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Preparing Activity: Agency

UFC 1-300-02 FORMAT STANDARD for
UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2020

SECTION TABLE OF CONTENTS

DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 32 18 16.23

SYNTHETIC POLYURETHANE RESILIENT SURFACING

02-12

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SYSTEM DESCRIPTION
 - 1.2.1 Scope of Work
- 1.3 CODE AND STANDARDS
- 1.4 SUBMITTALS
- 1.5 DELIVERY, STORAGE, AND HANDLING
- 1.6 INSPECTION
- 1.7 QUALITY ASSURANCE
 - 1.7.1 Material Qualification
 - 1.7.2 Manufacturer's Qualification
 - 1.7.3 Installer's Qualification
- 1.8 WARRANTY
- 1.9 MANUFACTURER'S REPRESENTATIVE
- 1.10 EVALUATION ITEMS AND CRITERIA

PART 2 PRODUCTS

- 2.1 MATERIALS
- 2.2 SUBSTRATE FOR URETHANE SURFACING
 - 2.2.1 Concrete Substrate
 - 2.2.2 Asphalt Substrate
- 2.3 SYNTHETIC SURFACING MATERIALS
 - 2.3.1 Polyurethane Granules
 - 2.3.2 Binder
 - 2.3.3 Primer
 - 2.3.4 Paint for Line Marking

PART 3 EXECUTION

- 3.1 INSTALLATION SHOP DRAWINGS
- 3.2 SUBSTRATE
 - 3.2.1 NCAA Certification Criteria
 - 3.2.2 Flood Test of Asphalt Surface
 - 3.2.3 Surface Cleanliness

- 3.2.4 Written Acceptance of Substrate
- 3.2.5 Obstructions below Ground
- 3.2.6 Subbase
- 3.2.7 Concrete or Bituminous Curing
- 3.3 INSTALLING SYNTHETIC SURFACING SYSTEM
 - 3.3.1 Temperature Limitation
 - 3.3.2 Substrate Surface Conditions
 - 3.3.3 Weather Conditions
- 3.4 PRIMING
- 3.5 URETHANE SURFACE FINISHING
 - 3.5.1 General
 - 3.5.2 Mixing of Polyurethane Granules
 - 3.5.3 Installation of Urethane Surfacing
- 3.6 LINE STRIPING AND EVENT MARKING
- 3.7 MAINTENANCE
- 3.8 TESTING
- 3.9 FINAL CLEANING

-- End of Section Table of Contents --

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SYNTHETIC POLYURETHANE RESILIENT SURFACING
02-12

NOTE: This specification covers the requirements
for Detail working method for athletic surfacing.

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.

ASTM INTERNATIONAL (ASTM)

ASTM D412 (2016; R 2021) Standard Test Methods for
Vulcanized Rubber and Thermoplastic
Elastomers - Tension

ASTM D1556/D1556M (2015; E 2016) Standard Test Method for
Density and Unit Weight of Soil in Place
by Sand-Cone Method

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (US EPA)

US EPA 3060A Alkaline Digestion for Hexavalent Chromium
(ICP-MS)

US EPA 5021A Volatile Organic Compounds in Various
Sample Matrices Using Equilibrium
Headspace Analysis (GC-MS)

US EPA 8100A Polynuclear Aromatic Hydrocarbon (GC-MS)

EUROPEAN NORMALIZATION

DIN EN 14809 (2006) Surfaces for sports areas -
Determination of vertical deformation

DEUTSCHES INSTITUT FÜR NORMUNG (DIN)

DIN 18035-6 (2021) Sports grounds - Part 6: Synthetic

surfaces

KOREAN INDUSTRIAL STANDARDS (KS)

KS F 2311	(2022) Test method for density of soil in place by sand-cone method
KS F 3888-2	(2016; R 2021) Outdoor sports facilities - Elastic paving materials
KS M 6518	(2021) Physical test methods for vulcanized rubber
KS M 6584	(2008; R 2023) Standard test method for rubber - Determination of metal content by Flame Atomic Absorption (AAS) analysis
KS R 1301	(2016; R 2021) Method for determination of lead and cadmium in rubber for automobiles

1.2 SYSTEM DESCRIPTION

This Section covers following urethane surfacing systems: Running Track, Walking Ground, Bike Path, Park, Jogging Trail, Basketball and Tennis Courts: Synthetic Polyurethane Granulated Surface on a concrete or asphalt substrate. The synthetic polyurethane resilient surfacing must be single component polyurethane granulated based. The layout of track lines and all court markings must conform to the requirements of IAAF (International Association of Athletics Federations) and NCAA (National Collegiate Athletic Association).

1.2.1 Scope of Work

Install synthetic athletic track or basketball court surfacing on a concrete or an asphalt substrate or on an existing concrete or an asphalt substrate as indicated on the drawings.

1.3 CODE AND STANDARDS

The athletic surface systems must conform to the applicable parts of requirements specified in IAAF and/or NCAA.

1.4 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets

following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; G

SD-03 Product Data

Synthetic Polyurethane Resilient Surfacing; G

Manufacturer's descriptive data; catalogue cuts; the technical data covering all components of the surfacing system. Manufacturer's specifications, handling and storage requirements, installation procedures, and safety data sheets to include warnings and critical height performance standards for synthetic surfacing loose fill surfacing. Delivery schedule and manufacturer name for synthetic surfacing plus delivery, storage and handling information.

SD-04 Samples

Synthetic Polyurethane Resilient Surfacing; G

Synthetic Surfacing: Minimum 50 mm x 50 mm (2 inches x 2 inches) samples in various colors available for use.

SD-06 Test Reports

Synthetic Polyurethane Resilient Surfacing; G

Chemical composition, color granule percentage, and test results to which material has been subjected. A chemical test result for

heavy metals, volatile organic compounds, and PAHs and a physical test result of the materials shall be included.

SD-07 Certificates

Material Certificates

Manufacturer's Certificates

Installer's Certificates

1.5 DELIVERY, STORAGE, AND HANDLING

Submit 5 copies of delivery schedule, product data and samples of [synthetic polyurethane resilient surfacing](#) at least 10 calendar days prior to the first day of delivery for approval. Deliver, handle, and store protective surfacing material in accordance with the manufacturer's recommendations. The storage area must be as designated. Store the materials in a dry, covered area until installed.

1.6 INSPECTION

Inspect synthetic polyurethane resilient surfacing materials upon arrival at the job site for ensuring compliance with the specified quality. Remove unacceptable materials from the job site.

1.7 QUALITY ASSURANCE

1.7.1 Material Qualification

Submit 5 copies of [material certificates](#) of compliance attesting that materials meet the specified requirements. The copies of the material certificates must include composition and tests to which the material has been subjected.

1.7.2 Manufacturer's Qualification

The manufacturer of the urethane surfacing material must have at least ten (10) sites, for which the product of the urethane surfacing materials manufactured have been installed in the past, and those are in successful service for a minimum of 5 years. The manufacturer must submit 5 copies of [Manufacturer's Certificates](#) including information to verify the service quality of the installed urethane surfacing: the company name and address, past experiences in field of urethane surfacing installations, name of the owner or user; service or preventive maintenance provider; date of the installation; point of contact and telephone number; and address for 10 sites.

1.7.3 Installer's Qualification

The installer of the urethane surfacing must be accredited by the manufacturer of the surfacing materials as the qualified installer of the product. Submit 5 copies of [Installer's Certificates](#) which contain qualified individual's name, company name and address, and past experiences in the field of urethane surfacing installations. Submit the installer's training and experience certification.

1.8 WARRANTY

Furnished synthetic polyurethane resilient surfacing must have a minimum 2 year warranty. Synthetic surfacing material found to be defective as a result of faulty workmanship and/or material failure during the warranty period must be replaced or repaired at no cost to the Government upon notification during the warranty period.

1.9 MANUFACTURER'S REPRESENTATIVE

The manufacture's qualified urethane surfacing inspector or the manufacturer's designated qualified urethane surfacing representative must supervise the installation at actual installation sites and verify that the installation meets the requirements established by the manufacturer and that specified herein.

1.10 EVALUATION ITEMS AND CRITERIA

Synthetic polyurethane resilient surfacing product must be tested in accordance with the requirements specified in the following Table 1, and test results must meet or exceed the testing criteria listed therein. The requirement criteria must be in accordance with DIN 18035-6 and KS F 3888-2.

Table 1. Evaluation items and criteria of the surfacing material

Test Items	Parameters	Test methods	Criteria	
			Value*	Unit
Heavy metals	Pb	KS R 1301	Max. 0.04	mg/l
	Cd		Max. 0.005	mg/l
	Hg	DIN 18035-6	Max. 0.001	mg/l
	Zn	KS M 6584	Max. 3	mg/l
	Cr (total)	US EPA 3060A	Max. 0.05	mg/l
	Cr6+	GC/MS US EPA 3060A	Max. 0.08	mg/l
T-VOCs	Benzene	US EPA 5021A	Max. 50(total)	mg/Kg
	Toluene	GC/MS	Benzene(Max.1)	
	Ethylbenzene			
	Xylenes			
	MIBK			
PAHs	Benzo[a]	US EPA 8100A	Max. 10(total)	mg/Kg
	-anthracene	GC/MS	Benzo(a)pyrene	
	Chrysene		(Max.1)	
	Benzo[b]			
	-fluoranthene			
	Benzo[k]			
	-fluoranthene			
	Benzo[a]pyrene			
	Benzo[e]pyrene			
	Dibenzo[a,h]			
	-anthracene			
	Benzo[j]			
	-fluoranthene			

Table 1. Evaluation items and criteria of the surfacing material

Tensile strength	ASTM D412 or KS M 6518	Min. 0.3	MPa
Elongation	KS M 6518	Min. 40	Percent
Hardness	DIN EN 14809 or KS M 6518	Min. 40	Hs
Sliding coefficient	DIN 18035-6	Dry Max, 1.1 Wet Min, 0.5	BPT

*Limits according to DIN 18035-6 and KS F 3888-2.

PART 2 PRODUCTS

2.1 MATERIALS

Materials must be the standard products of a manufacturer regularly engaged in the manufacture of protective surfacing and must be similar to surfacing in satisfactory use a minimum 3 year period.

2.2 SUBSTRATE FOR URETHANE SURFACING

Synthetic polyurethane resilient surfacing must be poured-in place system placed over the prepared substrate. The synthetic surfacing may be placed over either concrete finished substrate or asphalt finished substrate.

2.2.1 Concrete Substrate

Provide concrete material conforming to Section 32 13 13.06 PORTLAND CEMENT CONCRETE PAVEMENT FOR ROADS AND SITE FACILITIES.

2.2.2 Asphalt Substrate

Asphalt finished substrate must conform to the requirements of Section 32 12 16.16 ROAD-MIX ASPHALT PAVING

2.3 SYNTHETIC SURFACING MATERIALS

Synthetic surfacing materials must consist of polyurethane granules mixed in binder. The finished urethane surfacing material after rolling and curing must be elastic, impact resistant, and possessing specified rates of elongation and frictions. In addition, the testing shall verify the fact that finished product contains no heavy metal substances that will be harmful for the human health.

2.3.1 Polyurethane Granules

Polyurethane granules must be produced by breaking of polyurethane slabs into granules of the sizes between 2 mm in diameter to 5 mm in diameter. The polyurethane slab must be made of two-compound ultraviolet stabilized elastomeric polyurethane compounded from polyol and isocyanate components, based on one hundred percent Methylene Diphenyl Isocyanate (MDI). No Toluene Diisocyanate Isocyanate (TDI) will be allowed.

2.3.2 Binder

Binder for synthetic surfacing must be nontoxic, weather-resistant, ultraviolet stable, non-hardening, and retaining impact-attenuating performance. It must be 100 percent solids containing polyurethane, Methylene Diphenyl Isocyanate (MDI), or as recommended by the manufacturer. Weight of polyurethane must be between a minimum 1.02 kg per liter (8.5 pounds per gallon) and a maximum 1.14 kg per liter (9.5 pounds per gallon). Coloring pigments must be inorganic oxides.

2.3.3 Primer

Primer must be of the materials that must be compatible with urethane surfacing materials and as recommended by the manufacturer.

2.3.4 Paint for Line Marking

Single-compound, moisture curing aliphatic polyurethane paint. White color paint is commonly being used for urethane surfacing but other color required to satisfy the plan may be available.

PART 3 EXECUTION

3.1 INSTALLATION SHOP DRAWINGS

Submit shop drawings for approval 10 days prior to install synthetic polyurethane resilient surfacing. The drawings must include scale drawings defining the areas, tracks, borders, and marking configurations including section of surfaces with surface slopes in relation with the surrounding area.

3.2 SUBSTRATE

Lay the synthetic track surfacing system on an approved substrate. The subbase for the asphalt substrate must have 95% of maximum laboratory density test, and surface with asphalt surface.

Inspect construction of substrates for the synthetic polyurethane resilient surfacing to ensure the compliance with requirements for construction tolerance and slopes require for the installation of urethane surfacing.

3.2.1 NCAA Certification Criteria

For NCAA certification the following criteria must be followed. The track surface, asphalt substrate, must not vary from planned cross slope by more than +/- 2%, with a maximum lateral slope outside to inside of 1%, and a maximum slope of 0.1% in any running direction. The finished asphalt must not vary under a 3.3 meter straight edge more than 3 mm.

3.2.2 Flood Test of Asphalt Surface

Flood test of asphalt surface must be the responsibility of the asphalt paving contractor to flood the surface immediately after the asphalt is capable of handling traffic, but within 24 hour. If, after 20 minutes of drying time, there are birdbaths evident, it must be the responsibility of the surfacing contractor, to determine the method of correction. No cold tar patching, skin patching or sand mix patching will be acceptable.

3.2.3 Surface Cleanliness

Any oil spills (hydraulic, diesel, motor oil, etc.) must be completely removed and replaced with either polyurethane or new, keyed in asphalt. The minimum curing time for the asphalt base is 28 days. Surface cleanliness must be the responsibility of the surfacing contractor to determine if the asphalt substrate has cured sufficiently prior to the application of the polyurethane surfacing system.

3.2.4 Written Acceptance of Substrate

It must be the responsibilities of the general contractor to determine if the asphalt substrate meets all design specifications, i.e., cross slopes, planarity and specific project criteria. After all the above conditions are met, the synthetic surfacing contractor must, in writing, accept the planarity of the asphalt receiving base, before work can commence.

3.2.5 Obstructions below Ground

When obstructions below ground affect the work, provide updated shop drawings showing proposed adjustments for approval.

3.2.6 Subbase

Tolerance of the concrete or bituminous substrate surface finishing must be within a maximum 6 mm in 3 meters. Tolerance of aggregate subbase surface finish must be within a maximum similar to 6 mm in 3 meters. Aggregate subbase must be compacted to a maximum 95 percent and tested in accordance with ASTM D1556/D1556M or KS F 2311.

3.2.7 Concrete or Bituminous Curing

Concrete substrate must be cured in accordance with the manufacturer's requirements. Remove curing compounds and other deleterious substances that adversely affect adhesion. Surface must be clean and dry.

3.3 INSTALLING SYNTHETIC SURFACING SYSTEM

3.3.1 Temperature Limitation

Install the synthetic surfacing at ambient temperature of 3 degree C or above. Installation may be carried out at the temperature of 3 degree C below to zero when the substrate surface is heated to keep the surface temperature above 3 degree C.

3.3.2 Substrate Surface Conditions

The concrete substrate must be cured and dried to have its moisture contents not more than 8% to obtain satisfactory result of application of synthetic surface. Test the moisture content of the concrete substrate by heating a spot for 2 minutes when the color of the spot changes into white color, which indicates that the concrete substrate contains moisture to the degrees that will harm synthetic surfacing.

3.3.3 Weather Conditions

Do not begin the synthetic surfacing work when the raining is expected within 24 hours after placing of the mixed synthetic surfacing material.

3.4 PRIMING

All substrate surfaces that will be covered with urethane surfacing material must be primer before application of finishing material. The primer must be of the material that will be compatible with the finishing material, and as recommended by the manufacturer. Apply primer at the application rate of 5 kg per square meter unless otherwise recommended by the manufacturer. As prolonged curing of the applied primer will result in decreased of the adhesion between the primer and finishing material, the primer must be applied when the finishing materials are available at site for the immediate placement after primer curing.

3.5 URETHANE SURFACE FINISHING

3.5.1 General

Mechanically mix components of the poured-in-place system on site in accordance with manufacturer's recommendations. Hand-mixing is prohibited. Installation of poured-in-place surfacing must be seamless and completely bonded to subsurface. Material must cover foundations and must be tight around elements penetrating the surface. Synthetic track surfacing system components must be processed and installed by specially designed machinery with automatic electronic portioning, which provides continuous mixing, feeding and finishing for accurate quality controlled installation.

3.5.2 Mixing of Polyurethane Granules

Meter and mix fine mesh UV stabilized elastomeric polyurethane granules together on site to regulate the ration/quantity of polyurethane granules and binders. The mixing ration must be in accordance with the manufacturer's installation instructions. The mixing time must be for 3 minutes before application.

3.5.3 Installation of Urethane Surfacing

Install the elastomeric layer of the poured-in-place system in one continuous pour at the same day. The initial application thickness must be slightly in excess of the indicated thickness so that the final thickness after rolling will meet the specified thickness with satisfactory density. After the pouring in place and spreading with squeeze, continuously roll the surface until the thickness reach to that of specified within the specified tolerance. Provide the roller by means of maintaining the roller surface temperature uniform during rolling. For areas where the roller cannot reach, utilize the trowel for leveling, pressing, and finishing. All edges must be rounded to prevent irregular breaking. In case of multicolor surface finishing, finish the middle part of the surfacing first, then, cut all joining edges with successive finishing right angle to the substrate, and remove thoroughly all loose cutout materials from the area before successive color surface finishing begins.

3.6 LINE STRIPING AND EVENT MARKING

Provide marking on finished urethane surfaces as indicated on the plans. Lay out line striping and event marking in accordance with current IAAF and NCAA rules.

3.7 MAINTENANCE

For extended service of the urethane surface finishing, keep all surfaces free from any of chemical spills, such as thinner, volatile materials, and flammable substances etc. Maintain the finished urethane surfacing free from spoiling wit, accumulation of clay, sand and dusts, etc., by periodic cleaning.

3.8 TESTING

Upon completion of the installation, cut out sample(s) for testing from the finished urethane surface areas at spots to be designated by the Contracting Officer. The sample must be tested by an independent testing laboratory. The testing results must comply with the criteria specified in the Paragraph 1.10 "Evaluation Items and Criteria". Any deviation from the specified criteria shall become the causes for the rejection of the finished urethane surfacing work.

3.9 FINAL CLEANING

Upon completion of the urethane surfacing work, the finished work surface must be thoroughly cleaned to remove dust, soils, and other foreign materials. In addition, clean the entire work site to remove all debris, left over materials, and working tools from the site, and restore any damages sustained exiting area for working to the original or better conditions at the Contractor's expense.

-- End of Section --