Pine Hall Brick Tech Bullet #4

Heavy Vehicular Traffic

Basics

In practice, heavy vehicular traffic is thought of as a high frequency of fully loaded tractor-trailers typically found on a municipal street or road. A more precise definition would say "high volumes of heavy vehicles representing trucks or combination vehicles having three, four or more loaded axles with daily equivalent single axle loads (ESAL) of 250 or greater". The Brick Industry Association's VEHICULAR DESIGN GUIDE (a copy can be downloaded on this site) is a good reference for determining whether your project has heavy vehicular traffic. In general terms, occasional passes of a garbage truck or tractor trailer does not constitute heavy vehicular traffic.

If you determine that you have heavy vehicular traffic, you will need to design your paving system to accommodate the traffic, usually requiring a thicker, aggregate base equivalent. In your system, you will need to specify a heavy vehicular paver that meets ASTM C 1272 standards. There are two types of heavy vehicular pavers, Type R and Type F. Type R pavers are 2 1/4" thick and are used when the design calls for a rigid setting bed of mortar or bituminous over a rigid base. Type F pavers are a minimum of 2 5/8" thick and are used when the design calls for a proper base with a sand setting bed. The 2 5/8" thickness meets the generally accepted 3 to 1 aspect ratio (thickness to length on a 4" x 8" paver) necessary to achieve paver interlock under heavy loading.

For a typical residential driveway or a light/medium traffic commercial job, the added cost of a heavy vehicular design is not necessary and pavers meeting ASTM C 1272 would not be required. In those applications, pavers meeting ASTM C 902 would apply.

Design Considerations

Bedding Sand: We recommend that bedding sand conform to ASTM C33. In addition, we recommend that the specification specifically exclude all stone screenings that may pass the C33 sieve analysis. Stone screenings tend to contain too much fine material passing the 200 sieve as well as tending to break down over time. This allows sand to settle out of the joints and compromise interlock. In addition, the bed can lose permeability from excess fines to create what some researchers (Cook & Knapton) refer to as a "lubricating slurry" that promotes paver movement. Screenings from certain parts of the country have shown to contain soluble salts that will produce efflorescence. (see TechBullet #6)

Joint Width: Research from Lilley and Clifford indicates that a 3mm (1/8") joint size is optimum for generating the strongest interlock between the individual units. Our English Edge paver features spacer nibs to aid the installer in creating optimal and consistent joint widths for good interlock. Joint width specifications should call for a range between 1/16" & 3/16".

Pattern: For vehicular traffic, the herringbone pattern is universally recommended as the nature of this pattern dissipates traffic load more effectively than any other pattern. In confined areas like crosswalks; a 45-degree herringbone is recommended to avoid the tendency of joint widths being widened, in a 90-degree pattern to avoid partial cuts at the edge restraint. Wide joints can compromise interlock, promote paver pattern creep and lead to severe paver damage. Historically, many paver street applications used perpendicular running bond and if this pattern is used, the designer should expect pattern creep and paver damage over time. However, this movement may or may not affect the life expectancy of the pavement. Many prefer the historic look as it adds charm and character to a given project.

Joint Sand Retention: Joint sand loss is the most common cause for vehicular pavement failures. The causes for sand loss can be among the following: excessive run off, tire suction, poor drainage, inadequate bedding or joint sand, poor base design, street cleaning. Joint sand stabilizers and cement & sand mixtures have been used to prevent sand loss over the years with some degree of success, given sound system design. There are some drawbacks: a cement & sand mix forms a rigid matrix that tends to break down over time due to traffic loading and the pavers will need cleaning after installation (method not recommended); liquid stabilizers may leave a sheen to the pavers under certain lighting conditions and they may require reapplication after 3 to 5 years depending on joint condition; dry-mix stabilizers that activate with moisture may lose solidity under heavy saturation and become less effective. On balance, the benefits of sand stabilization far outweigh the drawbacks in vehicular applications. (see TechBullet#6)

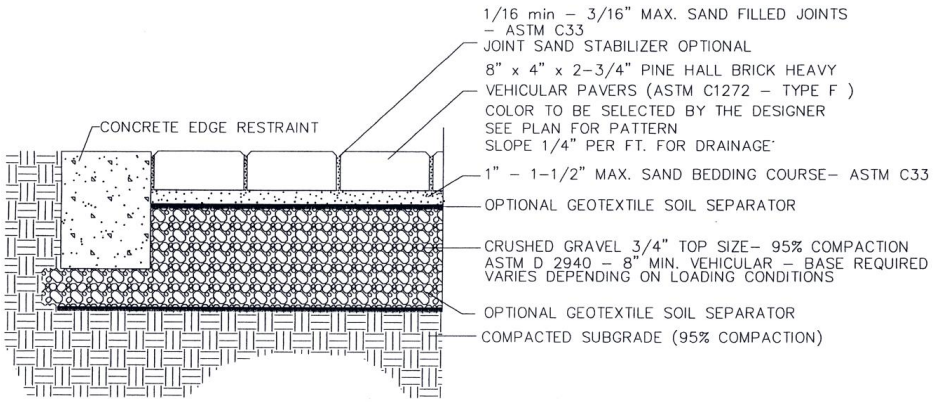
Edge Restraint: An adequate edge restraint is important to the proper functioning of any segmental paving system, vehicular or pedestrian. A DOT approved curb system will work fine as an edge restraint in street applications. For crosswalks, the general industry recommendation is to use concrete banding tied to a rigid base to prevent any displacement of the edge restraint under traffic loading. (See PHB CAD detail-PHB PV21)

Drainage: After the joint sand has fully compacted creating a full joint of sand, 90% of surface water will run off over the surface of the pavers. We recommend a 2% grade to ensure this run off. Underneath the pavement, we recommend weepholes in concrete bases to allow water draining through the pavers to escape. The 1-2” weepholes @ 24” OC should be filled with pea gravel and covered with filter fabric so that sand will not clog the weephole.

Paver Compaction: We recommend that pavers be compacted into the sand bed prior to joint filling to initialize the formation of interlock. However, it should be noted that research by Shackel indicates that segmental pavements experience a “bedding-in”

period where interlock fully develops under progressive wheel loading. So, despite the compaction process, paver movement and some initial paver damage may occur during initial usage and should be expected.

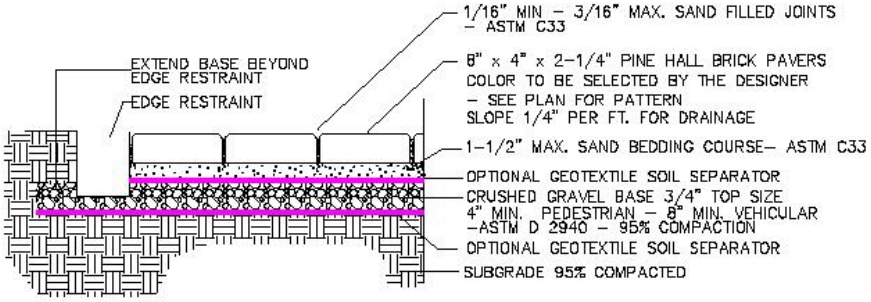
PHB–PV17



Pine Hall Brick – HEAVY VEHICULAR APPLICATION STANDARD
FLEXIBLE BASE W/ OPTIONAL GEOTEXTILE SEPARATORS

SCALE: NOT TO SCALE

PHB–PV12



Pine Hall Brick – STANDARD FLEXIBLE BASE
W/ OPTIONAL GEOTEXTILE SEPARATORS

SCALE: NOT TO SCALE

English Edge Heavy Duty Paver

Our heavy duty paver measures 4" X 8" X 2 3/4" and offers high compressive strength(over 12,000 psi) with low absorption (5.36%). Featuring beveled edges and spacer nibs to avoid chippage, we have sold over 3 million square feet of the English Edge Heavy Duty pavers-Type F(2 3/4"). Some of the notable heavy duty projects are:

Addison Circle Crosswalks Dallas, TX	**Bay Street Crosswalks Savannah, GA**
Davis Island Intersections Tampa, FL	**Intersections Whitehall, Ohio**
University of Cincinnati Cincinnati, OH	**Nationwide Blvd Columbus, Ohio**
Pinehurst Resort Pinehurst, NC	**Hubbard Way Los Angeles, CA**
MacArthur Mall Norfolk, VA	**Univ.of So. California Los Angeles, CA**
Falls Road Chagrin Falls, OH	**McKinley Ave Muncie, IN**
Pennsylvania Ave Winter Park,FL	

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