
USACE / NAVFAC / AFCEA / NASA

UFGS-09 64 66 (April 2006)

Preparing Activity: NAVFAC

Replacing without change

UFGS-09641 (August 2004)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2009

SECTION TABLE OF CONTENTS

DIVISION 09 - FINISHES

SECTION 09 64 66

WOOD ATHLETIC FLOORING

04/06

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 DELIVERY, STORAGE, AND HANDLING
- 1.4 ENVIRONMENTAL CONDITIONS

PART 2 PRODUCTS

- 2.1 HARDWOOD STRIP FLOORING SYSTEMS ON CONCRETE SLAB
 - 2.1.1 Clipped to Steel Channels on Underlayment
 - 2.1.2 Wood Sleepers with Rubber Cushions
 - 2.1.3 Wood Board Subflooring, Wood Nailers, and Asphalt Fill
 - 2.1.4 Plywood Subflooring with Rubber Pads
 - 2.1.5 Steel-Splined, Continuous Unit, [on Cork Underlayment]
- 2.2 MATERIALS
 - 2.2.1 Strip Flooring
 - 2.2.2 Hardwood Base
 - 2.2.3 Molded-Rubber Base
 - 2.2.4 Steel Angle Base
 - 2.2.5 Steel Channels and Clips
 - 2.2.6 Fiberboard Underlayment
 - 2.2.7 Rubber Cushions and Pads
 - 2.2.8 Flexible Foam Underlayment
 - 2.2.9 Polyethylene Vaporproofing Membrane
 - 2.2.10 Asphalt Primer
 - 2.2.11 Asphalt Mastic
 - 2.2.12 Asphalt Fill
 - 2.2.13 Felt
 - 2.2.14 Building Paper
 - 2.2.15 Sleepers and Nailers
 - 2.2.16 Wood Board Subflooring
 - 2.2.17 Plywood Subflooring
 - 2.2.18 Sealing and Finishing for Hardwood Strip Flooring
 - 2.2.19 Game Line Marking Materials
 - 2.2.20 Nails

- 2.2.21 Underlayment
- 2.2.22 Adhesives

PART 3 EXECUTION

- 3.1 PREPARATION
 - 3.1.1 Condition of Subfloors
 - 3.1.2 Preparation of Concrete Slab
 - 3.1.3 Anchor Plate Assemblies for Portable Sports Equipment
 - 3.1.4 Work of Other Trades
 - 3.1.5 Moisture Content
- 3.2 INSTALLATION
 - 3.2.1 Vaporproofing For Slabs on Grade
 - 3.2.2 Flooring Clipped to Steel Channels
 - 3.2.2.1 Channel Placing
 - 3.2.2.2 Laying of Finished Flooring
 - 3.2.3 Flooring on Wood Sleepers with Rubber Cushions
 - 3.2.3.1 Installation of Wood Sleepers With Rubber Cushions
 - 3.2.3.2 Laying of Finished Flooring
 - 3.2.4 Flooring on Board Subflooring, Wood Nailers, and Asphalt Fill
 - 3.2.4.1 Priming of Concrete Slab
 - 3.2.4.2 Wood Nailers
 - 3.2.4.3 Asphalt Fill
 - 3.2.4.4 Wood Board Subflooring
 - 3.2.4.5 Felt
 - 3.2.4.6 Laying of Finished Flooring
 - 3.2.5 Flooring on Plywood Subflooring With Rubber Pads
 - 3.2.5.1 Installation of Plywood Subflooring With Rubber Pads
 - 3.2.5.2 Laying of Finished Flooring
 - 3.2.6 Flooring, Continuous Steel-Splined, [on Cork Underlayment]
 - 3.2.6.1 Vaporproofing for Slabs on Grade
 - 3.2.6.2 Cork Underlayment
 - 3.2.6.3 Finished Flooring
 - 3.2.7 Hardwood Base Installation
 - 3.2.8 Molded-Rubber Base Installation
 - 3.2.9 Steel Angle Base Installation
- 3.3 SANDING, FINISHING, AND MARKING
 - 3.3.1 Sanding
 - 3.3.2 Finishing
 - 3.3.3 Marking
- 3.4 PROTECTION
- 3.5 SCHEDULE

-- End of Section Table of Contents --

USACE / NAVFAC / AFCEA / NASA UFGS-09 64 66 (April 2006)

Preparing Activity: NAVFAC Replacing without change
 UFGS-09641 (August 2004)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2009

SECTION 09 64 66

WOOD ATHLETIC FLOORING

04/06

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

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

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

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

Recommended changes to a UFGS 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 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 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 | (2002) Standard for the Care of Preservative-Treated Wood Products |

ASTM INTERNATIONAL (ASTM)

- | | |
|-----------------|---|
| ASTM A 36/A 36M | (2008) Standard Specification for Carbon Structural Steel |
|-----------------|---|

| | |
|-----------------|--|
| ASTM C 208 | (2008a) Cellulosic Fiber Insulating Board |
| ASTM D 1622 | (2008) Apparent Density of Rigid Cellular Plastics |
| ASTM D 2103 | (2008) Standard Specification for Polyethylene Film and Sheeting |
| ASTM D 2240 | (2005) Standard Test Method for Rubber Property - Durometer Hardness |
| ASTM D 226 | (2006) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing |
| ASTM D 395 | (2003; R 2008) Standard Test Methods for Rubber Property - Compression Set |
| ASTM D 41 | (2005) Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing |
| ASTM D 412 | (2006ae1e2) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension |
| ASTM D 449 | (2003; R 2008) Asphalt Used in Dampproofing and Waterproofing |
| ASTM E 96/E 96M | (2005) Standard Test Methods for Water Vapor Transmission of Materials |
| ASTM F 36 | (1999; R 2003) Compressibility and Recovery of Gasket Materials |

MAPLE FLOORING MANUFACTURERS ASSOCIATION (MFMA)

| | |
|---------------|--|
| MFMA AFSFSCL | (2003) Athletic Floor Sealer and Finish Specifications and Conformance List #22 |
| MFMA GRHM | (2000) Grading Rules for MFMA Northern Hardwood Maple |
| MFMA SSCLFMGF | (2000) Sanding, Sealing, Court Lining, Finishing and Resurfacing of Maple Gym Floors |

1.2 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

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. 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.

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" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted 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

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][; G, [____]]

Hardwood base[; G][; G, [____]]

Molded-rubber base[; G][; 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-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][; G, [_____]]

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.3 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 7 days before installation. Handle and store preservative-treated materials in accordance with AWP4 M4.

1.4 ENVIRONMENTAL CONDITIONS

NOTE: Termite protection must be included. For new work, provide perimeter protection, using Section 02361, "Soil Treatment for Termite Control." For existing buildings without perimeter protection, add termite protection to the flooring using AWP4 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 2 to 3 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.

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 |
| 3. Wood subflooring nailed to rubber cushioned wood nailers, before installing finished surface. Pour hot asphalt | Good shock absorption, good stability, improved uniformity of resilience and load bearing. Low sound transmission. | Gymnasiums, hardball courts. | 90 percent |

| DESCRIPTION OF FLOOR SYSTEM | PERFORMANCE FEATURES | RECOMMENDED APPLICATIONS | RELATIVE COST |
|--|---|---|---------------|
| fill under and between wood nailers. High Profile System. | | | |
| 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 racketball 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, racketball 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

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.

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.

Second or better grade [hard maple] [beech or birch] graded in accordance with current MFMA GRHM. Flooring shall 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. Each bundle of flooring shall be clearly grade stamped. Moisture content of strip flooring shall not exceed 8 percent at time of arrival on job site and shall be allowed to acclimate in accordance with paragraph entitled "Delivery, Storage, and Handling." [Flooring for steel-splined systems shall 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.]

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 mm 4 inch vertical leg by 75 mm 3 inch, designed to allow ventilation under floor, and as recommended by flooring manufacturer.

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 shall conform to ASTM A 36/A 36M.

2.2.5 Steel Channels and Clips

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

2.2.6 Fiberboard Underlayment

ASTM C 208, fiberboard insulation board, impregnated with asphalt or coated with asphalt on faces and edges, treated for termite and water resistance.

2.2.7 Rubber Cushions and Pads

Rubber cushions and pads shall have a durometer hardness of A50, plus or minus 5, when tested in accordance with ASTM D 2240 and shall have a minimum tensile strength of 10 MPa 1500 psi, when tested in accordance with ASTM D 412. 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 shall 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 D 395, Method A. Size of tested specimen shall be 57 by 75 by 10 mm 2 1/4 by 3 by 3/8 inch. Length of testing time shall be 22 hours; temperature of test shall be 70 degrees C 158 degrees F. Test specimen shall recover, without set or displacement.

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 D 1622. Foam shall 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.

2.2.9 Polyethylene Vaporproofing Membrane

ASTM D 2103 Type 21110. Minimum thickness shall be 0.15 mm 6 mils. Perm rating shall not exceed 0.02 when tested in accordance with ASTM E 96/E 96M.

2.2.10 Asphalt Primer

ASTM D 41.

2.2.11 Asphalt Mastic

As recommended by the flooring manufacturer.

2.2.12 Asphalt Fill

ASTM D 449, Type I.

2.2.13 Felt

ASTM D 226, type I, asphalt-saturated organic felt.

2.2.14 Building Paper

Water-vapor permeable, 290 grams per mm 20 lb per in. 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 AWWPA C1 and C2, water repellent requirements, if any, should be specified.

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 shall 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 AWWPA M4.

2.2.16 Wood Board Subflooring

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 shall be 25 by 150 mm or 25 by 100 mm one by 6 inches or one by 4 inches. Moisture content shall not exceed 15 percent.

2.2.17 Plywood Subflooring

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.

2.2.18 Sealing and Finishing for Hardwood Strip Flooring

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

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 AFSFSL, Group [II] [III] finish. Seal coat and finish coat materials shall be compatible with each other.

2.2.19 Game Line Marking Materials

As recommended by wood flooring finish manufacturer.

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 F 36.

2.2.22 Adhesives

Waterproof, suitable for use with molded rubber base, recommended by rubber base manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Condition of Subfloors

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 shall 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 shall be fully cured and dry.

3.1.3 Anchor Plate Assemblies for Portable Sports Equipment

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 shall 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.

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 shall 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. Boards shall be scribed to permanent obstructions and 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 mm 12 inches on center for 26.2 mm 33/32 inch] [225 mm 9 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 shall 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 shall 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 x 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 shall be set level and in alignment. Check level of tops of nailers with a surveyor's instrument.

3.2.4.3 Asphalt Fill

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

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 x 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 x 3 mm 8 pennyscrew 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 shall 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 shall 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 shall 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

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

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

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 shall be sanded to a smooth edge; the finished surface shall 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

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.

NOTE: Insert appropriate Section number and title in blank below using format per UFC 1-300-02.

[Finishing shall 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 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 shall be wiped with a tacky rag each burnishing. [Finish floors in accordance with MFMA SSCLFMGF. Four Coat Specification: Group II finish shall consist of one sealer coat and three finish coats. Group III finish shall 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 shall 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:

| <u>Products</u> | <u>English Units</u> | <u>Metric Units</u> |
|-----------------|----------------------|---------------------|
| 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 x 3 inches | 100 x 75 mm |
| Steel Channels | 16 gage | 1.5 mm |
| Sleepers | 2 x 3 inches | 50 x 75 mm |
| Plywood | 1/2 inch | 12.7 mm |

-- End of Section --