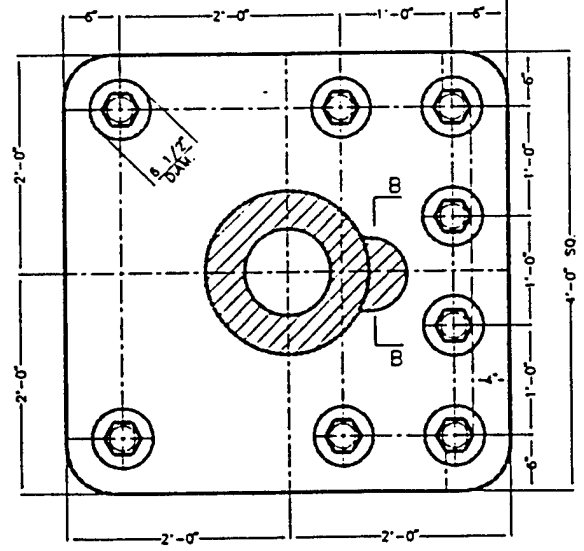
DOUBLE BITT, MEDIUM CAST STEEL
RATED CAPACITY: 61 TONS @ HORIZ.
37 TONS @ 45°

Low Double Bitt With Lip

CAPACITY 60000 LB (NOM)
WEIGHT 1425 LB



SECTION B–B

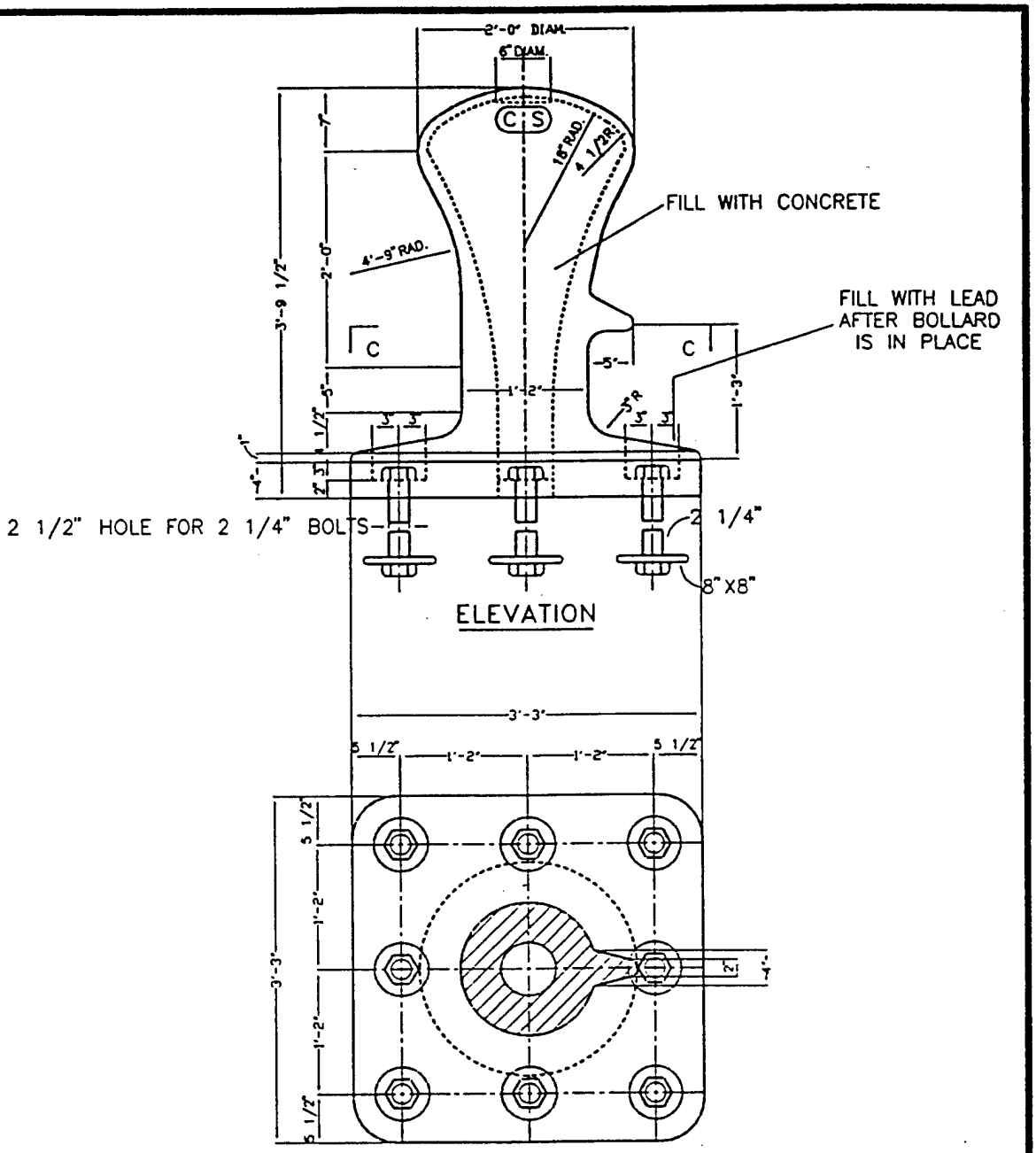


SECTION A–A

Special Mooring Bollard "A"

CAPACITY 450000 LB (NOM)

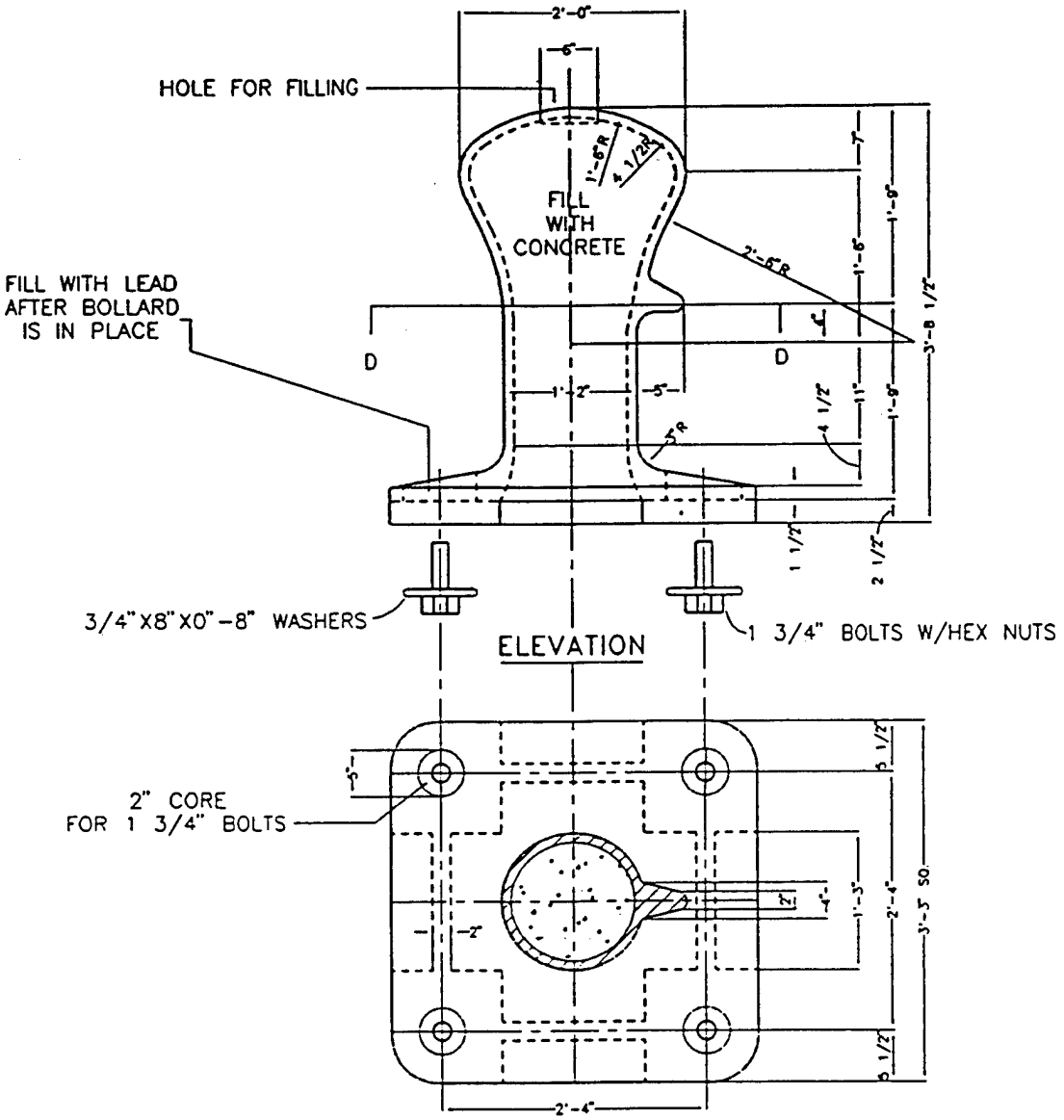
WEIGHT 5620 LB



CAST STEEL
RATED CAPACITY: 135 TONS (@ HORIZ.): 108 TONS (@ 45°)
APPROX. WT. = 3,570 POUNDS

Special Mooring Bollard "B"

CAPACITY 200000 LB (Nom)
WEIGHT 3570 LB

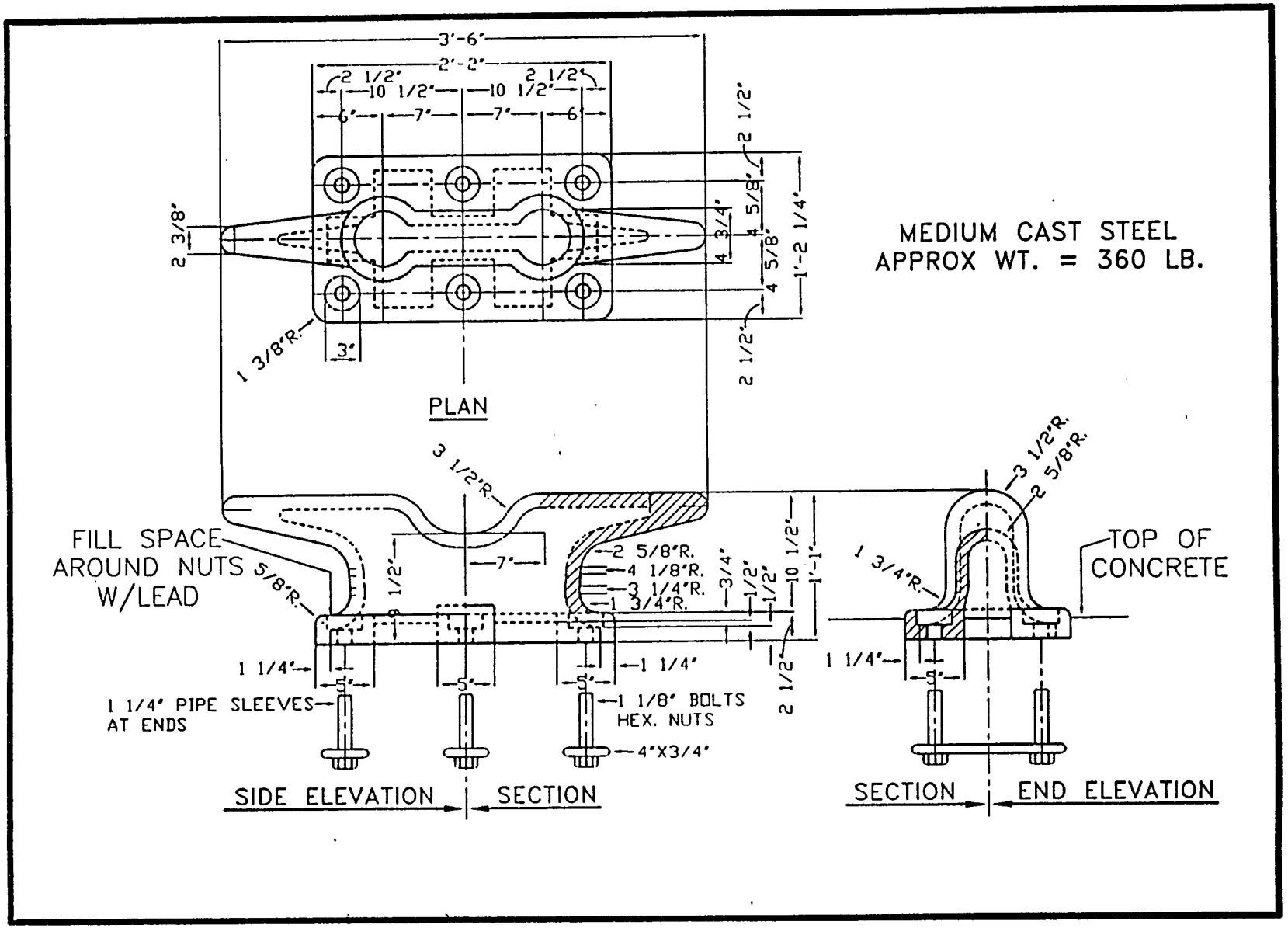


MEDIUM CAST STEEL
RATED CAPACITY: 52 TONS (@ HORIZ.): 33 TONS (@ 45)
APPROX. WT. = 2,200 LB.

Large Bollard With Horn

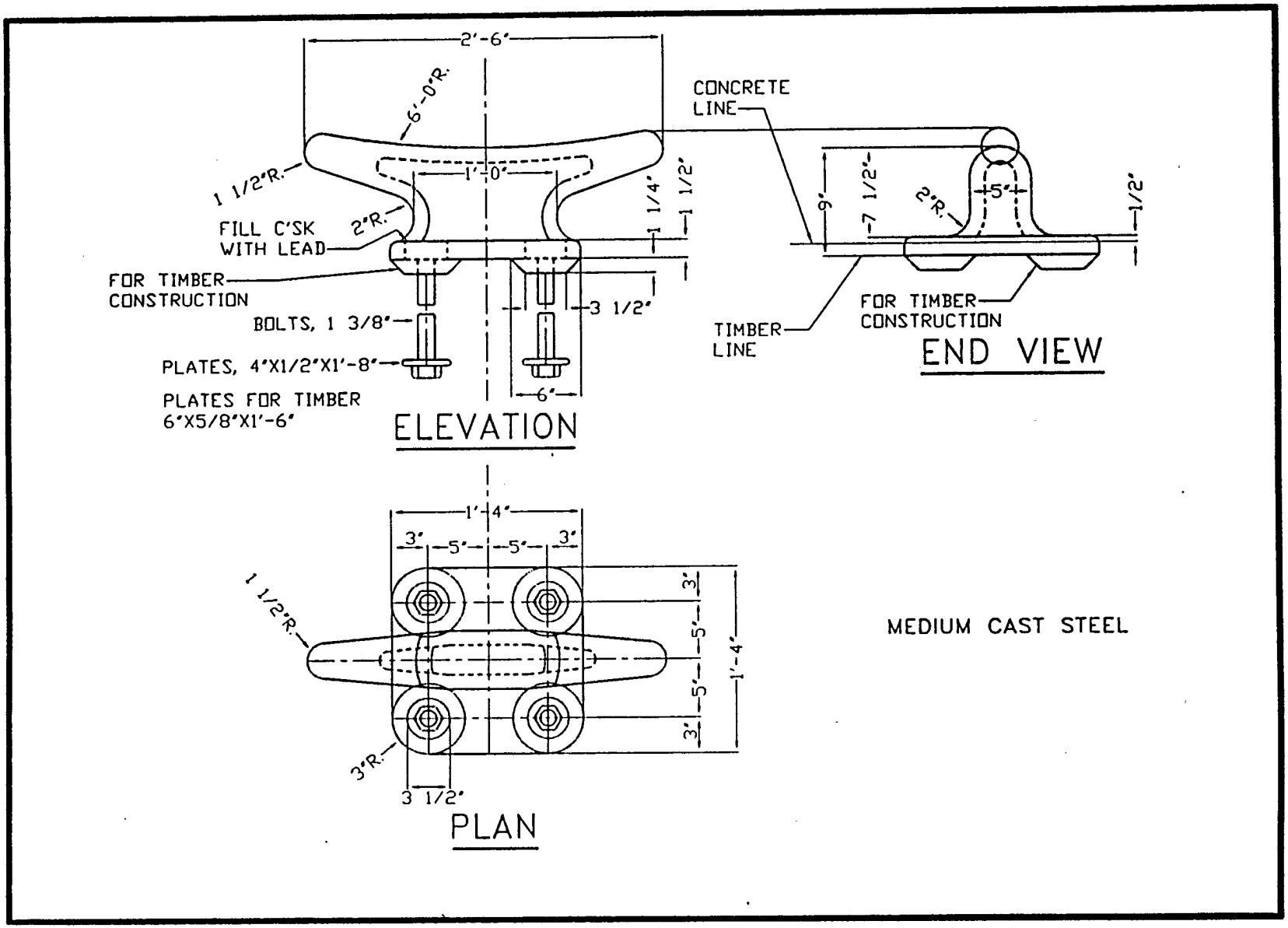
CAPACITY 70000 LB (NOM)

WEIGHT 2200 LB



42" Cleat

CAPACITY 40000LB (NOM)



30" Cleat

CAPACITY 20 000LB (NOM)

(All Dimensions in Inches)

Nominal Diameter	A (min)	A (max)	B (min)	C (min)	C (max)	D (min)	E (min)	E (max)	F (min)	G (min)	H (max)
1-3/4	10.50	10.76	2.62	1.75	1.81	1.69	6.21	6.50	1.50	1.41	1.58
2	12.00	12.30	3.00	2.00	2.06	1.94	7.10	7.37	1.65	1.59	1.77
2-1/4	13.50	13.84	3.42	2.25	2.34	2.19	8.04	8.35	1.80	1.59	2.09
2-1/2	15.00	15.38	3.76	2.50	2.59	2.44	8.88	9.20	1.95	1.64	2.23
2-3/4	16.50	16.91	4.12	2.75	2.84	2.79	9.76	10.18	2.10	1.80	2.48
3	18.00	18.45	4.49	3.00	3.09	2.94	10.65	11.05	2.25	1.94	2.62
3-1/2	21.00	21.53	5.25	3.50	3.59	3.38	12.43	12.81	2.40	2.38	3.12
4	24.00	24.60	6.20	4.00	4.10	3.88	14.40	14.78	2.70	2.58	3.58

Note: 'C' dimension is tolerance range for bar stock
'D' dimension is minimum bar diameter at crown
'E' dimension does not include flashing at weld

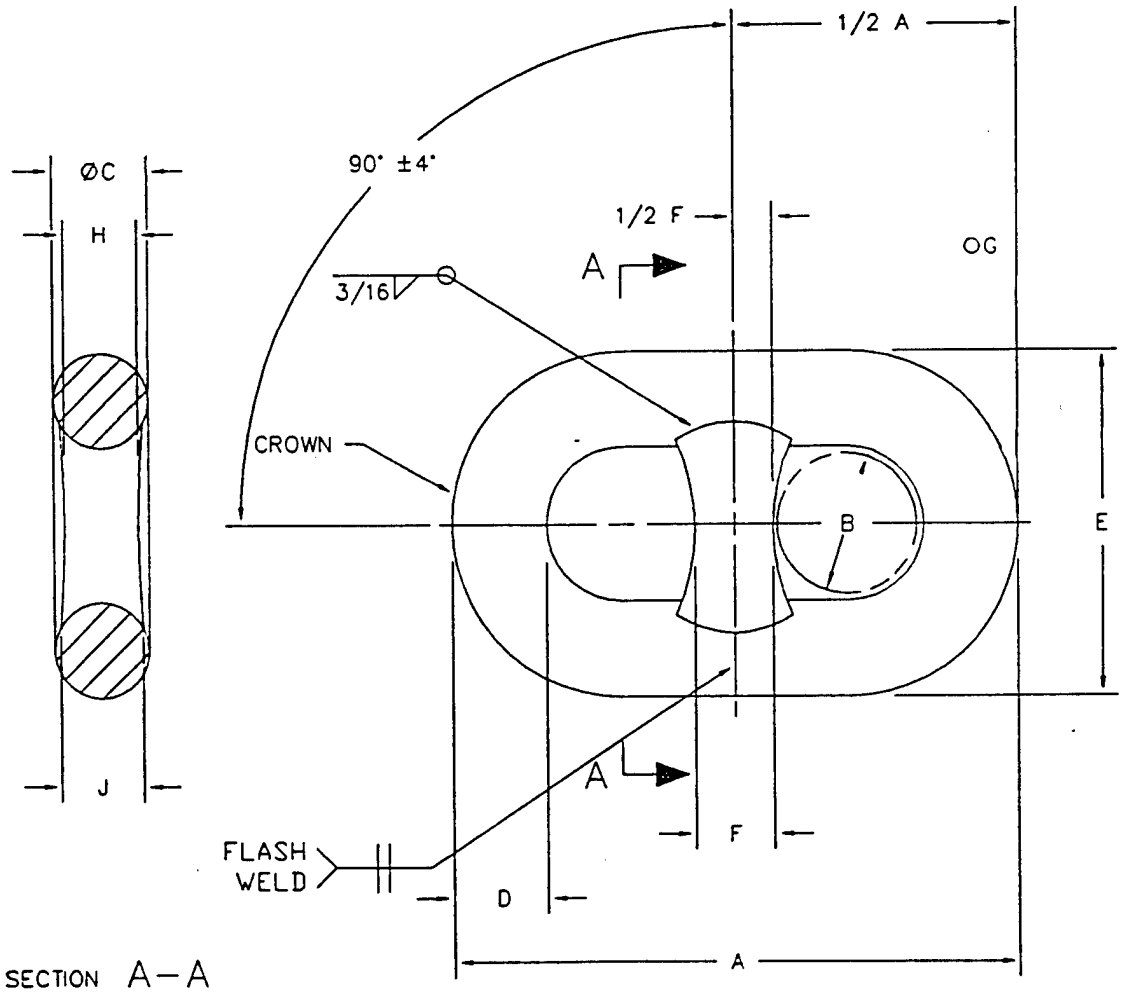


FIGURE 1A
Common Stud Link Chain

(All Dimensions In Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)	D (min)	D (max)	E (min)	E (max)	F (min)	F (max)	G (min)	G (max)
1-3/4	11.97	12.03	7.72	7.78	2.33	2.61	1.97	2.03	2.34	2.47	2.47	2.53	1.30	1.33
2	13.47	13.53	8.69	8.75	2.61	2.95	2.22	2.28	2.65	2.78	2.78	2.84	1.45	1.51
2-1/4	14.79	15.03	9.65	9.72	2.90	3.28	2.47	2.53	2.91	3.06	3.06	3.12	1.64	1.67
2-1/2	16.47	16.53	10.78	10.84	3.59	4.03	2.84	2.90	3.25	3.30	3.44	3.50	1.80	1.83
2-3/4	18.34	18.41	11.98	12.03	3.97	4.47	3.16	3.22	3.34	3.40	3.81	3.87	1.89	1.92
3	19.72	19.78	12.84	12.91	4.38	4.62	3.34	3.40	3.47	3.63	4.06	4.17	2.11	2.18
3-1/2	23.22	23.28	14.97	15.03	4.67	5.26	3.84	3.90	4.58	4.72	4.72	4.78	2.61	2.64
4	25.40	25.60	17.34	17.40	6.33	6.67	4.34	4.40	5.22	5.38	5.84	5.91	2.87	2.91

Note:
All Chain Joining Links Must Be Compatible Wite The Common Stud Link Of The Same Nominal Size

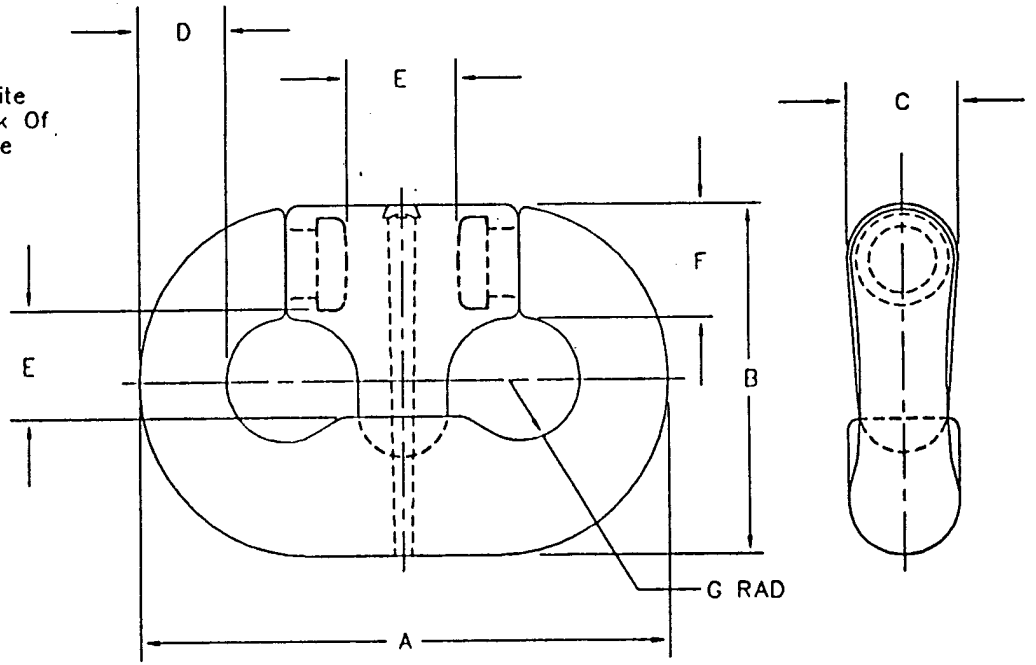
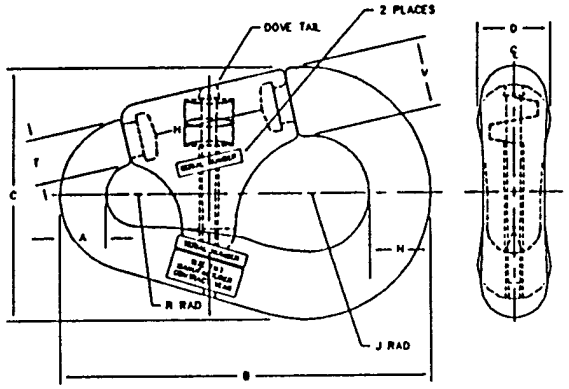


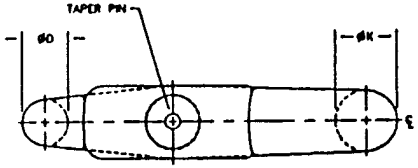
FIGURE 2
Chain Joining Link

(All Dimensions In Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)	D (min)	D (max)	H (min)	H (max)	J (min)	J (max)
1-3/4	1.97	2.03	14.84	14.90	10.22	10.28	3.00	3.18	3.91	3.97	2.05	2.08
2	2.34	2.41	17.84	17.90	12.28	12.34	3.62	3.86	4.72	4.78	2.51	2.54
2-1/4	3.09	3.15	22.09	22.15	14.78	14.84	4.75	5.03	5.84	5.91	2.98	3.01
2-1/2	3.09	3.15	22.09	22.15	14.78	14.84	4.75	5.03	5.84	5.91	2.98	3.01
2-3/4	3.09	3.15	22.09	22.15	14.78	14.84	4.75	5.03	5.84	5.91	2.98	3.01
3	3.59	3.66	25.72	25.78	16.47	16.53	5.25	5.57	6.06	6.17	3.11	3.14
3-1/2	3.59	3.66	25.72	25.78	16.47	16.53	5.25	5.57	6.06	6.17	3.11	3.14
4	4.87	5.12	36.77	37.23	23.75	24.25	7.87	8.12	7.87	8.12	4.25	4.50

Nominal Diameter	N (min)	N (max)	R (min)	R (max)	T (min)	T (max)	V (min)	V (max)
1-3/4	2.47	2.53	1.23	1.26	2.22 X 2.34	2.38 X 2.41	2.87	2.94
2	2.97	3.03	1.45	1.48	2.41 X 2.84	2.47 X 2.91	3.44	3.50
2-1/4	3.72	3.78	1.89	1.92	3.09 X 3.34	3.15 X 3.41	4.34	4.41
2-1/2	3.72	3.78	1.89	1.92	3.09 X 3.34	3.15 X 3.41	4.34	4.41
2-3/4	3.72	3.78	1.89	1.92	3.09 X 3.34	3.15 X 3.41	4.34	4.41
3	4.67	5.06	2.11	2.14	3.97 X 4.34	4.03 X 4.41	5.09 X 5.22	5.16 X 5.28
3-1/2	4.64	5.06	2.11	2.14	3.97 X 4.34	4.03 X 4.41	5.09 X 5.22	5.16 X 5.28
4	6.68	7.06	2.95	3.06	6.00	6.16	7.68	8.06





Note: All Anchor Joining Links Must Fit The Common Stud Link and the Ground Ring of the Same Nominal Size. 2-1/4 to 2-3/4 Inch Anchor Joining Links Shall be Tested to the 2-3/4 Inch Requirements and Marked With The Range of 2-1/4 to 2-3/4 Inches. Same Requirement for 3 and 3-1/2 Inch Sizes.

FIGURE 3
Anchor Joining Link

(All Dimensions in Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)
1-3/4	3.41	3.59	8.78	9.23
2	3.66	3.84	10.24	10.76
2-1/4	5.25	5.50	11.70	12.30
2-1/2	5.25	5.50	11.70	12.30
2-3/4	5.25	5.50	11.70	12.30
3	5.50	5.75	13.16	13.84
3-1/2	5.75	6.00	13.16	13.84
4	7.31	7.69	19.00	19.95

NOTE:

1. 2-1/4 to 2-3/4 inch Ground Rings shall be tested to the 2-3/4 inch requirements and marked with the range of 2-1/4 to 2-3/4.
2. Markings shall be as specified in Section 3.8.

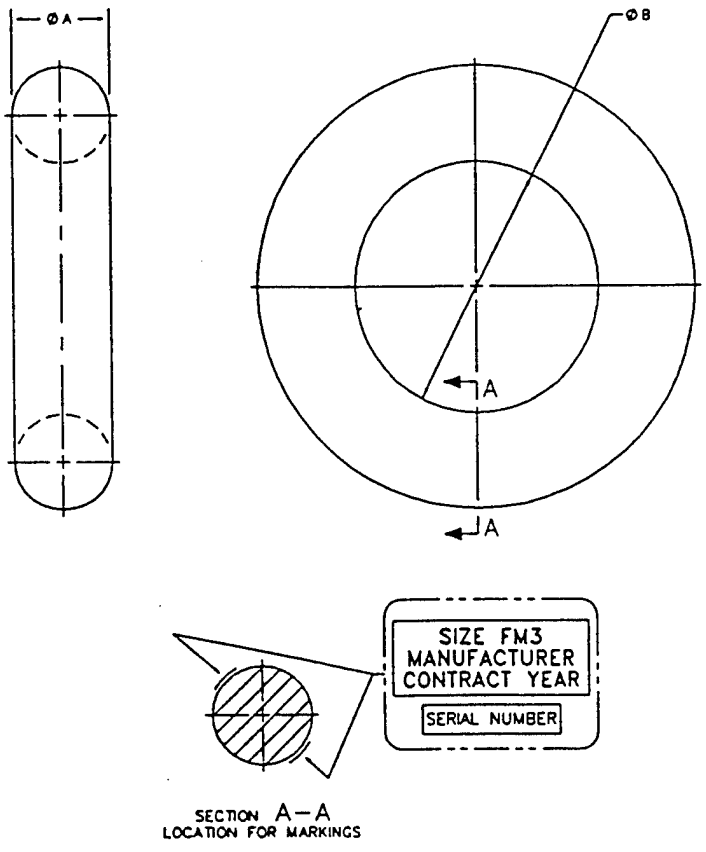
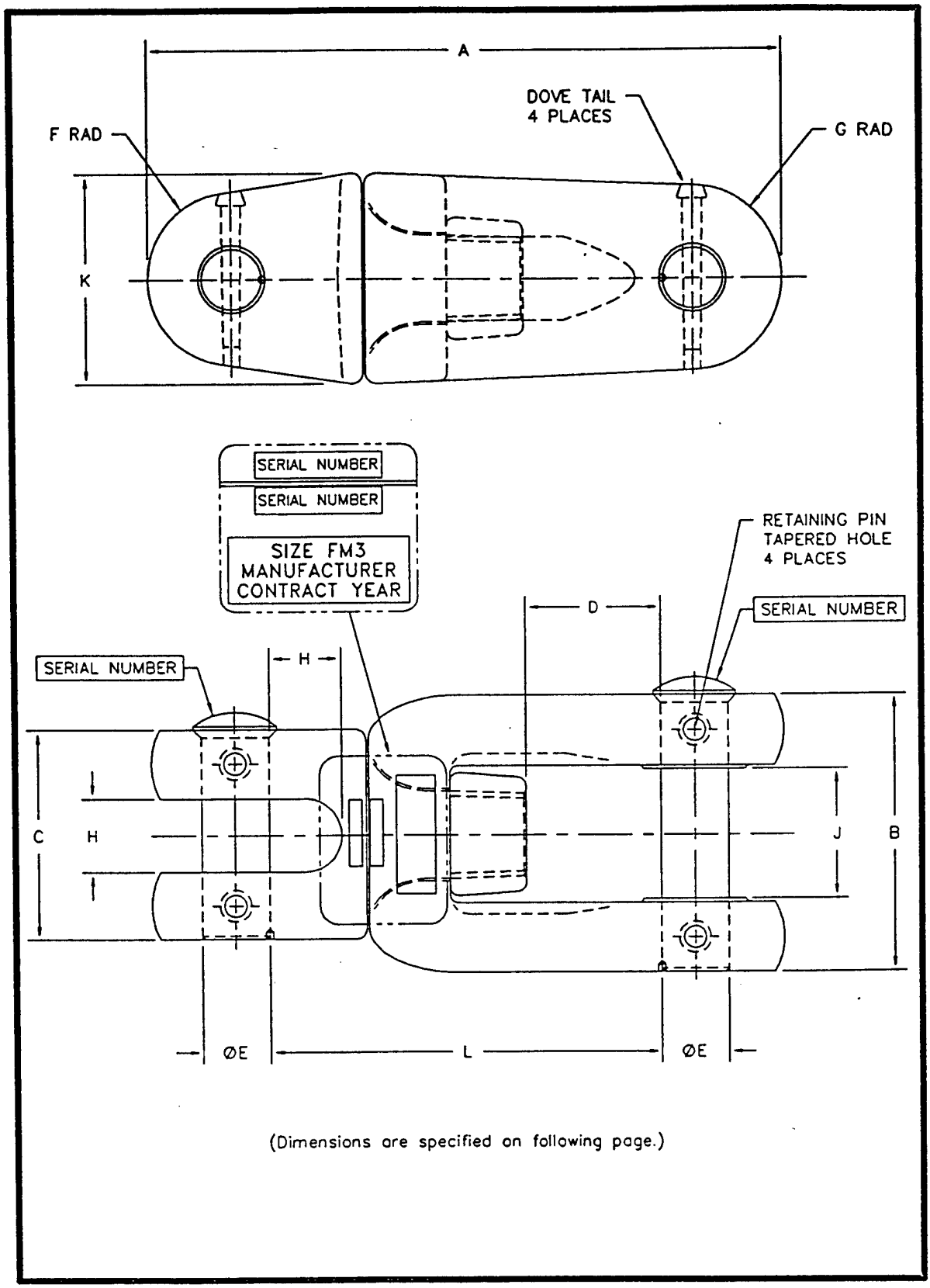


FIGURE 4
Ground Ring



(Dimensions are specified on following page.)

FIGURE 5
Swivel Shackle (Page 1 of 2)

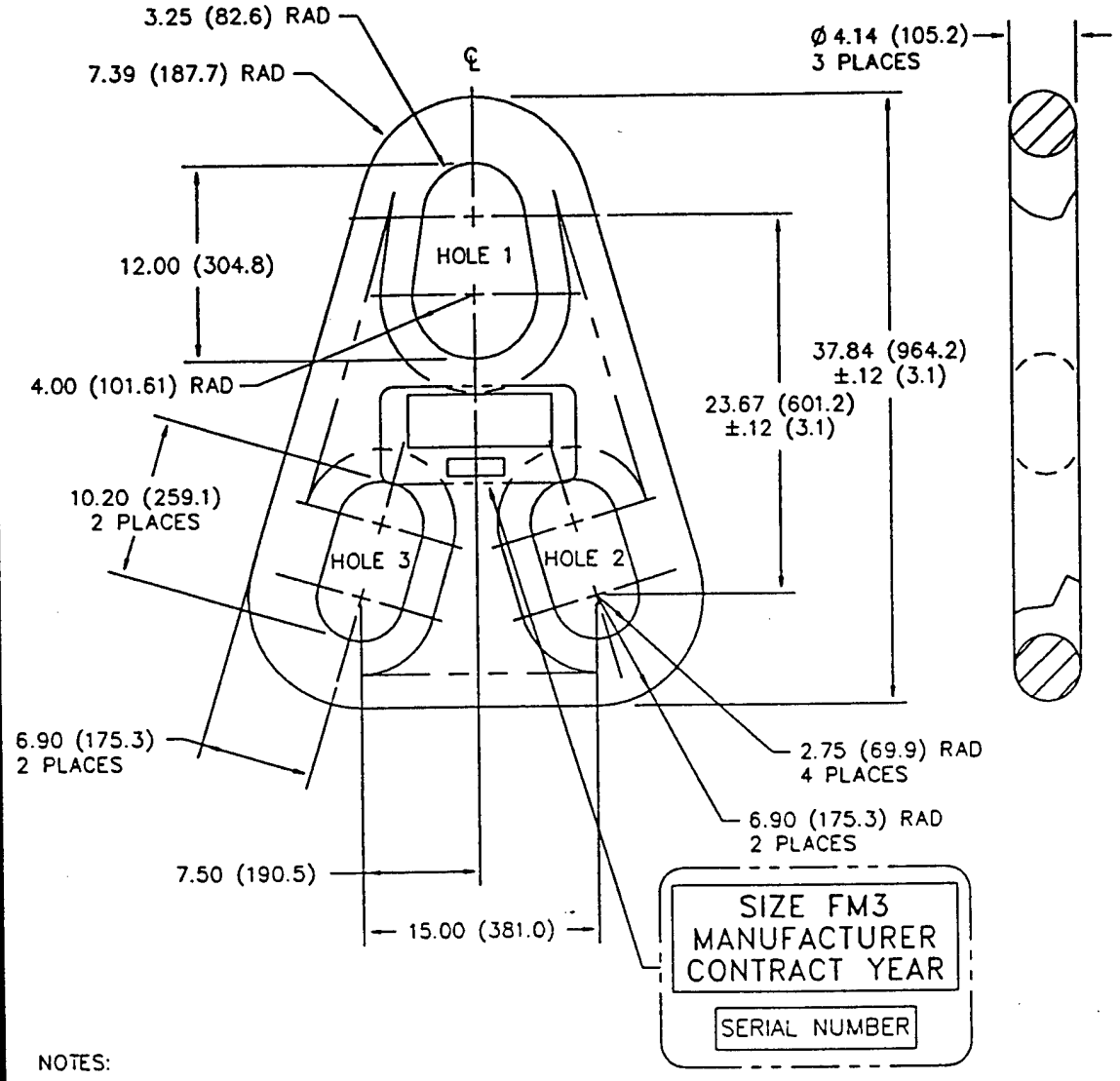
(All Dimensions In Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)	D (min)	E (min)	E (max)	F (min)	F (max)
1-3/4	20.91	22.44	9.07	9.53	6.83	7.18	5.62	2.22	2.34	2.80	2.94
2	25.36	26.66	11.21	11.79	7.99	8.39	5.62	2.57	2.71	3.29	3.45
2-1/4	27.44	30.50	12.29	12.92	8.76	9.20	8.00	2.84	2.98	3.61	3.79
2-1/2	31.89	33.53	13.74	14.44	9.83	10.32	8.00	3.23	3.39	4.07	4.27
2-3/4	34.09	35.83	15.04	15.82	10.74	11.30	8.00	3.23	3.39	4.42	4.64
3	38.74	40.72	16.43	17.27	12.05	12.67	9.00	3.76	3.96	4.99	5.25
3-1/2	45.90	48.26	19.34	20.34	13.82	14.52	9.00	4.45	4.67	5.53	5.81
4	52.11	54.79	21.96	23.08	15.74	16.54	9.00	4.62	4.87	6.44	6.78

Nominal Diameter	G (min)	G (max)	H (min)	H (max)	J (min)	J (max)	K (min)	K (max)	P (min)	P (max)
1-3/4	2.99	3.15	2.38	2.50	3.75	4.87	6.83	7.18	12.90	14.75
2	3.69	3.87	2.76	2.90	3.75	4.87	7.99	8.39	15.81	16.63
2-1/4	4.03	4.23	3.07	3.23	3.75	4.87	8.76	9.20	16.97	19.56
2-1/2	4.56	4.80	3.45	3.63	3.75	4.87	9.83	10.33	20.04	21.06
2-3/4	4.95	5.21	3.76	3.96	3.75	4.87	10.74	11.30	21.22	22.31
3	6.03	6.33	4.07	4.27	3.75	4.87	12.05	12.67	23.96	25.18
3-1/2	6.30	6.62	4.84	5.08	3.75	4.87	13.82	14.52	29.63	31.15
4	7.22	7.59	5.53	5.81	3.75	4.87	15.74	16.54	33.39	35.11

Note: Pin diameter to hole diameter looseness shall be +.090 max. for sizes 2-1/2, 2-3/4, 3, 3-1/2, 4, and +.072 max. for sizes 2 1/4, 2, 1 3/4.

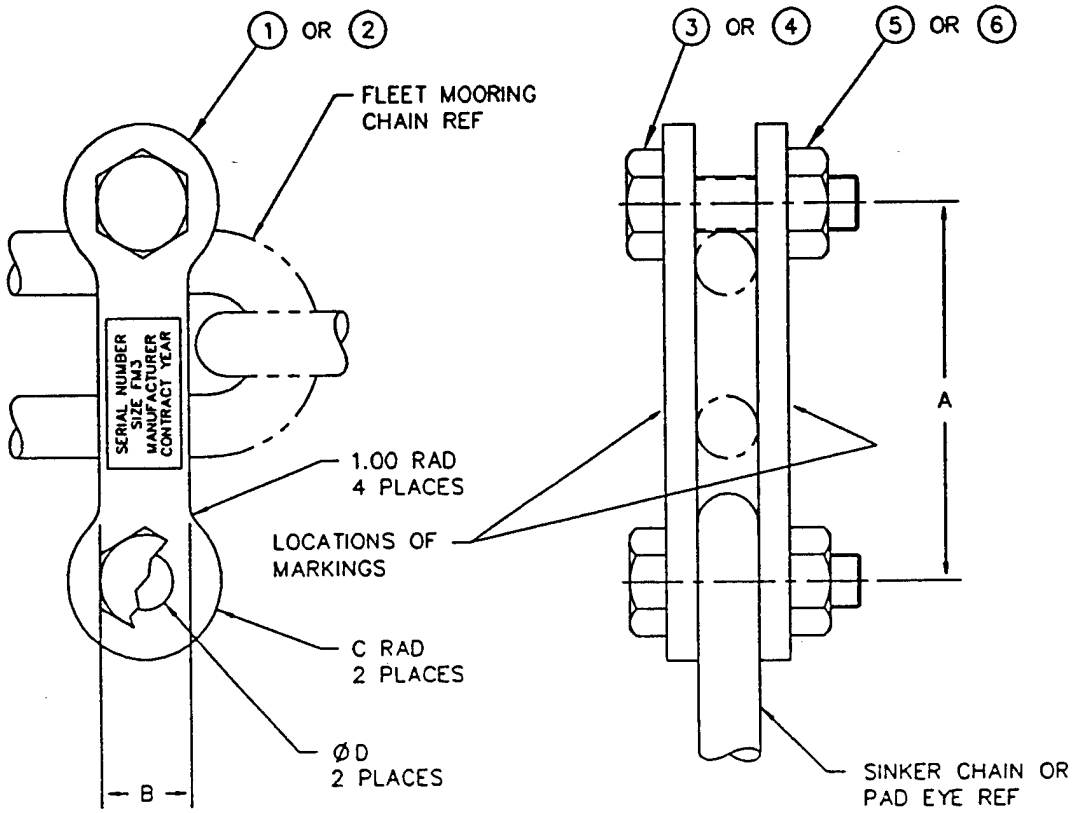
FIGURE 5
Swivel Shackle (Page 2 of 2)



NOTES:

1. HOLE 1 SHALL FIT THE SMALL END OF 3.50 AND 4.00 INCH NOMINAL SIZE ANCHOR JOINING LINKS.
2. HOLES 2 AND 3 SHALL FIT THE LARGE END OF 2.25, 2.50 AND 2.75 INCH NOMINAL SIZE ANCHOR JOINING LINKS.
3. ALL HOLES SHALL MEET THE PROOF AND BREAK LOAD REQUIREMENTS OF 4.00 CHAIN.
4. MARKINGS SHALL BE AS SPECIFIED IN SECTION 3.7.
5. ALLOWABLE DIMENSIONAL TOLERANCES SHALL BE −.06 +.12 UNLESS NOTED.
6. ALL DIMENSIONS ARE IN INCHES AND (CENTIMETERS).

FIGURE 6
Spider Plate



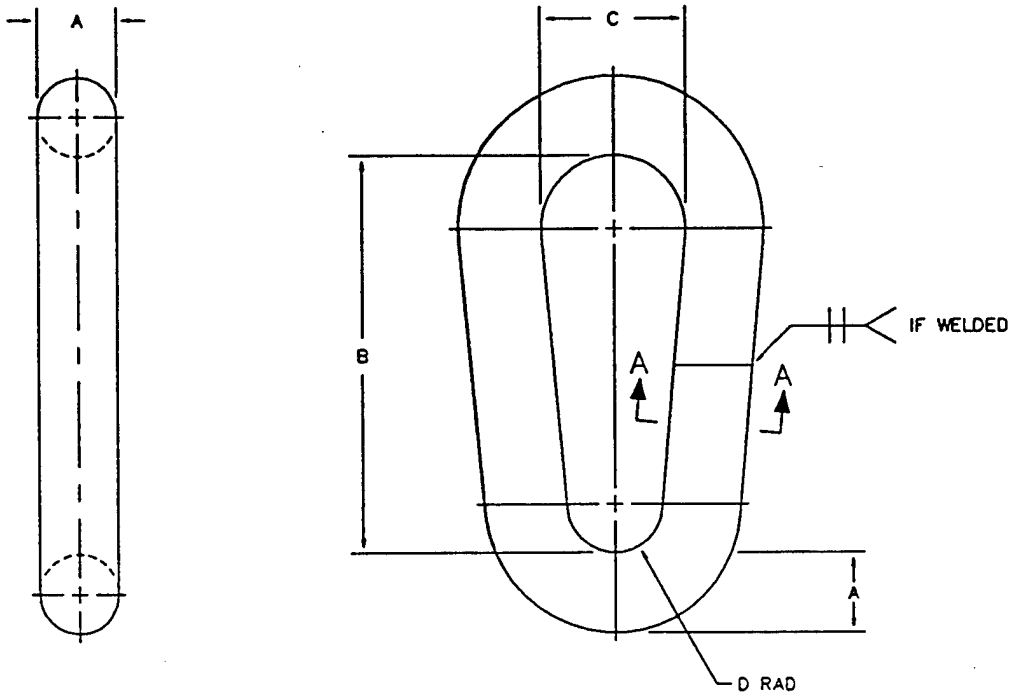
DASH NO.	SINKER CHAIN OR PAD EYE DIA REF	DIM. A ±.12	DIM. B ±.12	RAD C ±.12	DIA D ±.06
-1	1 3/4 TO 2	12.06	3.03	2.56	1.88
-2	2 1/4 TO 4	22.06	4.03	3.56	2.38

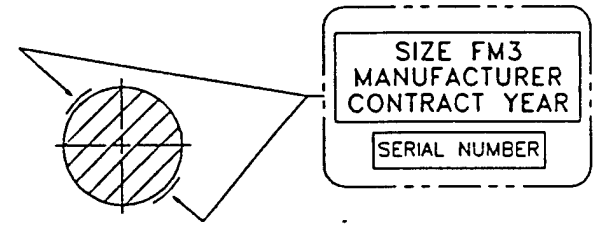
QTY REQD -2	QTY REQD -1	FIND NO.	PART OR IDENTIFYING NO.	PART OR IDENTIFYING NO.	SPEC	MATERIAL
				PARTS LIST		
2	-	6	GRADE DH	NUT, HEAVY, HEX, 2.250-8UN-2B	ASTM A563	STEEL
-	2	5	GRADE DH	NUT, HEAVY, HEX, 1.750-8UN-2B	ASTM A563	STEEL
2	-	4	GRADE BD	BOLT, HEX HD, 2.250-8UN-2A X 9.25L	ASTM A354	STEEL
-	2	3	GRADE BD	BOLT, HEX HD, 1.750-8UN-2A X 6.25L	ASTM A354	STEEL
2	-	2		PLATE, 1.25 STK	ASTM A36	STEEL
-	2	1		PLATE, 1.00 STK	ASTM A36	STEEL

NOTES:

1. PLATE SINKER SHACKLE MARKINGS SHALL BE AS SPECIFIED IN SECTION 3.7.

FIGURE 7
Plate Sinker Shackle





SECTION A–A
LOCATION FOR MARKINGS

(All Dimensions In Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)	D (min)	D (max)
1-3/4	2.25	2.38	11.50	11.67	4.19	4.32	1.38	1.44
2	2.50	2.63	13.73	14.03	4.91	5.21	1.64	1.74
2-1/4	2.75	2.87	14.50	14.69	5.37	5.50	1.73	1.83
2-1/2	3.00	3.13	16.16	16.34	5.92	6.05	1.92	2.02
2-3/4	3.50	3.63	17.17	17.88	6.47	6.60	2.11	2.21
3	3.75	3.83	19.21	19.33	6.82	7.28	2.28	2.40
3-1/2	4.25	4.33	23.90	24.08	8.77	8.90	2.85	2.79
4	4.75	4.87	26.22	25.40	9.61	9.74	3.13	3.25

NOTES:

1. MARKINGS SHALL BE AS SPECIFIED IN SECTION 3.7.

FIGURE 8
Pear Link

(All Dimensions in Inches)

Nominal Diameter	A (min)	A (max)	B (min)	B (max)	C (min)	C (max)
1-3/4	11.81	12.08	6.91	7.09	2.10	2.16
2	13.50	13.80	7.90	8.10	2.40	2.49
2-1/4	15.19	15.53	8.89	9.13	2.70	2.79
2-1/2	16.88	17.25	9.88	10.13	3.00	3.10
2-3/4	18.56	18.98	10.86	11.14	3.30	3.40
3	20.25	20.70	11.85	12.15	3.60	3.69
3-1/2	23.65	24.15	13.83	14.18	4.20	4.29
4	27.00	27.60	15.80	16.20	4.80	4.89

NOTE:

Markings shall be as specified in Section 3.8.

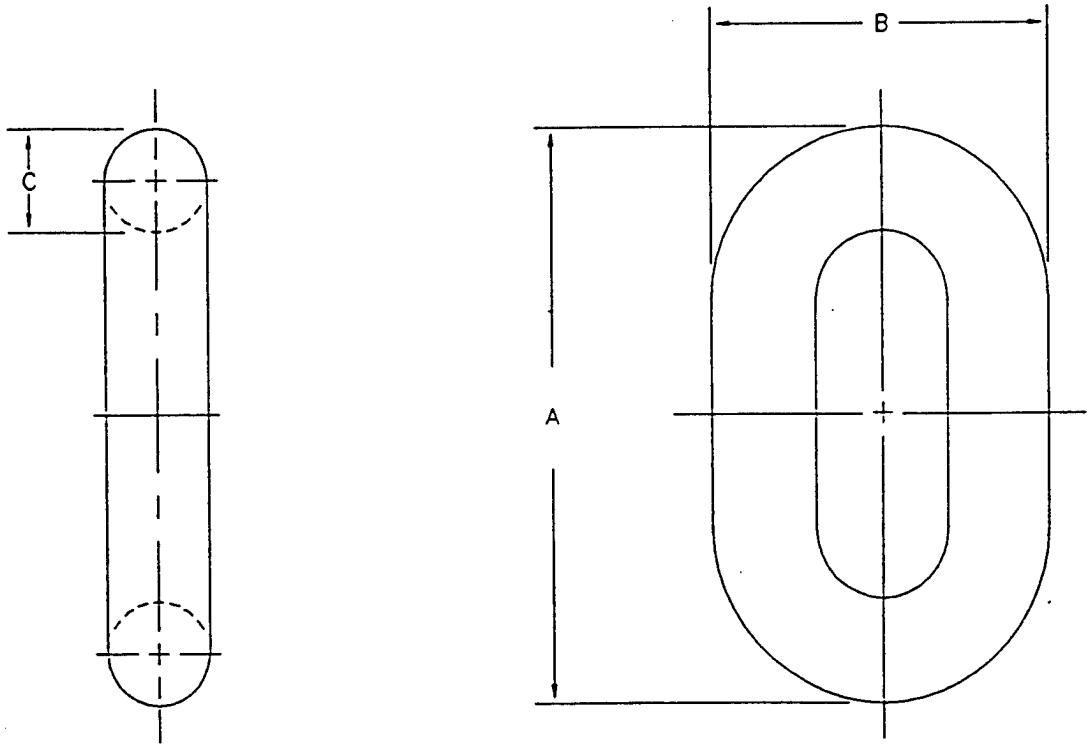


FIGURE 9
End Link

(All Dimensions in Inches)

Nominal Diameter	G (min)	G (max)	H (min)	H (max)	I (min)	I (max)	J (min)	J (max)	K
1-3/4	2.22	2.33	5.80	6.10	6.83	7.18	2.73	2.87	4.90
2	2.54	2.67	6.63	6.97	7.80	8.20	3.12	3.28	5.60
2-1/4	2.85	3.00	7.49	7.84	8.78	9.23	3.51	3.69	6.30
2-1/2	3.17	3.33	8.29	8.71	9.75	10.25	3.90	4.10	7.00
2-3/4	3.49	3.66	9.12	9.58	10.73	11.28	4.29	4.51	7.70
3	3.80	4.00	9.95	10.46	11.70	12.30	4.68	4.92	8.40
3-1/2	4.44	4.66	11.60	12.20	13.65	14.35	5.46	5.74	9.80
4	5.07	5.33	13.26	13.94	15.60	16.40	6.24	6.56	11.20

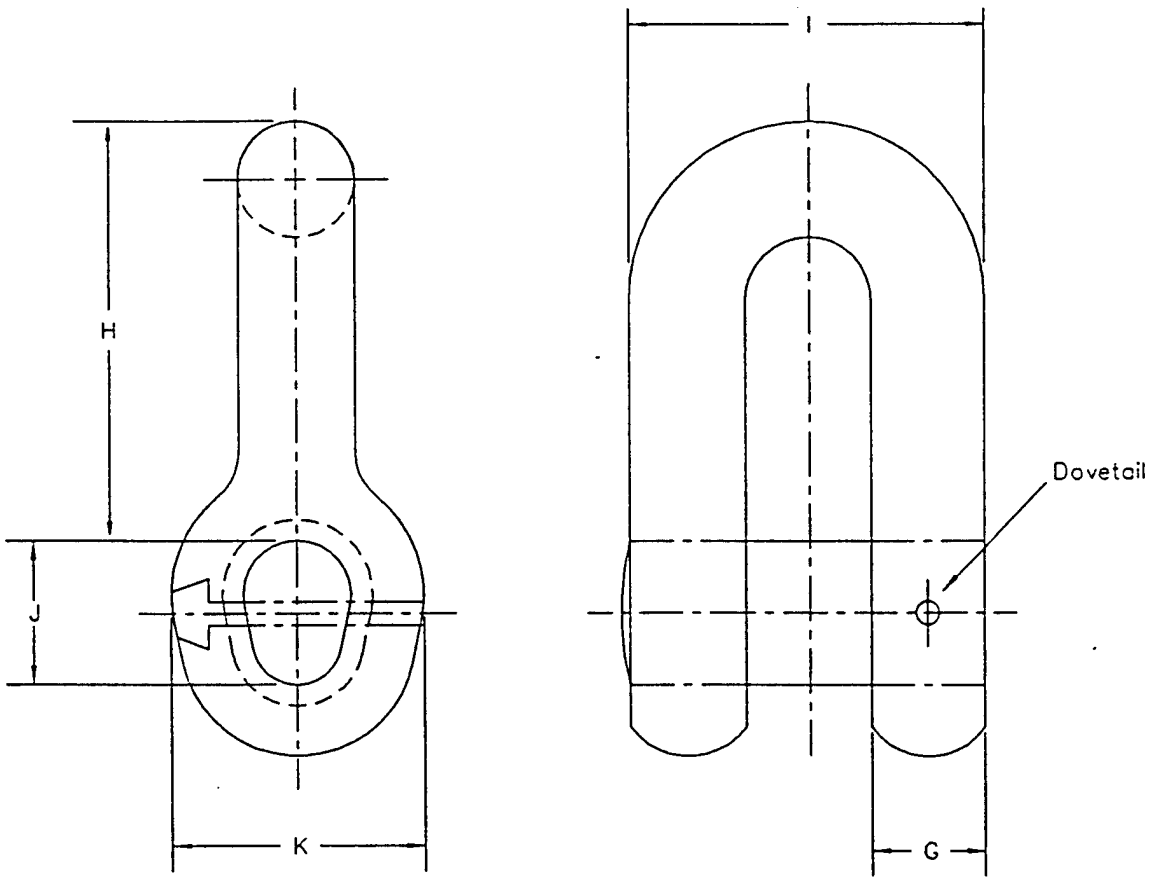


FIGURE 10
Joining Shackle

(All Dimensions In Inches)

Nominal Diameter	G (min)	G (max)	H (min)	H (max)	I (min)	I (max)	J (min)	J (max)	K
1-3/4	2.39	2.51	7.85	8.25	8.87	9.33	3.07	3.23	5.43
2	2.73	2.87	8.97	9.43	10.14	10.66	3.51	3.69	6.20
2-1/4	3.07	3.23	10.09	10.61	11.41	11.99	3.95	4.15	6.98
2-1/2	3.14	3.59	11.21	11.79	12.68	13.33	4.39	4.61	7.75
2-3/4	3.75	3.95	12.33	12.97	13.94	14.66	4.38	5.07	8.53
3	4.10	4.31	13.46	14.15	15.21	15.99	5.40	5.54	9.30
3-1/2	4.78	5.02	15.70	16.50	17.75	18.66	6.14	6.46	10.85
4	5.46	5.74	17.94	18.86	20.28	21.32	7.02	7.38	12.40

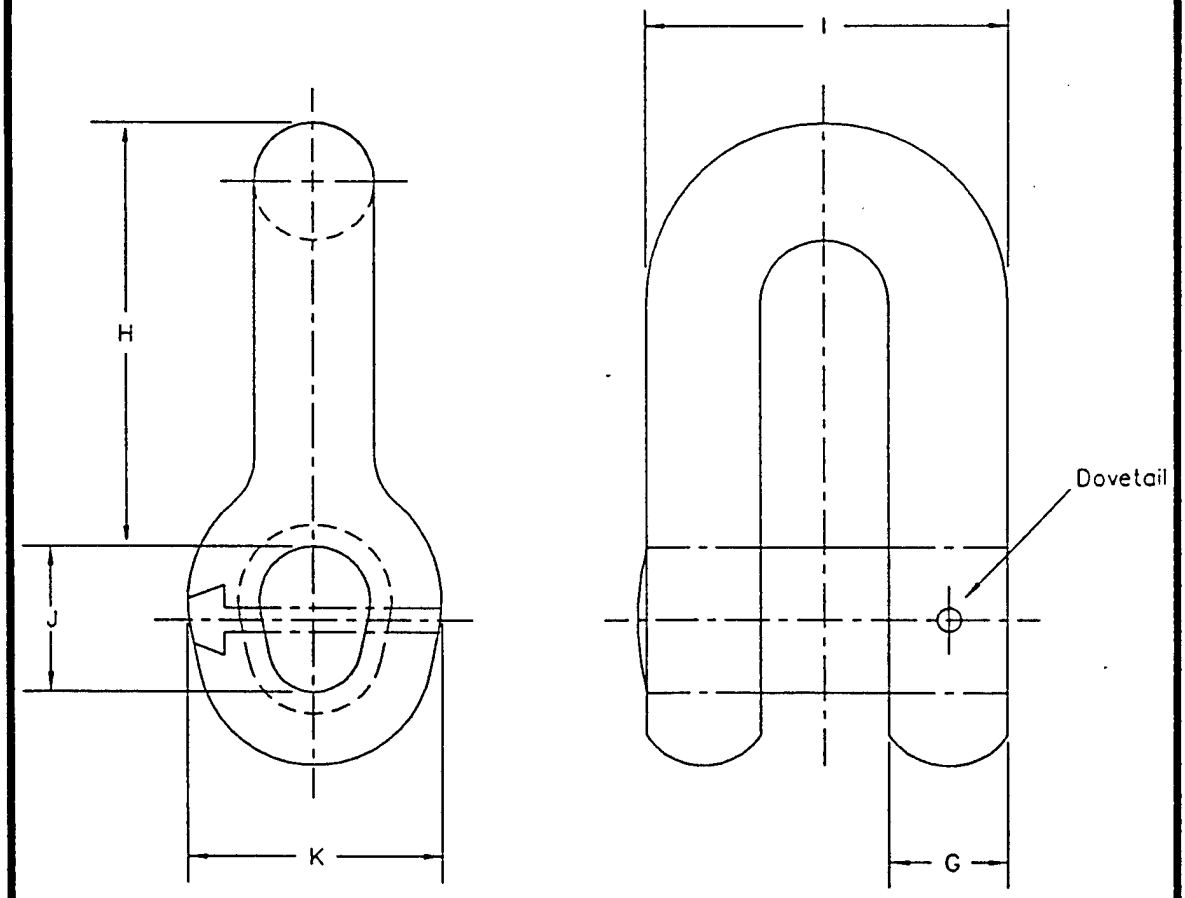
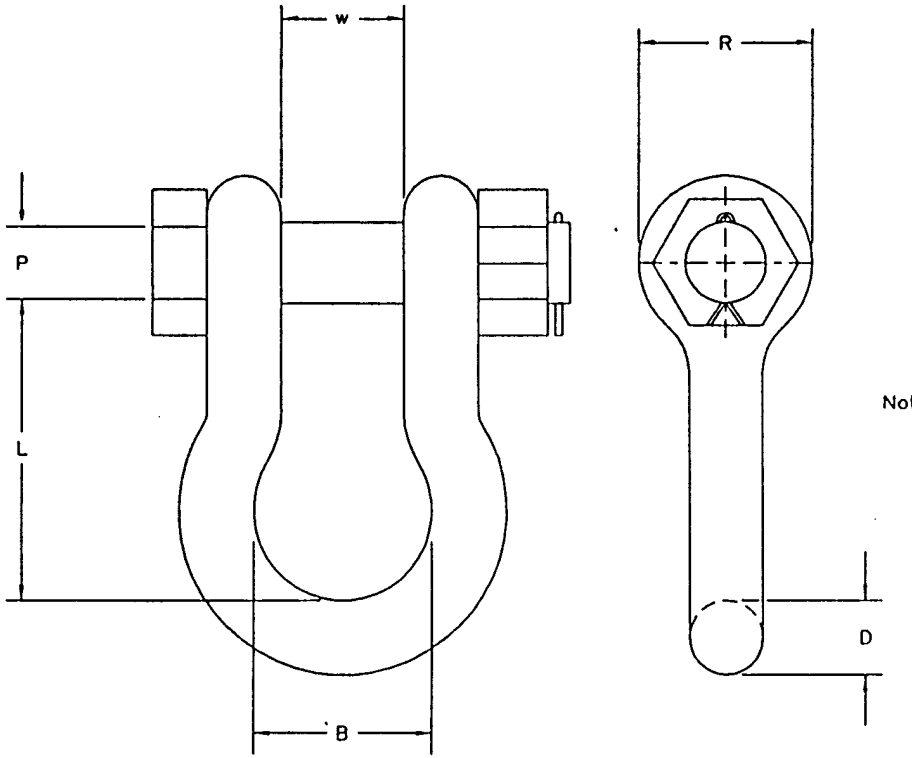


FIGURE 11
Anchor Shackle

(All Dimensions In Inches)

Nominal Diameter	W (min)	W (max)	P (min)	P (max)	R (min)	R (max)	L (min)	L (max)	D (min)	D (max)	B (min)	B (max)	Breaking Load (min pounds)
1-3/8	2.13	2.37	1.46	1.54	3.22	3.40	5.00	5.50	1.32	1.44	3.51	3.75	162,600
1-1/2	2.13	2.50	4.59	1.67	3.54	3.72	5.50	6.00	1.44	1.56	3.76	4.00	204,100
1-3/4	2.76	3.00	1.95	2.05	4.21	4.43	6.75	7.25	1.69	1.81	4.88	5.13	300,000
2	3.13	3.37	2.19	2.31	4.88	5.13	7.50	8.00	1.94	2.06	5.61	5.89	420,000
2-1/2	3.88	4.38	2.68	2.82	5.85	6.15	9.75	11.25	2.55	2.69	7.06	7.44	660,000
3	4.75	5.25	3.17	3.33	6.34	6.66	12.25	13.75	2.93	3.08	7.68	8.08	1,020,000
3-1/2	5.00	5.50	3.66	3.84	7.75	8.25	13.88	15.38	3.41	3.59	8.78	9.23	1,440,500
4	5.25	5.75	4.14	4.36	8.75	9.25	13.75	15.25	3.90	4.10	9.75	10.25	1,800,000



Note: Nominal Sizes Are The Manufacturer's Nomenclature And Do Not Correspond To The Nominal Chain Size; Specific Shackles Will Not Necessarily Have The Same Material And Strength Characteristics As Chain Of The Same Nominal Size. Buoy Shackles Shall Include Bolt, Nut, And Cotter Pin.

FIGURE 12
Buoy Shackle

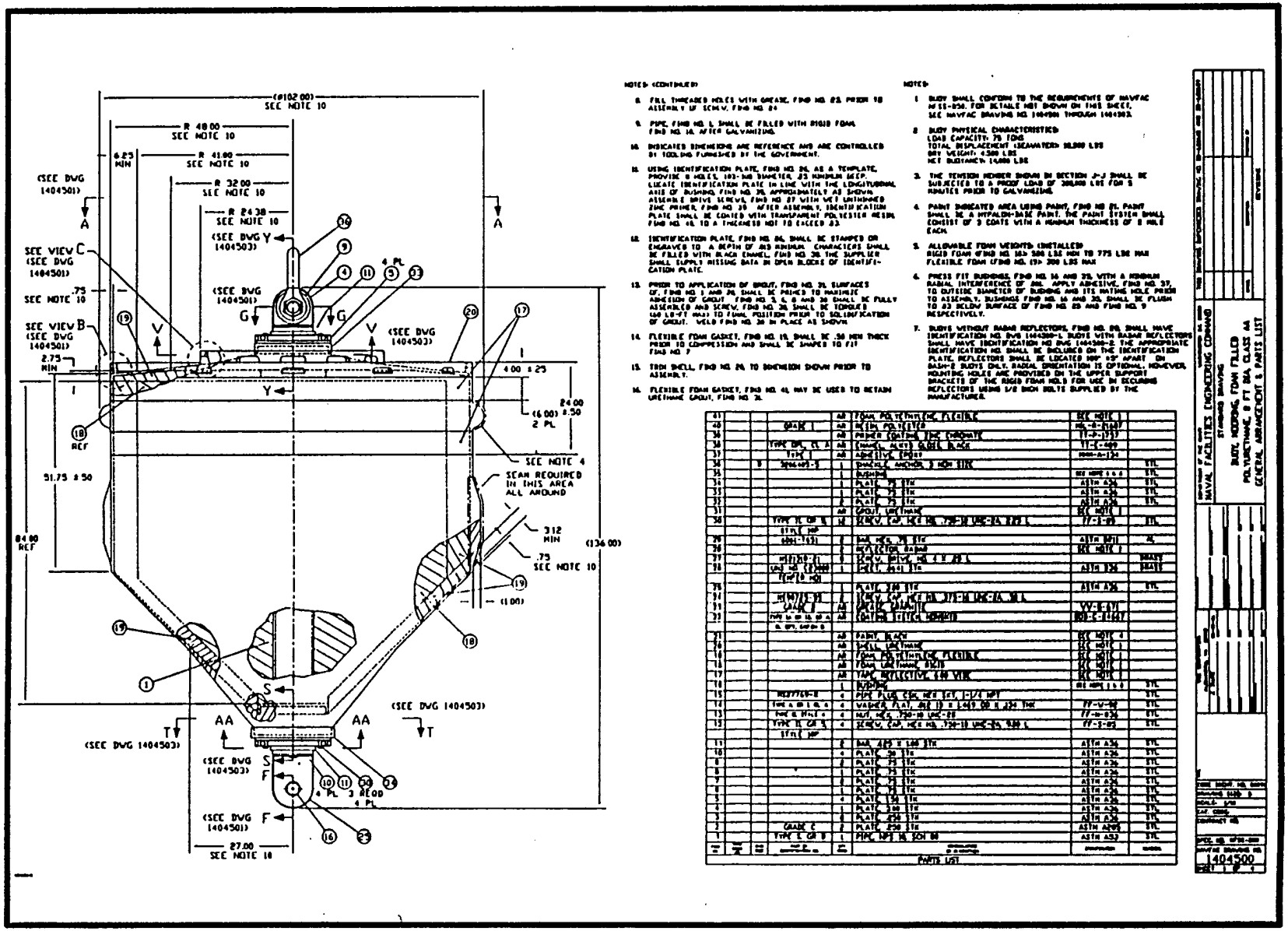
TABLE 1
Mechanical Properties

Property	Chain and Accessories	Swivel Shackle Pins	Pear Links
Ultimate strength (tensile)			
minimum	93,000 psi	145,000 psi	150,000 psi
maximum	115,000 psi	170,000 psi	
Elongation minimum (gage length = 5X specimen diameter)	17 percent	12 percent	9 percent
Reduction in area minimum	40 percent	40 percent	22 percent
Brinell Hardness (standard ball: 10mm ball and 3000 Kg load)			
chain	192-229	321 - 365	300 - 370
accessories	192-235		
Impact; average of three specimens at 32F (minimum)			
base metal	43 ft lb	43 ft lb	30 ft lb
across weld	36 ft lb		26 ft lb
cast components	30 ft lb		15 ft lb

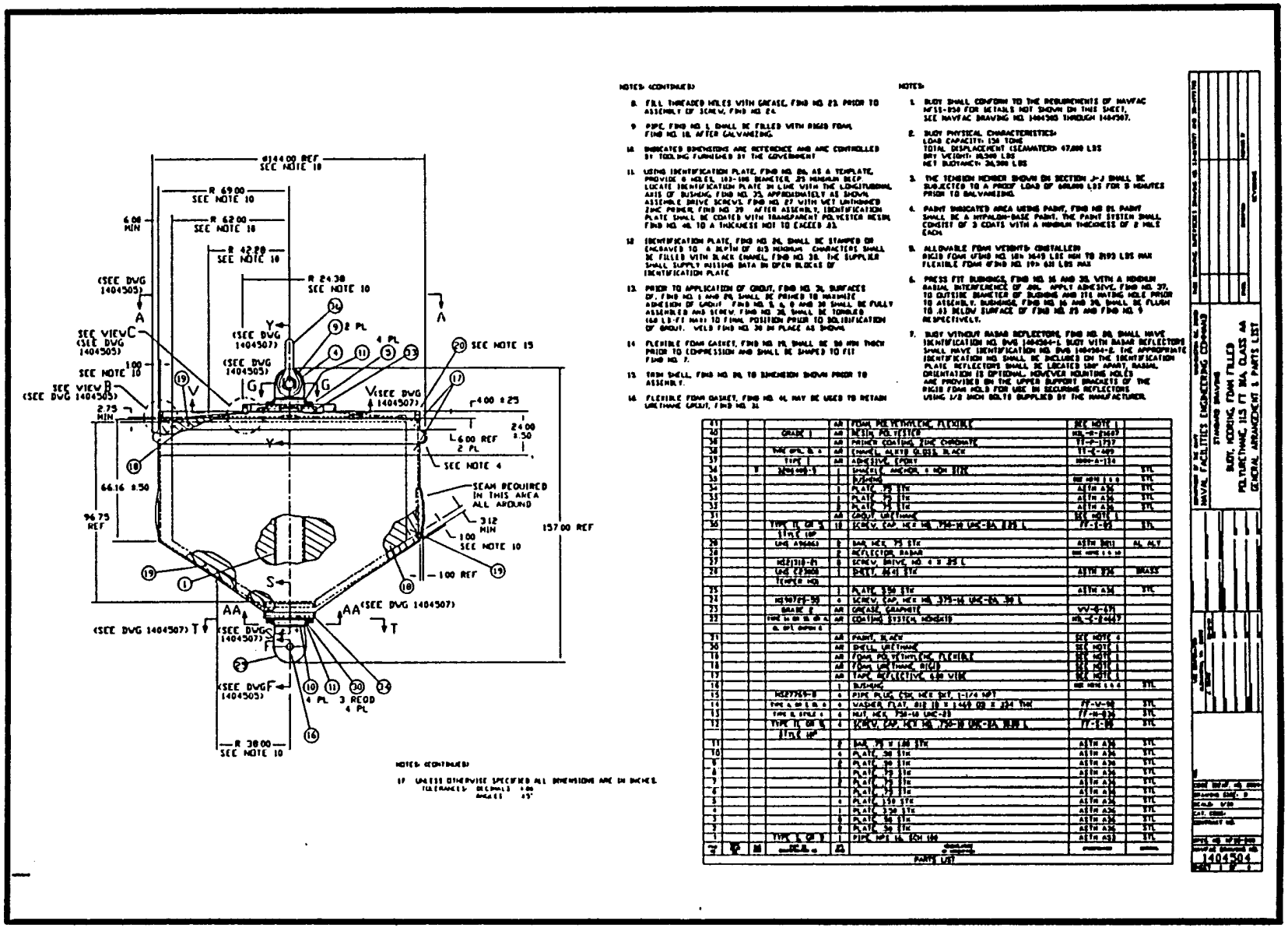
TABLE 2

Physical Properties of Finished Chain and Accessories

Chain Diameter (inches)	Proof Load (lbs)	Minimum Breaking Load (lbs)	Minimum Chain Weight per Shot (lbs)
1-3/4	247,000	352,000	2252
2	318,000	454,000	3276
2-1/4	396,000	570,000	4143
2-1/2	484,000	692,000	5138
2-3/4	578,000	826,000	6250
3	679,000	970,000	7459
3-1/2	900,000	1,285,000	10258
4	1,143,000	1,632,000	13358



Foam Filled Mooring Buoy
Polyurethane, 8 Ft. Diameter, Class AA



Foam Filled Mooring Buoy
Polyurethane, 11.5 Ft. Diameter, Class AA

TABLE E-1
Predicted Single Anchor Drag Distances

Anchor: Stockless Anchor with Stabilizers and Flukes Fixed at approximately 45°

Seafloor Type: Mud

Horizontal Design Load (kips)

Anchor Weight (Kips)	25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
6.	54.	*	*	*	*	*	*	*	*	*	*	*
7.	32.	*	*	*	*	*	*	*	*	*	*	*
8.	21.	*	*	*	*	*	*	*	*	*	*	*
9.	13.	*	*	*	*	*	*	*	*	*	*	*
10.	9.	*	*	*	*	*	*	*	*	*	*	*
11.	6.	183.	*	*	*	*	*	*	*	*	*	*
12.	6.	99.	*	*	*	*	*	*	*	*	*	*
13.	6.	64.	*	*	*	*	*	*	*	*	*	*
14.	5.	47.	*	*	*	*	*	*	*	*	*	*
15.	5.	40.	*	*	*	*	*	*	*	*	*	*
16.	5.	33.	*	*	*	*	*	*	*	*	*	*
17.	4.	27.	*	*	*	*	*	*	*	*	*	*
18.	4.	22.	154.	*	*	*	*	*	*	*	*	*
19.	4.	17.	95.	*	*	*	*	*	*	*	*	*
20.	3.	14.	77.	*	*	*	*	*	*	*	*	*
21.	3.	12.	64.	*	*	*	*	*	*	*	*	*
22.	2.	10.	53.	*	*	*	*	*	*	*	*	*
23.	2.	8.	48.	*	*	*	*	*	*	*	*	*
24.	2.	8.	42.	202.	*	*	*	*	*	*	*	*
25.	1.	8.	37.	152.	*	*	*	*	*	*	*	*
26.	1.	8.	33.	104.	*	*	*	*	*	*	*	*
27.	1.	7.	29.	89.	*	*	*	*	*	*	*	*
28.	1.	7.	25.	78.	*	*	*	*	*	*	*	*
29.	1.	7.	21.	68.	*	*	*	*	*	*	*	*
30.	0.	7.	19.	59.	245.	*	*	*	*	*	*	*

Drag Distance (Feet)

*Exceeds anchor ultimate holding capacity

TABLE E-1 (Continued)
Predicted Single Anchor Drag Distances

Anchor: Stockless Anchor with Stabilizers and Flukes Fixed at approximately 36°

Seafloor Type: Sand

Horizontal Design Load (kips)

Anchor Weight (Kips)	25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
5.	20.	*	*	*	*	*	*	*	*	*	*	*
6.	19.	*	*	*	*	*	*	*	*	*	*	*
7.	18.	37.	*	*	*	*	*	*	*	*	*	*
8.	17.	33.	*	*	*	*	*	*	*	*	*	*
9.	17.	29.	*	*	*	*	*	*	*	*	*	*
10.	17.	28.	*	*	*	*	*	*	*	*	*	*
11.	17.	27.	46.	*	*	*	*	*	*	*	*	
12.	17.	26.	43.	*	*	*	*	*	*	*	*	*
13.	17.	26.	39.	*	*	*	*	*	*	*	*	*
14.	17.	25.	37.	*	*	*	*	*	*	*	*	*
15.	17.	24.	35.	*	*	*	*	*	*	*	*	*
16.	17.	24.	34.	52.	*	*	*	*	*	*	*	*
17.	17.	23.	33.	49.	*	*	*	*	*	*	*	*
18.	17.	23.	32.	46.	*	*	*	*	*	*	*	*
19.	18.	23.	32.	44.	*	*	*	*	*	*	*	*
20.	18.	23.	31.	41.	*	*	*	*	*	*	*	*
21.	18.	22.	31.	40.	57.	*	*	*	*	*	*	*
22.	18.	22.	30.	39.	54.	*	*	*	*	*	*	*
23.	18.	22.	30.	38.	52.	*	*	*	*	*	*	*
24.	18.	22.	29.	37.	50.	*	*	*	*	*	*	*
25.	18.	22.	29.	36.	48.	*	*	*	*	*	*	*
26.	17.	22.	28.	36.	46.	62.	*	*	*	*	*	*
27.	17.	23.	28.	36.	45.	60.	*	*	*	*	*	*
28.	17.	23.	28.	35.	43.	58.	*	*	*	*	*	*
29.	17.	23.	28.	35.	43.	56.	*	*	*	*	*	*
30.	17.	23.	27.	35.	42.	54.	*	*	*	*	*	*

Drag Distance (Feet)

*Exceeds anchor ultimate holding capacity

TABLE E-1 (Continued)
Predicted Single Anchor Drag Distances

Anchor: Stato Anchor with Stabilizers and Flukes Fixed at apporoximately 50°

Seafloor Type: Mud

Horizontal Design Load (kips)

Anchor Weight (Kips)	25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
5.	4.	23.	64.	158.	*	*	*	*	*	*	*	*
6.	3.	15.	45.	96.	236.	*	*	*	*	*	*	*
7.	2.	10.	34.	68.	127.	322.	*	*	*	*	*	*
8.	2.	7.	25.	52.	93.	168.	398.	*	*	*	*	*
9.	1.	6.	18.	43.	72.	120.	205.	*	*	*	*	*
10.	1.	6.	14.	35.	57.	94.	148.	280.	*	*	*	*
11.	1.	5.	11.	27.	50.	76.	118.	183.	352.	*	*	*
12.	0.	4.	9.	21.	43.	63.	96.	140.	216.	418.	*	*
13.	0.	4.	8.	18.	36.	56.	81.	118.	169.	266.	*	*
14.	0.	3.	7.	15.	29.	50.	68.	99.	138.	200.	333.	*
15.	0.	3.	7.	13.	24.	43.	61.	85.	118.	158.	229.	395.
16.	0.	3.	6.	10.	21.	37.	55.	73.	102.	138.	188.	265.
17.	0.	2.	6.	10.	18.	32.	50.	66.	90.	120.	156.	216.
18.	0.	2.	5.	9.	16.	27.	44.	61.	78.	106.	138.	179.
19.	0.	2.	5.	8.	14.	24.	39.	56.	71.	94.	122.	156.
20.	0.	1.	5.	8.	12.	21.	34.	51.	66.	83.	109.	139.
21.	0.	1.	4.	7.	11.	19.	30.	46.	61.	75.	98.	124.
22.	0.	1.	4.	7.	10.	17.	26.	41.	56.	70.	88.	112.
23.	0.	1.	4.	7.	10.	15.	24.	36.	52.	66.	79.	102.
24.	0.	1.	3.	6.	9.	13.	22.	32.	47.	61.	74.	92.
25.	0.	1.	3.	6.	9.	12.	20.	28.	43.	57.	70.	83.
26.	0.	0.	3.	5.	8.	11.	18.	26.	39.	53.	66.	78.
27.	0.	0.	2.	8.	8.	11.	16.	24.	35.	49.	62.	74.
28.	0.	0.	2.	8.	8.	10.	15.	22.	31.	44.	58.	70.
29.	0.	0.	2.	7.	7.	10.	13.	21.	28.	41.	54.	66.
30.	0.	0.	2.	7.	7.	10.	12.	19.	26.	37.	50.	63.

Drag Distance (Feet)

*Exceeds anchor ultimate holding capacity

TABLE E-1 (Continued
Predicted Single Anchor Drag Distances

Anchor: Stato Anchor with Stabilizers and Flukes Fixed at approximately 30°

Seafloor Type: Sand

Horizontal Design Load (Kips)

Anchor Weight (Kips)	25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
5.	15.	21.	28.	39.	55.	*	*	*	*	*	*	*
6.	15.	20.	27.	36.	45.	63.	*	*	*	*	*	*
7.	15.	20.	27.	32.	42.	51.	77.	*	*	*	*	*
8.	15.	20.	26.	30.	39.	47.	59.	91.	*	*	*	*
9.	15.	20.	25.	30.	36.	45.	53.	67.	103.	*	*	*
10.	15.	21.	24.	30.	33.	42.	50.	58.	74.	116.	*	*
11.	16.	20.	24.	29.	33.	40.	47.	55.	65.	88.	*	*
12.	16.	20.	24.	28.	33.	37.	45.	52.	59.	72.	101.	*
13.	16.	20.	24.	28.	33.	36.	43.	50.	57.	65.	79.	114.
14.	17.	20.	24.	27.	32.	36.	41.	48.	55.	61.	72.	91.
15.	17.	20.	24.	27.	32.	36.	39.	46.	53.	59.	65.	78.
16.	17.	20.	24.	27.	31.	36.	38.	44.	51.	57.	63.	72.
17.	17.	20.	24.	27.	31.	35.	38.	52.	49.	55.	61.	67.
18.	18.	20.	24.	27.	30.	35.	38.	41.	47.	54.	59.	65.
19.	18.	20.	24.	27.	30.	34.	38.	41.	46.	52.	58.	63.
20.	18.	20.	24.	27.	30.	34.	38.	40.	44.	50.	56.	62.
21.	18.	20.	24.	27.	30.	33.	37.	40.	43.	49.	55.	60.
22.	19.	21.	24.	27.	30.	33.	37.	40.	43.	47.	53.	59.
23.	19.	23.	24.	27.	30.	32.	36.	40.	43.	46.	52.	57.
24.	19.	21.	24.	27.	30.	32.	36.	40.	42.	45.	50.	56.
25.	19.	21.	24.	27.	30.	32.	36.	40.	42.	45.	49.	54.
26.	19.	21.	24.	27.	30.	32.	35.	39.	42.	44.	47.	53.
27.	20.	21.	24.	27.	30.	32.	35.	39.	42.	44.	46.	52.
28.	20.	21.	24.	27.	30.	32.	35.	38.	42.	44.	46.	50.
29.	20.	22.	24.	27.	30.	32.	34.	38.	41.	44.	46.	49.
30.	20.	22.	24.	27.	30.	32.	34.	37.	41.	44.	46.	48.

Drag Distance (Feet)

*Exceeds anchor ultimate holding capacity

TABLE E-2
Predicted Tandem Anchor Drag Distances

Anchor: Tandem Stockless Anchors with Stabilizers and Flukes Fixed at approximately 45°

Seafloor Type: Mud

Horizontal Design Load (Kips)

Anchor Weight (Kips)	25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
5.	6.	*	*	*	*	*	*	*	*	*	*	*
6.	4.	54.	*	*	*	*	*	*	*	*	*	*
7.	4.	32.	*	*	*	*	*	*	*	*	*	*
8.	3.	21.	*	*	*	*	*	*	*	*	*	*
9.	3.	13.	70.	*	*	*	*	*	*	*	*	*
10.	2.	9.	47.	*	*	*	*	*	*	*	*	*
11.	2.	6.	35.	183.	*	*	*	*	*	*	*	*
12.	1.	6.	27.	99.	*	*	*	*	*	*	*	*
13.	1.	6.	21.	64.	*	*	*	*	*	*	*	*
14.	0.	5.	15.	47.	200.	*	*	*	*	*	*	*
15.	0.	5.	12.	40.	128.	*	*	*	*	*	*	*
16.	0.	5.	10.	33.	79.	*	*	*	*	*	*	*
17.	0.	4.	7.	27.	63.	*	*	*	*	*	*	*
18.	0.	4.	7.	22.	50.	154.	*	*	*	*	*	*
19.	0.	4.	7.	17.	44.	95.	*	*	*	*	*	*
20.	0.	3.	7.	14.	38.	77.	*	*	*	*	*	*
21.	0.	3.	6.	12.	33.	64.	179.	*	*	*	*	*
22.	0.	2.	6.	10.	28.	53.	124.	*	*	*	*	*
23.	0.	2.	6.	8.	23.	48.	90.	*	*	*	*	*
24.	0.	2.	6.	8.	19.	42.	77.	202.	*	*	*	*
25.	0.	1.	5.	8.	17.	37.	65.	152.	*	*	*	*
26.	0.	1.	5.	8.	15.	33.	56.	104.	*	*	*	*
27.	0.	1.	5.	7.	13.	29.	51.	89.	224.	*	*	*
28.	0.	1.	5.	7.	11.	25.	46.	78.	177.	*	*	*
29.	0.	0.	4.	7.	10.	21.	42.	68.	132.	*	*	*
30.	0.	0.	4.	7.	9.	19.	38.	59.	101.	245.	*	*

Drag Distance (Feet)

*Exceeds anchor system ultimate holding capacity

TABLE E-2 (Continued)
Predicted Tandem Anchor Drag Distances

Anchor: Tandem Stockless Anchors with Stabilizers and Flukes Fixed at approximately 36°

Seafloor Type: Sand

Horizontal Design Load (Kips)

Anchor Weight (Kips)	25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
5.	13.	20.	32.	*	*	*	*	*	*	*	*	*
6.	13.	19.	27.	*	*	*	*	*	*	*	*	*
7.	13.	18.	25.	37.	*	*	*	*	*	*	*	*
8.	13.	17.	24.	33.	*	*	*	*	*	*	*	*
9.	13.	17.	23.	29.	42.	*	*	*	*	*	*	*
10.	13.	17.	22.	28.	38.	*	*	*	*	*	*	*
11.	13.	17.	21.	27.	34.	46.	*	*	*	*	*	*
12.	13.	17.	21.	26.	32.	43.	*	*	*	*	*	*
13.	13.	17.	20.	26.	31.	39.	*	*	*	*	*	*
14.	13.	17.	20.	25.	30.	37.	47.	*	*	*	*	*
15.	13.	17.	20.	24.	29.	35.	44.	*	*	*	*	*
16.	13.	17.	20.	24.	29.	34.	41.	52.	*	*	*	*
17.	13.	17.	20.	23.	28.	33.	39.	49.	*	*	*	*
18.	13.	17.	20.	23.	28.	32.	37.	46.	*	*	*	*
19.	13.	18.	20.	23.	27.	32.	36.	44.	53.	*	*	*
20.	13.	18.	20.	23.	27.	31.	35.	41.	50.	*	*	*
21.	13.	18.	20.	22.	26.	31.	35.	40.	48.	57.	*	*
22.	13.	18.	20.	22.	26.	30.	34.	39.	46.	54.	*	*
23.	13.	18.	20.	22.	26.	30.	34.	38.	44.	52.	*	*
24.	14.	18.	20.	22.	25.	29.	33.	37.	42.	50.	58.	*
25.	14.	18.	20.	22.	25.	29.	33.	36.	41.	48.	56.	*
26.	14.	17.	20.	22.	25.	28.	32.	36.	40.	46.	54.	62.
27.	14.	17.	20.	23.	25.	28.	32.	36.	40.	45.	52.	60.
28.	14.	17.	21.	23.	25.	28.	32.	35.	39.	43.	50.	58.
29.	14.	17.	21.	23.	25.	28.	31.	35.	38.	43.	49.	56.
30.	14.	17.	21.	23.	25.	27.	31.	35.	38.	42.	47.	54.

Drag Distance (Feet)

*Exceeds anchor system ultimate holding capacity

TABLE E-2 (Continued)
Predicted Tandem Anchor Drag Distances

Anchor: Tandem Stato Anchors with Stabilizers and Flukes Fixed at approximately 50°

Seafloor Type: Mud

Horizontal Design Load (Kips)

Anchor Weight (Kips)	25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
5.	.	4.	10.	23.	41.	64.	99.	158.	324.	*	*	*
6.	0.	3.	6.	15.	29.	45.	66.	96.	140.	236.	*	*
7.	0.	2.	5.	10.	19.	34.	48.	68.	94.	127.	182.	322.
8.	0.	2.	5.	7.	14.	25.	39.	52.	70.	93.	122.	168.
9.	0.	1.	4.	6.	11.	18.	30.	43.	55.	72.	93.	120.
10.	0.	1.	3.	6.	8.	14.	22.	35.	46.	57.	74.	94.
11.	0.	1.	3.	5.	7.	11.	18.	27.	39.	50.	60.	76.
12.	0.	0.	2.	4.	7.	9.	15.	21.	32.	43.	53.	63.
13.	0.	0.	2.	4.	6.	8.	12.	18.	25.	36.	46.	56.
14.	0.	0.	1.	3.	5.	7.	10.	15.	21.	29.	40.	50.
15.	0.	0.	1.	3.	5.	7.	9.	13.	18.	24.	34.	43.
16.	0.	0.	1.	3.	4.	6.	8.	10.	16.	21.	28.	37.
17.	0.	0.	0.	2.	4.	6.	8.	10.	13.	18.	24.	32.
18.	0.	0.	0.	2.	4.	5.	7.	9.	11.	16.	21.	27.
19.	0.	0.	0.	2.	3.	5.	7.	8.	10.	14.	19.	24.
20.	0.	0.	0.	1.	3.	5.	6.	8.	10.	12.	17.	21.
21.	0.	0.	0.	1.	3.	4.	6.	7.	9.	11.	15.	19.
22.	0.	0.	0.	1.	2.	4.	5.	7.	9.	10.	13.	17.
23.	0.	0.	0.	1.	2.	4.	5.	7.	8.	10.	11.	15.
24.	0.	0.	0.	1.	2.	3.	5.	6.	8.	9.	11.	13.
25.	0.	0.	0.	0.	1.	3.	4.	6.	7.	9.	10.	12.
26.	0.	0.	0.	0.	1.	3.	4.	5.	7.	8.	10.	11.
27.	0.	0.	0.	0.	1.	2.	4.	5.	7.	8.	9.	11.
28.	0.	0.	0.	0.	1.	2.	4.	5.	6.	8.	9.	10.
29.	0.	0.	0.	0.	1.	2.	3.	5.	6.	7.	9.	10.
30.	0.	0.	0.	0.	1.	2.	3.	4.	6.	7.	8.	10.

Drag Distance (Feet)

*Exceeds anchor system ultimate holding capacity

TABLE E-2 (Continued)
Predicted Tandem Anchor Drag Distances

Anchor: Tandem Stato Anchor with Stabilizers and Flukes Fixed at approximately 30°

Seafloor Type: Sand

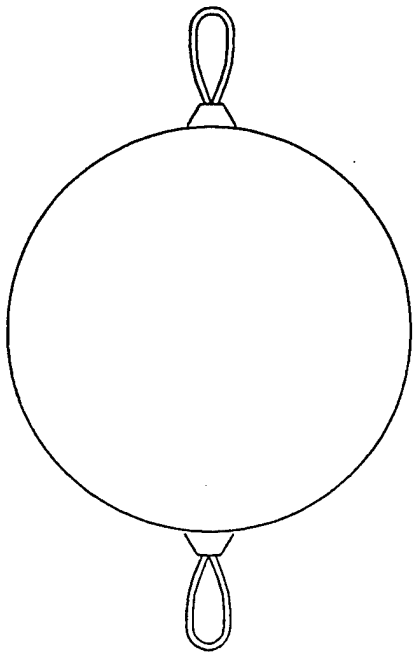
Horizontal Design Load (Kips)

Anchor Weight (Kips)	25.	50.	75.	100.	125.	150.	175.	200.	225.	250.	275.	300.
5.	12.	15.	18.	21.	25.	28.	34.	39.	45.	55.	78.	*
6.	13.	15.	18.	20.	24.	27.	30.	36.	41.	45.	52.	63.
7.	13.	15.	18.	20.	23.	27.	29.	32.	37.	42.	46.	51.
8.	13.	15.	18.	20.	22.	26.	28.	30.	34.	39.	43.	47.
9.	14.	15.	18.	20.	22.	25.	28.	30.	32.	36.	40.	45.
10.	14.	15.	18.	21.	22.	24.	27.	30.	32.	33.	38.	42.
11.	15.	16.	18.	20.	22.	24.	26.	29.	32.	33.	35.	40.
12.	15.	16.	18.	20.	22.	24.	26.	28.	31.	33.	35.	37.
13.	15.	16.	18.	20.	23.	24.	26.	28.	30.	33.	35.	36.
14.	16.	17.	18.	20.	23.	24.	26.	27.	30.	32.	34.	36.
15.	16.	17.	18.	20.	22.	24.	26.	27.	29.	32.	34.	36.
16.	16.	17.	18.	20.	22.	24.	26.	27.	29.	31.	34.	36.
17.	16.	17.	18.	20.	22.	24.	26.	27.	28.	31.	33.	35.
18.	17.	18.	19.	20.	22.	24.	26.	27.	28.	30.	32.	35.
19.	17.	18.	19.	20.	22.	24.	26.	27.	28.	30.	32.	34.
20.	17.	18.	19.	20.	22.	24.	26.	27.	29.	30.	32.	34.
21.	17.	18.	19.	20.	22.	24.	26.	27.	29.	30.	31.	33.
22.	18.	19.	19.	21.	22.	24.	26.	27.	29.	30.	31.	33.
23.	18.	19.	20.	21.	22.	24.	26.	27.	29.	30.	31.	32.
24.	18.	19.	20.	21.	22.	24.	26.	27.	29.	30.	31.	32.
25.	18.	19.	20.	21.	22.	24.	26.	27.	29.	30.	31.	32.
26.	19.	19.	20.	21.	22.	24.	26.	27.	29.	30.	31.	32.
27.	19.	20.	20.	21.	22.	24.	26.	27.	29.	30.	31.	32.
28.	19.	20.	21.	21.	22.	24.	26.	27.	29.	30.	31.	32.
29.	19.	20.	21.	22.	23.	24.	26.	27.	29.	30.	31.	32.
30.	19.	20.	21.	22.	23.	24.	26.	27.	29.	30.	31.	32.

Drag Distance (Feet)

*Exceeds anchor system ultimate holding capacity

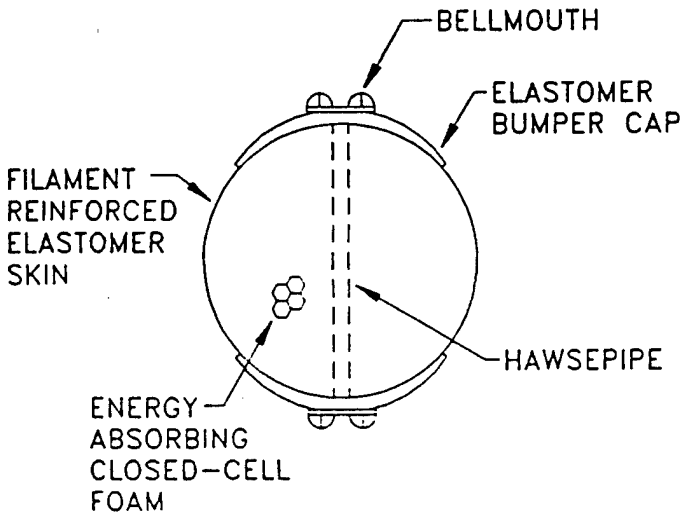
TABLE 70
Spherical Marker or Mooring Buoy[1]



Weitht	270 lbs
Dimensions	40 inches Diameter
Net Buoyancy	1240 lbs
Surface Visibility	23 sq ft.
Hull Construction	1/8" Fiberglass reinforced polyester resin
Foam Filling	4 lbs/ft^3 Closed cell polyurethane
Color	International orange

[1]Data provided by Tideland Signal Corp.

TABLE 71
Spherical Marker or Mooring Buoy[1]

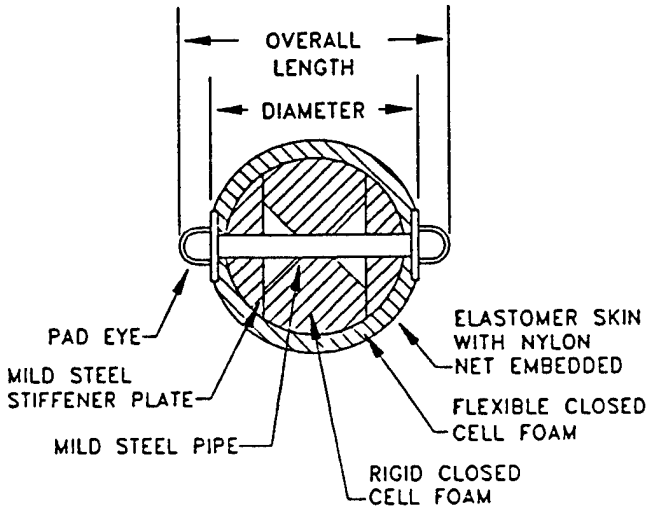


HAWSEPIPE TYPE

DIAMETER (FEET)	WEIGHT IN AIR (LBS.)	RESERVE BUOYANCY (LBS.)
6.0	1,500	5,500
7.0	2,200	9,000
8.0	2,900	14,000
9.0	3,900	20,000
10.0	5,900	28,000

[1]Data provided by Seward International Co.

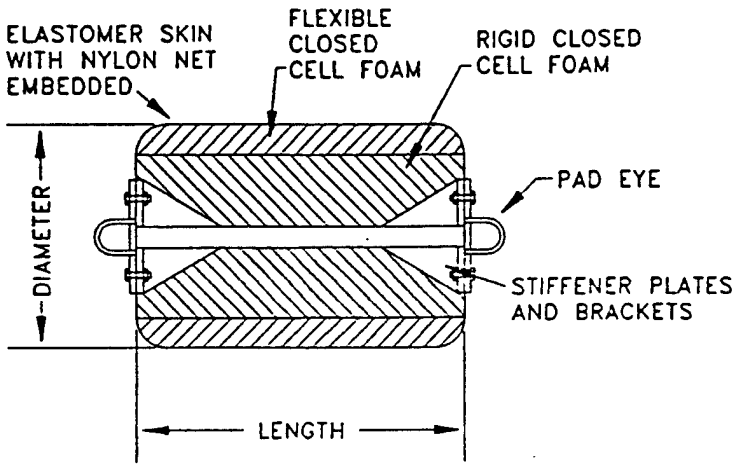
TABLE 72
Spherical Marker or Mooring Buoy[1]



DIAMETER (FEET)	OVERALL LENGTH (FEET)	WEIGHT IN AIR (LBS.)	RESERVE BUOYANCY (LBS.)	MANUF PART NO.
2.50	4.50	75	500	SB5
3.25	5.25	150	1,000	SB10
3.75	5.75	205	1,500	SB15
4.20	6.20	290	2,000	SB20
4.40	6.40	350	2,500	SB25
4.75	6.75	395	3,000	SB30
5.20	7.20	470	4,000	SB40
5.60	7.60	605	5,000	SB50
5.90	7.90	750	6,000	SB60

[1]Data provided by Samson Ocean Systems, Inc.

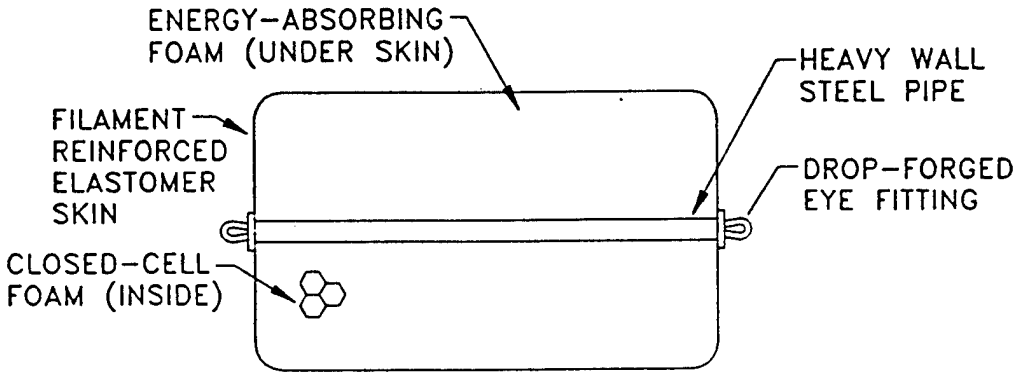
TABLE 73
Tension Bar Mooring Buoys[1]



DIAMETER (FEET)	HEIGHT OR LENGTH (FEET)	WEIGHT IN AIR (LBS.)	RESERVE BUOYANCY (LBS.)	MANUF. PART NO.
2.00	4.0	200	500	CB5
2.50	4.0	250	1,000	CB10
3.00	4.0	310	1,500	CB15
3.50	4.0	460	2,000	CB20
4.00	4.5	600	3,000	CB30
4.00	6.0	825	4,000	CB40
4.50	6.0	1000	5,000	CB50
5.00	6.0	1150	6,000	CB60
5.50	6.5	1350	8,000	CB80
5.75	6.5	1625	10,000	CB100
6.00	8.0	2475	12,000	CB120

[1]Data provided by Samson Ocean Systems, Inc.

TABLE 74
Tension Bar Mooring Buoys[1]



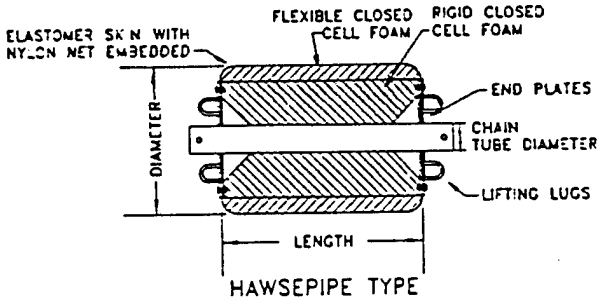
DIAMETER (INCHES)	HEIGHT OR LENGTH (INCHES)	OVERALL LENGTH (INCHES)	WEIGHT IN AIR (LBS.)	RESERVE BUOYANCY (LBS.)	PICK-UP LOAD RATING (LBS.)	PICK-UP EYE I.D. (INCHES)
20	30	40-3/8	40	300	5,000	2-1/4
24	36	47-7/8	70	500	7,500	2-1/2
29	48	61-7/8	140	1,000	10,000	3-1/8
37	59	79-3/8	280	2,000	20,000	4
50	81	102	700	5,000	40,000	4

[1]Data provided by Seaward International Co.

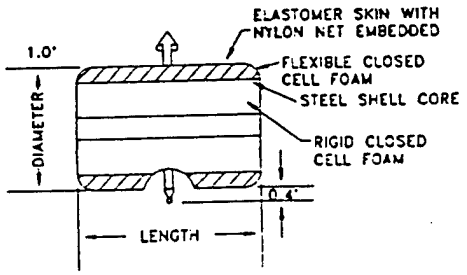
TABLE 75
Hawsepipe and Tension Bar Buoys[1]

TENSION BAR TYPE

DIAMETER (FEET)	LENGTH (FEET)	WEIGHT IN AIR (LBS.)	RESERVE BOUYANCY (LBS.)	MANF. PART NO.
5.75	8.0	1,900	11,400	PB11
6.50	9.0	2,700	16,400	PB16
7.25	10.0	3,400	23,000	PB23
8.00	11.0	3,800	30,000	PB30
8.75	13.0	5,000	40,000	PB40



HAWSEPIPE TYPE



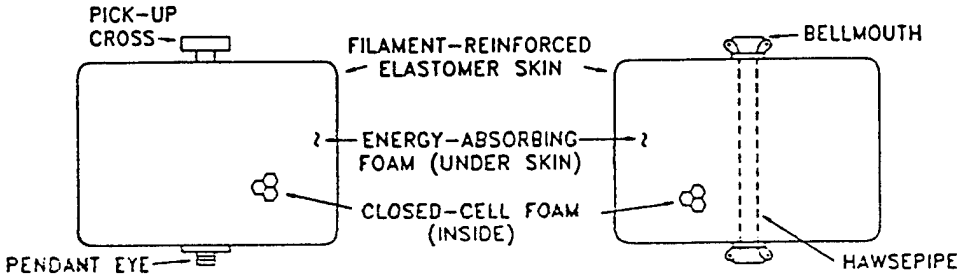
TENSION BAR TYPE

HAWSEPIPE TYPE

DIAMETER (FEET)	HEIGHT OR LENGTH (FEET)	WEIGHT IN AIR (LBS.)	RESERVE BOUYANCY (LBS.)	HAWSEPIPE INSIDE DIA (INCHES)	MANF. PART NO.
3.60	5.5	305	2,000	14	HB20
4.25	5.5	360	3,000	14	HB30
4.50	6.2	500	4,000	14	HB40
4.85	7.5	1,400	5,000	16	HB50
5.00	8.0	1,575	6,000	16	HB60
5.00	8.5	1,700	8,000	19	HB80
6.00	10.0	3,350	10,000	25	HB100
6.00	12.0	3,800	12,000	30	HB120

[1]Data provided by Samson Ocean Systems, Inc.

TABLE 76
Hawsepipe and Tension Bar Mooring Buoys[1]

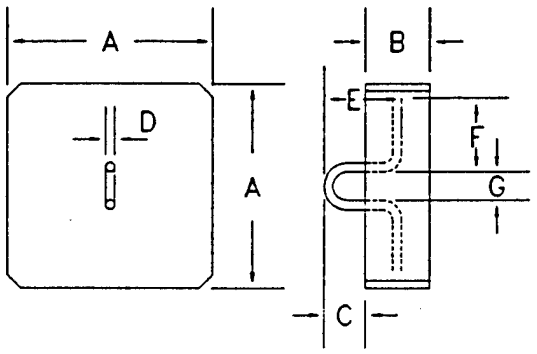


TENSION BAR TYPE HAWSEPIPE TYPE

DIAMETER (FEET)	HEIGHT OR LENGTH (FEET)	WEIGHT IN AIR (LBS.)	RESERVE BOUYANCY (LBS.)	PICK-UP LOAD RATING (LBS.) TENSION BAR TYPE
5.4	8.0	1,500	10,000	10,000
6.2	9.2	2,000	15,000	15,000
6.8	10.1	2,500	20,000	20,000
7.7	11.5	3,300	30,000	30,000
8.4	12.6	4,000	40,000	40,000
9.1	13.5	5,000	50,000	50,000

[1]Data provided by Seaward International Co.

TABLE 77
Concrete Sinkers[1]



WEIGHT (LBS.)	A	B	C	D	E	F	G
1,000	35	10	4	3/4	10	12	3-1/2
2,000	45	12	4	1	11	14	3-1/2
5,000	57	18	5	1-5/8	16	18	4

[1]Data provided by Automatic Power, Inc.

TABLE 78
Holding Power to Weight Ratios of Various Anchors[1]

ANCHOR[2]	Holding Power and Type of Bottom		
	SAND	MUD/SILT	HARD/DENSE SOIL
U.S. Navy Stockless	4.5[3]	3[3]	--
U.S. Navy Lightweight	10	3	--
U.S. Navy Stato	20[5]	15[5]	15[5]
Danforth	10	3	--
Stock Anchor Type 1 (offdrill II)	13.[5]	9	--
Moorfast	10	7	--
Boss	20	15	15[5]
Flipper Delta	15	15	15
Stevin	17	12[6]	15
Stevfix	20	--	20
Stevmud	--	19	--
Hook	--	18	10
Mark-2	20	--	--

[1]The anchor holding power ratios given are intended for use with conventional anchor weights up to 30,000 lb. only; heavier conventional anchors may possess lower holding power to weight ratios. The holding power ratios represent values established by field tests performed by the Civil Engineering Laboratory, Naval Construction Battalion Center, Port Hueneme, California and are based on efficiencies achieved during maximum permissible drag of 50 feet. Higher holding power ratios may be achieved by some anchors during longer drags. The holding power ratios do not apply where anomalous sealer conditions exist; erratic or unsatisfactory anchor performance is experienced under conditions such as layered sealers (soft sediment over stiff/dense sediment or vice versa), gravely (placated) sealers, thin sediment layer above rock, and unconsolidated clays with cohesion to pressure ratios less than 0.15.

[2]For weight ranges and dimensional characteristics of anchors and appurtenances, see Tables in Sections 4 and 6.

[3]The flukes should be restricted to a 35° angle opening in sand and fixed fully open in mud.

[4]Values indicated are for fabricated (welded) anchors only. They should not be applied to cast anchors.

[5]Only with fluke angle reduced to 32° and with stabilizers lengthened by 35%.

[6]In very soft bottoms this anchor should be installed without the retrieving wire rope pendant attached to the corner eye opening in one of the flukes. This pendant may cause a dissymmetric strain leading to anchor instability and overturning resulting in a major loss of holding power.

TABLE 79

Moorings Without Sinkers Bills of Materials

Class			AAA(Proposed)		BBB(Proposed)		
Holding Power (lbs)			500,000		50,000		
Basic Depth (ft)			50		50		
Assembly No.			5381		5382		
Description of Item		Req.	Size	Req.	Size		
Tension bar Mooring Buoy		1	dia. hgt. 15'0"x9'6"	1	dia. hgt. 15'0"x9'6"		
Anchors		6	--[1]	6	--[1]		
Chain Set Assembly No.		1	5788	1	5789		

Class	AA		BB		CC		DD	
Holding Power (lbs)	300,000		250,000		200,000		175,000	
Basic Depth (ft)	50		50		50		50	
Assembly No.	5377		5378		5379		5380	
Description of Item	Req.	Size	Req.	Size	Req.	Size	Req.	Size
Hawsepipe Mooring Buoy	1	dia. hgt. 12'0"x6'0"	1	dia. hgt. 12'0"x6'0"	1	dia. hgt. 12'0"x6'0"	1	dia. hgt. 12'0"x6'0"
Anchors	6	--[1]	6	--[1]	6	--[1]	3	--[1]
Chain Set Assembly No.	1	5784	1	5785	1	5786	1	5787

[1]For anchor selection procedure, see introduction to this part.

TABLE 80

Moorings Without Sinkers Chain Set Assembly for Basic Depth

Mooring Class	AAA (Proposed)			BBB (Proposed)		
Basic Depth (ft.)	50			50		
Chain Set Assembly No.	5788			5789		
Description of Item	Reqd.	Spare[1]	Chain Size	Reqd.	Spare[1]	Chain Size
Riser chain (45 ft.)	1	-	4-1/2	1	-	4-1/2
Ground chain (90 ft.)[2]	42	-	3	36	-	3
Ground chain (45 ft.)	0	-	3	0	-	3
Ground ring	1	-	4-1/2	1	-	4-1/2
Spider	3	-	-	3	-	-
End link ass. #1	1	-	4-1/2	1	-	4-1/2
End link ass. #1	12	-	3	12	-	3
End link ass. #2	3	-	4-1/2	3	-	4-1/2
Anchor link (pear shaped)	4	-	4-1/2	4	1	4-1/2
Detachable Link	3	1	4-1/2	3	1	4-1/2
Joining Link	48	16	3	42	14	3
End shackle	3	1	4-1/2	3	1	4-1/2
End shackle	6	1	3	6	1	3
Swivel assembly	1	-	4-1/2	1	-	4-1/2
Swivel shackle	6	-	3	6	-	3

Mooring Class	AA			BB			CC			DD		
Basic Depth (ft.)	50			50			50			50		
Chain Set Assembly No.	5784			5785			5786			5787		
Description of Item	Reqd.	Spare[1]	Chain Size	Reqd.	Spare[1]	Chain Size	Reqd.	Spare[1]	Chain Size	Reqd.	Spare[1]	Chain Size
Riser chain (45 ft.)[2]	1	-	4	1	-	3-1/2	1	-	3-1/2	1	-	3
Ground chain (90 ft.)[2]	24	-	2-3/4	24	-	2-1/2	24	-	2-1/4	12	-	3
Ground chain (45 ft.)	6	-	2-3/4	6	-	2-1/2	6	-	2-1/4	3	-	3
Ground ring	1	-	3-1/2	1	-	3-1/2	1	-	3-1/2	1	-	3
Spider	3	-	-	3	-	-	3	-	-	-	-	-
End link	1	-	4	1	-	3-1/2	1	-	3-1/2	1	-	3
F-shackle with lugs	1	1	4	1	1	3-1/2	1	1	3-1/2	1	1	3
Anchor Joining link	8	1	4	8	1	3-1/2	8	1	3-1/2	-	-	-
Anchor Joining link	12	3	2-3/4	12	3	2-1/2	12	3	2-1/4	8	2	3
Chain Joining link[3]	1	2	4	1	1	3-1/2	1	1	3-1/2	-	-	-
Chain Joining link[3]	30	10	2-3/4	30	10	2-1/2	30	10	2-1/4	16	6	3
Chain swivel[3]	1	-	4	1	-	3-1/2	1	-	3-1/2	-	-	-
Chain swivel[3]	6	-	2-3/4	6	-	2-1/2	6	-	2-1/4	4	-	3
Rubbing casting	1	-	4	1	-	3-1/2	1	-	3-1/2	1	-	3

[1]Ship to advanced bases for each Assembly regardless of water depth.

[2]Length of each ground leg includes one more shot of chain than that required by catenary configuration at rated load. This extra shot serves to accommodate any temporary load increases due to dynamic forces.

[3]If still in stock, a swivel chain shot of the same size may be substituted in the riser or ground chain for the listed swivel and chain shot. Each swivel chain shot will replace 1 chain shot, 1 swivel, and 1 chain joining link in the Bill of Materials

TABLE 81

Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths[1]

Depth of Water (ft)	(Proposed) Class AAA[2]	BBB[2]	AA	BB	CC	DD
Basic -	7	6	4-1/2	4-1/2	4-1/2	4-1/2
Basic to 50	7	6	4-1/2	4-1/2	4-1/2	4-1/2
50 to 60	7-1/2	6-1/2	5	5	5	5
60 to 70	8	7	5	5-1/2	5-1/2	5
70 to 80	8-1/2	7	5-1/2	5-1/2	5-1/2	5-1/2
80 to 90	9	7-1/2	6	6	6	6
90 to 100	9-1/2	8	6[3]	6-1/2	6-1/2	6
100 to 115	10	8	-	6-1/2	6-1/2	6-1/2
115 to 130	10	8-1/2	-	7[3]	7[3]	7
130 to 145	10-1/2[3]	9[3]	-	-	-	7
145 to 160	-	-	-	-	-	7-1/2
160 to 175	-	-	-	-	-	8
175 to 190	-	-	-	-	-	8[3]

[1]Lengths are 90 ft. shots. Depth of water is taken at mean high water from a firm bottom at anchor location.

[2]Includes an extra shot of chain to accommodate any temporary load increases due to dynamic forces.

[3]Freeboard limit of 2 ft. reached at this water depth for buoy size indicated in Table 79.

TABLE 82
Moorings Without Sinkers Chain Set Assemblies for Various Water Depths[1]

Depth of Water (feet)	Class AAA (Proposed)						Class BBB (Proposed)					
	3" chain (90° shot)	3" chain (45° shot)	3" Joining Link	4-1/2" chain (90° shot)	4-1/2" chain (45° shot)	4-1/2" Detachable Link	3" chain (90° shot)	3" chain (45° shot)	3" Joining Link	4-1/2" chain (90° shot)	4-1/2" chain (45° shot)	4-1/2" Detachable Link
Basic to 50	0	0	0	0	0	0	0	0	0	0	0	0
50 to 60	0	0	0	0	0	0	0	0	0	0	0	0
60 to 70	6	6	6	0	0	0	6	6	6	0	0	0
70 to 80	6	6	6	0	0	0	6	6	6	0	0	0
80 to 90	12	6	12	0	0	0	12	6	12	0	0	0
90 to 100	12	6	12	0	0	0	12	6	12	0	0	0
100 to 115	18	6	18	0	0	0	18	6	18	0	0	0
115 to 130	18	6	18	0	0	0	18	6	18	0	0	0
130 to 145	18	6	24	0	0	0	18	6	24	0	0	0
145 to 160	24	6	24	0	0	0	24	6	24	0	0	0
160 to 175	24	6	24	0	0	0	24	6	24	0	0	0
175 to 190	24	6	24	0	0	0	24	6	24	0	0	0

Depth of Water (feet)	Class AA						Class BB						Class CC						Class DD		
	2-3/4" chain (90°shot)	2-3/4" chain (45° shot)	2-3/4" Joining Link	4" chain (90° shot)	4" chain (45° shot)	4" Joining Link	2-1/2" chain (90° shot)	2-1/2" chain (45° shot)	2-1/2" Joining Link	3-1/2" chain (90° shot)	3-1/2" chain (45° shot)	3-1/2" Joining Link	2-1/4" chain (90° shot)	2-1/4" chain (45° shot)	2-1/4" Joining Link	3-1/2" chain (90° shot)	3-1/2" chain (45° shot)	3-1/2" Joining Link	3" chain (90° shot)	3" chain (45° shot)	3" Joining Link
Basic to 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50 to 60	6	6	6	0	0	0	6	6	6	0	0	0	6	6	6	0	0	0	4	4	4
60 to 70	6	6	6	0	0	0	6	6	6	0	0	0	6	6	6	0	0	0	4	4	4
70 to 80	6	6	6	0	0	0	6	6	6	0	0	0	6	6	6	0	0	0	4	4	4
80 to 90	6	6	6	0	0	0	6	6	6	0	0	0	6	6	6	0	0	0	4	4	4
90 to 100	6	6	6	0	0	0	6	6	6	0	0	0	6	6	6	0	0	0	4	4	4
100 to 115	12	6	12	0	0	0	12	6	12	0	0	0	12	6	12	0	0	0	7	7	7
115 to 130	12	6	12	0	0	0	12	6	12	0	0	0	12	6	12	0	0	0	7	7	7
130 to 145	12	6	18	0	0	0	12	6	18	0	0	0	12	6	18	0	0	0	7	10	10
145 to 160	18	6	18	0	0	0	18	6	18	0	0	0	18	6	18	0	0	0	10	10	10
160 to 175	18	6	18	0	0	0	18	6	18	0	0	0	18	6	18	0	0	0	11	11	11
175 to 190	18	6	18	0	0	0	18	6	18	0	0	0	18	6	18	0	0	0	11	14	14

[1]Add to Basic Depth Assembly to obtain Assembly for a particular depth.
A negative sign denotes removal of that amount from the Basic Assembly

TABLE 83

Moorings Without Sinkers Bills of Materials

Class	A		B		C		D		E		F		G	
Holding Power (lbs)	150,000		125,000		100,000		75,000		50,000		25,000		5,000	
Basic Depth (ft)	50		45		40		35		35		30		25	
Assembly No.	5370		5371		5372		5373		5374		5375		5376	
Description of Item	Reqd	Size	Reqd	Size	Reqd	Size	Reqd	Size	Reqd	Size	Reqd	Size	Reqd	Size
Riser buoy	1	dia 12'0" hgt 6'0"	1	dia 12'0" hgt 6'0"	1	dia 10'6" hgt 6'6"	1	dia 10'6" hgt 6'6"	1	dia 9'6" hgt 5'0"	1	dia 9'6" hgt 5'0"	1	dia 3'6" hgt
Anchors	3	--[1]	3	--[1]	3	--[1]	3	--[1]	3	--[1]	3	--[1]	3	--[1]
Chain Set Assembly No.	1	5777	1	5778	1	5779	1	5780	1	5781	1	5782	1	5783

[1]For anchor selection procedure, see introduction to this part.

TABLE 84

Moorings Without Sinkers Chain Set Assembly for Basic Depth

Class	A			B			C			D			E			F			G		
Basic Depth (ft.)	50			45			40			35			35			30			25		
Chain Set Assembly No.	5777			5778			5779			5780			5781			5782			5783		
Description of Item	Reqd	Spare[1]	Chain Size	Reqd	Spare[1]	Chain Size	Reqd	Spare[1]	Chain Size	Reqd	Spare[1]	Chain Size	Reqd	Spare[1]	Chain Size	Reqd	Spare[1]	Chain Size	Reqd	Spare[1]	Chain Size
Riser chain (45 ft.)[2]	1	-	2-3/4	1	-	2-1/2	1	-	2-1/4	1	-	2	1	-	1-3/4	1	-	1-1/4	1	-	3/4
Ground chain (90 ft.)[2]	12	-	2-3/4	12	-	2-1/2	12	-	2-1/4	12	-	2	9	-	1-3/4	9	-	1-1/4	9	-	3/4
Ground chain (45 ft.)[2]	3	-	2-3/4	3	-	2-1/2	0	-	2-1/4	0	-	2	3	-	1-3/4	3	-	1-1/4	0	-	3/4
Ground ring	1	-	2-3/4	1	-	2-1/2	1	-	2-1/4	1	-	2	1	-	1-3/4	1	-	1-1/4	1	-	3/4
End Link	1	-	2-3/4	1	-	2-1/2	1	-	2-1/4	1	-	2	1	-	1-3/4	1	-	1-1/4	1	-	3/4
F-shackle without lugs	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1-3/4	1	1	1-1/4	-	-	-
F-shackle with lugs	1	1	2-3/4	1	1	2-1/2	1	1	2-1/4	1	1	2	-	-	-	-	-	-	-	-	-
Anchor joining link	8	2	2-3/4	8	2	2-1/2	8	2	2-1/4	8	2	2	8	2	1-3/4	8	2	1-1/4	8	2	3/4
Joining link[2]	16	6	2-3/4	16	6	2-1/2	13	6	2-1/4	13	4	2	13	6	1-3/4	13	6	1-1/4	10	6	3/4
Swivel[2]	4	-	2-3/4	4	-	2-1/2	4	-	2-1/4	4	-	2	4	-	1-3/4	4	-	1-1/4	4	-	3/4
Joining link	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1
Rubber casting	1	-	2-3/4	1	-	2-1/2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[1]Ship to advanced bases for each assembly regardless of water depth.

[2]If still in stock, a swivel chain shot of the same size may be substituted in the riser or ground chain for the listed swivel and chain shot. Each swivel chain shot will replace 1 chain shot, 1 swivel, and 1 chain joining link in the Bill of Materials.

TABLE 85

Moorings Without Sinkers Maximum Mooring Depths With Various Buoys

Buoy Details	NAVFAC Dwg 620,662			NAVFAC Dwg 620,659 bar type		NAVFAC Dwg 620,605	NAVFAC Dwg 620,659
Size	3'6" spherical			Dia. Hgt. 9'6"x5'0"	Dia. Hgt. 10'6"x6'6"	Dia. Hgt. 12'0"x6'0"	Dia. Hgt. 10'6"x7'6"
Class				Depth (ft)[1]			
A	-			-	-	225	-
B	-			-	-	280	-
C	-			75	305	-	425
D	-			105	395	-	545
E	-			155	525	-	-
F	-			-	-	-	-
G	140[2]			-	-	-	-

[1]Buoys have a 2-ft. freeboard at depths tabulated, except as noted.

[2]1-ft. freeboard.

TABLE 86

Moorings Without Sinkers Lengths of Ground Chain Required for Various Water Depths[1]

Depth of Water (ft)	Class						
	A	B	C	D	E	F	G
Basic	4-1/2	4-1/2	4	4	3-1/2	3-1/2	3
Basic to 50	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2	3-1/2
50 to 60	5	5	5	5	4-1/2	4-1/2	4
60 to 70	5	5-1/2	5-1/2	5-1/2	5	5	4
70 to 80	5-1/2	5-1/2	5-1/2	5-1/2	5-1/2	5-1/2	4-1/2
80 to 90	6	6	6	6	5-1/2	5-1/2	4-1/2
90 to 100	6-1/2	6-1/2	6-1/2	6-1/2	6	6	4-1/2
100 to 120	7	7	7	7	6	6-1/2	5
120 to 140	7-1/2	7-1/2	7-1/2	7-1/2	6-1/2	6-1/2	5
140 to 160	7-1/2	7-1/2	7-1/2	7-1/2	7	7	-
160 to 180	8	8	8	8	7[2]	7	-
180 to 200	8-1/2	8-1/2	8-1/2	8-1/2	7-1/2[2]	7-1/2	-
200 to 240	9	9	9	8-1/2	8[2]	8	-
240 to 280	8-1/1[2]	9-1/2	9-1/2	9	8-1/2[2]	8-1/2	-
280 to 320	10[2]	10[2]	10	9-1/2	8-1/2[2]	9	-
320 to 360	10-1/2[2]	10-1/2[2]	10-1/2[2]	10	9[2]	9	-
360 to 400	10-1/2[2]	11[2]	11[2]	10-1/2	9-1/2[2]	9-1/2	-
400 to 440	11[2]	11[2]	-	11[2]	10[2]	9-1/2	-
440 to 480	-	11-1/2[2]	-	11[2]	10[2]	-	-
480 to 520	-	-	-	11-1/2[2]	10-1/2[2]	-	-
520 to 560	-	-	-	-	10-1/2[2]	-	-

[1]Lengths are 90-ft. shots. Depth of water is taken at mean high water from a firm bottom at anchor location. Maximum water depth determined on the basis of not exceeding the allowable stress in the chain.

[2]The freeboard limit of the mooring's standard buoy (see Table 83) will be exceeded at this depth. An optional buoy (see Table 85) must be used.

TABLE 87
Moorings Without Sinkers Chain Set Assemblies for Various Water Depths [1]

Depth of Water (feet)	Class A			Class B			Class C			Class D			Class E			Class F			Class G		
	2-3/4" chain (90°shot)	2-3/4" chain (45° shot)	2-3/4" Joining Link	2-1/2" chain (90°shot)	2-1/2" chain (45° shot)	2-1/2" Joining Link	2-1/4" chain (90°shot)	2-1/4" chain (45° shot)	2-1/4" Joining Link	2" chain (90°shot)	2" chain (45° shot)	2" Joining Link	1-3/4" chain (90°shot)	1-3/4" chain (45° shot)	1-3/4" Joining Link	1-1/4" chain (90°shot)	1-1/4" chain (45° shot)	1-1/4" Joining Link	3/4" chain (90°shot)	3/4" chain (45° shot)	3/4" Joining Link
Basic :: 50	0	0	0	0	1	1	0	4	4	0	4	4	3	1	4	3	1	4	0	4	4
50 :: 60	0	4	4	0	4	4	3	1	4	3	1	4	3	1	4	3	1	4	4	1	4
60 :: 70	3	4	7	3	4	7	3	4	7	3	4	7	3	4	7	3	4	7	4	3	7
70 :: 80	3	1	4	3	1	4	3	4	7	3	4	7	6	1	7	7	0	7	4	3	7
80 :: 90	3	4	7	3	4	7	7	0	7	7	0	7	7	0	7	7	0	7	4	3	7
90 :: 100	7	0	7	7	0	7	7	3	10	7	3	10	7	3	10	7	3	10	4	3	7
100 :: 120	7	3	10	7	3	10	10	0	10	10	0	10	7	3	10	10	0	10	7	1	8
120 :: 140	10	0	10	10	1	11	10	4	14	10	4	14	10	1	11	10	1	11	7	1	8
140 :: 160	10	1	11	10	1	11	10	4	14	10	4	14	10	4	14	10	4	14			
160 :: 180	10	4	14	10	4	14	14	0	14	14	0	14	11	3	14	11	3	14			
180 :: 200	14	0	14	14	0	14	14	3	17	14	3	17	14	0	14	14	0	14			
200 :: 240	14	4	18	14	4	18	17	1	18	14	4	18	14	4	18	14	4	18			
240 :: 280	18	0	18	18	0	18	18	3	21	18	0	18	15	0	15	18	0	18			
280 :: 320	18	3	21	18	4	22	21	1	22	18	4	22	18	1	19	18	4	22			
320 :: 360	21	1	22	21	1	22	22	3	25	22	0	22	19	3	22	19	3	22			
360 :: 400	22	0	22	22	3	25	25	0	25	22	4	26	22	1	23	22	1	23			
400 :: 440	22	4	26	22	4	26	-	-	-	25	1	26	22	4	26	23	0	23			
440 :: 480	-	-	-	26	0	26	-	-	-	25	0	26	23	3	26	-	-	-			
480 :: 520	-	-	-	-	-	-	-	-	-	26	4	30	26	1	27	-	-	-			
520 :: 560	-	-	-	-	-	-	-	-	-	-	-	-	27	0	27	-	-	-			

[1] Add :: Basic Depth Assembly to obtain Assembly for a particular depth

TABLE 88

Moorings With Sinkers - Bills of Materials

Class	A		B		C		D		E	
Holding Power (lbs.)	150,000		125,000		100,000		75,000		50,000	
Basic Depth (ft.)	50		45		40		35		35	
Assembly No.	5015		5254		5220		5231		5224	
Description of Item	Reqd.	Size	Reqd.	Size	Reqd.	Size	Reqd.	Size	Reqd.	Size
Riser buoy	1	dia. 12'0" hgt. 6'0"	1	dia. 12'0" hgt. 6'0"	1	dia. 10'6" hgt. 7'6"	1	dia. 10'6" hgt. 6'6"	1	dia. 9'6" hgt. 5'0"
Anchors	3	--[1]	3	--[1]	3	--[1]	3	--[1]	3	--[1]
Chain Set Assembly No.	1	5766	1	5764	1	5763	1	5741	1	5758
Sinkers	3	8,200 (lbs.)	3	8,200 (lbs.)	3	8,200 (lbs.)	3	8,200 (lbs.)	3	8,200 (lbs.)

[1]For anchor selection procedure, see introduction to this part.

TABLE 89

Moorings With Sinkers - Chain Set Assembly for Basic Depth

Class	A			B			C			D			E		
Chain Set Assembly No.	5766			5764			5763			5741			5758		
Basic Depth (ft.)	50			45			40			35			35		
Description of item	Reqd.	Spare[1]	Chain Size	Reqd.	Spare[1]	Chain Size	Reqd.	Spare[1]	Chain Size	Reqd.	Spare[1]	Chain Size	Reqd.	Spare[1]	Chain Size
Riser chain (45 ft.)[2]	1	-	2-3/4	1	-	2-1/2	1	-	2-1/4	1	-	2	1	-	1-3/4
Ground chain (90 ft.)[2]	12	-	2-3/4	12	-	2-1/2	9	-	2-1/4	9	-	2	9	-	1-3/4
Ground chain (45 ft.)[2]	0	-	2-3/4	0	-	2-1/2	3	-	2-1/4	0	-	2	0	-	1-3/4
Ground ring	1	-	2-3/4	1	-	2-1/2	1	-	2-1/4	1	-	2	1	-	1-3/4
End link	1	-	2-3/4	1	-	2-1/2	1	-	2-1/4	1	-	2	1	-	1-3/4
F-shackle without lugs	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1-3/4
F-shackle with lugs	1	1	2-3/4	1	1	2-1/2	1	1	2-1/4	1	1	2	-	-	-
Anchor Joining link	8	2	2-3/4	11	2	2-1/2	11	2	2-1/4	11	2	2	11	2	1-3/4
Joining link	16	6	2-3/4	14	6	2-1/2	13	6	2-1/4	10	6	2	10	6	1-3/4
Swivel	4	-	2-3/4	4	-	2-1/2	4	-	2-1/4	4	-	2	4	-	1-3/4
Rubbing casting	1	-	2-3/4	1	-	2-1/2	-	-	-	-	-	-	-	-	-
Sinker shackle	3	-	2"to3"	3	-	2"to3"	3	-	2"to3"	3	-	2"to3"	3	-	2"

[1]Ship to advanced bases for each Assembly regardless of water depth.

[2]If still in stock, a swivel chain shot of the same size may be substituted in the riser or ground chain for the listed swivel and chain shot. Each swivel chain shot will replace 1 chain shot. 1 swivel, and 1 chain Joining link in the Bill of Materials.

TABLE 90

Moorings With Sinkers - Maximum Mooring Depths With Various Buoys

Buoy Details	NAVFAC Dwg. 620659 bar type	NAVFAC Dwg. 620659 bar type	NAVFAC Dwg. 620605 hawsepipe type	NAVFAC Dwg. 620659 bar type
Size	Dia. Hgt.	Dia. Hgt.	Dia. Hgt.	Dia. Hgt.
	9'6" x 5'0"	10'6" x 6'6"	12'0" x 6'0"	10'6" x 7'6"
Class	Depth (ft.)[1]			
A	-	-	225	-
B	-	-	280	-
C	80	305	-	425
D	105	395	-	545
E	150	525	-	-

[1]Buoys have a 2-ft. freeboard at depth tabulated.

TABLE 91

Moorings With Sinkers - Lengths of Ground Chain Required for Various Water Depths[1]

Depth of Water (ft.)	Class				
	A	B	C	D	E
Basic	4	4	3-1/2	3	3
Basic to 50	4	4	4	3-1/2	3-1/2
50 to 60	4-1/2	4-1/2	4-1/2	4	3-1/2
60 to 70	4-1/2	4-1/2	4-1/2	4	4
70 to 80	5	5	5	4-1/2	4
80 to 90	5-1/2	5-1/2	5-1/2	5	4-1/2
90 to 100	5-1/2	5-1/2	5-1/2	5	5
100 to 120	6	6	6	5-1/2	5-1/2
120 to 140	6-1/2	6-1/2	6-1/2	6	5-1/2
140 to 160	7	7	7	6-1/2	6
160 to 180	7-1/2	7-1/2	7-1/2	7	6-1/2[2]
180 to 200	7-1/2	7-1/2	7-1/2	7	6-1/2[2]
200 to 240	8	8	8	7-1/2	7[2]
240 to 280	9[2]	9	8-1/2	8	7[2]
280 to 320	9-1/2[2]	9-1/2[2]	9	8-1/2	7-1/2[2]
320 to 360	10[2]	10[2]	9-1/2	9	8[2]
360 to 400	-	10-1/2[2]	10	9-1/2	8[2]
400 to 440	-	11[2]	10-1/2	10[2]	8-1/2[2]
440 to 480	-	-	-	10-1/2[2]	9[2]

[1]Lengths are 90-ft. shots. Depth of water is taken at mean high water from a firm bottom at another location. Maximum water depth determined on the basis of not exceeding the allowable stress in the chain.

[2]The freeboard limit of the mooring's standard buoy will be exceeded at this depth. An optional buoy must be used.

TABLE 92
Moorings With Sinkers – Chain Set Assemblies for Various Depths[1]

Depth of Water (feet)	Class A			Class B			Class C			Class D			Class E		
	2-3/4" chain (90'shot)	2-3/4" chain (45' shot)	2-3/4" Joining Link	2-1/2" chain (90'shot)	2-1/2" chain (45' shot)	2-1/2" Joining Link	2-1/4" chain (90'shot)	2-1/4" chain (45' shot)	2-1/4" Joining Link	2" chain (90'shot)	2" chain (45' shot)	2" Joining Link	1-3/4" chain (90'shot)	1-3/4" chain (45' shot)	1-3/4" Joining Link
Basic to 50	0	0	0	0	1	1	0	4	4	0	4	4	0	4	4
50 to 60	0	4	4	0	4	4	3	1	4	3	1	4	0	4	4
60 to 70	0	4	4	0	4	4	3	1	4	3	1	4	3	1	4
70 to 80	3	1	4	3	1	4	3	4	7	3	4	7	3	1	4
80 to 90	3	4	7	3	4	7	7	0	7	7	0	7	4	3	7
90 to 100	4	3	7	4	3	7	7	0	7	7	0	7	7	0	7
100 to 120	7	0	7	7	0	7	7	3	10	7	3	10	7	3	10
120 to 140	7	3	10	7	4	11	10	1	11	10	1	11	7	4	11
140 to 160	10	1	11	10	1	11	10	4	14	10	4	14	10	1	11
160 to 180	10	4	14	10	4	14	14	0	14	14	0	14	11	3	14
180 to 200	11	3	14	11	3	14	14	0	14	14	0	14	11	3	14
200 to 240	14	1	15	14	1	15	14	4	18	14	4	18	14	1	15
240 to 280	18	0	18	18	0	18	18	0	18	18	0	18	15	0	15
280 to 320	18	3	21	18	4	22	18	4	22	18	4	22	15	4	19
320 to 360	21	1	22	21	1	22	22	0	22	22	0	22	19	0	19
360 to 400	–	–	–	22	3	25	22	3	25	22	4	26	19	1	20
400 to 440	–	–	–	25	1	26	25	1	26	25	1	26	19	4	23
440 to 480	–	–	–	–	–	–	–	–	–	26	3	29	23	0	23

[1]Add to Basic Depth Assembly to obtain Assembly for a particular depth.

NOTES

In special situations, other fittings (than those shown) may be necessary to connect the anchor and ground chain if the swivel shackle is the wrong size for the anchor's shackle.

REFERENCES

Title	Reference
Bills of Materials	Table 79
Chain Set Assembly for Basic Depth	Table 80
Lengths of Ground Chain between Anchor and Spider for Various Water Depths	Table 81
Chain Set Assemblies for Depths greater than Basic	Table 82
Buoy Details	NAVFAC dwg 1404065
Chain and Fitting Details	Sections 4 and 6
Anchor Details	Sections 4, 5, and 6

CLASS	CHAIN & FITTINGS
AAA	ABS GRADE 3
BBB	ABS GRADE 2

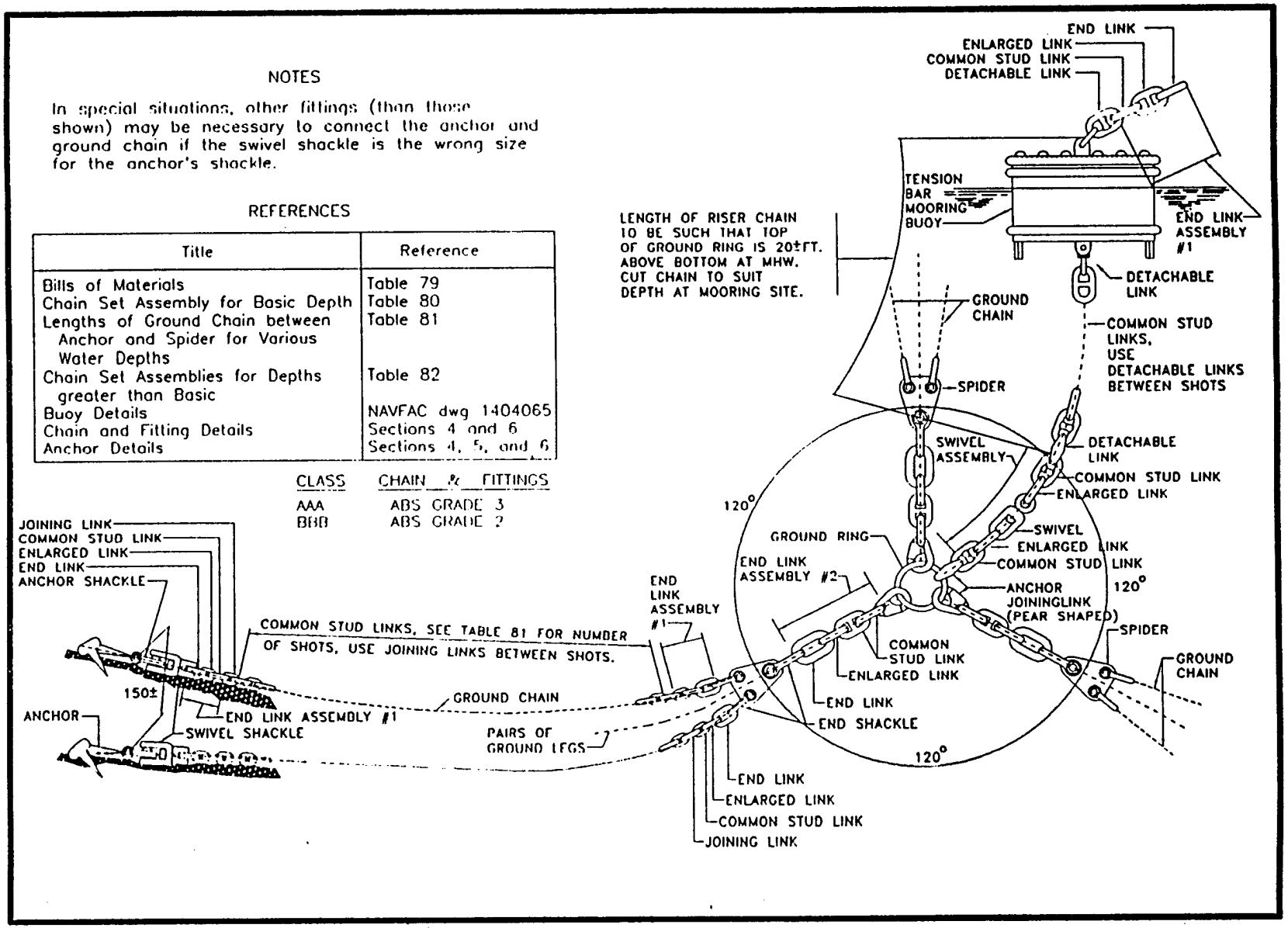


FIGURE 1
Free-Swinging, Riser-Type Mooring Without Sinkers - Classes AAA and BBB (Proposed)

NOTES

In special situations, other fittings (than those shown) may be required to connect the anchor and ground chain if the anchor connecting link is the wrong size for the anchor's shackle.

REFERENCES

Title	Reference
Bills of Materials	Table 79
Chain Set Assembly for Basic Depth	Table 80
Lengths of Ground Chain between Anchor and Spider for Various Water Depths	Table 81
Chain Set Assemblies for Depths greater than Basic	Table 82
Buoy Details	NAVFAC dwg 620,605
Chain and Fitting Details	Sections 4 and 6
Anchor Details	Sections 4, 5, and 6

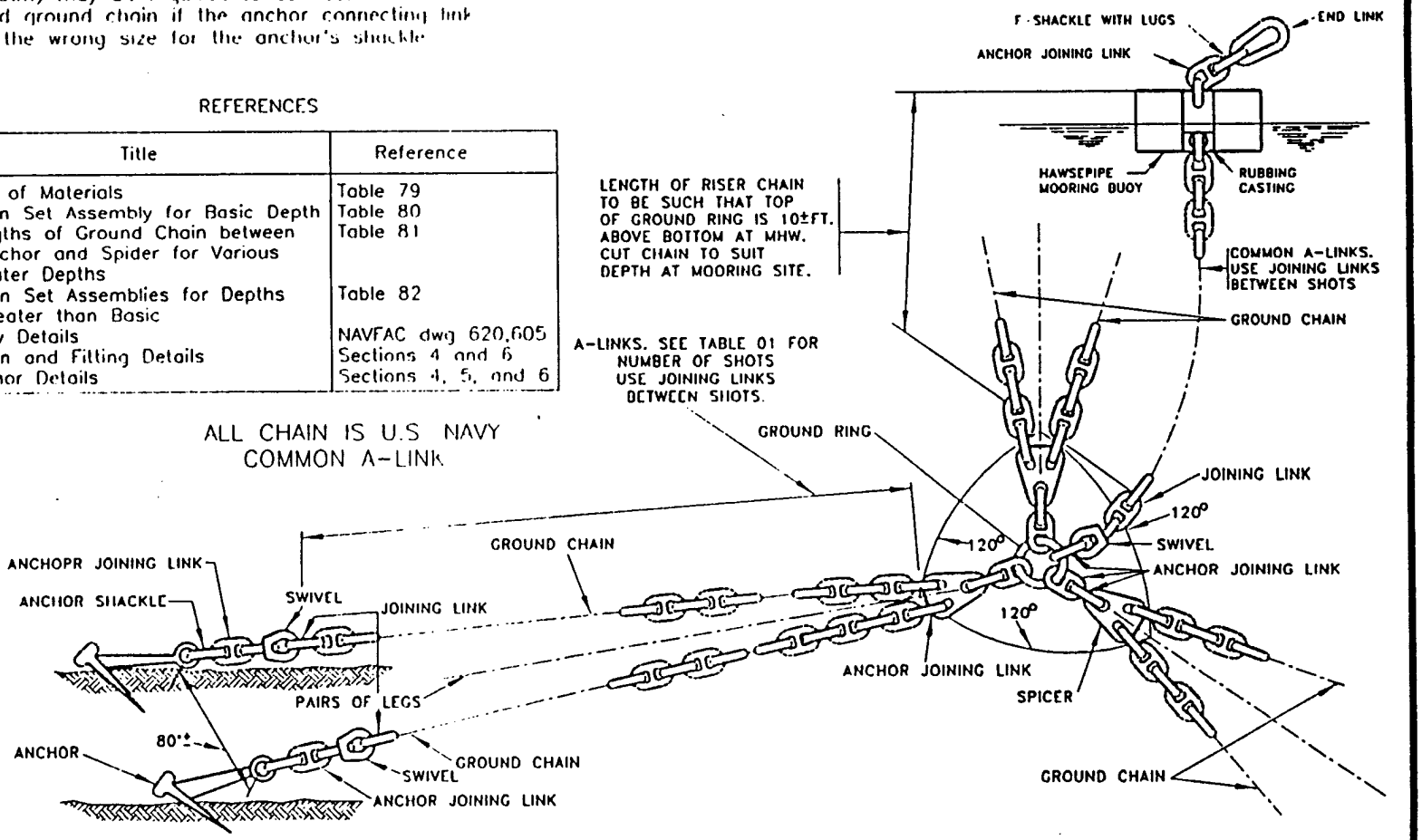
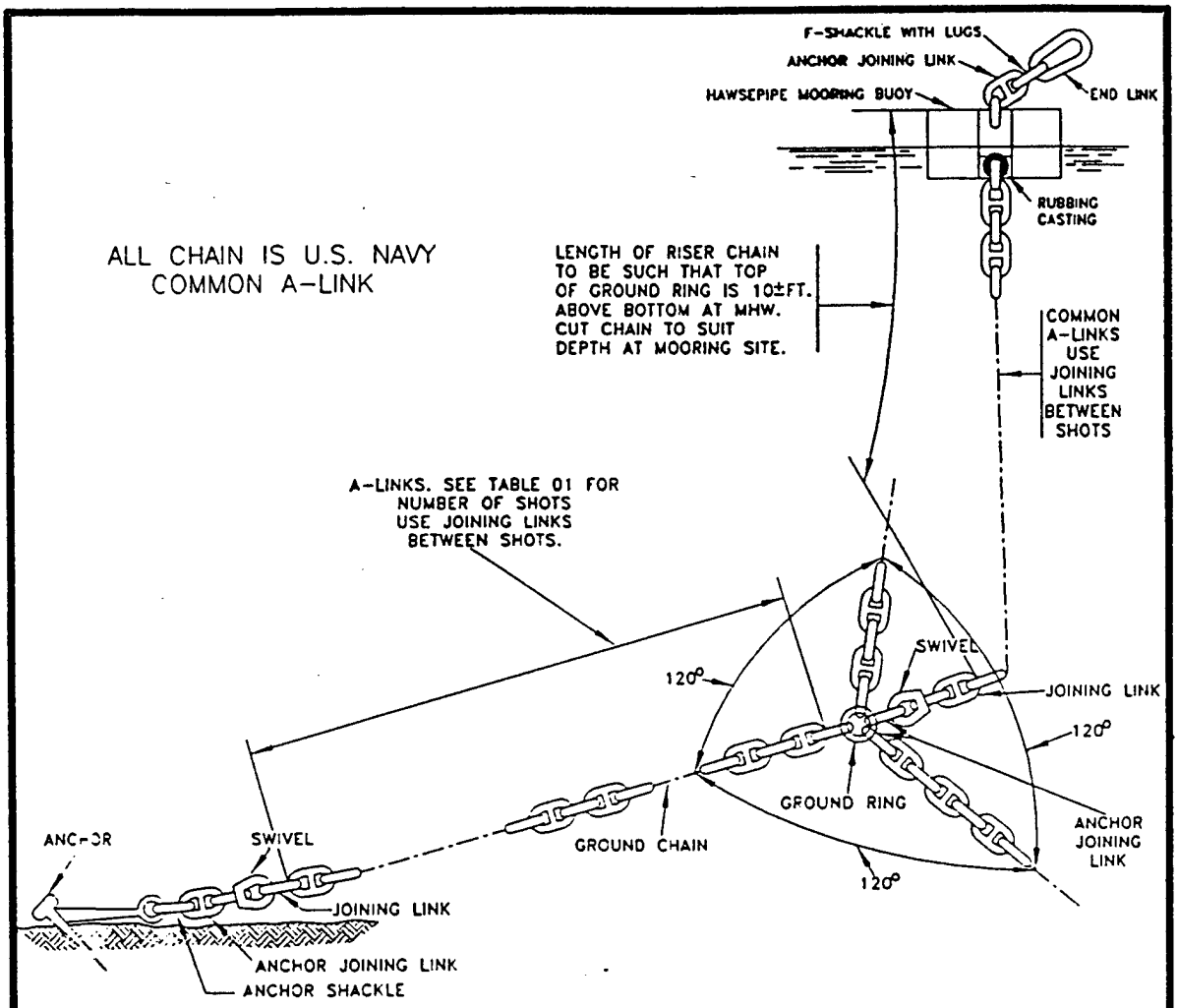


FIGURE 2
Free-Swinging, Riser-Type Mooring Without Sinkers – Classes AA, BB, and CC



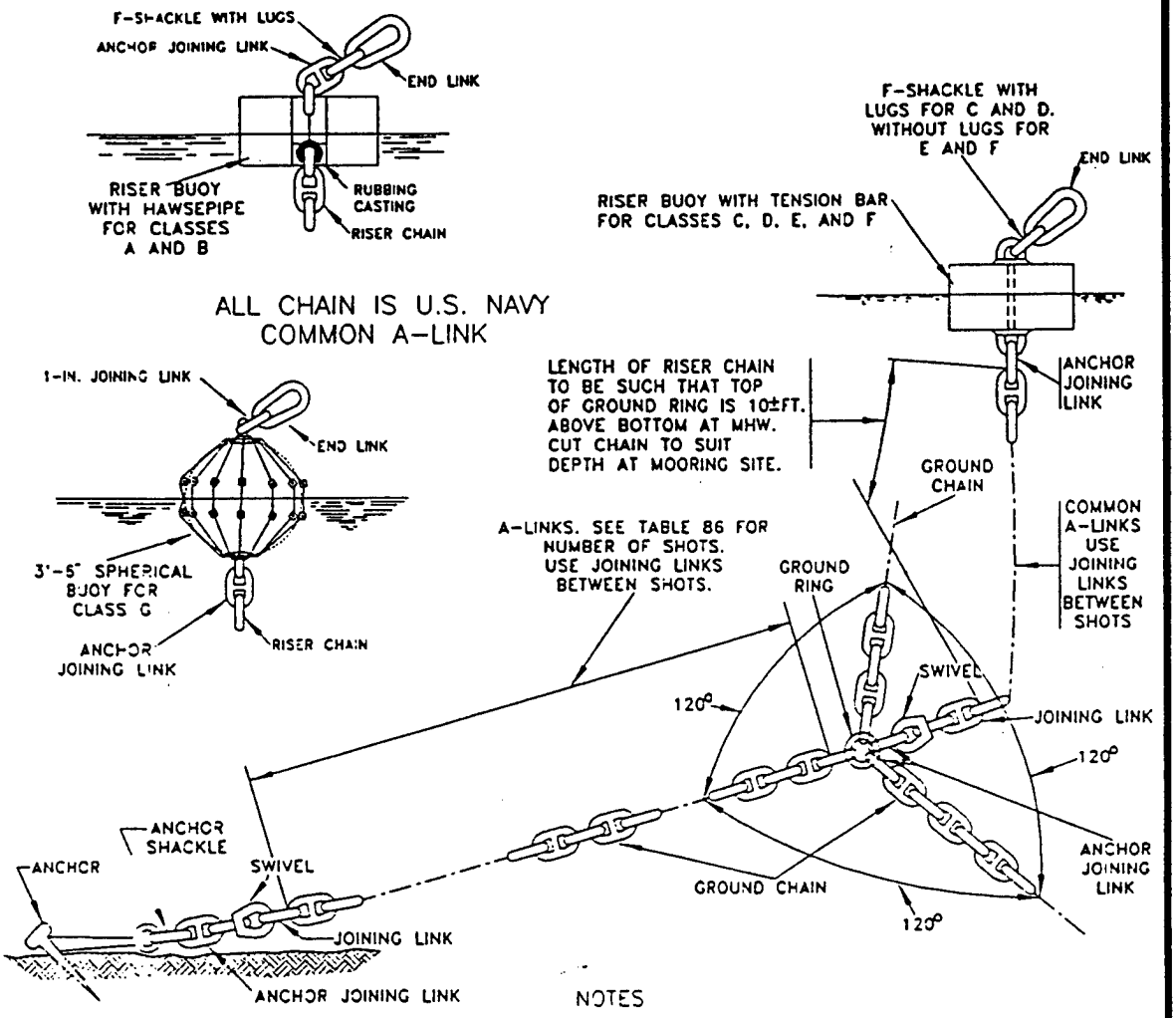
NOTES

In special situations, other fittings (than those shown) may be required to connect the anchor and ground chain if the anchor connecting link is the wrong size for the anchor's shackle.

References

Title	Reference
Bill of Materials	Table 79
Chain Set Assembly for Basic Depth	Table 80
Lengths of Ground Chain between Anchor and Ground Ring for Various Water Depths	Table 81
Chain Set Assemblies for Depths greater than Basic	Table 82
Buoy Details	NAVFAC dwg 620,605
Chain and Fitting Details	Sections 4 and 6
Anchor Details	Sections 4, 5, and 6

FIGURE 3
Free-Swinging, Riser-Type Mooring Without Sinkers - Class DD



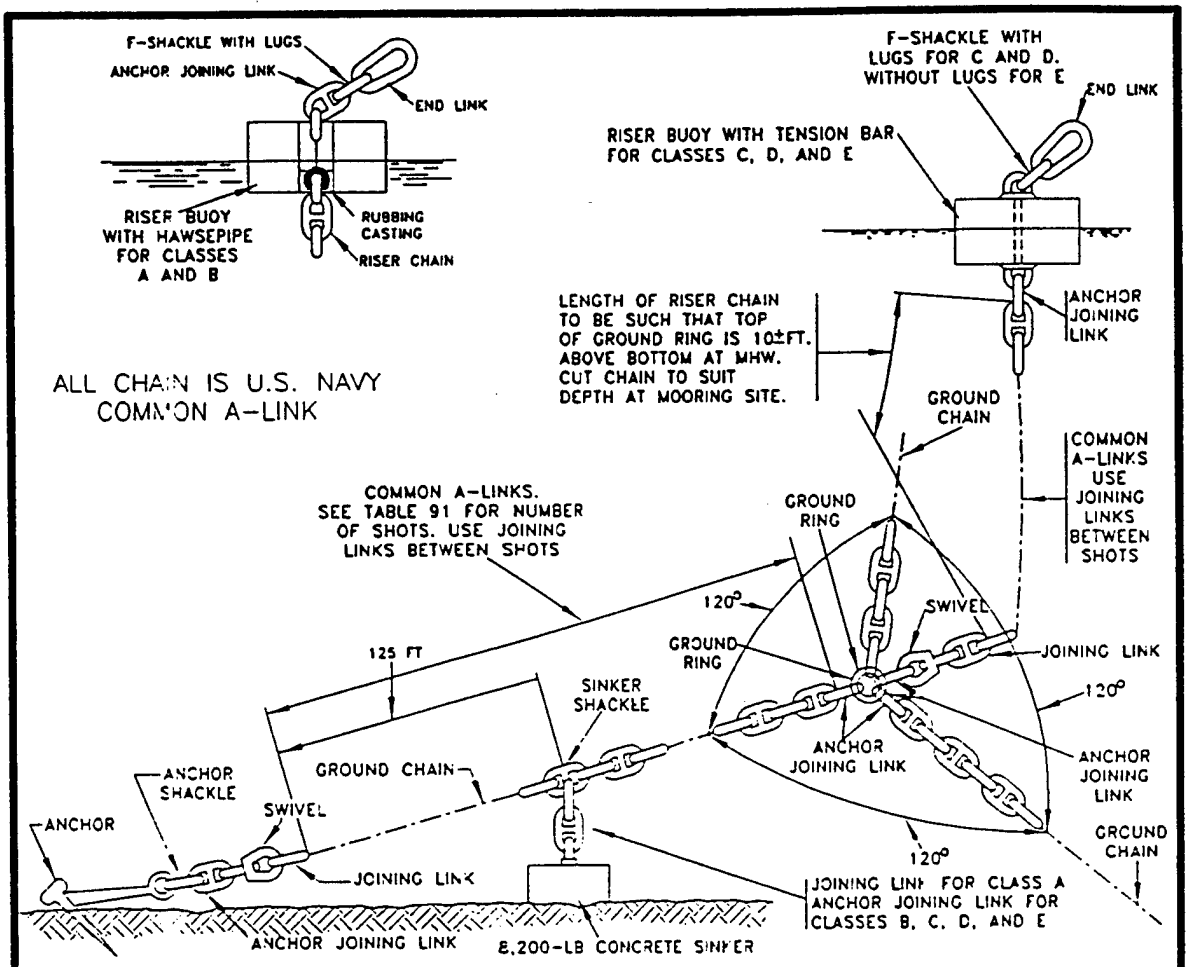
NOTES

In special situations, other fittings (than thhose shown) may be required to connect the anchor and ground chain if the anchor connecting link is the wrong size for the anchor's shackle

References

Title	Reference
Bills of Materials	Table 83
Chain Set Assembly for Basic Depth	Table 84
Maximum Mooring Depths with Various Buoys	Table 85
Lengths of Ground Chain between Anchor and Ground Ring for Various Water Depths	Table 86
Chain Set Assemblies for Depths greater than Basic	Table 87
Buoy Details – Classes A and B	NAVFAC dwg 620,605
– Classes C, D, E, and F	NAVFAC dwg 620,659
– Classes G	NAVFAC dwg 620,662
Chain and Fitting Details	Sections 4 and 6
Anchor Details	Sections 4, 5, and 6

FIGURE 4
Free-Swinging, Riser-Type Mooring Without Sinkers - Classes A, B, C, D, E, F, and G



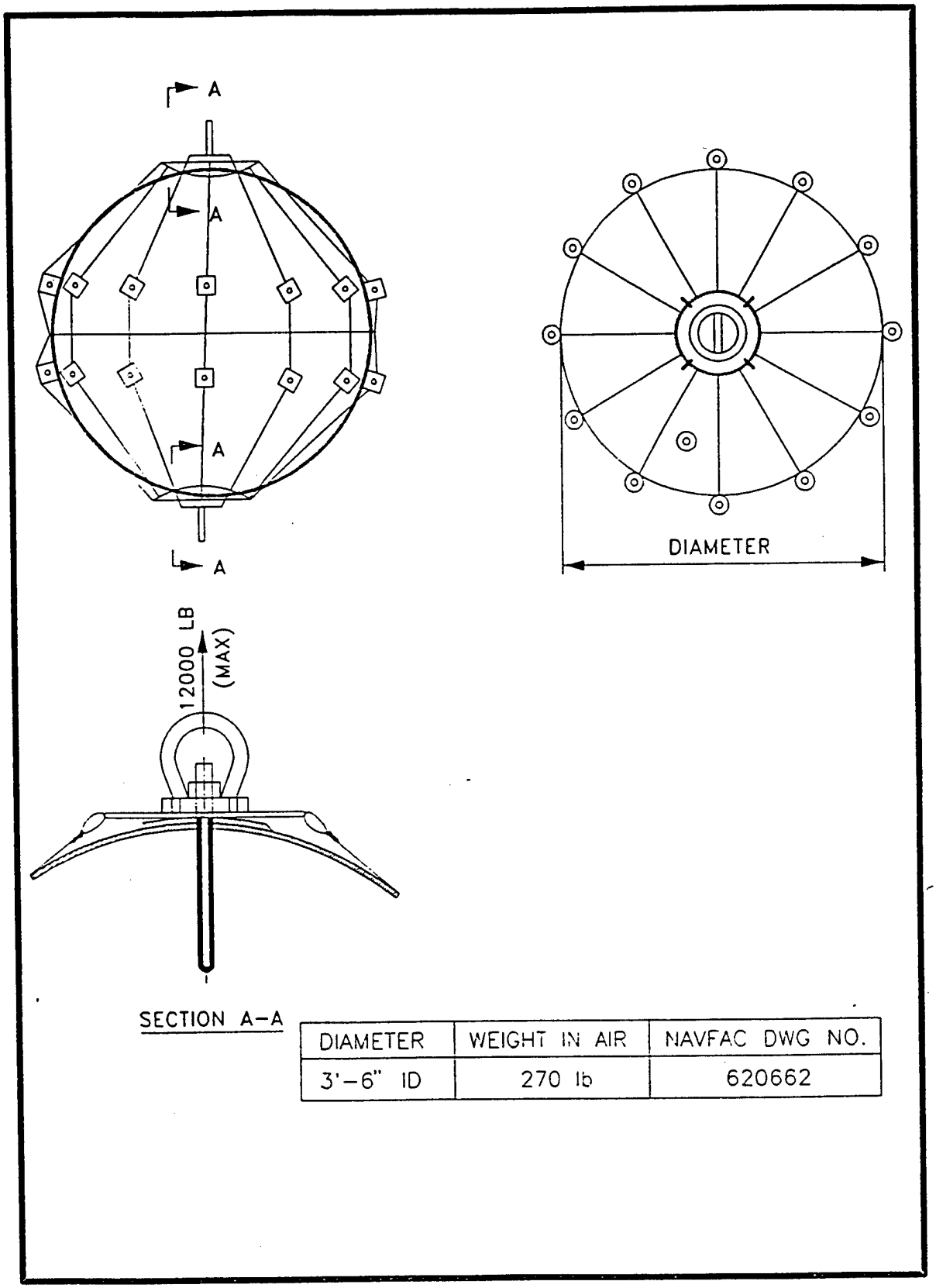
NOTES

In specific situations, other fittings (than those shown) may be required to connect the anchor and ground chain if the anchor connecting link is the wrong size for the anchor's shackle

References

Title	Reference
Bills of Materials	Table 88
Chain Set Assembly for Basic Depth	Table 89
Sinker Details	Table 119
Maximum Mooring Depths with Various Buoys	Table 90
Lengths of Ground Chain between Anchor and Ground Ring for Various Water Depths	Table 91
Chain Set Assemblies for Depths greater than Basic	Table 92
Buoy Details – Classes A and B	NAVFAC dwg 620,605
– Classes C, D, and E	NAVFAC dwg 620,659
Chain and Fitting Details	Sections 4 and 6
Anchor Details	Sections 4, 5, and 6

FIGURE 5
Free-Swinging, Riser-Type Mooring With Sinkers – Classes A, B, C, D, and E



DIAMETER	WEIGHT IN AIR	NAVFAC DWG NO.
3'–6" ID	270 lb	620662

FIGURE 9
Standard Marker or Mooring Buoy

DIAMETER	HEIGHT	WEIGHT IN AIR	NAVFAC DWG NO.
9'-6" O D	5'-0"	7,700 lbs	620,659
12'-6" O D	6'-6"	9,600 lbs	620,659
12'-6" O D	7'-6"	10,100 lbs	620,659

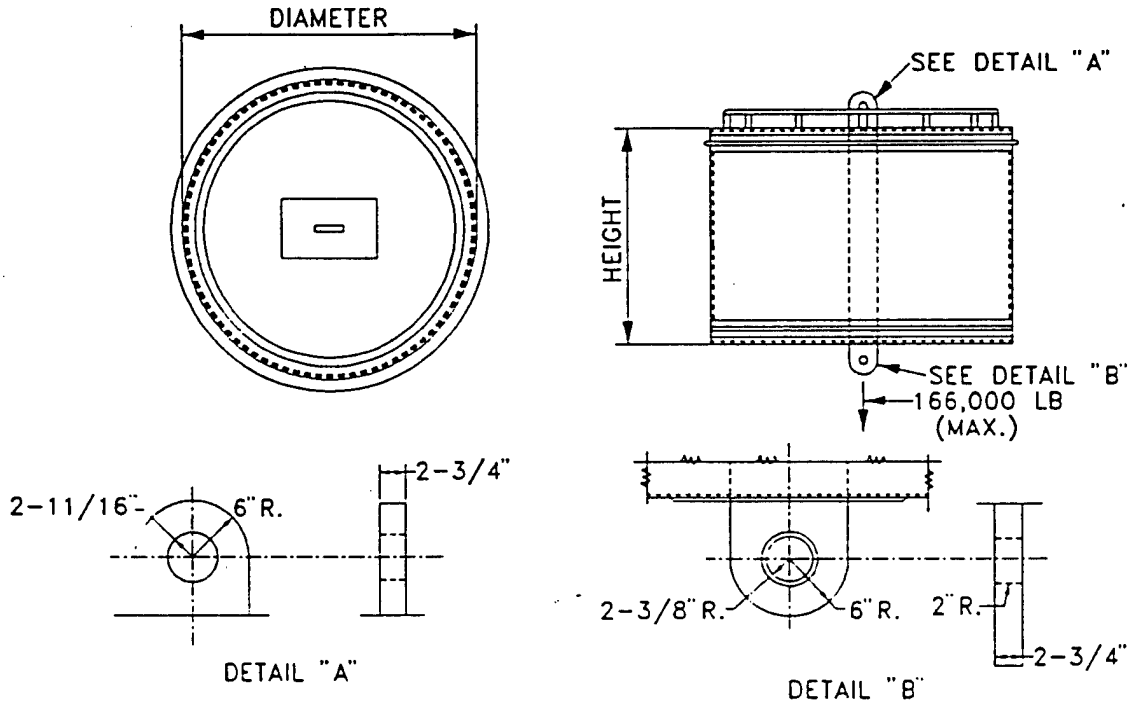


FIGURE 10
Tension Bar Mooring Buoy

DIAMETER	HEIGHT	WEIGHT IN AIR	NAVFAC DWG NO.
12'-0" O D	6'-0"	11,300 lbs	620,605

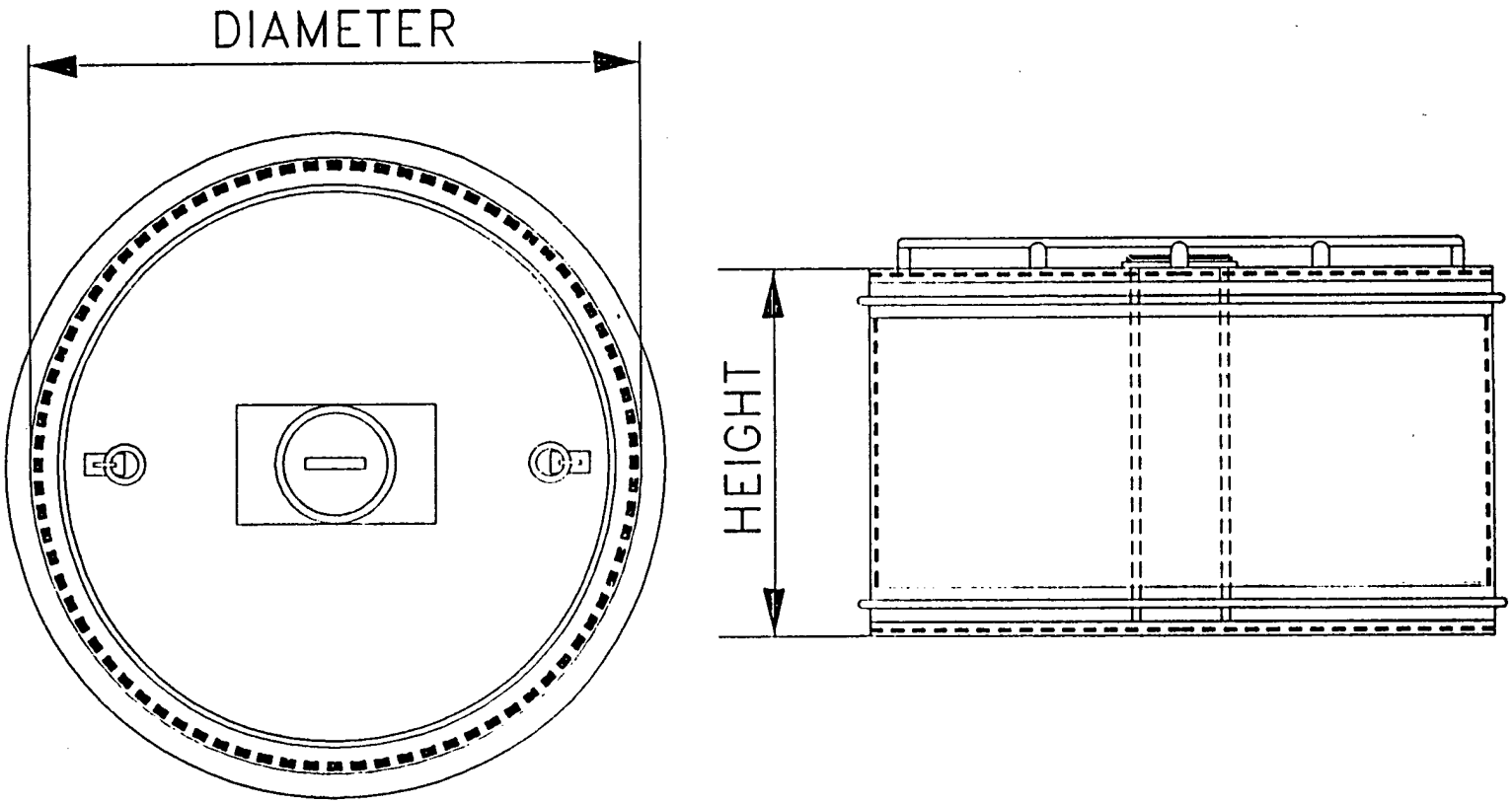
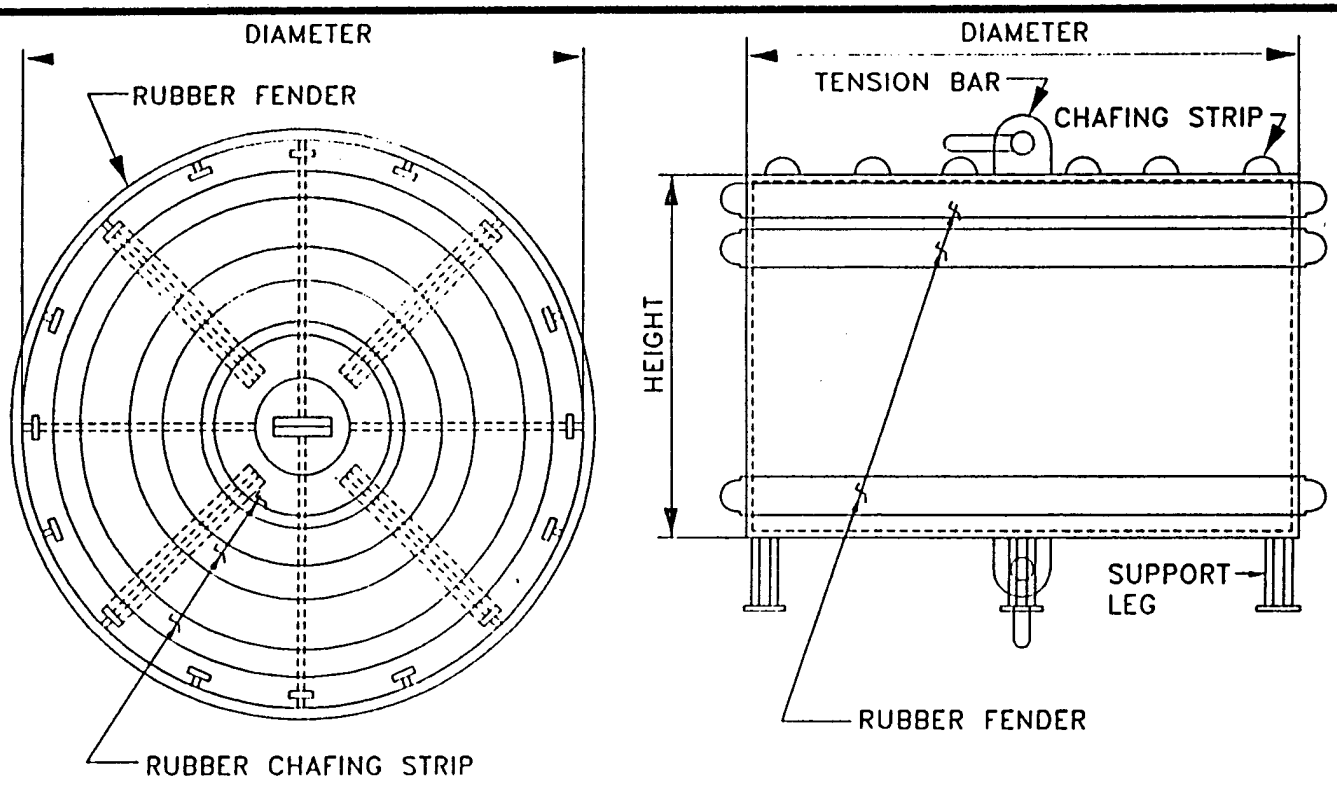


FIGURE 11
Hawsepipe Mooring Buoy



TOP PLAN

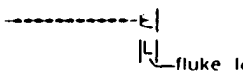
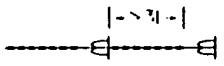
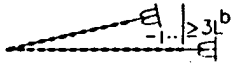
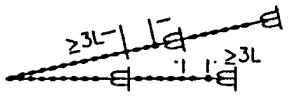
ELEVATION

DIAMETER	HEIGHT	WEIGHT IN AIR	NAVFAC DWG. NO.
15'-0"	9'-6"	34000 lbs.	1404065-1404067

THIS BUOY IS PROPOSED FOR USE IN THE AAA AND BBB CLASS MOORINGS

FIGURE 12
Tension Bar Mooring Buoy

TABLE 2
Recommended NAVMOOR Anchor Size[a] for Navy Fleet Moorings

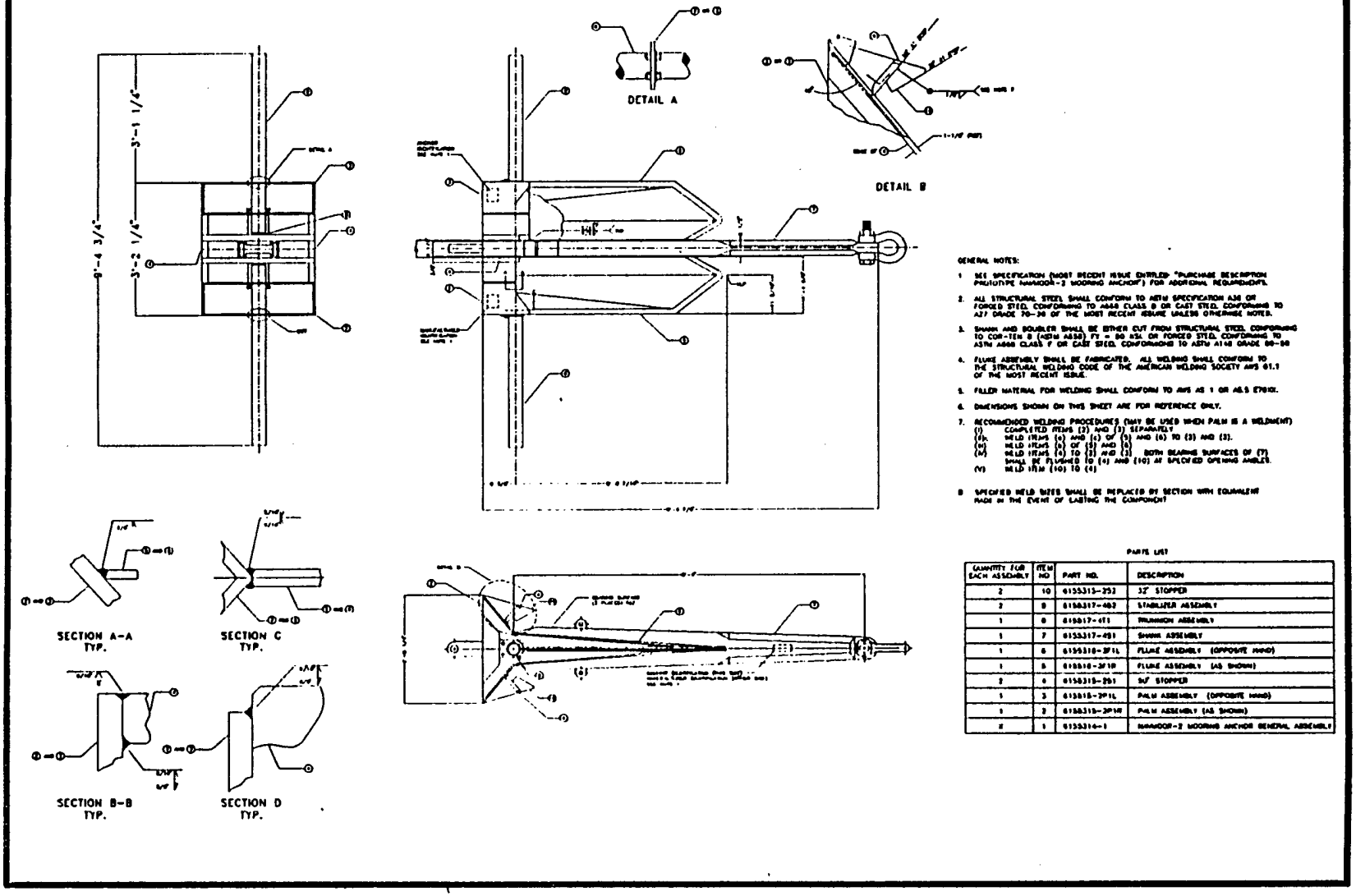
Mooring Class	Mooring Capacity (kips)	Anchor Weight (Nominal) for Ground Leg Options (lb)					
		1. Single Chain, Single Anchor 		2. Single Chain, Tandem Anchor  3. Twin Chain, Single Anchor 		4. Twin Chain, Tandem Anchor 	
		Mud[c]	Sand[d]	Mud	Sand	Mud	Sand
AAA	500					10,000	10,000
BBB	400				15,000	10,000	
AA	300			15,000	10,000		
BB	250			10,000	10,000		
CC	200		15,000	10,000			
DD	175	15,000	15,000				
A	150	15,000	10,000				
B	125	10,000	10,000				
C	100	10,000					

[a] Recommended anchor sizes provide system factor of safety of 1.75 to 2.25

[b] Minimum anchor separations related to fluke length (L).

[c] Includes very soft to soft silt and clay seafloors

[d] Includes sands and medium to stiff clay seafloors.



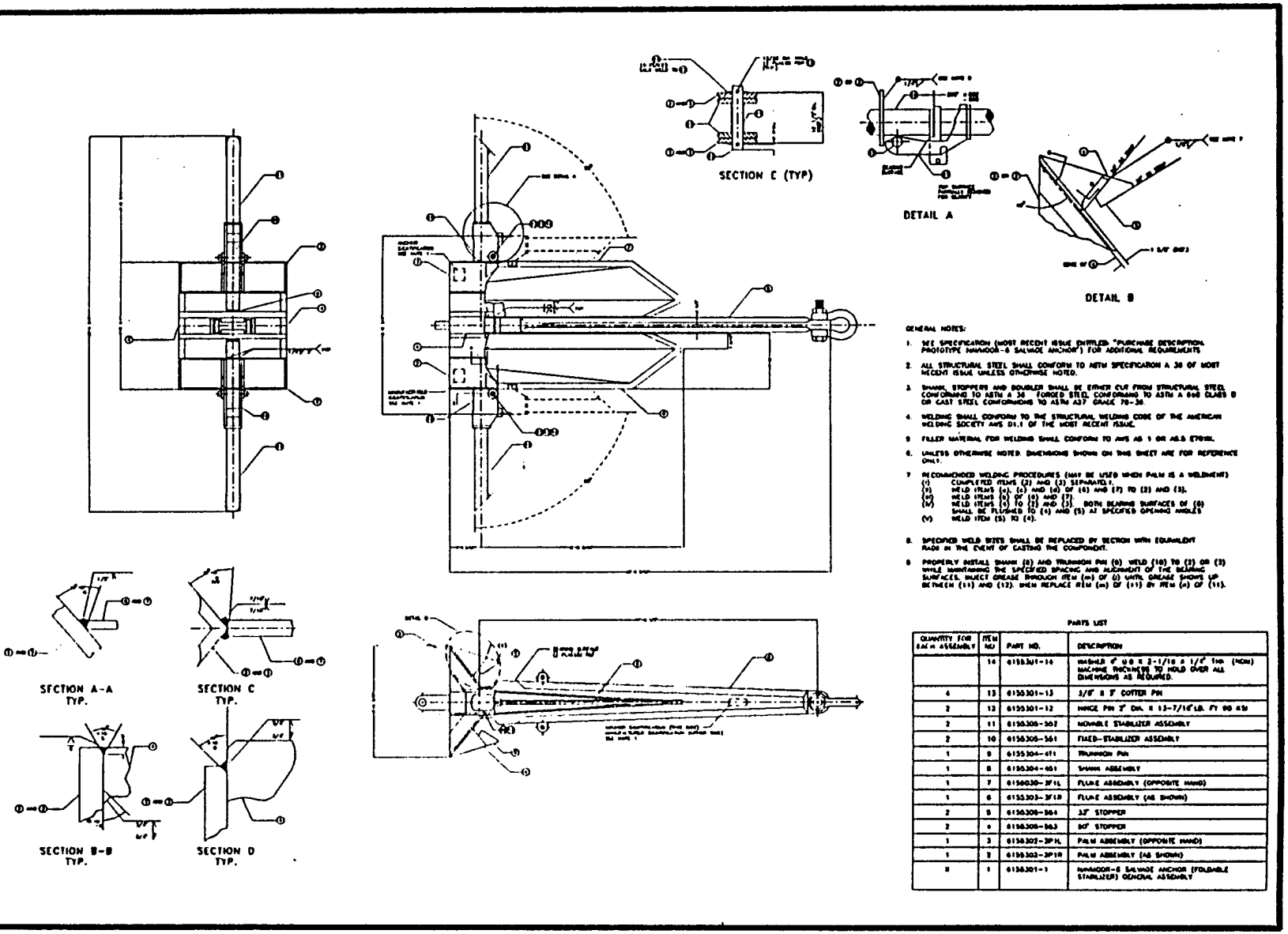
GENERAL NOTES:

1. SEE SPECIFICATION (MOST RECENT ISSUE ENTITLED "PURCHASE DESCRIPTION PROTOTYPE NAVMOOR-2 MOORING ANCHOR") FOR ADDITIONAL REQUIREMENTS.
2. ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM SPECIFICATION A36 OR FORGED STEEL CONFORMING TO A668 CLASS D OR CAST STEEL CONFORMING TO A27 GRADE 70-36 OF THE MOST RECENT ISSUE UNLESS OTHERWISE NOTED.
3. SHANK AND SHACKLE SHALL BE EITHER CUT FROM STRUCTURAL STEEL CONFORMING TO COR-TEN B (ASTM A588) F_y = 50 KSI OR FORGED STEEL CONFORMING TO ASTM A668 CLASS F OR CAST STEEL CONFORMING TO ASTM A148 GRADE 80-50
4. FLUKE ASSEMBLY SHALL BE FABRICATED. ALL WELDING SHALL CONFORM TO THE STRUCTURAL WELDING CODE OF THE AMERICAN WELDING SOCIETY AWS D1.1 OF THE MOST RECENT ISSUE.
5. FILLER MATERIAL FOR WELDING SHALL CONFORM TO AWS AS 1 OR AS 5 E70XX.
6. DIMENSIONS SHOWN ON THIS SHEET ARE FOR REFERENCE ONLY.
7. RECOMMENDED WELDING PROCEDURES (MAY BE USED WHEN PALM IS A WELDMENT)
   (i) COMPLETED ITEMS (2) AND (7) SEPARATELY
   (ii) WELD ITEMS (a) AND (c) OF (5) AND (6) TO (3) AND (3).
   (iii) WELD ITEMS (b) OF (5) AND (6) BOTH BEARING SURFACES OF (7)
   (iv) WELD ITEMS (4) TO (3) AND (3) SHALL BE (7) WELDED TO (a) AND (10) AT SPECIFIED OPENING ANGLES.
   (v) WELD ITEM (10) TO (4)
8. SPECIFIED WELD SIZES SHALL BE REPLACED BY SECTION WITH EQUIVALENT MADE IN THE EVENT OF LABYING THE COMPONENT

PARTS LIST

QUANTITY PER EACH ASSEMBLY	ITEM NO	PART NO.	DESCRIPTION
2	10	6155315-253	32" STOPPER
2	8	6158317-403	STABILIZER ASSEMBLY
1	8	6158317-411	TRUNNION ASSEMBLY
1	7	6155317-491	SHANK ASSEMBLY
1	6	6155318-3F1L	FLUKE ASSEMBLY (OPPOSITE HAND)
1	5	6155318-3F1R	FLUKE ASSEMBLY (AS SHOWN)
2	4	6158315-251	54" STOPPER
1	3	6155315-2P1L	PALM ASSEMBLY (OPPOSITE HAND)
1	2	6158315-2P1R	PALM ASSEMBLY (AS SHOWN)
X	1	6155314-1	NAVMOOR-2 MOORING ANCHOR GENERAL ASSEMBLY

NAVMOOR-2 Mooring Anchor
2,400 lbs. (wt.)
General Assembly



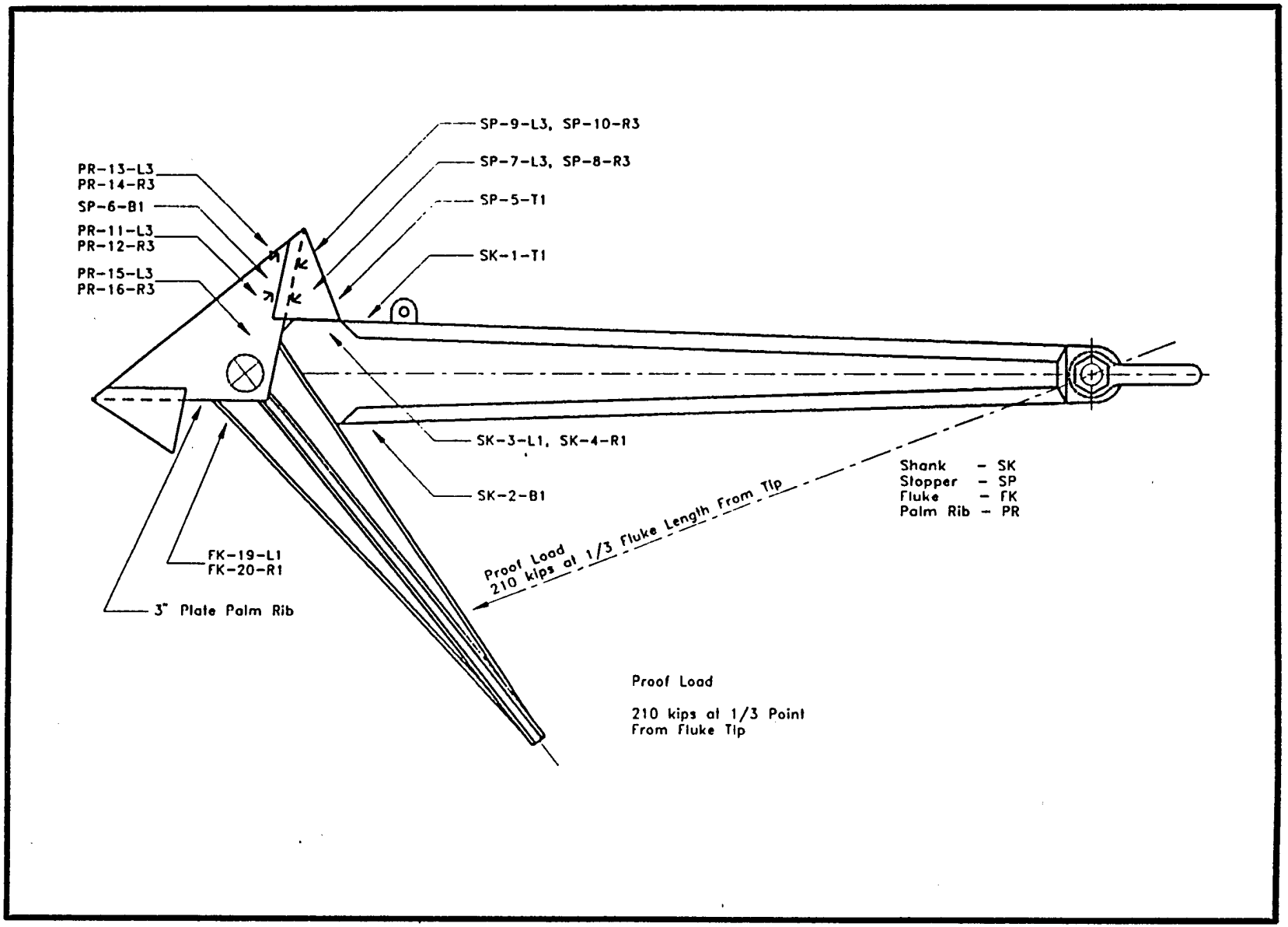
GENERAL NOTES:

1. SEE SPECIFICATION (MOST RECENT ISSUE ENTITLED "PURCHASE DESCRIPTION PROTOTYPE NAVMOOR-6 SALVAGE ANCHOR") FOR ADDITIONAL REQUIREMENTS
2. ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM SPECIFICATION A 36 OF MOST RECENT ISSUE UNLESS OTHERWISE NOTED.
3. SHANK, STOPPERS AND ROLLER SHALL BE EITHER CUT FROM STRUCTURAL STEEL CONFORMING TO ASTM A 36 FORGED STEEL CONFORMING TO ASTM A 668 CLASS D OR CAST STEEL CONFORMING TO ASTM A27 GRADE 70-36
4. WELDING SHALL CONFORM TO THE STRUCTURAL WELDING CODE OF THE AMERICAN WELDING SOCIETY AWS D1.1 OF THE MOST RECENT ISSUE.
5. FILLER MATERIAL FOR WELDING SHALL CONFORM TO AWS A5.1 OR A5.5 E7018.
6. UNLESS OTHERWISE NOTED, DIMENSIONS SHOWN ON THIS SHEET ARE FOR REFERENCE ONLY.
7. RECOMMENDED WELDING PROCEDURES (MAY BE USED WHEN PALM IS A WELDMENT)
   (-) COMPLETED ITEMS (2) AND (3) SEPARATELY.
   (○) WELD ITEMS (a), (c) AND (e) OF (4) AND (7) TO (2) AND (3).
   (○) WELD ITEMS (b) OF (8) AND (7).
   (○) WELD ITEMS (d) TO (12) AND (3). BOTH BEARING SURFACES OF (8) SHALL BE FLUSHED TO (4) AND (5) AT SPECIFIED OPENING ANGLES
   (V) WELD ITEM (5) TO (4).
8. SPECIFIED WELD SIZES SHALL BE REPLACED BY SECTION WITH EQUIVALENT PLATE IN THE EVENT OF CASTING THE COMPONENT.
9. PROPERLY INSTALL SHANK (8) AND TRUNNION PIN (9) WELD (10) TO (2) OR (3) WHILE MAINTAINING THE SPECIFIED SPACING AND ALIGNMENT OF THE BEARING SURFACES. INJECT GREASE THROUGH ITEM (m) OF (1) UNTIL GREASE SHOWS UP BETWEEN (11) AND (12). WHEN REPLACE ITEM (m) OF (11) BY ITEM (n) OF (11).

PARTS LIST

QUANTITY FOR EACH ASSEMBLY	ITEM NO.	PART NO.	DESCRIPTION
	14	6136301-14	WASHER 4" I.D. X 5-1/16 X 1/4" THK (NON) MACHINE THICKNESS TO HOLD OVER ALL DIMENSIONS AS REQUIRED.
4	13	6136301-13	3/8" X 3" COTTER PIN
2	12	6136301-12	HINGE PIN 3" DIA. X 13-7/16" LG. FY 90 KSI
2	11	6136305-307	MOVABLE STABILIZER ASSEMBLY
2	10	6136305-561	FIXED-STABILIZER ASSEMBLY
1	9	6135304-411	TRUNNION PIN
1	8	6136304-451	SHANK ASSEMBLY
1	7	6136030-3F1L	FLUKE ASSEMBLY (OPPOSITE HAND)
1	6	6135303-3F1R	FLUKE ASSEMBLY (AS SHOWN)
2	5	6136308-564	33° STOPPER
2	4	6136308-563	90° STOPPER
1	3	6136302-3P1L	PALM ASSEMBLY (OPPOSITE HAND)
1	2	6136302-3P1R	PALM ASSEMBLY (AS SHOWN)
1	1	6136301-1	NAVMOOR-6 SALVAGE ANCHOR (FOLDABLE STABILIZER) GENERAL ASSEMBLY

NAVMOOR-6 Salvage Anchor
7,200 lbs. (wt.)
General Assembly



10K Navmoor Anvhor
Plan View

NOTES:

1. OPTIONAL MATERIAL:
   A. 32 DEGREE STOPPER, ITEM 11, AND SHANK, ITEM 4, MAY BE MADE FROM PLATE IN ACCORDANCE WITH ASTM A36.
   B. SHANK, ITEM 4, MAY BE FORGED STEEL IN ACCORDANCE WITH ASTM A668 CLASS D

2. WELDING:
   A. WELDING SHALL BE IN ACCORDANCE WITH AWS D1.1 OR MIL-STD-248
   B. FILLER METAL SHALL BE IN ACCORDANCE WITH
      AWS/ANSI A5.1, CLASS E7015 E7016 OR E7018 (COVERED ARC PROCESS)
      AWS/ANSI AS 20, CLASS E6XT-1 OR E6XT-5 (FLUX CORED ARC PROCESS)
      AWS/ANSI AS 18, CLASS ER70S-2 OR ER70S-3 (GAS SHIELDED METAL ARC PROCESS)
      AWS/ANSI AS 17, CLASS F7A2-EM14 (SUBMERGED ARC PROCESS)

3. PAINTING:
   A. PREPARE EXTERIOR STEEL SURFACES IN ACCORDANCE WITH STEEL STRUCTURES PAINTING COUNCIL SSPC-SP10, NEAR-WHITE BLAST CLEANING COAT EXTERIOR SURFACE WITH ZINC CHROMATE PRIMER IN ACCORDANCE WITH TT-P-1757, TYPE AND COLOR OPTIONAL, .003 MM THICK, AND A TOP COATING OF ASPHALT VARNISH IN ACCORDANCE WITH TT-V-51, .003 MM THICK.
   B. INTERIOR SURFACES OF FLUKES AND STABILIZERS SHALL BE CLEANED AND FREE OF FOREIGN MATERIAL AND COATED WITH ZINC CHROMATE PRIMER IN ACCORDANCE WITH TT-P-1757, TYPE AND COLOR OPTIONAL .001 MM THICK, AND A COATING OF ASPHALT VARNISH IN ACCORDANCE WITH TT-V-51, .002 MM THICK.

4. UNLESS OTHERWISE SPECIFIED:
   CORNER RADII SHALL BE .10 MAX
   FILLET RADII SHALL BE .50 MAX
   DRAFT ANGLES SHALL BE 3° MAX (ADDITIVE TO DIMENSIONS SHOWN)

5. DISCARD COTTER PIN SUPPLIED WITH SHACKLE, ITEM 14. WELD NUT TO BOLT, AND CUT OFF EXCESS BOLT TO 1/2" MAXIMUM. AFTER TESTING AND INSPECTION IS COMPLETED MAXIMUM WELD PREHEAT AND INTERPASS TEMPERATURE SHALL NOT EXCEED 450 DEGREES F.

6. ANCHOR ASSEMBLY SHALL BE PROOF LOADED TO 165500 POUNDS IN ACCORDANCE WITH FIGURE 1, PRIOR TO EXTERIOR PAINTING. LINK ITEM 10, AND SHANK, ITEM 4, ASSEMBLED WITH PIN, ITEM 13, SHALL BE SEPARATELY PROOF LOADED TO 330000 POUNDS, EACH LIFTING PADEYE ON SHANK, ITEM 4, SHALL BE PROOF LOADED TO 24,000 POUNDS. MAGNETIC PARTICLE INSPECTION SHALL BE CONDUCTED IN ACCORDANCE WITH ASTM E709 AND SHALL BE PERFORMED AFTER PROOF TESTING. ACCEPTANCE REQUIREMENTS SHALL BE IN ACCORDANCE WITH NAVSEA 0900-LP-003-8000, CLASS 1
   100 PERCENT MPI INSPECTION SHALL BE PERFORMED ON THE FOLLOWING
   A. ALL WELDS, EXCLUDING SHACKLE WELD
   B. UPPER 3 FEET AND LOWER 2 FEET OF SHANK.
   C. TRIPPING PALM CASTING.
   D. LIFTING PADEYES ON SHANK.

   THE ANCHOR SHALL BE INSPECTED BEFORE AND AFTER PROOF TEST TO DETERMINE WHETHER PERMANENT DEFORMATION HAS OCCURRED

7. BEARING SURFACES OF TRIPPING PALM, ITEM 2, AND SHANK, ITEM 4, SHALL HAVE A MINIMUM OF 70% CONTACT AT FULL OPEN POSITION. AFTER WELDING BEARING SURFACES OF SHANK AND 32 DEGREE STOPPER, ITEM 11, SHALL HAVE MINIMUM OF 70% CONTACT. MATERIAL REMOVAL PERMISSIBLE TO A MAXIMUM OF 13 FROM SURFACES INDICATED.

8. IDENTIFICATION MARKINGS SHALL BE CAST OR WELDED INTO THE TRIPPING PALM, ITEM 2, AND SHANK, ITEM 4, IN THE APPROXIMATE LOCATION SHOWN. MARKINGS SHALL BE 100-150 HIGH CHARACTERS, RAISED .12 MINIMUM

   LOCATION NO. 1: U.S. NAVY
   NAVMOOR-10 ANCHOR
   WEIGHT 12000 POUNDS
   LOCATION NO. 2: (MANUFACTURER'S NAME)
   (SERIAL/MELT NUMBER)
   (YEAR OF MANUFACTURE)

9. SCREW THREADS SHALL BE IN ACCORDANCE WITH FED-STD-H28

10. MATERIAL TEST REPORTS SHALL BE SUPPLIED FOR ALL STRUCTURAL CAST AND FORGED STEEL. TEST REPORTS TO INCLUDE STEEL CHEMICAL AND TENSILE CERTIFICATIONS OF CONFORMANCE TO APPLICABLE ASTM REQUIREMENTS FOR MATERIAL. MATERIAL TESTED ATTESTS OF CONFORMANCE SHALL BE SUPPLIED FOR ALL PINS AND FITTINGS

11. THE ANCHOR WEIGHT SHALL NOT VARY FROM 12000 LBS MORE THAN PLUS 4 PERCENT TO MINUS 2 PERCENT

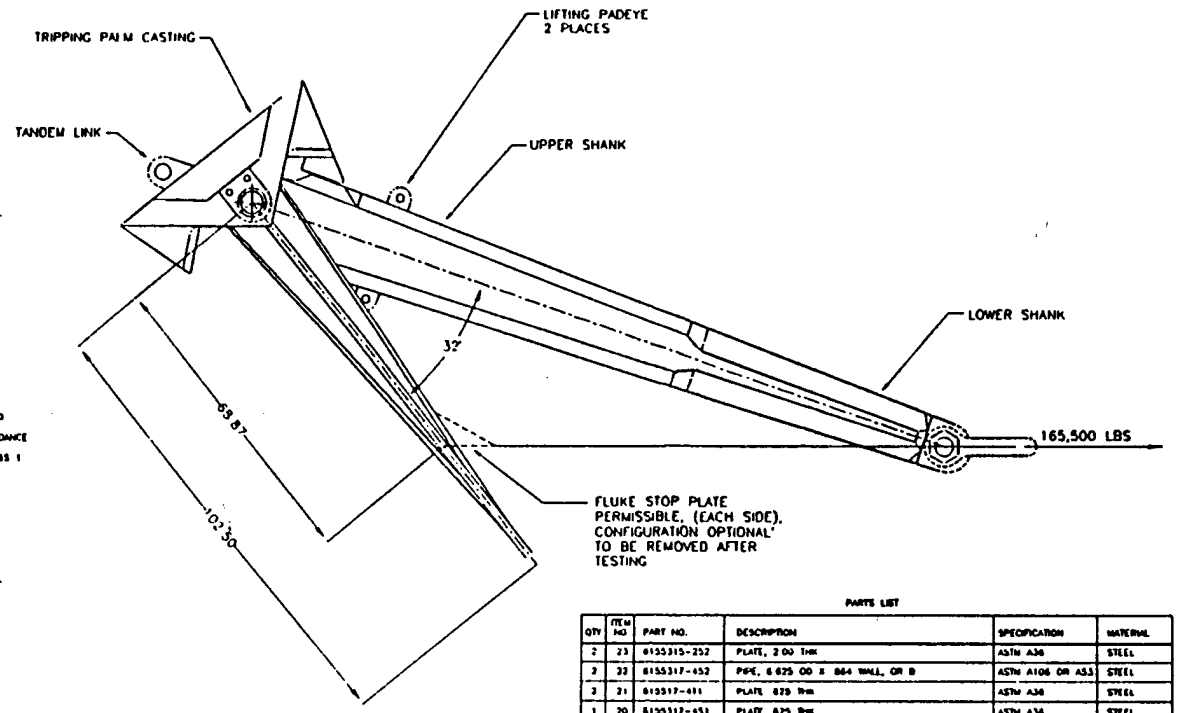
12. COMPLETED ANCHORS SHALL BE MARKED FOR SHIPMENT IN ACCORDANCE WITH MIL-STD-129

13. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN AN INSPECTION SYSTEM IN ALL RESPECTS WITH MIL-I-45208 OR A QUALITY PROGRAM IN ACCORDANCE WITH MIL-Q-9858

14. AFTER COMPLETION OF ALL ANCHOR TESTING AND INSPECTION, ANCHOR STABILIZERS SHALL BE SECURED FOR SHIPMENT AS SHOWN ON SHEET 2.

15. THE TRUNNION PIN, ITEM 9, AND THE TANDEM LINK PIN, ITEM 13, SHALL BE LUBRICATED BEARING FINAL ANCHOR ASSEMBLY WITH MIL-G-24139 GREASE, OR EQUIVALENT

16. CERTIFICATE OF COMPLIANCE: AS A MINIMUM AND PRIOR TO SHIPMENT OF MATERIAL FROM THE MANUFACTURER, CERTIFICATION DOCUMENTATION FOR EACH ANCHOR SHALL BE PROVIDED THE FOLLOWING INFORMATION SHALL BE PROVIDED IN ADDITION TO THE MANUFACTURER'S STATEMENT OF CONFORMANCE TO ALL CONTRACTUAL REQUIREMENTS
   A. MANUFACTURER'S SERIAL NUMBER FOR ANCHOR AND CONTRACT LINE ITEM NUMBER
   B. MAGNETIC PARTICLE INSPECTION REPORT
   C. CERTIFICATION OF PROOF LOADING
   D. SERIAL NUMBERS, MANUFACTURER AND DATE OF CALIBRATION OF TEST EQUIPMENT
   E. SIGNATURES OF GOVERNMENT AND CONTRACTOR QUALITY ASSURANCE PERSONNEL WHO WITNESSED TESTS AND REQUIRED EXAMINATIONS



PARTS LIST

QTY	ITEM NO	PART NO.	DESCRIPTION	SPECIFICATION	MATERIAL
2	23	8155315-252	PLATE, 2.00 THK	ASTM A36	STEEL
2	22	8155317-652	PIPE, 6.625 OD x .864 WALL, GR B	ASTM A106 OR A53	STEEL
3	21	8155317-651	PLATE .875 THK	ASTM A36	STEEL
1	20	8155317-651	PLATE .625 THK	ASTM A36	STEEL
1	19	8155316-3P1L	WEDGE PLATE, .625 THK	ASTM A36	STEEL
4	18	815516-3P1B	NUT, HEX. 3/4-10UNC-2B		CRES
8	17	8156315-251	WASHER, FLAT, .812 BASIC ID		CRES
4	16	815516-2P1L	SCREW, CAP, HEX HD 3/4-10UNC-2A x 3.500 L		CRES
2	15	8155315-2P1R	SCREW, CAP, HEX. HD 3/4-10UNC-2A x 1.500 L		CRES
1	14	8155316-1	SHACKLE, ANCHOR		STEEL
1	13	8155315-252	PIN, 3.375 DIA STK	ASTM A36	STEEL
3	12	8155317-652	WASHER .500 THK	ASTM A36	STEEL
1	11	8155317-651	32 DEGREE STOPPER, GR 70-36, CL 2	ASTM A27	SEE NOTE 1
1	10	8155317-651	TANDEM LINK	ASTM A36	STEEL
1	9	8155316-3P1L	PIN, TRUNNION, 8800 DIA STK, GR 1018	ASTM A108	STEEL
2	8	815516-3P1R	SPAR, .750 THK	ASTM A36	STEEL
2	7	8156315-251	PLATE, EDGE, 1.00 THK	ASTM A36	STEEL
2	6	8155315-2P1L	PLATE, .625 THK	ASTM A36	STEEL
2	5	8155315-2P1R	PLATE .625 THK	ASTM A36	STEEL
1	4	8155316-1	SHANK, GR 70-36, CL 2	ASTM A27	SEE NOTE 1
REF.	3	815515-2P1L	STABILIZER		
1	2	8155315-2P1R	PALM, TRIPPING, GR 70-36, CL 2	ASTM A27	STEEL
REF	1	8156316-1	TRIPPING PALM/FLUKE ASSEMBLY		

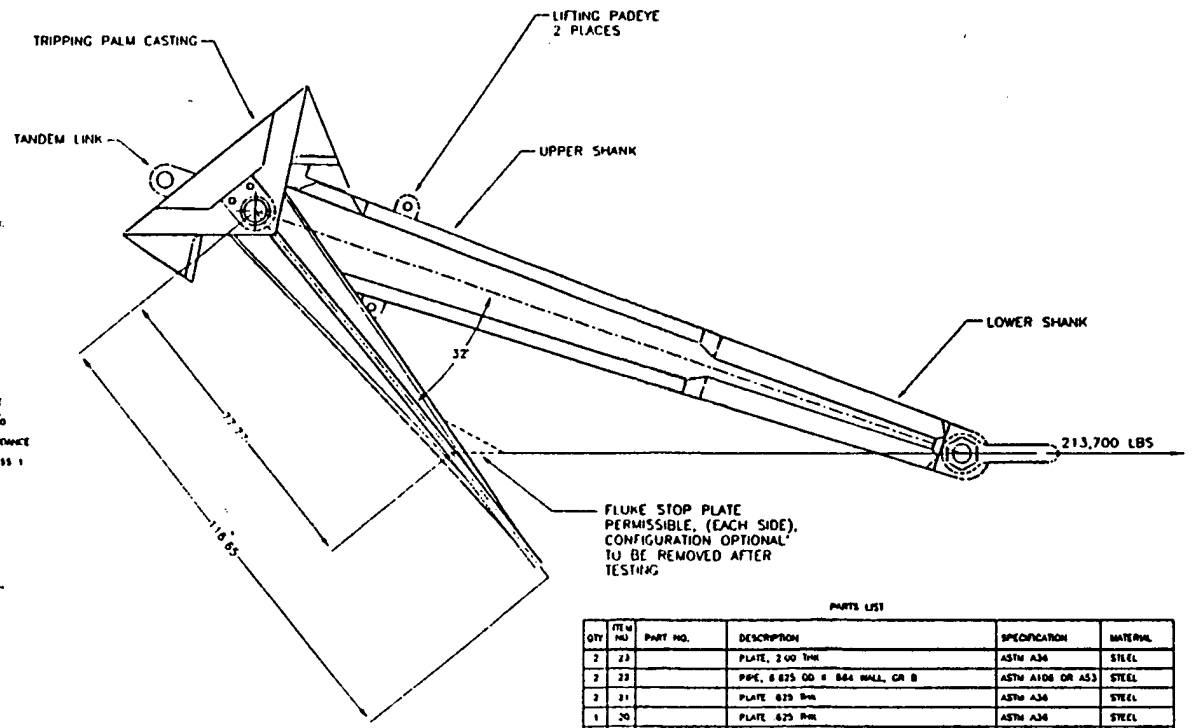
NAVMOOR-10, 12000 Pounds
Anchor Assembly, Mooring

NOTES:

1. OPTIONAL MATERIAL:
   A. 32 DEGREE STOPPER, ITEM 11, AND SHANK, ITEM 6, MAY BE MADE FROM PLATE IN ACCORDANCE WITH ASTM A36
   B. SHANK, ITEM 6, MAY BE FORGED STEEL IN ACCORDANCE WITH ASTM A668 CLASS D
2. WELDING:
   A. WELDING SHALL BE IN ACCORDANCE WITH AWS D1.1 OR MIL-STD-248
   B. FILLER METAL SHALL BE IN ACCORDANCE WITH AWS/ANSI, A5.1, CLASS E6015, E7016 OR E7018 (SHIELDED METAL ARC PROCESS)
   AWS/ANSI, A5.20, CLASS E70T-1 OR E70T-5 (FLUX CLAD ARC PROCESS)
   AWS/ANSI, A5.18, CLASS ER70S-2 OR ER70S-5 (GAS SHIELDED METAL ARC PROCESS)
   AWS/ANSI A5.17, CLASS F7A2-EM12 (SUBMERGED ARC PROCESS)
3. FINISH
   A. PREPARE EXTERIOR STEEL SURFACES IN ACCORDANCE WITH STEEL STRUCTURES PAINTING COUNCIL SSPC-SP10, NEAR-WHITE BLAST CLEANING. COAT EXTERIOR SURFACE WITH ZINC CHROMATE PRIMER IN ACCORDANCE WITH TT-P-1757, TYPE AND COLOR OPTIONAL, .051 MM THICK, AND A TOP COATING OF ASPHALT VARNISH IN ACCORDANCE WITH TT-V-51, .003 MM THICK.
   B. INTERIOR SURFACES OF FLUKES AND STABILIZERS SHALL BE CLEANED AND FREE OF FOREIGN MATERIAL AND COATED WITH ZINC CHROMATE PRIMER IN ACCORDANCE WITH TT-P-1757, TYPE AND COLOR OPTIONAL .001 MM THICK, AND A COATING OF ASPHALT VARNISH IN ACCORDANCE WITH TT-V-51, .003 MM THICK
4. UNLESS OTHERWISE SPECIFIED:
   CORNER RADII SHALL BE .10 MAX
   FILLET RADII SHALL BE .50 MAX
   DRAFT ANGLES SHALL BE 3° MAX (ADDITIVE TO DIMENSIONS SHOWN)
5. DISCARD COTTER PIN SUPPLIED WITH SHACKLE, ITEM 14. WELD NUT TO BOLT, AND CUT OFF EXCESS BOLT TO 1/2" MINIMUM. AFTER TESTING AND INSPECTION IS COMPLETED MINIMUM WELD PREHEAT AND INTERPASS TEMPERATURE SHALL NOT EXCEED 450 DEGREES F.
6. ANCHOR ASSEMBLY SHALL BE PROOF LOADED TO 185500 POUNDS IN ACCORDANCE WITH FIGURE 1, PRIOR TO EXTERIOR PAINTING, LINK ITEM 10, AND SHANK, ITEM 6, ASSEMBLED WITH PIN, ITEM 13, SHALL BE SEPARATELY PROOF LOADED TO 310000 POUNDS, EACH LIFTING PADEYE ON SHANK, ITEM 6, SHALL BE PROOF LOADED TO 24 000 POUNDS. MAGNETIC PARTICLE INSPECTION SHALL BE CONDUCTED IN ACCORDANCE WITH ASTM E709 AND SHALL BE PERFORMED AFTER PROOF TESTING. ACCEPTANCE REQUIREMENTS SHALL BE IN ACCORDANCE WITH NAVSEA 0900-LP-003-8010, CLASS 1 100 PERCENT WET FLUORESCENT SHALL BE PERFORMED ON THE FOLLOWING:
   A. ALL WELDS, INCLUDING SHACKLE WELD
   B. UPPER 3 FEET AND LOWER 2 FEET OF SHANK
   C. TRIPPING PALM CASTING
   D. LIFTING PADEYES ON SHANK.

   THE ANCHOR SHALL BE INSPECTED BEFORE AND AFTER PROOF TEST TO DETERMINE WHETHER PERMANENT DEFORMATION HAS OCCURRED
7. BEARING SURFACES OF TRIPPING PALM, ITEM 2, AND SHANK, ITEM 6, SHALL HAVE A MINIMUM OF 70% CONTACT AT FULLY OPEN POSITION. AFTER WELDING BEARING SURFACES OF SHANK AND 32 DEGREE STOPPER, ITEM 11, SHALL HAVE MINIMUM OF 70% CONTACT. MATERIAL REMOVAL PERMISSIBLE TO A MAXIMUM OF .12 FROM SURFACES INDICATED
8. IDENTIFICATION MARKINGS SHALL BE CAST OR WELDED INTO THE TRIPPING PALM, ITEM 2, AND SHANK, ITEM 6, IN THE APPROXIMATE LOCATION SHOWN. MARKINGS SHALL BE 1.00-1.50 HIGH CHARACTERS, RAISED .12 MINIMUM

   LOCATION NO 1. U.S. NAVY
   NAVMOOR-15 ANCHOR
   WEIGHT 18000 POUNDS
   LOCATION NO 2. (MANUFACTURER'S NAME)
   (SERIAL/MELT NUMBER)
   (YEAR OF MANUFACTURE)
9. SCREW THREADS SHALL BE IN ACCORDANCE WITH FED-STD-H28
10. MATERIAL TEST REPORTS SHALL BE SUPPLIED FOR ALL STRUCTURAL CAST AND FORGED STEEL. TEST REPORTS TO INCLUDE STEEL CHEMICAL AND TENSILE CERTIFICATIONS OF CONFORMANCE TO APPLICABLE ASTM REQUIREMENTS. FURTHERMORE, MATERIAL CERTIFICATIONS OF CONFORMANCE SHALL BE SUPPLIED FOR ALL PINS AND FITTINGS
11. THE ANCHOR WEIGHT SHALL NOT VARY FROM 12000 LBS MORE THAN PLUS 4 PERCENT TO MINUS 2 PERCENT
12. COMPLETED ANCHORS SHALL BE MARKED FOR SHIPMENT IN ACCORDANCE WITH MIL-STD-129
13. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN AN INSPECTION SYSTEM IN ACCORDANCE WITH MIL-I-45208 OR A QUALITY PROGRAM IN ACCORDANCE WITH MIL-Q 9858
14. AFTER COMPLETION OF ALL ANCHOR TESTING AND INSPECTION, ANCHOR STABILIZERS SHALL BE SECURED FOR SHIPMENT AS SHOWN ON SHEET 2
15. THE TRUNNION PIN, ITEM 9, AND THE TANDEM LINK PIN, ITEM 13, SHALL BE LUBRICATED DURING FINAL ANCHOR ASSEMBLY WITH MIL-G-24139 GREASE, OR EQUIVALENT
16. CERTIFICATE OF COMPLIANCE: AS A MINIMUM AND PRIOR TO SHIPMENT OF MATERIAL FROM THE MANUFACTURER, CERTIFICATION DOCUMENTATION FOR EACH ANCHOR SHALL BE PROVIDED. THE FOLLOWING INFORMATION SHALL BE PROVIDED IN ADDITION TO THE MANUFACTURER'S STATEMENT OF CONFORMANCE TO ALL CONTRACTUAL REQUIREMENTS
   A. MANUFACTURER'S SERIAL NUMBER FOR ANCHOR AND CONTRACT LINE ITEM NUMBER
   B. MAGNETIC PARTICLE INSPECTION REPORT
   C. CERTIFICATION OF PROOF LOADING
   D. SERIAL NUMBERS, MANUFACTURER AND DATE OF CALIBRATION OF TEST EQUIPMENT
   E. SIGNATURES OF GOVERNMENT AND CONTRACTOR QUALITY ASSURANCE PERSONNEL WHO WITNESSED TESTS AND REQUIRED EXAMINATIONS



PARTS LIST

QTY	ITEM NO	PART NO.	DESCRIPTION	SPECIFICATION	MATERIAL
2	23		PLATE, 2.00 THK	ASTM A36	STEEL
2	22		PIPE, 8.625 OD x .864 WALL, GR B	ASTM A106 OR A53	STEEL
2	21		PLATE .829 THK	ASTM A36	STEEL
1	20		PLATE .625 THK	ASTM A36	STEEL
1	19		WEDGE PLATE, .625 THK	ASTM A36	STEEL
4	18	6155316-3P1R	NUT, HEX, 3/4-10UNC-2B		CRES
6	17	6155315-251	WASHER, FLAT, .812 BASIC ID		CRES
4	16	6155315-2P1L	SCREW, CAP, HEX'S HD. 3/4-10UNC-2A x 2.500 L		CRES
2	15	6155315-2P1R	SCREW, CAP, HEX. HD. 3/4-10UNC-2A x 1.500 L		CRES
1	14	6155314-1	SHACKLE, ANCHOR		STEEL
1	13		PIN, 3.375 DIA STK	ASTM A36	STEEL
2	12		WASHER .500 THK	ASTM A36	STEEL
1	11		32 DEGREE STOPPER, GR 70-36, CL 2	ASTM A27	SEE NOTE 1
1	10		TANDEM LINK	ASTM A36	STEEL
1	9		PIN, TRUNNION, 8500 DIA STK, GR 1018	ASTM A108	STEEL
2	8		SPAR, .750 THK	ASTM A36	STEEL
2	7		PLATE, EDGE, 1.00 THK	ASTM A36	STEEL
2	6		PLATE, .875 THK	ASTM A36	STEEL
2	5		PLATE .875 THK	ASTM A36	STEEL
1	4		SHANK, GR 70-36, CL 2	ASTM A27	SEE NOTE 1
REF	3		STABILIZER		
1	2		PALM, TRIPPING, GR 70-36, CL 2	ASTM A27	STEEL
REF	1		TRIPPING PALM/FLUKE ASSEMBLY		

NAVMOOR-15, 18000 Pounds
Anchor Assembly, Mooring

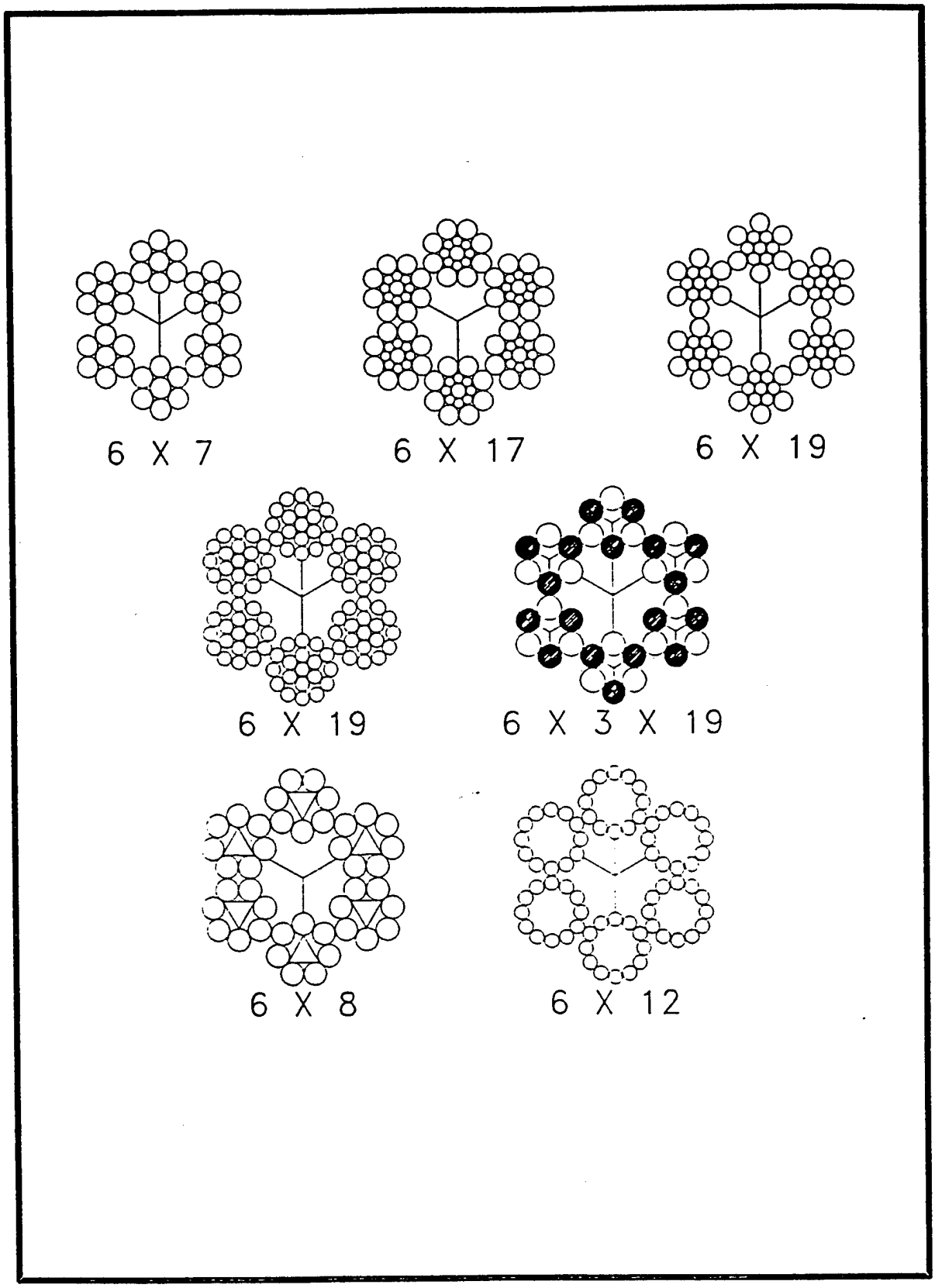


FIGURE 613-6
Common Wire Rope Construction Examples

TABLE 613-6
Fiber Rope Specification

Type of Rope	Circumference Inches	Specifications
Untreated Manila	Up to 12	FED Spec T-R--6-5
Mildew Resistant Manila	Up to 12	FED Spec T-T-616
Jute	5/8 to 6	FED Spec T-R-650
Polypropylene	Up to 10	MIL-R-24049
Nylon Three Strand	Up to 12	MIL-R-17343
Nylon Plaited	up to 16	MIL-R-24337
Nylon Double Braid	Up to 21	MIL-R-204050
Polyester Three Strand	Up to 12	MIL-R-30500
Polyester Plaited (Staple Wrap)	3/4 to 4-1/2	MIL-R-24537
Polyester Double-Braid	Up to 21	MIL-R-24677
Polyester Double-Braid (Staple Wrap)	3/4 to 5	MIL-R-24536

TABLE 613-8
Plain-Laid Rope Construction

Size Circumference Inches	Minimum Breaking Strength (Lbs)[1]				
	Sisal	Manila	Polypropylene	Nylon[2]	Polyester
5/8	360	405	700	950	800
3/4	480	540	1,000	1,500	1,200
1	800	900	1,700	2,600	2,000
1-1/8	1,080	1,215	2,150	3,300	2,800
1-1/4	1,400	1,525	2,500	4,800	3,800
1-1/2	2,120	2,385	3,700	5,800	5,000
1-3/4	2,760	3,105	4,800	7,600	6,500
2	3,520	3,960	6,000	9,800	8,000
2-1/4	4,320	4,860	7,000	13,200	10,000
2-1/2	5,200	5,850	9,000	15,300	13,000
2-3/4		6,930	11,000	19,000	15,000
3		8,100	13,000	23,200	18,500
3-1/2		10,800	16,500	32,000	25,000
3-3/4		12,150	19,500	36,500	
4		13,500	21,500	41,300	31,000
4-1/2		16,650	26,000	50,000	
5		20,250	32,000	60,000	48,000
4-1/2		23,850	38,000	72,000	
6		27,900	44,000	90,000	68,000
6-1/2			50,000	100,000	
7		36,900	60,000	127,000	88,000
8		46,800	75,000	164,000	110,000
9		57,600	94,000	209,000	140,000
10		69,300	115,000	265,000	165,000
11		81,900		316,000	240,000
12		94,500		375,000	285,000

NOTE:
[1]Comparative strengths of various fiber ropes.
[2]The minimum breaking strength of nylon when wet is reduced approximately 15 percent.

TABLE 613-9

Braided Rope Construction

Size Circumference Inches	Minimum Breaking Strength (lbs.)		
	Double Braided		Plaited
	Nylon	Polyester	Nylon
3/4	1,700	1,730	1,500
1	2,700	2,670	2,500
1-1/8	3.9	3,860	3,700
1-1/4	5,100	5,210	5,000
1-1/2	6,900	6,820	6,400
1-3/4	9,000	8,590	8,000
2	12,000	10,600	11,000
2-1/4	15,000	15,100	17,000
2-1/2	18,400	17,800	20,000
2-3/4	22,500	20,600	24,000
3	26,500	26,800	31,000
3-1/2	36,000	33,900	38,000
3-3/4	42,000	41,700	46,000
4	48,000	46,000	53,000
4-1/2	60,000	59,900	63,000
5	73,000	69,900	73,000
5-1/2	90,000	81,200	78,000
6	102,000	106,000	95,000
6-1/2	123,000	119,000	106,000
7	140,000	133,000	125,000
7-1/2	160,000	164,000	137,000
8	180,000	181,000	165,000
9	225,000	236,000	200,000
10	273,000	277,000	250,000
11	325,000	343,000	300,000
12	385,000	417,000	360,000

TABLE 613-9
Braided Rope Construction - Continued

Size Circumference Inches	Minimum Breaking Strength (Lbs)[1]		
	Double Braided		Plaited
	Nylon[2]	Polyester	Nylon[2]
13	440,000	470,000	380,000
14	508,000	527,000	441,000
15	576,000	649,000	507,000
16	650,000	715,000	572,000
17	726,000	784,000	
18	808,000	931,000	
19	893,000	1,012,000	
20	980,000	1,091,000	
21	1,070,000	1,263,000	

NOTE:

[1]Comparative strengths of various fiber ropes for current minimum breaking strength of each type, consult the MIl-Spec.

[2]The minimum breaking of nylon when wet is reduced approximately 15 percent.

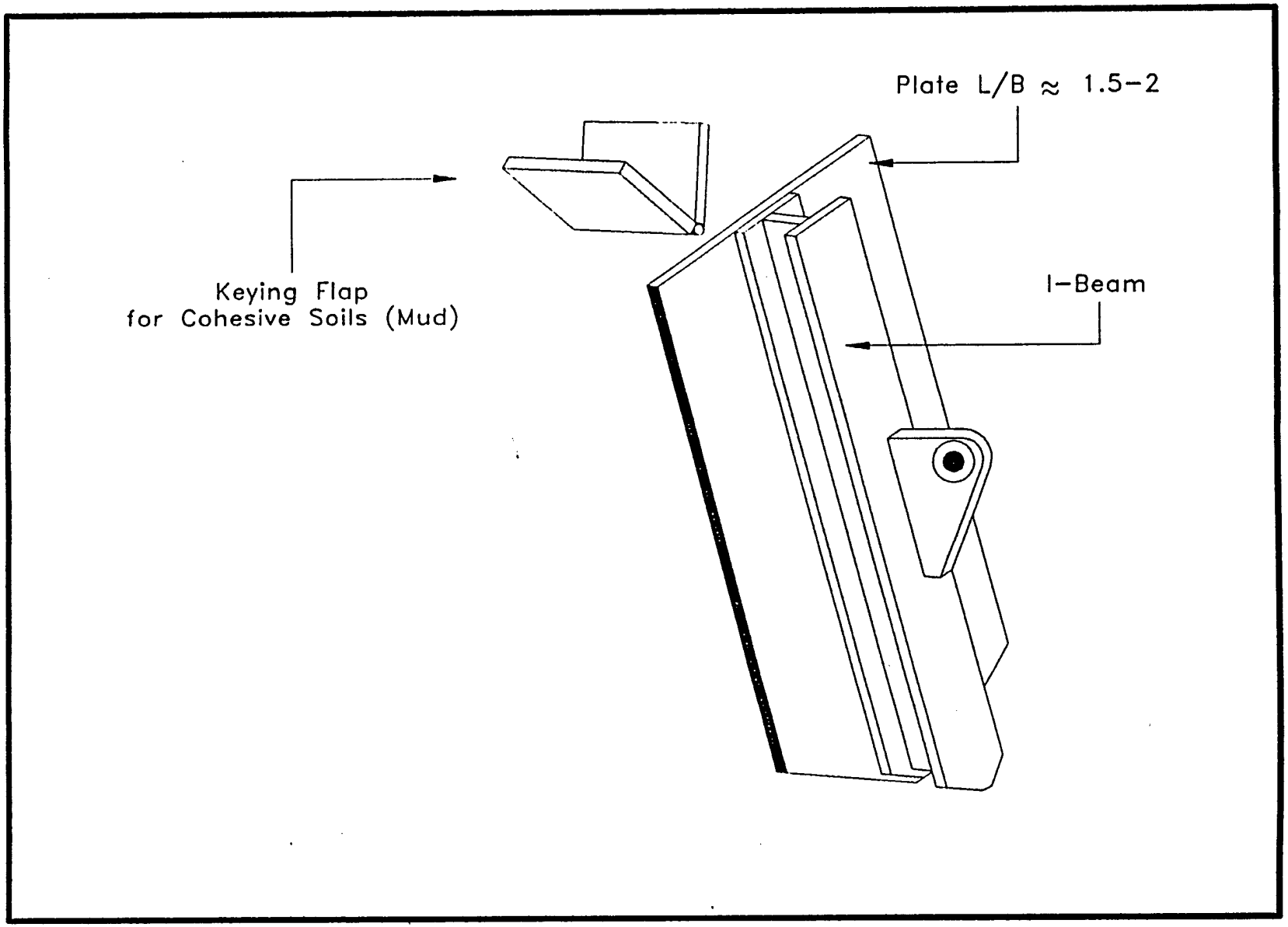
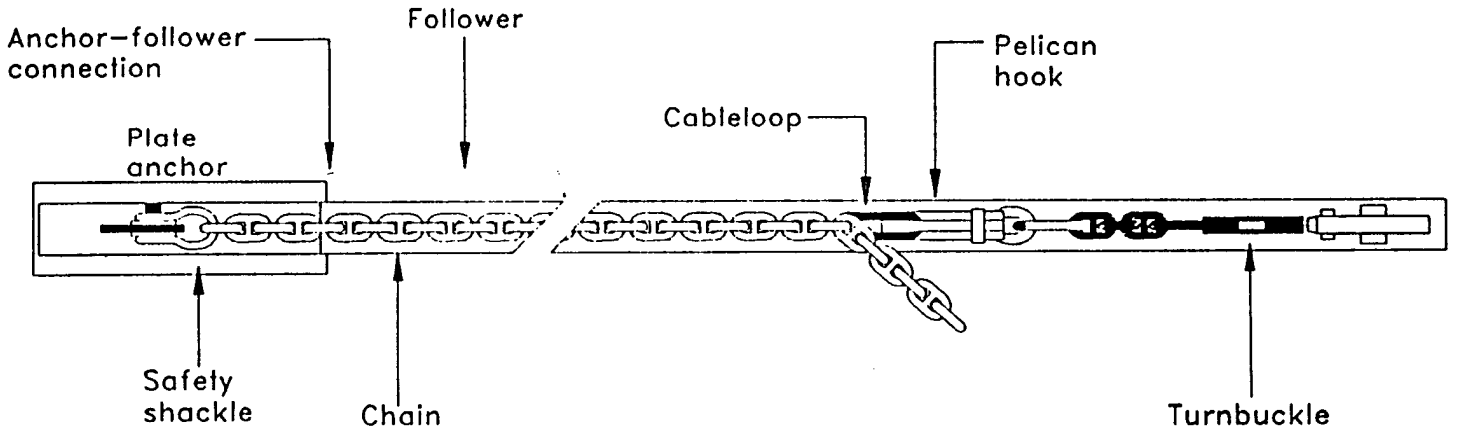


FIGURE 3
Driven Plate Anchor Configuration



Anchor–Follower Assembly

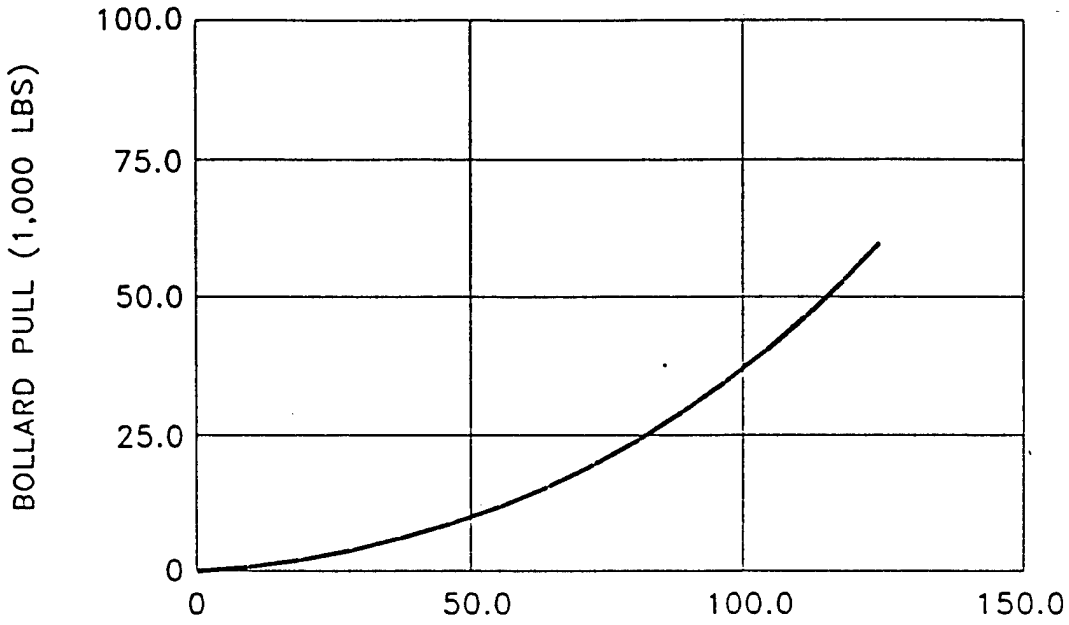


FIGURE J-1
Variation of Bollard Pull with Shaft Speed for ARS-38 Class Ships

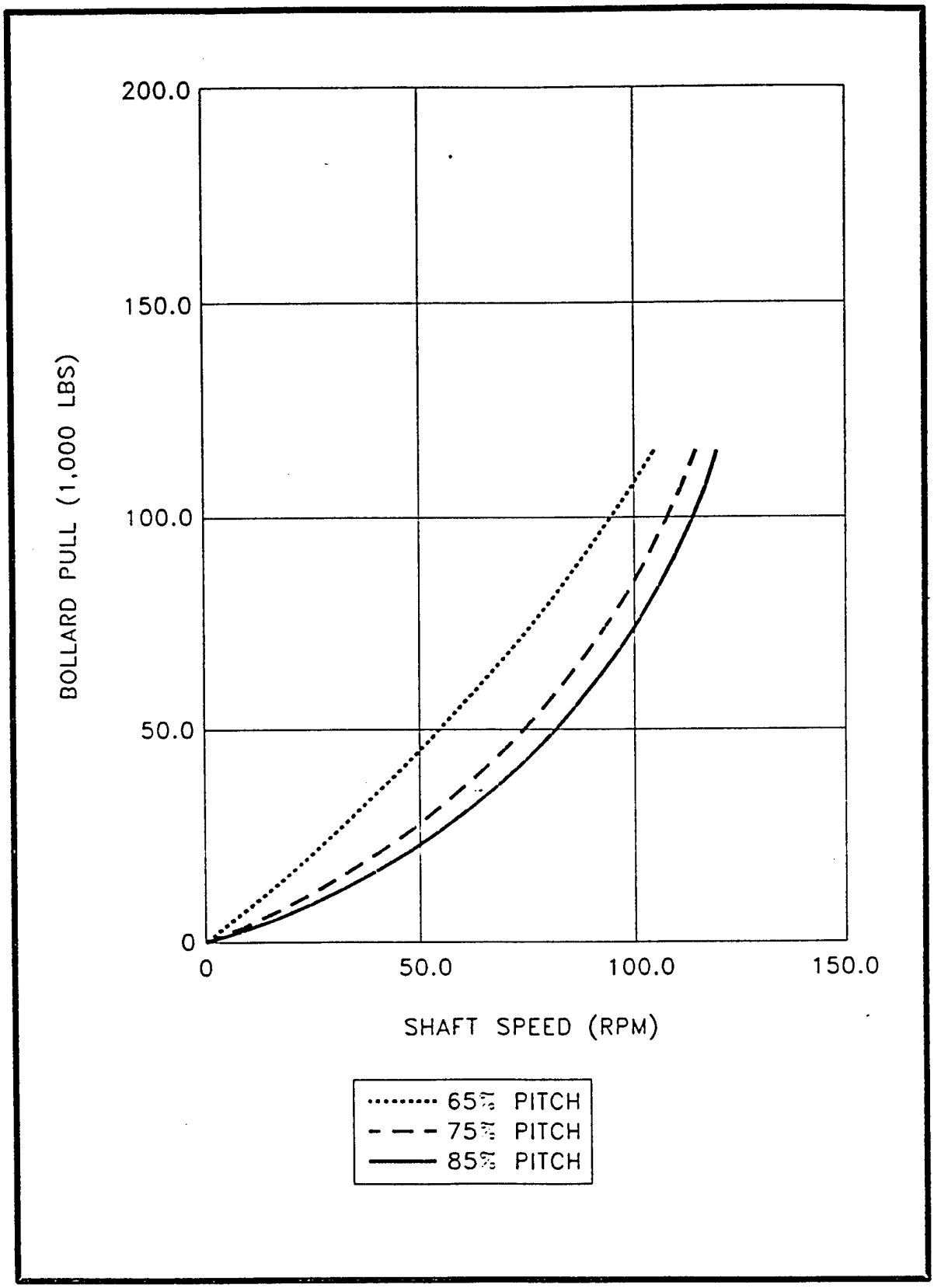
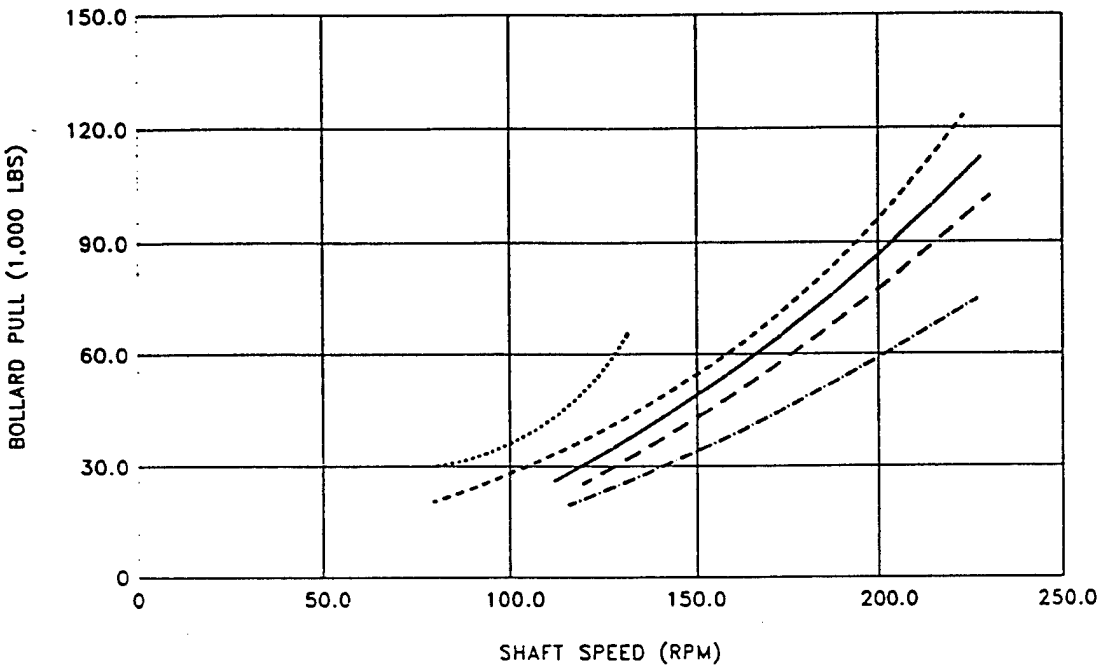


FIGURE J-2
Variation of Bollard Pull with Shaft Speed and Propeller Pitch for ARS-50 Class Ships



PITCH (FT)
- 6.5
- 8.0
- 9.0
- 10.0
- 12.5

NOTE:
These performance curves are not typical of all T-ATF-168 Class tugs. Some ships of this class are fitted with Kort nozzles.

FIGURE J-3
Bollard Pull vs. Shaft Speed and Propeller Pitch
For T-ATF-169 Class Ship Without Kort Nozzle

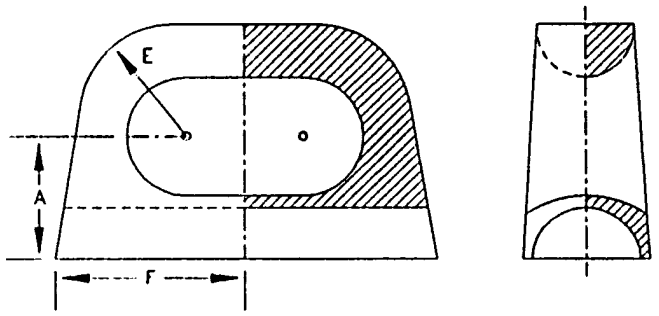
TABLE 1
Chocks for Nylon Rope (4)

Chock size		Breaking strength of rope		A		E		F		Chock weight	
in.	mm	lb	kN	in.	mm	in.	mm	in.	mm	lb	kg
6	152	22,000	98	4-1/2	114	3-5/8	92	6-1/2	165	50	23
8	203	37,500	167	5-1/2	140	4-1/2	114	8	203	80	36
10	254	54,400	242	6	152	5-1/4	133	9-1/2	241	120	54
12	305	74,000	329	7	178	6	152	11	279	180	82
14	356	110,000	489	8	203	6-3/4	171	12	305	230	104
16	406	137,000	609	9	229	7-3/4	197	14	356	360	163
18	475	170,000	756	10	254	8-1/2	216	15	381	470	213
20	508	200,000	890	10-1/2	267	9-1/4	235	16	406	550	249

Notes

1. Chock shall be set parallel to baseline athwarthships and shall follow sheer in fore and aft direction.

2. Chock is designed for use with nylon rope as shown in table. Chock shall withstand a horizontal endwise pull equal to double the minimum breaking strength of 2 parts of the specified size of nylon rope applied one inch above the centerline of the chock. The chock shall also withstand an upward load of 50,000 pounds applieed at its midpoint.



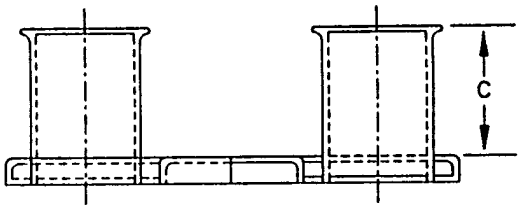
(4) NAVSHIPS Drawing 805-1843363, Chocks for nylon rope.

TABLE 2
Bitts for Nylon Rope (5)

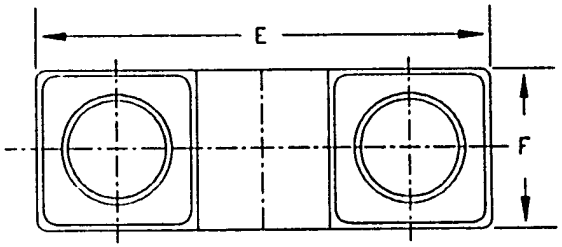
Nominal bit size		Maximum size of nylon rope		Maximum allowable moment		C		E		F		Approximate weight	
in.	mm	in.	mm	in.–lb (000)	kNm	in.	mm	in.	mm	in.	mm	lb	kg
4	102	3–1/2	89	142.5	16.10	10	254	16–1/2	419	7–1/2	191	80	36
6	152	6	152	481.0	54.35	13	330	24–1/8	613	11–1/8	283	210	95
8	203	7	178	770.0	87.00	14	355	30–5/8	778	13–5/8	346	320	145
10	254	9	228	1490.0	168.35	17	432	39–1/4	997	17–1/4	438	580	263
12	305	10	254	2110.0	238.40	21	533	45–1/4	1150	20–1/4	514	870	395

Notes

1. The maximum moment is the product of the breaking strength of the rope times half the height of the barrel above the base plate.
2. Bitts are designed for a yield stress of 24,000 lb/in^2 based on the maximum moment.



Front elevation and section

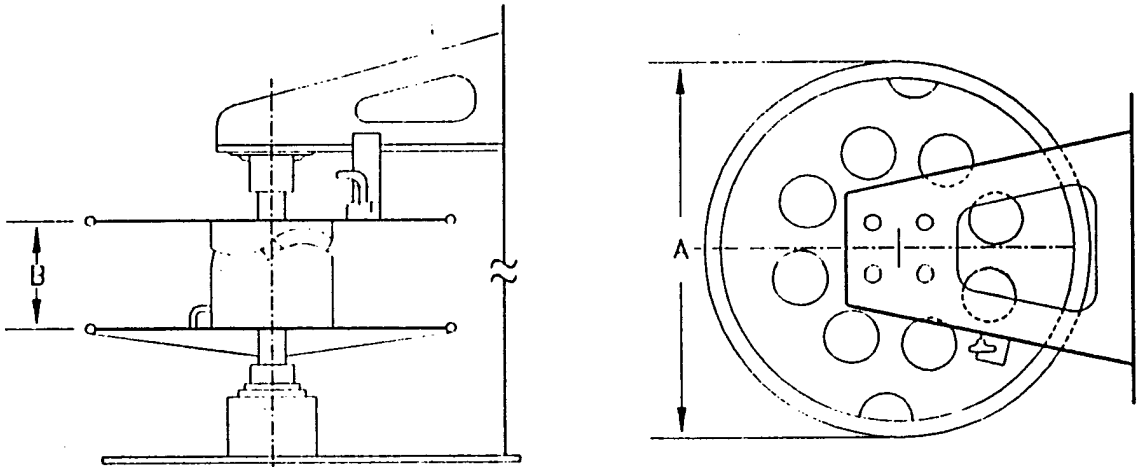


Bottom view

(5) NAVSHIPS Drawing 804–1843362, Bitts for nylon rope.

TABLE 3
Vertical Hawser Reels (6)

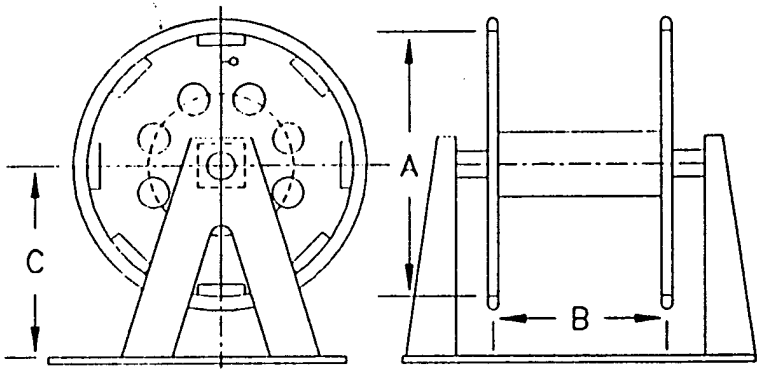
Reel type	Rope size		Capacity	A		B		Approx assy weight		Approx rope weight	
	in.	mm	fathoms	in.	mm	in.	mm	lb	kg	lb	kg
I	6	152	100	30	762	72	1829	285	129	648	294
	6	152	120	30	762	72	1829	285	129	778	353
	7	178	100	30	762	72	1829	285	129	876	397
II	7	178	120	34	864	66	1676	325	147	1050	476
	8	203	80	34	864	66	1676	325	147	935	424
III	8	203	100	38	965	66	1676	400	181	1128	512
	8	203	120	38	965	66	1676	400	181	1352	613
	10	254	80	38	965	66	1676	400	181	1440	653
IV	10	254	100	45	1143	66	1676	460	209	1798	816
V	10	254	120	50	1270	66	1676	510	231	2154	977



(6) NAVSHIPS Drawings S2604-921842, Vertical hawser reels for manila rope.

TABLE 4
Horizontal Hawser Reels (7)

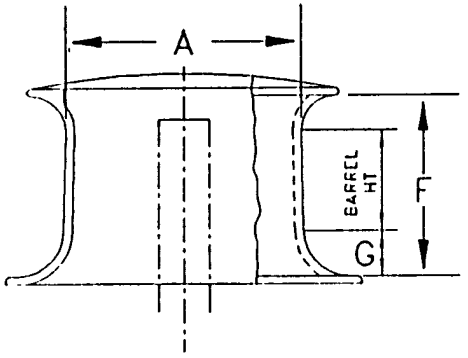
Reel type	Rope size		Capacity	A		B		C		Approx assy weight		Approx rope weight	
	in.	mm	fathoms	in.	mm	in.	mm	in.	mm	lb	kg	lb	kg
A	3	76	300	32	813	38	965	21	533	330	150	485	220
	4	102	167	32	813	38	965	21	533	330	150	485	220
	5	127	100	32	813	38	965	21	533	330	150	485	220
B	6	152	100	38	965	39	991	24	610	380	172	875	397
C	7	178	100	38	965	39	991	24	610	380	172	875	397
	8	203	100	38	965	52	1321	24	610	440	200	1150	522



(7) NAVSHIPS Drawing S2604-921841, Horizontal hawser reels for manila rope.

TABLE 5
Capstan Head Sizes for Nylon Ropes (8)

Nylon rope circumference		A (Barrel diameter)		F		G		Barrel height		Nylon rope wrap height	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
3	76	12	305	9.6	244	2.5	64	5.4	137	5.0	127
3-1/2 - 4	89-102	15	381	12.0	305	3.1	79	6.7	170	6.5	165
4-1/2	114	18	457	14.4	366	3.7	94	8.1	206	7.5	190
5 - 5-1/2	127-140	21	533	16.8	427	4.4	112	9.4	239	8.1	206
6 - 6-1/2	152-164	24	610	19.2	488	5.0	127	10.8	274	10.0	254
7	178	27	686	21.6	549	5.6	142	12.2	310	11.2	284
8	203	30	762	24.0	610	6.2	157	13.5	343	13.1	333
9	229	36	914	28.8	732	7.5	190	16.2	411	15.0	381



(8) NAVSHIPS Drawings S2601-860303, Capstan & gypsy heads.

Three-Strand Nylon Rope
MIL-R-17343

Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	(4020-00-)
5/8	16	950	4.20	700	213	541-7075*
5/8	16	950	4.20	1200	365	263-3483*
5/8	16	950	4.20	2250	685	701-3044
5/8	16	950	4.20	2250	685	242-4083*
5/8	16	950	4.20	100	30	270-8245*
3/4	19	1500	6.65	2250	685	618-0261
3/4	19	1500	6.65	900	274	523-9461
3/4	19	1500	6.65	600	182	542-2523*
3/4	19	1500	6.65	200	61	929-0058*
1	25	2600	11.55	2250	685	641-8898
1	25	2600	11.55	42	12	593-9584
1-1/8	29	3300	14.65	1620	493	842-2431*
1-1/8	29	3300	14.65	1620	493	641-8899
1-1/4	32	4800	21.35	1200	365	753-2886
1-1/4	32	4800	21.35	50	15	530-2701
1-1/2	38	5800	25.80	1200	365	641-8900
1-1/2	38	5800	25.80	300	91	741-3154
1-3/4	44	7600	33.80	1200	365	560-7732
2	51	9800	43.80	1200	365	753-2887
2-1/4	57	13200	58.70	125	38	595-2530
2-1/2	64	15300	68.05	1200	365	573-2888
2-3/4	70	19000	84.50	1200	365	174-1231
3	76	23200	103.20	1200	365	752-8878
3-1/2	89	3200	142.30	1200	365	174-1232
4	102	41300	183.70	600	182	752-8879
4-1/2	114	50000	222.40	600	182	542-3306
5	127	60000	266.90	600	182	752-8880
5-1/2	140	72000	320.25	600	182	542-3307
6	152	90000	400.35	600	182	542-3308
6-1/2	165	100000	444.82	600	182	843-6306
7	178	127000	564.90	600	182	752-8881
8	203	164000	729.50	720	219	752-8882
8	203	164000	729.50	600	182	892-4028
9	229	209000	929.65	600	182	842-7468
10	254	265000	1178.75	600	182	843-6307

* An asterisk indicates an NSN for which an alternative (nonasterisked) NSN pertaining to the same rope size may be substituted when the order is filled.

Plaited Nylon
MIL-R-24337

Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	m(4020-00-)
3/4	19	1,500	6.70	2250	685	106-9384
1	25	2,400	10.70	2250	685	106-9388
1-1/8	29	3,300	14.70	1620	494	106-9389
1-1/4	32	4,800	21.40	1200	365	106-9390
1-1/2	38	6,200	27.60	1200	365	106-9391
1-3/4	44	7,700	34.30	1200	365	106-9392
2	51	10,000	44.50	1200	365	106-9393
2-1/4	57	13,800	61.40	1200	365	106-9394
2-1/2	64	16,000	71.20	1200	365	106-9395
2-3/4	70	19,000	84.50	1200	365	106-9396
3	76	25,000	111.20	1200	365	106-9397
3-1/2	89	33,000	146.80	1200	365	106-9398
3-3/4	92	38,000	169.00	600	182	106-9399
4	102	43,000	191.30	600	182	106-9464
4-1/2	114	50,000	222.40	600	182	106-9400
5	127	60,000	266.90	600	182	106-9401
5-1/2	140	75,000	333.60	600	182	106-9261
6	152	86,000	382.50	600	182	106-9298
6-1/2	165	98,000	435.90	600	182	106-9333
7	178	117,000	520.40	600	182	106-9334
7-1/2	191	134,000	596.10	600	182	106-9335
8	203	153,000	680.60	600	182	106-9336
9	229	192,000	854.10	600	182	106-9337
10	254	237,000	1054.20	600	182	106-9338
11	279	280,000	1245.50	500	152	106-9339
12	305	345,000	1534.60	400	122	106-9340

Double Braided Nylon Rope
MIL-R-24050

Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	(4020-)
3/4	19	1,700	7.55	600	182	00-106-9342
1	25	2,700	12.00	600	182	00-106-9341
1-1/8	29	3,900	17.30	600	182	00-946-0436
1-1/4	32	5,100	22.70	600	182	00-926-4529
1-1/2	38	6,900	30.70	600	182	00-106-9361
1-3/4	44	9,000	40.00	600	182	00-106-9364
2	51	12,000	53.40	600	182	00-106-9402
2	51	12,000	53.40	480	146	01-025-5175
2	51	12,000	53.40	300	91	01-025-5176
2	51	12,000	53.40	180	54	10-025-5177
2-1/4	57	15,000	66.70	600	182	00-106-9403
1-1/2	64	18,400	81.80	600	182	00-106-9404
2-3/4	70	22,500	100.10	600	182	00-106-9405
2-3/4	70	22,500	100.10	900	274	01-025-5172
2-3/4	70	22,500	100.10	300	91	01-025-5173
2-3/4	70	22,500	100.10	200	61	01-025-5174
3	76	26,500	117.90	600	182	00-471-9336
3-1/2	89	36,000	160.10	600	182	00-519-7916
3-3/4	92	42,000	186.80	600	182	00-106-9406
4	102	48,000	213.50	600	182	00-106-9407
4	102	48,000	213.50	900	274	01-025-5170
4	102	48,000	213.50	300	91	01-025-5171
4-1/2	114	60,000	266.90	600	182	00-106-9408
5	127	73,000	324.70	600	182	00-106-9409
5-1/2	140	90,000	400.30	600	182	00-106-9410
5-1/2	140	90,000	400.30	900	274	01-025-5178
5-1/2	140	90,000	400.30	300	91	01-025-5180
6	152	102,500	455.90	600	182	00-106-9411
6-1/2	165	123,000	547.10	600	182	00-106-9412
7	178	140,000	622.80	600	182	00-519-7946
7-1/2	191	160,000	711.80	600	182	00-486-6009
8	203	180,000	800.70	600	182	00-003-6293
8	203	180,000	800.70	1200	365	01-025-5179
9	229	225,000	1000.80	600	182	00-519-7951
10	254	273,000	1214.40	600	182	00-519-7960
11	279	325,000	1445.70	600	182	00-519-7980
12	305	385,000	1712.60	600	182	00-519-7992

Plaited Continuous Polyester Filament with Staple Wrap
MIL-R-24537

Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	(4020-01-)
3/4	19	2,080	9.30	2250	685	029-2778
1	25	2,980	13.30	2250	685	028-3842
1-1/8	29	3,970	17.70	1620	493	028-3825
1-1/4	32	5,050	22.50	1200	365	028-3828
1-1/2	38	6,400	28.50	400	122	028-3826
1-1/2	38	6,400	28.50	800	244	028-3829
1-1/2	38	6,400	28.50	1200	365	028-3830
1-1/2	38	6,400	28.50	200	61	028-3843
1-3/4	44	8,100	36.00	1200	365	028-3839
2	51	9,900	44.00	1200	365	028-3831
2-1/4	57	12,200	54.30	1200	365	029-8664
1-1/2	64	14,500	64.60	1200	365	028-3832
2-3/4	70	16,700	74.30	1200	365	028-3833
3	76	19,000	84.50	400	122	028-3834
3	76	19,000	84.50	600	182	028-3835
3	76	19,000	84.50	1200	365	028-3841
3-1/4	83	22,000	97.90	200	61	028-3836
3-1/2	89	25,000	111.20	1200	365	028-3837
3-3/4	92	27,500	122.30	600	182	028-3840
4	102	30,700	136.60	600	182	028-3838
4-1/2	114	37,000	164.60	600	182	028-3827

Three-Strand Polyester

MIL-R-30500

Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	(4020-)
5/8	16	800	3.60	2700	823	00-202-1345*
5/8	16	800	3.60	50	15	00-659-8923
3/4	19	1,200	5.30	2250	685	00-536-3476*
1	25	2,500	11.10	24	7	00-180-6548
1	25	2,500	11.10	2250	685	01-041-0789
1-1/4	32	3,800	16.90	1200	365	00-085-4424
1-1/2	38	5,000	22.20	1200	365	00-630-4873
3	76	18,500	82.30	1200	365	00-142-6115
4	102	31,000	137.90	600	182	00-630-4875

* An asterisk indicates an NSN for which an alternative (nonasterisked) NSN pertaining to the same rope size may be substituted when the order is filled.

Three-Strand Polypropylene
MIL-R-24049

Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	(4020-00-)
3/4	19	1,000	4.45	2250	685	999-3894
1	25	1,700	7.55	900	274	530-0698
1	25	1,700	7.55	210	64	499-7529
1-1/2	38	3,700	16.45	50	15	874-7920
1-1/2	38	3,700	16.45	600	182	968-1352
2-1/4	57	7,000	31.15	200	61	874-7921
2-1/4	57	7,000	31.15	600	182	968-1354
3	76	13,000	57.80	600	182	968-1355

Double Braided Polyester Filament With Staple Wrap

MIL-R-24536

Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	(4020-01-)
3/4	19	1,700	7.55	600	182	028-3823
1	25	2,600	11.55	600	182	028-3824
1-1/8	29	3,600	16.00	600	182	329-2775
1-1/4	32	4,700	20.90	600	182	028-3844
1-1/2	38	6,000	26.70	600	182	028-4526
1-3/4	44	7,900	35.15	600	182	028-4527
2	51	10,000	44.50	600	182	028-4525
2-1/4	57	12,200	54.25	600	182	028-6770
2-1/2	64	14,700	65.40	600	182	029-2776
2-3/4	70	17,400	77.40	600	182	028-4531
3	76	20,000	89.00	350	106	029-8665
3	76	20,000	89.00	700	213	028-3845
3-1/4	83	23,400	104.00	600	182	029-2777
3-1/2	89	26,700	118.75	600	182	028-3846
3-3/4	92	30,000	133.45	600	182	028-3822
4	102	33,700	150.00	350	106	029-8663
4	102	33,700	150.00	1200	365	028-4528
4-1/2	114	45,000	200.15	600	182	028-4529
5	127	50,000	222.40	600	182	028-4530

Three-Strand Dual Fiber
MIL-R-43942

Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	(4020-01-)
3/4	19	1,130	5.00	2250	685	036-6819
1	25	1,710	7.60	2250	685	036-6820
1-1/8	29	2,430	10.80	1600	487	037-6290
1-1/2	38	3,960	17.60	1200	365	036-6291
2	51	5,760	25.60	1200	365	037-6292
2-1/4	57	7,560	33.60	1200	365	037-6293

Plaited Dual Fiber

MIL-R-43952

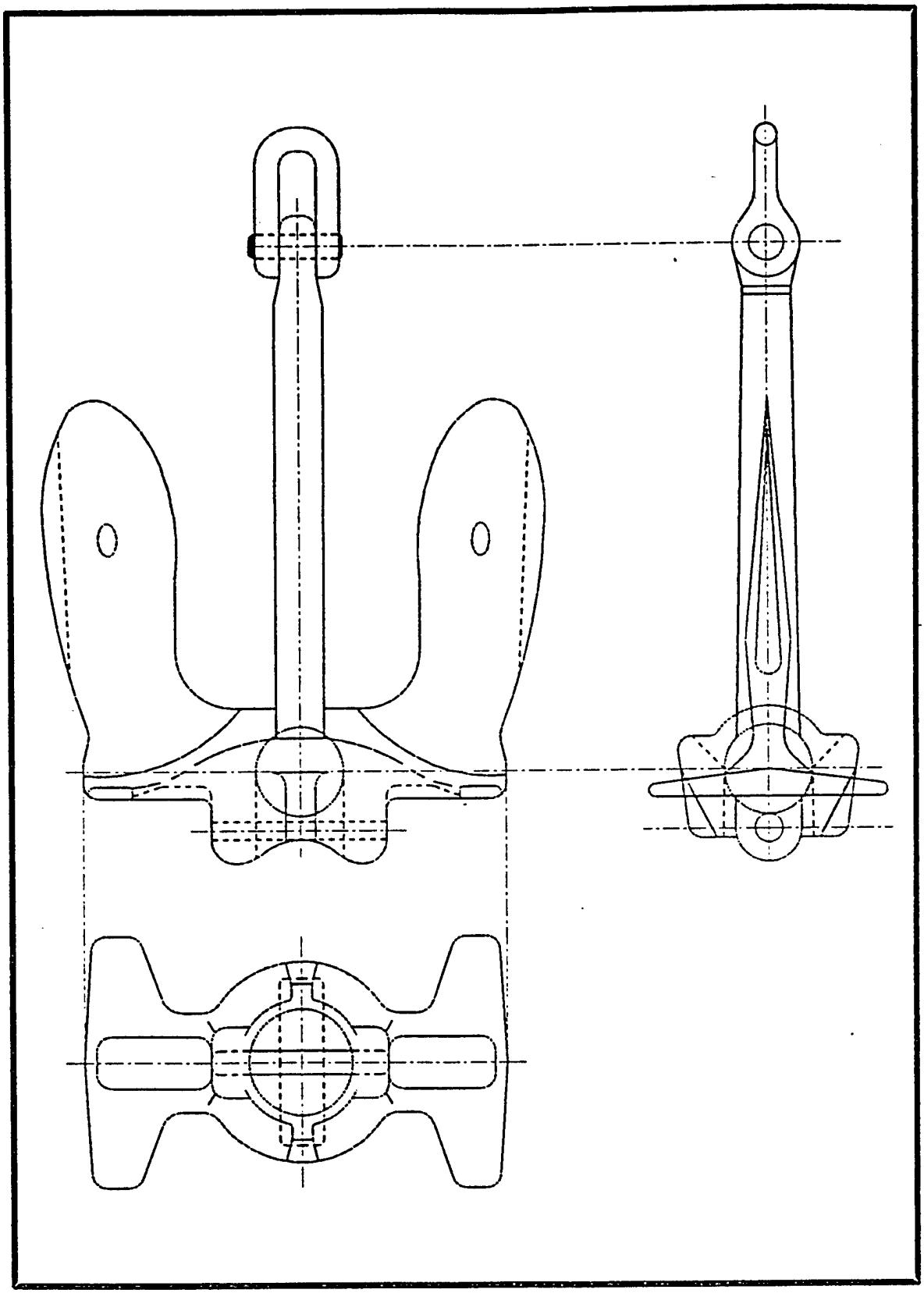
Circumference		Breaking strength		Standard length		NSN
inches	mm	lb	kN	feet	m	(4020-01-)
1-1/8	29	2,430	10.80	1600	487	038-4897
1-1/2	38	3,960	17.60	1200	365	038-4898
2-1/2	64	9,180	40.85	1200	365	038-4899

APPENDIX C

Minimum Number of Lines Used in Preliminary Mooring Analysis

In the preliminary design stage the following table may be used to prepare a mooring line arrangement for analysis purposes. All lines are presumed to be doubled up, with three parts per line.

Ship type	Displacement (long tons)	Number and size of mooring lines (heavy weather condition)	Camel width (feet)
Destroyers	2000 - 4000	Eight 5-inch	4
	4000 - 6000	Eight 6-inch	4
	6000 - 8000	Nine 6-inch	4
Cruisers	8000 - 12000	Two 8-inch, eight 6-1/2-inch	6
	12000 - 16000	Four 8-inch, eight 6-1/2-inch	6
Auxiliaries	15000 - 20000	Four 8-inch, eight 6-1/2-inch	
	20000 - 25000	Four 9-inch, eight 6-1/2-inch	6
	25000 - 30000	Four 9-inch, eight 7-inch	6
Minesweepers		Six 5-inch	-
Tugs		Six 5-inch	-



U.S. Navy Stockless Anchor

CHAIN - 8-6-93 (C-40)

	* FLASH BUTT-WELDED * MIL-C-24633A		* NON-MAGNETIC FBW * MIL-C-24774	
WIRE DIA	BRK STR (#)	MX WT/SH	BRK STR (#)	MX WT/SH
3/4	75,000	525	64,800	563
7/8	98,000	713	88,200	765
1	129,000	925	115,200	1,000
1-1/8	161,000	1,150	145,800	1,270
1-1/4	198,000	1,430	180,000	1,565
1-3/8	235,000	1,760		
1-1/2	280,000	2,080		
1-5/8	325,000	2,390		
1-3/4	380,000	2,750		
1-7/8	432,000	3,150		
2	454,000	3,540		
2-1/8	510,000	3,980		
2-1/4	570,000	4,450		
2-3/8	628,000	4,960		
2-1/2	692,000	5,490		
2-5/8	758,000	6,280		
2-3/4	826,000	6,890		
2-7/8	897,000	7,520		
3	970,000	8,180		
3-1/8	1,046,000	8,890		
3-1/4	1,124,000	9,600		
3-3/8	1,204,000	10,350		
3-1/2	1,285,000	11,140		
3-5/8	1,369,000	12,190		
3-3/4	1,455,000	12,920		
3-7/8	1,543,000	13,850		
4	1,632,000	14,680		
4-1/8	1,724,000	15,520		
4-1/4	1,817,000	16,360		
4-3/8	1,911,000	17,200		
4-1/2	2,008,000	18,030		
4-5/8	2,105,000	18,840		
4-3/4	2,550,000	20,300		

FIBEROPE - 1-19-94 (O-49)

********** ********** ***

<% STRETCH @BRK STR>>				* ARAMID 4-STR * CID A-A-50435B <6%>		* POLYESTER DB * MIL-R-24677A <30%>	
NOM DIA		NOM CIRC		ACCPT B/S (#)	WT (#/F)	ACCPT B/S (#)	WT (#/F)
3/16	D	5/8	C				
1/4	D	3/4	C			1,900	0.020
5/16	D	1	C			2,935	0.031
3/8	D	1-1/8	C			4,245	0.045
7/16	D	1-1/4	C			*5,730*	0.061
1/2	D	1-1/2	C			7,500	0.080
9/16	D	1-3/4	C			9,450	0.101
5/8	D	2	C			11,660	0.125
3/4	D	2-1/4	C			16,610	0.179
13/16	D	2-1/2	C			19,580	0.211
7/8	D	2-3/4	C			22,660	0.244
1	D	3	C			29,480	0.319
1-1/16	D	3-1/4	C				
		3-3/8	C	50,000	0.329		
1-1/8	D	3-1/2	C	60,000	0.369	37,290	0.404
1-1/4	D	3-3/4	C	70,000	0.416	45,870	0.498
1-5/16	D	4	C			50,600	0.550
		4-1/8	C	96,000	0.503		
1-1/2	D	4-1/2	C			61,000	0.718
		4-3/4	C	135,000	0.657		
1-5/8	D	5	C			74,000	0.840
		5-3/8	C	180,000	0.859		
1-3/4	D	5-1/2	C			84,000	0.977
		5-7/8	C	225,000	1.13		
2	D	6	C			105,000	1.28
		6-1/4	C	280,000	1.42		
2-1/8	D	6-1/2	C			118,000	1.44
2-1/4	D	7	C			133,600	1.61
2-1/2	D	7-1/2	C			162,000	1.99
		7-5/8	C	350,000	1.74		
2-5/8	D	8	C			180,000	2.20
		8-3/16	C	420,000	2.09		
3	D	9	C			232,000	2.87
3-1/4	D	10	C			277,000	3.37
3-5/8	D	11	C			335,000	4.19
4	D	12	C			396,150	5.10
4-1/4	D	13	C			446,500	5.76
4-1/2	D	14	C			500,650	6.46
5	D	15	C			616,550	7.98
5-1/4	D	16	C			679,250	8.79

(1-5/16 C)

FIBEROPE - 1-19-94 (O-49)
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<% STRETCH @BRK STR>>		* POLYESTER 12-STR * MIL-R-24750 <30%>		* POLYESTER 8-STR PL * MIL-R-24730 <45%>	
NOM DIA	NOM CIRC	ACCPT B/S (#)	WT (#/F)	ACCPT B/S (#)	WT (#/F)
3/16 D	5/8 C				
1/4 D	3/4 C			2,000	0.020
5/16 D	1 C			3,100	0.031
3/8 D	1-1/8 C	4,240	0.042	4,500	0.045
7/16 D	1-1/4 C	*5,680*	0.057	*6,000*	0.062
1/2 D	1-1/2 C	7,440	0.077	7,700	0.080
9/16 D	1-3/4 C	9,280	0.098	9,700	0.102
5/8 D	2 C	11,520	0.115	12,100	0.130
3/4 D	2-1/4 C	16,640	0.166	15,200	0.175
13/16 D	2-1/2 C			18,800	0.206
7/8 D	2-3/4 C	19,440	0.226	21,800	0.250
1 D	3 C	25,600	0.300	26,700	0.304
1-1/16 D	3-1/4 C				
	3-3/8 C				
1-1/8 D	3-1/2 C	32,800	0.380	35,900	0.400
1-1/4 D	3-3/4 C	37,600	0.440	40,200	0.464
1-5/16 D	4 C	43,200	0.500	45,600	0.525
	4-1/8 C				
1-1/2 D	4-1/2 C	54,400	0.630	56,900	0.670
	4-3/4 C				
1-5/8 D	5 C	67,200	0.780	69,500	0.820
	5-3/8 C				
1-3/4 D	5-1/2 C	80,800	0.940	82,000	0.980
	5-7/8 C				
2 D	6 C	96,000	1.12	97,200	1.18
	6-1/4 C				
2-1/8 D	6-1/2 C	113,600	1.32	112,000	1.35
2-1/4 D	7 C	131,200	1.53	129,000	1.57
2-1/2 D	7-1/2 C	151,200	1.76	149,000	1.81
	7-5/8 C				
2-5/8 D	8 C	172,000	2.00	167,000	2.04
	8-3/16 C				
3 D	9 C	215,200	2.53	208,000	2.58
3-1/4 D	10 C	264,800	3.12	255,000	3.18
3-5/8 D	11 C	319,200	3.78	306,000	3.84
4 D	12 C	376,800	4.49	365,000	4.54
4-1/4 D	13 C	440,800	5.27	429,000	5.40
4-1/2 D	14 C	508,800	6.12	496,000	6.30
5 D	15 C	581,600	7.02	570,000	7.20
5-1/4 D	16 C			638,000	8.20
		(1-5/16 C)		*(1-5/16 C)*	

FIBEROPE - 1-19-94 (O-49)
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<% STRETCH @BRK STR>>			* POLYESTER 3-STR * MIL-R-30500B/2 <35%>		* POLYESTER DB (SW) * MIL-R-24536 <25%>	
NOM DIA		NOM CIRC	ACCPT B/S (#)	WT (#/F)	ACCPT B/S (#)	WT (#/F)
3/16	D	5/8 C	800	0.012		
1/4	D	3/4 C	1,200	0.021	1,700	0.017
5/16	D	1 C	2,000	0.032	2,600	0.026
3/8	D	1-1/8 C	2,800	0.046	3,600	0.038
7/16	D	1-1/4 C	3,800	0.062	4,700	0.053
1/2	D	1-1/2 C	5,000	0.081	6,000	0.067
9/16	D	1-3/4 C	6,500	0.105	7,900	0.091
5/8	D	2 C	8,000	0.132	10,000	0.118
3/4	D	2-1/4 C	10,000	0.175	12,200	0.149
13/16	D	2-1/2 C	13,000	0.198	14,700	0.185
7/8	D	2-3/4 C	15,000	0.250	17,400	0.222
1	D	3 C	18,500	0.300	20,000	0.267
1-1/16	D	3-1/4 C			23,400	0.313
		3-3/8 C				
1-1/8	D	3-1/2 C	25,000	0.420	26,700	0.364
1-1/4	D	3-3/4 C			30,000	0.417
1-5/16	D	4 C	31,000	0.525	33,700	0.476
		4-1/8 C				
1-1/2	D	4-1/2 C			45,000	0.599
		4-3/4 C				
1-5/8	D	5 C	48,000	0.808	50,000	0.741
		5-3/8 C				
1-3/4	D	5-1/2 C				
		5-7/8 C				
2	D	6 C	68,000	1.24		
		6-1/4 C				
2-1/8	D	6-1/2 C				
2-1/4	D	7 C	88,000	1.59		
2-1/2	D	7-1/2 C				
		7-5/8 C				
2-5/8	D	8 C	110,000	2.10		
		8-3/16 C				
3	D	9 C	140,000	2.63		
3-1/4	D	10 C	165,000	3.18		
3-5/8	D	11 C	240,000	4.00		
4	D	12 C	285,000	4.67		
4-1/4	D	13 C				
4-1/2	D	14 C				
5	D	15 C				
5-1/4	D	16 C				

FIBEROPE - 1-19-94 (O-49)

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<% STRETCH @BRK STR>>			* POLYESTER PL (SW) * MIL-R-24537 <*25%*>		* NYLON DB * MIL-R-24050D <40%>	
NOM DIA		NOM CIRC	ACCPT B/S (#)	WT (#/F)	ACCPT B/S (#)	WT (#/F)
3/16	D	5/8 C				
1/4	D	3/4 C	2,080	0.021	1,785	0.015
5/16	D	1 C	2,980	0.032	2,835	0.024
3/8	D	1-1/8 C	3,970	0.044	4,095	0.034
7/16	D	1-1/4 C	5,050	0.057	*5,355*	0.047
1/2	D	1-1/2 C	6,400	0.074	7,245	0.061
9/16	D	1-3/4 C	8,100	0.096	9,450	0.083
5/8	D	2 C	9,900	0.122	12,600	0.108
3/4	D	2-1/4 C	12,200	0.152	15,750	0.137
13/16	D	2-1/2 C	14,500	0.184	19,320	0.169
7/8	D	2-3/4 C	16,700	0.215	23,625	0.204
1	D	3 C	19,000	0.252	27,825	0.243
1-1/16	D	3-1/4 C	22,000	0.296		
		3-3/8 C				
1-1/8	D	3-1/2 C	25,000	0.336	37,800	0.331
1-1/4	D	3-3/4 C	27,500	0.378	44,100	0.380
1-5/16	D	4 C	30,700	0.425	50,400	0.433
		4-1/8 C				
1-1/2	D	4-1/2 C	37,000	0.630	64,200	0.546
		4-3/4 C				
1-5/8	D	5 C			78,110	0.676
		5-3/8 C				
1-3/4	D	5-1/2 C			96,300	0.820
		5-7/8 C				
2	D	6 C			109,675	0.971
		6-1/4 C				
2-1/8	D	6-1/2 C			131,610	1.14
2-1/4	D	7 C			149,800	1.32
2-1/2	D	7-1/2 C			171,200	1.52
		7-5/8 C				
2-5/8	D	8 C			192,600	1.73
		8-3/16 C				
3	D	9 C			243,000	2.19
3-1/4	D	10 C			284,840	2.70
3-5/8	D	11 C			351,000	3.27
4	D	12 C			415,800	3.89
4-1/4	D	13 C			475,200	4.50
4-1/2	D	14 C			548,640	5.24
5	D	15 C			622,080	6.00
5-1/4	D	16 C			702,000	6.85

(@75%BS) *(1-5/16 C)*

FIBEROPE - 1-19-94 (O-49)
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<% STRETCH @BRK STR>>			* NYLON 8-STR PL * MIL-R-24337A <65%>		* NYLON 3-STR * MIL-R-17343D <55%>	
NOM DIA		NOM CIRC	ACCPT B/S (#)	WT (#/F)	ACCPT B/S (#)	WT (#/F)
3/16	D	5/8 C			950	0.010
1/4	D	3/4 C	1,500	0.014	1,500	0.016
5/16	D	1 C	2,500	0.023	2,600	0.028
3/8	D	1-1/8 C	3,700	0.035	3,300	0.036
7/16	D	1-1/4 C	5,000	0.049	4,800	0.051
1/2	D	1-1/2 C	6,400	0.062	5,800	0.063
9/16	D	1-3/4 C	8,000	0.075	7,600	0.083
5/8	D	2 C	11,000	0.102	9,800	0.106
3/4	D	2-1/4 C	17,000	0.141	13,200	0.143
13/16	D	2-1/2 C	20,000	0.162	15,300	0.169
7/8	D	2-3/4 C	24,000	0.195	19,000	0.207
1	D	3 C	31,000	0.250	23,200	0.253
1-1/16	D	3-1/4 C				
		3-3/8 C				
1-1/8	D	3-1/2 C	38,000	0.339	32,000	0.347
1-1/4	D	3-3/4 C	46,000	0.400	36,500	0.400
1-5/16	D	4 C	53,000	0.430	41,300	0.453
		4-1/8 C				
1-1/2	D	4-1/2 C	63,000	0.500	50,000	0.582
		4-3/4 C				
1-5/8	D	5 C	73,000	0.680	60,000	0.702
		5-3/8 C				
1-3/4	D	5-1/2 C	78,000	0.820	72,000	0.843
		5-7/8 C				
2	D	6 C	95,000	0.950	90,000	1.06
		6-1/4 C				
2-1/8	D	6-1/2 C	106,000	1.09	100,000	1.18
2-1/4	D	7 C	125,000	1.25	127,000	1.50
2-1/2	D	7-1/2 C	137,000	1.41		
		7-5/8 C				
2-5/8	D	8 C	165,000	1.67	164,000	1.95
		8-3/16 C				
3	D	9 C	200,000	2.14	209,000	2.51
3-1/4	D	10 C	250,000	2.62	265,000	3.20
3-5/8	D	11 C	300,000	3.19	316,000	3.85
4	D	12 C	360,000	3.84	375,000	4.58
4-1/4	D	13 C	380,000	4.46		
4-1/2	D	14 C	441,000	5.17		
5	D	15 C	507,000	5.95		
5-1/4	D	16 C	572,000	6.76		

FIBEROPE - 1-19-94 (O-49)

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<% STRETCH @BRK STR>>		* POLYPROPYLENE 3-STR * MIL-R-24049B <45%>		* MANILA 3-STR * T-R-605B/3 <*20%*>	
NOM DIA	NOM CIRC	ACCPT B/S (#)	WT (#/F)	ACCPT B/S (#)	WT (#/F)
3/16 D	5/8 C	720	0.008	405	0.015
1/4 D	3/4 C	1,130	0.012	540	0.020
5/16 D	1 C	1,710	0.021	900	0.029
3/8 D	1-1/8 C	2,440	0.028	1,215	0.041
7/16 D	1-1/4 C	3,160	0.033	1,575	0.053
1/2 D	1-1/2 C	3,780	0.048	2,385	0.075
9/16 D	1-3/4 C	4,600	0.063	3,105	0.104
5/8 D	2 C	5,600	0.083	3,960	0.13
3/4 D	2-1/4 C	7,650	0.110	4,860	0.17
13/16 D	2-1/2 C	8,900	0.132	5,850	0.19
7/8 D	2-3/4 C	10,400	0.157	6,930	0.22
1 D	3 C	12,600	0.192	8,100	0.27
1-1/16 D	3-1/4 C			9,450	0.31
	3-3/8 C				
1-1/8 D	3-1/2 C	16,500	0.263	10,800	0.36
1-1/4 D	3-3/4 C	18,900	0.303	12,150	0.42
1-5/16 D	4 C	21,200	0.342	13,500	0.48
	4-1/8 C				
1-1/2 D	4-1/2 C	26,800	0.439	16,650	0.60
	4-3/4 C				
1-5/8 D	5 C	32,400	0.526	20,250	0.75
	5-3/8 C				
1-3/4 D	5-1/2 C	38,800	0.633	23,850	0.89
	5-7/8 C				
2 D	6 C	46,800	0.794	27,900	1.08
	6-1/4 C				
2-1/8 D	6-1/2 C	55,000	0.909		
2-1/4 D	7 C	62,000	1.11	36,900	1.46
2-1/2 D	7-1/2 C				
	7-5/8 C				
2-5/8 D	8 C	81,000	1.43	46,800	1.91
	8-3/16 C				
3 D	9 C	103,000	1.83	57,600	2.42
3-1/4 D	10 C	123,000	2.33	69,300	2.99
3-5/8 D	11 C			81,900	3.66
4 D	12 C			94,500	4.35
4-1/4 D	13 C				
4-1/2 D	14 C				
5 D	15 C				
5-1/4 D	16 C				

(REF)

FIBEROPE - 1-19-94 (O-49)
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<% STRETCH @BRK STR>>			* SISAL 3-STR * T-R-605B <*20%*>	
NOM DIA		NOM CIRC	ACCPT B/S (#)	WT (#/F)
3/16	D	5/8 C	360	0.015
1/4	D	3/4 C	480	0.020
5/16	D	1 C	800	0.029
3/8	D	1-1/8 C	1,080	0.041
7/16	D	1-1/4 C	1,400	0.053
1/2	D	1-1/2 C	2,120	0.075
9/16	D	1-3/4 C	2,760	0.104
5/8	D	2 C	3,520	0.13
3/4	D	2-1/4 C	4,320	0.17
13/16	D	2-1/2 C	5,200	0.19
7/8	D	2-3/4 C	6,160	0.22
1	D	3 C	7,200	0.27
1-1/16	D	3-1/4 C	8,400	0.31
		3-3/8 C		
1-1/8	D	3-1/2 C	9,600	0.36
1-1/4	D	3-3/4 C	10,800	0.42
1-5/16	D	4 C	12,000	0.48
		4-1/8 C		
1-1/2	D	4-1/2 C	14,800	0.60
		4-3/4 C		
1-5/8	D	5 C	18,000	0.75
		5-3/8 C		
1-3/4	D	5-1/2 C	21,200	0.89
		5-7/8 C		
2	D	6 C	24,800	1.08
		6-1/4 C		
2-1/8	D	6-1/2 C		
2-1/4	D	7 C	32,800	1.46
2-1/2	D	7-1/2 C		
		7-5/8 C		
2-5/8	D	8 C	41,600	1.91
		8-3/16 C		
3	D	9 C	51,200	2.42
3-1/4	D	10 C	61,600	2.99
3-5/8	D	11 C	72,800	3.66
4	D	12 C	84,000	4.35
4-1/4	D	13 C		
4-1/2	D	14 C		
5	D	15 C		
5-1/4	D	16 C		

(REF)

SHACKL Size D	RR-C-271 Grade A	RR-C-271 Grade B	Crosby Grade A	Crosby Grade B	Midland F Grade A	Midland F Grade B	CooperT Grade A	CooperT Grade B	Amd 1 Grade A	Amd 1 Grade B	Amd 1 Proof A	Amd 1 Proof B	Amd 1 Break A	Amd 1 Break B
3/16	520	900	1/3T	-----	1/2T	-----	1/3T	-----	650	900	1,430	1,980	3,250	4,500
1/4	710	2,000	1/2T	-----	3/4T	-----	1/2T	-----	1,000	2,000	2,200	4,400	5,000	10,000
5/16	1,060	3,120	3/4T	-----	1T	-----	3/4T	-----	1,500	3,120	3,300	6,864	7,500	15,600
3/8	1,590	3,800	1T	2T	1-1/2T	2T	1T	2T	2,000	4,000	4,400	8,800	10,000	20,000
7/16	2,170	5,180	1-1/2T	2.6T	2T	2-5/8T	1-1/2T	-----	3,000	5,200	6,600	11,440	15,000	26,000
1/2	2,830	6,500	2T	3.3T	3T	3-1/4T	2T	3-1/3T	4,000	6,600	8,800	14,520	20,000	33,000
9/16	3,580	-----	-----	-----	-----	-----	-----	-----	5,180	8,200	11,396	18,040	25,900	41,000
5/8	4,420	10,000	3-1/4T	5T	4-1/2T	5T	3-1/4T	-----	6,500	10,000	14,300	22,000	32,500	50,000
3/4	6,360	13,800	4-3/4T	7T	6-1/2T	7T	4-3/4T	7T	9,500	14,000	20,900	30,800	47,500	70,000
7/8	8,650	18,700	6-1/2T	9.5T	8-1/2T	9-1/2T	6-1/2T	-----	13,000	19,000	28,600	41,800	65,000	95,000
1-	11,310	24,400	8-1/2T	12.5T	10T	12-1/2T	8-1/2T	12-1/2T	17,000	25,000	37,400	55,000	85,000	125,000
1-1/8	13,360	28,600	9-1/2T	15T	12T	s15T;b17	9-1/2T	-----	19,000	30,000	41,800	66,000	95,000	150,000
1-1/4	16,500	36,000	12T	18T	14T	s18T;b21	12T	18T	24,000	36,000	52,800	79,200	120,000	180,000
1-3/8	19,800	41,400	13-1/2T	21T	17T	s21T;b24	13-1/2T	-----	27,000	42,000	59,400	92,400	135,000	210,000
1-1/2	23,740	48,800	17T	30T	20T	s25T;b30	17T	30T	34,000	60,000	74,800	132,000	170,000	300,000
1-5/8	27,900	57,400	-----	-----	24T	s29T;b35	20T	-----	40,000	70,000	88,000	154,000	200,000	350,000
1-3/4	32,320	65,000	25T	40T	30T	s34T;b40	25T	40T	50,000	80,000	110,000	176,000	250,000	400,000
2-	42,220	85,040	35T	50T	35T	s43T;b50	35T	50T	70,000	100,000	154,000	220,000	350,000	500,000
2-1/4	54,000	-----	-----	-----	-----	-----	40T	-----	80,000	128,000	176,000	281,600	400,000	640,000
2-1/2	67,600	121,400	55T	80T	-----	-----	55T	-----	110,000	160,000	242,000	352,000	550,000	800,000
2-3/4	81,000	-----	-----	-----	-----	-----	60T	-----	120,000	188,000	264,000	413,600	600,000	940,000
3-	96,200	150,000	85T	110T	-----	-----	75T	-----	170,000	220,000	374,000	484,000	850,000	1,100,000
3-1/2	131,100	200,000	120T	140T	-----	-----	100T	-----	240,000	280,000	528,000	616,000	1,200,000	1,400,000
4-	171,140	260,000	150T	175T	-----	-----	-----	-----	300,000	350,000	660,000	770,000	1,500,000	1,750,000

WIREROPE - 8-6-93 (E-33)

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NOM DIA	NOM CIRC	* WIRE/6X37 EIPS IWRC * RR-W-410D TABLE XII ACCPT B/S (#)	WT (#/F)	* WIRE/6X37 IPS IWRC * RR-W-410D TABLE XI ACCPT B/S (#)	WT (#/F)	* WIRE/6X37 IPS FC * RR-W-410D TABLE X ACCPT B/S (#)	WT (#/F)
3/16 D	5/8 C						
1/4 D	3/4 C	6,640	0.116	5,740	0.116	5,340	0.105
5/16 D	1 C	10,280	0.180	8,940	0.180	8,300	0.164
3/8 D	1-1/8 C	14,720	0.260	12,800	0.260	11,900	0.236
7/16 D	1-3/8 C	19,900	0.350	17,340	0.350	16,120	0.320
1/2 D	1-5/8 C	26,000	0.460	22,400	0.460	20,800	0.420
9/16 D	1-3/4 C	32,800	0.590	28,200	0.590	26,400	0.530
5/8 D	2 C	40,200	0.720	35,000	0.720	32,600	0.660
3/4 D	2-3/8 C	57,400	1.04	50,000	1.04	46,400	0.950
7/8 D	2-3/4 C	77,600	1.42	67,400	1.42	62,800	1.29
1 D	3-1/8 C	100,800	1.85	87,600	1.85	81,600	1.68
1-1/8 D	3-1/2 C	126,800	2.34	110,200	2.34	102,600	2.13
1-1/4 D	3-7/8 C	155,800	2.89	135,400	2.89	126,000	2.63
1-3/8 D	4-3/8 C	187,200	3.50	162,800	3.50	151,600	3.18
1-1/2 D	4-3/4 C	222,000	4.16	192,800	4.16	179,400	3.78
1-5/8 D	5-1/8 C	258,000	4.88	224,000	4.88	208,000	4.44
1-3/4 D	5-1/2 C	298,000	5.67	260,000	5.67	242,000	5.15
1-7/8 D	5-7/8 C	340,000	6.50	296,000	6.50	274,000	5.91
2 D	6-1/4 C	386,000	7.39	336,000	7.39	312,000	6.72
2-1/8 D	6-5/8 C	431,000	8.35	374,000	8.35	350,000	7.59
2-1/4 D	7-1/8 C	482,000	9.36	420,000	9.36	390,000	8.51
2-1/2 D	7-7/8 C	589,000	11.6	511,000	11.6	476,000	10.5
2-3/4 D	8-5/8 C	704,000	14.0	612,000	14.0	570,000	12.7
3 D	9-3/8 C	828,000	16.6	722,000	16.6	668,000	15.1
3-1/4 D	10-1/4 C	960,000	19.5	836,000	19.5	798,000	17.7
3-1/2 D	11 C	1,100,000	22.7	958,000	22.7	892,000	20.6