Technical Note

BELGARD COMMERCIAL

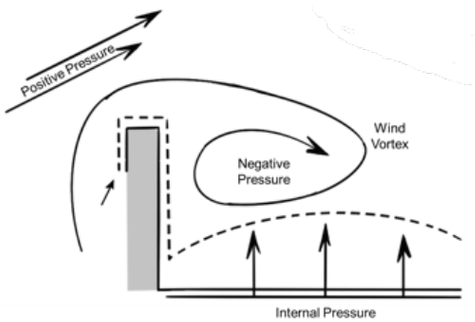
HIGH WIND APPLICATIONS FOR ROOF TOP PAVING SYSTEMS

Roof top paver systems have become an integral part of commercial roofing that not only improves the energy efficiency but also increases the life expectancy of the overall roof system. Changes to building codes and design standards along with concerns regarding climate change and severe weather have brought wind uplift design to the forefront as a vital component to roof top paver systems. ASCE 7 (American Society of Civil Engineers) standard provides minimum load requirements for the design of buildings and other structures that are subject to building code requirements. The following are some of the factors that go into the calculations for wind uplift:

- **Basic wind speed**
- **Wind directional factor**
- **Exposure category**
- **Topographical factor**
- **Gust effect factor**
- **Enclosure classification**
- **Internal pressure coefficient**

Wind pressure is a calculation of the force on a structure over a given area due to fluctuating external wind velocities. During a wind event, structures are subject to both positive (pushing) and negative (pulling) pressures. ASCE 7 provides guidelines on calculating required design pressures which incorporate multiple factors to develop uplift resistance requirements.

Wind load ratings are a characteristic of a system's capacity to withstand specific experienced wind loads. The engineer applies wind load factors to approximate wind effects on a structure and provides a required wind load rating (or minimum design load). Uplift pressures are presented in pounds per square foot (psf) and are calculated on a project-specific basis and for each deck area.



Because of the complexity and the multiple variables that must be considered, wind uplift requirements and calculations should be done by the engineer of record for the project. This would include calculating positive and negative pressures and their applicable roof zones with dimensions.

Generally, these zones would be:

1. **Field Areas**
2. **Perimeter Areas**
3. **Corner Areas**

ZONE 3	ZONE 2	ZONE 3
ZONE 2	ZONE 1	ZONE 2
ZONE 3	ZONE 2	ZONE 3

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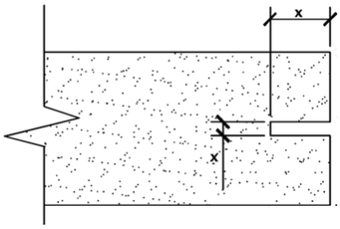
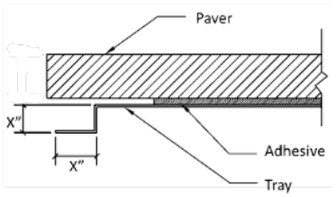
Available methods for addressing wind uplift requirements for roof top paving systems include:

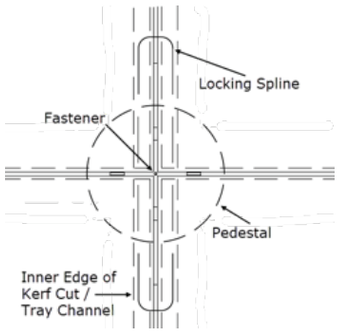
Side Locking – Kerf cut into the side of the paver that will receive a locking spline or clip to tie pavers & pedestals together.



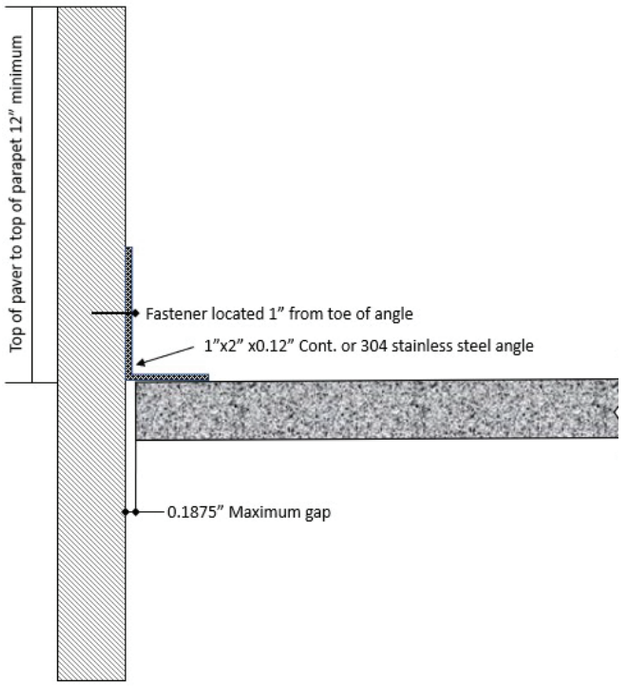
Tray Systems – Metal or composite trays that are adhered to the bottom of the paving unit with a perimeter channel that will receive a locking spline or clip to tie paver and pedestals together.



A locking spline can be slid into the kerf cut on the paver or the channel of the tray. The spline is fastened to the pedestal locking pavers and pedestals together creating a semi-monolithic system. This results in significant improved uplift resistance.



In many cases, a perimeter ledger metal must be installed to provide increased uplift resistance at the perimeter. This ledger metal can be installed on top of the paver (as shown in image below) or inserted in the kerf cut / tray channel on perimeter pavers. With either the side kerf cut or adhered tray system, wind uplift resistance is significantly improved.



The following table is a summary of the system's uplift resistance capabilities. Note that these values are based on laboratory testing and should be evaluated by the structural engineer of record to determine appropriateness of use on a specific project.

	WOOD PAVERS W/ KERF CUT			ADHERED TRAY			CONCRETE PAVERS W/ KERF CUT		
Roof Wind Zone	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3
Ultimate Strength Design	-39 psf	-65 psf	-98 psf	-57 psf	-89 psf	-121 psf	-89 psf	-150 psf	-226 psf
Allowable Stress Design	-23 psf	-39 psf	-59 psf	-34 psf	-53 psf	-73 psf	-54 psf	-90 psf	-136 psf

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