Progress Report 1
PP-2308 Dry Dock Block Indicator System

01 May 2023
Rev A

Prepared for:

National Shipbuilding Research Program

Prepared by:

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Category B Funding: Data developed partially with funding from project participants that was not charged to a government contract, and partially with government funding.

Contents

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1. Executive Summary

This document summarizes the activities since the start of the project to date. This document is a preliminary / rough draft of the final report, with portions or sections written as the engineering related to those section is performed. The intent is to continue to add, revise, and expand this report until the final report is completed.

As of the date on this report, the main system components have been identified and ordered. Their expected delivery is approximately 12 weeks (end of July delivery). Prior to receiving the materials, the system programming and all other ancillary components (such as power supply, cables, etc.) will be designed and ready for assembly and bench testing once the main components are received.

2. Introduction

Divers are often used when drydocking after vessel touchdown but before the main lifting sequence to confirm that all of the blocks are properly contacted. If the diver inspection indicates that the blocks are not properly contacted by the vessel being lifted, the dry dock operator has the chance to submerge and re-align the vessel or abandon the drydocking prior to lifting a vessel and possibility damaging the vessel or the dry dock.

Two challenges that occur when using divers in drydocking is reliability and visibility. Unfortunately, a large percentage of dry dock accidents are a result of issues with divers. Miscommunication, lack of knowledge, or confusion of the divers can give a dock master bad information when lifting a vessel. Furthermore, even a well-informed experienced diver can have issues when diving in locations with poor visibility. In some locations, visibility can be as low as six inches. This makes the reliability of divers worse and exposes diving personnel to risk of injury or loss of life. The proposed system could be a less expensive package for obtaining reliable information and reducing diver time.

An additional benefit of this system is to get real time data of the touch down and landing of vessel. With use of hauling blocks, this system gives the ability to see when the hauling blocks are contacting the lifted vessel. Due to safety concerns, divers are unable to be in the water near blocks while they are being hauled, and divers are only used after hauling to confirm contact between the lifted vessel and the hauling block.

This paper describes the use and increased safety during dry docking when using a block contact indicator system as described herein. This paper also briefly discusses the design, components, and installation of the system.

If successful, the project will lead to the widespread use of a dry dock block contract indicator system throughout the industry, providing dock masters with more feedback during docking and greatly increasing safety for the vessel being dry docked and the dry docks themselves.

3. Progress Report

Since award, DM Consulting has accomplished the following tasks / activities since the project award:

<u>Accomplished to Date:</u>

- Wrote project execution plan
- Further researched and refined the functional requirements of the system

- Advanced the design of the system
- Verified and ordered the major components
- Prepared project timesheet and invoice templates for the project
- Prepared this document

Planned Activities for Next Month

- Continue detail design of the system including cables and other ancillary items
- Procure the cables and other ancillary items
- Begin writing code for the micro controller
- Update this document

Major and Noteworthy Changes to Project

- None for this revision

The remainder of this document represents the current revision of the final deliverable that will be issued at the end of this panel project.

4. System Functionality & Design

The system will consist of three main components.

System Functionality

The goal of the system is to place sensors at specific or targeted dry dock blocks so that a dock master can have real-time verification that the vessel being lifted is in contact with the dry dock blocks. The system will be able to detect a vessel as it approaches the blocks within a few inches as well as detect the moment of touchdown and even post-contact crushing of the soft cap.

The information provided by the system is intended to allow the dock master to pause, investigate, and take corrective action if / when the blocks are not loaded as anticipated.

Contact detectors will be mounted to the specified blocks (varies per naval architect for each docking) prior to submerging the dock. Once the vessel is within the detectable range, the sensors will contact the vessel will start to actuate the sensors. A micro controller located in the dry dock control room and connected to the sensors by cables will process the sensor information and then make the information available to the dock master on a display. The dock master will then interpret the information to determine what, if any, corrective actions are needed.

Contact Detectors

The first component will be a set of linear transmitters (or detectors) that are mounted on blocks. These transmitters will be waterproof to at least the maximum depth of the 100 ft. They will be designed to detect when a vessel contacts the block, but also allow for overtravel / compression of the block without damaging the vessel, the blocks, or the switches. The exact location of the transmitters will be strategically located to provide full block contact indication. The minimum envisioned transmitter locations would be the first and last keel block and at least one side block per side of the vessel. The system will be designed to have additional transmitters for more complex dockings. Finally, the transmitter will be designed so that it returns a low signal even when not activated so that the indicator board can have an “off scale zero” indication as well.

Instrument Cables

The second component will be the wires / cables connecting the switch to the indicator board. The wires will also be designed for submergence of the dry dock. The system will be run on low voltage power (50V or less) so that divers may still operate in the vicinity of the blocks without restriction. Additionally, the cables, while they will be suitable for installation in 'rough service' environments, still need to be suitably protected. Selection of the cable materials and construction together with installation techniques combined with steps to protect the cables will be utilized to enable the use of less expensive non-armored cables.

Micro Controller & Operator Interface Terminal

The third component will be the micro controller with attached Operator Interface Terminal indicator board. This device will receive signals from the dry dock block contact transmitters ~~detectors~~. Using these signals, it will process and then display the signals into the dry dock control room.

5. Installation

Hold for development.

6. Procurement Information

The system components ordered so far as listed below.

Dry Dock Block Indicator System Cost Tracking				
Line No.	**Description**	**Unit Cost**	**Qty**	**Cost**
1	Sensors (Linear transmitt	$ 1,425	4	$ 5,700
2	Micro 800 PLC	$ 362	1	$ 362
3	HMI	$ 2,666	1	$ 2,666
4	Power Supply	$ 72	1	$ 72
5	Programming Cable	$ 52	1	$ 52
6	HMI to PLC Cable	$ 52	1	$ 52
7	Analog Input Card	$ 221	1	$ 221
	Total Cost			**$ 9,125**

7. Risk Management

Technical difficulties during testing and analysis

Delays in procurement due to material availability

Budget overruns due to unexpected costs

8. Dockings

Hold for development.

9. Interpretations of Indicators

Hold for development.

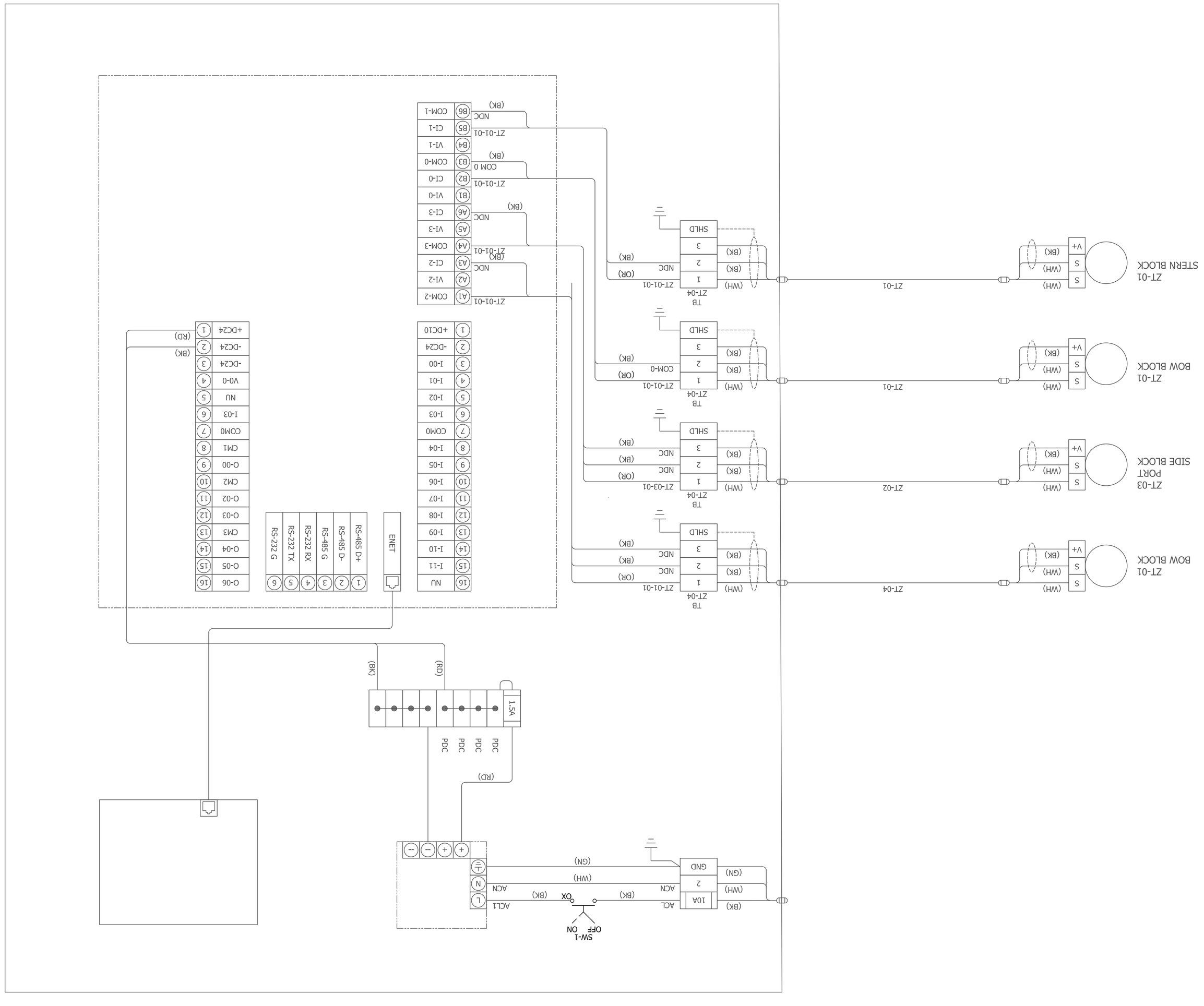
10. Recommended Future Changes

Hold for development.

Appendix A. System Block Diagram

The following items are contained within this appendix:

1. Control Panel Wiring Diagram: Preliminary
2. Control Panel Layout: Preliminary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ZT-02
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S
V+
SHLD
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RS-485 G
RS-232 TX
RS-232 RX
RS-232 G
+DC24
-DC24
VO-0
NU
CM0
CM1
CM2
CM3
1.5A
PDC
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ON
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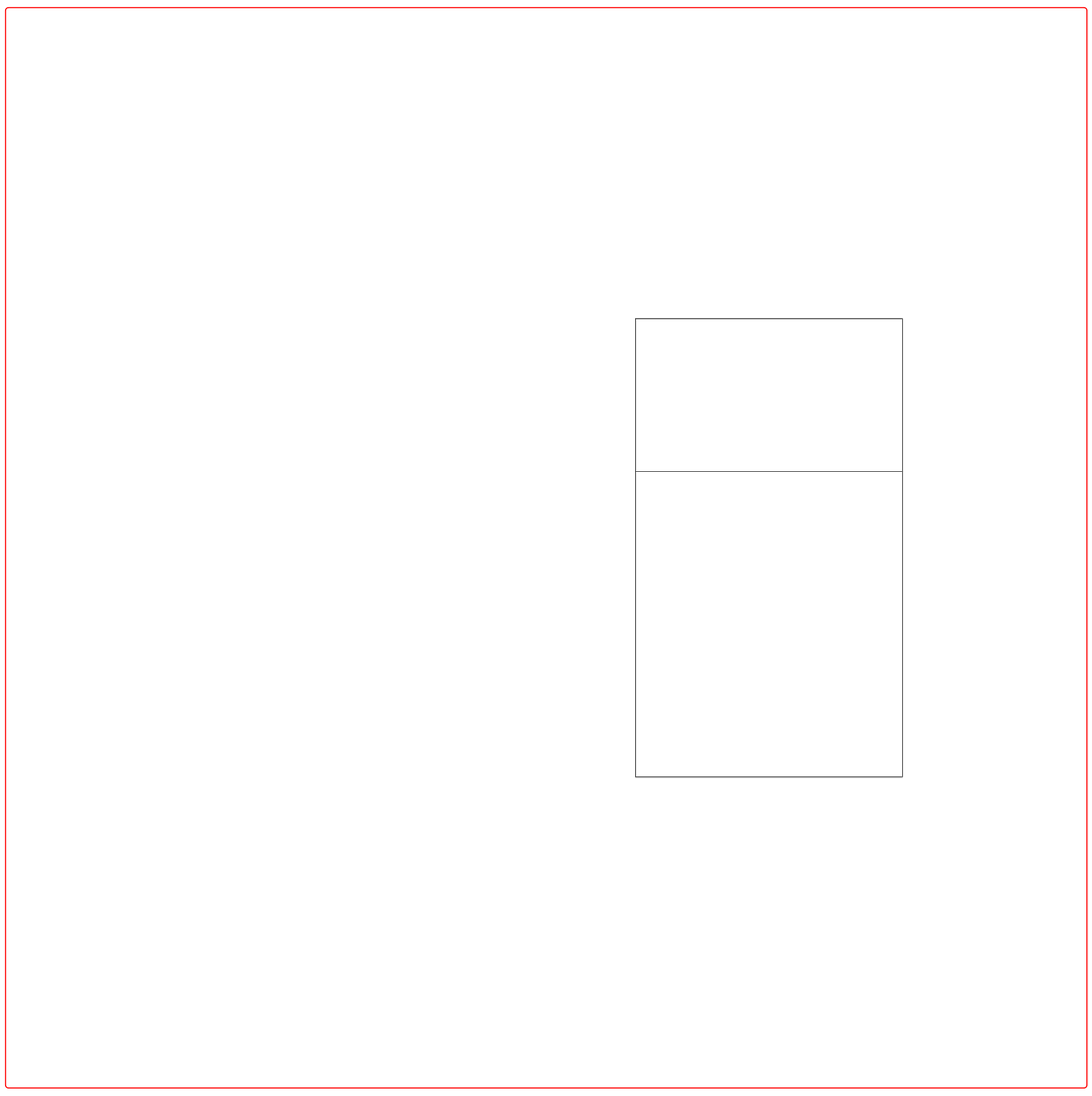

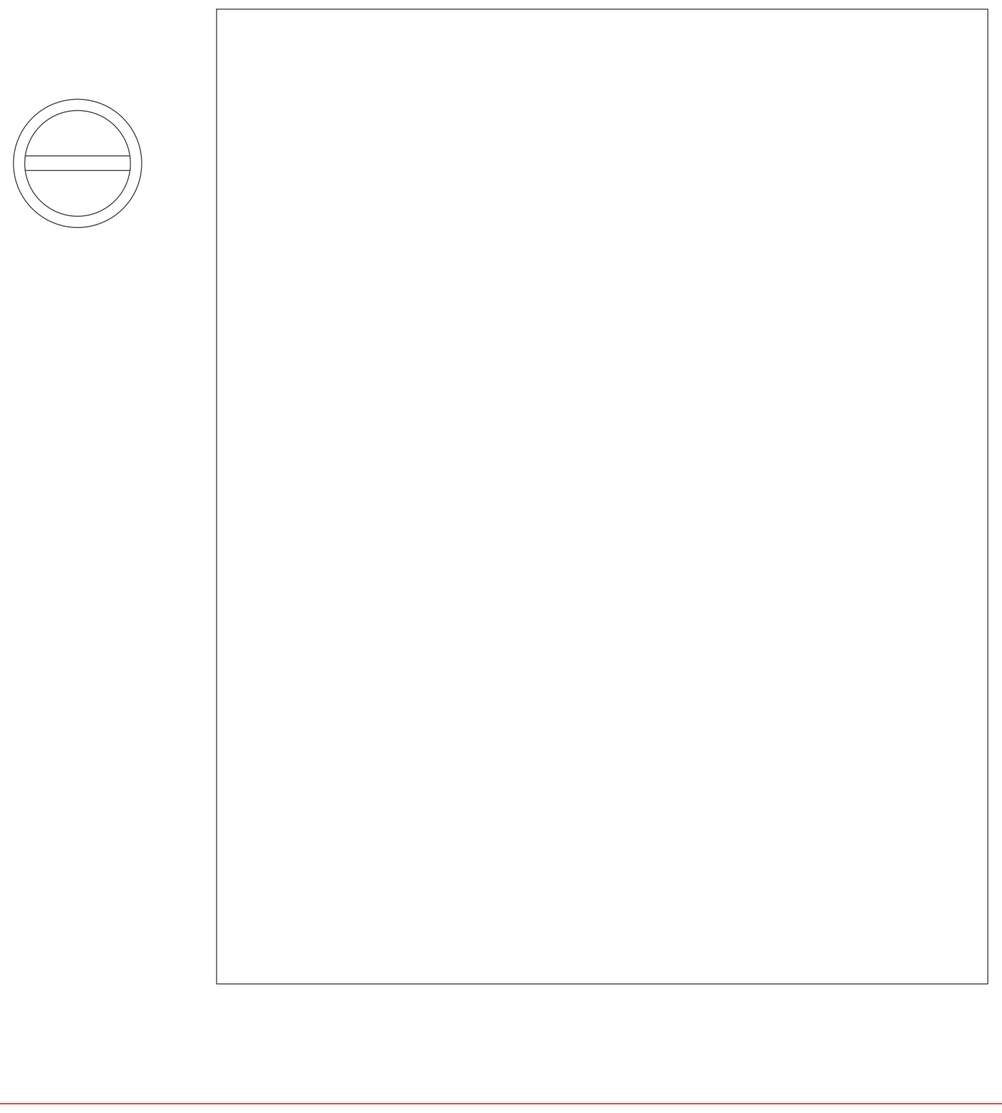

CAD FILE: STS-20-XX-XXX Hybrid Tug Template rev A.3dm