Installation of New Beitstadsundsbridge in Steinkjer, Norway.

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ABSTRACT

SARENS has installed total of six bridge sections of the new Beitstandsund bridge at Steinkjer, Nord Tronsdelag in Norway. All bridge sections are being pre-assembled up in Malm. SARENS scopes includes the inland transports of new bridge sections and their installation on final positions. SARENS used one of our 1.600 tons capacity crawler crane on one of our 330ft barges from our facilities at Ghent (Belgium) to the project site. To bring the bridge sections in the right position under crane hook block reach, SARENS is using two sets of our SPMTs. Then all bridge sections will be picked up with the crane on the barge and sailed by around 3 km to the final bridge location.

KEYWORDS: New bridge decks, installation, CC880-1, barges, tugs, SPMTs (Self-Propelled Modular Trailers).

1. Introduction

SARENS has performed the installation of the new bridge over the Beitstad sund between Steinkjer and Verran.

A total of six bridge sections were installed till July 2019 for the construction of the new 580 m long bridge. All bridge sections are being pre-assembled up in Malm.

Other installation methods were studied as launching (but variable steel box height made it too complicated) or advanced cantilever segments at piers, but finally SARENS' proposal was selected as the most competitive one.

SARENS transported these six bridge sections from Malm about 5 kilometers via water to Nord-Trøndelag. Sarens deployed the barge Paula and two tugs, Neptune and Balder, for the transport operation.

SARENS scopes includes the inland transports of new bridge sections and their installation on final positions at the project site at Steinkjer.

SARENS transported a 1.600 tons capacity crawler crane (Terex-Demag CC8800-1) on Paula, one of our 330ft fleet barges, and towed from our facilities at Ghent (Belgium) to the project site at Malm by means of a tugboat. Technical studies and arrangements to sail all the crane parts in one single shipment was by itself a very detailed engineering task. This sailing operation took eight days (see Figure 1).

The crane was partially rigged during transport (see Figure 2) and was completed and commissioned at site in 1,5 week time.

2. Features of bridge segments

The six bridge segment dimensions varied between 38,5 to almost 150 meter long and 5,5 to 15 meters wide (see details of each segment at Figure 3).

The lighter segment weighed 130 tons and the heaviest bridge section, which was the second one to be installed, weighed up to 780 tons.

3. Carne configurations

Two different crane configurations were required to install all bridge segments: one with SSL 84m main boom (for the four first lifts of the biggest sections that have to be installed one by one, see Figures 4 to 12) and another one with 120 m main boom (for the two remaining and smaller bridge sections at the abutments, see Figures 13 and 14).

The worst load case scenario for all the six bridge segments was in one of the abutments (see Figure 13) were the crane with configuration SSL and 120 meters of main boom had to install the 90t weight of the segment at 100 meters radio.

4. Installation of the bridge segments

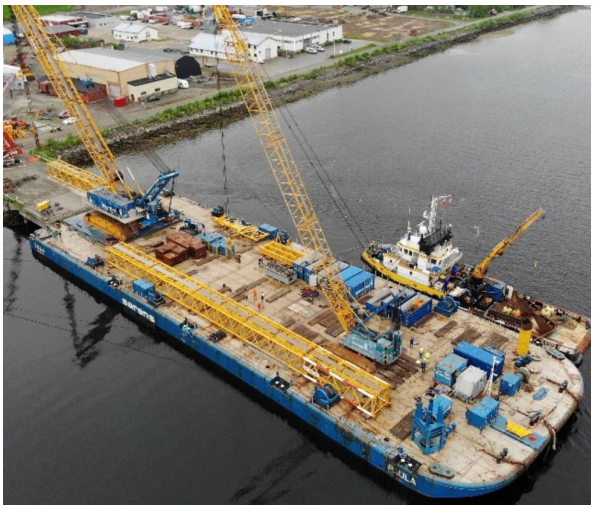
To bring the bridge sections in the right position under crane hook block reach, SARENS is using two sets of our SPMTs up to 24 axel liens for these approaches at Malm (see Figures 4 and 5). Operations were supported also by another SARENS CKE-2500 crane

Then all bridge sections will be picked up with the CC8800-1 on the barge and sailed by around 3 km to the final bridge location (see Figure 6).

The two smaller and last bridge sections were sailed all at the same time on the barge to save the amounts of maneuvers.

This was the first time a CC8800-1 crane had been used to install bridge elements from a Sarens barge, and its capacity and range made it an ideal choice for this operation.

To determine the barge positions for installing all the bridges segments it was required a detailed bathymetry study of the final bride area together with a combined study of the barge ballasting among the different installation spots.



Segment n°	Location	Weight (t)	Length (mm)	Width (mm)
1	Between axis 2 – axis 3	699	146.170	5.502
2	Between axis 5 – axis 6	779	148.847	9.000
3	Between axis 4- axis 5	602,4	112.034	5.502
4	Between axis 3- axis 4	443.8	93.200	5.502
5&6	Between axis 1 – axis 2	131	40.241	6.670
7&8	Between axis 6 – axis 7	205.5	38.445	15.140

Figure 3: details of all the 6 steel segments

Figure 5: General view of the first segment on SPMTs brought to the reach of the CC8800 (hooking phase).

Figure 6: General view of the first segment sailing from Malm to its final bridge position

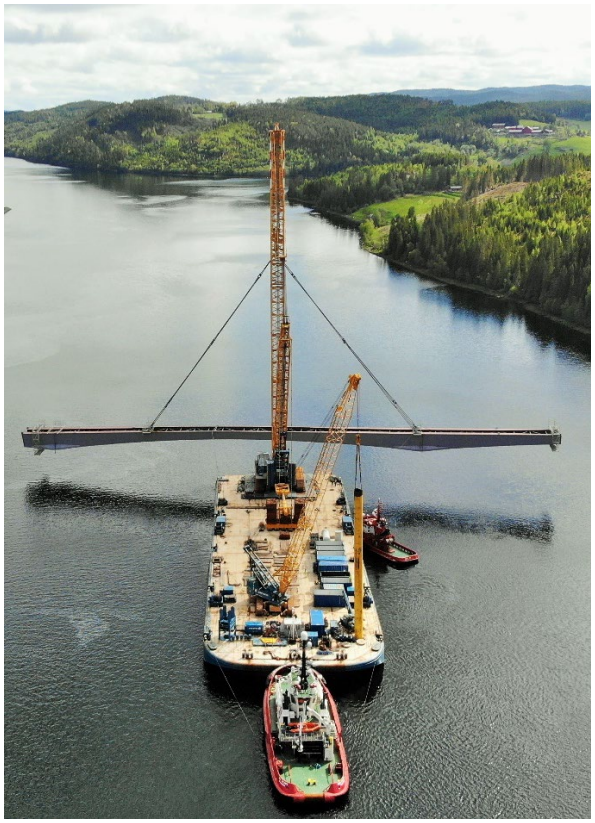


Figure 7: First segment sailing to its final position hanging form CC8800 on SARENS barge

One of the main challenges for theses lifting were not the movement of the crane (as usually) but the exact positioning of the barge as SARENS intended to minimize crane movements on the barge to only boom up and down to the installation radius.

All six bridge sections had to be installed in just two week time. The SARENS crew lifted the first segment on Day 1 and the sixth and final segment on Day 14. So, the operation was completed within a narrow timeframe of 14 days, as set by the client.

Along the next pages the reader can see several pictures showing the sequence of the complete installation of all these six bridge segments, from their prefabrication area at Malm till their final position on the bridge.

Acknowledgments

This operation was performed on behalf of client SRBG (Sichuan Road & Bridge Group). SARENS wants to thank the trust and confidence showed on us company for awarding this job to us.

SARENS is pleased to have been part of such an ambitious project, and would like to congratulate everyone who helped make it a success from the safety point of view till fulfilling the tied schedule, passing by a very complicated technical liftings.

Figure 8: General view for typical installation of one segment.

Figure 9: General view of the first segment arriving to its final bridge position

Figure 11: General view of the third segment installing at its final bridge position.

Figure 12: General view of the fourth segment installing at its final bridge position

Figure 13: Installation of the fifth segment. Worst load case: SSL 120 meters main boom, 90t @ 100 m radio

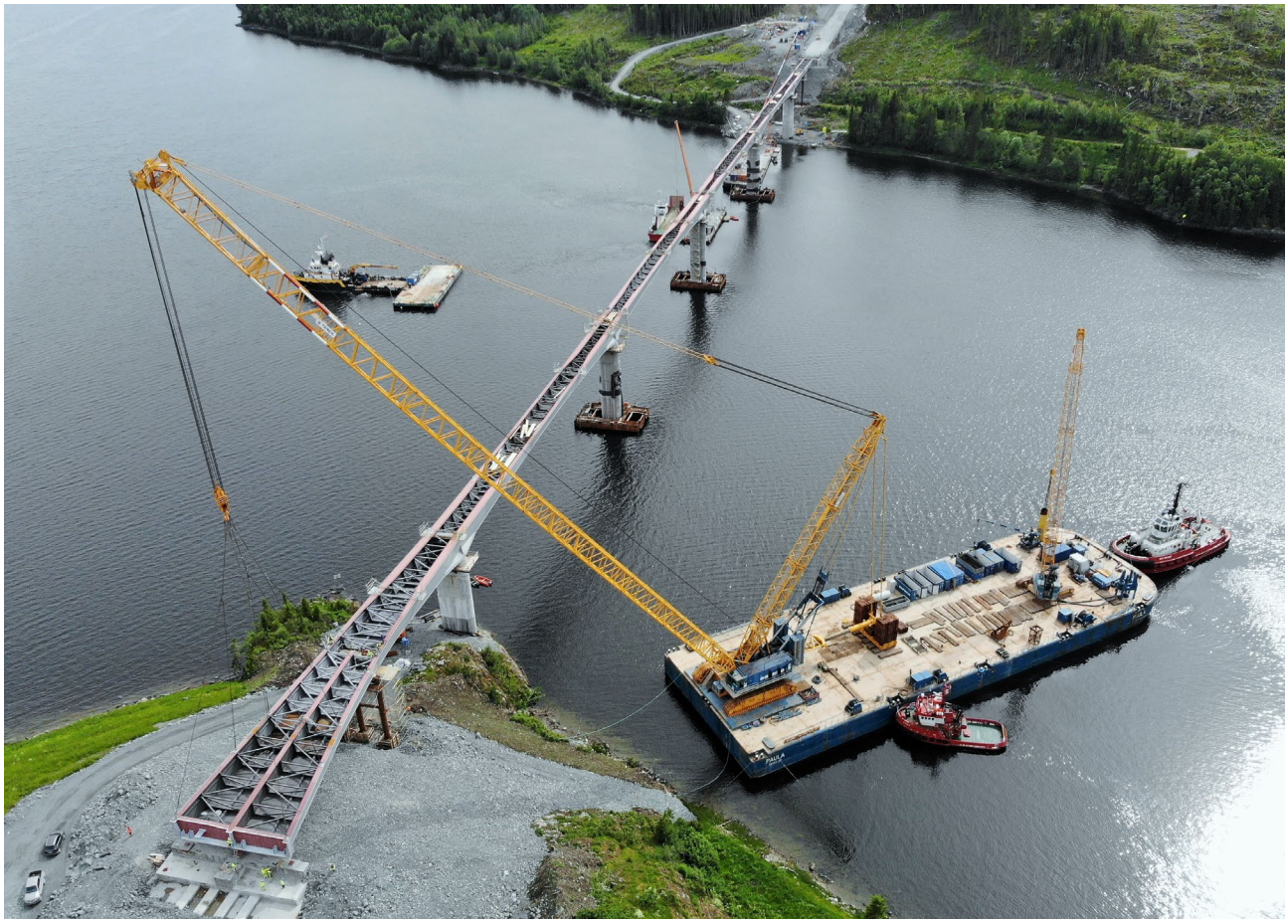


Figure 14: General view of the sixth and last segment installing at its final bridge position.