

MASTERGRAIN PRODUCTS

Thermal Testing Results

*Testing completed on 35.75 x 83 Six Panel Oak Grain Slab.
Testing performed and documented by Weber Manufacturing Technologies Inc.*



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1 Introduction

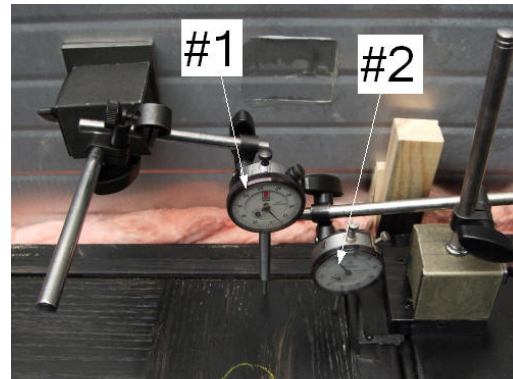
Weber Manufacturing conducted a Thermal test on a MasterGrain door slab to prove the resistance of thermal bow. The test samples outlined in section #3 were all in good condition and the test was started on May 1, 2009 thru till May 6, 2009. This report gives the detailed information of the evaluation of MasterGrain slabs thermal bowing resistance. All results shown below have been documented by Weber Manufacturing according to guidelines and procedures put in place by Weber Manufacturing.

2 Test Installation and Procedures

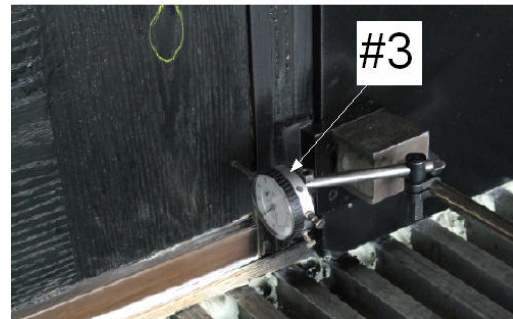
A 2x6 stud wall with door assembly was installed into a refrigeration unit, which was fully insulated and sealed. The inside of the unit was to simulate outdoor temperature extremes as seen in severe winter conditions and the outside of the container would represent the inside conditions of a home. All holes and small voids were then stuffed with batt insulation or filled with low expansion spray foam. The door clearances were no less than .060" and no greater than .100" to ensure the door was not binding prior to the test start up. All weather seals were checked for good compression and seal. The dead bolt and lock set were tested to ensure they were functioning without any interference. Prior to applying the cold temperatures to the inside of the unit we installed indicators in three positions on the door to monitor the movements under thermal differences. See Images 2-1 thru 2-3 for the indicator positions.



2-1



2-2



2-3

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3 Thermal Testing of MasterGrain slabs - Testing Samples and Assembly Description

| Component | Size / Configuration | Details | Part Number | Manufacturer |
|-------------------------|-------------------------------------|---|--------------|--------------|
| MasterGrain Door Slab | 6 Panel Oak 1.72" x 35.75" x 83" | Skins: Fiberglass .085-.095 thick, 18% glass with polyester resin. Material: CSP - SMC 520B | SK-O-3480-6P | Pasda |
| | | Stiles: Engineered LSL wood with .63 hardwood caps | N/A | Weyerhaeuser |
| | | Top Rail: Weyerhaeuser, 1.0" Wood Composite | N/A | Weyerhaeuser |
| | | Bottom Rail: Weyerhaeuser, 1.5" Wood Composite | N/A | Weyerhaeuser |
| | | Core: Urethane Foam CE 101 (density 1.1 lbs/ft cubed) | CR 857 | Voracor |
| Jambs | 6/ 916" | Finger jointed pine construction | N/A | N/A |
| Sill | 5 5/8" x 1 3/8" | Z Classic sill - black anodized aluminum. | ZAIL5625F | Endura |
| Sill Extension | 3" x 5° / 7° | Black anodized aluminum. | XXW / XXW7 | Endura |
| Seal | Perimeter Weather Strip | Compression seal with .650" reach | V-9650 | Loxcreen |
| Sweep | Door Bottom Weather Seal | Fixed Kerf Style Sweep | V-2964 | Loxcreen |
| Hinges | Standard 4" x 4" Steel | Plain steel standard hinges. Brass plated | N/A | N/A |
| Lock Set | Standard | Plain Brass Dead Bolt with single lock set handle | N/A | Weiser |
| Indicators | Plunger Dial Indicators | Indicator #1 - Last calibrated on 06-Nov-08 | 1000 R | Lawson |
| | | Indicator #2 - Last calibrated on 06-Nov-08 | 2416 F | Mitutoyo |
| | | Indicator #3 - Last calibrated on 06-Nov-08 | 2416 F | Mitutoyo |
| Wall Construction | 2 x 6 stud wall | 2 x 6 Studs | STD. | STD. |
| | | Fiberglass insulation R20 | STD. | STD. |
| | | 1/2" Plywood sheeting & Reinforcement | STD. | STD. |
| | | 1/2" Drywall sheeting on the inside. | STD. | STD. |
| | | Vapor Barrier | STD. | STD. |
| Refrigeration Container | 30' insulated container | Capable of reaching temperatures up to -30°C | R-134A | Carrier |

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4 Thermal Testing of MasterGrain Slabs – Testing and Evaluation of Results

The door slab proved very well throughout the duration of the test, with very minimal thermal bow. At no time did the door slab ever bow or twist more than the allowable limits of the weather seals. The indicators were checked on separate occasions for each temperature range over the four-day period. Indicator #1 was mounted on the roof of the container and Indicator's #2 & 3 were mounted against the wall structure to give independent readings. The difference between indicator #1 & 2 were very minimal, showing that the wall was very stable and not affected by the thermal differences.

- Category Descriptions:
- “Outside Set Point °C” is the current room temperature or “Ambient Air”.
 - “Inside Set Point °C” is what the refrigeration unit is set to.
 - “Inside Sensor °C” is a thermostat located inside the refrigeration unit.
 - “Outside Sensor °C” is a thermostat located outside the refrigeration unit in the room temperature.
 - “Actual Surface Temp Checks °C” are surface locations checked with a pyrometer. See Chart on page 5

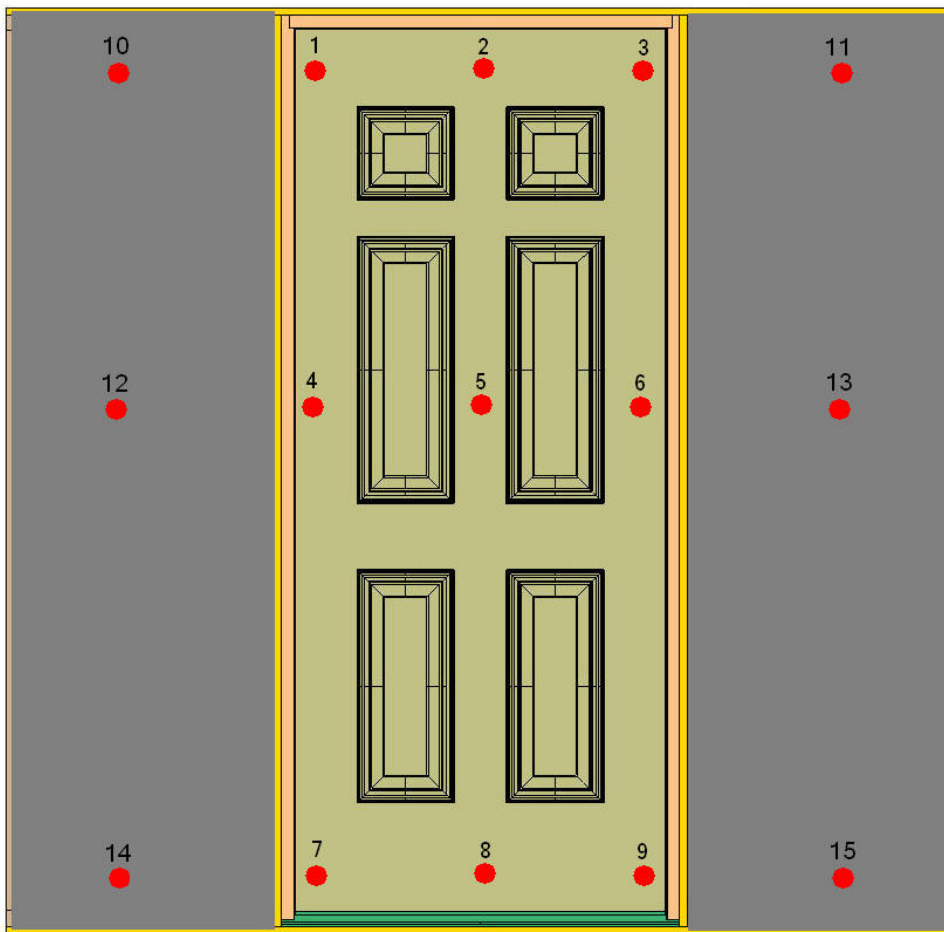
Thermal Testing – Documented Thermal Bow Results

| Date | Time | Inside Set Point °C | Outside Set Point | Inside Sensor °C | Outside Sensor °C | Actual Surface Temp Checks °C | Top of Door Indicator #1 | Top of Door Indicator #2 | Bottom of Door Indicator #3 | Thermal Imaging Camera File Reference Number |
|----------|----------|---------------------|-------------------|------------------|-------------------|-------------------------------|--------------------------|--------------------------|-----------------------------|--|
| 1-May-09 | 2:00 PM | Ambient | Ambient Air | 24.4 | 24.2 | See Chart | 0.000 | 0.000 | 0.000 | 010509-200-TI |
| 1-May-09 | 3:00 PM | -10 | Ambient Air | -7.6 | 24.2 | See Chart | -0.050 | -0.045 | 0.040 | Not Recorded |
| 4-May-09 | 9:00 AM | -10 | Ambient Air | -10.5 | 20.1 | See Chart | -0.075 | -0.070 | -0.020 | 040509-900-TI |
| 4-May-09 | 11:00 AM | -15 | Ambient Air | -15.1 | 23.4 | See Chart | -0.080 | -0.078 | -0.038 | Not Recorded |
| 4-May-09 | 1:00 PM | -15 | Ambient Air | -15.2 | 24.1 | See Chart | -0.083 | -0.080 | -0.042 | 040509-1100-TI |
| 4-May-09 | 4:00 PM | -20 | Ambient Air | -20.0 | 24.9 | See Chart | -0.095 | -0.085 | -0.070 | Not Recorded |
| 5-May-09 | 9:00 AM | -20 | Ambient Air | -19.7 | 21.2 | See Chart | -0.094 | -0.083 | -0.065 | 050509-400-TI |
| 5-May-09 | 11:00 AM | -25 | Ambient Air | -24.3 | 22.6 | See Chart | -0.105 | -0.091 | -0.070 | Not Recorded |
| 5-May-09 | 1:00 PM | -25 | Ambient Air | -24.9 | 23.4 | See Chart | -0.106 | -0.093 | -0.702 | Not Recorded |
| 5-May-09 | 4:00 PM | -30 | Ambient Air | -29.3 | 24.5 | See Chart | -0.116 | -0.101 | -0.073 | 050509-900-TI |

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5 Thermal Testing of MasterGrain Slabs – Actual Surface Temperatures



Points Checked on Door & Wall with Pyrometer °C

| Date | Time | Inside Sensor °C | Outside Sensor °C | Points Checked on Door & Wall with Pyrometer °C | | | | | | | | | | | | | | |
|----------|----------|------------------|-------------------|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 1-May-09 | 3:00 PM | -7.6 | 24.2 | 24.1 | 24.1 | 24.2 | 23.9 | 24.0 | 24.0 | 23.8 | 23.8 | 23.7 | 24.2 | 24.1 | 24.1 | 24.0 | 23.9 | 23.8 |
| 4-May-09 | 9:00 AM | -10.5 | 20.1 | 16.2 | 19.5 | 15.9 | 15.9 | 19.4 | 15.7 | 15.1 | 18.8 | 15.4 | 21.6 | 21.4 | 21.2 | 21.1 | 20.5 | 20.4 |
| 4-May-09 | 11:00 AM | -15.1 | 23.4 | 18.9 | 22.2 | 18.5 | 18.8 | 22.4 | 18.4 | 17.4 | 21.1 | 17.6 | 23.2 | 23.9 | 24.0 | 24.1 | 23.2 | 23.7 |
| 4-May-09 | 1:00 PM | -15.2 | 24.1 | 19.1 | 22.5 | 18.6 | 19.0 | 22.4 | 18.5 | 17.6 | 21.4 | 17.8 | 23.3 | 23.9 | 24.1 | 24.2 | 23.4 | 23.7 |
| 4-May-09 | 4:00 PM | -20.0 | 24.9 | 19.1 | 22.3 | 18.6 | 18.0 | 22.3 | 16.7 | 16.1 | 21.1 | 16.5 | 23.3 | 23.7 | 23.8 | 24.0 | 22.9 | 23.2 |
| 5-May-09 | 9:00 AM | -19.7 | 21.2 | 16.7 | 19.9 | 16.7 | 15.8 | 19.9 | 15.9 | 14.7 | 19.0 | 15.8 | 20.8 | 21.1 | 21.5 | 21.6 | 20.7 | 20.9 |
| 5-May-09 | 11:00 AM | -24.3 | 22.6 | 16.5 | 20.4 | 16.6 | 15.7 | 20.8 | 15.7 | 15.6 | 19.7 | 14.8 | 21.7 | 22.4 | 22.5 | 23.1 | 21.8 | 22.3 |
| 5-May-09 | 1:00 PM | -24.9 | 23.4 | 16.7 | 21.4 | 16.9 | 16.2 | 21.2 | 16.1 | 16.0 | 20.9 | 15.8 | 22.1 | 22.2 | 21.9 | 21.7 | 21.4 | 21.6 |
| 5-May-09 | 4:00 PM | -29.3 | 24.5 | 17.1 | 21.9 | 17.2 | 17.1 | 22.5 | 17.2 | 15.5 | 20.5 | 15.3 | 23.2 | 24.1 | 24.1 | 24.5 | 23.5 | 23.8 |

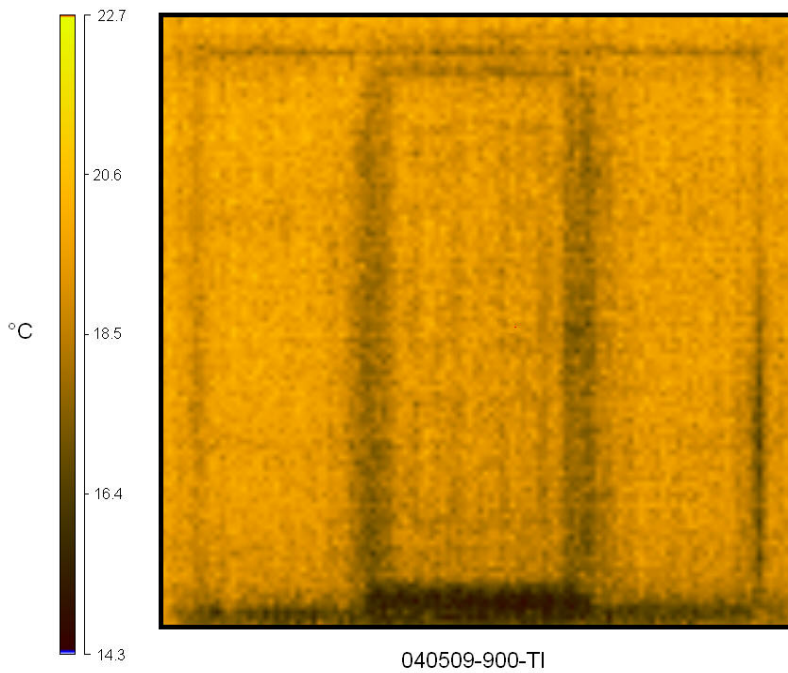
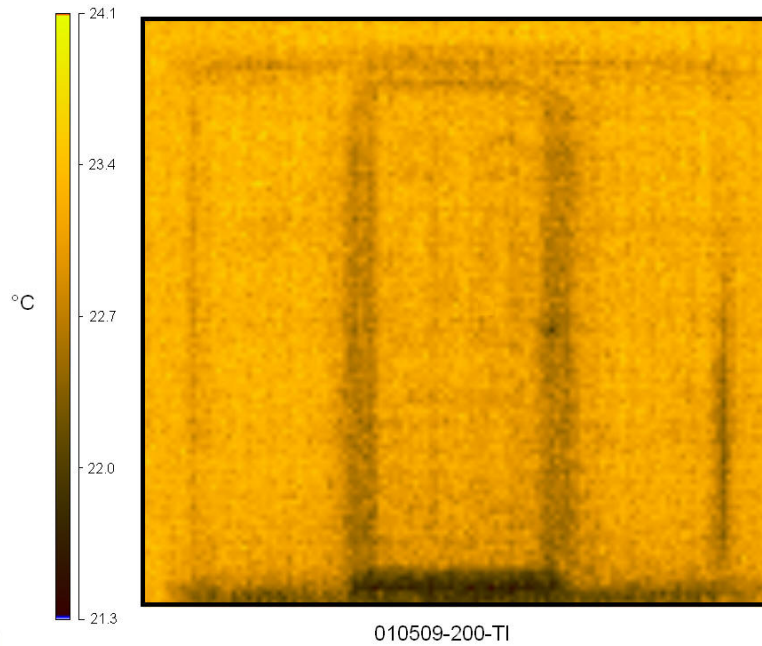
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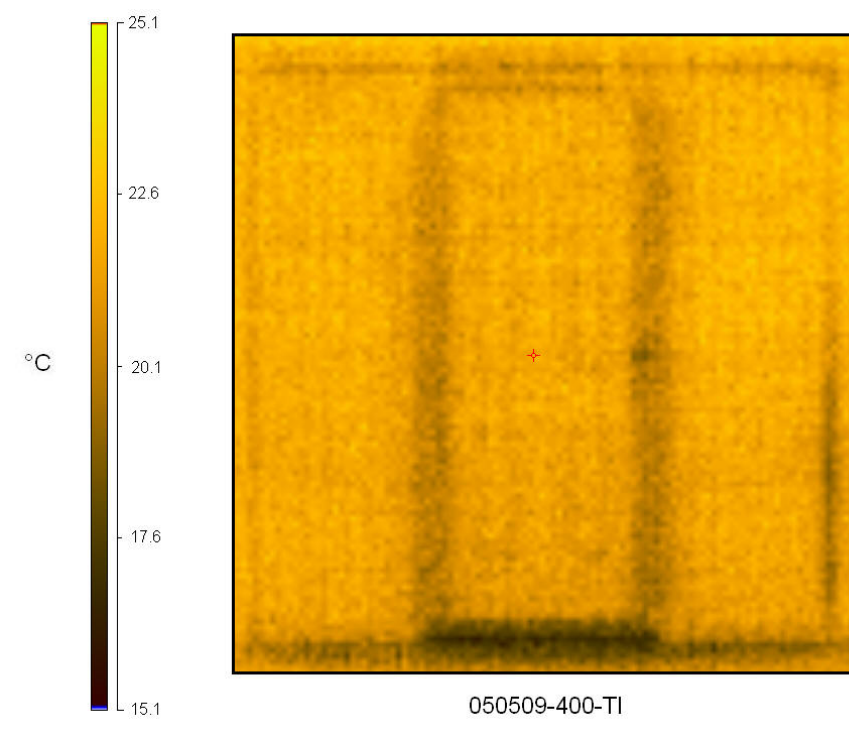
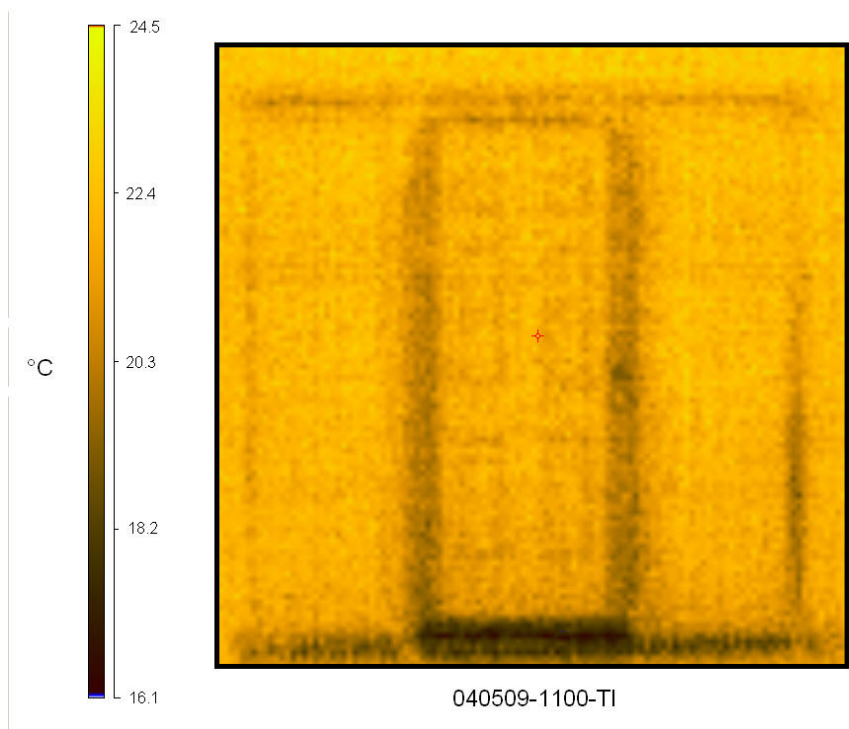
6 Thermal Imaging Camera Pictures (page1 of3)

On separate occasions throughout the testing procedure thermal imaging picture were taken. These pictures illustrate the temperature differences between the door slab and the wall. The most notable area of temperature loss was found along the stiles of the door slab and sill.

Thermal Imaging Camera used: **Raytek Thermo View Ti30 - High performance Thermal Imager**



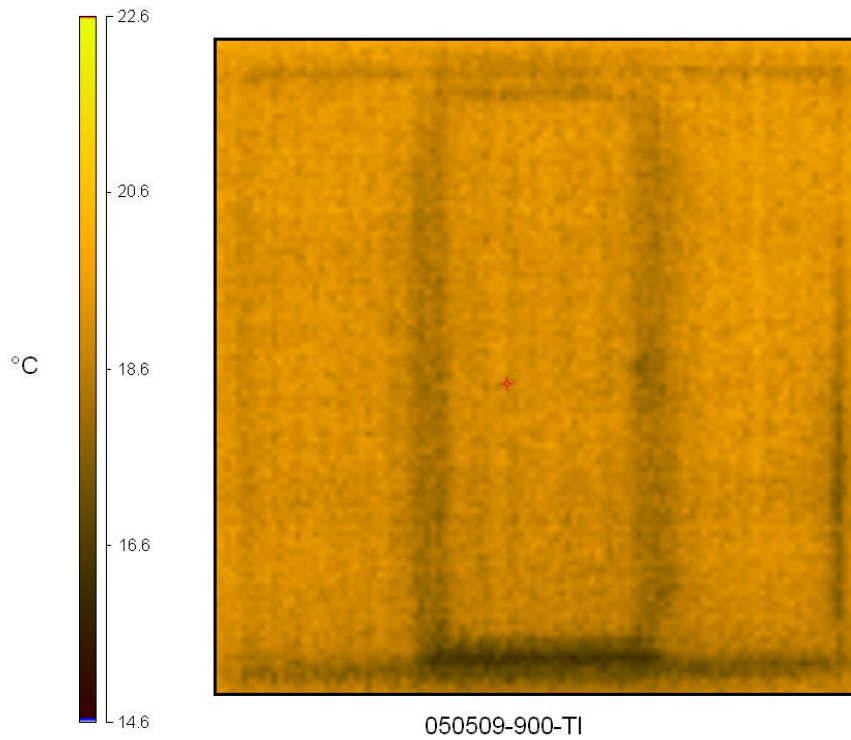
Thermal Imaging Camera Pictures (page 2 of 3)



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Thermal Imaging Camera Pictures (page 3 of 3)



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6 Conclusion

The MasterGrain 6 Panel Slab 3'0" by 7'0" with the polyurethane foam core, engineered wood stiles and composite top and bottom rails, complied well within the limits of thermal bowing acceptance. At no time during the 4-day test did the slab ever lose contact with the weather seals. The maximum recorded movement of 0.116" was located at the top of the door with a recorded inside temperature of -29.3°C and a recorded outside temperature of 24.5°C.

This report does not automatically imply that every slab will perform as documented in this test. All data was recorded in a controlled environment to simulate severe temperature differences.

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