Minutes of Meeting

Project: Sewol Salvage
Date: March 21st 2016
Room: GoToMeeting Video Conference (https://global.gotomeeting.com/join/168570189)

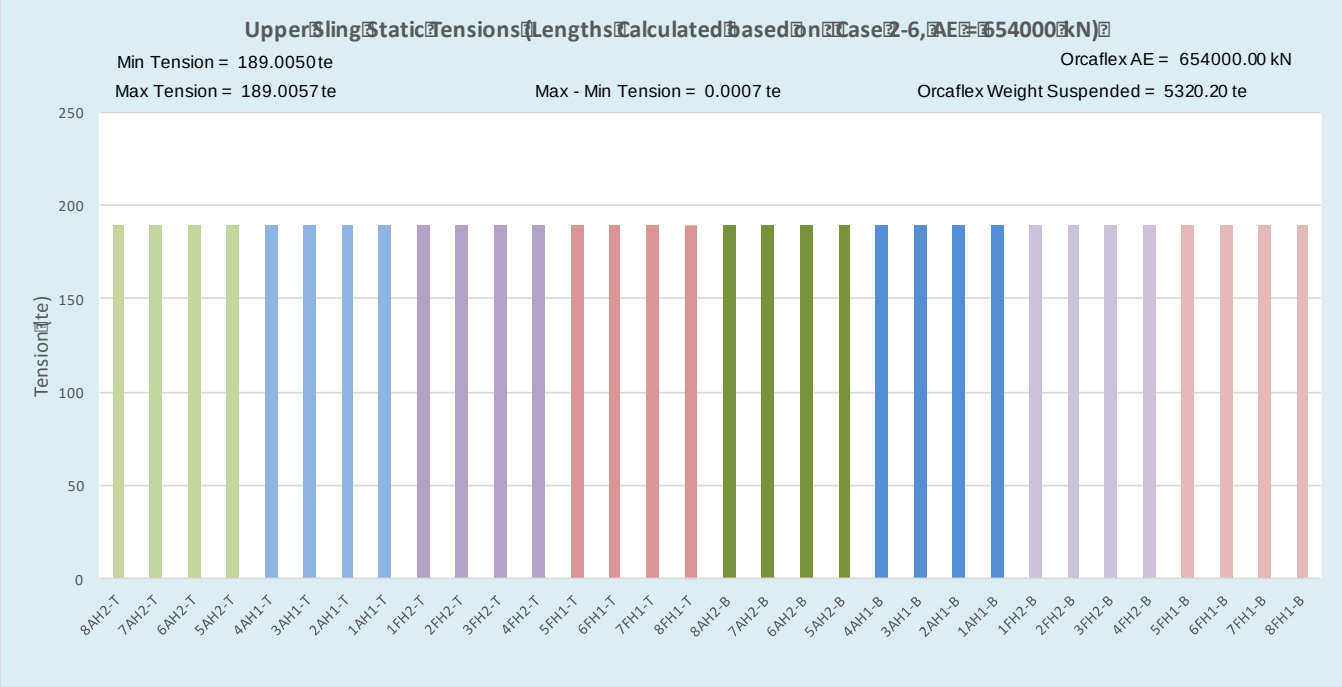
Note: Minutes are provided for information purposes only
Note: Key previous meeting notes repeated are shown in Dark Red

Key Actions:

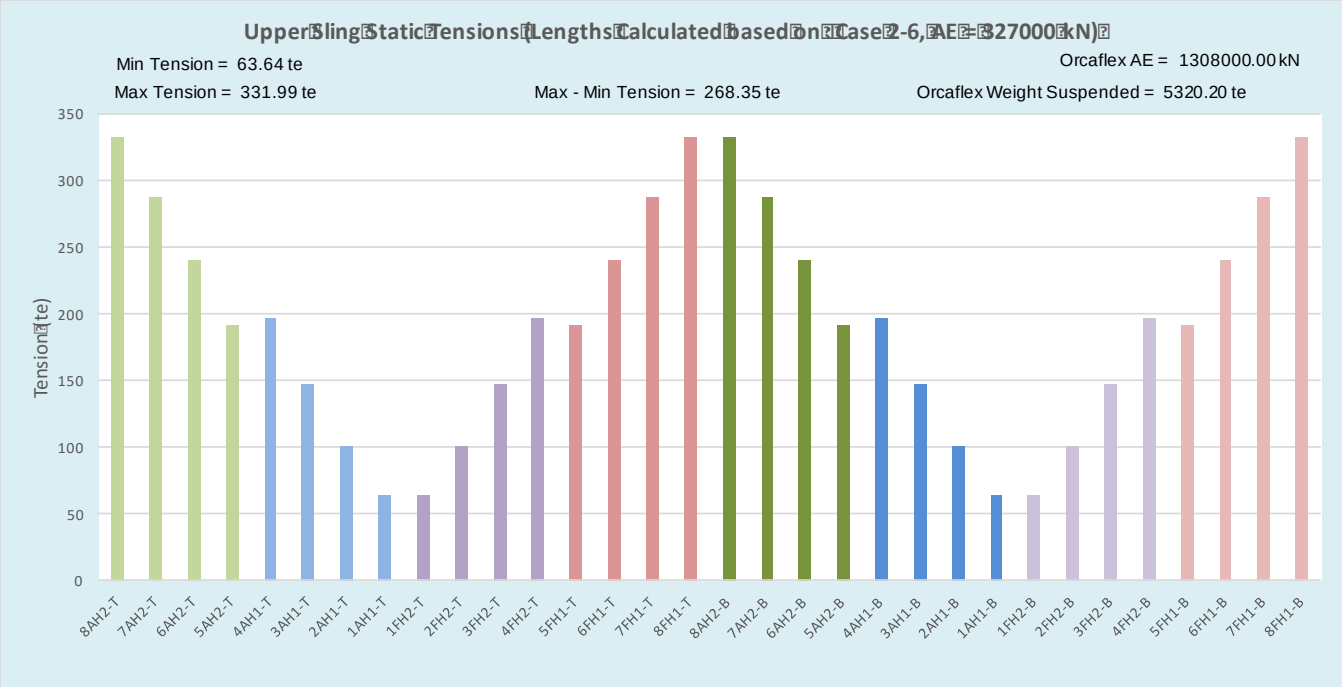
S.No	Description	Actioner	Due Date
1	Issue dynamic bow lift Global FE analysis report	STA	24 Mar 2016
2	STA Preliminary Report on risks and Instrumentation/monitoring	STA	24 Mar 2016
3	Issue updated Bow lift hull FE report	STA	24 Mar 2016

Discussions Notes:

- General (WPS, MF, LY)
  - Project Schedule as per information provided on 18th Jan 2016:
    - Bow Lift - 1st May 2016
    - Submerged Side Lift – 13th July 2016
  - A high level risk management and monitoring requirement document will be issued.
- Bow Lift
  - A bow sling may exceed 400 mT capacity for a significant wave height (Hs) of 1 m and 7s wave period. **Mitigations** are required:
    - If bow slings 3 and 4 pull more load, the vessel will heel.
  - Analysis with measured data is performed and report will be released.
  - Bow lift Hull analysis report is expected to be released
  - Bow Sling Failure Concerns
    - TMC and STA continued to express concern over strength of attachment of Sling 1 (continuously attached to Sling 2) to Sewol at bow hawse tube.
- Submerged Side Lift
  - Sling data – AE Values Urgently Required
    - Sling elongation test data is **incorrect and not useful**. SSC mentioned it belongs to the material.
    - STA has issued note to SSC on problems with sling tests (attached with these minutes).
    - STA to send a further clarification notes to SSC regarding required data and SSC to pass on to Juli Ropes
  - Examples of sling tension variations with sling AE values were presented. If the slings are manufactured to lengths calculated on a value of AE that is lower than the as-built AE value, the sling tensions will be poorly distributed. Possible tension variations are illustrated in the figure below.

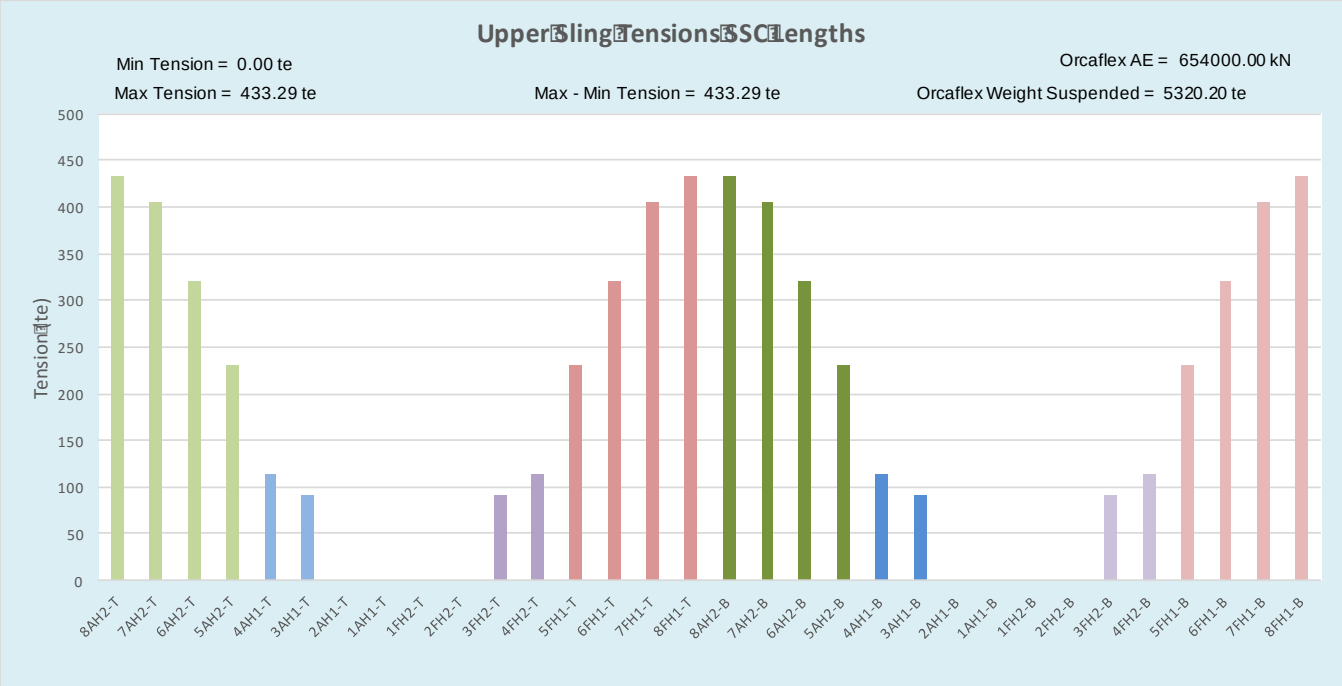


The above static sling tensions result from using sling lengths calculated based on a "correct" AE value, which is the same as the as-built AE.



The above static sling tensions result from using sling lengths calculated based on an incorrect AE value (that is too low) when the correct AE value is much higher.

- The sling tension distribution is highly sensitive to the manufactured length of slings.



The above static sling tensions result from using sling lengths provided by SSC in DOC-R023-A08-001 and the probable AE value anticipated by STA.

The differences in SSC lengths and STA lengths are a maximum of about 0.53 meters. Length comparisons are shown in the table below.

Comparison of Sling Lengths in meters			
SSC Group Number	**SSC Lengths 03/15/15**	**STA Lengths for AE mean**	**Difference STA-SSC**
8	62.00	62.125	0.125
7	64.10	64.187	0.087
6	66.70	66.943	0.243
5	70.00	70.256	0.256
4	70.00	70.381	0.381
3	73.50	73.975	0.475
2	77.50	78.074	0.574
1	81.90	82.520	0.620

Attendees:

Name	Initials	Company
Bil Stewart	WPS	STA
Mike Fitzgerald	MF	TMC
Luis Yu	LY	SSC
Amitava Guha	AG	STA
Will Ashley	WA	STA
Vamsee Achanta	VA	STA
Manoj Pydah	MP	STA

Two relevant emails are attached.

October 28, 2015 email

Bil Stewart <stewart.bil@gmail.com> Wed, Oct 28, 2015 at 6:50 PM
To: 刘雨 <ly@coes.cn>
Cc: 技服中心 <ec@coes.cn>

Dear Louis:

Can we get test data for load-extension curves from 20% to 40% MBR, cycled at least 100 times, then returned to zero, followed by another set of cycles from 20% to 40% MBR, cycled at least 100 times. Permanent elongation needs to be recorded. Data needs to be in Excel format. Cycle time from 20% to 40% and back to 20% should be 10 seconds. Hence 100 cycles will take 100 x 10 = 1000 seconds.

Kind regards, Bil.

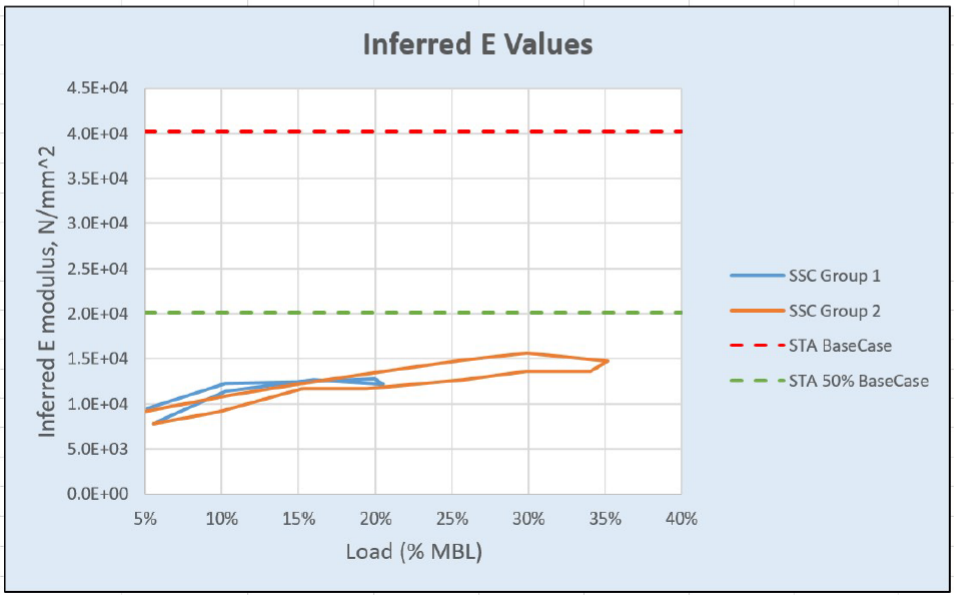
March 16, 2016 email.

Dear Luis:

The sling load/extension tests reported in DOC-R023-C09-001 are not for the final slings. They are on smaller slings with MBL, or theoretical break load, of only 1,440 kN and 35 mm diameter. DOC-R023-C09-001 does not contain any useful data.

The actual slings (that have been shown on SSC drawings for several months) are specified to have an MBL of about 20,000 kN and a diameter of 104 mm. The ratio of the nominal areas of the actual/tested slings is 8.8, but the ratio of the actual/tested break strengths is 13.6. This implies a higher elastic modulus, or E value, in the larger slings.

The derived E modulus values from the test results in DOC-R023-C09-001 is a maximum of about 16000 N/mm^2. Earlier data from other sources, including the various data sets from Jiumax some months ago, showed values **five to ten times higher** than this, based on load extension tests and using the nominal diameter to find the area. A comparison is provided in the chart below. Our highest estimated possible E modulus values are off the chart.



One expected trend seen in the data provided for the small slings (DOC-R023-C09-001) is that the derived E value is not a constant.

March 16, 2016 email continued.

Very confusingly the document DOC-R023-A08-001 (received yesterday) contains Jiumax data in Appendix 2, but you have told us that the Jiumax slings are not being used. However, in DOC-R023-A08-001 an elastic modulus, or E value, is stated for the Jiumax slings as 8.3E3 N/mm^2 (MPa).

Jiumax Data from Appendix 2, 03/15/16					
D	A	E	A x E	MBL Load	dL/L at break
104 mm	8495 mm^2	8305 N/mm^2	7.05E+04 kN	19620 kN	0.03
104 mm	8495 mm^2	8305 N/mm^2	7.05E+04 kN	19620 kN	0.05

The extension at break is stated by Juli Rope company in Appendix 2 to be 3% to 5%. This enables the following table to be made:

	STA Derived Values		
dL/L at break	AE = Load/(dL/L)	(A x E)/AE	Resulting E
0.03	6.54E+05 kN	0.11	7.70E+04
0.05	3.92E+05 kN	0.18	4.62E+04

The resulting E values are 7.70E4 and 4.62E4 N/mm^2, based on the sling area calculated from the nominal diameter. Clearly the E values do not match. They are up to **ten times higher**.

WE URGENTLY NEED REAL TEST DATA FOR THE ACTUAL SLINGS.

We have wasted a lot engineering time because of the sling data uncertainties. The sling stiffnesses are critically important to the dynamic lift simulations and to the dynamic hook loads.

Kind regards, Bil.