

MARINE OCCURRENCE REPORT

BOTTOM CONTACT

BY THE BULK CARRIER "STEEL FLOWER"  
IN THE WELLAND CANAL  
28 APRIL 1996

REPORT NUMBER M96C0022

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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### Summary

While proceeding downbound in the Welland Canal, the "STEEL FLOWER" contacted the bottom at the side of the canal causing damage to the lower shell plating on the port side forward. The bottom contact likely occurred as a result of the vessel, which was drawing in excess of Seaway draught, experiencing bank/bottom suction.

*Ce rapport est également disponible en français.*

## Other Factual Information

### Particulars of the Vessel

Name	"STEEL FLOWER" ex-"FEDERAL RHINE"
Port of Registry	Panama, Panama
Flag	Panamanian
Official Number	7199
Type	Bulk carrier
Gross Tonnage	22,679
Length	222.48 m
Built	1977, Ulsan, South Korea
Propulsion	B & W diesel engine, 19,400 BHP; Kort nozzle with single fin; Bow thruster
Crew	26
Owners	Steel Flower Shipping S.A.

On 28 April 1996, the downbound "STEEL FLOWER" arrived at Port Colborne, Ontario, at the upper end of the Welland Canal. Drawing 8.11 m forward and 7.95 m aft, the vessel was in excess of the maximum permissible Seaway draught of 8.00 m. After attempts to correct the draught in Lock 8 failed, the St. Lawrence Seaway Authority (SLSA) ordered the vessel to proceed to Wharf 12 to do so. The vessel was able to reduce her forward trim, but when she left the wharf to continue the voyage, the "STEEL FLOWER" was still overdraught, at 8.03 m forward and 8.02 m aft. The SLSA had permitted the bulk carrier to continue her transit "under violation".

The pilot who had joined the "STEEL FLOWER" at Wharf 12 to take her as far as Lock 7, had been familiar with the vessel as the "FEDERAL RHINE". In clear calm weather, navigation on the night passage got under way at 1903 28 April, under the conduct of the pilot. The master left the bridge some time later, leaving the pilot, the navigating officer, and a helmsman on the bridge.

The "STEEL FLOWER" was passing mile No. 11 near the centre of the canal when the pilot ordered a course alteration to starboard to negotiate a change in direction in that section of the waterway, but

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<sup>1</sup> Although allowed to proceed, the vessel remains subject to prosecution and must leave a financial deposit with the Seaway Authority. In a case such as this, where the vessel is overdraught, the Seaway Authority must verify that all sections to be transited have the necessary extra water.

<sup>2</sup> All times are expressed in EDT (Coordinated Universal Time (UTC) minus four hours) unless otherwise stated.

the vessel did not respond to the helm. The pilot then ordered hard-a-starboard helm and full starboard thrust on the bow thruster, but the vessel continued to head toward the west bank at a shallow angle with no course alteration effected. The speed of the vessel at the time was approximately 4.5 to 5 knots, greater than the speed at which the bow thruster is effective. The pilot ordered a "kick" slow ahead, but quickly opted for full astern with the wheel initially amidship, before port helm was applied. The vessel continued toward the west bank, under full astern power, and eventually made contact with the rocky bottom before the way could be taken off her. An entry in the ship's log states that she touched bottom at 2104.

The master came promptly to the wheel-house when he felt the astern revolution vibrations. The "STEEL FLOWER" was quickly realigned and proceeded through Bridge 11. The pilot did not feel any impact as the vessel came to a stop and he did not notify the SLSA, as no damage was suspected. The master suspected that the vessel had touched bottom, but he did not insist on reporting to the Seaway Traffic Control.

When the vessel arrived in Lock 7, she was reported as having a significant port list which the SLSA asked to have corrected. By the time the vessel reached Lock 3, it was determined that a port list had developed again. When the ship arrived at the Cape Vincent pilot exchange area on the evening of 29 April, the boarding pilot noted that the vessel had a pronounced list. The SLSA ultimately directed the bulk carrier to Prescott, Ontario, where an underwater examination was carried out.

The examination revealed that the "STEEL FLOWER" had sustained damage on the port side forward. The damage consisted of an 8 m-long indentation with four fractures which extended forward from just aft of the No. 1 double-bottom tank at the turn of the bilge.

#### Aspect of the Vessel

As the "STEEL FLOWER" was approaching Bridge 11, the bridge operator noticed that the vessel was out of alignment for a period of three to four minutes and he notified the Welland Canal Traffic Centre. The Bridge 11 operator estimated that the vessel was at an angle of 25 to 30 degrees to the shore. The change in direction of the ship channel in this section of the canal is approximately 5 degrees. The bridge operator considered the "STEEL FLOWER" had approached to an estimated 7 m from the shore. The master judged that the vessel's bow had come within 10 m of the shore when the vessel stopped; this was disputed by the pilot as being 20 m.

In this vicinity, the canal is approximately 100 m wide, the ship channel is approximately 55 m wide, and it is a "no-meeting" zone. Seaway Traffic Control operates video cameras which are located above Port Robinson and below Bridge 10. The distance of these cameras from the site of the occurrence prevented them from being used to accurately determine the ship's aspect.

### Previous Bottom Contact

Before this occurrence, the "STEEL FLOWER" had run aground in the American Narrows on 10 April 1996, and repairs had been carried out in Detroit, Michigan, with the vessel afloat. On completion of the repairs, she proceeded to Toledo, Ohio, to load corn, arriving there on 22 April. Because of ballast problems, loading was interrupted on 23 April, and it was stated in the shore loading log that the vessel "sat" on the bottom. On 25 April, because of south-westerly gales, loading was interrupted again, with the vessel near loaded draught. At that time, there was little remaining underkeel clearance, and it is suspected that the bulk carrier may have "sat" on the bottom again as the water level decreased. However, as confirmed by the U.S. Army Corps of Engineers and dock personnel, the bottom at the berth is soft mud and silt. While completing loading, the vessel probably overloaded since the observed draught would have been incorrect until after the vessel left the dock, thus giving rise to an overdraught at Port Colborne.

### Operation of the Vessel

There had been a complete crew change, with the exception of the master, 45 days before this incident.

The engine-room crew experienced difficulty in pumping ballast at the time of loading in Toledo, which was attributed by vessel personnel to rusting pipes.

At the time of investigation, there was evidence of the previous grain loading on the vessel's decks. In general, the exterior and interior of the ship reflected a lack of maintenance and of cleanliness.

### Other Relevant Factors

The pilot indicated that no machinery difficulties or inadvertent wheel movements had contributed to the occurrence. He found that he had to anticipate for the quartermasters when giving helm orders and he was not impressed with the ability of either of the two who steered the vessel during the passage, but he also acknowledged that the ship was hard to hold on a steady heading. Some masters of Canadian vessels fitted with kort nozzles attest to the benefit of the nozzles when entering and departing locks. Further, they find that where more than one fin is fitted to the nozzle, the vessels' steerability increases in those sections of the canal where the vessels proceed at or near the speed limit.

Reportedly, pilots, and masters familiar with the area, tend to hold downbound vessels to the port side of the centre line of the canal, toward the west bank, when passing Mile No. 11. The channel in this vicinity follows the west bank which alters direction somewhat more abruptly than the east bank. The underwater slope of the east bank thus intrudes further into the canal in that area, increasing the

possibility of a vessel "feeling" the bottom.

## **Analysis**

The vessel had a recent history of bottom contact which involved the grounding in the American Narrows and "sitting" on the bottom in Toledo prior to the subject bottom contact in the canal. However, reference to reports of these events and the damage involved confirmed that the underwater port bow damage was incurred when the vessel contacted the bottom in the Welland Canal on 28 April 1996.

The Toledo loading berth does not have any outcrops of rock to create the type of damage sustained, and the diver reports indicated that the kind of damage found on the port bow had to have occurred while the vessel was moving ahead and was not static damage. The diver reports on the American Narrows grounding did not reveal any damage on the port side forward.

At Mile No. 11, a vessel in the centre of the canal, as the "STEEL FLOWER" was reported to be, is somewhat off the centre line of the channel, toward the east bank. Being overdraught contributed to the possibility that the stern of the "STEEL FLOWER" experienced suction from the east bank to an extent sufficient to prevent the vessel from responding to the helm. For the vessel to contact the bottom at the side of the channel, it was not necessary for her to be at an angle of 25 to 30 degrees to the course line as described by the witness. In fact, a vessel the size of the "STEEL FLOWER" would be aground forward and aft when less than 15 degrees to the line of the channel. It can be calculated that, proceeding at 4.5 knots, a vessel the size of the "STEEL FLOWER" would run out of the channel within approximately 3 ½ minutes if the five-degree alteration of course was not effected.

The vessel speed was estimated at between 4.5 and 5 knots, and this did not allow the bow thruster to initially assist in turning the vessel. In the event, the bow thruster did not prevent the vessel contacting the bottom when the speed diminished, and it could not be determined with certainty whether the accident could have been averted if more than a single fin had been fitted on the Kort nozzle.

Although the pilot found it difficult to hold the vessel's head steady on course and indicated that he was dissatisfied with the helmsmen, it is unlikely that the vessel contacted the bottom as a result of either the design of the steering gear or of the level of competence of the helmsmen.

## **Findings**

1. When the "STEEL FLOWER" arrived at Port Colborne to undertake a downbound passage of the Welland Canal, she was drawing in excess of the maximum permissible Seaway draught.

2. At the request of the SLSA, the vessel reduced her forward trim but was unable to reduce her draught to the Seaway maximum.
3. At the request of the vessel, the SLSA were able to give the "STEEL FLOWER" specific permission to continue her passage.
4. The "STEEL FLOWER" did not respond to the helm for a heading adjustment on passing Mile No. 11 and contacted the bottom at the side of the ship channel.
5. With the vessel deeply laden and toward the east side of the ship channel, the failure to respond to the helm was likely due to bottom/bank suction.
6. The pilot did not notify the SLSA because contacting the bottom reportedly did not involve an impact which would have suggested damage.
7. The SLSA subsequently diverted the "STEEL FLOWER" to Prescott to investigate the pronounced list the vessel developed as she continued through the Seaway.
8. The damage discovered by divers on the port side of the vessel on 03 May occurred when she contacted the bottom at Mile No. 11.

### **Causes and Contributing Factors**

The "STEEL FLOWER" was drawing in excess of Seaway draught and most likely contacted the bottom because the vessel experienced bank/bottom suction.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson Benoît Bouchard, and members Maurice Harquail, Charles Simpson and W.A. Tadros, authorized the release of this report on 17 September 1997.*