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NAVFAC **IGS-02535 (MAY 2002)**

Preparing Activity: LANTNAVFACENGCOM **Based on UFGS-02535N**

ITALIAN GUIDE SPECIFICATIONS

Use for ITALIAN projects only

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SECTION 02535

PLAYGROUND SAFETY SURFACING
05/02

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NOTE: This guide specification is issued by the Atlantic Division, Naval Facilities Engineering Command for regional use in Italy.

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NOTE: This guide specification is issued by the Atlantic Division, Naval Facilities Engineering Command, as approved by the Naval Facilities Engineering Command (Code 15G), for regional use in the EFA Mediterranean Area. This is a sample guide specification written for a poured-in-place safety surfacing system. For other types of safety surfacing material such as tile, wood mulch, gravel, and sand refer to Army Section 02791, "Playground Protective Surfacing."

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Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents, including their organization designation and telephone number, is on the Internet.

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

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PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the

basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136	(1996; Rev. A) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 412	(1998; Rev. A) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 698	(1991) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft; 600 kN-m/m)
ASTM D 2047	(1993) Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine
ASTM D 2240	(1997) Rubber Property - Durometer Hardness
ASTM D 2859	(1993) Flammability of Finished Textile Floor Covering Materials
ASTM D 4491	(1992) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991) Grab Breaking Load and Elongation of Geotextiles
ASTM F 1292	(1993) Impact Attenuation of Surface Systems Under and Around Playground Equipment
ASTM F 1487	(1993) Playground Equipment for Public Use

CODE OF FEDERAL REGULATIONS (CFR)

28 CFR 36	Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities

FEDERAL STANDARDS (FED-STD)

FED-STD 795	(Basic) Uniform Federal Accessibility Standards

NATIONAL RESEARCH COUNCIL (CNR)

CNR BU 69	Standards on Road Construction Materials. Soil Compacting Test

U.S. CONSUMER PRODUCT SAFETY COMMISSION (USCPSC)

USCPSC-01	(1994) A Handbook for Public Playground Safety Vol. II: Technical Guidelines for Equipment and Surfacing

AIR FORCE REGULATIONS

A.A.B.D.S.	Aviano Air Base Design Standards

1.2 DEFINITIONS

a. Critical Height: The fall height at which the protective surfacing meets the requirements of ASTM F 1292.

b. Designated Play Surface: Any elevated surface for standing, walking, sitting, or climbing; or a flat surface a minimum 50 mm 2 inches wide having up to a maximum 30 degree angle from horizontal. In some play events the platform surface will be the same as the designated play surface. However, the terms should not be interchanged as they do not define the same point of measurement, ASTM F 1487.

c. Head Injury Criteria (HIC): A measure of impact severity that considers the duration over which the most critical section of the deceleration pulse persists as well as the peak level of that deceleration. Head impact injuries are not believed to be life threatening if the HIC does not exceed a value of 1,000.

d. Impact Attenuation: The ability of protective surfacing to reduce and dissipate the energy of an impacting body.

e. Loose Fill: Consisting of small independent movable components such as sand, gravel, or wood chip. The percent of fine material in the loose fill affects its compression properties from rainfall.

f. Maximum Equipment Height: The highest point on the equipment (i.e., roof ridge, top of support pole).

g. Play Event: A piece of manufactured playground equipment that supports one or more play activities.

1.3 PERFORMANCE REQUIREMENTS

Safety surfacing within playground equipment use zone shall meet or exceed the impact attenuating performance requirements of USCPSC-01 and ASTM F 1292 that a surface yield both a peak deceleration of not more than 200 G's, and a Head Injury Criteria (HIC) value of no more than 1,000, for a head-first fall from the highest accessible portion of play equipment being installed. The highest accessible portion of playground equipment shall be as specified in Section 02860 entitled "Playground Equipment".

1.4 ACCESSIBILITY

Safety surfaces indicated to serve as accessible paths of travel for persons with disabilities shall be firm, stable, and slip resistant, and shall meet the requirements of FED-STD 795, 28 CFR 36, ASTM F 1487, and ASTM F 1292.

1.5 SUBMITTALS

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NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item is required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Recommended codes for Army projects are "RE" for Resident Engineer approval, "ED" for Engineering approval, and "AE" for Architect-Engineer approval. Codes following the "G" typically are not used for Navy projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

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Submit the following in accordance with the section entitled, "Submittal Procedures."

SD-02 Shop Drawings

Playground Safety Surfaces G

Drawings showing depth of the playground safety surface system, including depths of material, sub-base materials, hardware, edge details, and drainage. Provide a list of materials and components to be installed as part of the system, by weight and/or volume and recommended coverage, including manufacturer's name, shipment date, storage requirements, and precautions. The list shall state chemical composition and test results to which material has been

subjected.

SD-03 Product Data

Playground Safety Surfaces G

Manufacturer's descriptive data and installation instructions, including cleaning and preventative maintenance instructions.

SD-04 Samples

Playground Safety Surfaces G

Color charts G

SD-06 Test Reports

Playground Safety Surfaces G

Manufacturer's test data reflecting the results of ASTM F 1292 test for the synthetic playground safety surface proposed for use on the outdoor play area.

Impact Attenuation G

Coefficient of Friction G

Flammability of Finished Floor Cover G

SD-07 Certificates

Playground Safety Surfaces G

A listing of at least 10 installations where synthetic playground safety surfaces products similar to those proposed for use have been installed and have been in successful service for a minimum period of [3][5] years. This list shall include owner or purchaser; address of installation; service or maintenance organization; date of installation; contact person; and phone number.

Installation G

Liability Insurance G

1.6 QUALITY FACTORS

Provide resilient safety surfacing which meets or exceeds the following tests:

1.6.1 Impact Attenuation

ASTM F 1292, shall meet or exceed the U.S. Consumer Product Safety Commission guidelines for impact attenuation of G-max and head injury

criteria (HIC). Head injury criteria results shall be administered and evaluated under the same test as the G max. Results must be shown for three drops at each temperature of -1 degree, 22 degrees, and 49 degrees Centigrade yielding less than 200 G's and less than 1,000 for HIC.

1.6.2 Coefficient of Friction

ASTM D 2047, of the resilient safety surface shall meet the minimum standards of 0.9 wet and 1.0 dry.

1.6.3 Flammability

Flammability of Finished Floor Cover shall meet the requirements of ASTM D 2859.

1.6.4 Permeability

Permeability of the resilient safety surfacing shall meet or exceed a coefficient of permeability of 5 feet 1.524 meter per minute. The surfacing shall be capable of handling a minimum of 8 inches 200 mm of rainfall per hour.

1.7 ACCEPTABLE MANUFACTURERS

Surface America Inc.,
P.O. Box 157
Williamsville, New York 14231
Tel: 1-800-999-0555

BSW Germany-Surface America
Jorgen Jeschke
Berle Burger Schaumstoftwerk
P.O. Box 1180
D-57301 Bad Berkburg
Tel: 49-2751-8030
FAX: 49-2751-803109

1.8 DELIVERY, STORAGE AND HANDLING

Materials shall be delivered and stored in accordance with the manufacturer's recommendations. All materials shall be delivered in good condition in original unopened packages with labels intact. All materials shall be protected from weather and the adhesive shall be stored in temperatures 4 degrees C or higher.

1.9 SITE CONDITIONS

At the time of application ambient air temperature shall be 4 degrees C or greater with a chill factor of no less than 0 degrees C and remain so for at least 72 hours after completion. Do not install resilient safety surfacing in high winds.The subsurface shall be dry, with no prospect of rain during the installation period. All materials shall be protected from weather and other damage prior to application, during application and while curing.

1.10 SEQUENCING AND SCHEDULING

Playground safety surfaces shall be installed after the playground equipment is installed. Safety surfacing installation shall be coordinated with playground equipment and site element installation.

1.11 MANUFACTURER QUALIFICATION

Protective surfacing shall be installed in a minimum 10 sites and have been in successful service for a minimum [3][5] year calendar period. The manufacturer shall provide a Certificate of Insurance AA rated for a minimum 2,000,000,000 Italian Lire covering both product and general liability.

1.12 INSTALLER QUALIFICATION

The installer shall be certified by the manufacturer for training and experience installing the protective surfacing.

1.13 WARRANTY

Furnished protective surfacing shall have a minimum 1 year calendar period warranty.

1.14 MANUFACTURER'S REPRESENTATIVE

The manufacturer's certified playground safety inspector or the manufacturer's designated certified playground safety representative shall supervise the installation and adjustment of the protective surfacing to verify the installation meets the requirements of the manufacturer, this specification, and Section 02860, "Playground Equipment".

1.15 QUALITY ASSURANCE

1.15.1 Playground Safety Surfaces

Sample of synthetic safety surface, minimum 50 by 50 mm (2 by 2 inches),2 by 2 inches,, proposed for this project.

1.15.2 Color charts

Two (2) copies of manufacturer's standard color charts displaying synthetic safety surfacing color selections and finishes, and identifying those colors and finishes proposed for use.

Color selections:

a. Red

b. Orange

c. Blue

d. Green

e. Yellow

f. Purple

g. Grey

1.15.3 Installation

For synthetic surfacing product manufactured for the purpose of safety surfacing, a statement signed by an official authorized to certify on behalf of the manufacturer attesting that the installed surfacing meets the requirements of ASTM F 1292 for a head-first fall from the highest accessible portion of specified playground equipment. The statement shall be dated after the award of the contract, shall state the Contractor's name and address, and shall name the project and location. The statement shall also provide the name, address, and telephone number of the testing company, the date of the test, and the test results. Regardless of the installer, the statement shall also attest that the installation complies with manufacturer's instructions and specifications.

1.15.4 Liability Insurance

A Certificate of Insurance by manufacturers of synthetic safety surfacing products manufactured for use as safety surfacing, covering both product and general liability, of not less than 2,000,000,000 Italian Lire. The issuing underwriter shall be AA rated.

PART 2 PRODUCTS

2.1 SAFETY SURFACING

Safety surfacing shall consist of synthetic surfacing product. The type of safety surfacing shall be as indicated on the drawings. The resilient safety surface shall be seamless, porous, resilient, and slip resistant designed for outdoor children's playgrounds as indicated. The resilient safety surface shall be poured-in-place. No rolled products or pre-fabricated tiles will be acceptable.

2.2 SYNTHETIC SURFACING

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NOTE: The designer will select the surfacing system most appropriate for the climate and character of the installation.

Poured-in-place systems are generally preferred because of low cost for large play areas and low maintenance. Select poured-in-place systems where irregular color patterns are desired, or where the use zone has a rounded or irregular shape.

Consider tile systems for small projects, for projects where a checkerboard pattern is desired, or for remote locations where experienced surfacing installers are not readily available. Tile systems have the advantage of easy replacement of damaged tiles.

Combination systems should only be used in areas of low activity level, for example, in infant areas, or where low numbers of users are expected. If an impervious system is selected, coordinate drainage requirements. In hot, desert-like environments, do not select systems with SBR or dark colored wear surfaces.

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Synthetic surfacing shall consist of an impact attenuating substrate and a wear surface bonded to produce a unified system. The type of synthetic surfacing shall be poured-in-place system and shall be as indicated on the drawings.

2.2.1 Impact Attenuating Substrate

Substrate shall consist of shredded styrene butadiene rubber (SBR) adhered with a 100 percent solids polyurethane binder to form a resilient, porous material. Strands of SBR may vary from 0.5 mm (1/50 inch) 1/50 inch (0.5 mm) to 2 mm (2/25 inch) 2/25 inch (2 mm) in thickness, by 3 mm (1/8 inch) 1/8 inch (3 mm) to 20 mm (4/5 inch) 4/5 inch (20 mm) in length. Foam rubber will not be permitted in substrate. Binder shall be not less than 12 percent, nor more than 16 percent, of the total weight of rubber, and shall provide 100 percent coating of the particles. The substrate shall be compatible with the wearing surface poured-in-place, and shall meet specified requirements for impact attenuation.

2.2.2 Wear Surface

Wear surface shall consist of a durable, weather-resistant, ultraviolet stable, water permeable material, which shall be an integral component of a tile system. The wear surface shall meet ASTM D 2047 for minimum coefficient of friction of 0.9 wet and 1.0 dry. The color shall be as indicated.

2.2.2.1 Poured-in-Place Wear Surface

Wear surface shall consist of ethylene propylene diene monomer (EPDM) particles adhered with a polyurethane binder formulated to produce an even uniform surface. Particles of EPDM shall meet requirements of ASTM D 412 for tensile strength and elongation, ASTM D 2240 (Shore A) hardness of 50-70, not less than 25 percent rubber hydrocarbons. Particles of EPDM shall be peroxide cured. Size of rubber particles shall be not less than 1/32 inch, (1 mm) nor greater than 1/8 inch (3 mm) across. Binder shall be not less than 16 percent nor greater than 21 percent of the total weight of rubber used in the wear surface, and shall provide 100 percent coating of

the particles. Thickness of wear surface shall be minimum 3/8 inch. The wearing surface shall have a minimum weight of 2.2 pounds per square foot. The wear surface shall be porous.

2.2.3 Binder

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NOTE: TDI is listed as a carcinogen with OSHA and IARC. Special handling is required with more than 0.1 percent TDI.
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Binder for synthetic surfacing shall be nontoxic, weather-resistanct, ultraviolet stable, nonhardening, retaining impact attenuating qualities, and shall be 100 percent solids polyurethane, methylene diphenel isocyanate (MDI), or as recommended by the manufacturer. No toluene diphenel isocyanate (TDI) shall be used (zero percent). Weight of polyurethane shall be no less than 8.5 lbs/gal, nor more than 9.5 lbs/gal. Color tinted binder will not be accetable. The color shall be as indicated.

2.4 STONE BASE COURSE

Provide stone base course as indicated. The stone base course shall be washed; free of dust, clay, dirt, hazardous substances or foreign objects; and sieved in accordance with ASTM C 136 with the following gradation:

SIEVE SIZE	PERCENT PASSING
1-1/2 inch	100 percent
1 inch	90-100 percent
3/4 inch	70-100 percent
No. 4	35-65 percent
No. 40	12-32 percent
No. 200	5-12 percent
38 mm	100 percent
25 mm	90-100 percent
19 mm	70-100 percent
4.75 mm	35-65 percent
0.425 mm	12-32 percent
0.075 mm	5-12 percent

2.5 GRAVEL DRAINAGE PIPE

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NOTE: Coordinate safety surfacing required drainage piping.
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Provide subsurface drainage pipe as indicated and specified in Section 02630, "Storm Drainage."

2.7 CONCRETE EDGING

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NOTE: Indicate on the drawings if concrete edging is to be used. Delete if not applicable.

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Provide concrete edging as indicated. Concrete shall conform to Section 03300, "Cast-In-Place Concrete". Do not use deleterious substances that might adversely affect the adhesion of the synthetic safety surface.

2.8 FILTER FABRIC

Filter fabric shall be a nonwoven polypropylene sheet or a 100 percent polyester sheet meeting specified requirements.

Grab strength: 80 lbs ASTM D 4632

Trapezoid Tear Strength: 30 lbs ASTM D 4533

Permeability: 2/25 inch ASTM D 4491

2.1 MATERIALS

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NOTE: Use these paragraphs for proprietary poured-in-place material by Playbound. A/E needs to obtains prior Code 02 waiver justifying the use of proprietary products.

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[All material components of the Playbound Poured-in-Place System shall be obtained from Surface America, Inc. or its authorized distributors.]

2.1.1 [Playbound]Poured-in-Place Primer

A single component moisture cured polyurethane primer.

2.1.2 [Playbound]Poured-in-Place Binder

An elastic polyurethane prepolymer with minimal odor, excellent weathering and binding characteristics. Binder shall be 100 percent mehtylene diphenel isocyanate (MDI) based and contain zero (0) percent of toluene diphenel isocyanate (TDI monomers). Note: TDI is listed as a carcinogen with OSHA and IARC. Special handling is required with more than .1 percent TDI.

2.1.3 [Playbound]Poured-in-Place Black SBR

Shall be recycled SBR rubber.

2.1.2.1 Temperature

SBR rubber shall be ground at ambient temperature.

2.1.3.2 Contents

SBR rubber shall be ground into 10 mm shredded strands and contain less then 4 percent dust.

2.1.3.2 Protection

SRB rubber shall be transported in suitable bags to protect from moisture.

2.1.3.3 [Playbound]Poured-in-Place EPDM Rubber

Shall be UV stable and 1-3 mm.

2.1.3.4 Colors and Patterns

Colors and patterns shall conform to plans.

2.1.3.5 Size

Shall be 1-4 mm.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Drainage

The Contractor shall verify that subsurface drainage has been installed to provide positive drainage.

3.1.3 Subsurface

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NOTE: Sand, gravel, and wood products must not be installed over concrete or bituminous subsurfaces, in accordance with USCPSC.
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Tolerance of aggregate subsurfaces shall be within 10 mm (3/8 inch)3/8 inch in 3 m (10 feet). 10 feet and within 1/8 inch in 3 feet. Aggregate subsurfaces shall be compacted to 95 percent of ASTM D 698 standard.

3.1.4 Finished Grade

Finished elevations of adjacent areas shall be as indicated on the drawings and safety surfacing manufacturer's directions. The subgrade elevation shall be as required for the safety surface installation. The subsurface shall be installed in a true, even plane, and sloped to drain as indicated on drawings. Subsurface irregularities shall be corrected.

3.1.5 Curing of Concrete Edging

Concrete edging surfaces shall be cured a minimum of 30 days, and curing

compounds and other deleterious substances that might adversely affect adhesion shall be removed. Surface shall be clean and dry.

3.2 SYNTHETIC SURFACE INSTALLATION

Provide a stone base course, impact attenuating substrate, and wearing course. Install resilient safety surfacing in accordance with manufacturer's instructions.

3.2.1 Poured-in-Place System

Components of the poured-in-place system shall be mixed mechanically on site in accordance with manufacturer's recommendations. Hand-mixing will not be allowed. Installation of poured-in-place surfacing shall be seamless and completely bonded to subsurface. Material shall cover foundations and shall fit tightly around elements penetrating the surface.

3.2.1.1 Poured-in-Place Substrate

Whenever practical, the substrate layer of the poured-in-place system shall be installed in one continuous pour on the same day. When a second pour is required, the edge of the previous work shall be fully coated with polyurethane binder to ensure 100 percent bond with new work. Adhesive shall be applied in small quantities so that new substrate can be placed before the adhesive dries.

3.2.1.2 Poured-in-Place Wear Surface

Wearing surface shall be bonded to substrate. Adhesive shall be applied to substrate in small quantities so that wearing surface can be applied before adhesive dries. Surface shall be hand troweled to a smooth, even finish. Except where wearing surface is composed of different color patterns, pour shall be continuous and seamless. Where seams are required due to color change, adjacent color shall be placed as soon as possible, before initial pour has cured. The edge of initial pour shall be coated with adhesive and wearing surface mixture shall be immediately applied.

3.2.1.3 Thickness

Construction methods, such as use of measured screeds 1 mm (1/16 inch)1/16 inch thicker than the required surfacing depth, shall be employed to ensure full depth of specified surfacing material is installed. Surfacing system, for playground equipment use zone, shall be installed with the proper thickness to meet the specified impact attenuation safety performance requirements.

3.2.4 Clean-up

Adhesives will not be allowed on adjacent surfaces. Spills or excess adhesive shall be immediately cleaned up.

3.2.5 Protection

The synthetic surface shall be allowed to cure in accordance with

manufacturer's instructions. The surface shall be protected from traffic during the curing period for 48 hours or as instructed by the manufacturer.

3.4 GRAVEL SUBBASE COURSE INSTALLATION

Gravel subbase course shall be installed over a compacted subgrade. Subgrade preparation shall be as specified in Section 02315, "Excavation and Filling." Provide stone base course with positive drainage as per resilient safety surfacing manufacturer's recommendations. Begin spreading base material at the point nearest the source of supply. Do not permit traffic and hauling over the base. After subbase course placement, continue machining and rolling until surface is smooth, compacted, well bonded, and true to the designed cross section. Compact to 95 percent ASTM D 698 maximum dry density. Maintain the subbase smooth and true to grade and cross sction until resilient safety surface resilient surface courses are installed.

3.6 SUBSURFACE DRAINAGE PIPE INSTALLATION

Place subsurface drainage pipe as specified in Section 02630, "Storm Drainage" and Section 02315, "Excavation and Fill."

3.7 MANUFACTURER'S SERVICES

A manufacturer's representative experienced in installation of the specified playground safety surface shall be provided. The representative shall supervise the installation to ensure that the safety surfacing meets the specified impact attenuation safety performance requirement.

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ADDITIONAL NOTES

NOTE A: For additional information on the use of CEGS, see CEGS 01000 CEGS GENERAL NOTES.

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3.3 [PLAYBOUND]POURED-IN-PLACE SYSTEM

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NOTE: Used for proprietary specification written around Playbound product.

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3.3.1 Primer

Shall be applied at a rate of [7.5 square meter per liter] to the substrate or geotextile fabric on the substrate using a short nap roller.

3.3.2 SBR Base Mat

3.3.2.1 Mix

SBR shall be mixed with binder in a ratio of 88 percent SBR to 12 percent binder by weight to achieve maximum resilience.

3.3.2.2 Trowel

Using trowel, SBR/binder mix shall be spread in a consistent density to specified thickness at at rate of 500 kg per m^3.

3.3.2.2 Cure

SBR/binder mix shall be allowed to cure (necessary time varies based on temperature and humidity).

3.3.3 Primer

Shall be applied at a rate of 7.5 square meter per liter to the base mat using a sort nap roller.

3.3.4 Top Course

3.3.4.1 Mix

EPDM shall be mixed with binder in a ratio of 82 percent EPDM rubber to 18 percent binder by weight to achieve maximum wearability and resilience.

3.3.4.2 Trowel

Using trowel, EPDM/binder mix shall be spread in a consistent density to specified thickness at a rate of 900 kg per m^3.

3.3.4.3 Cure

EPDM/binder mix shall be allowed to cure (necessary item varies based on temperature and humidity).

-- End of Section --