

KBI Flexi®-Pave — Technical Specification Sheet

K.B. Industries, Inc. (KBI), a wholly owned subsidiary of Atlantic Power & Infrastructure Corp. (AP&I)

KBI FLEXI®-PAVE HD2000 CSI 32 13 73 – FLEXIBLE POROUS PAVING

PART 1 — GENERAL

1.1 SUMMARY

- A. This section includes requirements for **KBI Flexi®-Pave HD2000**, a flexible porous pavement system manufactured exclusively by K.B. Industries (KBI), a wholly owned subsidiary of Atlantic Power & Infrastructure Corp. (AP&I).
- B. The system provides a permeable, resilient, ADA-compliant pavement surface designed for stormwater infiltration, groundwater recharge, environmental pollutant reduction, and long-term durability across all climate zones.
- C. **No substitutions or equivalents are permitted.** Products marketed as “Flexi-Pave” or similar names **are not approved** and do not meet the testing requirements referenced herein.

1.2 DEFINITIONS

- A. **Flexible Porous Pavement:** A monolithic, urethane-bound composite surface consisting of recycled rubber granules and crushed stone, designed to provide hydraulic conveyance, ADA stability, and long-term durability.
- B. **Manufacturer:** K.B. Industries, Inc. (KBI), the sole producer of KBI Flexi®-Pave HD2000.
- C. **Installer:** A contractor or municipal crew that has been trained and certified by KBI to install KBI Flexi®-Pave HD2000 in accordance with manufacturer requirements.
- D. **Subbase:** A compacted crushed-stone layer meeting project-specified gradation and thickness requirements, providing structural support and hydraulic conveyance for the flexible porous pavement system.
- E. **Overpour Condition:** Installation of KBI Flexi®-Pave HD2000 over an engineered base such as concrete, asphalt, or wood, where the existing substrate provides structural support.

1.3 SYSTEM DESCRIPTION

A. Flexible porous pavement composed of recycled rubber, crushed stone, and urethane binder. B. Designed to provide:

- 1. High infiltration (up to 3000 gph per sq. ft.)
- 2. 23% void structure for hydraulic conveyance
- 3. Freeze-thaw stability through 300 cycles
- 4. ADA-compliant slip resistance (0.65 COF)
- 5. Nutrient pollutant reduction (up to 86% nitrate/phosphorus)
- 6. Sound absorption and temperature moderation
- 7. Structural resilience under pedestrian and vehicular loads
- 8. Trip-and-fall liability mitigation (documented by City of Key West)
- 9. Root-heave elimination without root cutting
- 10. Long-term stability in coastal, freeze-thaw, desert, and high-humidity environments

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1.4 RELATED SECTIONS

- A. **31 00 00 – Earthwork:** Subgrade preparation, grading, compaction, and drainage considerations.
- B. **32 01 00 – Pavement Maintenance:** Cleaning, vacuuming, and long-term surface care requirements.
- C. **32 93 00 – Plants and Soil Preparation:** Tree-surround coordination, root-zone protection, and landscape integration.
- D. **33 40 00 – Storm Drainage:** Hydrologic design, infiltration systems, and stormwater conveyance.

1.5 REFERENCES

- A. ASTM C666/C666M – Freeze/Thaw Durability
- B. ASTM D2047 – Slip Resistance
- C. ASTM D4123 – Resilient Modulus / Heat Aging
- D. ASTM E84 – Surface Burning Characteristics
- E. ASTM C423 / E795 – Sound Absorption
- F. ASTM G57 – Electrical Resistivity
- G. EPA 353.2 / EPA 365.4 – Nutrient Reduction
- H. FL DOT FM 5-565 – Permeability
- I. TX DOT 242-F – Hamburg Loaded Wheel Test
- J. TX DOT 231-F – Static Creep
- K. ISSA TB100 / TB139 – Abrasion & Cohesion
- L. UNH Stormwater Center – Porous Pavement Hydrologic Performance
- M. UCF Stormwater Academy – Leachate, Water Quality, Infiltration Testing

1.6 PROCUREMENT PATHWAYS

A. Green Partnership Program (GPP)

- 1. Municipal crews may be trained and certified by KBI in a single day.
- 2. Allows agencies to install KBI Flexi[®]-Pave in-house.
- 3. May eliminate competitive bidding depending on local procurement rules.
- 4. Reduces project cost and accelerates installation timelines.
- 5. Supports extended warranty eligibility.

B. Traditional Contractor Installation

- 1. Installation performed by KBI-certified contractors.
- 2. Competitive bid required where applicable.

1.7 SUBMITTALS

- A. Product Data
- B. Certificates of Compliance
- C. Installation Instructions
- D. Material Samples
- E. Testing Portfolio (upon request)

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1.8 QUALITY ASSURANCE

- A. Manufacturer shall have minimum 20 years of experience with installations in all climate zones.
- B. Installers must be KBI Certified prior to installation.
- C. Mock-ups may be required by Owner.

1.9 INSTALLER QUALIFICATIONS

- A. Installer shall be **KBI-Certified** prior to performing any work associated with KBI Flexi[®]-Pave HD2000.
- B. Installer shall have a minimum of **2 years of experience** installing urethane-bound or porous pavement systems, or shall complete manufacturer-provided training prior to project start.
- C. Installer shall demonstrate familiarity with:
 - 1. Subbase preparation and compaction
 - 2. Binder temperature conditioning
 - 3. Mixing and placement procedures
 - 4. Curing protection requirements
 - 5. Manufacturer's written installation instructions
- D. Work performed by non-certified installers shall not be accepted and may void warranty.

1.10 PROJECT CONDITIONS

- A. **Environmental Conditions:**
 - 1. Do not install when ambient temperature is below 32°F or above 95°F unless manufacturer provides written approval.
 - 2. Do not install during rain, snow, or when subbase contains standing water.
 - 3. Binder shall be temperature-conditioned to manufacturer specifications prior to mixing.
- B. **Substrate Conditions:**
 - 1. Subgrade shall be stable, compacted, and free of organic material.
 - 2. Subbase shall meet specified thickness and gradation requirements.
 - 3. Subbase moisture content shall be within manufacturer-approved limits.
- C. **Protection Requirements:**
 - 1. Protect installed material from vehicular traffic, forklifts, track vehicles, dumpsters, lifts, or other heavy equipment during curing.
 - 2. Prevent contamination from oils, solvents, or construction debris.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Store binder between 40–77°F.
- B. Protect materials from moisture, contamination, and freezing.
- C. Use binder within 12 months of delivery.

1.12 WARRANTY

- A. Standard material warranty: 1 year.
- B. Extended warranties available with approved maintenance program or GPP participation.

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PART 2 — PRODUCTS

2.1 MANUFACTURER

K.B. Industries, Inc. (KBI)

A wholly owned subsidiary of Atlantic Power & Infrastructure Corp. (AP&I)
2420 Enterprise Rd., Ste 103
Clearwater, FL 33763

2.2 PRODUCT NAME

KBI Flexi[®]-Pave HD2000 *No substitutions or equivalents permitted.*

2.3 MATERIALS

- A. Composition:
 - 1. 50% recycled rubber (wire-free, fiber-free)
 - 2. 50% crushed granite stone
 - 3. MDI-based urethane binder (no extender oils)
- B. Colors: Natural and ZX Vibrant color ranges as specified.

2.4 PERFORMANCE REQUIREMENTS

A. Hydraulic Performance

- 1. Permeability: up to 3000 gph per sq. ft. per hour
- 2. Void content: 23%
- 3. Water storage: 0.6 gal per sq. ft.
- 4. FL DOT FM 5-565: Highly permeable
- 5. Maintains hydraulic conveyance after vacuuming
- 6. Eliminates surface ponding and glare
- 7. Reduces stormwater infrastructure requirements

B. Environmental Performance

- 1. Removes up to 86% dissolved nitrates and ortho-phosphorus
- 2. Bio-film formation naturally treats stormwater
- 3. Cools stormwater temperature
- 4. Leachate <6 ppb, no heavy metals
- 5. Supports groundwater recharge
- 6. Meets 7 of 7 LEED categories (up to 11 points)

C. ADA & Public Safety Performance

- 1. Slip-resistant surface (ASTM D2047, 0.65 COF)
- 2. Continuous ADA-stable surface with no uplift or cracking
- 3. Mitigates trip-and-fall liability (City of Key West documented reduction)
- 4. Eliminates root-heave without root cutting
- 5. Stable under pedestrian and mobility-device traffic

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D. Structural & Durability Performance

1. Freeze-thaw: no cracks through 300 cycles
2. Compression: withstands 250 psi without deformation
3. Hamburg Wheel Test: ≤ 2.3 mm rut depth at 8,000 cycles; full recovery in 24 hours
4. Resilient Modulus: $\geq 68,495$ lbs
5. Heat-resistant to 400°F
6. Abrasion-resistant (ISSA TB100/TB139)
7. Static creep permanent strain $\leq 0.514\%$
8. Chemical-resistant to gasoline, diesel, hydraulic fluid, saltwater, chlorine, ozone, bromine, muriatic acid

E. Maintenance & Lifecycle Performance

1. 25+ years of proven field performance with no material failures when installed over a stable subbase and used within design limits.
2. Minimal maintenance — vacuuming only
3. High recoverability after silt embedment
4. Optional urethane overspray every 4–6 years
5. Lower lifecycle cost than concrete, asphalt, or porous asphalt

F. Climate Performance

1. Performs in subzero to 120°F conditions
2. Promotes thawing by releasing stored heat
3. Reduces need for road salt (0–25% of normal application)
4. Stable in coastal, freeze-thaw, desert, and high-humidity environments

G. Vegetation & Urban Forestry Performance

1. Eliminates root-heave
2. Improves oxygen and water transfer to root zones
3. Ideal for tree surrounds, medians, shaded corridors
4. Used in Yellowstone for sensitive ecological zones

H. Safety & Accessibility

1. Slip resistance: ADA compliant (ASTM D2047)
2. Sound absorption: ASTM C423/E795
3. Electrical resistance: ASTM G57

2.5 MIXING

A. Mix rubber, stone, and binder per manufacturer's instructions. B. No extender-oil binders permitted.

2.6 CURING

- A. 24 hours at 45–95°F
- B. 48 hours near freezing
- C. 72 hours subzero
- D. Certified installer must verify hardness before use.

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PART 3 — EXECUTION

3.1 EXAMINATION

- A. Verify subgrade is stable, dry, and free of standing water.
- B. Confirm elevations and drainage patterns.

3.2 SUB-BASE REQUIREMENTS

- A. Heavy Traffic:
 - 1. 2" KBI Flexi[®]-Pave over 4" crushed stone base
- B. Pedestrian Traffic:
 - 2. 1.5" KBI Flexi[®]-Pave over 4" crushed stone base
- C. Over-Pour Conditions:
 - 3. 1" KBI Flexi[®]-Pave over engineered base (concrete, asphalt, wood)

3.3 INSTALLATION

- A. Install per manufacturer's written instructions.
- B. Protect surface from forklifts, track vehicles, dumpsters, or lifts during curing.
- C. Any damage voids warranty.

3.4 WEATHER LIMITATIONS

- A. Do not install above 95°F or below 32°F without extended certification.
- B. Do not install during rain or snow.
- C. Binder must be temperature-conditioned.

3.5 FIELD QUALITY CONTROL

- A. Perform water bucket test after cleaning to confirm hydraulic conveyance.
- B. Inspect for raveling, slumping, cracking.

3.6 CLEANING AND PROTECTION

- A. Remove spills, stains, and debris.
- B. Protect adjacent surfaces.

3.7 MAINTENANCE

- A. Annual inspection recommended.
- B. Vacuum sweeping only (no brooms or water spray).
- C. Overspray urethane binder every 4–6 years if needed.

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PART 4 — MULTI-JURISDICTIONAL PRECEDENT

This table provides a non-exhaustive selection of jurisdictions where KBI Flexi[®]-Pave has been installed.

Agency / Owner	Jurisdiction / Site	Application	Years Active	Performance Summary
National Park Service (NPS)	Yellowstone National Park, WY	Trails / Sensitive ecological zones	2015-2021	Freeze–thaw validated; water quality improvement; high infiltration; ADA stability
Arlington National Cemetery Administration	Arlington National Cemetery, Arlington, VA	Tree surrounds; walkways	2010	Zero root-heave; ADA stability; high infiltration
Smithsonian Institution Facilities Division	Smithsonian Institute, Washington, DC	Walkways	2012	No maintenance beyond cleaning; high infiltration; ADA stability
City of Key West - Public Works	Key West, FL	Coastal sidewalks, tree surrounds	2008-2025	Reduced trip & fall liability; saltwater-resistant; high infiltration; long-term ADA stability
City of Madeira Beach	St. John's Pass, Madeira Beach, FL	Coastal tree surrounds, street medians	2023-2025	Low maintenance; high infiltration; verified trip-and-fall liability mitigation; ADA compliance
The City of Sunrise	Shotgun Trail, Sunrise, FL	Pathways	2016	Strong ADA performance; stormwater benefits; high infiltration
City of Cambridge Parks Department	Cambridge Triangle Park, Cambridge, MA,	Tree surrounds	2022	ADA-stable; root-heave mitigation; high infiltration
City of Cambridge Parks Department	Binney Street Park, Cambridge, MA	Courtyard	2022	Long-term stability; aesthetic retention; high infiltration; ADA stability
City of Waltham – Waltham Public Schools	Waltham High School, Waltham, MA	Pathways	2024	Strong ADA performance; stormwater benefits; high infiltration; ADA stability