



WAUSAU

WINDOW AND WALL
SYSTEMS

Brattleboro Retreat Osgood Building · Brattleboro, Vermont · Lavallee | Brensinger Architects



4000i-DT AND 2187-DT SERIES WINDOWS FOR BEHAVIORAL CARE

Patients, doctors and medical staff agree that views and daylighting help reduce hospital stays, increase patients' sense of well-being, and expedite the healing process.

Wausau Window and Wall Systems® 4000i-DT Series casement and fixed exterior windows, and 2187-DT Series interior accessory windows help ensure security by resisting up to **2000 ft-lbs** of interior human impact energy.

Wausau behavioral care products are time-tested and cited nationwide as a **basis of design**, creating home-like, safe and therapeutic environments.

Triple glazing and thermal barrier framing address today's energy efficiency and condensation resistance standards.

www.wausauwindow.com



FEATURES

- 4" frame depth with polyamide thermal barrier
- AAMA AW-120 Architectural Performance Class
- Resists interior human impacts of up to 2000 ft-lbs of energy
- Fixed or side-hinged vents
- 15 psf static and cyclical water resistance
- Low U-Factors allow broad expanses of vision glass
- Equal sightline at vents and fixed lites
- 1/8" principal wall thickness
- Radius access door edges with optional corner relief
- Integral between-glass blinds with 5/8" or 1" aluminum slats
- Concealed, extruded aluminum butt hinges with stainless steel pins
- Tamper-resistant locking hardware and interior glazing materials
- Recycled content in aluminum framing

4000i-DT BEHAVIORAL CARE EXTERIOR WINDOWS

Operable windows can provide emergency ventilation in patient rooms.

Between-glass blinds offer safe, occupant-controlled exterior privacy and a sense of control.



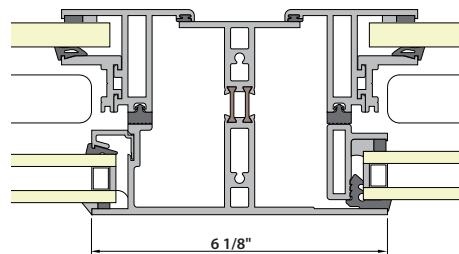
4000i-DT Side-Hinged Inswing Window - Exterior View

Interior View

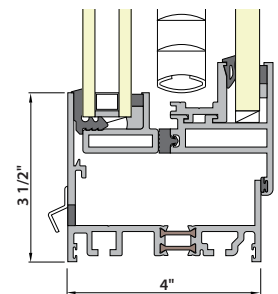


OPTIONS

- Triple glazing standard, dual glazing optional
- Interior glazing is 1/2" polycarbonate, 7/16" or 9/16" tempered laminated glass, or 19/32" glass-clad polycarbonate
- Non-impact standard interior access doors available
- Dual-color frame finishes
- Exterior applied muntins
- Concealed through-frame anchorage or hook-in steel anchors
- Head, jamb and sill receptors ; panning systems for renovation
- Safety keys non-removable in the unlocked position (as pictured)
- Anti-ligature bars above interior access doors (see detail at right)



Fixed-Casement Post



Casement Sill

4000i-DT Behavioral Care

ALLOWABLE AIR	WATER	NFRC U-FACTOR	CRF _{FRAME}	STC _{OITC}
0.10 cfm/sqft at 6.24 psf	15 psf	0.34 to 0.39 BTU/hr.sqft.*F	57 to 60	47 to 49 33 to 37

Project-specific test results may vary

www.wausauwindow.com

Download comprehensive details, specifications and product performance information

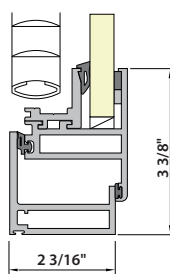
2187-DT SEAL™ BEHAVIORAL CARE INTERIOR ACCESSORY WINDOWS (IAWs)

In **new construction**, 2187-DT Series SEAL IAWs are often used as a curtainwall or storefront add-on, for integral blinds - or for interior impact performance in hurricane or blast applications. Companion products are featured on the back cover.

In **renovation or adaptive re-use** projects, where existing windows are weather-tight, and ventilation is unnecessary, SEAL IAWs can improve Sound, Energy, Air and Light control and add security - economically, and with a minimum of occupant disruption.



2187-DT Series
SEAL™ IAW



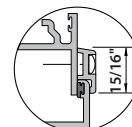
2187-DT
Behavioral Care

FEATURES

- 2-3/16" frame depth to fit flush with interior wall surfaces
- Complete performance characterization test results available, for air infiltration, air exfiltration, vertical loads, etc.
- Resists interior human impacts of up to 2000 ft-lbs of energy
- Side-hinged or lift-out access doors
- Low U-Factors allow broad expanses of vision glass
- 1/8" principal wall thickness
- Radius access door edges with optional corner relief
- Integral between-glass blinds with 5/8" or 1" aluminum slats
- Concealed, stainless steel four-bar friction hinges
- Tamper-resistant locking hardware and interior glazing materials
- Recycled content in aluminum framing

OPTIONS

- Interior glazing is 1/2" polycarbonate, 7/16" or 9/16" tempered laminated glass, or 19/32" glass-clad polycarbonate
- Non-impact standard interior access doors available
- Concealed through-frame anchorage
- Can be mounted within the daylight opening, or on the interior face of existing system framing members
- Safety keys non-removable in the unlocked position (as pictured)
- Anti-ligature bars above interior access doors (see detail below)



Optional
Anti-Ligature Bar
at Head of Sash

U-FACTORS - SEAL™ SERIES INTERIOR ACCESSORY WINDOWS				
Exterior Glass Type	Nominal Air Space (in.)	Estimated Center-of-Glass U-Factor (Thermal Transmittance - BTU/hr.sqft. °F)		
		Interior Glass Type		
		1/4" Uncoated (annealed or heat-treated)	1/4" Pyrolytic Low-E (facing air space)	7/16" Laminated
1/4" Uncoated (annealed or heat-treated)	2 1/2"	0.49	0.37	0.47
	5"	0.49	0.37	0.47
1" Insulating Glass	2 1/2"	0.31	0.25	0.30
	5"	0.31	0.25	0.30

All estimates based on Wausau 1297 Series SEAL IAWs, using WINDOWS 6.0 software. Results will change with exterior glass and frame type, as well as air space and wall cavity conditions. Test results may vary. Refer to standard Wausau disclaimers and qualifications.

ACOUSTIC PERFORMANCE - SEAL™ SERIES INTERIOR ACCESSORY WINDOWS					
Exterior Glass Type	Nominal Air Space (in.)	Estimated Acoustic Performance Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC)			
		Interior Glass Type			
		1/4" Uncoated or Low-E (annealed or heat-treated)		7/16" Laminated	
		STC	OITC	STC	OITC
1/4" Uncoated (annealed or heat-treated)	2 1/2"	40	31	44	33
	5"	42	33	46	35
1" Insulating Glass	2 1/2"	45	36	48	37
	5"	48	37	50	39

All estimates inferred from Wausau test data on similar glazing make-ups. Results will change with exterior glass and frame type, as well as air space and wall cavity conditions. Test results may vary. Refer to standard Wausau disclaimers and qualifications.

Estimated performance values are NOT test results. As noted, actual performance will vary. Validation may require project-specific testing, adding cost and impacting schedule.

HARDWARE

- Concealed, tamper-resistant, die cast security locks
- Optional die cast escutcheon plates render keys non-removable in the unlocked position
- Optional Gematic™ locks enhance the perception of security
- Ligature-resistant interior hardware components
- Radius edge, overlap sash with optional corner relief minimizes sharp edges
- Optional extruded aluminum anti-ligature bars available

ANCHORS

- Ductile corner construction and standard steel strap anchors maximize energy absorption
- Through-frame anchors are optional as substrates allow
- Specially-designed impact receptors available
- Substrates may require reinforcement to transfer impact loads to the building structure

BETWEEN-GLASS BLINDS

- Blinds are protected from damage and patient access; available with 5/8" or 1" aluminum slats in a broad range of standard colors
- Corrosion-resistant extruded aluminum head rail
- Hinged interior access door allows for easy cleaning
- Concealed raise/lower cords; optional occupant-controlled tilt
- Tilt control slip-clutch feature prevents damage
- Air cavity is vented to the exterior to minimize fogging

SEALANTS

- Installers are urged to follow NYSOMH recommendations on the selection of flexible, abrasion resistant, and highly tenacious security sealants if exposed to the interior

IN-LINE TESTING

- Production line testing ensures real-world performance equal to the laboratory

Both "overlap" and "flush" sash designs have been deemed acceptable by the NYSOMH and other specifying authorities when considering all inherent ligature and security risks. More information available upon request.

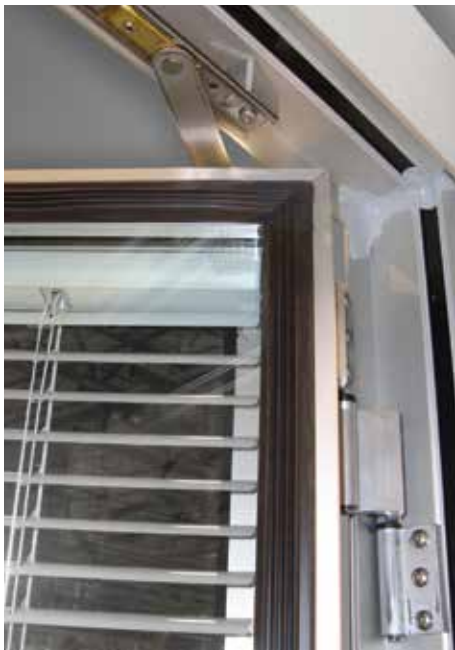
"The built environment, no matter how well designed and constructed, cannot be relied on as an absolute preventive measure. Staff awareness of the environment, the latent risks of that environment, and the behavior risks and needs of the patients served in the environment are absolute necessities..."

The Facility Guidelines Institute (FGI/AIA) 2019 "Guidelines for Design and Construction of Hospitals"

Flush-mounted occupant-operable blind tilt control knob - One of several options



Stainless steel four-bar friction hinge and between-glass blinds (2187-DT Series)



Extruded blind head rail, stainless steel friction adjuster and concealed butt hinges (4000i-DT Series)



Rounded-corner, vented access door and concealed butt hinges



Custodial security lock and optional escutcheon, so key is non-removable in the unlocked position

IMPACT DROP TESTING PER AAMA 501.8

2000 foot-pounds of energy, as imparted by the human impact drop test apparatus, simulates shoulder impact of a 200-pound person moving at 25 feet per second. Energy must be transferred sequentially through hardware, window frames, anchorage and substrates. Specific post-impact safety, security and enclosure conditions must be met.

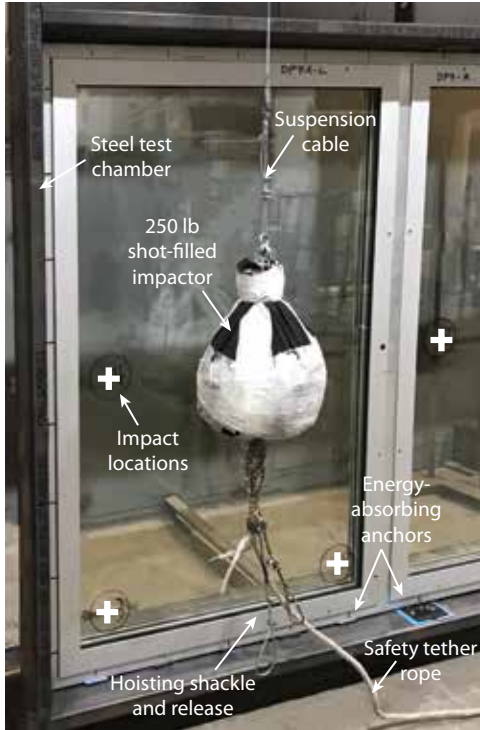
Important Design Team Note: Appropriate minimum requirements for interior human impact performance depend on application, occupancy, and level of supervision, as well as other project-specific parameters. Consultation with on-site medical and security staff is encouraged, with special consideration given to pass/fail criteria.

Simulation of physical attack with objects likely to be accessible to occupants in seclusion may be advisable.

Wausau behavioral care products are listed in the *"New York State Office of Mental Health's Patient Safety Standards, Materials and Systems Guidelines,"* researched and maintained by Lomonaco and Pitts, P.C. doing business as architecture+ of Troy, New York.

Evaluation of window products for behavioral health applications may include resistance to, or restriction of:

- . Escape attempts or passage of contraband
- . Patient access to unauthorized areas or routes of egress
- . Attack to window components using blunt or sharp objects
- . Tampering with, or disabling, locking devices
- . Laceration or self-harm by cutting
- . Pica behavior (ingestion of components or materials)
- . Abrasion, prying or cutting
- . Weaponization of parts
- . Ligature



Human Impact "Drop Test" Apparatus



4000i-DT TESTING SUMMARY Exterior Behavioral Care Windows 2000 ft-lbs Impact Energy <i>AAMA 501.8 - 14 "Standard Test Method for Determination of Resistance to Human Impact of Windows Intended for Use in Psychiatric Applications"</i>				
Test Specimen Configuration	Width (inches)	Height (inches)	Interior Glazing	Anchors and Substrate
Fixed Single Lite with Hinged Access Door DP6	72	84	1/2" Polycarbonate	Steel Strap Anchors in a Steel Test Buck
Fixed Single Lite with Hinged Access Door DP7	66	84	7/16" Tempered Laminated Glass	
Fixed** Single Lite with Hinged Access Door DP8	72	84	9/16" Tempered Laminated Glass	
Fixed Single Lite with Hinged Access Door DP8A	54	84	19/32" Glass-Clad Polycarbonate	
Fixed Single Lite with Lift-Out Access Door DP4	60	30	1/2" Polycarbonate	Impact Receptors in a Steel Test Buck (see note below)
Inswing Casement/Fixed*** with Meeting Rail DP5	40 (Two lites wide)	72	7/16" Tempered Laminated Glass	
Inswing Casement/Fixed* with Meeting Rail DP1	96 (Two lites wide)	72	1/2" Polycarbonate	Through-Frame and Steel Strap Anchors in SPF #2 Wood Blocking
Inswing Casement/Fixed with Meeting Rail DP9	96 (Two lites wide)	72	9/16" Tempered Laminated Glass	Through-Frame and Steel Strap Anchors in a Steel Test Buck
Inswing Casement/Fixed with Meeting Rail DP9A	96 (Two lites wide)	72	19/32" Glass-Clad Polycarbonate	
Inswing Casement/Fixed with Stacking Mullion DP2	96 (Two lites wide)	72	1/2" Polycarbonate	Through-Frame and Steel Strap Anchors in 16-Gauge Steel Studs

**Testing was successfully repeated at 2500 ft-lb impact energy on Unit DP8
 ***CMU substrate tested on a larger test unit of this configuration and glazing infill

AW Class

*Test unit DP1 achieved an AAMA AW120 rating for the "SHW" (side-hinged inswing window) product type - including AAMA 910 cycle testing - per AAMA/WDMA/CSA 101/1.S.2/A440-17 (NAFS), at the minimum NAFS gateway test size of 48" x 72" for SHWs.

Breadth of Testing

Successful human impact testing is an exercise in energy absorption, not unlike hurricane or blast hazard-mitigation testing. In general, larger, more flexible glazing represents the worst-case scenario for infill areas, while smaller or more-rigid glazing places higher loads on hardware and anchors. Both situations need to be addressed in testing and analysis.

A number of variables must be addressed when outlining a representative standard product certification test regimen:

- | | | |
|----------------------------------|-------------------------|---|
| Size (both minimum and maximum) | Aspect ratio | Impact energy (typically expressed in ft.-lbs.) |
| Prime windows versus IAWs | Receptors and trim | Operability |
| Locks, hinges and other hardware | Anchorage | Substrate material(s) |
| Interior film protection | Interior glazing infill | |

Applicability

Wausau's engineering department is involved in all behavioral care projects, to assess the applicability of existing test reports to specific situations. Using confidential, time-tested structural calculation guidelines and engineering judgment, recommendations are made on the necessity for further testing. Design teams choose from a relatively limited option set. If project-specific testing is expected, requirements must be included in bid documents, or change orders and schedule delays may result.

Exterior Thrown-Object Impact

See the 2187-DT Testing Summary for thrown-object impact test results.

Substitutions

Interior glazing identified as 1/2" polycarbonate may be Covestro Tuffak® 15 (formerly Makrolon® 15) or Sabic LEXAN® SL4855 per the "New York State Office of Mental Health's Patient Safety Standards, Materials and Systems Guidelines." Flame spread and smoke generation code requirements may require sprinkler wash, or the selection of other glazing infill laminates.

2187-DT TESTING SUMMARY				
Behavioral Care Interior Accessory Windows (IAWs)				
2000 ft-lbs Impact Energy				
<i>AAMA 501.8 -14 "Standard Test Method for Determination of Resistance to Human Impact of Windows Intended for Use in Psychiatric Applications"</i>				
Test Specimen Configuration	Width (inches)	Height (inches)	Interior Glazing	Anchors and Substrate
Hinged Access Door Single Lite SV10	60	84	1/2" Polycarbonate	Through-Frame Anchors on Inside Face of Wausau SuperWall™
Hinged Access Door Single Lite SV11	48	72	7/16" Tempered Laminated Glass	Through-Frame Anchors within DLO of Wausau SuperWall™
Hinged Access Door Single Lite SV12	19	72	1/2" Polycarbonate	
Hinged Access Door Single Lite SV13	19	72	7/16" Tempered Laminated Glass	
Lift-Out Access Door Single Lite SV16	36	72	19/32" Glass-Clad Polycarbonate	

Characterization Testing of IAWs

IAWs are explicitly excluded from the scope of NAFS. In the absence of an industry standard for IAWs, test protocols and performance criteria were jointly developed by an AAMA-accredited test lab and Wausau, based on relevant model building codes, industry standards and other criteria. For the purposes of representative testing, Wausau SuperWall™ was used to simulate a single-glazed existing fenestration product at the exterior, vented to reflect aging operable windows. Results may not be fully representative of what can be expected for IAWs used in conjunction with more-airtight exterior products, including, but not limited to, IAWs used as an upgrade on new windows, curtainwall or storefront.

Included in Scope of Characterization:

Air infiltration rate
Structural loading resistance to internal pressures
Life cycle testing of access door and hardware

Air exfiltration rate
Misuse loading

Excluded from Scope of Characterization:

Water penetration resistance of IAWs or exterior windows
Safety glazing or code requirements for safety glazing
Thermal performance
Heat build-up or thermal stress on existing glass*
Varying existing (exterior) glass/frame combinations
Occupant operation of IAWs (custodial only)

Water drainage from the air cavity
Shared structural loading due to exterior wind
Internal fogging or condensation*
Hermetically sealed air cavities
Insect or dust entry

*Internal fogging and thermal stress may be affected by air cavity venting, as quantified by air exfiltration test results normalized to reflect project-specific in-situ conditions.

Breadth of Testing and Applicability

Refer to the 4000i-DT Testing Summary for notes on breadth of testing and applicability.

Anchorage

Special provisions may be needed in anchorage and reinforcement of exterior framing or existing windows to provide adequate support for 2187-DT Series IAWs.

Substitutions

Refer to the 4000i-DT Testing Summary for notes on substitutions.

Weight Limits

Maximum 2187-DT unit size is limited by weight and aspect ratio restrictions on the four-bar friction hinges used for side-hinged access doors. Lift-out options may be available.

Exterior Thrown-Object Impact

In addition to interior impacts, supervised patients in courtyards or outdoor exercise areas may have access to objects which could be hurled at exterior glazing. 1-1/16" overall IGUs incorporating laminated exterior lites were subjected to impact from three solid, smooth steel spheres dropped from a height of 30 feet, striking the specimens within one inch of the center, at a speed of 30 mph. Results are tabulated at right.



2187-DT SEAL™ Series
Interior Accessory
Window

COURTYARD GLAZING TESTING SUMMARY		
Laminated Insulating Glass		
The sharp object impact test was conducted in substantial accordance with ANSI/SAE Z 26.1-2007 "American National Standard for Safety Glazing Materials for Glazing Motor Vehicles and Motor Vehicle Equipment Operating on Land Highways - Safety Standard."		
Exterior Glass	Object Diameter	Results
7/16" Fully Tempered Laminated	8 mm (ASTM E 1996 "A" Missile)	No damage or breakage
	12 mm (Intermediate size)	Exterior lite of laminate shattered (No penetration)
	38 mm (ANSI/SAE Z26.1 standard size)	Both lites of laminate shattered (No penetration)
7/16" Annealed Laminated	8 mm (ASTM E 1996 "A" Missile)	No damage or breakage
	12 mm (Intermediate size)	No damage or breakage (Glass repair an option if chipped)
	38 mm (ANSI/SAE Z26.1 standard size)	Both lites of laminate shattered (No penetration)

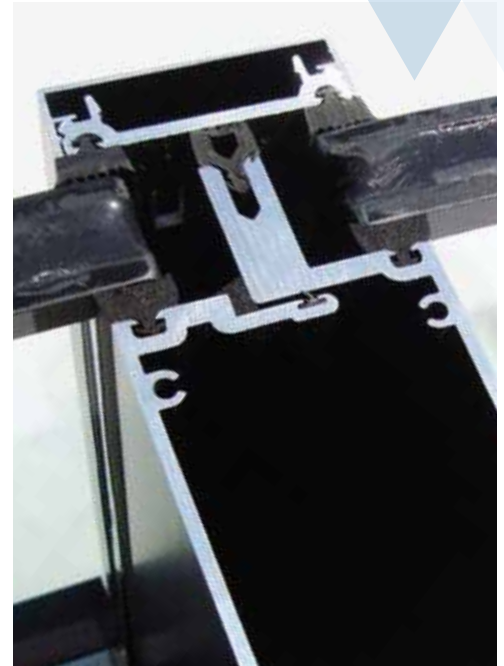
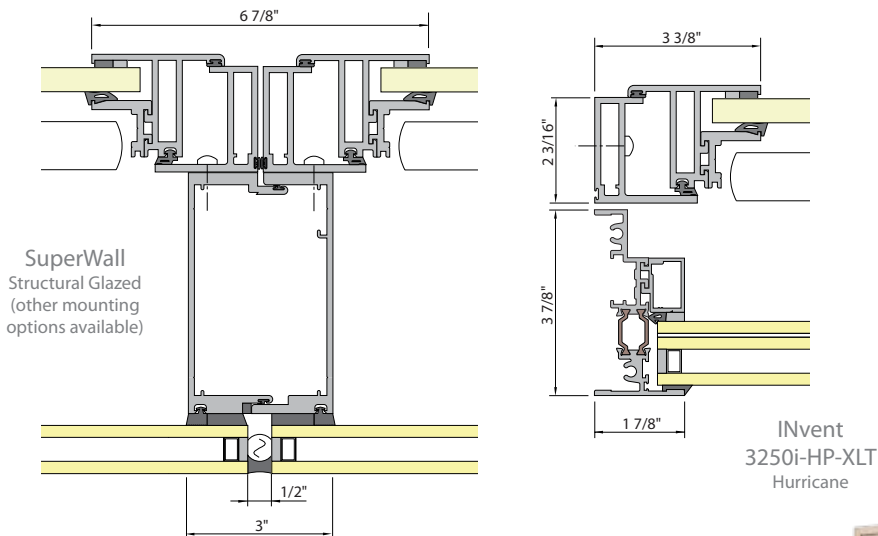
COMPANION PRODUCTS FOR DESIGN FLEXIBILITY

Wausau 2187-DT Series SEAL™ IAWs may be applied to the interior of Wausau SuperWall™ for an integral-blind behavioral care upgrade of **curtainwall and window wall** configurations.

INvent™ -HP -XLT or -BHM Series fixed windows may be upgraded for use in behavioral care occupancies by applying 2187-DT Series SEAL™ IAWs, when blast-hazard-mitigating design is also necessary, or for wind-borne debris resistance in hurricane-prone areas.

SUPERWALL™ 7250, 8250 and 10250 Series

Three complete 3" face systems in 7-1/4", 8-1/4", and 10-1/4" frame depths to efficiently address almost any span/load requirement - all systems' components are internally consistent and interchangeable.



INVENT™ -HP -XLT

Hurricane impact-resistant fixed windows, with polyamide thermal barriers and a full line of installation accessories.

INVENT™ -BHM

Shock-tube tested **blast hazard mitigation** for all threat levels, backed by Wausau's experienced structural engineers.



WAUSAU

WINDOW AND WALL
SYSTEMS

📍 7800 International Drive. Wausau, WI 54401

📞 1.877.678.2983

✉ info.wausauwindow.com

🌐 wausauwindow.com



"SuperWall," "INvent" and "SEAL" are trademarks of Apogee Wausau Group, Inc. All rights reserved. © 2021 Apogee Wausau Group, Inc.