

Installation of New Soderstromsbridge in Stockholm - Sweden.

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ABSTRACT

SARENS replaced the Soderstorms South rail in the center of Stockholm. SARENS dismantled the 3 steel sections of the existing bridge and installed the 2 new steel sections bridges, all performed during the 8 weeks shut down of the rail tracks. The new bridge sections will be fabricated in Tallinn and SARENS sailed them to Sweden. There, they were transferred to a smaller barge able to sail through the locks and river/lakes until Västerås Harbour, where the two larger sections were welded together. Again these bridge sections were transferred to another barges able to sail until the jobsite, where they are storage temporarily. The installation of the major bridge section will be carried out by 4 at a time.

KEYWORDS: Replacement, bridge decks, barges, tugs, SPMTs (Self Propelled Modular Trailers).

1. Introduction

SARENS has successfully replaced the Soderstorms South rail bridge for the Getingmidjan project in the center of the city of Stockholm, Sweden.

SARENS dismantled the old bridge which was divided in three steel sections and installed new steel bridge which was divided in two sections.

All these operations had to be performed during the tied schedule of just eight weeks shut down of the rail tracks in summer 2019.

2. Features of the bridge sections

The old bridge was inaugurated in 1950. It had a total length of 235m with two main parts: one of 190 m (over 6 spans with a maximum one of 33,7m) and 21 m wide, and a second one of 45m (over 3 spans). The continuous steel girders of the bridge are resting on concrete pillars firmly anchored to the soil by numerous poles. A concrete deck was resting on these steel girders.

For the old bridge, three steel sections were replaced with the following main dimensions:

Two of 700t and 95m length, plus one of 300t and 45m length (see Figures 5 and 6).

For the new bridge, two steel sections (with a total same weight and shape as the old ones) were installed with the following main dimensions:

• one of 1.400t and 190m length (see Figures 7, 8 and 9), plus one of 300t and 45m length

3. SARENS' scope of works

The new bridge sections were fabricated at a steel shop in Tallinn (Estonia). SARENS had to loaded them out with SPMTs in our 400ft barge (named Caroline, see Figure 3) are were sailed to Södertälje Harbour in Sweden.

At this harbor, these bridge sections were transferred one by one to a smaller barge able to sail through the locks (like the one at Sodertalje, see Figure 2) and river/lakes to get into the Mälaren Sea until Västerås Harbour, where the two larger sections were welded together by the customer into one single piece of 190m long, weighing 1400ts.

Once again all these bridge sections were transferred to another two barges coupled in a row (with some intermediate Sarens Modular Barges SMB acting as spacers) able to sail until the jobsite at central Stockholm (see Figure 7), where they are storage temporarily around the 26th of June.

The old three bridge sections were removed by SPMTs on two barges with some additional steel structure on them to reach the right level. Two of these three old railway bridge sections were spanning the bay of Söderstrom (see Figure 5) and the remaining was over the road (see Figure 6).

Later on, these old three bridge sections were sailed and transported until Västerås Harbour, where they were loaded in again with the same SPMTs in order our client could cut them for scrapping.

The installation of the two new sections started by the small one of 300t. It was transported from Södertalje harbour to Stockholm, loaded in and then installed at its final position (see top part of Figure 9, already at final place waiting for the next big section). Finally, the installation of the major bridge section of 190 m and 1.400 tons was the most complicated manoeuvre and carried out by 4 barges at a time with SPMTs on them by 'float over' method This method consists basically on sailing first on just two barges along the longitudinal axis of the bridge section (over the shadow of the bridge, see Figure 7) and right before the final bridge place add another two barges at the edges of the bridge section (perpendicular to the previous ones) and then rotate 90^a those two original barges till they become also perpendicular to the bridge section (see Figures 8 and 9).

The turning of those barges below the bridge section is achieved by the SPMTs around a turning table with a vertical axis installed on the top of them.

Like this way, the bridge section can reach its final position leaving the pier among these four barges and not interfering with them.



3. Main equipments supplied by SARENS

For this project, SARENS deployed several seagoing and inland barges, as well as auxiliary equipment, including among others:

- Sarens seagoing 400ft barge Caroline (See Figures 3 and 4), 122m length, 36,6 m beam and 7,6m depth.
- Three inland barges including Sarens barge Jozef - Rosa (see Figures 5, 8 and 9) 51,85m length, 19m beam and 3,5 depth.
- Four sets of SMB used for the removal of the old segment (see Figures 5 and 6), installation of the new sections (see Figures 8 and 90 and spacer between the barges along the river/lakes (see Figure 7).
- Seagoing and inland tugs.
- Mooring and ballasting equipment.
- Up to 96 axle lines SPMTs
- Wide range of additional and temporary steel support equipment for barge deck heightening, stooling on SPMT and SMB.
- Stooling under bridge parts in Västerås during welding activities.

4. Schedule

All these bridge sections replacements (including the removal of the three old ones plus installing the two news ones) had to be performed on due time during summer 2019 along the short temporary 8 weeks shut down in of the rail tracks.

During 3 months, starting by the end of May'19 with the load out activities in Tallinn and completing the site works at Stockholm by the end of July'19, more than twenty SARENS specialists were involved somehow in all these manoeuvres mentioned above.

As reader can understand, it was really a huge challenge job it terms of organizing, coordination and planning all these required activities at Estonia and at the three different locations in Sweden.

Besides it, we have to manage a very tight time schedule plus a limited and tight operational space right in the heart of Stockholm during one of the most touristic holiday period.

SARENS team was able to finally achieve and combine all these requirements with the highest safety, quality and precision.



Figure 2: New bridge section passing section by Sodertalje lock

Acknowledgments

This operation was performed on behalf of client IMPLENIA SWEDEN AB and owner TRAFIKVERKET. 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 operations.

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



Figure 3: Load outs of three new bridge sections at Tallinn by means of SPMTs on Caroline SARENS 400ft barge.









Västerås Harbour to Stockholm final site place





Figure 9: Lateral view of new main bridge section (190m and 1.400t) supported on 4 barges close to its final place