StoneAge Electrical System Safety Document

WARNING: The system operates at voltages up to 75VDC. Use caution when working on live circuits.

This document outlines safety procedures and design considerations for the StoneAge dual-axis waterjet positioning system. It ensures that engineers and operators follow standardized practices for safe and efficient use of the system.

1. Purpose

This document outlines the key safety components, protocols, and procedures required for safe operation and maintenance of the StoneAge dual-axis waterjet control system. It is intended for engineers, technicians, and operators who interact with the electrical hardware.

2. System Overview

The electrical system powers and controls:

- A 2-axis motion platform
- ClearPath motors (NEMA 34)
- User interface box (UI box) with emergency stop and dual enable buttons
- Control logic (NUCLEO-F411RE MCU)
- Power conversion and safety interlocks

3. Safety Components

- Emergency Stop (E-Stop): Cuts motor power immediately and activates the dump valve
- Optocoupler Isolation: Prevents back current into logic systems
- Schmitt Trigger: Ensures clean digital signals to the microcontroller
- 5V DC Converter: Isolated power for logic
- Dual Motor Enable Buttons: Both must be pressed to activate motors; pressing either one disengages motor power

4. Startup Procedure

1. Supply power to the Teknic 75V power system
2. Then supply power to the 24V power system
3. Ensure E-Stop is disengaged (pulled out)
4. Press and hold both motor enable buttons to allow motion
5. Wait for motors to show idle/ready state

StoneAge Electrical System Safety Document

5. Shutdown Procedure

1. Press either motor enable button again to disengage the motors
2. Turn off the 24V power system
3. Turn off the Teknic 75V power system
4. Press the E-Stop if full system lockout is required

6. Emergency Procedures

- If motion is unexpected or dangerous: Press E-Stop
- If smoke or smell: Shut off 75V and 24V power
- If software crash: Use manual disengage via enable buttons
- Water ingress: Shut off system, inspect and dry before reuse

7. Electrical Isolation Map

- 75V Power: Teknic motor supply
- 24V Power: Sensor and logic supply
- 5V Logic: Regulated and opto-isolated
- Dump Valve: Connected in series with E-Stop circuit

8. Maintenance Protocol

- Inspect the emergency stop and dump valve connection weekly
- Ensure both motor enable buttons are responsive and operate as intended
- Check all connectors for signs of corrosion or damage
- Only update or flash firmware when the system is fully powered down and locked out

9. Personal Protective Equipment (PPE) Guidelines

Wiring live circuits: Insulated gloves

10. Revision History

Version 1.0 - April 2025 - Initial draft created