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ISO 9001
Certificate No. 38806

9 September 2013

Mazatlan Evaluation 2013

OVERVIEW

This report describes the results and conclusions of a brief simulation study of a turning basin and twin finger piers installation at the port of Mazatlan. Currently, the port of Mazatlan hosts visiting car and passenger ferries at the ferry terminal located near the harbor entrance. Present plans are to relocate this terminal and accompanying piers to a new location in the inner harbor, nearer to the city center.

During the previous study conducted in March 2012, a channel extension 150 meters wide and 10 meters deep extended the current harbor channel. A 360 meter diameter turning basin was located at the end of this channel, and two new piers, were installed at the newly located terminal. Simulation testing, as part of that study, indicated that the channel and turning basin were adequate in size and depth to support the safe operation of the ferry vessel tested. The pier design, while adequate for vessel operations, did present some limitations for maneuvering vessels, when higher wind velocities were experienced. Project results suggested a redesign of these piers should be considered.

The focus of this project was to examine a slightly reduced turning basin, and redesigned piers. The one-day evaluation was conducted at STAR Center, located in Dania Beach, Florida on 3 September 2013. **Figure 1 – Project Plan** is provided below:

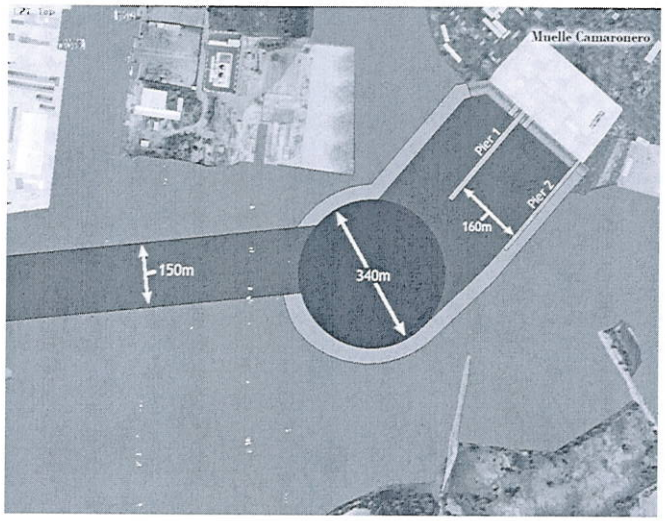

Figure 1 – Project Plan

PARTICIPANTS

An experienced Mazatlan Pilot assisted in the study. He provided assistance and expert opinions concerning the harbor and local weather conditions. He actively participated by operating the test vessel during all simulation exercises. A port official attended all simulation exercises as an observer, and provided specific observations concerning the redesign project. STAR Center provided a senior researcher, simulator technician, simulator operator to operate and record data, and a project facilitator to observe simulations, and conduct debriefings at the conclusion of each exercise.

SIMULATOR MODEL

The ship response model of the ferry "Blue Horizon" was the vessel utilized in simulations. This vessel model was available from STAR's library of vessel models, and it had been used in prior simulation studies at the port of Mazatlan. "Blue Horizon" is a passenger/car ferry closely resembling the ferries currently servicing the port. Ship particulars for "Blue Horizon" are provided below:

VESSEL PARTICULARS

Vessel Name	Blue Horizon
Condition	Loaded
Displacement	15,700
Wind Profile	3,985
LOA (m)	187
Beam (m)	27
Draft (m)	6.4
Propulsion	Diesel Elec.
Shaft HP	14,684
Propeller	2 (V) (OT)
Max Rudder	35

V= variable pitch OT= outboard turning

TUGBOAT

The port of Mazatlan has at its disposal, modern tractor type tugboats of approximately 4,000hp. Use of a tugboat by transiting Ferries is mandatory at the port. They may stand-by for use, or actively assist as directed by the Pilot/vessel Master as conditions warrant.

GEOGRAPHIC DATABASE

The geographic database of the port of Mazatlan was already available at STAR Center having been utilized in previous studies. The database and harbor bathymetry were modified to represent a "model of the future" representation of the port as identified in the proposed plan submitted by the client. The modifications include extension of the navigation channel, delineation of the turning basin, and specifications of the two piers contemplated for construction. Depths in the channel, turning basin, and the pier area are 10 meters as called for in the proposed plan.

Extended Navigation Channel

The extended 150 meter wide navigation channel was previously examined and proved to provide adequate transit and maneuver room for the vessel in all conditions tested.

Turning Basin

The 340 meter diameter, 10 meter depth turning basin is located at the end of the navigation channel immediately adjacent to the two piers. It provides maneuver room for vessels to turn 180 degrees upon arrival or departure.

Piers

The plan includes the installation of two finger piers. Pier length of the northern pier is 237 meters and the pier length for the southern pier is 241 meters. The distance between piers is 160 meters. For the purposes of this report, the northern most pier is referred to as Pier 1, and it provides two berths, north or south side, for use by the ferries. The southern pier is referred to as Pier 2, and provides one berth on its north face. Depths at the berths were 10 meters.

ENVIRONMENTAL CONDITIONS

Winds in the area are generally from the Northwest and South. Winds selected for use in simulations were predominantly from the NW because pier orientation running generally NNE/SSW direction caused winds to be nearly abeam on vessels approaching or departing any berth. Wind velocities were 15 to 25 knots, the upper limit for safe maneuvers in order to challenge the shiphandler with worse case scenarios.

Tidal currents, anticipated to be 0.5 knots or less in the harbor interior, in the vicinity of the turning basin and berth area, were not considered a significant factor, and not used in simulations. Exercise particulars are presented in **Table 1 – Run Matrix** provided below:

Table 1 – Run Matrix

Run#	Direction	Wind Dir/Spd	Berth Side Pier #1	Tug Placement	Comments
1	Inbound	NW/15	north	SB	
2	Inbound	NW/20	north	SB	
3	Inbound	NW 15/20	south	PB	
4	Inbound	NW 20/25	south	PB	
5	Inbound	S 20/25	south	PB	
6	Outbound	NW 20/25	north	SB	Near channel boundary
7	Outbound	S 20/25	south	PB	

Tug placement SB = Starboard Bow; PB = Port Bow

TEST PROCEDURES AND RESULTS

Inbound simulation runs commenced with the vessel in the extended channel just west of the turning basin at a speed of approximately 4 knots. The vessel was turned in the basin to moor stern-first at each berth. The run ended when the vessel was in the berth parallel to the pier at minimum or stopped speed.

Outbound runs commenced with the vessel in the berth, parallel to the pier with mooring lines released, and zero speed. Runs ended when the vessel was clear of the pier and entering the channel.

The ferries utilize Pier 1 which offers a north and/or south berth at the terminal. Pier 2 provides a single berth on its north face for miscellaneous commercial vessels. Because the pier 2 berth usage could limit maneuver room at pier 1 south berth, a 32.2 meter wide, pamamax tanker was moored in that berth.

Arriving ferries, because wind velocities were in the upper range, used a tugboat on the bow to assist in each docking and undocking maneuver. Most maneuvers were successfully completed with the exception of run #6. In run #6 the vessel set uncomfortably to the southern boundary of the channel. This fact was possibly due to momentary inattention by the shiphandler, and not indicative of vessel/tugboat capabilities. Pilot oral remarks indicated that 20 knot winds should be the upper limit for routine arrival and departures, higher winds would be conducted on a case-by-case basis. The possibility of utilizing a second tugboat was not mentioned, but would be a consideration in such cases. ***Run Evaluation Forms*** completed by the participating shiphandler and ***Track Plots*** accompany this report.

CONCLUSIONS

Testing indicates that the 150 meter wide navigation channel does provide an adequate transit lane for arriving or departing ferry vessels in all conditions tested.

The 340 meter diameter turning basin provides ample maneuver room for safely turning the ferry in all conditions tested.

Pier 1 does provide ample maneuver room at its north berth to safely dock and undock the ferry in all conditions tested. The south berth also provides ample maneuver room to safely dock and undock the ferry, even when pier 2 is occupied by a panamax vessel. There is ample maneuver room for an assist tug to work alongside the vessel in both berths.

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