Design of a proposed research survey bottom trawl to conduct standardized resource surveys on a newly designed research vessel.

TRAWL PARAMETERS:

A.) maintain a consistent bottom contact over a speed range of 3.0 to 3.8 knots.
B.) maintain a headrope height of 4.5 - 5.5 meters.
C.) utilize interchangeable sweeps, one for good bottom and one for rough bottom.

TRAWL SPECIFICATIONS:

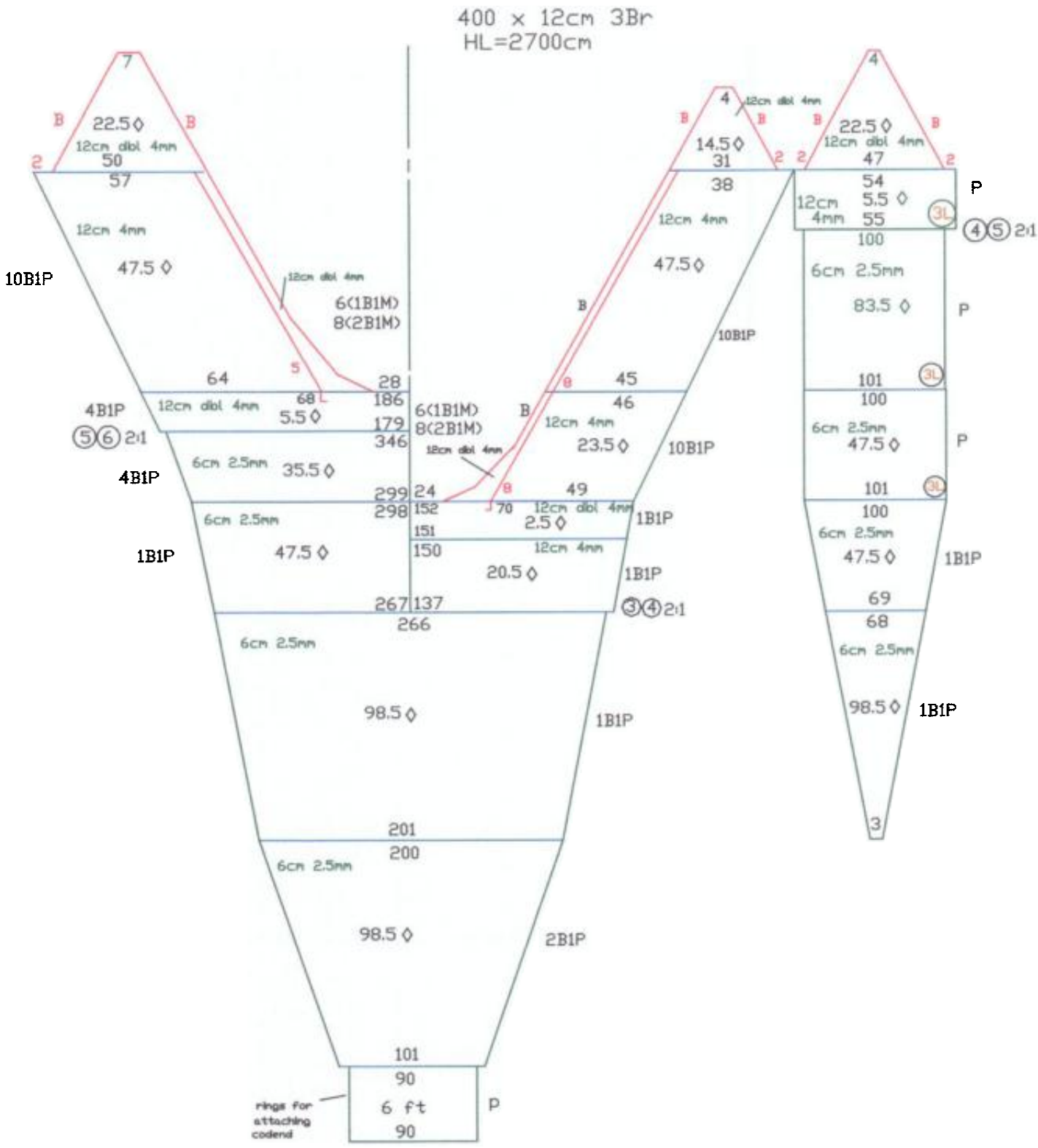
The design consists of a three bridle trawl with a fishing circle of 400 meshes of 12cm 4mm br. PE. Side panels, top square, top bellies, 2nd and 3rd bottom bellies are of 6cm 2.5mm br. PE. The codend is of approx. 12cm dbl 4mm br. PE with a 1 inch knotless liner material and is attached to the tailpiece with zipper rings to facilitate changing. The exact size of codend mesh size will correspond to the 12cm dbl 4mm material required for the cut out 12cm selvage.

The trawl is mounted on 3/4" ss IWRC combination with 5/8" ss combination "up and down" lines. Floats consist of approx. 60 8" HD center hole plastic floats.

The trawl accommodates the utilization of two sweeps. The good bottom sweep consists of 3" rubber discs with leads and the rough bottom sweep has 16 and 14 inch rock hoppers with floppies without leads. Both sweeps are on 3/4 inch ss wire. The weights of the sweeps in air/sea water are approx. 643/371lbs and 2560/448lbs respectively.

Submitted to: Northeast Fisheries Science Center, 166 Water St., Woods Hole, MA 02543 under NFFM-7220-4-14243 of May 26, 2004.

Submitted jointly by: Reidar's Manufacturing Inc., Superior Trawl and Trawlworks, Inc.


400 x 12cm 3Br
HL=2700cm
7
B
22.5◊
B
12cm dbl 4mm
2
50
57
12cm 4mm
47.5◊
10B1P
12cm dbl 4mm
6(1B1M)
8(2B1M)
5
64
28
68
186
4B1P
12cm dbl 4mm
5.5◊
179
5⑥ 2:1
346
4B1P
6cm 2.5mm
35.5◊
299
24
6cm 2.5mm
298
152
70
12cm dbl 4mm
2.5◊
1B1P
151
1B1P
47.5◊
150
12cm 4mm
20.5◊
1B1P
267
137
3④ 2:1
266
6cm 2.5mm
98.5◊
1B1P
201
200
6cm 2.5mm
98.5◊
2B1P
101
90
rings for attaching codend
6 ft
P
90
4
12cm dbl 4mm
B
14.5◊
B
B
2
2
31
38
12cm 4mm
47.5◊
10B1P
B
8
45
46
12cm 4mm
23.5◊
10B1P
8
49
12cm dbl 4mm
1B1P
12cm 4mm
1B1P
4
B
22.5◊
B
12cm dbl 4mm
2
2
47
54
P
12cm
4mm
5.5◊
55
3L
4⑤ 2:1
100
6cm 2.5mm
83.5◊
P
101
3L
100
6cm 2.5mm
47.5◊
P
101
3L
100
6cm 2.5mm
47.5◊
1B1P
69
68
6cm 2.5mm
98.5◊
1B1P
3

Trawl

- 4-seam
  3- bridle
- 400 x 12cm 4800cm or 1890inches
- Foot rope = 2700cm
- Head rope = 2336cm

Twine size and thickness

- 12cm 4mm reg. braided pe
  in top & bottom wings
  in 1st 5.5 meshes of the side panel
  in bunts
  in 1st bottom belly
- 6cm 2.5mm reg. braided pe
  from the square back
  almost the entire side panel
  from the 2nd bottom belly back

Selvedge

- selvedge will be cut out of 12.6cm (str. Mesh) dbl 4mm web
- 8 meshes deep on the bottom wing bars
- 5 meshes deep on the top wing bars
- All jibs, (top, bottom and side), are to be made from 12cm dbl 4mm web

Tailpiece

- tailpiece diameter is 180 meshes of 6cm 2.5mm
- 6 ft tailpiece with 30 large plastic rings for quick change of the codend
- The rings should be sewn up on the tailpiece to create a skirt that will enter the top of the codend.

Codend

- The codend is to be made from the same material as the selvedge, 12cm dbl 4mm
- The codend is 75meshes in diameter and 75meshes deep
- It is to have 30 large plastic rings on the trawl end
- It is to have 30 ¼" x 2 SS rings at the terminus

Liner

- size of the liner? (the allowable mesh size is something that is being debated at the Science Center)

Gore ropes

It was felt that at least for this 1st prototype gore ropes would not be necessary.

Hanging lines

Headrope

- ¾" stainless steel combination
- ¾" SS HWR thimbles
- The headrope is 2070cm eye to eye (see hanging information)
- The headrope eye, the top jib end meshes and the upper wing end eye are all put in a ¾" Blue Line bow shackle with the headrope extension chain of 11mm long link coming from it
- The extension chain of 3/8 Trawlex is 133cm – 9cm(3/4" bow shackle) = 124cm to even. An additional 50cm of is to be added to facilitate the slacking out of the headrope during the initial towing trials. This yields a total chain length of 174cm.

Wing End

- 5/8" stainless steel combination
- 5/8" SS HWR thimbles
- The upper wing end is 552cm eye to eye
- The lower wing end is 459cm eye to eye (see hanging information)
- The top jib eye goes into the ¾ " shackle on the top (see above)
- The two side panel eyes and the middle jib end meshes are put into a 3/4 bow shackle with middle extension coming from it.
- The middle extension is made of 5/8 SS wire with 5/8 HWR thimbles. It is 133cm – 9cm(3/4 bow shackle) = 124cm eye to eye

Footrope

- rubber covered wire
  - 2433 – [2 * 10(5/8 hammerlock)] = 2413 eye to eye
  - 5/8 stainless wire
  - 2 3/8 spacer cookies
  - use of a 2-hole hanger
  - 1 link to pass traveler through
  - Selvedge will be sewn to the 2-hole hangers with single 5mm pe.

Floats

- 60 – 8" center hole floats
- The floats are mounted vertically in two 30 – float strings with the first float of each string starting 50cm from the center of the headrope.
- The first 24 floats are mounted at 25cm on center and the remaining 6 floats are mounted at 50cm on center

Sweep to Footrope Attachment

- zipper traveler
- 9/16 galv. Wire 2700cm eye to eye

Sweep

flat sweep 3-piece

-center

- 890cm eye to eye
- ¾ Stainless wire
- 3" cookies
- 8 - 1.33lb leads per section for a total of 112 leads
- 1st and last drop chains at 25cm
- 60cm drop chain spacing
- 15 drop chains
- 3-link ½ trlx chains
- clamp in every 3rd section 4 clamps total

-wing sections

-820cm eye to eye (75cm adjusting chain)
- 3" cookies
- 2 leads per section 22 leads total per wing section
- no lead in 1st and last sections
- 3-link ½ trlx drop chains
- 1st drop chain at 25cm (center end)
- last drop chain at 135 (wing end)
- 60cm spacing
- 12 drop chains
- clamp in every 3rd section 4 clamps total

-rock hopper sweep

center

-890cm ETE
-disc size
- 2 - 16" rock hoppers per section with 1 in the end sections
- 30 - 16" rock hoppers total
- 8 - 16" floppies per section with 2 in the end sections
- 116 – 16" floppies total
- 5" spacer discs

no lead
- 3-link ½ " long link trawlex drop chains
- 1st and last drop chains at 25cm
- 60cm drop chain spacing
- 15 drop chains
- clamp in every 3rd section 4 clamps total

wings

- 820 ETE
- disc size
  - 2 - 14" rock hoppers per section with 1 in the 1st section
  - 23 – 14" rock hoppers total in each wing
  - 8 14" floppies per section with 2 in the 1st section
  - 90 – 14" floppies in each wing
  - 1 – 12" bunt bobbin in the last section
  - 5" spacer discs

no lead

- 3-link ½" long link trlx drop chains
- 1st drop chain at 25cm (center end)
- last drop chain at 135 (wing end)
- 60cm spacing
- 12 drop chains
- clamp in every 3rd section 4 clamps total

HANGING INFORMATION

NEFSC SURVEY TRAWL
400 x 12cm - 3-bridal
HL = 2700cm

TWINE SIZE = 12.00cm Bars hung at 105% FOOTROPE EXT = 97.cm

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BOTTOM
24. MESHES @ 6. = 138.0
6. 1B1M @ 10. = 60.0
9. 2B1M @ 16. = 144.0
BUNT BARS = 151.
WING + 1/2 = 605.
JIB + 1/2 = 188.
TOTAL WEBBING = 2433. - (2 * 10 (5/8 Hammer lock)) = 2413 ETE
EXT = 133. - 9(3/4 bow shac.) =. 124 ETE (5/8 SS wire)
TOTAL FOOTROPE = 2700

TOP
30. MESHES @ 6. = 174.0
6. 1B1M @ 10. = 60.0
9. 2B1M @ 16. = 144.0
WING BARS = 454.
JIB + 1/2 = 290.
TOTAL WEBBING = 2070.
EXT = 133. - 9 =124 to even + 50 for slacking = 174 ETE (3/8 trawlex chain)
TOTAL HEADROPE = 2336.

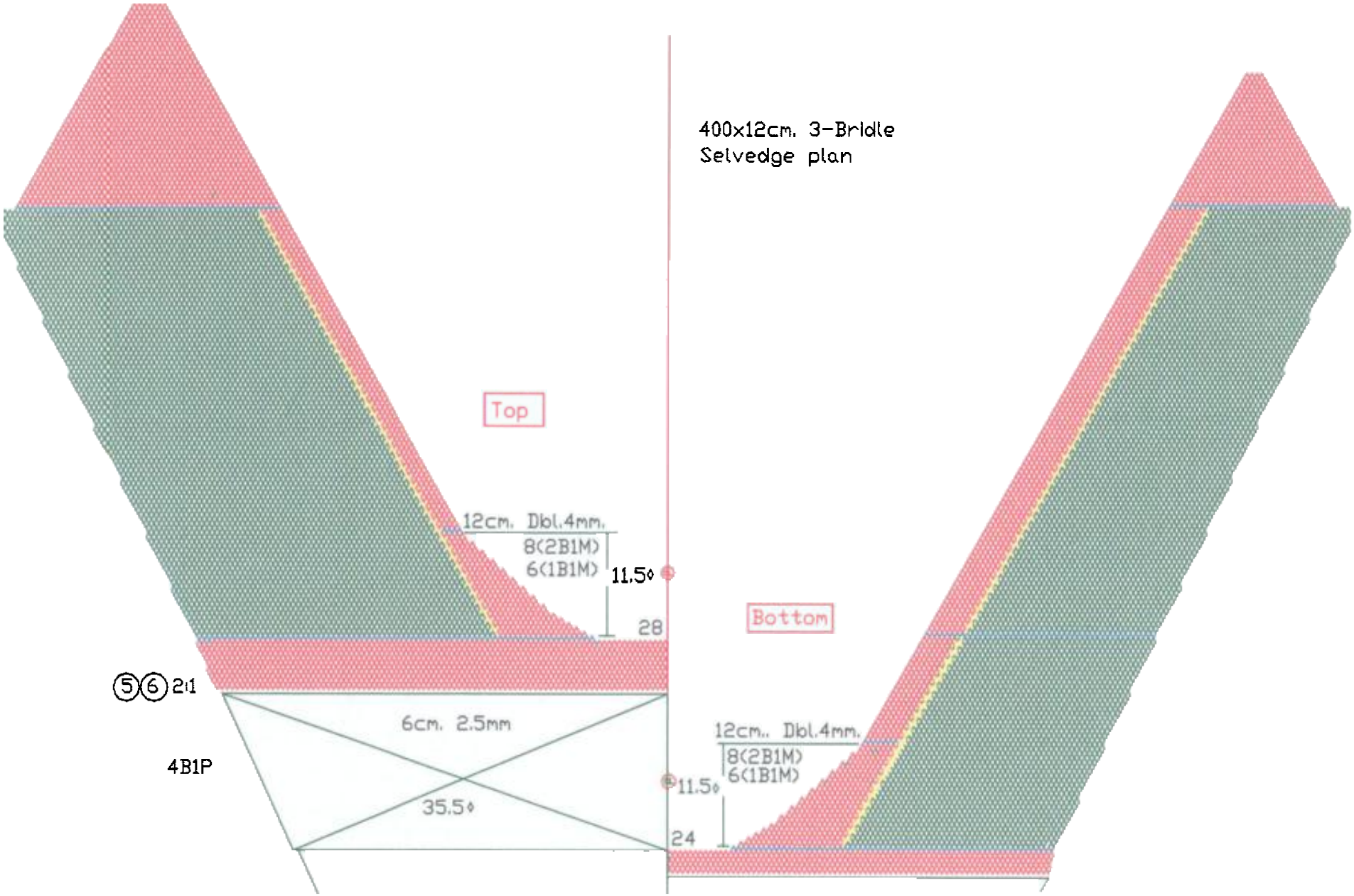
WING END
LOWER
BOT 15. Bars @ 1.025 = 183.
SIDE 23. Bars @ 1.0 = 276.
TOTAL WEBBING = 459.
EXT = 133. - 9 = 124 ETE (5/8 SS wire)
TOTAL WING END = 726.
UPPER
TOP 23. Bars @ 1.0 = 276..
SIDE 23. Bars @ 1.0 = 276.
TOTAL WEBBING = 552.
EXT = 133. - 9 = 124 ETE (5/8 SS wire)
TOTAL WING END = 818

TRAVELER
ZIPPER TRAVELER 9/16 Galv
EYE TO CENTER = 1350
ADD 50cm FOR OTHER EYE

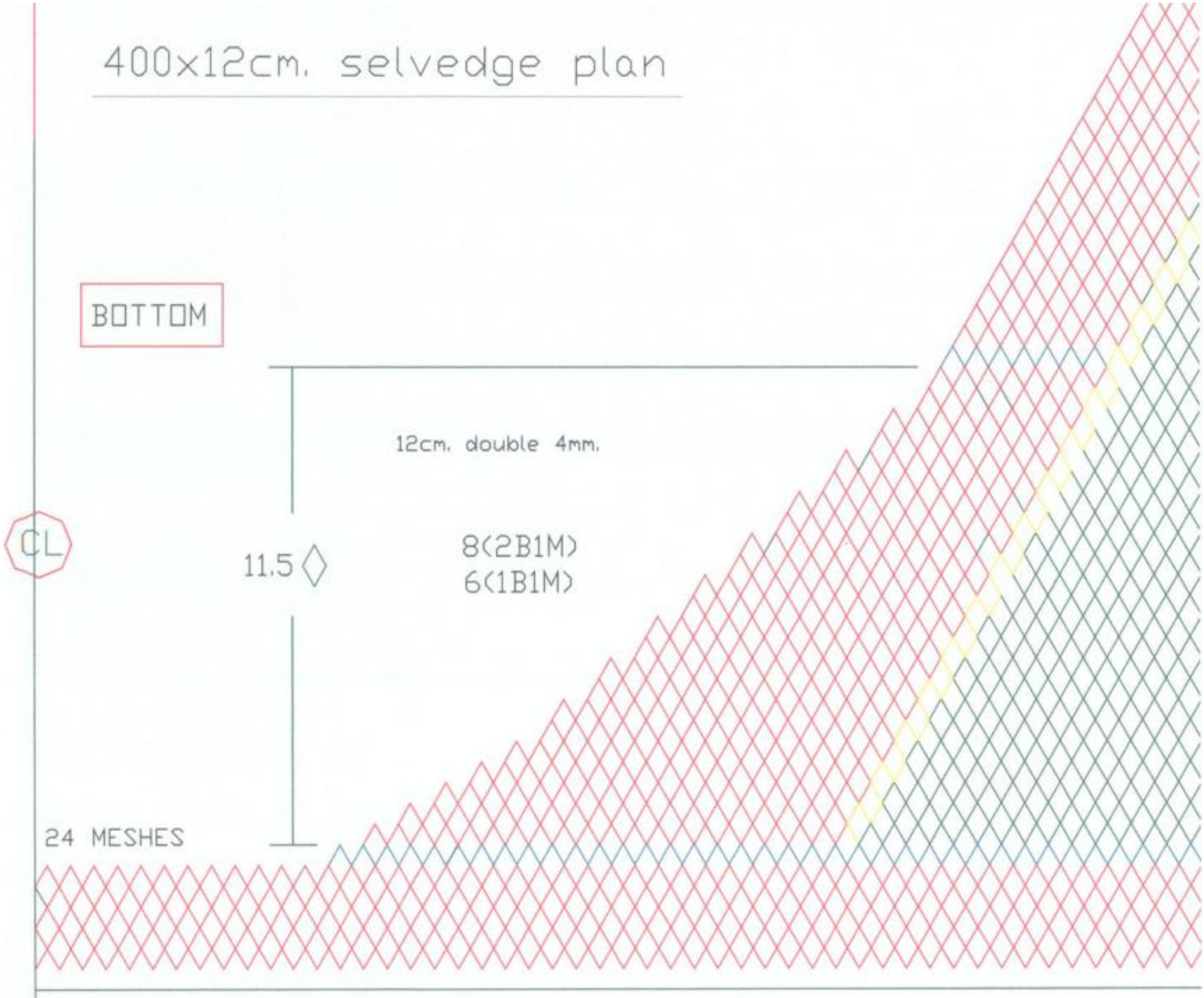
FLOATS 60 8" center hole

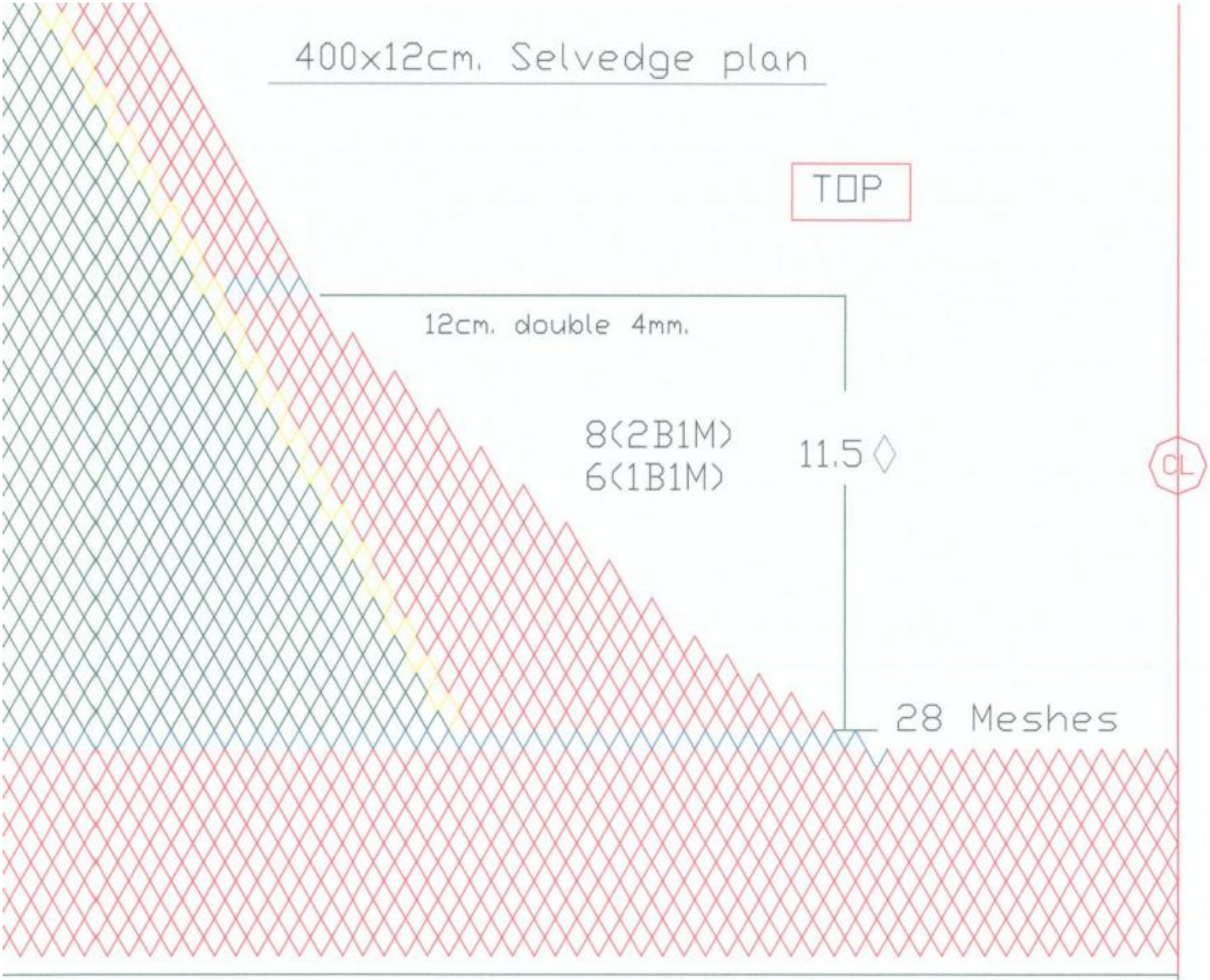
SWEEP 75cm ADJUSTING CHAIN

CENTER 890cm	WINGS 820cm
1st & last = 25	1st = 25
others = 60	last = 135
15 Chains	others = 60
	12 chains

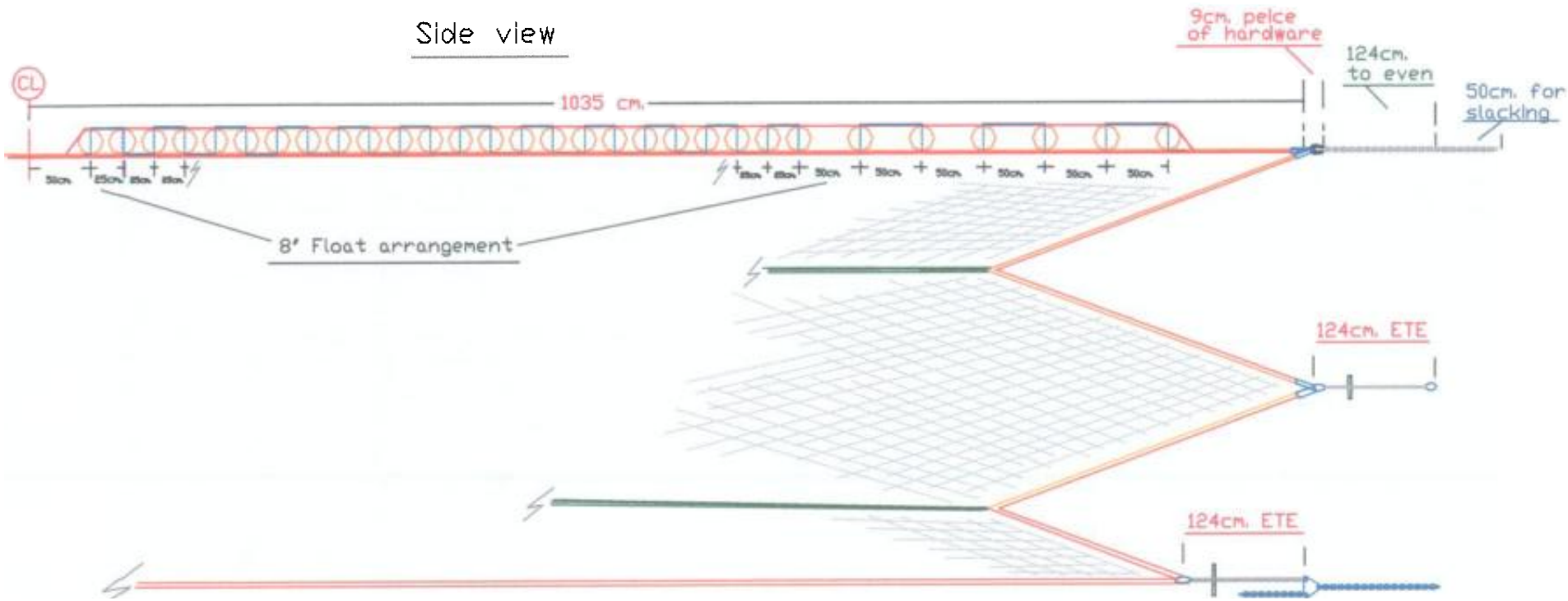

400x12cm. 3-Bridle
Selvedge plan
Top
12cm. Dbl.4mm.
8(2B1M)
6(1B1M)
11.5ø
28
Bottom
⑤⑥ 2:1
6cm. 2.5mm
4B1P
35.5ø
12cm.. Dbl.4mm.
8(2B1M)
6(1B1M)
11.5ø
24

400x12cm. selvedge plan

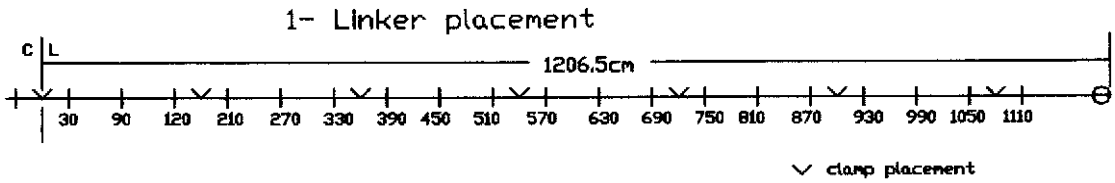



400x12cm. Selvedge plan
TOP
12cm. double 4mm.
8(2B1M)
6(1B1M)
11.5 ◊
CL
28 Meshes

400 x 12cm 3-Br HL = 2700cm

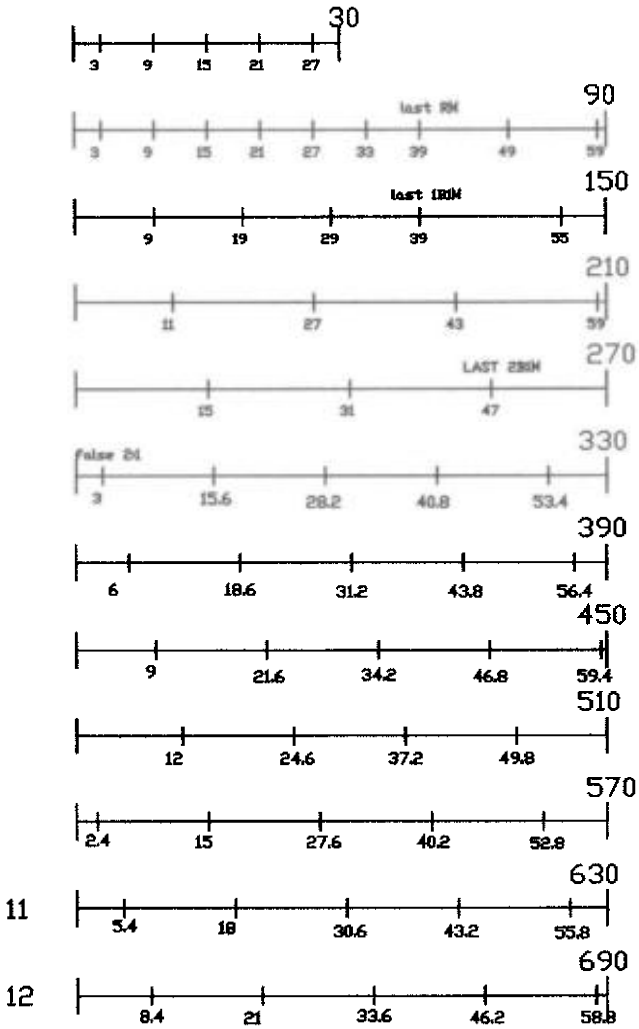


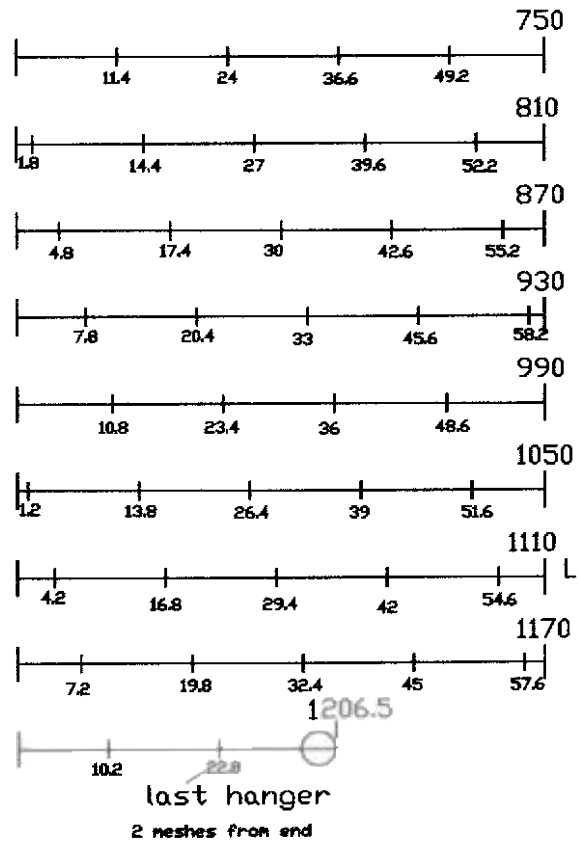
400 x 12cm 3- bridle FR = 2700cm Rubberline = 2413



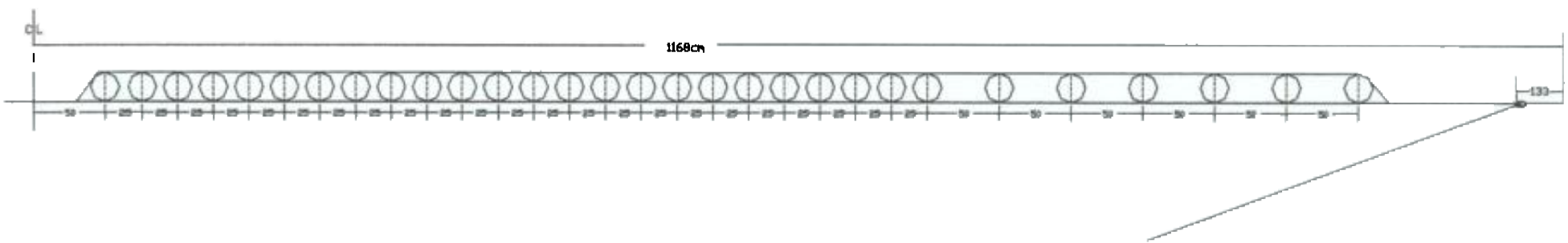
38 1 - Linkers Total

200 2 - Hole Hangers Total

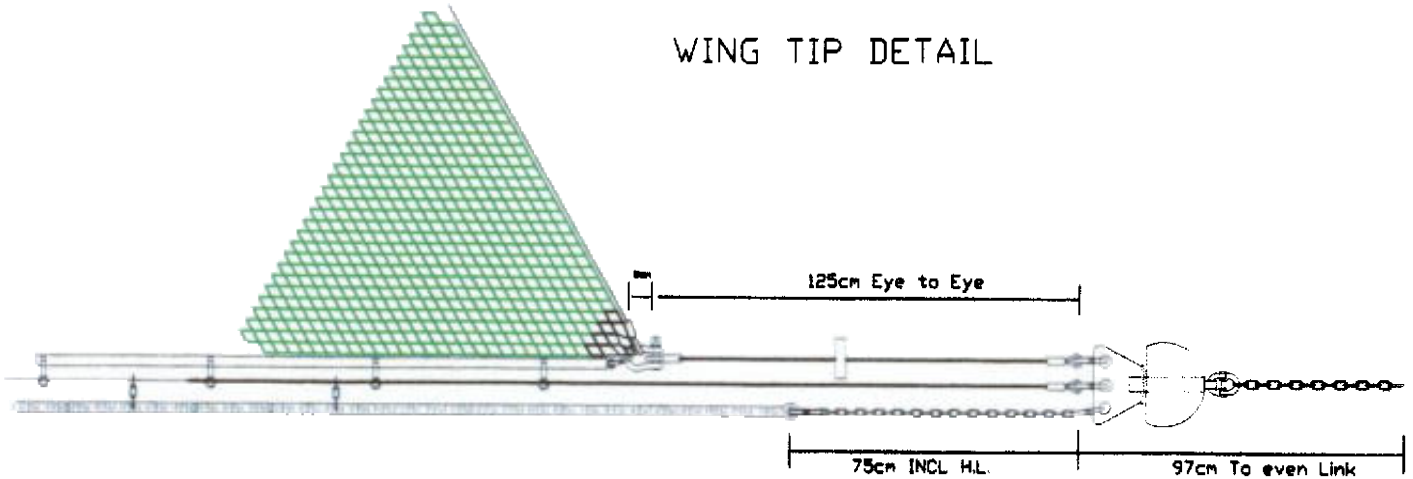


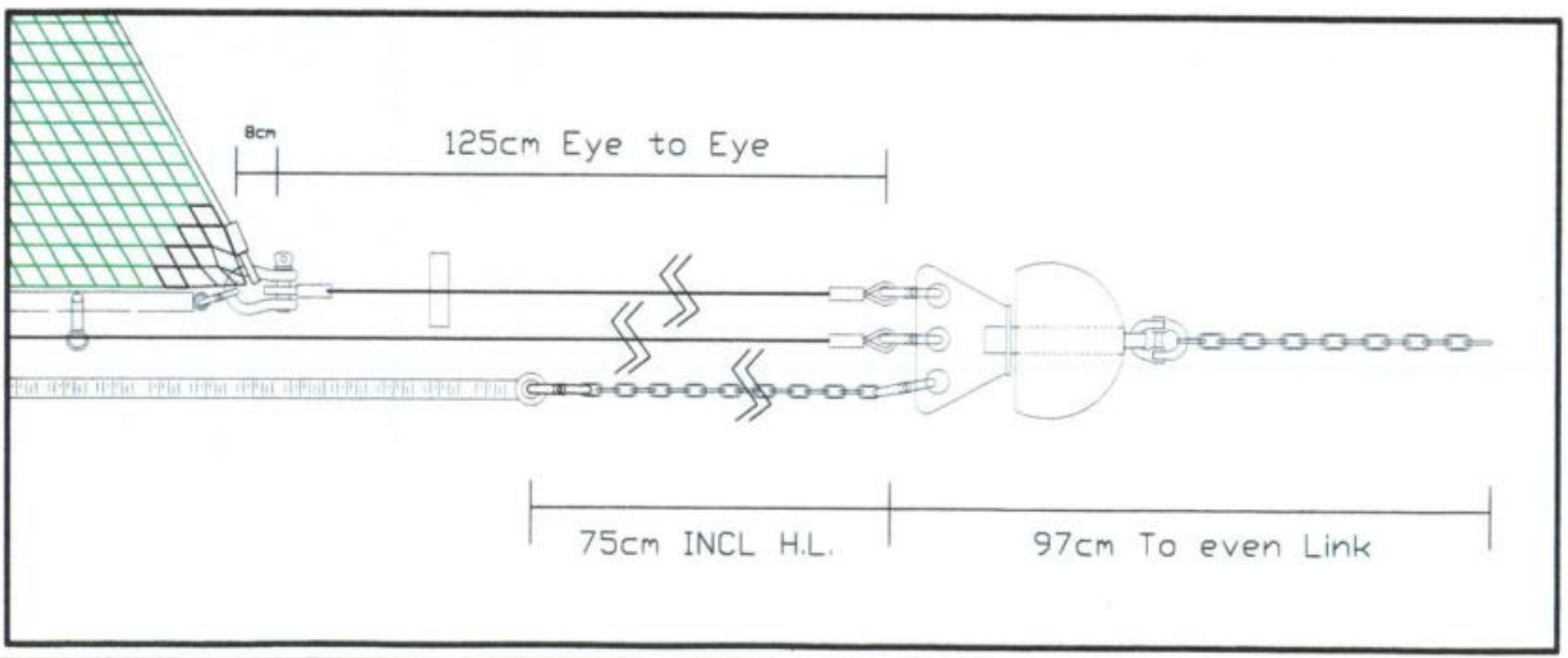


400 x 12cm 3-br Float Arrangement

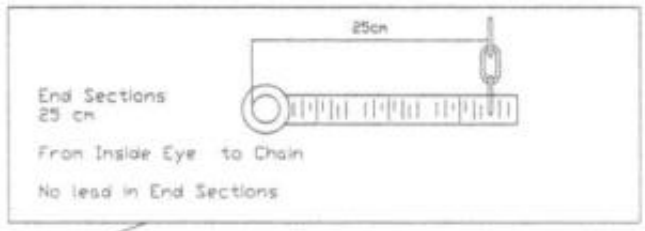


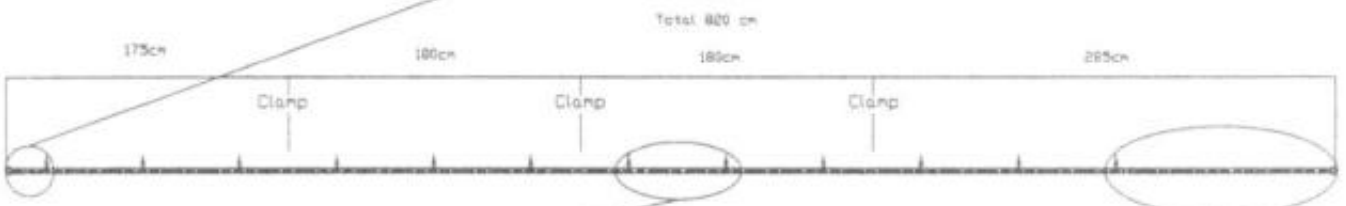
WING TIP DETAIL

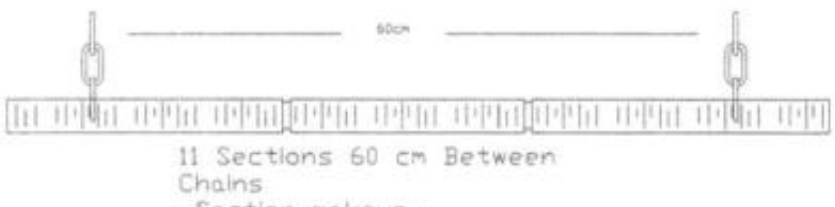




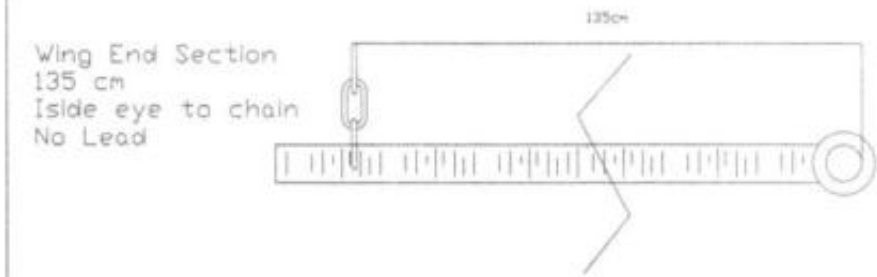
FLAT SWEEP WING SECTION







11 Sections 60 cm Between Chains
-Section makeup-
2 - Lrg. Leads
(22 Total in Wings)



Ends ¾ Esco Stainless Steel Sockets

12 Hanging Chains in Canter 3 links of ½ Trawlex

22 Large Leads (27.5 Lbs.)

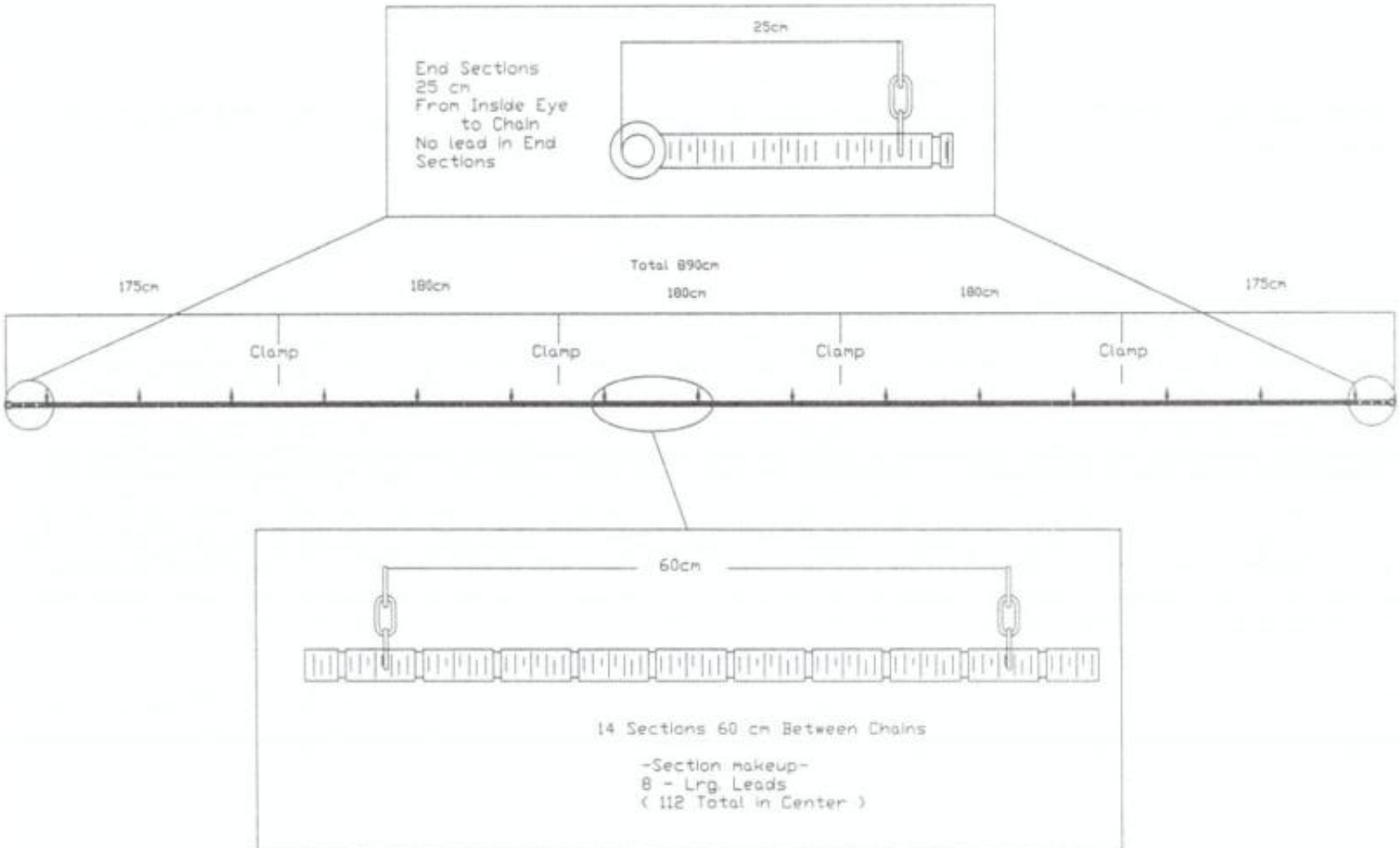
3 - ¾ Wire Clamps

Stainless Steel Wire ¾ 6X25 IWRC

Total Center Section Length EyeTo Eye
890 cm

All 3" X 1" Filler Rubber

FLAT SWEEP CENTER SECTION



15 Hanging Chains in Canter3 links of ½ Trawlex
112 Lrg. leads 140 Lbs.
Stainless Steel Wire ¾ 6X25 IWRC

4 - ¾ Wire Clamps

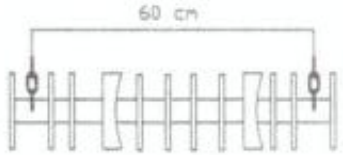
Total Center Section Length Eye To Eye 890 cm
Ends ¾ Esco Stainless Steel Sockets
All 3" X 1" Filler Rubber

ROCKHOPPER CENTERSECTION

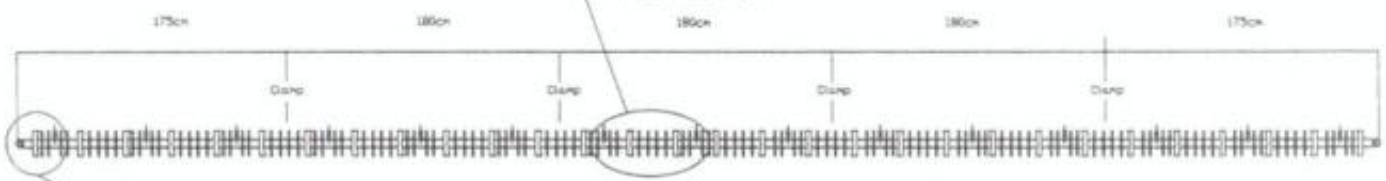
SECTION- 890cm

14 Sections
60 cm Spacing Between chains

- Section Makeup-
2 - 16" X 1" Rockhopper Disc
8 - 16" X 1" Floppy Disc



Total 890 cm

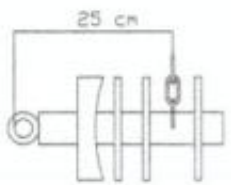


Begining And End Sections
25 cm
Inside the Eye to Chain

-Section Makeup-

1 - 16" X 1" Rockhopper Disc

2 - 16" X 1" Floppy Disc



$\frac{7}{16}$ 6X25 IWRC STAINLESS STEEL WIRE

$\frac{3}{4}$ ESCO STAINLESS STEEL SOCKETS

4 - $\frac{3}{4}$ Wire Clamps

5" X 1" FILLER RUBBER

15 HANGING CHAINS EACH 3 LINKS OF $\frac{1}{2}$ LONG LINK TRAWLEX

ROCKHOPPER WING SECTIONS

Section - 820 cm

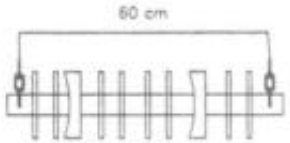
Rest of Sections
–Containing Floppies–

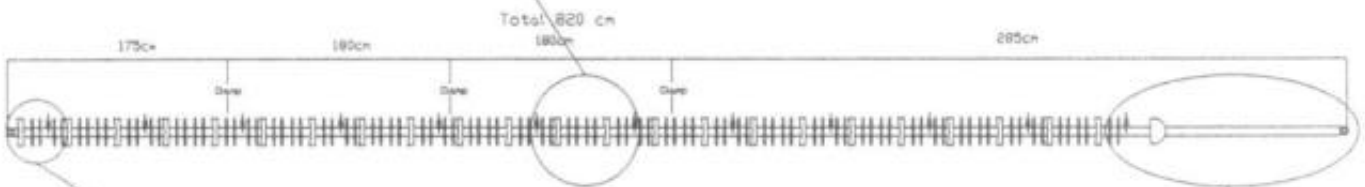
60 cm Spacing Between Chains

–Section Makeup–

2 – 14" X 1" RH Disc

8 – 14" X 1" Floppy Disc



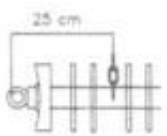


First Section 25cm
Inside Eye To Chain

–Section Makeup–
1 – 14" X 1" RH Disc

2 – 14" X 1" Floopy Disc

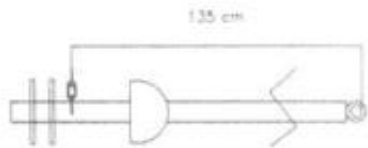
1 – 5 X 2½ X X ½ Steel Washer



Wing End Section
135 cm Inside Eye To Chain

1 – 12" Bunt Roller

Note: Bunt Roller placed in the last section



STAINLESS STEEL WIRE ¾ 6X25 IWRC

ENDS ESCO STAINLESS STEEL SOCKETS

3 – ¾ Wire Clamps

TOTAL WING SECTION LENGTH EYE TO EYE 820 cm

5" X 1" FILLER RUBBER

12– HANGING CHAINS 3 LINKS ½ TRAWLEX LONG LINK

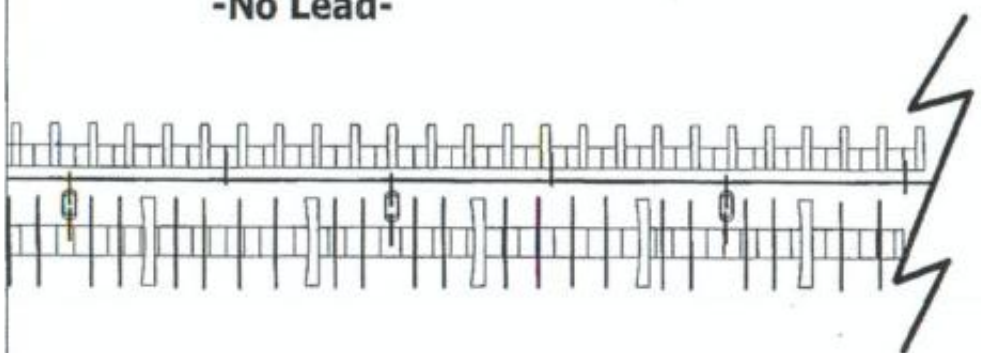
2433 cm Balsmine

2 3/8 x 5/8 cockles
20 ½ Wire Clamps
79" 5/8 SS Wire
2-5/8 Esco Eye Sockets
202 - Plastic Sp

Section of sweep with Bolshline

Approximate +/- 5%

Weight Of Sweeps:	Weight in Air	Weight in water
3"Cookie Sweep w/160large leads @ 1.4lbs.	597 Lbs.	332 Lbs.
16"/14" Rockhopper Sweep -No Lead-	2240 Lbs.	360 Lbs.



Notes: Both sweeps on 3/4 6x25 Iwrc s/s wire

16"x1" Rockhopper discs 2.5" Thick +/- .5"
14"x1" Rockhopper discs 2.0" Thick +/- .5"