

Scripps Institution of Oceanography Shipboard Technical Support

Development of Replacement Cable and
Termination for SeaSpy Magnetometer/
Gradiometer System



Why?

Poorly designed termination lead to a generally unreliable system. Saltwater short causing damage to towfish increasing repair costs. Unable to hold manufacturer accountable for warranty repairs.

Manufacturer unwilling to admit there was a problem or work towards a solution, saltwater intrusion was a “design feature”.

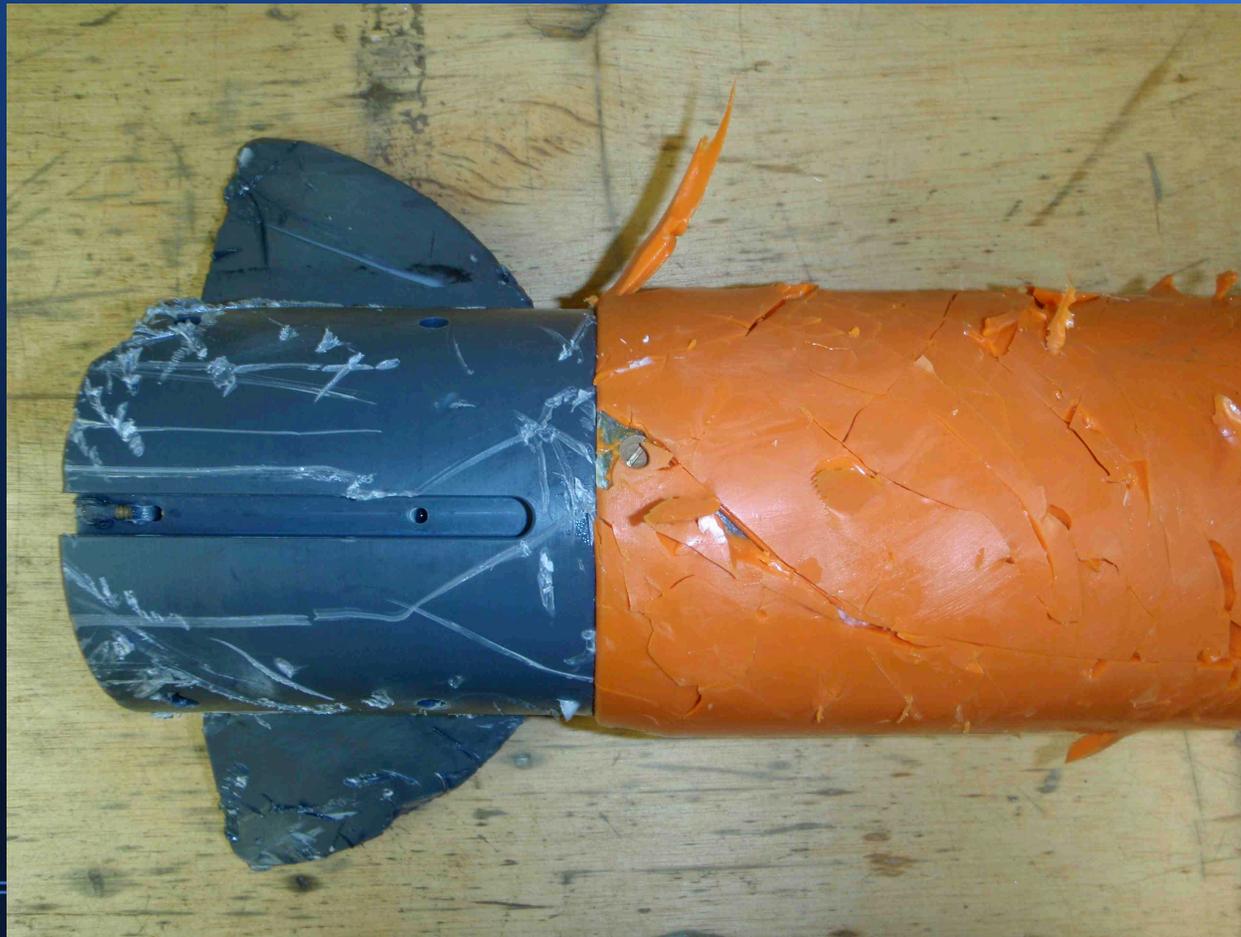
The Problem

Part 1

- Small cut in jacket usually from shark bite.



Shark Bites



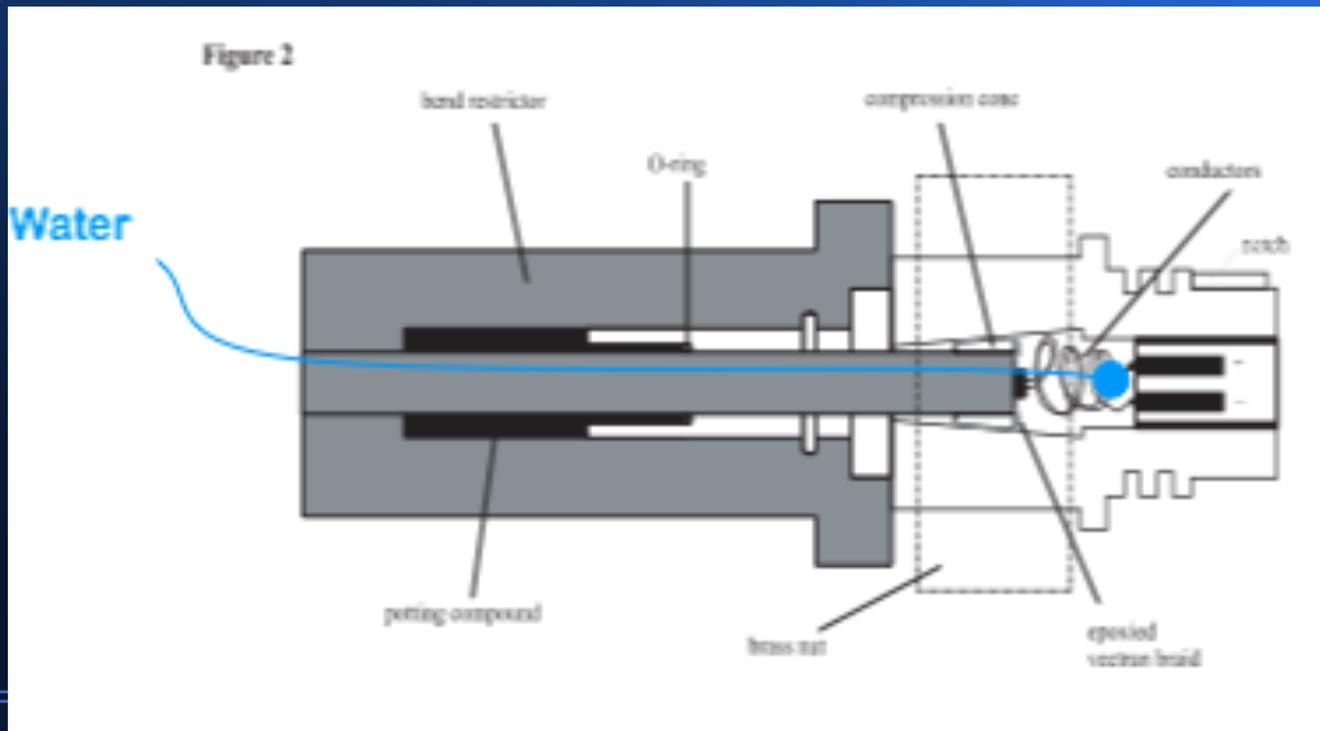
Shark Bites



The Problem

Part 2

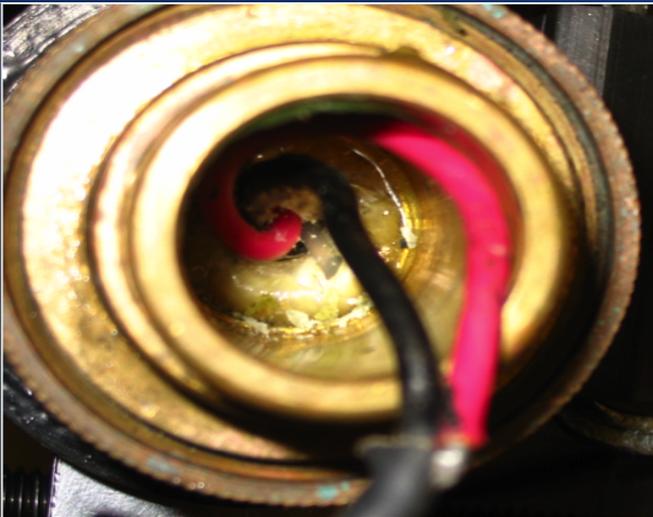
- Saltwater wicks down Vectran strength member into termination.



The Problem

Part 3

- With no barrier saltwater shorts the electrical component of the termination



Actions Taken Replace Termination

1. Began discussions with multiple companies, decided to move forward with PMI Industries.
2. Basic Design developed, quote provided by PMI included one termination and design verification testing.
3. Four vendors were asked to quote replacement cable, South Bay Cable was chosen.
4. Once cable was delivered termination development continued.

Cable Design

THIS DOCUMENT IS ISSUED IN STRICT CONFIDENCE ON CONDITION THAT IT IS NOT COPIED REPRINTED OR DISCLOSED TO A THIRD PARTY EITHER WHOLLY OR IN PART WITHOUT THE PRIOR WRITTEN CONSENT OF SOUTH BAY CABLE CORPORATION.

REVISION		
DESCRIPTION	DATE	APPROVAL

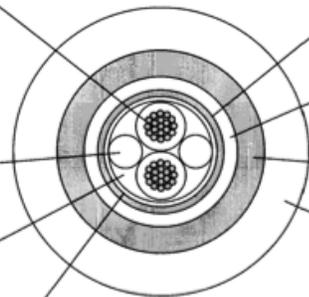
SINGLE CONDUCTORS-2 UNITS

Awg No. 16(19x0.0113")T/C
 DC Resistance @ 20° C ≤ 5.4 Ohms/1000 Ft
 HD Polyethylene Insulation
 Voltage rating: 600 V
 Color code: Red
 Black

FILLERS
 Plastic Rods

INTERSTICES WATERBLOCKED

TAPE
 Mylar tape



SHIELD
 Tinned Copper Braid

INNER JACKET
 HD Polyethylene
 Color: Black

STRENGTH MEMBER
 Vectran™ Braid

OUTER JACKET
 Polyurethane
 Color: Yellow
 Jacket marking:
 Parallel Black Stripe (1/16" wide)

ESTIMATED VALUES

Nominal O.D.	0.420"
Weight in Air	90 Lb/1000 Ft
Weight in Seawater	28 Lb/1000 Ft
Breaking Strength	7,000 Pounds
Maximum Load	1,000 Pounds
Min. Bend Diameter	12 Inches

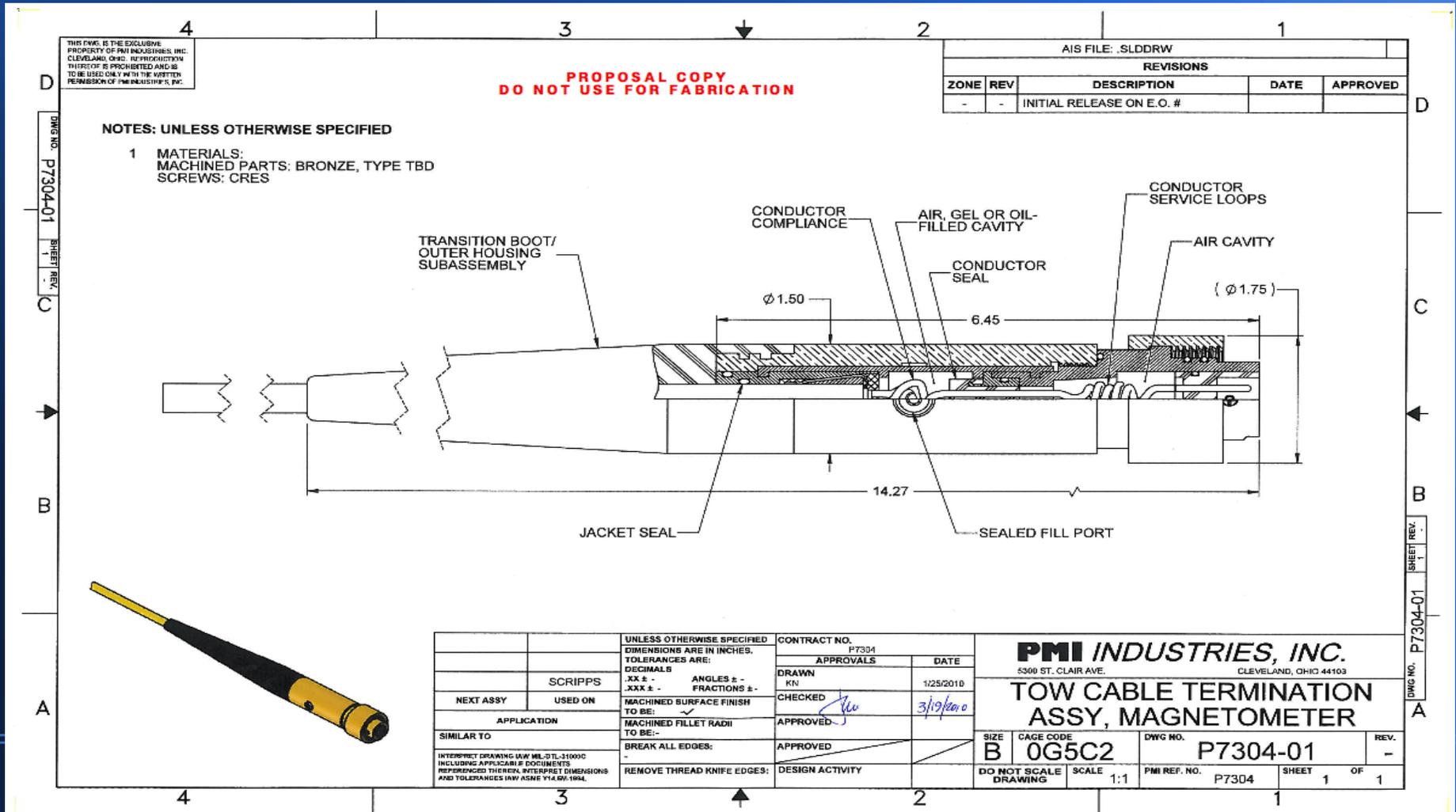
**South Bay
 Cable**



S
B
C

Drawn	OL	7/12/10	Approval	
Checked			Approval	
E-M Cable			SB-47107	

Termination Design



Design Verification Testing

SCRIPPS MAGNETOMETER TOW CABLE TERMINATION DESIGN VERIFICATION TEST PLAN

PRE-DVT Cable Electrical Characteristics
DC Resistance & Insulation Resistance (500VDC)



Tension Proofload

~50 lbf to 1000 lbf for 10 cycles while monitoring & recording Tension, Elongation, Gauge-Length Elongation & DC Resistance



Tension Cycling

~50 lbf to 1000 lbf for 10,000 cycles while monitoring and recording Tension, Elongation & DC Resistance



Hydrostatic Pressure Testing

0 to 1500 psig for 10 cycles + 4-hour hold at 1500 psig while monitoring and recording Pressure & Low-Voltage Insulation Resistance



POST-DVT Cable Electrical Characteristics
DC Resistance & Insulation Resistance (500VDC)



Tension to Failure

While monitoring and recording Tension, Elongation & DC Resistance

Conclusions

- Termination exceeded the minimum pass criteria of the test plan
- First Termination installed on Melville Aug 2011.
- Towed from San Diego to Panama without incident.
- Towed from Barbados to Cape Town, South Africa without incident
- Will be installed on Revelle in 2012.