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Ice tank dive ladder

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SUMMARY

This report discusses the objective, criteria, and design of a new dive ladder for the Ice Tank. Redesign should allow divers easier exit from the tank and should eliminate the need for a second ladder occupying valuable space.

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ICE TANK DIVE LADDER

SR-2006-24

Grant Parr

August 2006

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1.0 – Introduction

This project is a response to issues raised by the staff of the IOT ice tank. Currently two ladders are used in the ice tank. The first ladder is the dive ladder and has a diving platform about 4 feet below the top of the tank. This is used primarily for performing dives in the ice tank. The second ladder is a standard extension ladder that is used to access the bottom of the tank when the water has been drained. A secondary use of the extension ladder is to assist divers in bringing weights from the bottom of the tank to the surface.

The main problems with the current ladders are that they occupy too much lateral space at the end of the tank, and that it is very hard to exit the water using a vertical ladder when the ice tank carriage is overhead and thus limiting head room.

2.0 – Design

At first it was suggested that the existing dive ladder, shown in Figure 1, be modified so that a ladder at an angle of 30 degrees could be used to exit the tank. Additionally, a removable ladder section would be added to the bottom of the existing dive ladder to extend to the bottom of the tank. This would eliminate the need for the second ladder, and thus require less space along the back end of the tank. The inclined ladder and extra lower ladder that were proposed can be seen in Figure 2.

The disadvantage of modifying and adding to the current ladder in such a way is that the dive platform, the area in which divers stand while preparing to enter and exit the tank, would be eliminated. This was unacceptable and as a result it was proposed that a new idea be considered.

It was proposed that a new ladder be created from scratch. The new ladder would incorporate all the features required including an inclined ladder that extends all the way to the floor of the ice tank, a dive platform, handrails and stairs that are within the requirements of the building code. The new ladder is based on the one currently installed in the Offshore Engineering Basin (OEB). Figure 3 shows a conceptual CAD drawing of this new design.

The inclination angle of the concept is 15 degrees. This should be sufficient to allow easier use for divers and also eliminate the problem of using up excess floor space in the ice tank. The ladder in the OEB is built at a similar angle.

The handrails are laid out in such a fashion as to not interfere with the dive platform. The platform remains a large and flat area that divers can stand on while preparing to dive.

The old dive ladder incorporated round foot channels. This can be uncomfortable to a diver's foot and as a result the new ladder will use flat channels similar to those in the OEB. The stairs are spaced vertically at a distance of 12 inches within a tolerance of 1 inch.

It has been assumed that the depth of the tank is exactly 10 feet for the concept. A more precise measurement is needed before final construction.

The existing ice tank ladder uses stand-offs to help hold it in place as well as members that hold it to the lip of the ice tank. Similarly, the new ladder will use stand-offs to increase stability although the stand-offs will be longer in order to account for the inclination of the ladder.

3.0 – Components

The following is an estimate of the required components for the ice tank ladder.

Material for all components is 6061-T6 Aluminium.

3" x 1.5" x 1/4" thickness channel - 44 feet

2" round tube 1/4" walls - 37 feet

1/4" sheet - 13 sq feet

2" L angle 1/4" thick - 4 feet

1.5" round tube 1/4" walls - 4 feet

4.0 – Conclusion

This document has presented the objective, criteria, and conceptual design of a new dive ladder for the ice tank. A list of estimated materials is included as well as a dimensioned drawing in Appendix A.

5.0 – Figures

Figure 1: Existing Ice Tank Ladder

Figure 2: Modified Existing Ladder

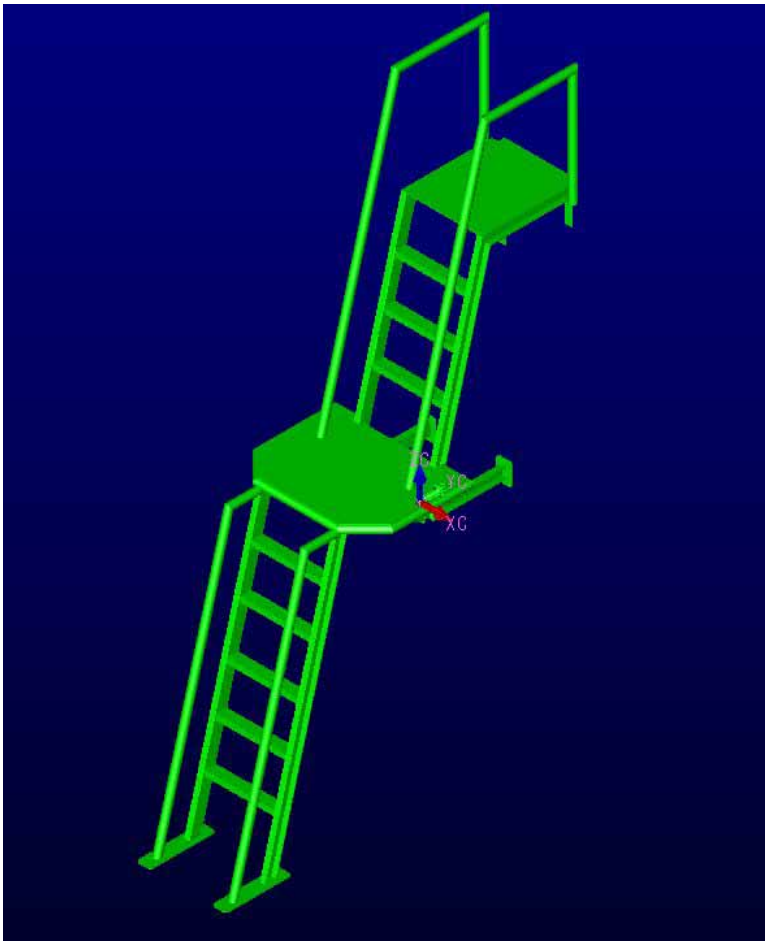
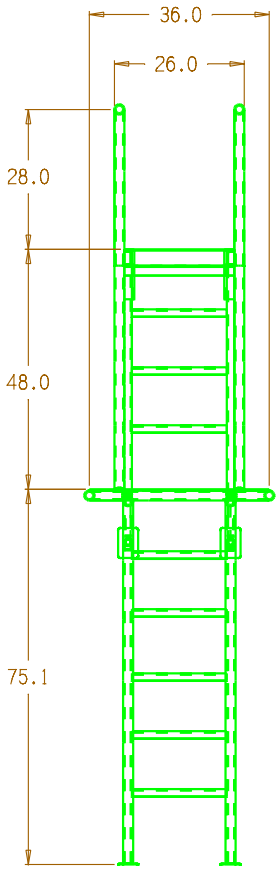
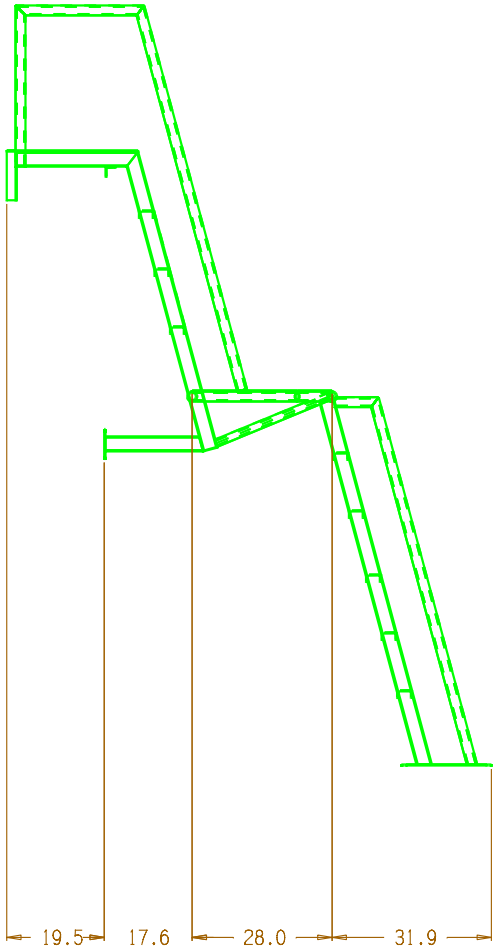


Figure 3: New Ladder Concept

6.0 – Appendice

Appendix A





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TOLERANCES (unless specified)
0.X ± 0.03
0.XX ± 0.015
0.XXX ± 0.005
Angle +/- .5 deg.
Fabrication +/- .04
Fraction < 6 inch +/- 1/64
> 6 inch +/- 1/32

Material: 6061-T6 Al
Heat Treatment:

Institute for Marine Dynamics
Kerwin Place, P.O. Box 12093, Postal Station A
St. John's, Newfoundland A1B 3T5

DRAWN: G. Parr
APPROVED:
Quantity: 1

TITLE: Ice Tank Ladder
SIZE: A3
NUMBER: XXXD01
REV:
SCALE: 1 : 10
DATE: 14-Aug-2006
SHEET 1 of 1