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Acronal® 4160

Superior Waterproofing for Masonry and Concrete Surfaces

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The home restoration market is calling for high performance waterproofing solutions to address the challenges with more frequent water-related damage. Acronal 4160 is an aqueous styrene-acrylic copolymer dispersion for creating versatile waterproofing membranes that resist standing water, withstand negative-side hydrostatic pressure, and prevent water intrusion. Formulations using Acronal 4160 will provide exceptional waterproofing performance for interior and exterior coating applications.

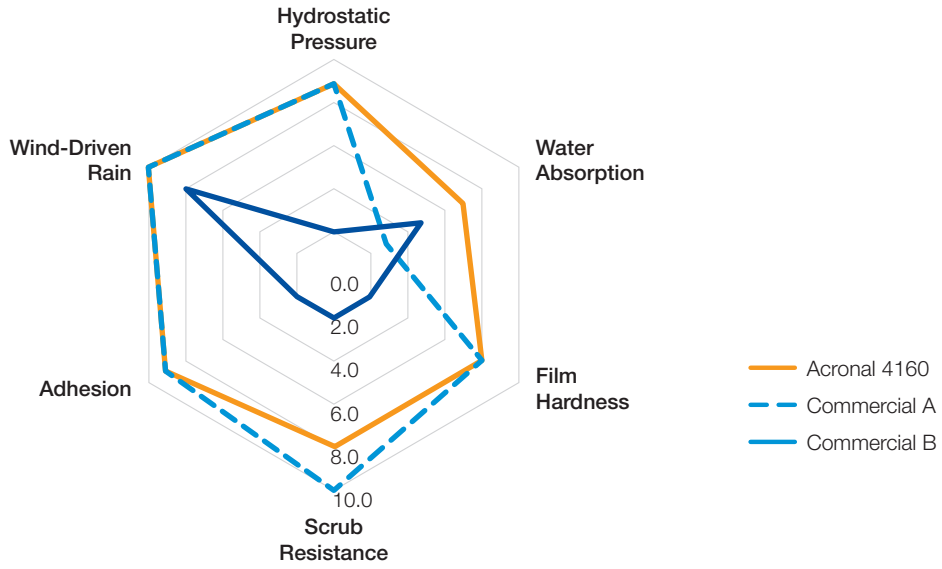
Features

- Impressive performance under hydrostatic pressure
- High film strength
- Excellent water resistance
- Brushable, rollable, and sprayable formulation
- Low-VOC and non-APEO dispersion

Properties

Solid content, weight %	ca. 45
VOC content, weight %	< 0.1
Viscosity, cps	350
pH	7.2
Density, lbs/gal	8.6
Tg	ca. 38°C
Particle size, micron	ca. 0.1

Performance of Acronal 4160 in a masonry waterproofing formulation



	Acronal 4160	Commercial A	Commercial B
Hydrostatic Pressure	9	9	2
Water Absorption	7	3	5
Film Hardness	8	8	2
Scrub Resistance	8	10	2
Water Softening	9	9	2
Wind-Driven Rain	10	10	8

Commercial A: Commercial masonry waterproofing paint

Commercial B: Quality exterior residential paint

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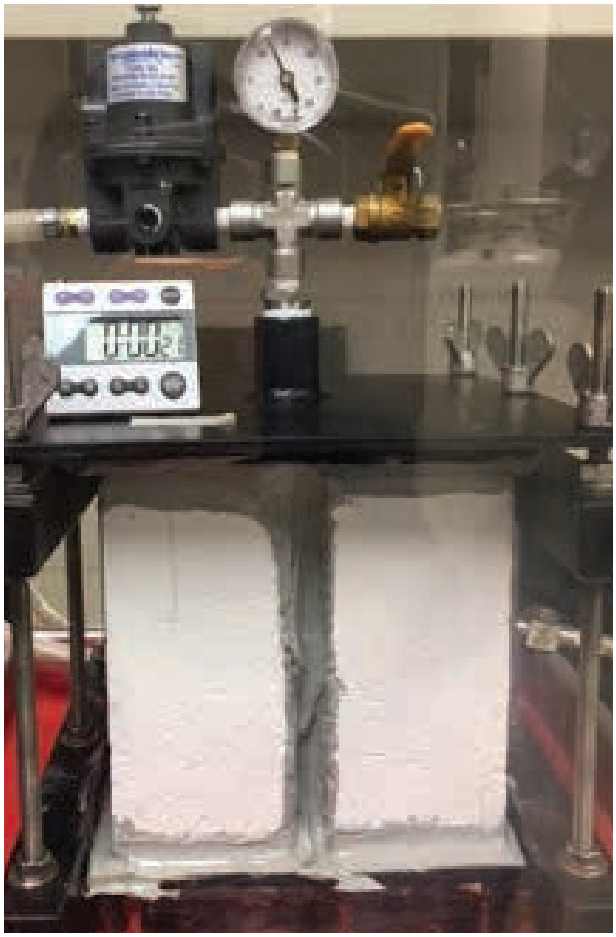
Exceptional Performance Under Hydrostatic Pressure

Masonry coatings formulated with Acronal 4160 exhibit impressive hydrostatic pressure resistance – in excess of 10 psi – and pass standard tests for negative-side waterproofing. Formulations with Acronal 4160 are ideal for basement and retaining walls that are exposed to appreciable negative-side water pressure.

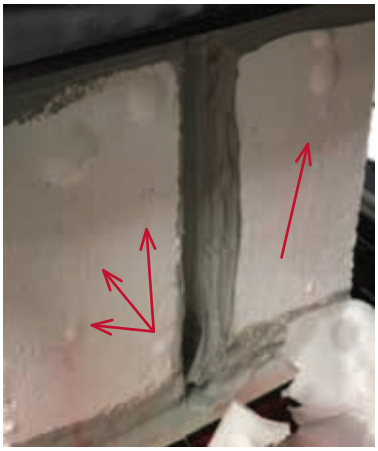
Hydrostatic pressure testing

In this standard ASTM D 7088 test, the outside faces of a hollow concrete cinder block are coated with a masonry waterproofing coating containing Acronal 4160. The coated block is filled with water and allowed to sit for seven days. The block is then sealed and placed into a chamber and air pressure is applied to the water within the block – forcing the water outward against the coating. The pressure is started at 4 psi then gradually increased up to 15 psi.



Top left: ASTM D 7088 test set up to evaluate waterproofing coatings under hydrostatic pressure.

Top right: Performance of coating formulated with Acronal 4160 passing ASTM D 7088 without blistering or coating failure.



Bottom right: Performance of commercial quality exterior residential paint under hydrostatic pressure. Blisters formed at 4psi, failing ASTM D 7088 test.

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Water Absorption and Water Resistance

Acronal 4160 provides excellent water resistance properties. In a water absorption comparative test, formulated waterproof coating films with Acronal 4160 were found to absorb the least amount of water. In a wind-driven rain test, formulated waterproof coatings with Acronal 4160 withstand high velocity rain exposure. Therefore, waterproof membranes formulated with Acronal 4160 are ideal for coatings exposed to wind-driven rain and standing water.

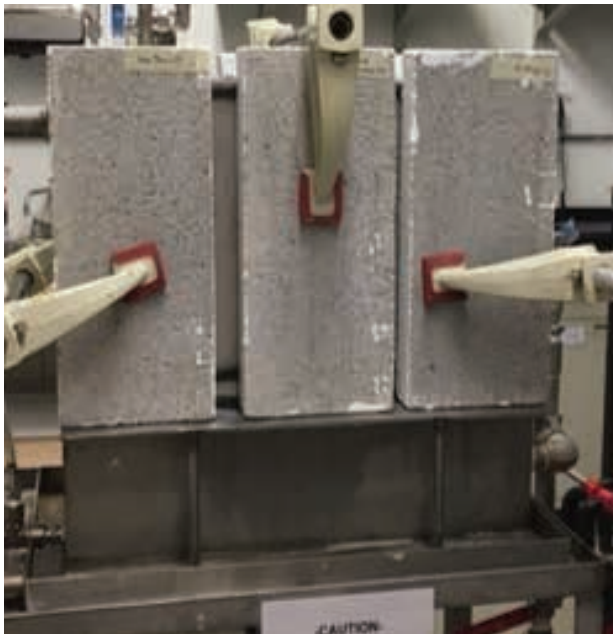
Water absorption testing

In the water absorption test, dry waterproofing coating films containing Acronal 4160 are submerged in water and the films are then re-weighed. The percent water absorption is reported as a percentage of the initial film.

	1 Day % Absorption
Acronal 4160	21.80%
Commercial A	30.60%
Commercial B	25.50%

Wind-driven rain testing

In the wind-driven rain test, ASTM D6904, concrete blocks coated with Acronal 4160 containing formulation are exposed to a continuous pressurized water spray and air pressure for 24 hours. This replicates exposure of painted surfaces to high velocity rain.



Top left: ASTM D 6904 test apparatus to evaluate waterproofing coatings under wind-driven rain. The coated side of the blocks are facing the inside of the apparatus (i.e., not visible).

Right: Masonry blocks coated with Acronal 4160-based formulation exhibits no coating failure and no moisture gain after extended exposure to wind-driven rain.

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Formulation Guidelines

Dispersants

Due to its more hydrophobic character, Dispex® CX 4320 dispersant is particularly recommended in waterproofing formulations containing Acronal 4160. The Dispex CX line of polymeric dispersing agents, based on the sodium salt of a modified polycarboxylate in water, provides excellent dispersing efficiency for inorganic fillers and pigments, improved water resistance and a good balance of tint strength and performance properties. Dispex CX 4320 is low-VOC, low-odor, and non-APEO.

Defoamers

FoamStar® ST 2420 is a high efficiency, hyper-branched polymer blend defoamer well suited for use with Acronal 4160 in waterproofing formulations. FoamStar ST defoamers are ultra low-VOC, low-odor, highly persistent and effective against microfoam. Specifically, FoamStar ST 2420 is a well-rounded option for formulating with this Acronal 4160.

Rheology Modifiers

Rheovis® PU 1341 is a non-APEO, solvent-free, low-VOC, low-odor non-ionic associative thickener specifically designed to provide a Newtonian rheology profile and an excellent balance of performance properties in a wide range of coating formulations. Used in combination with Attagel® 50 natural attapulgite clay and a cellulosic rheology modifier in the enclosed waterproofing formulation, Rheovis PU 1341 helped provide stable formulation viscosities over time with no pigment/filler settling nor syneresis. Rheovis PU 1341 helps impart excellent flow and leveling with good sag resistance as well. With Rheovis AS 1188 used in place of Rheovis PU 1341, improved substrate adhesion and dirt-pickup resistance properties may be achievable.

Wetting Agents

Hydropalat® WE 3320 is a nonvolatile, non-ionic alcohol ethoxylate used in waterborne coatings to simultaneously improve both pigment dispersing, stabilization and substrate wetting. It is non-APEO, zero-VOC and moreover helps reduce water sensitivity.

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Suggested Formulation

Suggested Masonry Waterproofing Formulation		
raw materials	**lbs**	**gallons**
Grind		
Water	102.12	12.05
Natrosol[1] 250 HBR	2.89	0.34
AMP[2] 95	0.71	0.09
Hydropalat[3] WE 3320	3.04	0.34
Dispex[3] CX 4320 (25%)	27.20	3.04
Foamstar[3] ST 2420	2.03	0.29
Attagel[3] 50	1.89	0.09
TiPure[4] R902	125.93	3.81
Minex[5] 7	74.36	3.36
Minex[5] 2	223.04	10.09
ASP[3] NC X-1	9.03	0.41
Zoco[6] 103	14.18	0.30
Grind for 20 minutes, then add letdown		
Letdown		
Acronal[3] 4160	425.45	48.75
Water	98.12	11.58
Velate[7] 368	13.42	1.65
Butyl Carbitol[8]	20.14	2.50
Foamstar[3] ST 2420	2.03	0.27
Polyphase[9] 663	3.44	0.41
Proxel[10] AQ	3.44	0.41
Rheovis[3] PE 1341	2.00	0.23
Total	**1154.46**	**100**
Formula Properties		
Vol solids %	42.0	
Wt solids %	58.7	
pH	9.5	
PVC %	45.2	
VOC g/L	81	
KU	100	
ICI	0.59	

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Safety

General

The usual safety precautions when handling chemicals must be observed. These include the measures described in Federal, State and Local health and safety regulations, thorough ventilation of the workplace, good skin care and wearing of protective goggles.

Material Safety Data Sheet

Please refer to the most current version of the Material Safety Data Sheet that can be found on-line at www.basf.us/sds

Storage

Acronal 4160 has a shelf life of six months from delivery date, provided it is stored in accordance with the “Handling and Storage of polymer dispersions” brochure. Technical information regarding the storage of BASF polymer dispersion products is available upon request.

About the Dispersions & Resins Business

The Dispersions & Resins business of BASF develops, produces, and markets a range of high-quality resins, additives, colorants, and polymer dispersions worldwide. These raw materials are used in formulations for coatings and paints, printing and packaging products, construction coatings, adhesives, cellulosics and composites, and paper manufacturing. With a comprehensive product portfolio and extensive knowledge of the industries we serve, our customers benefit from innovative and sustainable solutions to help them advance their formulations through chemistry. For further information about the Dispersions & Resins business in North America, please visit http://www.basf.us/dpsolutions.

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At BASF, we create chemistry for a sustainable future. We combine economic success with environmental protection and social responsibility. The more than 115,000 employees in the BASF Group work on contributing to the success of our customers in nearly all sectors and almost every country in the world. Our portfolio is organized into five segments: Chemicals, Performance Products, Functional Materials & Solutions, Agricultural Solutions and Oil & Gas. BASF generated sales of €64.5 billion in 2017. BASF shares are traded on the stock exchanges in Frankfurt (BAS), London (BFA) and Zurich (BAS). Further information at w ww.basf.com.

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