

Offshore riser installation methods and procedures.



KVA...NER F J BROWN
...ing a better way
through innovati... engineering

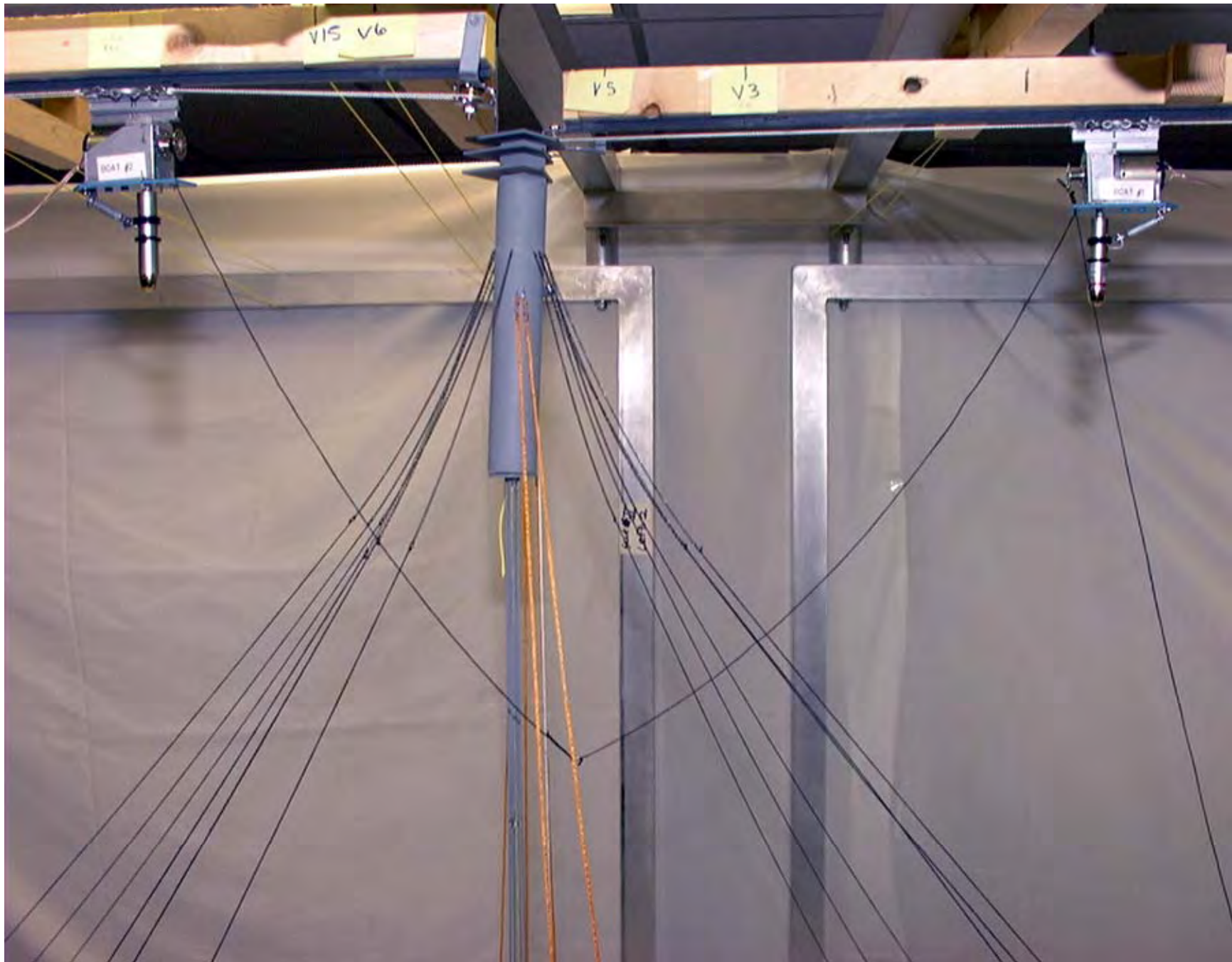




Figure 15

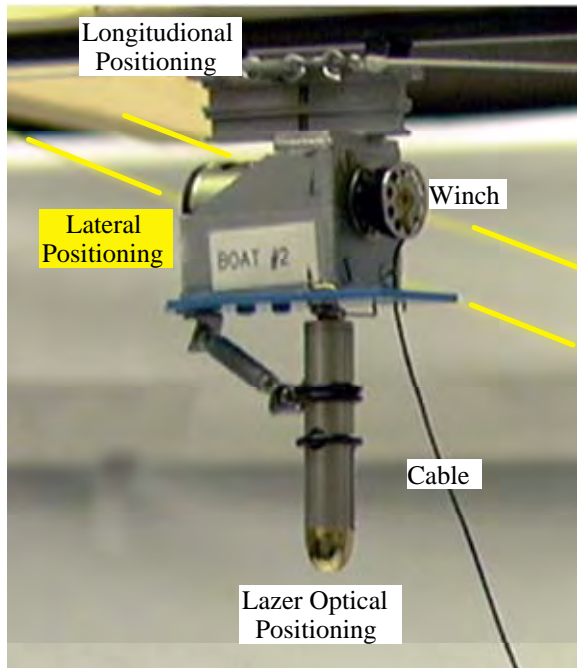


Figure 19

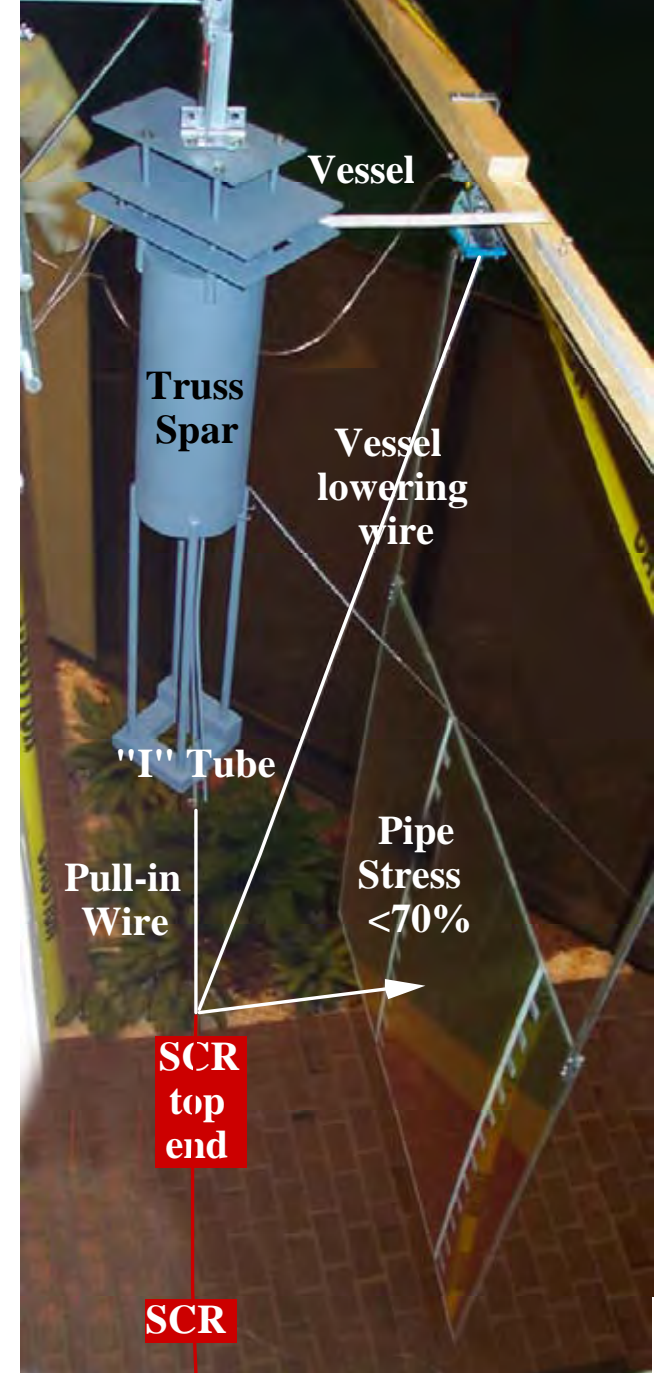


Figure 17

$H_f=40k$, $T=237k$

V10

Cable out= 562'

Pipe off bottom= 3690'

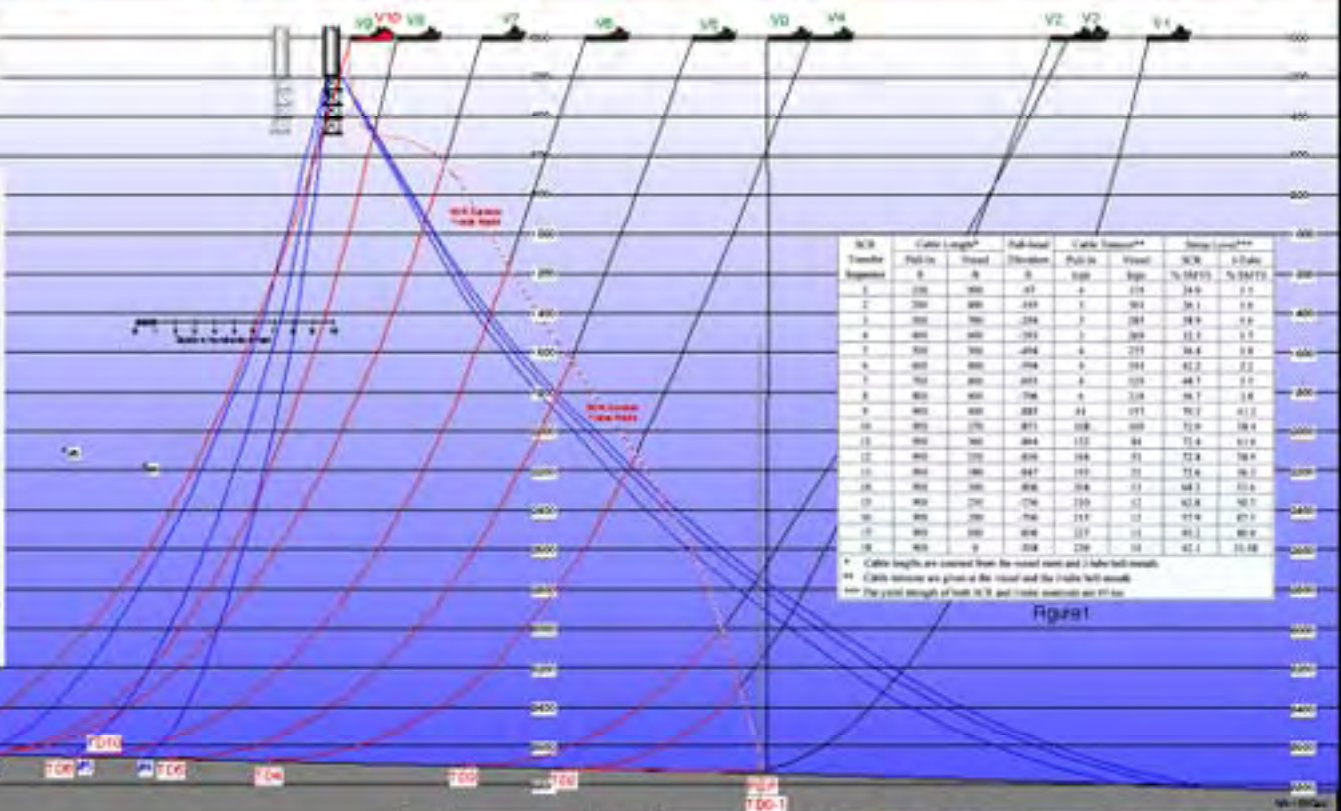
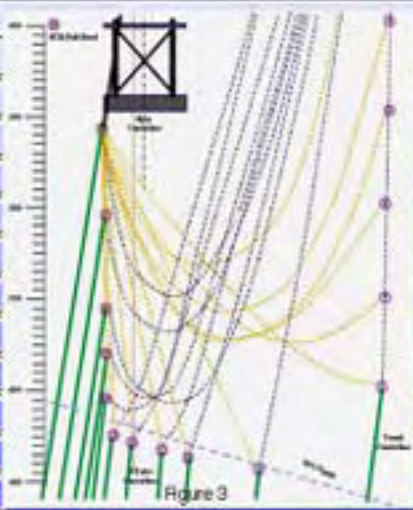
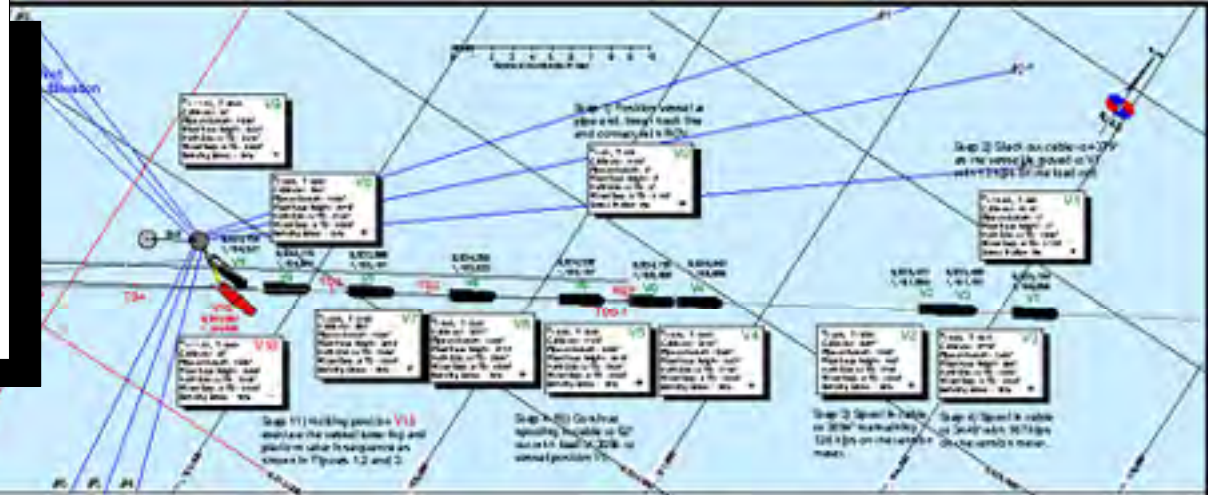
Riser head height= 3055'

Horiz. Dist. to TD= 1658'

Water Dep. at TD= 3650'

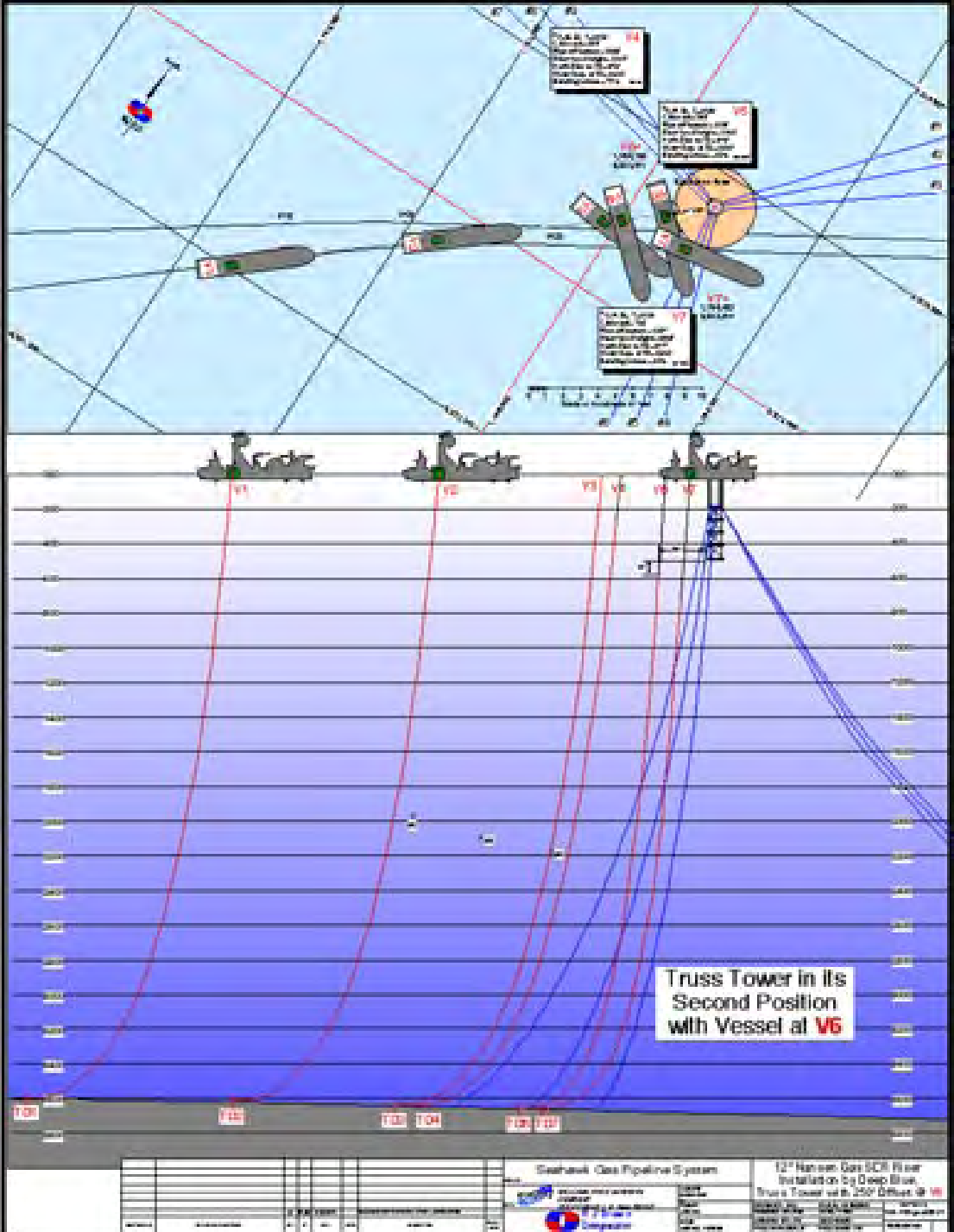
Bending Stress = 37%

10



Riser	Cable Length*		Full-load	Cable Tension**		Stress Level***	
	Full in	Steel		Full in	Steel	% NPS	% SMYS
1	200	300	37	4	114	34.9	1.1
2	200	300	37	4	104	36.1	1.0
3	200	300	34	3	104	38.9	1.0
4	200	300	33	3	109	33.7	1.1
5	200	300	29	4	111	36.4	1.0
6	200	300	29	4	114	31.2	1.2
7	200	300	29	4	108	48.7	1.1
8	200	300	28	4	108	36.7	1.0
9	200	300	28	4	111	31.7	1.1
10	200	300	27	4	108	31.9	1.0
11	200	300	26	4	111	34.7	1.0
12	200	300	26	4	111	31.9	1.0
13	200	300	26	4	111	31.9	1.0
14	200	300	26	4	111	31.9	1.0
15	200	300	26	4	111	31.9	1.0
16	200	300	26	4	111	31.9	1.0
17	200	300	26	4	111	31.9	1.0
18	200	300	26	4	111	31.9	1.0

* Cable lengths are measured from the riser head and 1 meter below riser head.
 ** Cable tension was given at the riser head and the riser head riser head.
 *** The yield strength of steel is 35 and tensile strength is 51 ksi.



Item No.	Description	Quantity	Unit
1	Truss Tower	1	Unit
2	Gas Pipeline	1	Unit
3	Support Structure	1	Unit
4	Vessel V6	1	Unit

Sabahak Gas Pipeline System

12" Gas SCR Pipe Truss Tower installed on Deep Blue Truss Tower at 250' Offset @ V6

Item No.	Description	Quantity	Unit
1	12" Gas SCR Pipe	1	Unit
2	Truss Tower	1	Unit
3	Support Structure	1	Unit
4	Vessel V6	1	Unit



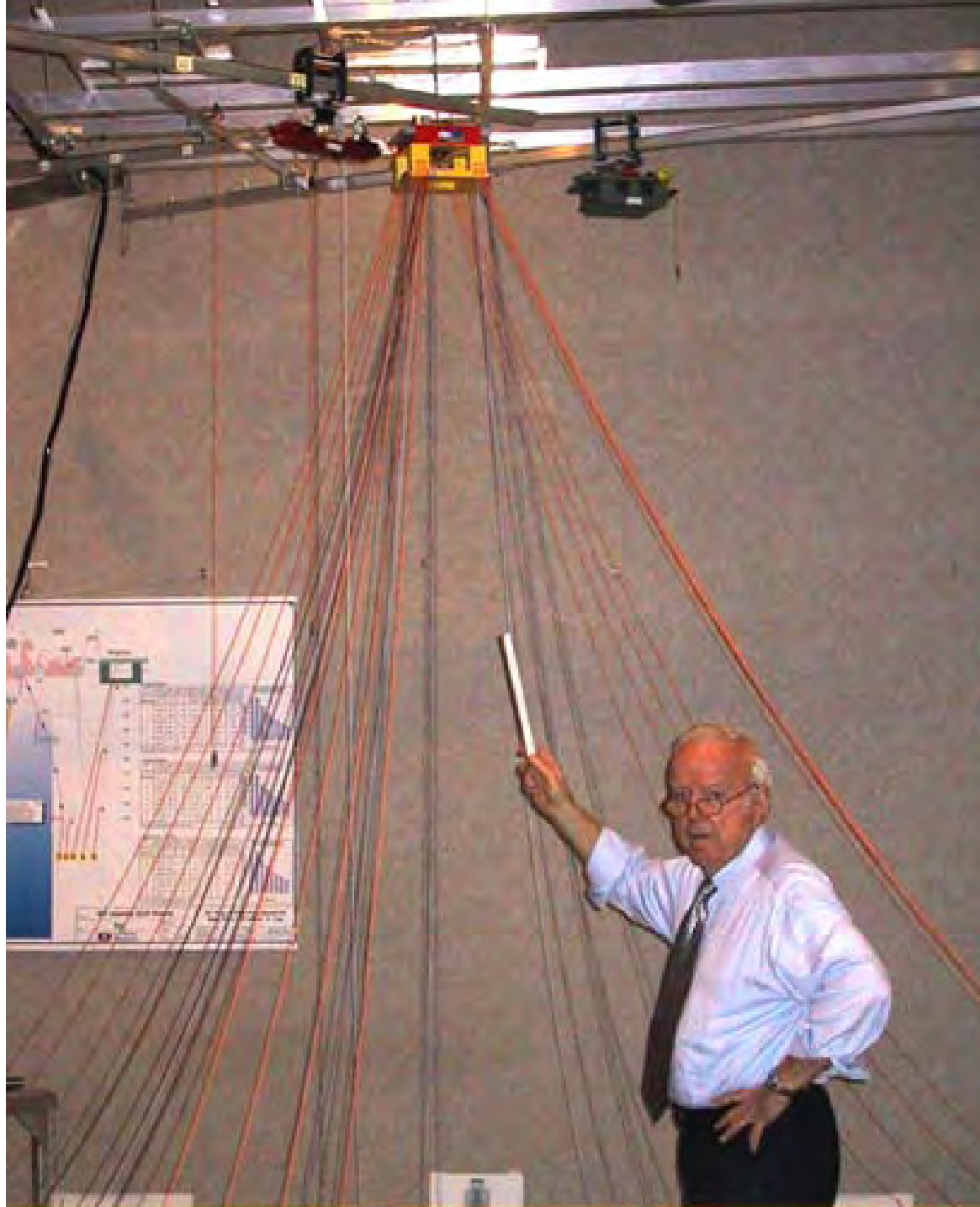





Thunder Horse Installation Model

SCALE: 1" = 800'

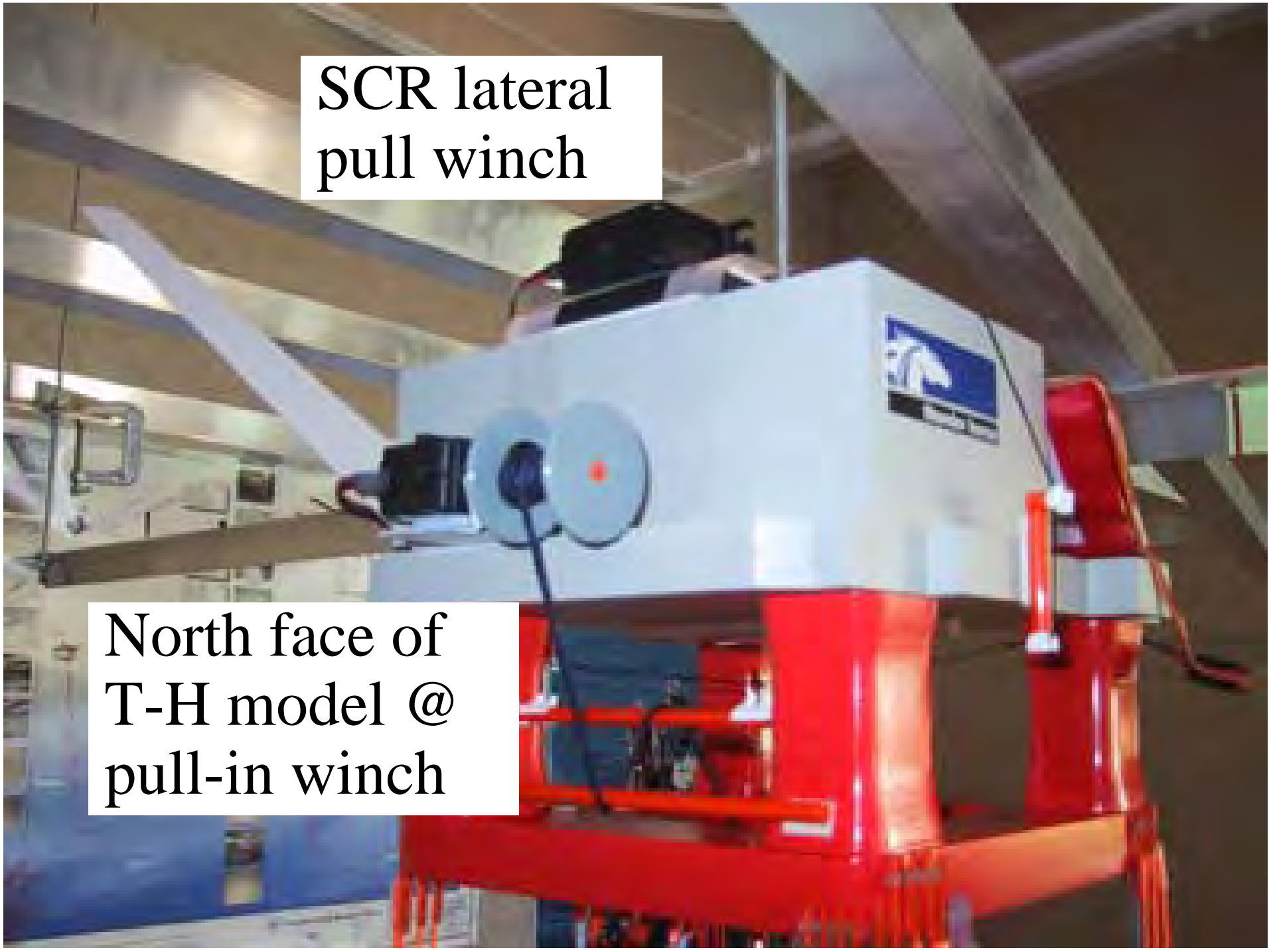






SCR lateral
pull winch

North face of
T-H model @
pull-in winch



SCR PDQ
chain lifting
winch





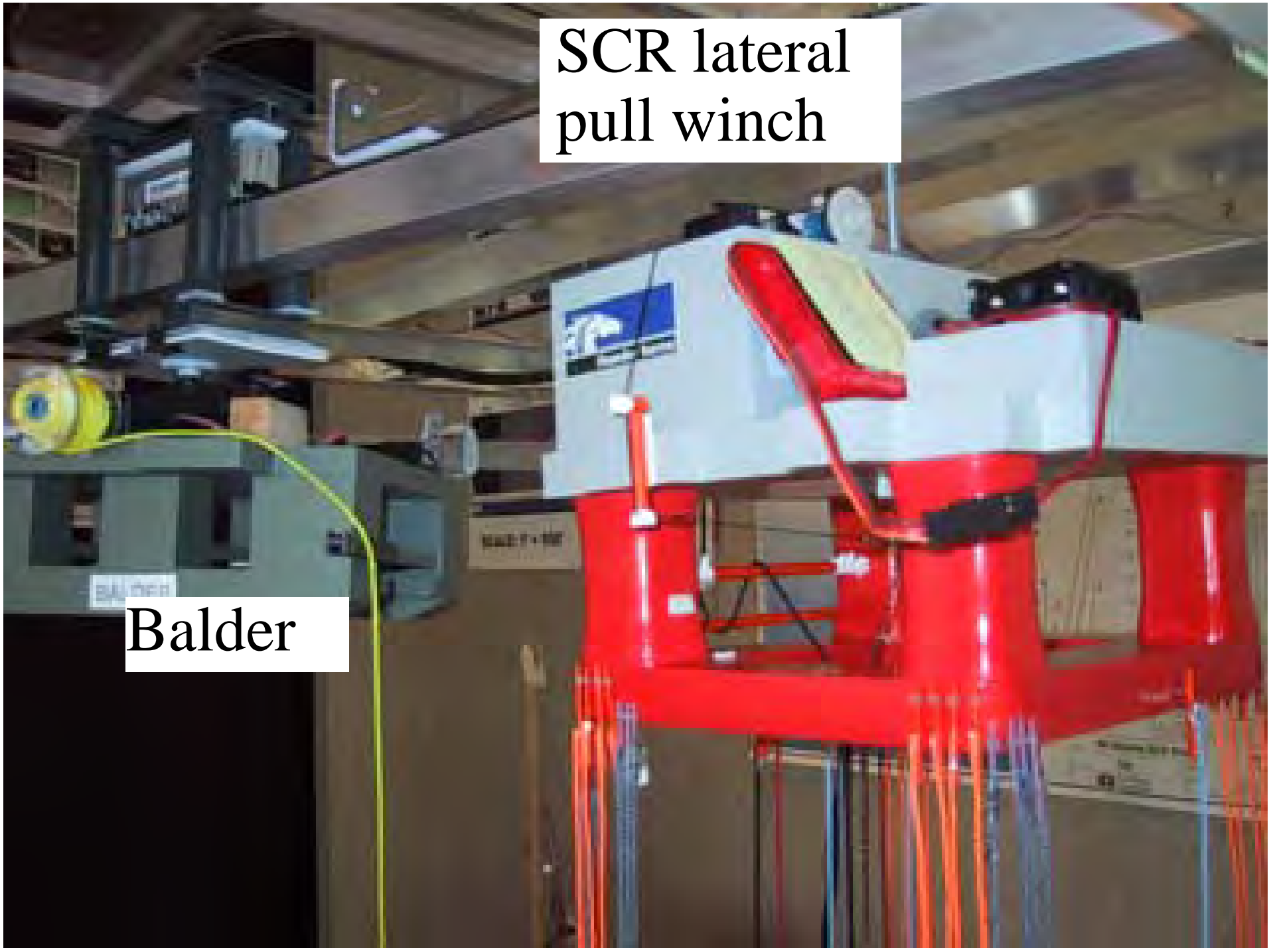
PDQ model camera



Monitor of PDQ
moon pool

SCR lateral
pull winch

Balder









Typical pre installations
of strakes on pipelines
and risers.











Texas

Mississippi

Mobile

New Orleans

Houston

Port
Lavaca

North

Gulf of Mexico

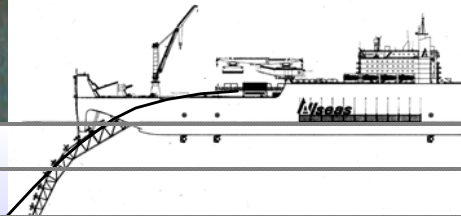
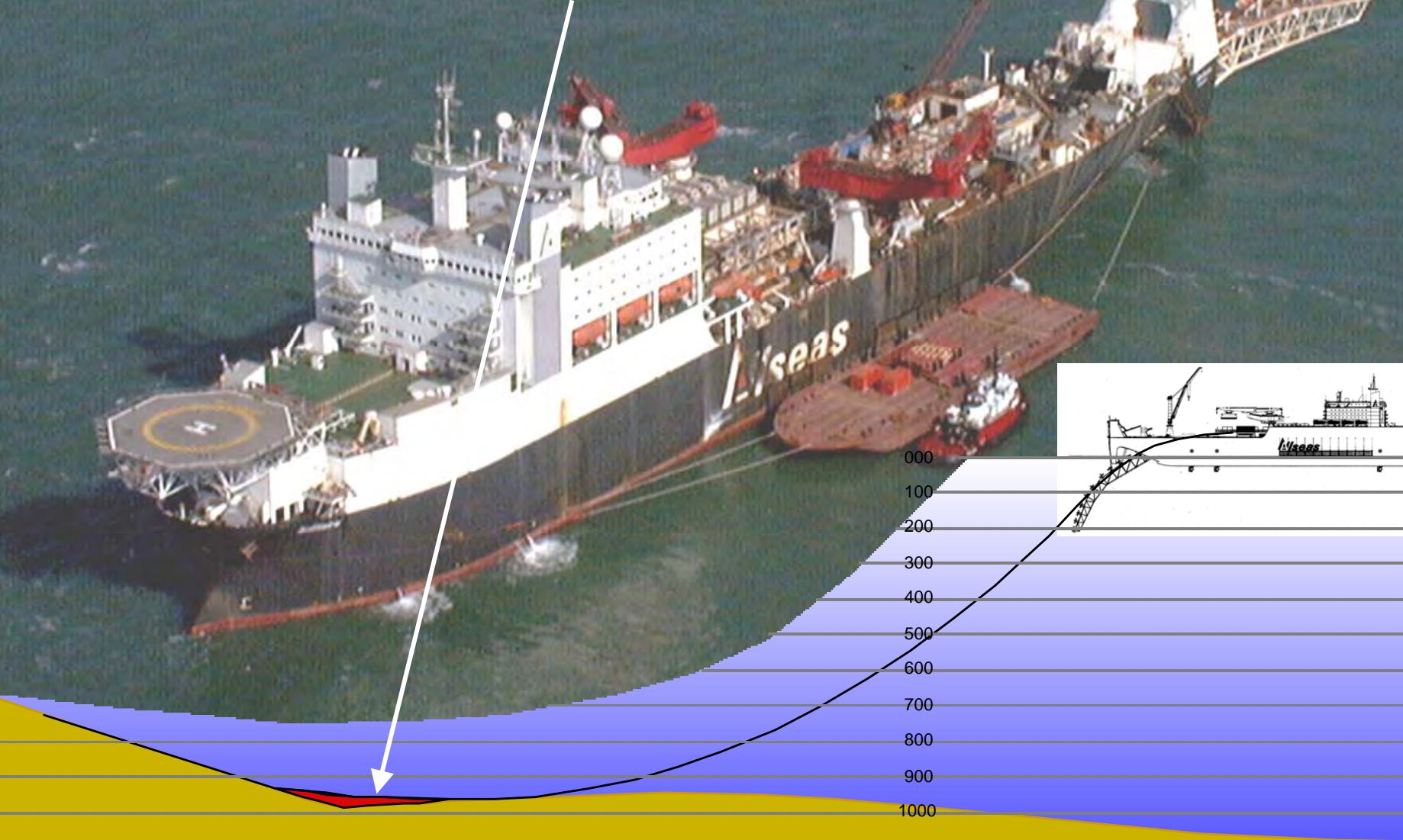
Typical post installation of
strakes on pipeline spans in the
VIV range



Houston ●

New Orleans ●

GULF OF MEXICO



000
100
200
300
400
500
600
700
800
900
1000

Texas

Beaumont

Houston

Louisiana

Mississippi

Mobile

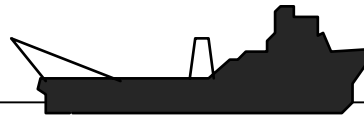
New Orleans

Port
Lavaca



North

Gulf of Mexico



Strake Installation Equipment



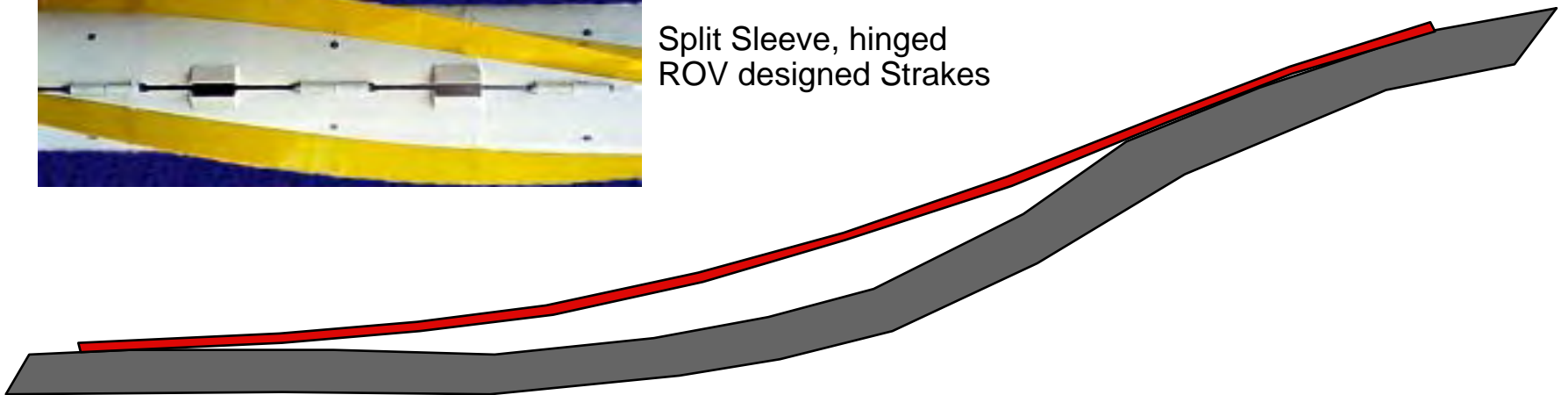
Vessel with GPS, DP and ROV support equipment

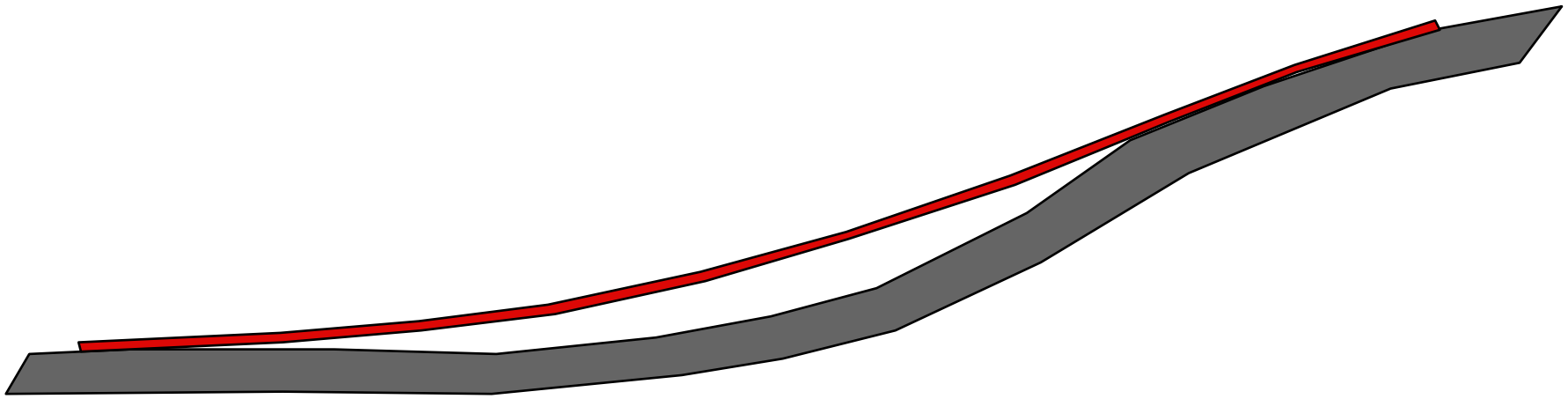
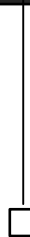


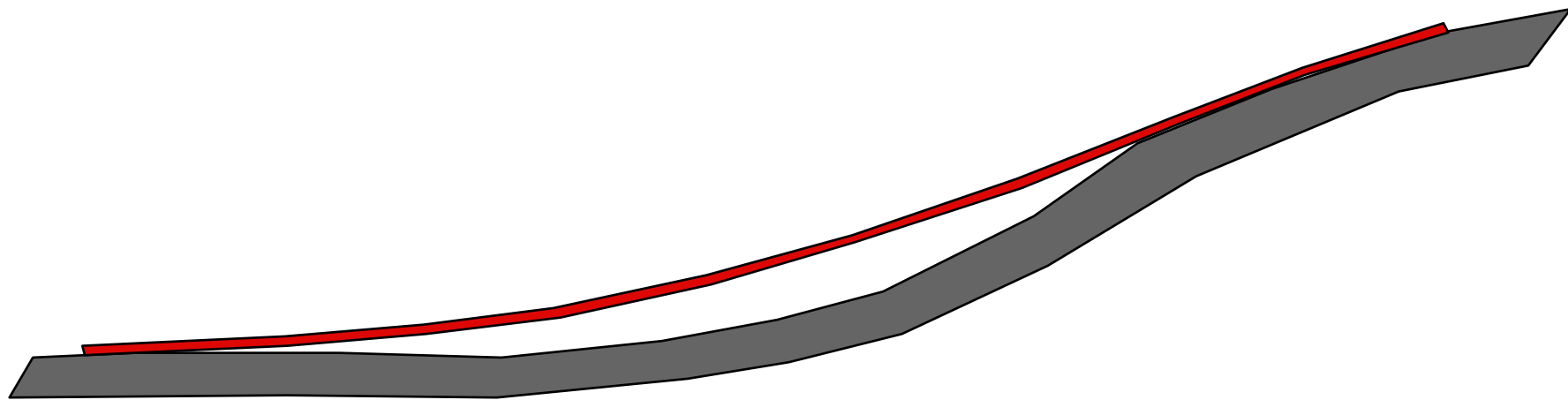
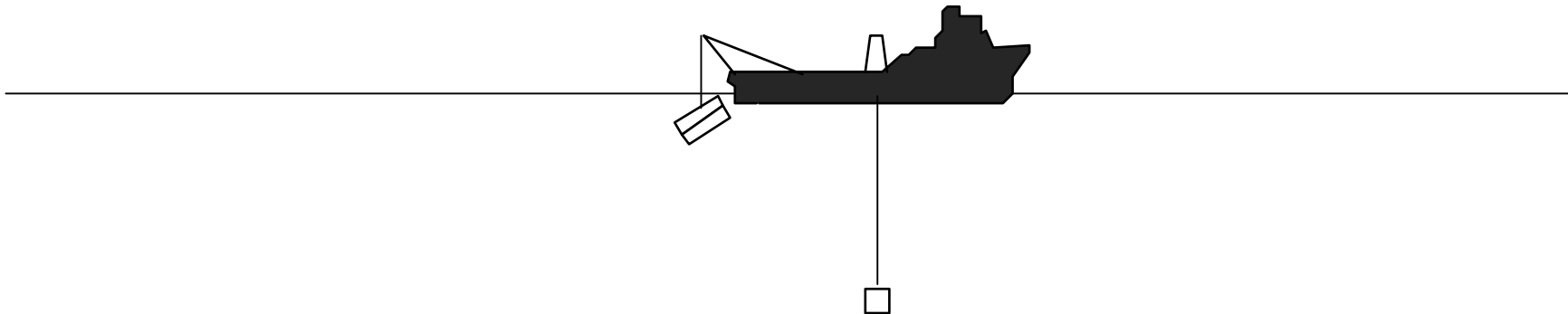
Remote Operated Vehical (ROV) with cage

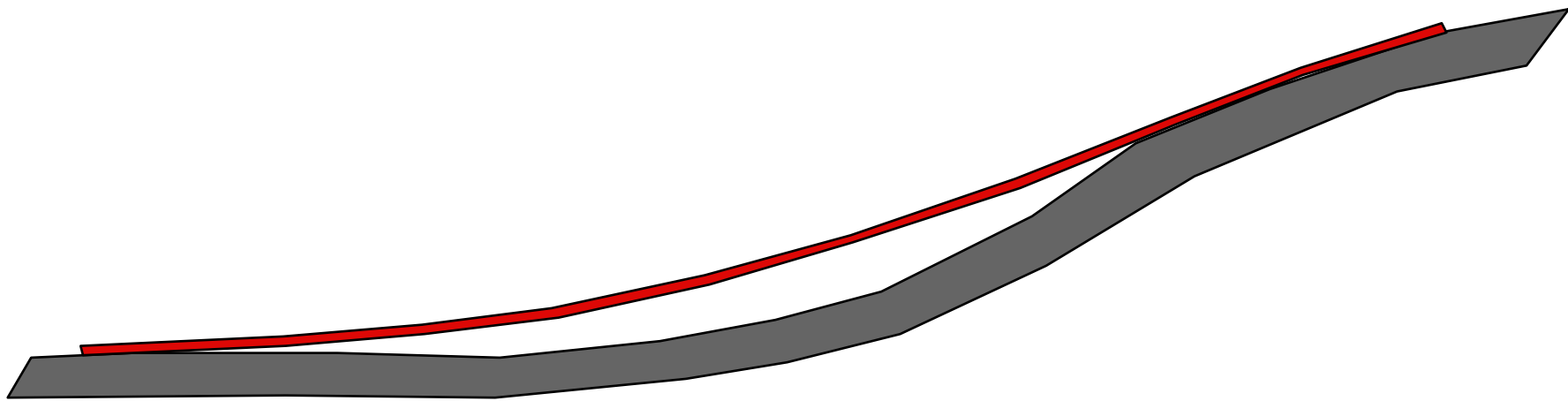
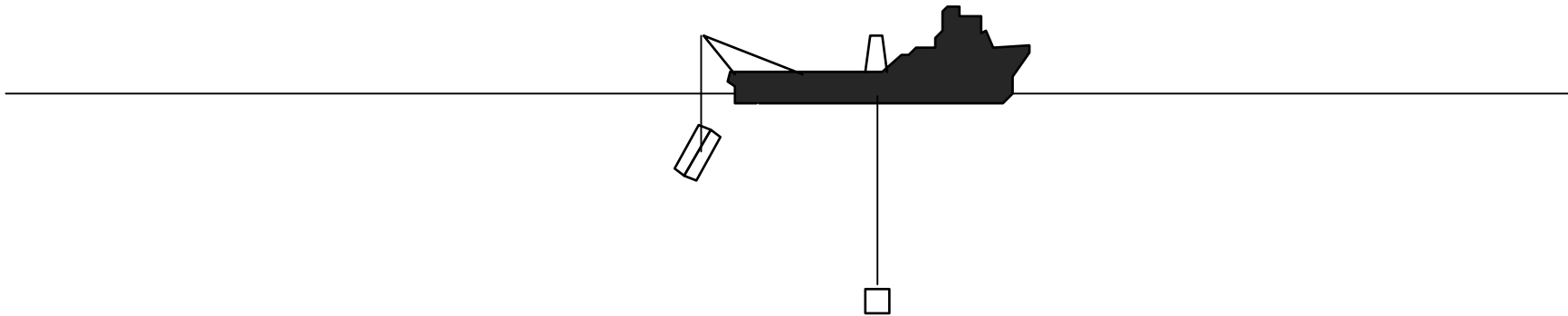


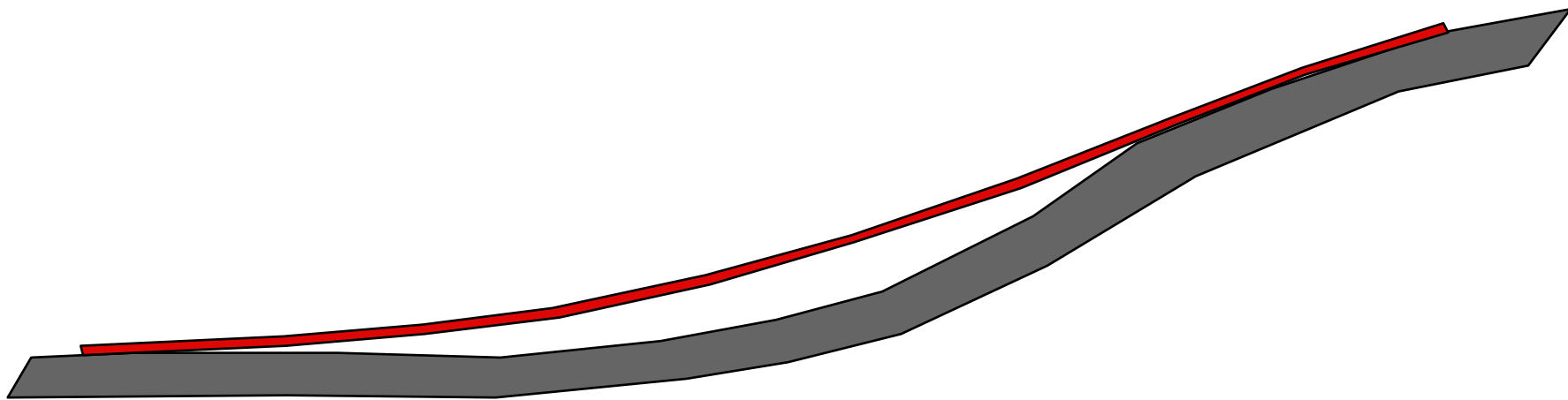
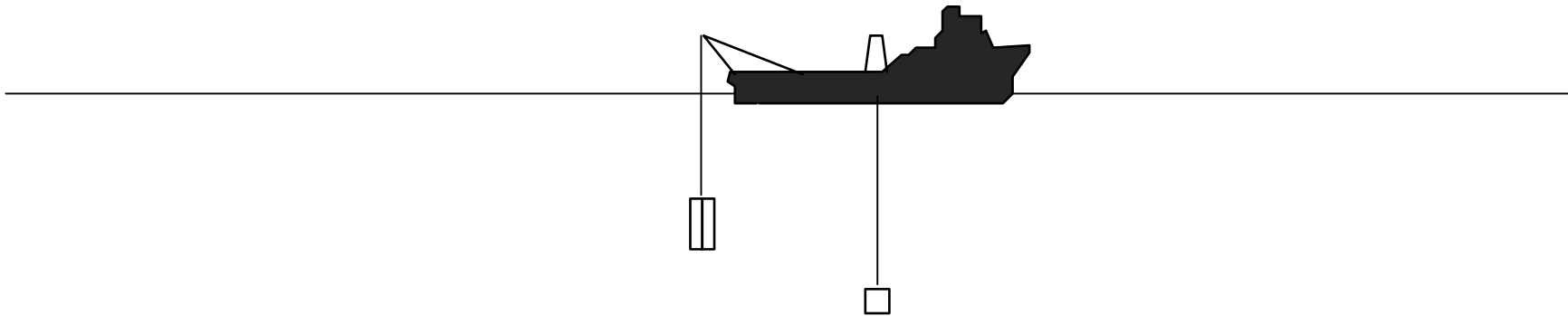
Split Sleeve, hinged ROV designed Strakes

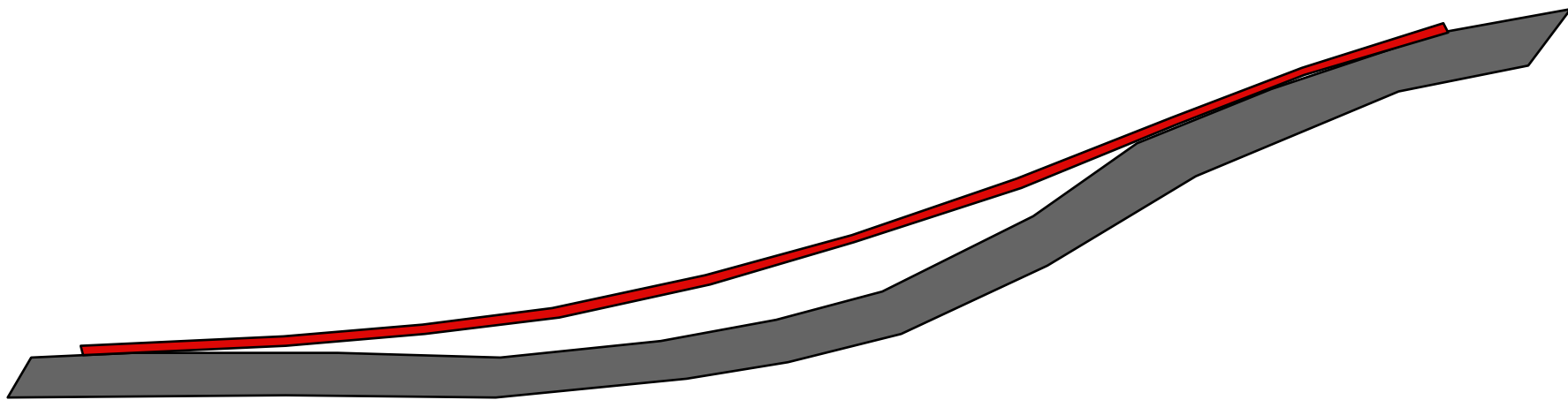
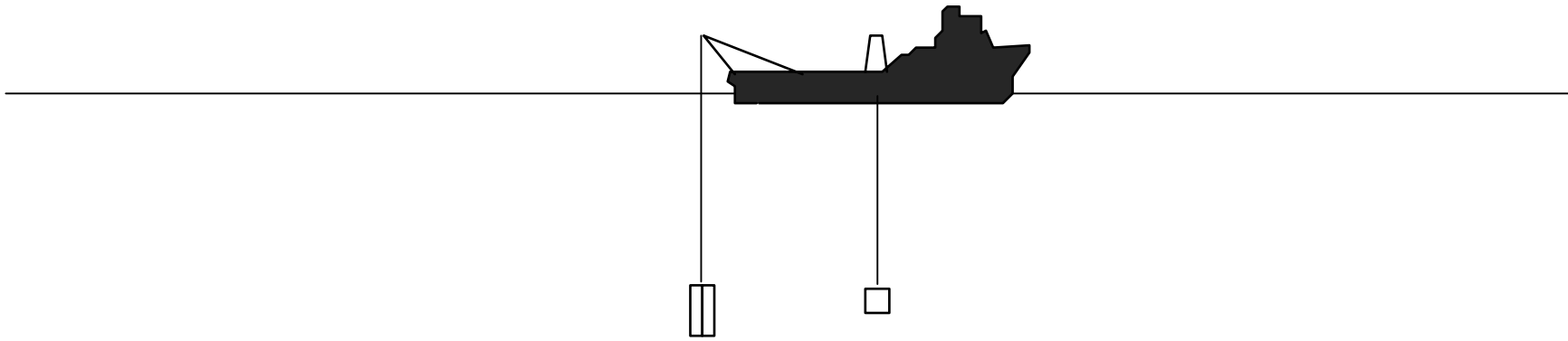


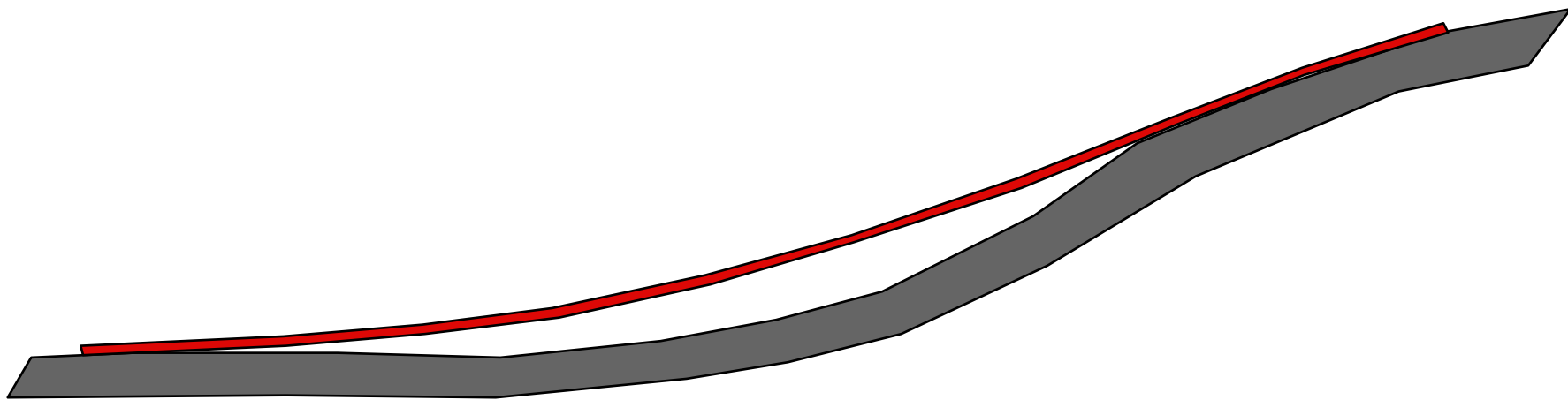
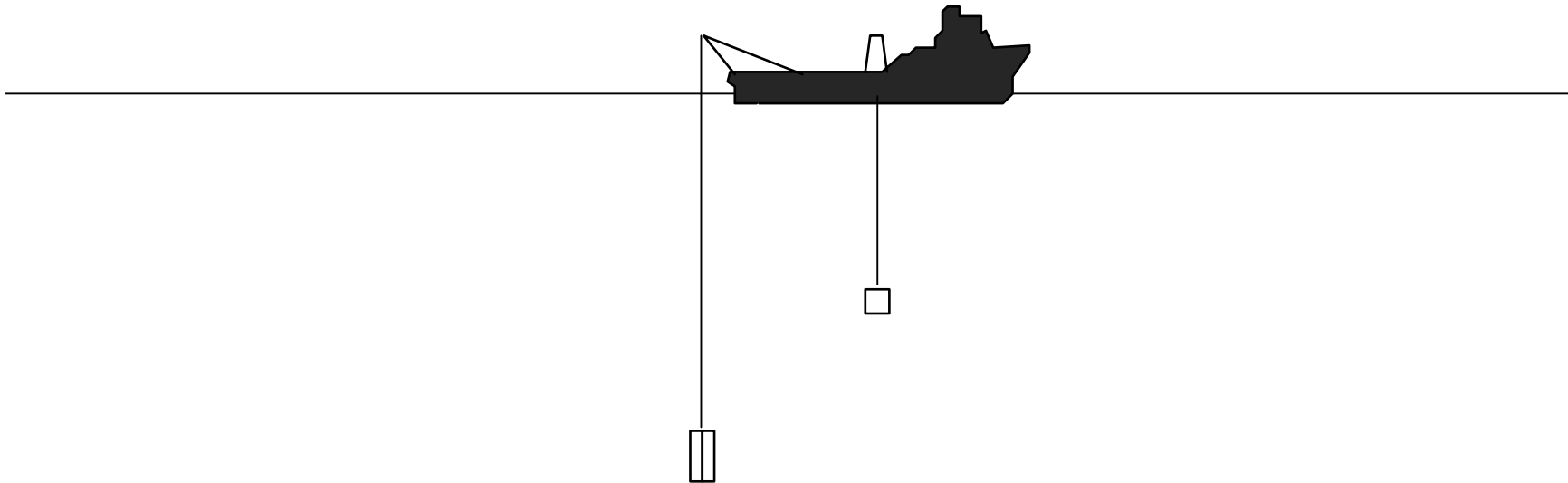


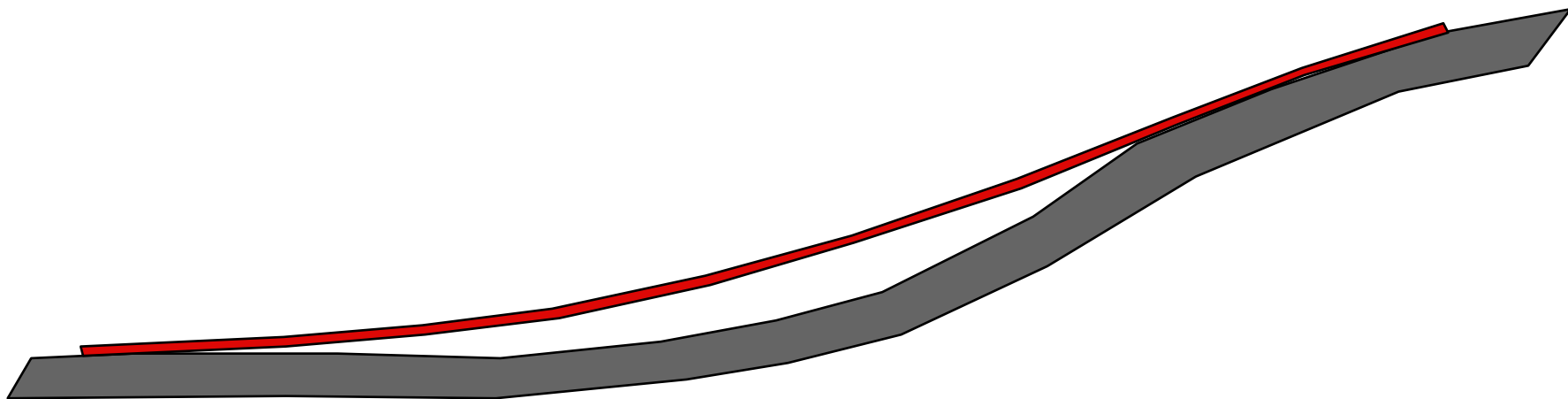
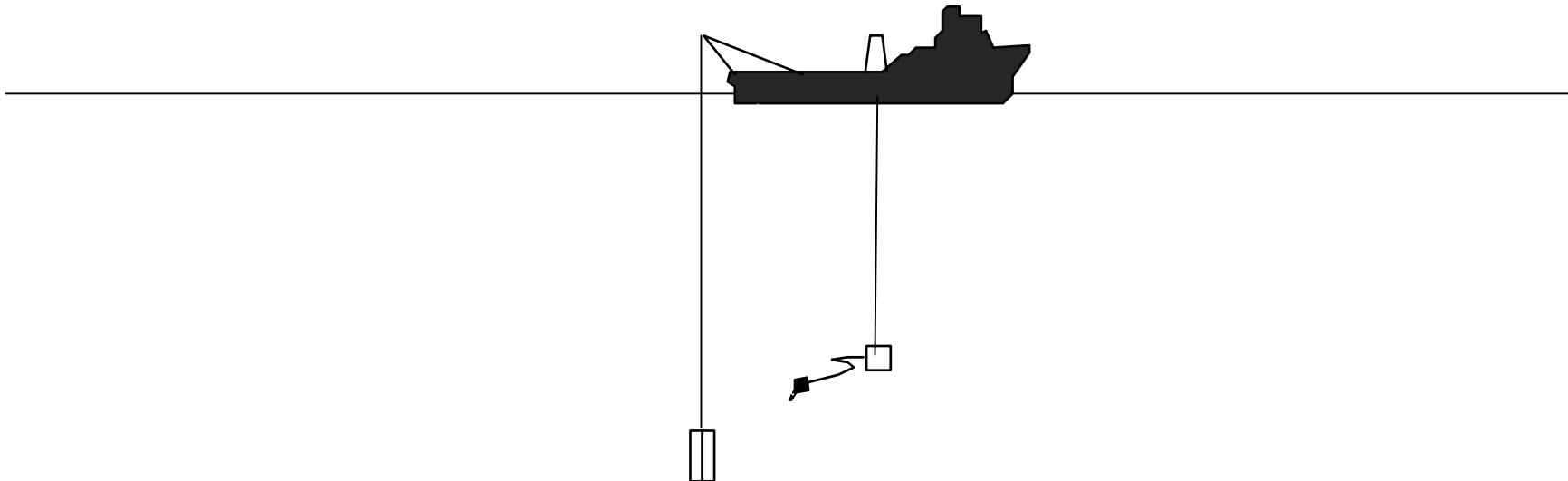


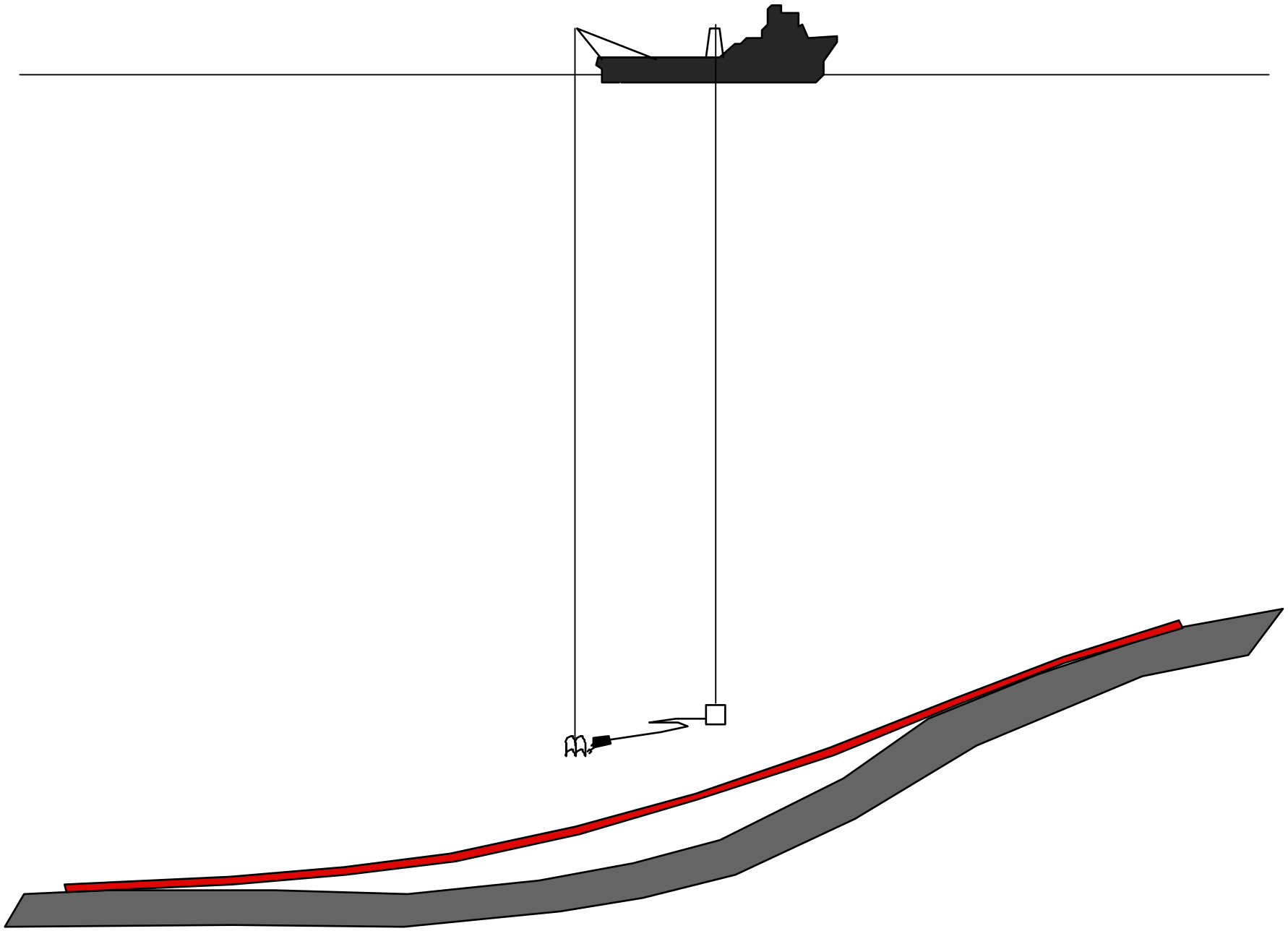


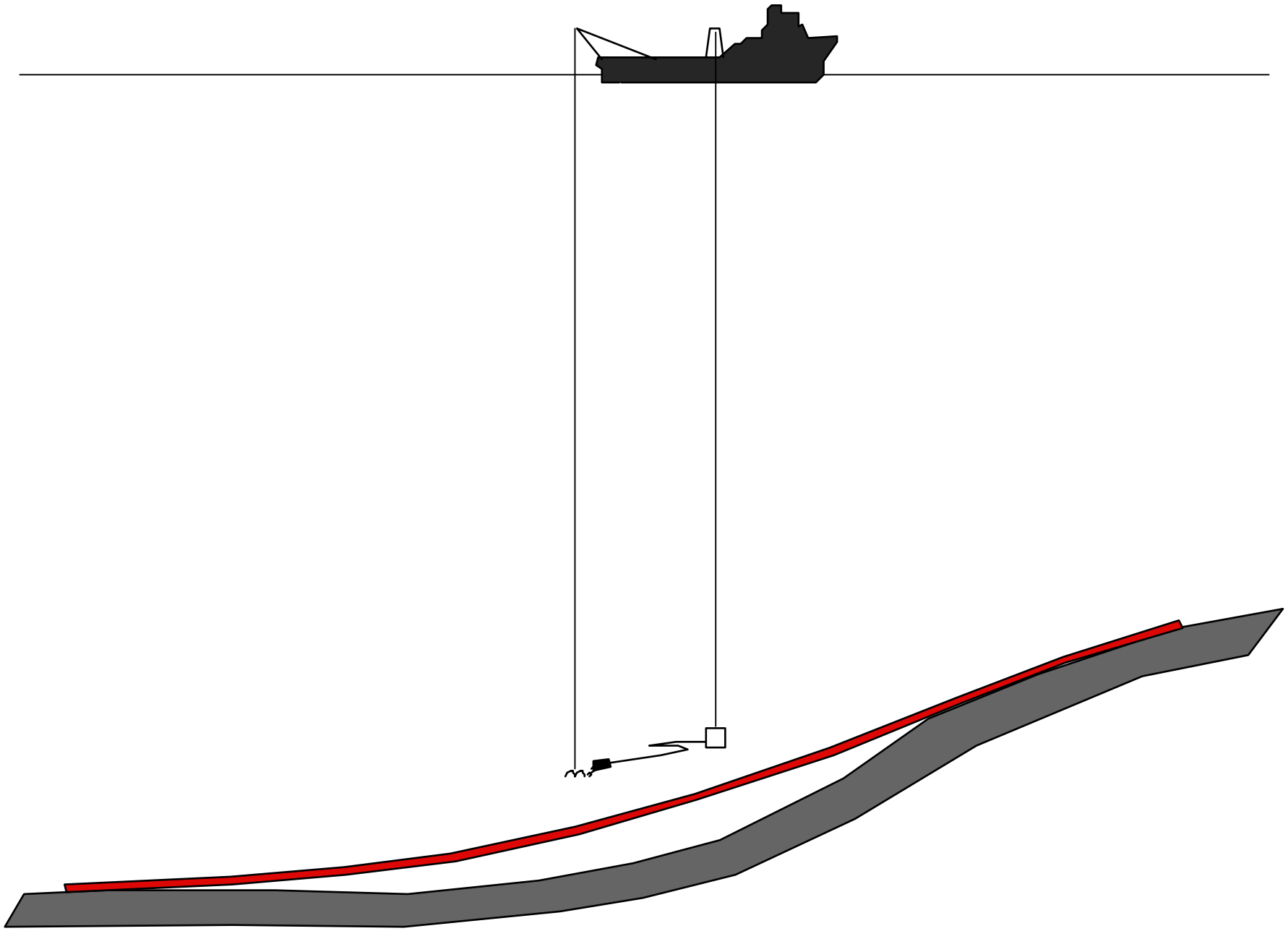


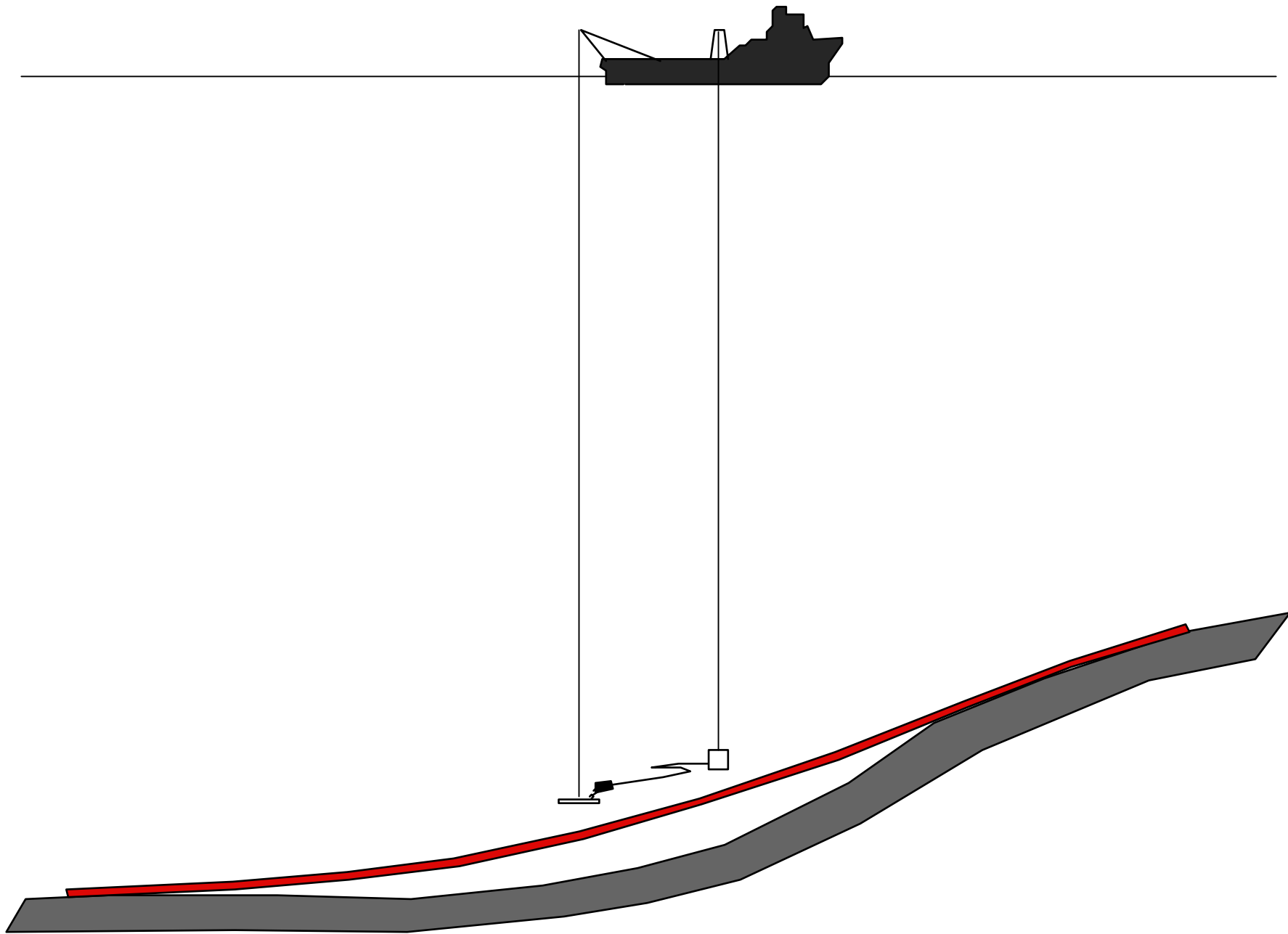


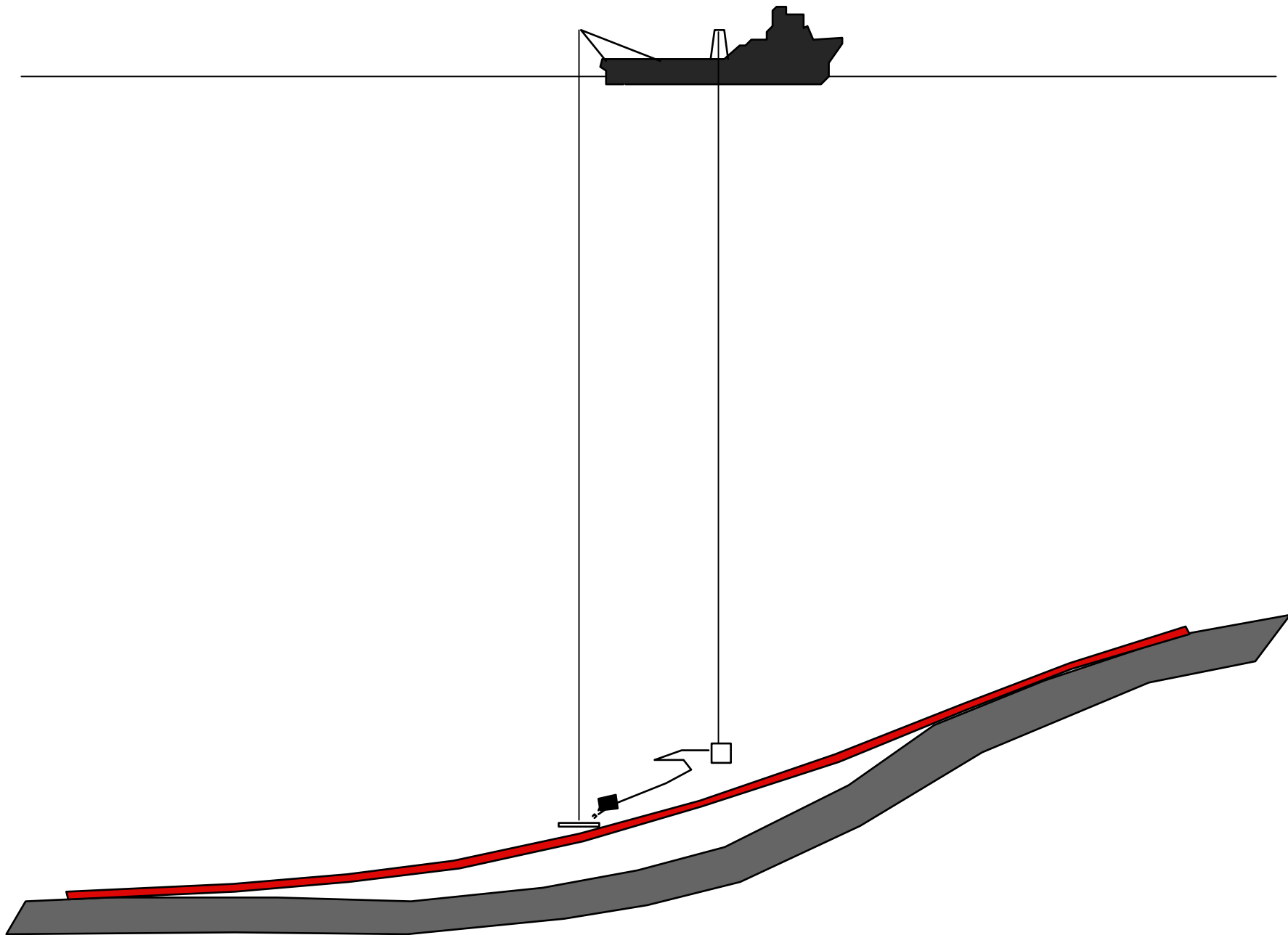


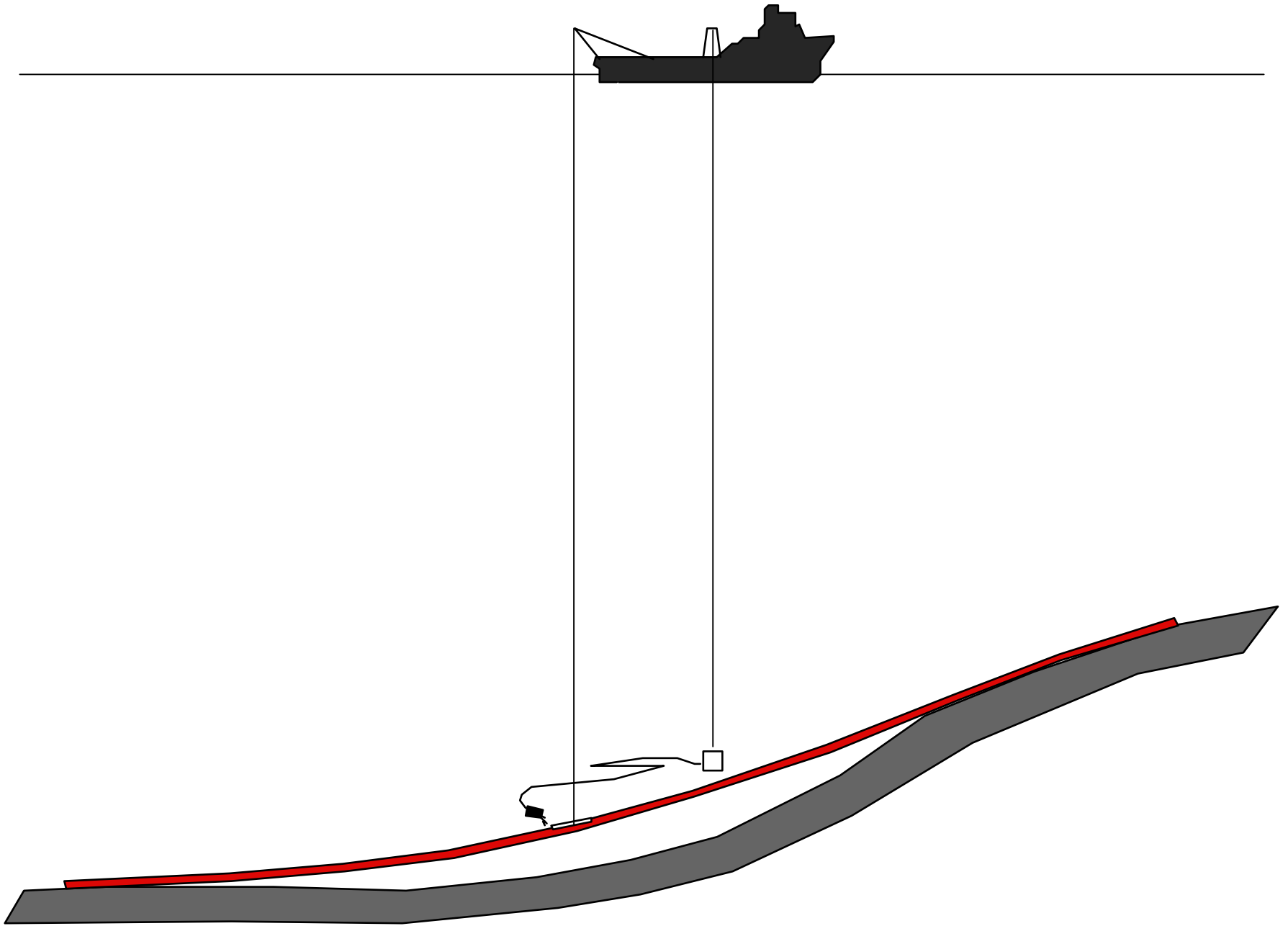


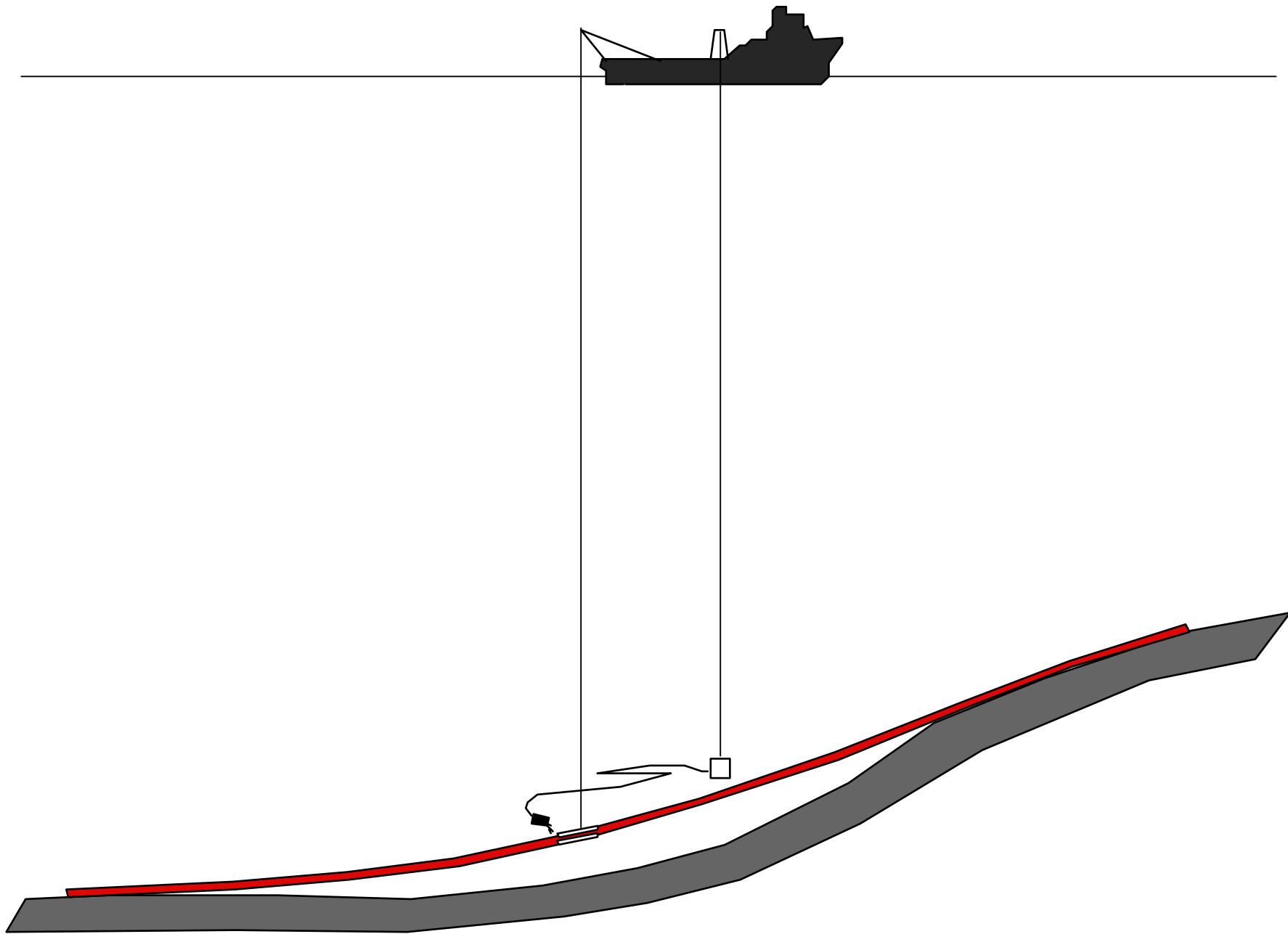


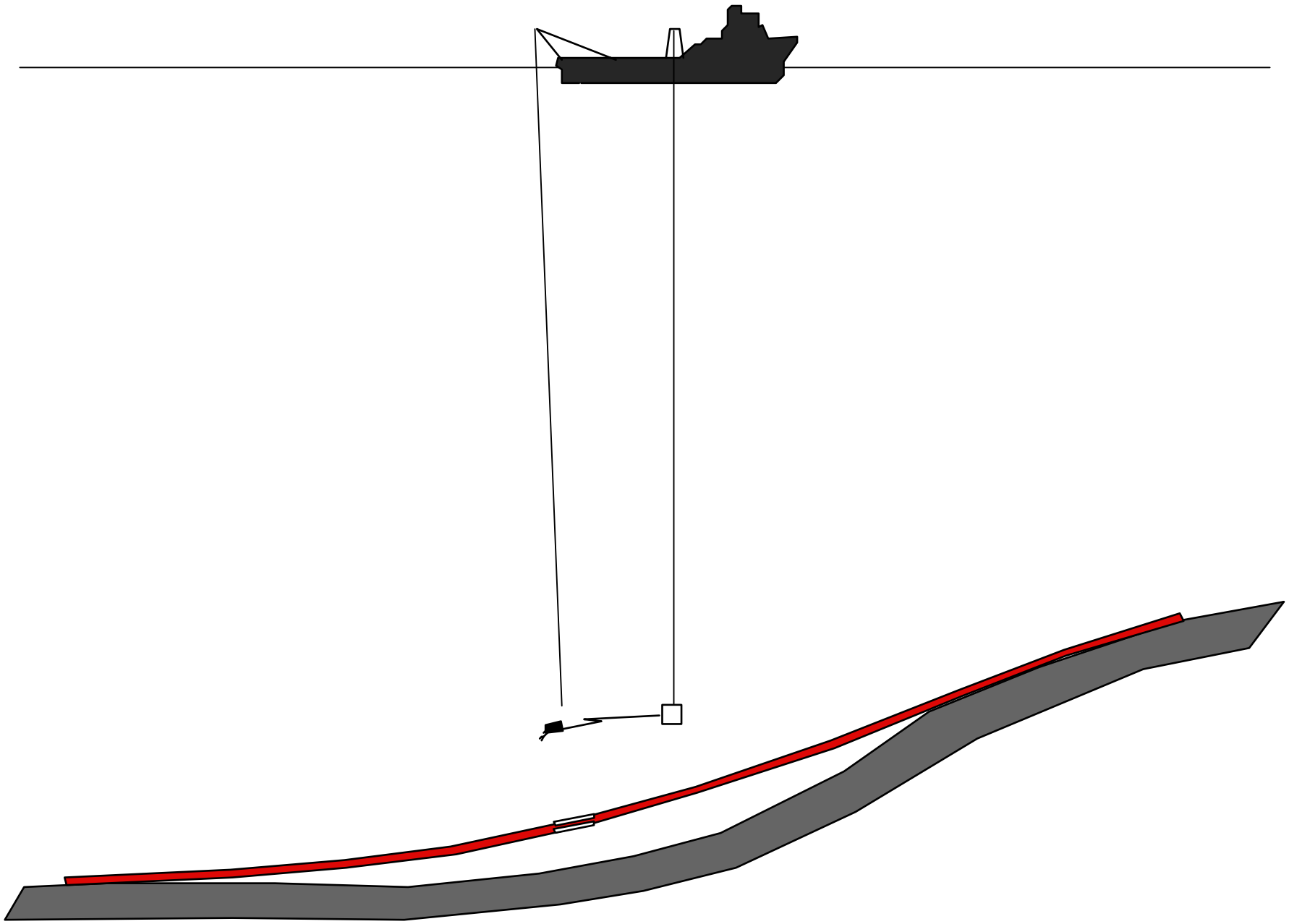


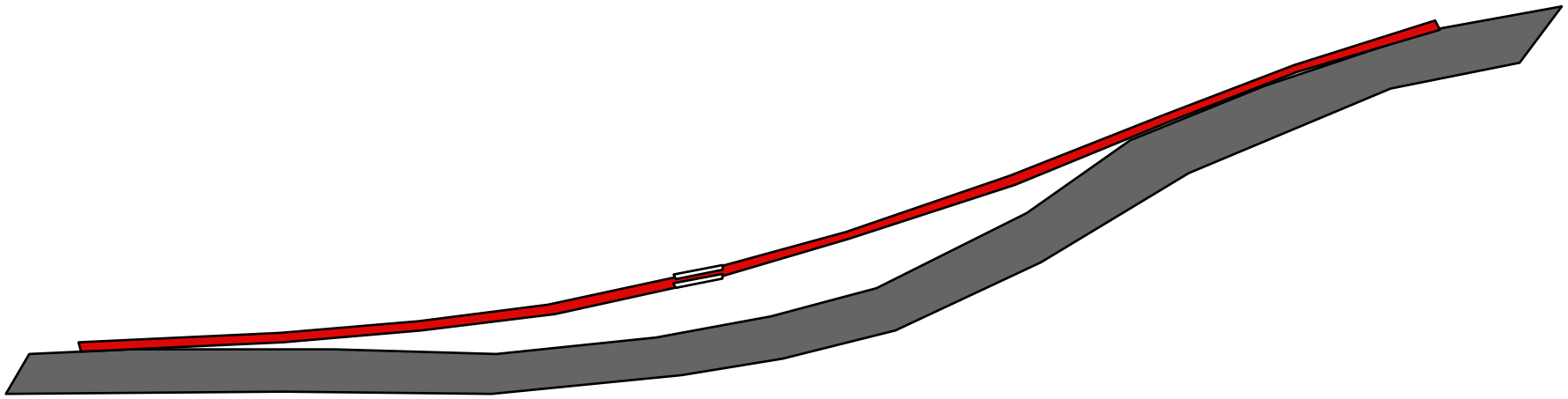
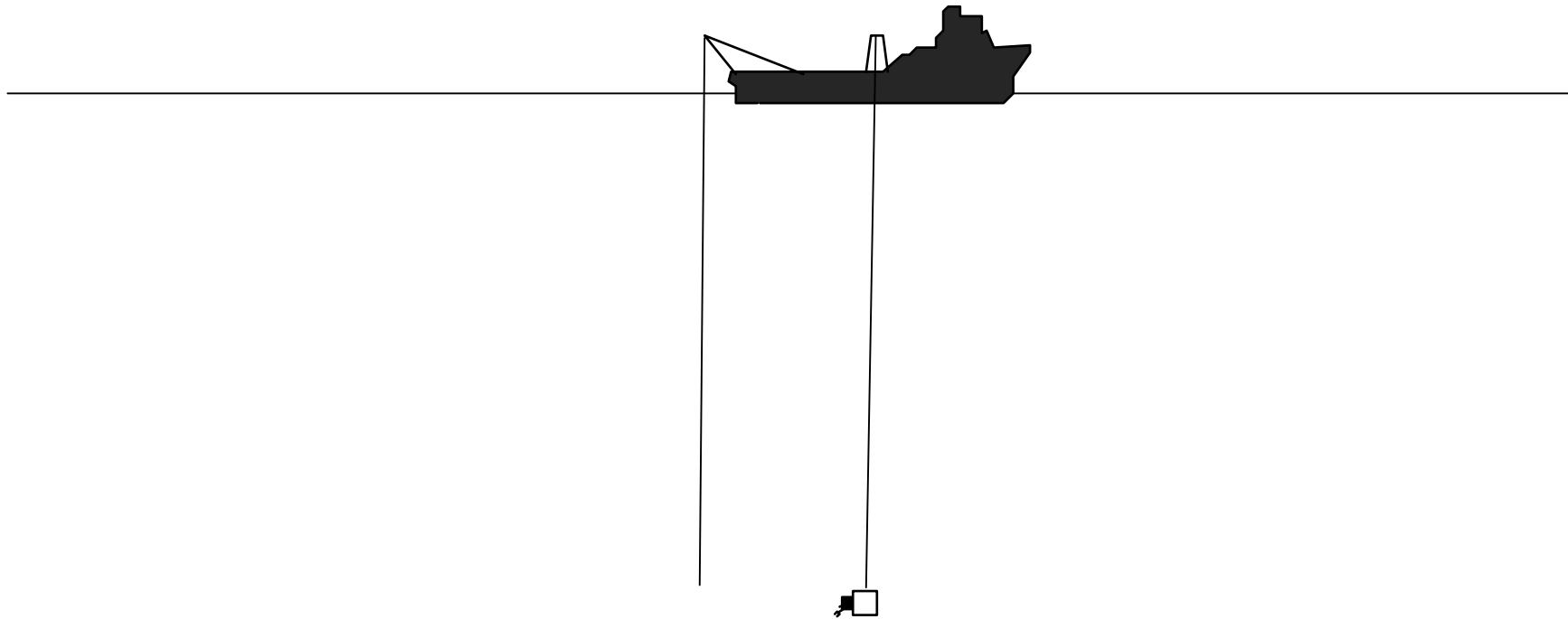








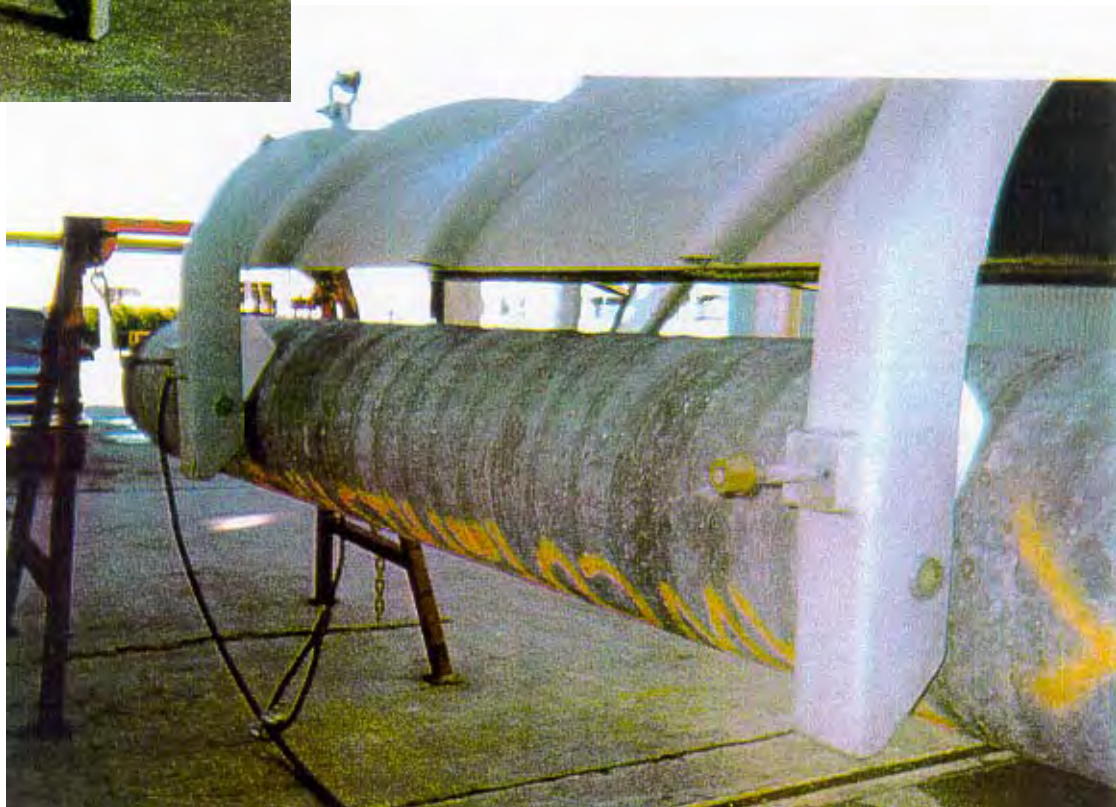




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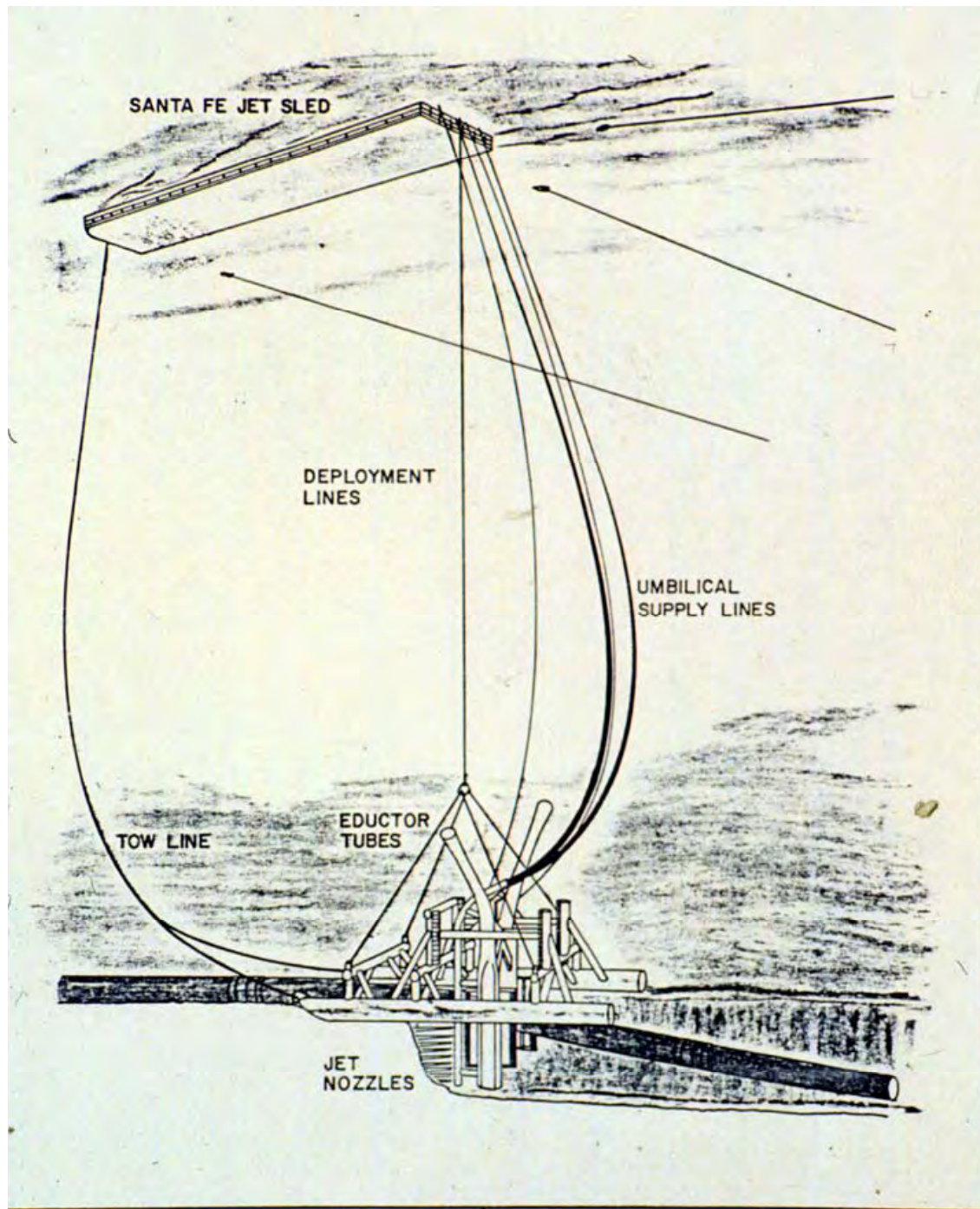
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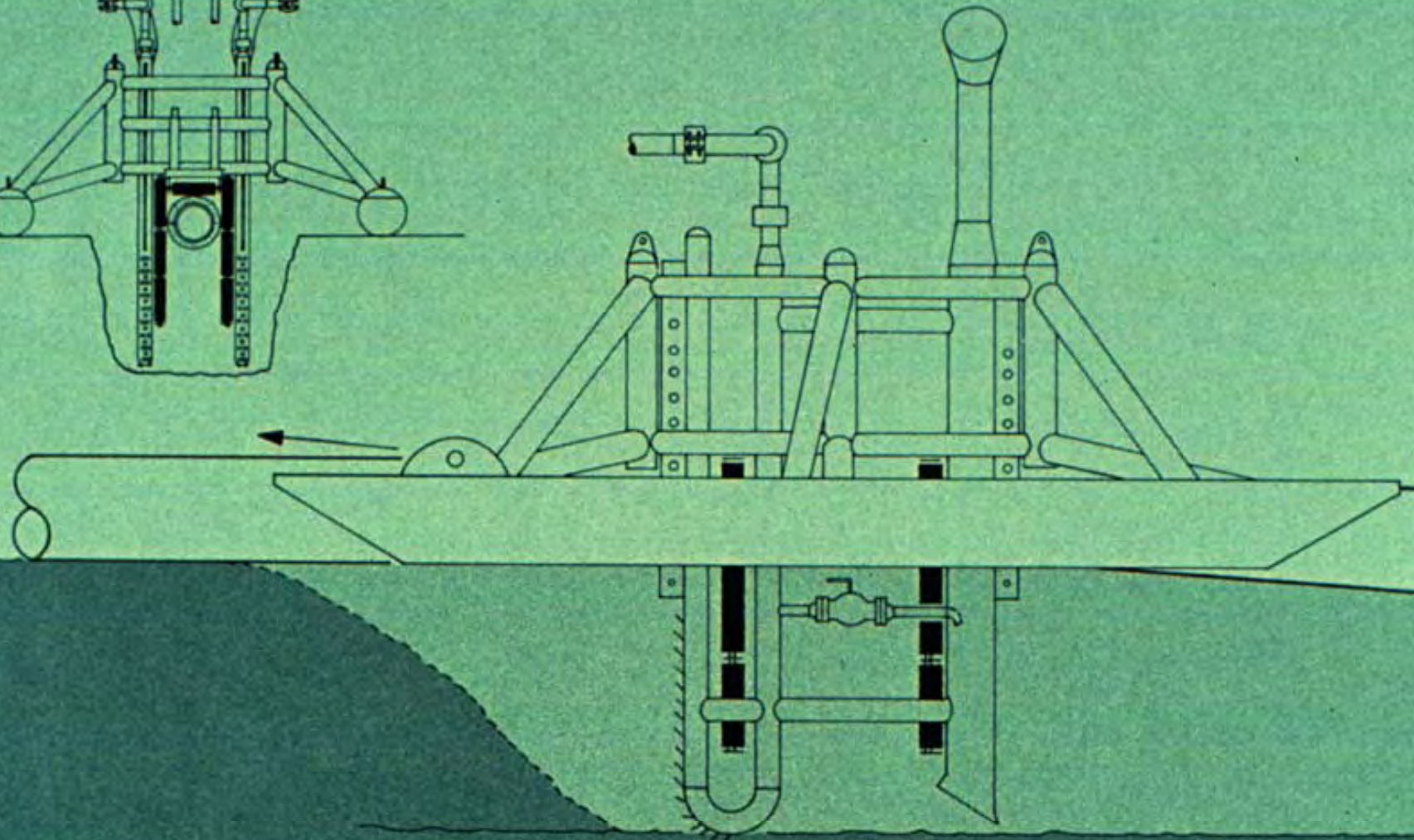
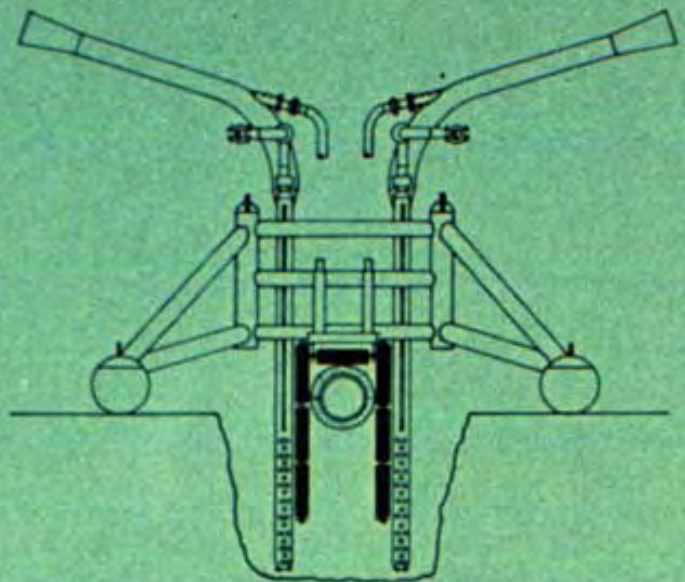




Methods of trenching to avoid
VIV.







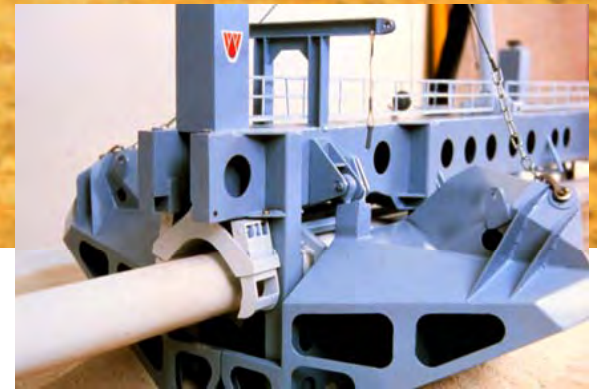
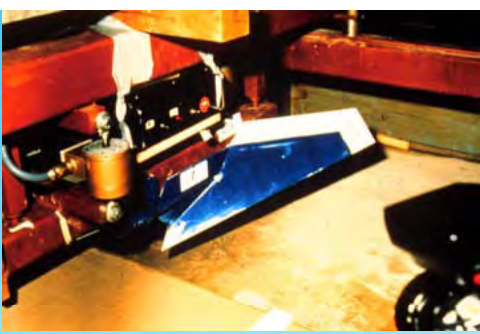




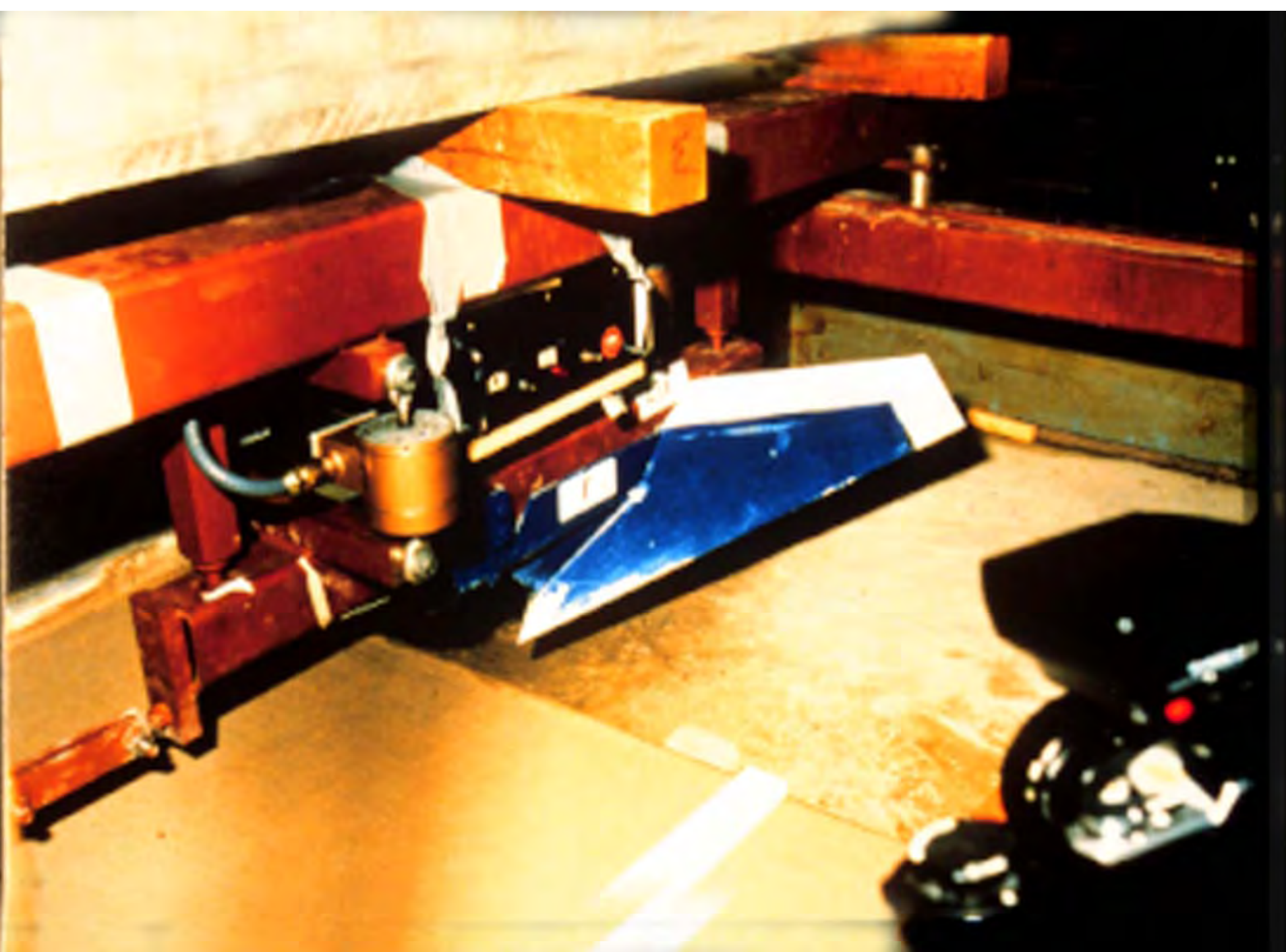


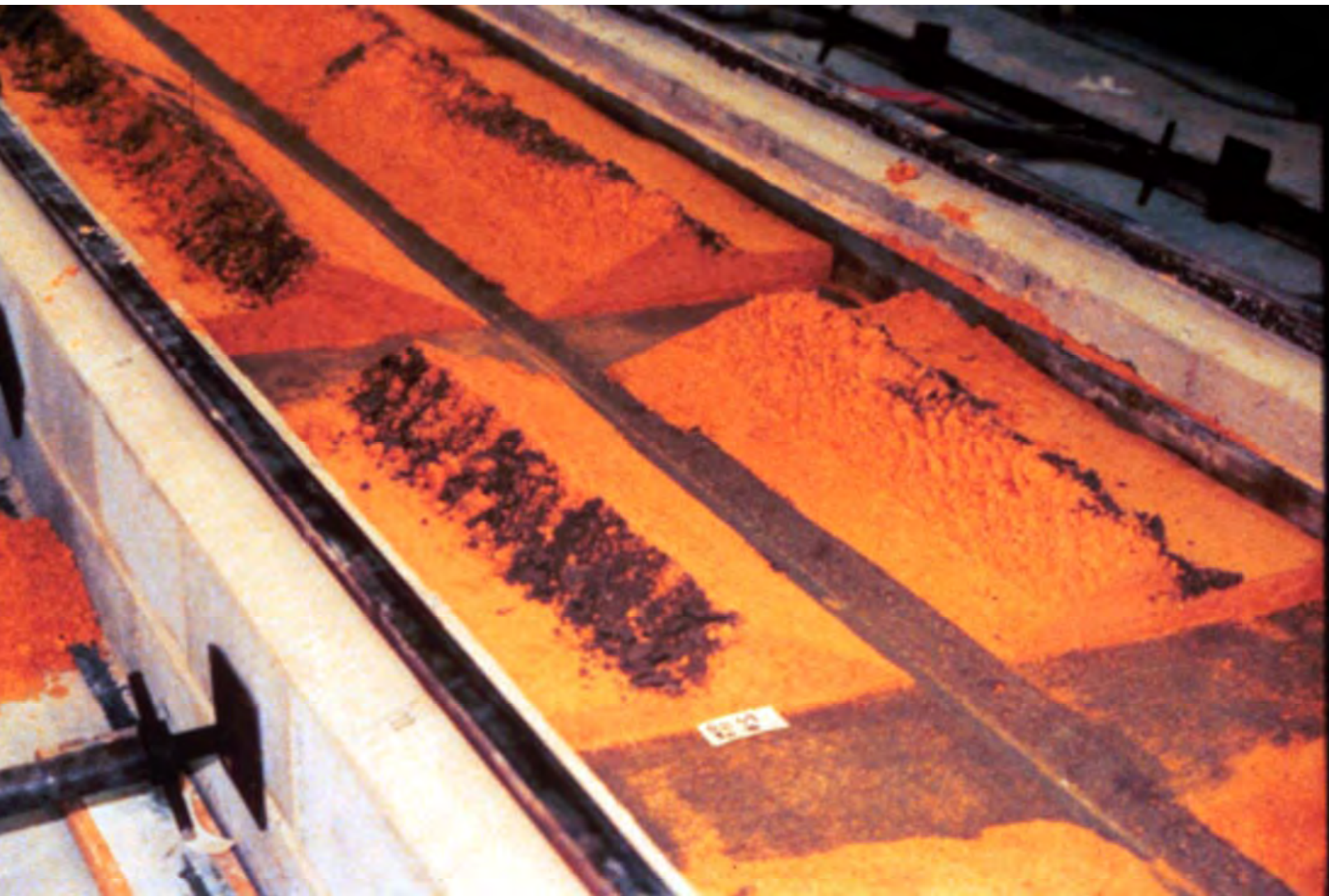
JAMES McARTY and SON
NORTH FREMANTLE • 335 4677

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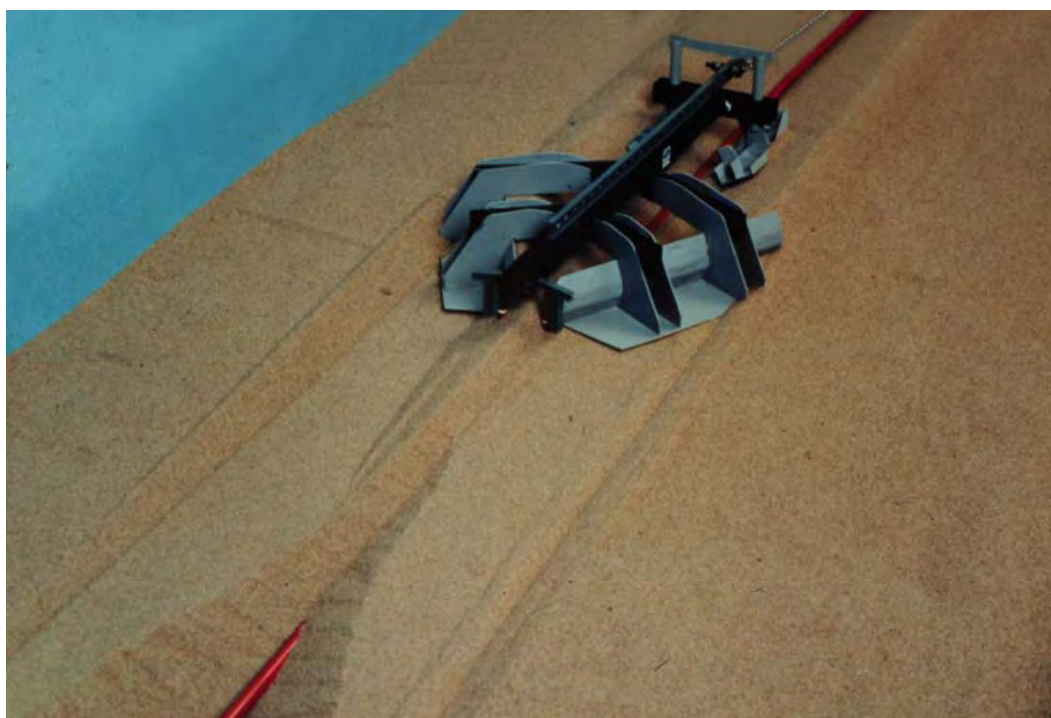


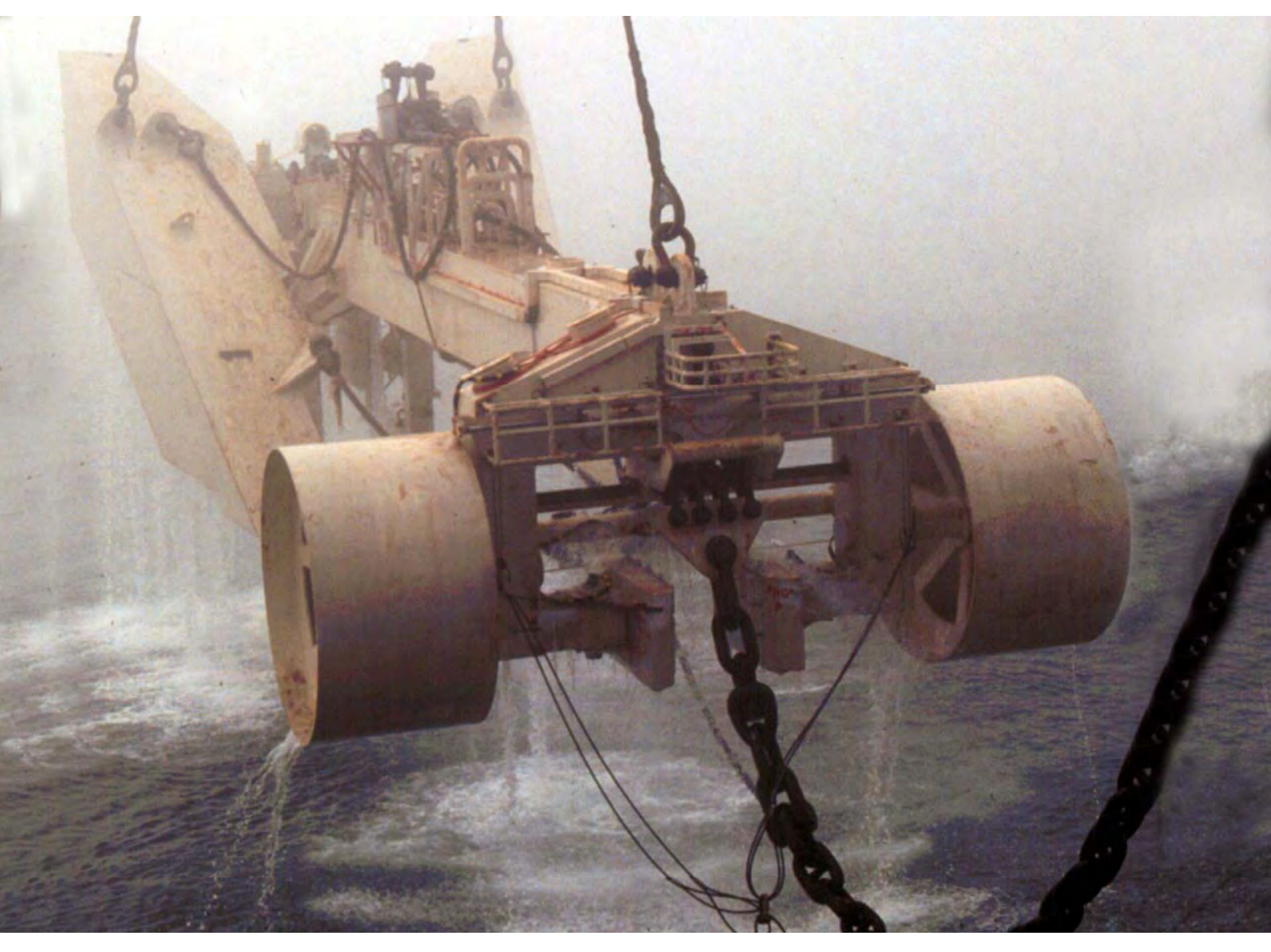


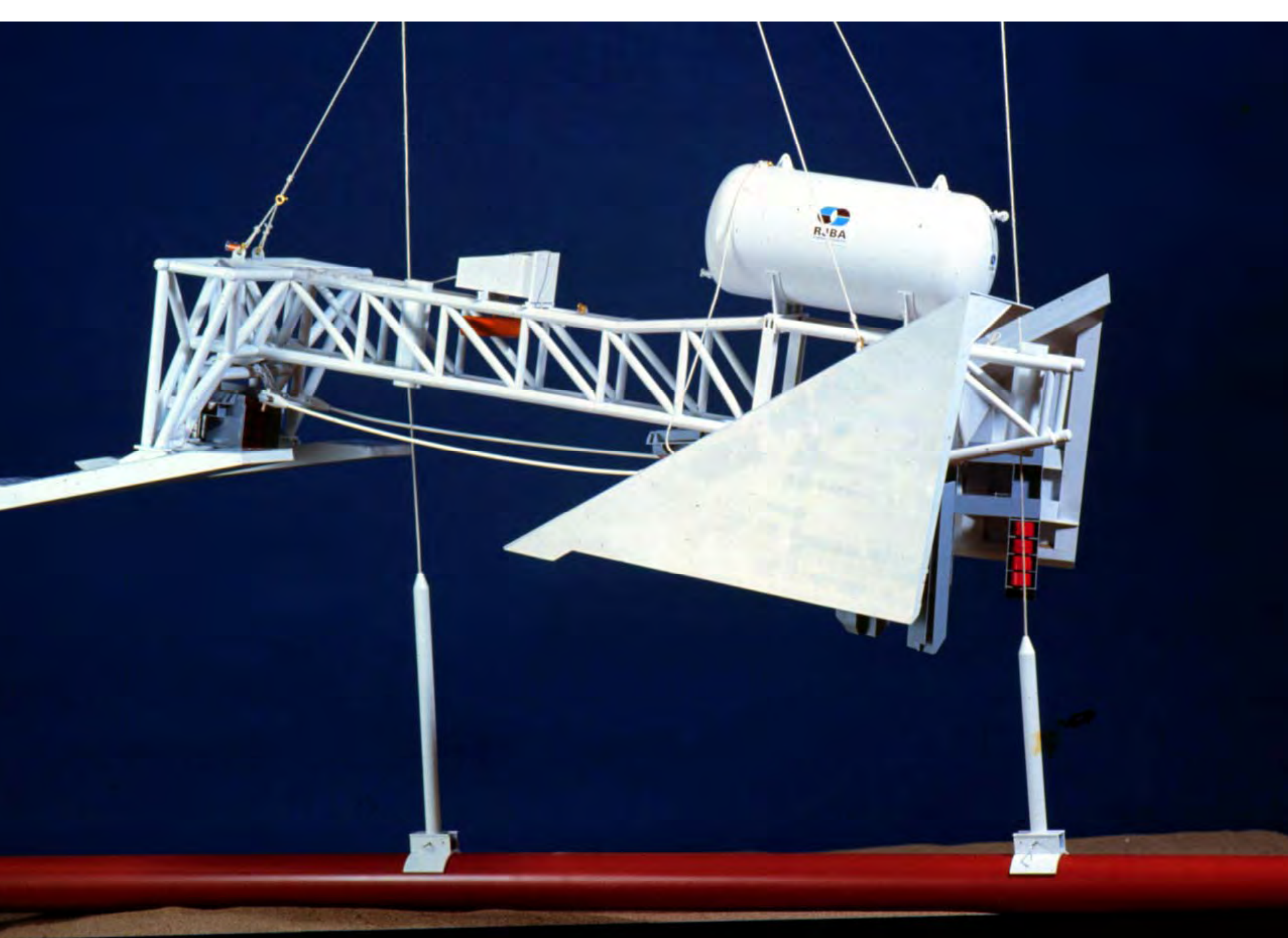
Model Plow Digging in Undulating Bottom



















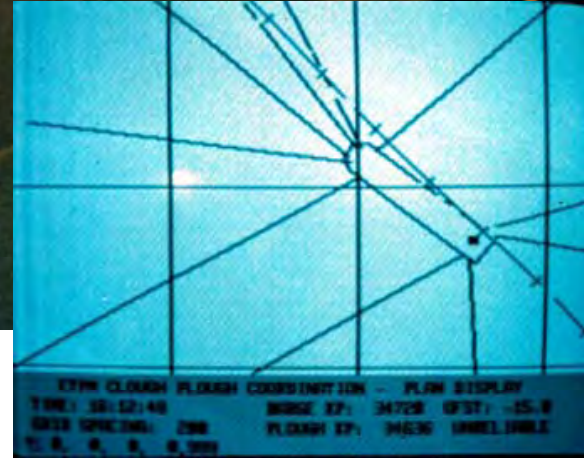












THU 24 NOV 1990 16:11:09 LB=8 LI=8 VI=8

IPTH OF CUT	781 mm	PULL FORCE	30 t
HOLE FORCE	2.9 t	SHOCK ABSORBER STROKE	0.0 Metre
TEERING FORCE "L"	0.6 t	SHOCK ABSORBER PRESSURE	363 t
TEERING FORCE "R"	2.9 t	QUICK RELEASE	----->READY
CRIB OPERATING	-5.5 DEG.		
PE VERT. CLEARANCE	007 mm	CRADLE ANGLE	0 Deg
		CRADLE IS	----->OPEN
		CRADLE LOCK PIN	----->UNLOCKED
C LOAD LEFT	45 t	PIPE LIFT LOAD	23 t
C LOAD RIGHT	46 t	SHARE ANGLE LEFT	- 0 DEG.
C LOAD SUR	112 t	SHARE ANGLE RIGHT	- 0 DEG.
D. PUMP PRESSURE	0.3 MPa	PLOUGH BODY PITCH	1.5 DEG
PE HORIZ. DEVIATION	11 cm	PLOUGH BODY ROLL	0.0 DEG
W ANGLE VERTICAL	50 DEG	WATER DEPTH	25 Metres

----->READY
 ----->UNLOCKED
 ----->OPEN
 ----->UNLOCKED

ATTENTION - YOU BAR OVER TO PORT SIDE







