Genius Quest Global Limited
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Design-Basis Performance Verification - Snow Guard Stand

Applicant: ArcticAnchor USA | 800 N Rainbow Blvd, Unit 208, Las Vegas, NV 89107 | Number: MRIB-1BK101525 | Date: December 15, 2025

Sample Description:

Submitted Sample Test	Force/Temperature
Item Name	TitanCore Snow Guard Stand
Test Sample Quantity	10 Pieces
Date Sample Received	October 12, 2025
Date Sample Tested	October 16, 2025
Testing Standards	Mechanical: Internal method (fixture-based), applicable standards, and engineering practice.

Product Image:

Detailed report continued on attached pages.

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CONTENTS

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I. Introduction

Design-Basis Performance Verification Report:

I.A Purpose and Scope

The purpose of this report is to document in-house design-basis performance verification testing of the MRIB Stand used within a roof-mounted snow retention system. The intent is to demonstrate that the MRIB Stand design provides a capacity and durability margin relative to design-basis snow/ice load demands representative of light- and heavy-snow regions in the United States. In the United States, snow retention systems are generally evaluated using engineering design practice based on known roof snow/ice demands and project conditions rather than a single universal product certification test standard that defines "pass/fail" requirements for all applications. Therefore, this in-house program verifies product performance against internal design-basis load cases established from known roof snow/ice demand ranges and conservative conversion assumptions to the stand level. Because there is no single universal U.S. product standard for snow retention systems, the verification approach used here is to:

1. define conservative design-basis load categories representative of light and heavy snow regions,
2. confirm the MRIB Stand has a strong intrinsic capacity under controlled boundary conditions, and
3. screen durability using severe thermal cycling and UV exposure, with post-exposure functional verification.

I.B Laboratory

Testing was performed at the GeniusQuest Global testing facility. Unless otherwise stated, testing was conducted under controlled laboratory conditions. Equipment identification, capacity, and calibration status are provided on the associated results pages and/or in the equipment appendix, where available.

I.C Description of Unit

The test article is the MRIB Stand, a roof-mounted stand component used in snow-retention systems for metal roofing assemblies. The MRIB Stand provides the structural interface between the snow-retention rail and the roof attachment points, transferring snow and ice retention forces into the roof system through the stand's base and fasteners while maintaining the retention assembly's alignment and positional stability along the roofline. The stand incorporates two primary load-path features: (1) the forward Ice Blocker face, which resists and supports leading-edge ice/snow accumulation, and (2) the rail seat region, which supports the rail and transfers load into the stand body. Representative photographs of the test article and the test setup are included in this report.

II. Summary

II.A Pretest Information

The samples were received as finished parts. Sample quantity and conditioning groups are listed in the test results tables. Receipt dates, lot/batch traceability (where applicable), and drawing revision records are retained internally as part of the controlled verification file.

II.B Information Log

Strength margin (baseline mechanical): Baseline ultimate capacity in the test configuration(s) exceeds the internal design-basis verification targets for both light and heavy snow regions.

Cold-temperature performance: Testing at low temperatures shows no unacceptable reductions in performance or brittle behavior compared with ambient testing.

Durability screening (thermal + UV): After thermal cycling (−30 °C to +55 °C) and UV weathering (1,000 hours under xenon-arc), the stand showed no disqualifying functional damage during documented inspections. Post-exposure mechanical verification is performed per Section IV and retained internally as part of the controlled verification record.

II.C Summary of Test Results
Ultimate load-to-failure results are summarized below for ambient (22 °C) and cold (−30 °C) testing. Descriptive statistics are calculated from the listed specimen force values. Raw data exports (load versus displacement) are retained internally as part of the controlled verification record.

Ice Blocker - Cold Load–Displacement Curve Representative
In addition to the stand's overall load-to-failure testing, separate mechanical evaluations were performed for the Ice Blocker region and the rail-seat region. This is because the Ice Blocker carries the majority of the load in service while the rail-seat region carries the remaining portion through the rail interface. The two regions function together to distribute snow load; therefore, both regions are reported for ambient (22 °C) and (−30 °C) testing.

ICE BLOCKER REGION

Metric	22 °C	−30 °C	Change
Mean ultimate load (N)	12,753.13	12,226.56	- 4.13%
Minimum listed load (N)	11,558.96	11,258.88	—
Sample count	10	10	—

RAIL SEAT REGION

Metric	22 °C	−30 °C	Change
Mean ultimate load (N)	7,860.80	8,367.80	6.45%
Minimum listed load (N)	7,699.30	7,648.40	—
Sample count	10	10	—

III. Test Set-Up and Procedure

III.A Intended Field Installation (Client-Provided)
In an intended field installation, the MRIB Stand is installed on standard metal roofing. Typical installation practice places stands approximately 18 inches (457 mm) apart (center-to-center) and attaches each stand to the roof using four to five roofing screws. The number of screws is selected based on the design snow load for the installation region. A representative fastener used for installation is a #10 carbon-steel roofing screw with a neoprene sealing washer with an

approximate outside diameter of 1.5 inches. No dedicated installation torque specification is defined for the roofing screw; installation is performed per standard roofing practice, tightening until the washer seats without over-compression.

Ice Blocker – 22 °C Load–Displacement Curve (Representative)
The stand incorporates two primary load-bearing features: (1) the forward Ice Blocker face, which arrests and supports ice/snow accumulation at the leading edge, and (2) the rail seat region, which supports the snow rail and transfers load into the stand body. Because these two features share the service load through different load paths, both regions were evaluated separately to characterize strength and stiffness under the applicable fixture configurations.

III.B As-Tested Mounting and Boundary Conditions
For destructive testing, specimens were mounted directly to a rigid steel support using through-bolting rather than attached to the roof sheet using roofing screws. This approach was selected to prevent roof sheet deformation or fastener pull-through from governing the test outcome and to isolate the strength of the MRIB Stand body under the applied loading mode. For the purpose of this test, the base of the stand is treated as fully fixed to the rigid steel fixture. Because this destructive configuration bypasses the roof panel and roofing screw attachment, the measured ultimate loads represent intrinsic stand capacity under the applied fixture configuration and boundary condition and should not be interpreted as allowable loads for an as-installed roof system without separate system-level verification.

IV. MRIB Stand Test Methods

Mechanical Load-to-Failure, Rapid Thermal Cycling, and UV Accelerated Weathering.

IV.A Purpose
This document provides a clear, technically precise description of the test procedures used to evaluate the MRIB Stand. It is intended to be read alongside the corresponding test results pages, which contain the measured data, equipment identification, calibration references, and photographic records. Together, the method description and results pages form the complete test record supporting the engineering review.

IV.B Scope
The procedures described herein cover three categories of testing: (i) mechanical destructive load-to-failure testing to determine ultimate capacity and characterize failure modes under quasi-static loading; (ii) rapid thermal cycling between −30 °C and +55 °C to screen durability under severe temperature switching, followed by post-exposure inspection and verification per the internal test plan; and (iii) xenon-arc UV accelerated weathering to evaluate susceptibility to photodegradation, with documented inspections at defined exposure intervals.

IV.C Specimens, Identification, and Handling
All specimens shall be uniquely identified prior to testing using a traceable specimen ID scheme. Specimen IDs shall be linked to the part number and drawing revision, the material designation, and the lot/batch (where applicable), and to the assigned test condition (baseline, thermal-cycled duration, or UV exposure). Prior to each test phase, specimens shall be visually inspected and photographed to document initial conditions. Following environmental exposures, specimens should be handled to avoid unintended damage and conditioned at standard laboratory conditions prior to mechanical testing, when required by the test plan or supporting standards.

IV.D Mechanical Load-to-Failure Test Method
Mechanical destructive testing was performed to determine the MRIB Stand's ultimate load capacity and to document observed failure modes under controlled, quasi-static loading. The source test report may refer to this activity as tensile

testing; however, the applied loading configuration is designed to represent an even snow load through predominantly bending and/or cantilever-type loading, depending on the fixture configuration.

In an intended field installation, the MRIB Stand is installed on standard metal roofing. Typical installation practice places stands approximately 18 inches (457 mm) apart (center-to-center). Each stand is attached using four to five roofing screws, with the screw count selected based on the design snow load for the installation region. A representative fastener for installation is a #10 carbon-steel roofing screw with a neoprene sealing washer (approximately 1.5 inches in outside diameter). No dedicated installation torque specification is defined for the roofing screw; field installation is performed per standard roofing practice, tightening until the washer seats without over-compression.

For destructive testing, specimens were mounted directly to a rigid steel support using through-bolting rather than attached to the roof sheet using roofing screws. This approach was selected to prevent roof sheet deformation or fastener pull-through from governing the test outcome and to isolate the strength of the MRIB Stand body under the applied loading mode. The base of the stand is therefore treated as fully fixed to the rigid steel fixture for the purpose of this test.

Two custom fixtures are used to apply a load in distinct orientations. In the first configuration, a load is applied at the front of the stand, at the ice-stopper region, to generate a direct force into the main body relative to the fixed base. In the second configuration, load is applied to the triangular region of the stand to generate a bending moment relative to the fixed base. Photographs of the setups and controlled fixture drawings are maintained as part of the test record; fixture drawing Number and revision should be referenced on the associated results pages or appended where required.

Testing is performed using a universal testing machine (UTM). The machine make, model, serial number, load cell range, and current calibration status are documented on the test results pages. Load is measured by the UTM load cell. Displacement is recorded using the machine crosshead and/or an equivalent displacement measurement system as identified in the results pages. The loading rate and control mode (displacement control unless otherwise stated) are likewise documented on the results pages.

During testing, the load is increased continuously and quasi-statically until failure. Failure is defined as the onset of catastrophic fracture, loss of load-carrying capacity, or other clearly observable structural collapse consistent with the test objective. After failure, specimens are photographed, and the failure mode is recorded, including the failure location and any relevant observations such as crack initiation, plastic deformation, or interface separation.
Because the destructive test configuration bypasses the roof sheet and roofing screw attachment, the measured ultimate loads represent the intrinsic capacity of the stand under the applied fixture loading mode and fixed-base boundary condition. These values should not be interpreted as allowable loads for an as-installed roof system without separate verification of roof panel capacity, fastener pull-out and pull-through performance, and system-level load distribution.

IV.E Rapid Thermal Cycling (−30 °C to +55 °C) and Post-Aging Mechanical Testing
Rapid thermal cycling is performed to evaluate the MRIB Stand's durability under severe temperature switching that may be experienced in service. Specimens are exposed in a programmable environmental chamber that alternates between −30 °C and +55 °C, with setpoint switching every eight hours. This protocol is intended to induce repeated thermal strain and to reveal susceptibility to cracking, embrittlement, warpage, and other thermally driven damage mechanisms.

The thermal cycling program is executed for three exposure durations: 10, 20, and 30 days. Ten specimens are allocated to each duration set. At the completion of each exposure duration, the corresponding specimen set is removed and evaluated

by mechanical load-to-failure testing using the same mechanical fixture configuration, loading orientation, and test procedure used for baseline mechanical testing, unless otherwise specified in the test plan.

Specimens are placed within the chamber so that airflow is not obstructed, and they do not contact the chamber walls or each other in a manner that would create significant thermal gradients. Where racks are used, they are arranged to minimize conduction paths that could bias specimen temperature. The chamber manufacturer, model, serial number, sensor locations, calibration references, and the recorded temperature time history are documented on the thermal cycling results pages.

Visual inspection and photo documentation are performed prior to exposure and at the time of removal for each exposure duration. Observations include surface cracking or crazing, warpage or distortion, whitening or other appearance changes, and any indicators of brittleness. Prior to mechanical testing, specimens should be conditioned at standard laboratory conditions (e.g., 23 ± 2 °C and 50 ± 10% relative humidity) for a defined period when such conditioning is required for consistency.

For each post-aging mechanical test, ultimate load to failure and failure mode are recorded. Where displacement measurements are available, displacement at defined load levels and stiffness may be calculated and compared with baseline performance. Raw data exports and plots (load versus displacement) are retained internally as part of the controlled verification record.

IV.F UV Accelerated Weathering (Xenon-Arc) and Inspection
UV accelerated weathering is performed to evaluate the MRIB Stand's resistance to sunlight-driven degradation using a xenon-arc weathering chamber. Xenon-arc devices are selected because they provide a full-spectrum light source, including ultraviolet components relevant to outdoor exposure. The exposure method is conducted in accordance with ISO 4892-2 xenon-arc practices, using an applicable exposure cycle as defined in the chamber program.

Specimens are mounted on the chamber sample rack such that the intended exposed surface faces the light source and mounting does not create shadowing or non-uniform exposure. When the chamber includes a rotating specimen holder, rotation improves exposure uniformity. Chamber identification, programmed exposure parameters (including irradiance setpoint, filter type, black panel or black standard temperature, chamber air temperature, humidity control, and any moisture cycle such as spray), and calibration references are documented on the UV results pages.

The UV exposure duration is 1,000 hours. Inspections are performed at defined intervals of 250 hours, 500 hours, 750 hours, and 1,000 hours. At each interval, specimens are inspected and documented for changes in appearance, including cracking or crazing, chalking, haze, warpage, and embrittlement indicators. Color change is evaluated using a gray scale rating method. Upon completion of the 1,000-hour exposure, a gray-scale color change score of 4 was achieved.

Post-UV mechanical performance verification is required; exposed specimens are conditioned at standard laboratory conditions prior to mechanical testing. Post-exposure mechanical testing uses the same fixture and procedure as baseline testing to quantify retention of strength and to identify any shifts in failure mode.

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V. Testing Equipment

2-ton microcomputer universal testing machine (UTM) in a double-column configuration.

Machine Specifications:

Maximum test force:	2000KG
Accuracy level:	Level 1N
Test force range:	0.4%～100%FS
Power resolution:	1/200000
Strength accuracy:	within ±1%
Test stroke:	1000mm including fixture
Displacement indication error:	within ±1% of indication
Displacement resolution:	0.1mm

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VI. Test Results: 22 Celsius Ice Blocker

Test Results: Mechanical Load-to-Failure Summary (Fixture-Based) Results:

Sample No.	N	Weight (g)
1	12,987.02	67.50
2	13,425.37	67.60
3	11,558.96	67.50
4	13,498.73	67.50
5	13,031.93	67.60
6	13,156.67	67.50
7	13,023.30	67.50
8	12,614.95	67.50
9	12,561.60	67.50
10	11,672.72	67.50
Average Break Point (N)	**12,753.13**	**67.52**

Before:

After:

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VII. Test Results: −30 Celsius Ice Blocker

Test Results: Mechanical Load-to-Failure Summary (Fixture-Based) Results:

Sample No.	N	Weight (g)
1	11,258.88	67.50
2	12,754.59	67.50
3	12,699.28	67.60
4	11,906.51	67.50
5	11,721.75	67.50
6	12,003.79	67.50
7	11,616.62	67.50
8	13,178.64	67.50
9	12,274.07	67.50
10	12,851.48	67.60
Average Break Point (N)	**12,226.56**	**67.52**

Before:

After:

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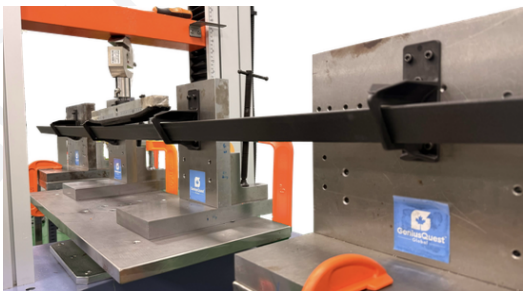
VIII. Test Results: 22 Celsius

Test Results: Mechanical Load-to-Failure Summary (Fixture-Based) Results:

Sample No.	N	Weight (g)
1	7,820.78	67.50
2	7,960.33	67.60
3	7,699.26	67.50
4	8,329.84	67.50
5	7,772.42	67.60
6	7,794.55	67.50
7	7,795.55	67.50
8	7,795.76	67.50
9	7,813.73	67.50
10	7,828.25	67.50
Average Break Point (N)	**7,861.05**	**67.52**

Before:



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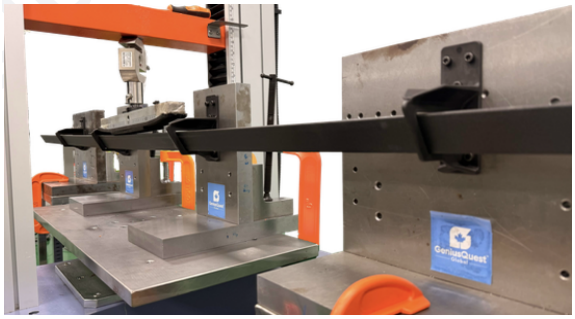
IX. Test Results: −30 Celsius

Test Results: Mechanical Load-to-Failure Summary (Fixture-Based) Results:

Sample No.	N	Weight (g)
1	9,017.79	67.50
2	7,648.38	67.50
3	8,019.59	67.60
4	9,050.61	67.50
5	7,817.63	67.50
6	8,953.45	67.50
7	8,713.03	67.50
8	8,202.86	67.50
9	8,465.63	67.50
10	7,750.35	67.60
Average Break Point (N)	**8,367.78**	**67.52**

Before:



After:

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X. UV Testing Equipment

Methods of exposure to plastic laboratory light sources - Part 2: Xenon-arc lamps - and other applicable international standards. Test method/standard: ISO 4892-2 Cycle 1 or equivalent xenon-arc exposure program as configured on the chamber. Where a wavelength-banded irradiance basis (e.g., 300–400 nm or 340 nm) is required by a specific standard, the applicable radiometer basis and calibration details are retained internally as part of the controlled verification record.

Machine Test Specifications:

Test method/standard	ISO 4892-2 (Xenon-Arc), Method A (Daylight filter), Cycle 1.
Irradiance (control basis)	850 W/m²
Spectral wavelength (lamp capability)	290-800nm;
Cycle definition (Cycle 1)	102 min light (dry) + 18 min light with water spray, repeating (120-min cycle)
Chamber air temperature (setpoint)	38 °C (typical control setpoint)
Black panel / black standard temperature (setpoint)	65 °C (typical control setpoint)
Relative humidity (during light/dry period)	65% RH controlled per programmed Cycle 1 settings; detailed as-run settings retained internally.
Water spray	Enabled during the 18-min segment of each cycle (Cycle 1 spray interval).

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CONT. UV Testing Equipment

Test Results UV Testing Summary of Results:

No.	Test Item	Test Method	Result	Conclusion
1	Light Aging Test-Xenon-arc Exposure	ISO 4892-2:2013/Amd.1:2021 Cycle 1	Gray scale: 4 1000h	PASS
2	Stress Test	IEC 60068-2-1:2007 & IEC 60068-2-2:2007 and the client's requirement	See images result below	PASS
Note	"PASS" indicates the verification outcome met the internal design verification criteria for this program. "FAIL" indicates the outcome did not meet the internal criteria. "/" indicates not applicable.			

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Gray Scale Level 4 1000h

XI. HT-HW-80L Thermal Cycling Equipment

80L Constant Temperature and Humidity Test Chamber. Alternating humidity and heat test method (IEC68-2−30).
Note: IEC68-2−30 is a chamber capability reference; this program uses temperature cycling.

Equipment Performance:

Analysis accuracy:	Temperature ±0.01°C; Humidity: ±0.1% R.H
Temperature range:	-40°C ~ +150°C
Temperature fluctuation:	±2°C
Temperature uniformity:	±2°C
Humidity range:	20% to 98% R.H
Humidity uniformity:	±3%

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Heating rate:	2°C - 4°C/min *(from room temperature to maximum temperature, non-linear no-load)*
Cooling rate:	0.7°C - 1°C/min *(from room temperature to the lowest temperature, non-linear no-load)*

XII. Authorization - Limitations and Disclaimer

Approved for internal release as an in-house verification report (not third-party certification).

QUALITY CERTIFICATION
APPROVED
GENIUSQUEST 1997

Sam Kwan

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Sam Kwan
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In-house test report. Testing was performed by GeniusQuest Global as an internal laboratory for product development and internal approval purposes. The test equipment used is of the appropriate type and capacity to conduct the procedures described; however, this laboratory is not an accredited or registered third-party testing or certification body. Unless explicitly stated otherwise, the test methods described are internal methods and/or methods based on applicable standards and good engineering practice. Results apply only to the specific samples tested under the stated conditions and are not intended to represent third-party certification. This report shall not be interpreted as a certification, listing, or approval by an independent laboratory or certification body.

End of report.
