

**THE UNIVERSITY OF WISCONSIN  
SPACE SCIENCE & ENGINEERING CENTER**

MADISON, WISCONSIN

**DOCUMENT IDENTIFICATION**

<b>Title:</b>	<b>BLUE ICE DRILL DEVELOPMENT</b>		
	<b>SCIENCE REQUIREMENTS DOCUMENT</b>		
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**DOCUMENT APPROVAL**

<b>ORIGINATOR:</b> JAJ	<b>DATE:</b> 9/28/09	<b>SCIENCE:</b> JPS	<b>DATE:</b> 9/30/09
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<b>DESIGNER:</b> NA	<b>DATE:</b>	<b>PROJECT:</b> AJS	<b>DATE:</b> 9/28/09

**REVISION HISTORY**

(maintain last 3 versions)

REV	ECN	DESCRIPTION	DATE	APPROVAL
-	NA	Original Document	9/30/09	See above
A	1140	<ul style="list-style-type: none"> <li>• Removed '10-Inch' from project name.</li> <li>• 4.2 – Added 'Science Project'.</li> <li>• 4.3 – Added 'IDDO'.</li> <li>• Added 4.5 – QA definition.</li> <li>• Changed 6.1.1 to reflect new core diameter requirements.</li> <li>• 6.1.4 – Updated core diameter and changed surface area number from 20 to 21 m<sup>2</sup>/m<sup>3</sup>.</li> <li>• 8.1 – Added "It is desired that the drill be able to operate down to -40°C for future projects.</li> </ul>	10/19/09	KRD

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## 1.0 PURPOSE

- 1.1 This document presents science requirements related to the development and implementation of the Blue Ice Drill.

## 2.0 SCOPE

- 2.1 The requirements in this document focus on the criteria that must be met in the design of the Blue Ice Drill.
- 2.2 This document applies to project management and design personnel for the Blue Ice Drill.

## 3.0 REFERENCES

- 3.1 Field Manual for the United States Antarctic Program, Chapter 6: McMurdo Area Helicopter Transportation:  
<http://www.usap.gov/travelAndDeployment/documents/USAPFieldManual.pdf>

## 4.0 DEFINITIONS

- 4.1 **IDDO** – Ice Drilling Design and Operations group
- 4.2 **P.I.** – Science Project Principal Investigator
- 4.3 **P.M.** – IDDO Project Manager
- 4.4 **SSEC** – University of Wisconsin-Space Science & Engineering Center
- 4.5 **QA** – Quality Assurance

## 5.0 RESPONSIBILITIES

- 5.1 IDDO Management is responsible for:
- 5.1.1 Ensuring project deadlines are met.
- 5.1.2 Ensuring the project P.I. and P.M. are kept up to date on any changes regarding development of this system.
- 5.2 The project P.I. and P.M. are responsible for the creation and updating of this document.
- 5.3 The P.M. and IDDO Engineering are responsible for ensuring the device design fulfills these science requirements.
- 5.4 SSEC QA is responsible for ensuring that documents are created, reviewed, approved, maintained and updated per appropriate procedures.

## 6.0 SCIENCE REQUIREMENTS

### 6.1 Core Characteristics

- 6.1.1 Ideal core diameter of 24.13 cm (acceptable range 22.86 - 24.77 cm) or 9.50 in. (acceptable range 9.00 - 9.75 in.).
- 6.1.2 Minimum core length of 1.0m.
- 6.1.3 Maximum core length of 1.6m.

6.1.4 Core quality shall be such that the total surface area-volume ratio of 10 linear meters of consecutively drilled 24.13 cm core does not exceed  $21 \text{ m}^2/\text{m}^3$ .

6.1.5 Samples must be free of contamination from oils, greases, exhaust fumes and any carbon-containing lubricants or fluids.

## **6.2 Hole Characteristics**

6.2.1 Drill system must be capable of reaching depths of at least 12m.

6.2.2 Core to be collected with an angle of deviation less than  $10^\circ$  from vertical.

## **6.3 Core Production**

6.3.1 Drill shall be capable of producing a minimum of 7 sample cores per day.

Note: For each hole, the top 5 meters of ice will be augered or drilled and discarded. Sample core will then be drilled from this depth.

## **7.0 TRANSPORTATION**

7.1 Drill components shall be such that the entire drill system is transportable by one helicopter load.

7.1.1 System design shall be based on the load capacity of a Bell 212 helicopter or similar (exact dimensions TBD).

7.1.1.1 All components shall fit inside the helicopter.

7.2 The optimum drill system weight is no more than 200kg (440 lbs), and the maximum weight should not exceed 500kg (1100 lbs).

7.2.1 Generator, fuel and camp equipment are not included in drill system weight, as defined in 7.2.

7.3 Individual drill components shall be of a size and weight that they are moveable by 1-2 people.

## **8.0 OPERATIONAL CONCERNS**

8.1 Drill system shall have the ability to operate at temperatures down to  $-20^\circ\text{C}$ . It is desired that the drill be able to operate down to  $-40^\circ\text{C}$  for future projects.

8.2 Drill system shall be ready for use during the 2010-2011 Antarctic season.