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Engineering and Materials Consultants

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Date: July 8, 2015

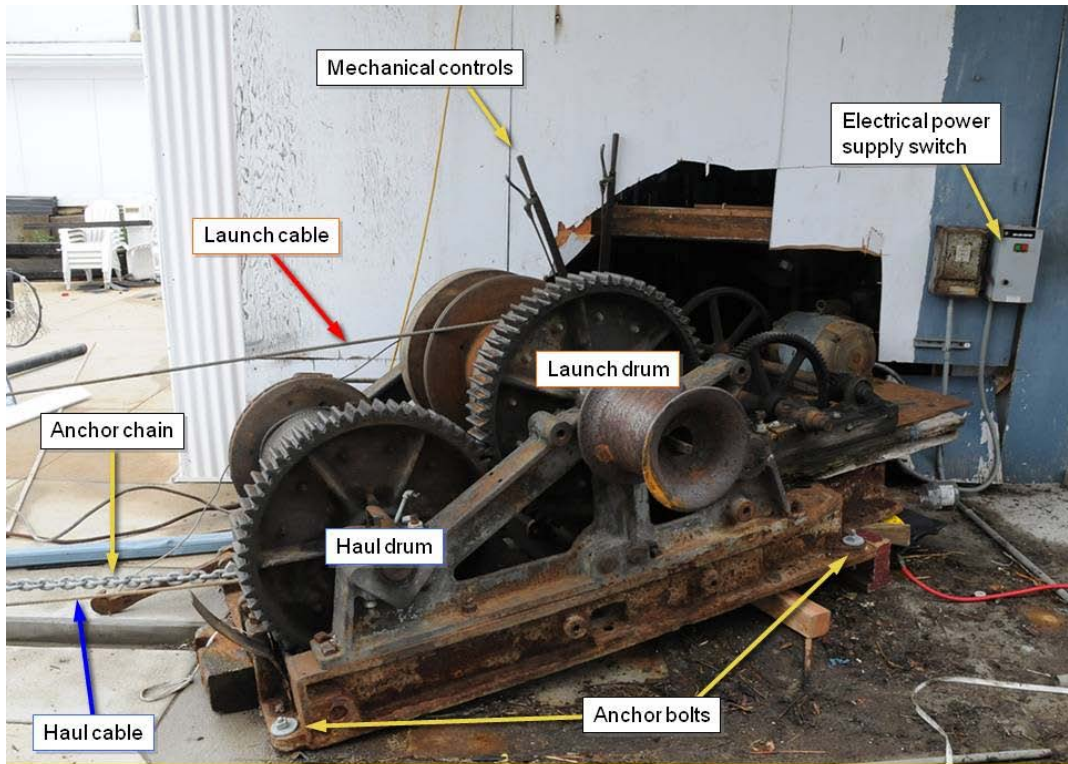
Re: Selected case summaries

Boat winch:

A winch operator was fatally injured when the anchor bolts of a ten ton boat winch pulled out of the concrete mounting pad pinning him against an adjacent building as he was attempting to put a boat into the water.

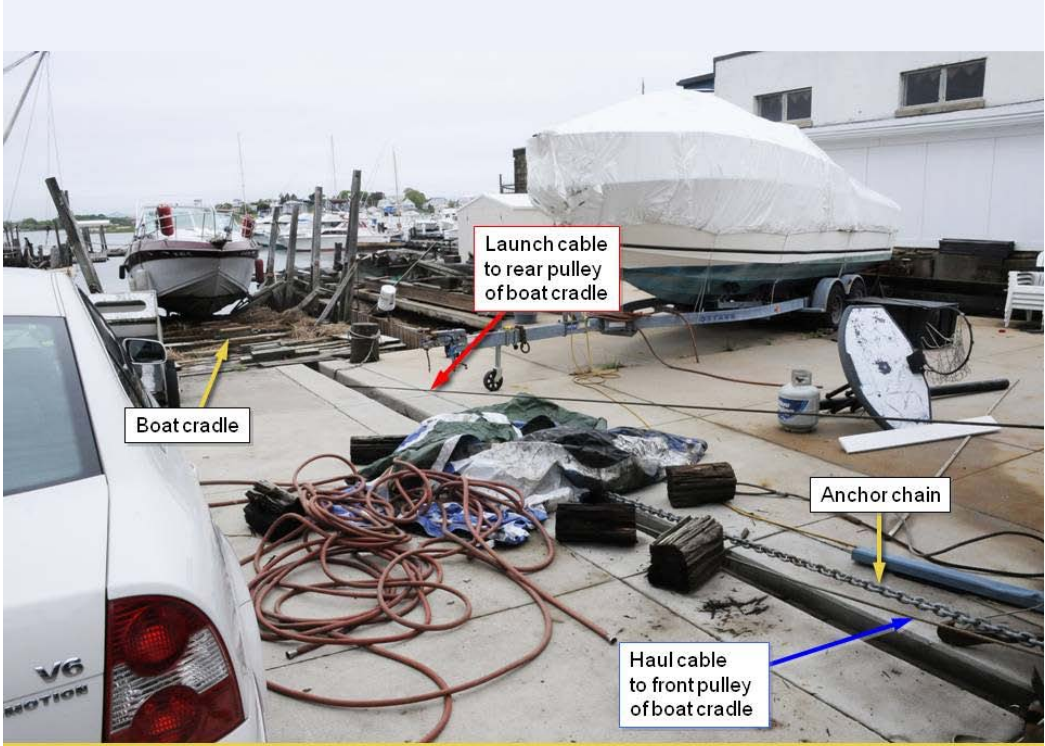
Rapperport Associates was engaged to determine what caused the anchor bolts to rip out of their base. Most of the evidence had been disposed of by the time we had an opportunity to view the site so the pre-accident environment was reconstructed from post-accident OSHA photographs.

It was discovered that a safety chain was inadvertently left connected during launch which resulted in high winch loads. Further investigation revealed that there were several serious deficiencies with regard to the anchor bolt placement and that had the winch anchoring system been properly designed and constructed, the anchor bolts would have withstood the cable forces and prevented the winch from coming lose and killing the operator.

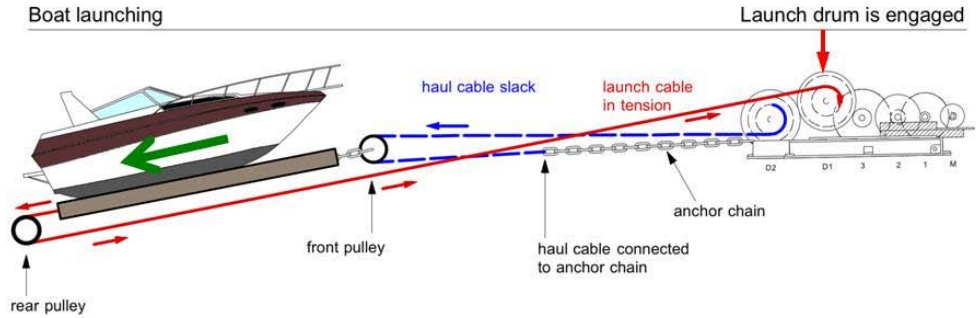


Boat Winch post-accident position

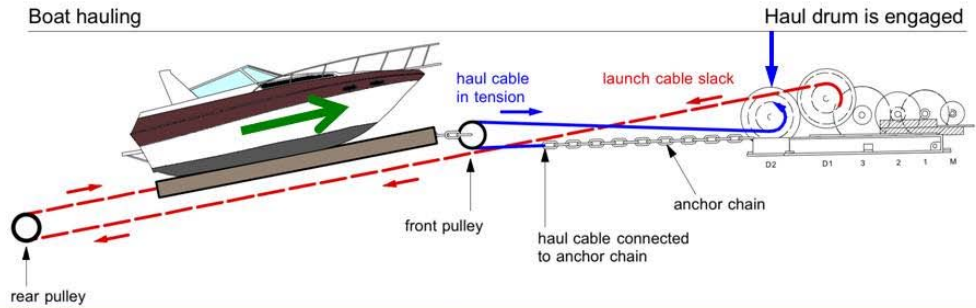




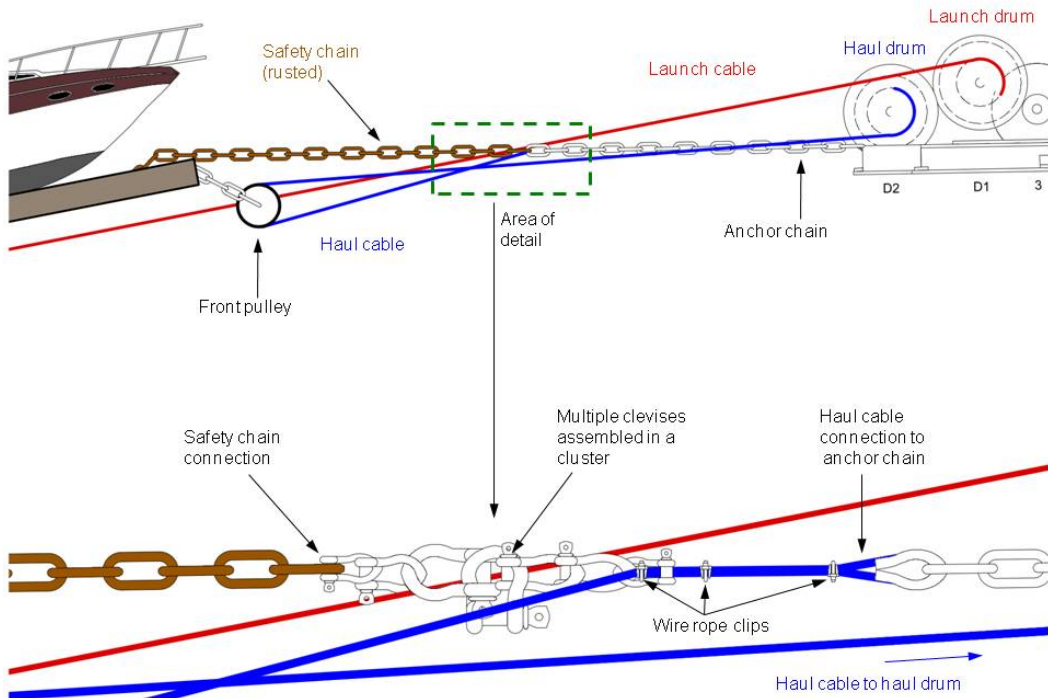
Boat launching



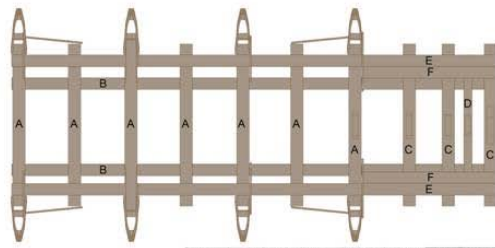
Boat hauling



Boat Winch function schematic (safety chain disconnected from cradle)



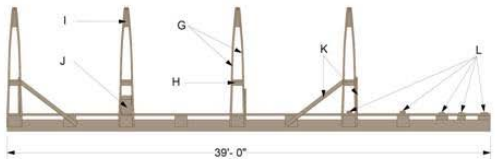
Safety chain and haul cable connections in detail



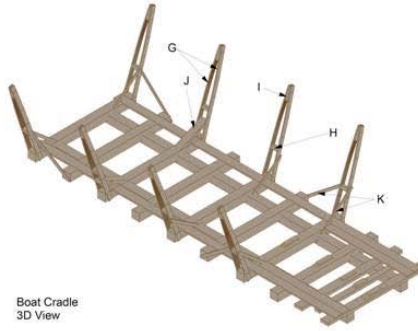
Top View

Member	Height	Width	Length	Cubic feet	number of members	Total cubic feet per member type
A	11.25	11.25	156	11.43	7	79.98
B	11.25	11.25	468	34.28	2	68.55
C	4	11.25	156	4.06	3	12.19
D	8	8	135	5.00	1	5.00
E	2	11.25	468	6.09	2	12.19
F	2	11.25	129	1.68	2	3.36
G	2	6	120	0.83	16	13.31
H	4	5.5	209	2.86	8	21.29
I	4.5	5.5	18	0.26	8	2.06
J	4	10	48	1.11	2	2.22
K	1.5	3.5	72	0.22	10	2.19
L	1.5	7.25	18	0.11	18	2.04
Total Cubic Feet						224.40

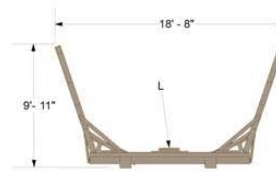
Note:
All dimensions are derived from visual estimates made from a scaled aerial view combined with visual estimates from photos of the accident site.



Side View



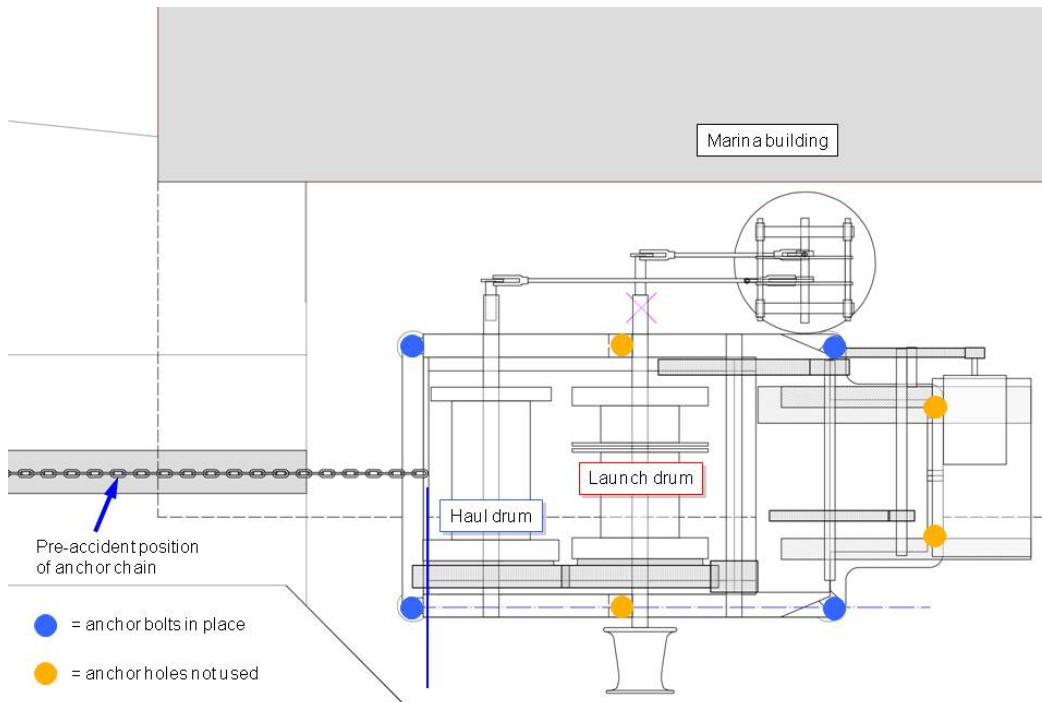
Boat Cradle 3D View



End View

Drake Exhibits DEMONSTRATIVE EVIDENCE & FORENSIC ART SERVICES
1275 Main Street • Brewster MA 02031 • 508-698-0500
www.Drake-Exhibits.com date: 6-17-13

Visual estimate of cradle construction



Boat winch top view before accident – anchor bolt number and positions

