TECHNICAL BULLETIN #1
RESILIENT PLAYGROUND SURFACING SYSTEMS
Poured in Place Playground Surfacing

SHOCK ATTENUATING PLAYGROUND SURFACINGS have gained wide acceptance throughout the world as the single most important contribution to increased recreational safety on and around play apparatus. The shock absorption capability of a surface is measured by ASTM 1292 and should be installed to the appropriate depth as recommended by the Consumer Product Safety Commission. Specifiers and installers of playground equipment and surfacings should be thoroughly familiar with both ASTM and CPSC technical standards.

Playground surfacings that are resilient, shock attenuating, seamless, and durable can be laid in a multitude of custom colors and patterns. These surfaces are known by various names: CIP (Cast-in-Place), PIP (Pour-in-Place), Wet Pour, In-situ, and other similar terms. All these terms refer to a mixture of graded, sized rubber particles which are combined with the appropriate BTR™ polyurethane binder in a mixer, and cast "wet" upon a stable subsurface with hand trowels. When formulated and applied with precision and care, the result is a matrix of rubber particles and voids that will cure to a resilient, porous and durable surface.

The term "seamless" differentiates a poured surface from a tile surface but it is a relative term, as seams are sometimes necessary. Working day-seams are used for large surface installations, pattern inlays, and when weather requires curtailing of work unexpectedly. Working seams should be clean, well knitted and flush. Seams are obviously necessary when different colored patterns or designs are introduced. Seams, whether required during initial installation or for repairs, require detailed attention to assure strong bond and aesthetic quality.

The resilience or shock absorbing capability of the surface is dependent upon several factors, the most common being the size of the rubber particles, exceptional elongation and strength of the binder, the thickness of the system, and the troweling (compaction) technique of the installer. Mix formulations will vary slightly from one installer to another, as each will be based upon the available preferred rubber stock sieve size and the desired characteristics of the finished surface appearance. The surface usually consists of a coarse, thick SBR rubber cushion layer that is topped with a firm, granulated EPDM rubber wearing course. Installer variations may occur; therefore, the end user should always require that the installing contractor provide a certified ASTM test report for a sample produced with the materials used for that particular installation.

While most PIP surfaces are designed to be porous, the system can also be modified to be non-porous. Related information is available in other Technical Bulletins and Technical Data Sheets.

PROCEDURE FOR INSTALLATION OF A 'PIP' SURFACE

General:

PIP surfaces can be installed over any stable and well drained subsurface including concrete, asphalt, or compacted, crushed stone. Concrete or asphalt is the most stable, and must be fully cured prior to overlay of a rubberized surface. A crushed stone base will be subject to freeze-thaw movements, and therefore must be evenly and firmly compacted, and underdrained. If crushed stone is used as a base, a light-duty geotextile fabric overlay is recommended.

Inspect the rubber for size and gradation. All rubber must be dry. Do not accept rubber that is not uniform, contains metal or fiber fragments, or excessive dust.

Check surface planarity and compaction. Set screeds and reference points to control the desired thickness of the surface to be installed. Thoroughly mix the proper quantities of rubber and binder for the cushion course using a ribbon or paddle-type blade (mortar) mixer until the rubber is uniformly coated with binder. The mixing process takes one to three minutes, depending on the mixer, batch size, and temperature. Over-mixing as well as under-mixing can result in installation failures. If laid on concrete or asphalt, prime the area to assure a strong bond. Deposit and evenly spread the mixture. Finish the top of the cushion layer to the exact thickness required with the aid of a screed and hand trowel, being careful not to over-compact. The cushion course should exhibit a uniform density or firmness after troweling to an even and smooth surface. The type of binder selected depends on temperature and the presence of moisture in the air for proper curing; cure time is also based on the prevailing weather conditions.

***Wearing Course*:**

Usually the wearing course is laid as soon as the cushion course has cured. Ensure that the cushion course is clean and fresh - if not, a hand applied primer is recommended to provide an enhanced bond between the cushion and wearing course layers. Do not install a wearing course surface when temperatures will radically vary or fall below freezing during the cure cycle. Rapid drops in temperature during the curing process may cause contraction of the surface, resulting in cracking.

Apply a primer along the perimeter edge of the pad to assure a strong bond between all surfaces. It is recommended that primer is also used on the top of the base course under swing or other high impact areas.

Plan the work so as to position a probable day-seam in the "least objectionable" location, such as under the equipment. Installing a seam is a critical work item that takes special attention. If a seam is required, prime all cut and previously laid edges or special shapes or graphics that may be inlaid.

Deposit and evenly spread the mixture along a screed which controls depth. Carefully trowel the material to a uniformly compacted density and thickness. Handwork the seams between the working rows to form a tight knit surface without raised or uneven areas. Hand finishing should take place quickly after spreading, as once the material begins to set, overworking can cause weakness in the wearing course and textural differences in the surface. In addition to screeding and hand troweling, large areas may also be finish rolled.

Curing of the Surface:

The CIP surface must be protected until fully cured. The curing time will depend upon the prevailing weather, however, the process may be accelerated once a partial cure has been achieved.

Experienced installers trained in accelerated curing techniques will sometimes apply a light water mist to the surface to speed the cure.

Normally, a play surface may be walked upon without damage within 36 hours after installation, but this depends on temperature and the presence of moisture. Walking upon or using a surface before the full cure is reached may result in cracking which might not be evident for weeks after installation. Be sure to ask for the written recommendation of the installer who is more familiar with his particular installation and prevailing weather conditions that would affect the curing process.

GUIDELINE MIX FORMULATIONS

RAW MATERIAL REQUIREMENTS FOR APPROXIMATELY ONE (1) SQUARE FOOT OF VARIOUS DEPTHS OF PIP SURFACING. ACTUAL REQUIREMENTS MAY VARY BASED ON THE BLEND OF MATERIALS UTILIZED, EDGING DETAILS, GRANULE DISTRIBUTION, PRIMING, AND INSTALLATION TECHNIQUES. CRITICAL FALL HEIGHTS ARE APPROXIMATE - CHECK INSTALLER'S TEST REPORTS. THIS IS A GUIDELINE ONLY, BASED ON INDUSTRY AVERAGES.

Total Surface Thickness (inches)	Critical Fall Height (feet)	Cushion Course		1/2" Wearing Course	
		SBR Rubber (pounds)	OTS BTR™ Binder (pounds)	EPDM Rubber (pounds)	OTS BTR™ Binder (pounds)
1.75"	4'	2.8	0.42	2.3	0.46
2.00"	5'	3.5	0.52	2.3	0.46
2.50"	6'	4.5	0.67	2.3	0.46
3.25"	7'	6.3	0.94	2.3	0.46
3.75"	9'	7.3	1.09	2.3	0.46

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