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USACE / NAVFAC / AFCEC / NASA | UFGS-09 64 66 (August 2016)
Change 1 - 08/18

Preparing Activity: NAVFAC | Superseding
UFGS-09 64 66 (August 2010)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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08/16, CHG 1: 08/18

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SECTION 09 64 66

WOOD ATHLETIC FLOORING
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****
NOTE: This guide specification covers the requirements for five gymnasium-type hardwood strip flooring systems.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

****
NOTE: This specification is intended for use in gymnasiums and for other similar uses and purposes. Guidance for selection of a system can be made based on the recommended applications, local availability or costs as shown in Selection Guidance Table in paragraph entitled "Hardwood Strip Flooring Systems on Concrete Slab." Construction of squash and handball court walls is not within the scope of this specification.
****

****
NOTE: On the drawings, show:

1. Elevation of top of concrete slab on which the floor system will be installed.

2. Location of permanent or temporary seats

3. Location of equipment and other permanent obstructions around which flooring is to be laid

4. Structural provisions for anchor-plate assemblies for sport equipment

5. Edge detail, including kind and size of wall base

6. Location, width, and color of game lines.

****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

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 FOREST FOUNDATION (AFF)

ATFS STANDARDS	(2015) American Tree Farm System Standards of Sustainability 2015-2020

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA C1	(2003) All Timber Products - Preservative Treatment by Pressure Processes
AWPA C2	(2003) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes
AWPA M4	(2023) Standard for the Care of Preservative-Treated Wood Products

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM C208	(2022) Standard Specification for Cellulosic Fiber Insulating Board
ASTM D41/D41M	(2011; R 2016) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D226/D226M	(2017) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D395	(2016; E 2017) Standard Test Methods for Rubber Property - Compression Set
ASTM D412	(2016; R 2021) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D449/D449M	(2003; R 2021) Standard Specification for Asphalt Used in Dampproofing and Waterproofing
ASTM D1622/D1622M	(2014) Apparent Density of Rigid Cellular Plastics
ASTM D2103	(2015) Standard Specification for Polyethylene Film and Sheeting
ASTM D2240	(2015; E 2017) Standard Test Method for Rubber Property - Durometer Hardness
ASTM E96/E96M	(2022a; E 2023) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM F36	(2015; R 2021) Standard Test Method for Compressibility and Recovery of Gasket Materials

CALIFORNIA AIR RESOURCES BOARD (CARB)

CARB 93120	(2007) Airborne Toxic Control Measure (ATCM) to Reduce Formaldehyde Emissions from Composite Wood Products

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

CARPET AND RUG INSTITUTE (CRI)

CRI GL CUSHION	Green Label Cushion Program

CSA GROUP (CSA)

CSA Z809-08	(R2013) Sustainable Forest Management

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001	(2015) Principles and Criteria for Forest Stewardship

MAPLE FLOORING MANUFACTURERS ASSOCIATION (MFMA)

MFMA AFSFSCL	(2016) Athletic Floor Sealer and Finish Specifications and Conformance List #35
MFMA GRHM	(2000) Grading Rules for MFMA Northern Hardwood Maple
MFMA SSCLFMGF	(2016) Sanding, Sealing, Court Lining, Finishing and Resurfacing of Maple Gym Floors

PROGRAMME FOR ENDORSEMENT OF FOREST CERTIFICATION (PEFC)

PEFC ST 2002:2013	(2015) PEFC International Standard Chain of Custody of Forest Based Products Requirements

RESILIENT FLOOR COVERING INSTITUTE (RFCI)

FLOORSCORE	FLOORSCORE IAQ Certification

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1113	(2016) Architectural Coatings
SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

SUSTAINABLE FOREST INITIATIVE (SFI)

SFI 2015-2019	(2015) Standards, Rules for Label Use, Procedures and Guidance

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 770	Formaldehyde Standards for Composite Wood Products

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building

1.2 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 Contractor Quality Control approval.][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

Hardwood Strip Flooring System

Clearly delineate components of the system. Show layout of [sleepers] [steel channels] [steel spines]; location of anchor plate assemblies, floor outlets, and underfloor conduit or raceway location; flooring system details; and flooring abutting other construction. Accessories shall be approved by the flooring manufacturer.

SD-03 Product Data

Hardwood Strip Flooring Components

Indoor Air Quality for Asphalt Fill; S

Indoor Air Quality for Asphalt Primer; S

Indoor Air Quality for Asphalt Mastic; S

Indoor Air Quality for Seal Coat and Finish Coat Materials; S

Indoor Air Quality for Game Line Marking Materials; S

Indoor Air Quality for Adhesives; S

SD-04 Samples

****
NOTE: Delete materials not included in floor system selected. Samples shall be complemented with manufacturer's data and standard catalogs to describe the flooring system selected.
****

Strip Flooring; G[, [_____]]

Hardwood Base; G[, [_____]]

Molded-Rubber Base; G[, [_____]]

Steel Channels and Clips

[Fiberboard Underlayment

][Flexible Foam Underlayment

] Cushions and Pads

Corkboard or Corkroll

Sleepers and Nailers

SD-06 Test Reports

Preservative Treatment

SD-07 Certificates

Certified Sustainably Harvested Wood Strip Flooring; S

[Certified Sustainably Harvested Sleepers and Nailers; S

][Certified Sustainably Harvested Wood Board Subflooring; S

][Certified Sustainably Harvested Plywood Subflooring; S

][Indoor Air Quality for Wood Strip Flooring; S

] Indoor Air Quality for Molded-Rubber Base; S

[Indoor Air Quality for Fiberboard Underlayment; S

] Indoor Air Quality for Rubber Cushions and Pads; S

[Indoor Air Quality for Flexible Foam Underlayment; S

] SD-08 Manufacturer's Instructions

Flooring System

Adhesive for Membrane Installation

Submit flooring system manufacturer's installation instructions. Submit vaporproofing manufacturer's written recommendations for adhesives to be used in membrane installation.

SD-10 Operation and Maintenance Data

Hardwood Strip Flooring, Data Package 1; G[, [_____]]

1.3 CERTIFICATION

1.3.1 Certified Sustainably Harvested Wood

****

NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Sustainably Harvested Wood is a product which comes from a third-party Forestry Certification Program and thus carries certain characteristics: 1) Protection of biodiversity, species at risk and wildlife habitat, sustainable harvest levels, protection of water quality, and prompt regeneration (e.g., replanting and reforestation); 2) Third-party certification audits performed by accredited certification bodies; 3) Publicly available certification audit summaries; 4) Multi-stakeholder involvement in a standards development process; 5) Complaints and appeals process.

Verify suitability, availability within the region, cost effectiveness and adequate competition before specifying these sustainably harvested wood certifications - if these conditions are verified for the project locale, include the following section. For projects pursuing LEED, delete certifications other than FSC; for all other projects pursuing third-party certification allow the entire list of third party certifications.

****

Provide wood certified as sustainably harvested by FSC STD 01 001[, ATFS STANDARDS, CSA Z809-08, SFI 2015-2019, or other third party program certified by PEFC ST 2002:2013]. Provide a letter of Certification of Sustainably Harvested Wood signed by the wood supplier. Identify certifying organization and their third party program name and indicate compliance with chain-of-custody program requirements. Submit sustainable

wood certification data; identify each certified product on a line item basis. Submit copies of invoices bearing certification numbers.

1.3.2 Indoor Air Quality Certification

Submit required indoor air quality certifications in one submittal package.

1.3.2.1 Floor Covering Materials

Provide wood strip flooring and molded rubber base products certified to meet indoor air quality requirements by FLOORSCORE, UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide rubber cushions and pads, and flexible foam underlayment products certified to meet indoor air quality requirements by FLOORSCORE, UL 2818 (GreenGuard) Gold, SCS Global Services Indoor Advantage Gold, CRI GL CUSHION or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

****

NOTE: Include following section when fiberboard underlayment is included in project.

****

[1.3.2.2 Composite Wood, Wood Structural Panel and Agrifiber Products

For purposes of this specification, composite wood and agrifiber products include particleboard, medium density fiberboard (MDF), wheatboard, strawboard, panel substrates, and door cores. Provide products certified to meet requirements of both 40 CFR 770 and CARB 93120. Provide current product certification documentation from certification body.

]1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in original unopened packages, bundles, or containers. Protect materials against dampness during shipment and after delivery. Store material under cover in a well-ventilated building. Prevent exposure to extreme changes of temperature and humidity. Do not store materials in building under construction until wet-applied building materials are dry. Store flooring in accordance with MFMA GRHM, under adequate and controlled ventilation and under approved temperature and humidity conditions at the location where it is to be laid for at least seven days before installation. Handle and store preservative-treated materials in accordance with AWPA M4.

1.5 ENVIRONMENTAL CONDITIONS

****

NOTE: Termite protection must be included. For new work, provide perimeter protection, using Section 31 31 16.13 CHEMICAL TERMITE CONTROL. For existing buildings without perimeter protection, add termite protection to the flooring using AWPA Standard C2 or other method recommended by the manufacturer.

****

For at least one week prior to and during installation, in the location to receive finish flooring and the location where flooring will be stored, maintain a temperature of between 18 and 27 degrees C 65 and 80 degrees F, and a relative humidity of between 40 and 60 percent. When the interior relative humidity exceeds 60 percent during or after installation of flooring, sanding and finishing of flooring shall be delayed for two to three weeks after completion of laying, unless directed otherwise. Provide adequate ventilation during the entire sealing and finishing process to ensure that no unhealthy or hazardous accumulation of vapors occurs. Ensure that environmental conditions are met.

PART 2 PRODUCTS

2.1 HARDWOOD STRIP FLOORING SYSTEMS ON CONCRETE SLAB

****

NOTE: Select the system most suited to the project and as recommended in Selection Guidance Table below.

In areas where termite or other insect attack is likely to occur specify that flooring be treated with wood preservative as recommended by flooring manufacturer.

Designer must indicate on finish schedule, schedule at end of specification or on drawings the location of selected subfloor systems.

SELECTION GUIDANCE TABLE			
DESCRIPTION OF FLOOR SYSTEM	**PERFORMANCE FEATURES**	**RECOMMENDED APPLICATIONS**	**RELATIVE COST**
1. Steel channel and clip-fastening system using special-milled random length hardwood strip flooring in hard maple and white pine. Low Profile System.	Greatest resistance to expansion and cupping. A tight, solid floor and a "fast" playing surface. High static load bearing. Expansion provisions at perimeter. A "quiet" floor.	Large gymnasiums, handball, squash and racket ball courts. Large stages.	100 percent
2. Rubber-cushioned softwood sleepers placed over polyethylene covered slab and random-length standard hardwood strip flooring in hard maple nailed to sleepers. High Profile System.	Entire floor "floats" on slab. Excellent shock absorbing characteristic. Low sound transmission. "Slower" floor.	Gymnasiums with lesser use and size potentials.	85 percent

SELECTION GUIDANCE TABLE			
DESCRIPTION OF FLOOR SYSTEM	**PERFORMANCE FEATURES**	**RECOMMENDED APPLICATIONS**	**RELATIVE COST**
3. Wood subflooring nailed to rubber cushioned wood nailers, before installing finished surface. Pour hot asphalt fill under and between wood nailers. High Profile System.	Good shock absorption, good stability, improved uniformity of resilience and load bearing. Low sound transmission.	Gymnasiums, hardball courts.	90 percent
4. Cushioned double plywood subfloor, standard random length hardwood strip flooring in hard maple or other species as top surface. Flooring can be installed in special patterns. Low Profile System.	Combines best of shock absorbency with uniform resiliency and fast playing surface. Good load bearing characteristics. Good stability. Low sound transmission. Quiet floor.	Gymnasiums, handball, squash, racquetball courts.	95 percent
5. Mastic-set uniform length hard maple flooring in continuous courses interlocked with steel splines.	Uniform resilience. "Quiet" surface. Easy replacement of damaged areas.	Gymnasiums, handball, squash, racquetball courts. Heavy industrial applications.	90 percent

****

[2.1.1 Clipped to Steel Channels on Underlayment

Provide flooring system consisting of hardwood strip flooring clipped to steel channels that rest in premilled grooves in [fiberboard] [flexible foam] underlayment. Anchor steel channels to concrete floor slab.

][2.1.2 Wood Sleepers with Rubber Cushions

Provide flooring system consisting of hardwood strip flooring nailed to wood sleepers that are seated on rubber cushions resting on the concrete floor slab.

][2.1.3 Wood Board Subflooring, Wood Nailers, and Asphalt Fill

Provide flooring system consisting of hardwood strip flooring nailed to wood board subflooring that is, in turn, nailed to shimmed wood nailers anchored to the concrete floor slab. Provide hot asphalt fill under and between the wood nailers.

][2.1.4 Plywood Subflooring with Rubber Pads

Provide flooring system consisting of hardwood strip flooring nailed to two-layer plywood subflooring that is seated on cushioned pads resting on the concrete floor slab.

][2.1.5 Steel-Splined, Continuous Unit, [on Cork Underlayment]

Provide flooring system consisting of uniform lengths of hardwood strip flooring interlocked with steel splines and laid in asphalt mastic [on cork underlayment which is laid in asphalt mastic over membrane of felt] on the concrete floor slab.

]2.2 MATERIALS

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NOTE: Delete materials not included in floor system selected. Samples shall be complemented with manufacturer's data and standard catalogs to describe the flooring system selected.

****

2.2.1 Strip Flooring

****

NOTE: Flooring of 26.2 mm 33/32 inch thickness should be used for floors subjected to hard and frequent service and frequent sanding.

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NOTE: Maple flooring should be used for floors subjected to hard and frequent service or major athletics. Use beech and birch for less critical service.

Include last bracketed sentences requiring with indoor air quality certification or

validationproducts when product will be located in offices or classrooms.
****

Second or better grade [hard maple] [beech or birch] graded in accordance with current MFMA GRHM. Flooring must be [19.8] [26.2] [_____] mm [25/32] [33/32] [_____] inch thick by [57] [38] mm [2 1/4] [1 1/2] inches or narrower on the face, kiln dried, continuous tongue-and-groove, and end-matched. Provide wood products with no added urea-formaldehyde resins. Each bundle of flooring must be clearly grade stamped. Moisture content of strip flooring must not exceed 8 percent at time of arrival on job site and must be allowed to acclimate in accordance with paragraph DELIVERY, STORAGE, AND HANDLING.[Flooring for steel-splined systems must be edge-grain 26.2 mm 33/32 inch thick by 33 mm 1 5/16 inch on the face, kiln-dried, continuous tongue-and-groove, and end grooved.] Provide certified sustainably harvested wood strip flooring.

[Products must meet emissions requirements of CDPH SECTION 01350. Provide certification or validation of indoor air quality for wood strip flooring.

]2.2.2 Hardwood Base

Clear [hard maple] [beech or birch]. Provide shape and size of base as indicated or as recommended by the flooring manufacturer.

2.2.3 Molded-Rubber Base

100 mm4 inch vertical leg by 75 mm 3 inch, designed to allow ventilation under floor [with premolded outside corners and mitered inside corners], and as recommended by flooring manufacturer. Products must meet emissions requirements of CDPH SECTION 01350. Provide certification or validation of indoor air quality for molded-rubber base.

2.2.4 Steel Angle Base

Provide 75 by 75 by 5 mm 3 by 3 by 3/16 inch continuous steel angle along perimeter walls, designed to allow ventilation under the floor. Base angle must conform to ASTM A36/A36M.

2.2.5 Steel Channels and Clips

Provide channels and clips not less than 1.5 mm thick 16 gagezinc-coated steel.

[2.2.6 Fiberboard Underlayment

ASTM C208, fiberboard insulation board, impregnated with asphalt or coated with asphalt on faces and edges, treated for termite and water resistance. Products must contain no added urea-formaldehyde resins. Provide certification of indoor air quality for fiberboard underlayment.

]2.2.7 Rubber Cushions and Pads

Rubber cushions and pads must have a durometer hardness of A50, plus or minus 5, when tested in accordance with ASTM D2240 and must have a minimum tensile strength of 10 MPa 1500 psi, when tested in accordance with ASTM D412. When subjected to an aging period of 70 hours and exposed to a temperature of 70 degrees C 158 degrees F, allowed to cool to room temperature over a period of 4 hours and retested, tested specimen must

have a change in hardness of 10 points maximum, a change in tensile strength of minus 25 percent maximum and a change in ultimate elongation of minus 25 percent maximum in accordance with the applicable test methods referenced above. Test rubber cushions, under a load of 275 kPa 40 psi, in accordance with ASTM D395, Method A. Size of tested specimen must be 57 by 75 by 10 mm 2 1/4 by 3 by 3/8 inch. Length of testing time must be 22 hours; temperature of test must be 70 degrees C 158 degrees F. Test specimen must recover, without set or displacement. Products must meet emissions requirements of CDPH SECTION 01350. Provide certification or validation of indoor air quality for rubber cushions and pads.

[2.2.8 Flexible Foam Underlayment

Multicellular, closed cell flexible polyethylene plastic foam having smooth skin; density 27 to 52 kg/cu m 1.7 to 3.3 pounds per cubic foot when tested by ASTM D1622/D1622M. Foam must be 13 mm 1/2 inch thick by 1200 mm 48 inches wide by manufacturer's standard length, premilled to receive steel channels at 300 mm 12 inch centers. Products must meet emissions requirements of CDPH SECTION 01350. Provide certification or validation of indoor air quality for flexible foam underlayment.

]2.2.9 Polyethylene Vaporproofing Membrane

ASTM D2103 Type 21110. Minimum thickness shall be 0.15 mm 6 mils. Perm rating must not exceed 0.02 when tested in accordance with ASTM E96/E96M.

2.2.10 Asphalt Primer

ASTM D41/D41M. Provide asphalt primer products meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for asphalt primer.

2.2.11 Asphalt Mastic

As recommended by the flooring manufacturer. Provide asphalt mastic products meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide validation of indoor air quality for asphalt mastic.

2.2.12 Asphalt Fill

ASTM D449/D449M, Type I. Provide asphalt fill material products meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for asphalt fill.

2.2.13 Felt

ASTM D226/D226M, type I, asphalt-saturated organic felt.

2.2.14 Building Paper

Water-vapor permeable, 290 grams per mm 20 lb per inch dry tensile strength.

2.2.15 Sleepers and Nailers

****
NOTE: Preservative treatment specified herein shall be modified as necessary to suit local conditions. When referencing AWPA C1 and C2, water repellent requirements, if any, should be specified.
****

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

Surfaced on four sides, 50 by 75 mm 2 by 3 inches nominal size, Standard or No. 2 grade douglas fir, northern or western and west coast hemlock, engleman-spruce or No. 2 dimension southern pine. Moisture content must not exceed 15 percent. Provide preservative treatment in accordance with [AWPA C1] [AWPA C2]. Identify treatment on each piece of material by the quality mark of an agency accredited by the Board of Review of the American Lumber Standard Committee. Brush coat exposed areas that are cut or drilled after treatment with the same preservative in accordance with AWPA M4.[Provide certified sustainably harvested sleepers and nailers.]

2.2.16 Wood Board Subflooring

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

No. 2 common douglas fir, northern or western hemlock, englemann spruce, or southern pine No. 2 boards, northern red or Norway pine, surfaced on four sides. Nominal sizes must be 25 by 150 mm or 25 by 100 mm 1 by 6 inches or 1 by 4 inches. Moisture content must not exceed 15 percent.[Provide certified sustainably harvested wood board subflooring.]

2.2.17 Plywood Subflooring

****
NOTE: Use certified sustainably harvested wood where suitable for application and cost effective. Verify suitability, availability within the region, cost effectiveness, and adequate competition before specifying this certification.
****

Douglas fir, southern pine, or western larch plywood; grade C-D, with exterior glue; 12.7 mm 1/2 inch thick by 4200 by 2400 mm 4 by 8 feet.[Provide certified sustainably harvested plywood subflooring.]

2.2.18 Sealing and Finishing for Hardwood Strip Flooring

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NOTE: Use Group II finish for aerobics, dance, and stage applications; use Group III for floors to be utilized for gymnasium and multipurpose applications.
****

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NOTE: Use Group II finish for multipurpose, high wear areas; use group III for floors to be utilized solely for sports. Group III finish generally requires two sealer coats and two finish coats. Group II finish requires one sealer coat and two finish coats. Regardless of which finish is selected, each coat except the final coat should be burnished with No. 2 steel wool and wiped with a tack rag before application of the next coat.
****

Conform to MFMA AFSFSCL, Group [II] [III] finish. Seal coat and finish coat materials must be compatible with each other. Provide seal coat and finish coat products meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for seal coat and finish coat materials.

2.2.19 Game Line Marking Materials

As recommended by wood flooring finish manufacturer. Provide game line marking products meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for game line marking materials.

2.2.20 Nails

Shape and size as recommended by flooring manufacturer.

2.2.21 Underlayment

Corkboard or corkroll, 13 mm 1/2 inch thick, conforming to ASTM F36.

2.2.22 Adhesives

Waterproof, suitable for use with molded rubber base, recommended by rubber base manufacturer. Provide adhesive products meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide validation of indoor air quality for adhesives.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Condition of Subfloors

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NOTE: The concrete slab on which the floor system is to be installed must be depressed according to the requirements of floor system being used. Ensure that the required depressions are shown on the drawings.

****

Do not install flooring on surfaces that are not suitable for proper installation. Before beginning work under this section, correct defects such as rough or scaling concrete, low spots, high spots, uneven surfaces, and repair damaged portions of concrete slabs. Concrete slabs must be given a leveling course of latex fill and the surface shall not vary more than 3 mm 1/8 inch when measured with a 3 meter 10 foot straightedge placed in any direction.

3.1.2 Preparation of Concrete Slab

Sweep concrete floor. Ensure that slab is dry and clean. Remove paint spots, plaster, masonry droppings, grease, dirt, and other foreign matter [including chemical curing agents which may affect the bond of adhesive-applied wood flooring systems]. Concrete must be fully cured and dry.

3.1.3 Anchor Plate Assemblies for Portable Sports Equipment

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NOTE: Anchor plate assemblies for portable sports equipment should be specified as a part of each individual piece of equipment in Division 11 of the project specifications; however, if no equipment is to be specified and anchor plates are desired for future equipment, they must be detailed in the drawings, and materials and installation must be specified in Part 2 of this section. Do not specify anchors to be supplied by floor manufacturer; they do not normally supply them.

****

Floor anchor plate assemblies for vertically adjustable portable sports equipment shall be installed where indicated. Flooring must be cut neatly around floor plates.

3.1.4 Work of Other Trades

Do not start work specified under this section until work of trades which could create moisture, has been completed.

3.1.5 Moisture Content

Check flooring, subflooring, sleepers and nailers with an approved meter verifying conformance with the requirements specified hereinbefore.

3.2 INSTALLATION

****

NOTE: Provisions for expansion and contraction will be governed by local weather conditions and by temperatures and humidities to be maintained within building. Modify specifications accordingly. The floor systems included in this specification are intended for installation on or above grade. If installation is below grade, provisions for waterproofing must be made and the requirements specified in Division 7. Select type of flooring to be used and delete other.

In conjunction with vapor-proofing, at least 150 mm 6 inches of porous fill, capillary water barrier, consisting of clean, washed gravel graded from 19 to 38 mm 3/4 to 1 1/2 inch sizes should be provided under slab and specified in Division 2. No sand or crushed coral should be used between top of gravel and bottom of slab. If surrounding drainage conditions indicate probable development of hydrostatic pressure under slab, three-ply membrane waterproofing should be provided under slab. Specify in Division 7.

****

Do not install building construction materials that show visual evidence of biological growth.

3.2.1 Vaporproofing For Slabs on Grade

Cover slab with the polyethylene membrane. Lap joints at least 150 mm 6 inches. Seal joints with a full coverage of the adhesive recommended by the membrane manufacturer.

3.2.2 Flooring Clipped to Steel Channels

3.2.2.1 Channel Placing

Install each channel in premilled grooves spaced 300 mm 12 inches on center in [fiberboard] [flexible foam] parallel to the short side of the room, with butted end-to-end joints staggered at least 600 mm 24 inches. Anchor channels to the slab at 350 mm 14 inches on center with 10 mm 3/8 inch diameter, flat headed anchors that penetrate the slab by at least 32 mm 1-1/4 inches. Set channels level.

3.2.2.2 Laying of Finished Flooring

Lay finished flooring at right angles to the steel channels. Begin installation with double-tongue strips of flooring in center of room. Clip each board down tightly at each channel intersection with zinc-coated flooring clips. Each clip must firmly engage the side edges of the flooring and the steel channels. Ensure that each clip is placed properly. Stagger adjacent end joints of flooring so that there will be at least two boards between joints. Where floor plates occur, install steel channels along edges of flooring board; provide clips for flooring. Drive each flooring strip up sideways and endways as tightly as practicable using steel driving tools that prevent marring of exposed flooring.

Scribe boards to permanent obstructions and be securely blocked at wall lines.

3.2.3 Flooring on Wood Sleepers with Rubber Cushions

3.2.3.1 Installation of Wood Sleepers With Rubber Cushions

Install rubber-cushioned wood sleepers, [300 mm12 inches on center for 26.2 mm 33/32 inch] [225 mm9 inches on center for 19.8 mm 25/32 inch] thick flooring, parallel to short side of the room, with butted end-to-end joints, 6 mm 1/4 inch apart at the joints, staggered at least 600 mm 24 inches. Sleepers must have the rubber cushions attached at 300 mm 12 inch centers. Provide a 50 mm 2 inch air space between ends and sides of sleepers at walls and other permanent obstructions. Sleepers must be seated level and firm with rubber cushions bearing completely on the subfloor.[In areas where fixed or temporary seats are indicated, provide 40 by 48 mm 1-5/8 by 1-7/8 inch wood screeds midway between the cushioned wood sleepers.]

3.2.3.2 Laying of Finished Flooring

Begin installation of flooring in center of space with double-tongue strips of flooring. Lay flooring at right angles to the wood sleepers. Blind nail each strip of flooring to each wood sleeper with 63 by 3 mm 8 penny spiral screw nails. Leave a continuous air space, 50 mm 2 inches wide, between the finished flooring and perimeter walls and other permanent obstructions. Stagger end joints of adjacent strips of flooring so that there will be at least two boards between each joint.

3.2.4 Flooring on Board Subflooring, Wood Nailers, and Asphalt Fill

3.2.4.1 Priming of Concrete Slab

Prime slab with asphalt primer using minimum of 1.6 liter per 10 square meters one gallon per 250 square feet. Allow primer to dry.

3.2.4.2 Wood Nailers

Install continuous 50 by 75 mm 2 by 3 inch nominal size wood nailers 300 mm 12 inches on center, parallel to short side of room, with butted end-to-end staggered joints, 6 mm 1/4 inch apart at the joints. Elevate bottoms of nailers about 5 mm 3/16 inch above concrete slab with fiber shims. Fasten nailers to slab with 6 by 88 mm 1/4 by 3 1/2 inch power driven anchors spaced 750 mm 30 inches on center and staggered in adjacent rows. Provide an additional anchor not more than 150 mm 6 inches from the end of each nailer. Provide a 50 mm 2 inch air space between ends and sides of sleepers at walls and other permanent obstructions. Nailers must be set level and in alignment. Check level of tops of nailers with a surveyor's instrument.

3.2.4.3 Asphalt Fill

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NOTE: Because of asphalt cushion and fill specified, no additional vapor barrier is recommended.

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When the wood nailers have been set and leveled, pour the hot asphalt over

the entire concrete slab surface; fill the spaces under the wood nailers completely and cover the concrete slab surface between the nailers to a depth of approximately 10 to 13 mm 3/8 to 1/2 inch. Pour asphalt up 6 mm 1/4 inch on the sides of the nailers.

3.2.4.4 Wood Board Subflooring

Apply wood subflooring diagonally over the wood nailers. Cut ends parallel to and over center lines of wood nailers. Nail subflooring securely to each wood nailer with 57 by 3 mm 7 penny steel spiral screw nails; use two nails for 100 and 150 mm 4 and 6 inch wide boards. Space boards approximately 3 mm 1/8 inch apart. Top of subflooring shall have a true, even plane. Provide 50 mm 2 inches of clearance between subflooring and perimeter walls and other permanent obstructions.

3.2.4.5 Felt

Cover wood subflooring with a layer of the felt. Butt edges tightly. Do not extend felt over air space between ends and sides of finished floor and perimeter walls or other permanent obstructions.

3.2.4.6 Laying of Finished Flooring

Begin installation of flooring in center of space with double-tongue strips of flooring. Lay flooring at right angles to the wood nailers and parallel with the long dimension of the room. Blind nail each strip of flooring through the subflooring and into the sleeper with 63 by 3 mm 8 penny screw type nails, spaced not over 300 mm 12 inches apart over the sleepers. Leave a continuous air space 50 mm 2 inches wide between the finished flooring and perimeter walls and other permanent obstructions. Stagger end joints of adjacent strips of flooring so that there will be at least two boards between each joint.

3.2.5 Flooring on Plywood Subflooring With Rubber Pads

3.2.5.1 Installation of Plywood Subflooring With Rubber Pads

Provide two layers of 12.7 mm 1/2 inch thick plywood sheets, of 1200 by 2400 mm 4 by 8 feet. Each 1200 by 2400 mm 4 by 8 foot sheet in the bottom layer bearing on slab must have 32 rubber pads, 57 by 75 by 10 mm 2-1/4 by 3 by 3/8 inch thick, approximately 300 mm 12 inches on center in each direction, stapled to underside of sheet. Partial sheets must have rubber pads 300 mm 12 inches on center and at perimeters. Lay first layer of plywood on concrete floor slab, parallel to short side of room. Lay second layer at a 45 degree angle to first layer and fasten it to first layer by machine nailing or stapling on 600 mm 24 inch centers using 25 mm one inch nails or staples. Leave a continuous air space 50 mm 2 inches wide between the subflooring and perimeter walls and other permanent obstructions and 6 mm 1/4 inch between panels at sides and ends. Lap panels so that no joint will fall over any joint of the first layer.[In areas where fixed or temporary seats are indicated, provide fixed hardboard shims, 3 mm 1/8 inch thick, between the cushioned pads.]

3.2.5.2 Laying of Finished Flooring

Begin installation of flooring in center of space with double-tongue strips of flooring. Lay flooring parallel with the long dimension of the room. Flooring must be blind nailed on 250 mm 10 inch centers with 45 mm 1-3/4 inch spiral screw nails. Leave a continuous air space, 50 mm 2

inches wide, between the finished flooring and perimeter walls and other permanent obstructions. Stagger end joints of adjacent strips of flooring so that there will be at least two boards between each joint.[Roller skating rink flooring shall be 26.2 mm 33/32 inch thick or 19.8 mm 25/32 inch and laid in special octagonal pattern as indicated. Diagonal intersections of flooring shall be joined with barbed steel splines.]

3.2.6 Flooring, Continuous Steel-Splined, [on Cork Underlayment]

3.2.6.1 Vaporproofing for Slabs on Grade

Prime concrete slab with asphalt primer using a minimum of 1.6 liter per 10 square meters one gallon per 250 square feet. Following application and drying of the primer apply a membrane of two layers of felt. Lay each layer of felt in a coating of trowelled asphalt mastic, applied at the rate of at least 11.5 liters per 10 square meters one gallon per 35 square feet. Felts shall be butted at joints. Turn up felt 40 mm 1-1/2 inches at perimeter walls and other permanent obstructions. Roll felt thoroughly, eliminating air pockets and blisters, to provide an overall smooth and level surface. Cover top layer of felt with a coating of trowelled asphalt mastic applied at the rate of at least 11.5 liters per 10 square meters one gallon per 35 square feet.

[3.2.6.2 Cork Underlayment

Install underlayment in asphalt mastic. Provide a 2 mm 1/16 inch space at joints of corkboard. After underlayment has been installed, roll entire area with a 68 kilogram 150 pound roller to attain maximum bond and a uniformly even surface. Leave a 40 mm 1-1/2 inch air space between underlayment and perimeter walls and other permanent obstructions.

]3.2.6.3 Finished Flooring

Lay 300 mm 12 inch long strips of finished flooring firmly in full bed of asphalt mastic in end-to-end courses, interlocking with saw-tooth steel splines into the slotted ends. Break joints of continuous strip units in succeeding courses. Lay continuous strip units parallel with the width of the room. Lay flooring level and in correct alignment. Leave a continuous air space, 40 mm 1-1/2 inches wide, between the finished flooring and perimeter walls and other permanent obstructions. Lay flooring with hairline joints. Do not drive flooring up tightly.

3.2.7 Hardwood Base Installation

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NOTE: Select type of base desired and delete the inapplicable types. Bases specified are not a standard product of any manufacturer, and must be detailed on the drawings.

****

Install molded and perforated continuous hardwood base of the type indicated, along perimeter walls. Base shall have 10 mm 3/8 inch diameter vent holes spaced 125 mm 5 inches on center in a straight row. Nail or bolt base to wall. Do not fasten base to flooring.

3.2.8 Molded-Rubber Base Installation

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NOTE: Select type of base desired and delete the inapplicable types. Bases specified are not a standard product of any manufacturer, and must be detailed on the drawings.
****

Install molded-rubber base firmly on perimeter walls in continuous adhesive as recommended by the base manufacturer. Provide vertical, circular or semicircular vent holes in base spaced 125 mm 5 inches on center in a straight row. Do not fasten base to flooring.

3.2.9 Steel Angle Base Installation

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NOTE: Select type of base desired and delete the inapplicable types. Bases specified are not a standard product of any manufacturer, and must be detailed on the drawings.
****

Install 75 by 75 by 5 mm 3 by 3 by 3/16 inch continuous steel angle along perimeter walls. Bottom leg of angle shall have 10 mm 3/8 inch diameter vent holes spaced 125 mm 5 inches on center in a straight row. Fasten angle to wall at intervals of 400 mm 16 inches with countersunk head [expansion] [toggle] bolts. Do not fasten angle to flooring.

3.3 SANDING, FINISHING, AND MARKING

3.3.1 Sanding

Sand wood floor surfaces with a machine using coarse, medium, and fine grades of sandpaper; the edges must be sanded to a smooth edge; the finished surface must be smooth and level, free from scratches. A final disc sanding shall be provided. After final sanding or buffing, vacuum floors until clean. Do not walk on floors thereafter until finish has been applied and is dry.

3.3.2 Finishing

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NOTE: Use first bracketed sentence if finish is to be specified elsewhere in Division 9 of the project specifications; use second bracketed sentence if finish is specified under this section. Select Group II or Group III finish in the next-to-last sentence of this section.
****

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NOTE: Insert appropriate Section number and title in blank below using format per UFC 1-300-02.
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[Finishing must be provided as specified in [_____].] [Within one day after the final sanding, buffing, and sweeping have been completed, use a tacky rag to clean flooring with a low VOC solvent recommended by the manufacturer of the floor finish material. Follow cleaning with a coating of sealer; when thoroughly dry, burnish with No. 2 steel wool, using a power machine. After final burnishing and prior to application of final

finish coat(s), layout and mark game lines as specified herein; after game lines are thoroughly dry, apply final finish coat.] Floors must be wiped with a tacky rag each burnishing.[Finish floors in accordance with MFMA SSCLFMGF. Four Coat Specification: Group II finish must consist of one sealer coat and three finish coats. Group III finish must consist of two sealer coats and two finish coats. Allow 5 days for proper curing.]

3.3.3 Marking

Lay out game lines and fields [and patterns] where indicated, masking edges to provide sharp, clean edges. Edge must be straight and width shall be uniform. Apply marking of colors indicated, providing a minimum dry film thickness of one mil.

3.4 PROTECTION

After completion of laying, finishing, and marking of the flooring, do not use the floor for at least 72 hours. Avoid heavy traffic on the floor for at least one week. Upon floor drying, use nonstaining, porous building paper of the type and grade recommended by manufacturer, taped along edges. Remove kraft paper covering after work in this area is completed.

3.5 SCHEDULE

Metric measurements in this section are based on mathematical conversion of English unit measurement, and not on metric measurement commonly agreed to by the manufacturers or other parties. The English and metric units for the measurements shown are as follows:

Products	English Units	Metric Units
Flooring	25/32 inch	19.8 mm
	33/32 inch	26.2 mm
	2 1/4 inches	57 mm
	1 1/2 inches	38 mm
	1 5/16 inches	33 mm
Rubber Base	4 by 3 inches	100 by 75 mm
Steel Channels	16 gage	1.5 mm
Sleepers	2 by 3 inches	50 by 75 mm
Plywood	1/2 inch	12.7 mm

-- End of Section --