

INSTALLATION REQUIREMENTS - SUBZERO STORAGE FACILITIES

Polar Dynamics Robotics, Inc.

Document Version: 2.4

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1. GENERAL PROVISIONS

1 This Installation Requirements document ("Requirements") sets forth the mandatory specifications and procedures for installing Polar Dynamics Robotics, Inc. ("PDR") autonomous mobile robot systems ("AMR Systems") in temperature-controlled and subzero storage facilities ("Facilities").

2 These Requirements are binding upon all authorized installers, facility operators, and maintenance personnel involved in the deployment of PDR AMR Systems.

2. FACILITY PREREQUISITES

1 Temperature Specifications

- Minimum ambient temperature: -40 C (-40 F)
- Maximum ambient temperature: +25 C (+77 F)
- Temperature variation tolerance: 2 C per hour
- Humidity range: 20% to 85% non-condensing

2 Structural Requirements

- Minimum floor load capacity: 2,500 kg/m
- Floor flatness: FF75 or better per ASTM E1155
- Floor levelness: FL50 or better per ASTM E1155
- Minimum ceiling height: 4.5 meters
- Minimum aisle width: 2.8 meters

3. INFRASTRUCTURE REQUIREMENTS

1 Power Systems

- Dedicated 480V three-phase power supply

- Emergency power backup system capable of 30-minute runtime
- UPS systems for all control infrastructure
- Ground fault protection systems rated for subzero environments

2 Network Infrastructure

- Redundant fiber optic backbone (minimum 10Gb/s)
- Industrial-grade Wi-Fi coverage with minimum -65dBm signal strength
- Separate VLAN for AMR operations
- Emergency offline operation capability

4. SAFETY SYSTEMS

1 Emergency Systems

- E-stop stations at maximum 15-meter intervals
- Automated fire suppression systems compatible with electronics
- Emergency lighting with minimum 2-hour battery backup
- Audio-visual warning systems for AMR operations

2 Access Control

- Biometric access control for AMR charging stations
- RFID-enabled safety zones
- Personnel detection systems
- Automated door interlocking systems

5. AMR DEPLOYMENT ZONES

1 Charging Infrastructure

- Minimum one charging station per three AMR units
- Charging stations must maintain +5 C minimum temperature
- Thermal isolation from main storage areas
- Dedicated ventilation systems

2 Navigation Infrastructure

- QR code grid with maximum 2-meter spacing

- Reflective markers at 3-meter intervals
- Minimum 500 lux lighting at floor level
- Anti-glare floor coating

6. ENVIRONMENTAL CONTROLS

1 Temperature Management

- Independent temperature monitoring every 100 square meters
- Automated thermal mapping system
- Frost prevention systems for charging stations
- Temperature gradient monitoring system

2 Moisture Control

- Dew point monitoring systems
- Anti-condensation heating elements
- Moisture barriers at transition zones
- Drainage systems for defrost cycles

7. COMPLIANCE AND CERTIFICATION

1 Required Certifications

- UL 1995 compliance for cold storage equipment
- IP65 rating for all exposed components
- CE marking for European installations
- ISO/IEC 60204-1 compliance

2 Documentation Requirements

- As-built drawings
- Load calculations
- Safety system certification
- Environmental monitoring logs

8. WARRANTY AND LIABILITY

- 1 Installation warranty shall be void if any Requirements herein are not met or maintained.

2 PDR assumes no liability for system failures resulting from non-compliance with these Requirements.

9. AMENDMENTS AND UPDATES

1 PDR reserves the right to modify these Requirements at any time with 30 days' written notice.

2 Facility operators must implement requirement updates within 90 days of notification.

EXECUTION

IN WITNESS WHEREOF, the undersigned acknowledges receipt and understanding of these Installation Requirements.

Facility Operator: _

Name:

Title: _

Date: _

Polar Dynamics Robotics, Inc.

By:

Name:

Title: _

Date: _