

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: February 14, 1978

Forwarded to:

Honorable William M. Cox
Administrator
Federal Highway Administration
Washington, D.C. 20590

SAFETY RECOMMENDATION(S)
H-78-1 through -4

On February 24, 1977, the SS MARINE FLORIDIAN, an oceangoing bulk sulfur carrier, was downbound from Hopewell, Virginia, in the James River en route to Newport News, Virginia. About 2 miles downriver from Hopewell, the vessel veered to the left (north) of the channel and away from the lifted center span of the Benjamin Harrison highway bridge. The vessel collided with the north pier of the north tower truss span of the bridge, 245 feet north of the lift span, collapsing one leg of the pier. The adjacent deck slab, north of the impacted pier, fell into the river, and the northern end of the truss span collapsed onto the deck of the ship. Two motor vehicles, which were stopped at drawbridge warning gates located immediately north of this pier on the deck slab, fell with the slab into the river. The occupants of these vehicles had fled from the span before it collapsed. 1/

This location of the gates allowed vehicles to queue behind the gates on a section of the bridge over water up to 23 feet deep. Large vessels could navigate up to the bridge in waters adjacent to this channel. A traffic control signal and a "blank-out" sign with the message "STOP - DRAW OPEN" and a stop line were located 20 feet north of the gates. A bell and another signal and sign with the "blank-out" message "STOP AHEAD - DRAW OPEN" were located 288 feet farther north.

This accident demonstrates the presence of two highway safety hazards that could exist at drawbridges nationwide: (1) bridge piers and spans that are vulnerable to impact by large marine vessels, and (2) the stopping of vehicles on sections of a bridge over navigable waters.

1/ For more detailed information read "Marine Accident Report - U.S. Tankship SS MARINE FLORIDIAN Collision With Benjamin Harrison Bridge, Hopewell, Virginia, February 24, 1977," (NTSB-MAR-78-1).

The Safety Board previously discussed these hazards in its reports of two accidents involving marine vessels and bridges in 1972. ^{2/} The Board also made recommendations (H-74-40 through -43) to alleviate these hazards after its investigation of a tug boat collision with the east span of the Lake Pontchartrain Causeway in New Orleans, Louisiana, on August 1, 1974.

Application by the Commonwealth of Virginia of FHWA guidelines issued in October 1974 in response to Board recommendations would have eliminated the hazard of stopped vehicles on bridge sections in this accident. Federal-aid Highway Program Manual (FHPM) Section 6.8.3.1(4c), Traffic Control Devices--Movable Bridges, requires that:

"...For all movable bridges, the protection for traffic is to be provided both by resistance gates which offer protective resistance to moving vehicles and by warning gates..."

Further in the same section:

"...For bridges that cross a long reach of water which may be impacted by large marine vessels, additional warning gates should be installed in positions to reduce the number of vehicles which would be exposed to hazards from marine navigation...."

and:

"The operation shall be so arranged that...after the warning gates are closed, a time interval shall elapse before the resistance gates come into position to allow traffic to clear the space between the gates."

Also, sections 4E-13 through 4E-17 of the Manual on Uniform Traffic Control Devices (MUTCD) discuss the design and application of signalling devices at drawbridges. However, neither the FHPM nor the MUTCD discuss proper signing and pavement markings.

The presence of these gating and signalling directives in two separate sources, and the lack of regulations for signing and pavement markings, impedes the efficient elimination of the safety hazards. All aspects of traffic control at railroad grade crossings are discussed in the MUTCD; this approach should be used for movable bridges. Where additional gates and clearance time as described above may not be feasible such as on multispan bridges over wide navigable waterways, positive surveillance and control of traffic operations could be achieved with a

^{2/}"Marine Casualty Report--SS AFRICAN NEPTUNE: Collision With the Sidney Lanier Bridge at Brunswick, Georgia, on 7 November 1972 With Loss of Life," (USCG/NTSB-MAR-74-4).

"Marine Casualty Report--Tug CAROLYN and Barge WEEKS No. 254 Collision with Chesapeake Bay Bridge and Tunnel, September 21, 1972," (USCG/NTSB-MAR-74-2).

system of closed-circuit TV and variable message signs with lane control devices. Such a system would be an application of provisions in Section 6.8.3.4 of the FHPM.

The hazard of bridge piers and spans that are vulnerable to impact by large marine vessels is covered in part by existing regulations. Title 23 USC 144, "Special Bridge Replacement Program," requires a classification of all bridges on federal-aid highways for safety and serviceability, and 23 CFR 650, Subpart C, states that bridges must be inspected at "...regular intervals not to exceed 2 years." However, there are no requirements, guidelines, or suggested designs by either the FHWA or the U. S. Coast Guard for the use of dolphins and fenders for the protection of bridge piers and bents. The Coast Guard does have some control of dolphin and fender use through its construction permit procedures, COMMANDANT NOTICE 3271 of August 17, 1973. The bridge classification/inspection program of the FHWA does not require a determination of the maximum load that can be sustained by a bridge pier from floating debris or impact by vessels.

Therefore, the National Transportation Safety Board recommends that the Federal Highway Administration:

Study and publish a report on the completeness and effectiveness of its bridge classification/inspection program under 23 USC 144, 23 CFR 650, and the AASHTO "Manual for Maintenance Inspection of Bridges" Part 2.5, especially as to bridges over navigable channels, for their ability to sustain pier impact at water level and for the design of the traffic control system on the bridges. (Class II, Priority Action) (H-78-1)

Work with the U.S. Coast Guard to develop specifications for the design of dolphins, fenders, and other energy absorption and/or vessel redirection devices for the protection of both bridge and vessel during an accidental impact. Issue these design specifications along with guidelines and requirements for the placement of dolphins, fenders, and energy absorption and redirection devices. (Class III, Longer Term Action) (H-78-2)

Bring together in one publication all guidelines for traffic control at movable bridges, including signs, signals, pavement markings, and restraint devices. (Class II, Priority Action) (H-78-3)

Include as part of the Federal-Aid Highway Program Manual 6.8.3.4 Paragraph 5d(3), "Special Purpose Surveillance and Control Systems," a description of surveillance and control systems used on multispan bridges over wide navigable waterways. (Class II, Priority Action) (H-78-4)

BAILEY, Acting Chairman, McADAMS, HOGUE, and KING, Members, concurred in the above recommendations.



By: Kay Bailey
Acting Chairman