Foreword

The Draft Standard posted here has been approved by the Technical Committee and is submitted by the Board of Directors to the NAMA General Membership and public at large for review and comment. NAMA is soliciting comments on the Draft Standard from all interested parties and "request" that comments be submitted in the format presented in the Comment Form.

Please download the Comments Form and send directly to Summer Mays snd204@msstate.edu

Standard Number: NAMA TX-nnnnn

Title: Timber Mat Production Standard

Organization: North American Matting Association (NAMA)

Preamble: Mats provide modular work and access foundations during heavy industrial construction. They are widely used in the construction of: transmission power lines, pipelines, oil field development, cranes & lifting, other rigging, other energy development, roads and bridges, etc. Mats spread relatively heavy loads over large areas and thereby reduce or minimize or manage ground pressure. Mats serve multiple purposes. They protect environmentally sensitive areas such as soils, wetlands, and others. They protect and facilitate access to and around construction sites by machinery, equipment, materials and supplies. Matting systems can be designed to carry a variety of loads (point, line, distributed, uniform) over a variety of ground conditions including soft or marshy soils. They can be applied quickly. Also, upon completion of a job, mats can be removed and the site can return to its pre-construction state. To better manage and improve the use, specification, applications, and expectations related to mats, it can be helpful for manufacturers, users, engineers, brokers, and other interested parties to be able to reference minimum physical standards and generally accepted practices and materials that apply to mats. This standard applies to mats at their time of manufacture and initial shipping from the manufacturer.

2023 Technical Committee Members

Name	Affiliation	Sector
Atkin, Jeff	World Forest	Producer
Beasley, Truss	Beasley Group	Producer
Brown, Claude		Producer
Cleve, Tad	Timber Products Inspection	3rd Party Inspection
Collins, Jim	Guardian Composites	Producer
Couvillon, Don	Quality Mat	Producer
Deeb, Chris	Superior Energy Resources	Producer
Duerr, David	2DM Associates	Engineering
Glied, Bob	Yak Access	Producer
Harding, Todd	Bechtel	Engineering
Kahn, Rakesh	FDH incorporated	Engineering
Kicklighter, Ben	Dakota	
Koberg, Kris	Dica	Producer
Mills, Mike	Retired, Liberty Mutual, P30	
Perry, John	Dominion Energy	User/Specifier
Rezaei, Fatemeh	Mississippi State University	Academic/Research
Richardson, Chris	Lonestar Rigging	User/Specifier
Shmulsky, Rubin	Mississippi State University	Academic/Research
Tubbs, Orain	Apex Trench & Mat	Producer/Engineering
Twellman, Chuck	Ameren	User/Specifier
Walsh, Mike	Dearborn Companies	Engineering

Mat Standard

1.0 Consensus Statement:
The following standard is voluntary. It is developed and offered by the Association, hereafter "NAMA." NAMA members that **do not follow** the standard shall not use the NAMA mark in any manner associated with products.

This voluntary standard was developed by a NAMA Technical Committee of balanced interests, including non-members, in an effort to ensure that individuals from competent and concerned interests had an opportunity to participate. Participation by federal or state agency representative(s) or person(s) affiliated with industry is not to be interpreted as government or industry endorsement of this standard.

NAMA does not approve, rate, or endorse any item, construction, proprietary device, or activity. NAMA does not take any position with respect to the validity of any patent or other intellectual property (IP) rights asserted in connection with any items mentioned in this standard and does not undertake to insure or indemnify anyone utilizing this standard against liability for infringement of any applicable patents or other IP rights , nor assume any such liability. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

General. This standard was developed and is maintained with the intent to represent the consensus of concerned interests. As such, users of this standard may interact with NAMA by requesting information, proposing revisions, and attending NAMA Technical Committee meetings. Correspondence should be addressed to:

Secretary
North American Matting Association
[street address or email address]

Proposing Revisions. The adopted standard is being made available on the NAMA webpage for public review and comment so as to provide an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large. It is anticipated that NAMA will periodically review and revise this standard to make appropriate changes, and that approved revisions will be published on the NAMA webpage. NAMA welcomes proposals for revisions to this standard. Proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Interpretations. Upon request, NAMA will endeavor to render an interpretation of any requirement of the standard. Interpretations can only be rendered in response to a written request sent to the Secretary of NAMA. Request for interpretation should address the interpretation of a specific requirement in a manner suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. Requests should not contain proprietary names or information. NAMA will not provide advice or act as a consultant with respect to specific engineering problems or the general application or understanding of the requirements of this standard.

2.0 Preamble:

Construction Variation and Comparability: A mat can be constructed using a variety of materials. Some matting applications require mats to have known mechanical (strength and stiffness) properties. These applications involve, but are not limited to situations with heavier loads, overhead rigging, soft/sensitive soils, and others. Some matting applications do not require mats to have known mechanical properties. These applications often involve, but are not limited to, situations with relatively small loads, minimal lifting, or lesser environmental sensitivity.

For the applications that require mats to have known mechanical properties ("Structural Applications"), it is important to develop standards that allow engineers to compare the material properties of mat products so they can make informed decisions about the products being considered for the application. For this reason, the following material properties of mats to be used in Structural Applications shall be developed, tested and reported in accordance with generally recognized standards: Design Bending Stress - Fb; Average Modulus of Elasticity - MOE; Design Shear Stress – Fv; and Design Compressive Stress – Fc.

For the applications that do not require mats to have known mechanical properties, non-rated mats may be appropriate. See the Non-Mandatory Commentary section for more details.

In all cases, information about mat size (thickness, width, and length), species or species mix (in the case of wood mats), etc. shall be specified.

3.0 NON-STRUCTURAL:

3.1 GENERAL PURPOSE MAT PRODUCED TO QUALITATIVE SPECIFICATIONS

3.1.1Timber Mat produced to Qualitative Specifications: This section applies to assembled wood-based mats consisting of individual timbers and larger members that are manufactured to qualitative standards described herein. Mats produced under this Section 3.1.1 shall be stamped as NON-STRUCTURAL GENERAL PURPOSE.

Lumber/Timber specification: Shall allow the use of any timber or lumber, provided that each piece as a whole is intact to permit its use for general matting.

Mats and timbers produced to this qualitative specification shall not have assigned mechanical/allowable design properties.

Permissible species are not restricted. Generally accepted species are shown in the Appendices A & B.

3.2 INDUSTRIAL/UTILITY PRODUCED TO QUALITATIVE AND/OR QUANTITATIVE SPECIFICATIONS

3.2.1Timber Mat produced to Qualitative and/or Quantitative Specifications: This section applies to assembled wood-based mats consisting of individual timbers and larger members that are manufactured to qualitative and/or quantitative standards/specifications described in a company's production manual or by consumers. Mats produced under this Section 3.2.1 shall be stamped as NONSTRUCTURAL UTILITY.

Lumber/Timber specification: Shall allow the use of any timber or lumber, provided that each piece as a whole is intact to permit its use for general matting.

Mats produced to this qualitative specification may be made in conjunction with customer and/or user specifications. Mats produced in or associated with the UTILITY category are often destined for more rigorous, demanding and/or application-specific uses as compared to mats classified as GENERAL PURPOSE. Mats and timbers produced to this qualitative specification shall not have assigned mechanical/allowable design properties.

Permissible softwood and hardwood species may include but are not limited to any species shown in the Appendices A or B and/or any species with specific gravity (green) values at or above 0.42 or specific gravity (MC 12%) values at or above 0.48. It is under consideration that in the future, this section may be further subdivided into tiers based on timber specific gravity, durability, or other metrics.

4.0 STRUCTURAL

4.1 MEMBER SPECIFICATION

4.1.1 TIMBER MEMBER SPECIFICATION

Timber Mat produced to a Timber Member Specification: This section applies to wood-based mats assembled using individual timbers and larger members that are manufactured to known and/or accepted specifications per the American Lumber Standard Committee[1], Voluntary Product Standard 20[2], and the National Grade Rule. There are 24 agencies operating under the oversight of the American Lumber Standard Committee that serve as grading agencies or rules-writing grading agencies. The grade rules include but are not necessarily limited to:

- Northeastern Lumber Manufacturer's Association[3] Standard Grade Rules (for many North American hardwood species);
- Southern Pine Inspection Bureau[4] (2021) Standard Grade Rules (for Southern Pine species); and

[1] American Lumber Standard Committee. www.alsc.org

[2] American Softwood Lumber Standard. Voluntary Products Standard PS20-20. October 2021. U.S. Department of Commerce, National Institute of Standards and Technology.

[3] Northeastern Lumber Manufacturers Association. www.nelma.org.

[4] Southern Pine Inspection Bureau. www.spib.org.

- Western Wood Products Association[5] (2021) Western Lumber Grading Rules (for Douglas fir, Western Larch, Western Hemlock).

Within these agencies and rules, lumber and timbers have descriptive characteristics that, when coupled with species descriptions, have associated allowable design values. Examples of grade or timber quality categories include Select Structural, Number 1, and Number 2. Appendix C lists these grades, several species or species groups, and their respective mechanical properties.

Tropical species groups that are important for matting, such as those in Appendix D, are not covered by the national grade rule. Their potential design performance can be estimated by procedures outlined in ASTM D245 (2011) and ASTM D2555 (2016).

Additionally, alternate species and/or grades may be considered if approved in writing, in accordance with one or more appropriate, recognized standards, by a "*qualified*" person or agency approved in writing by the NAMA technical committee and NAMA. For purposes of this activity, the term "*qualified"* means one who:

(1) by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter (of approving standard and alternative species and grades for use in all types and applications of matting), the work (including but limited to determining whether a particular piece of timber complies with standard or alternative specifications), or the project (including but limited to determining whether a particular piece of timber complies with standard or alternative specifications) (Per OSHA standard 29 CFR 1926.32); and

(2) is accredited in this subject matter by a recognized accrediting body such that the person or agency would be considered: (1) qualified to determine that a standard to be applied in evaluating alternative species and/or grades is recognized and establishes appropriate requirements for that purpose; and (2) qualified to determine whether the proposed alternate species or grades, as well as particular timbers, comply with the requirements of the recognized standard.

Mats produced under Section 4.1, Timber Member Specifications shall be stamped STRUCTURAL along with the applicable bending strength (Fb) and stiffness (MOE) characteristics.

4.2 PERFORMANCE-BASED MATS

4.2.1 Wood Based Mat produced to a Performance-based standard. This specification applies to wood-based mats manufactured under the guideline of ASTM D5456, or some

[5] Western Wood Products Association. www.wwpa.org.

other known and/or accepted standard. To reduce the complexity of testing methods, 2-foot-wide specimens are used to establish the representative material properties of the mat product. Assumptions regarding distribution of load to multiple two-foot-wide sections can then be made by the engineer. Mats produced under Section 4.2 Performance-based standard shall be stamped STRUCTURAL along with the applicable bending strength (Fb) and stiffness (MOE) characteristics.

5.0 In each of the Specifications described in sections 3.0 and 4.0 any product that bears the NAMA trademark shall be manufactured by a mill that has both: a Facility Production Manual and a Facility Quality Control Manual. Together those two documents assure quality and consistency of production over time. Routine third party inspections and reporting are a requirement of mats bearing a NAMA certification mark.

5.1 Production Manual: Each production facility shall have a mill-specific production manual that describes how a given manufacturing facility makes mats. In the case of wood-based mats, the production manual shall include at a minimum:

- Mill/company level organizational chart/structure
- List of product(s) covered by the Production Manual
- Species (groups)
- Mat sizes and tolerances (thickness classifications with tolerance ranges, width classifications with tolerance ranges, length classifications with tolerance ranges)
- Timber sizes and tolerances (thickness classifications with tolerance ranges, width classifications with tolerance ranges, length classifications with tolerance ranges)
- Timber/mat grading quality specifications that is 3.0 (NON STRUCTURAL qualitative specification), 4.0 (4.1.1 STRUCTURAL prescriptive timber grade specification or 4.2.1 STRUCTURAL performance-based specification).
- Generalized description of material flows within the production facility, production sequence, major production equipment.
- Machining characteristics. If mats are to be notched, beveled, slotted, staggered, or otherwise machined then the dimensional characteristics of these machined portions must be described.
- Fasteners (nuts, bolts, rods, nails, etc.) Description of fastener types, how they are installed, fastener schedules, etc.

5.2 Quality Control Manual: Each production facility shall have a mill-specific Quality Control Manual. This document describes how a given manufacturing facility assures the consistency of the stated characteristics of their mats as described in their Production Manual. This includes some stipulation for routine verification. This document will be attested to by the third party and is confidential to the mill/production facility.

6.0 Any product that bears the NAMA trademark shall be manufactured by a mill that engages the services of a third-party auditing service approved in writing by NAMA. Duties and obligations of the third-party auditing entity shall include but are not necessarily limited to:

- Review mill-specific Production Manual (Each production facility may desire or need some type of non-disclosure agreement/arrangement between mill/production facility and third-party auditing entity)
- Review mill-specific quality manual (Each production facility may desire or need some type of non-disclosure agreement/arrangement between mill/production facility and third-party auditing entity)
- Perform inspections at the participating mill site. At a minimum, on-site inspections shall occur quarterly. On-site inspections may be required more often particularly for mills producing mats per section 4.0.

7.0 No product may bear the NAMA certification mark except as authorized in accordance with a signed licensing agreement between NAMA and the producer of the mat. Among the requirements imposed by the licensing agreement are the following. Any product that bears the NAMA certification mark shall also bear a conspicuous mark identifying the: manufacturer, mill, grade, and date of manufacture. Mats produced under Section 3.0 of this standard shall include the phrase “NON-STRUCTURAL” in the mark in lettering and a size approved by NAMA. Mats produced under Section 4 of this standard shall include the word “STRUCTURAL” in the mark in lettering and a size approved by NAMA.

Any and all production and quality information associated with any product that bears the NAMA certification mark, shall be applicable to the said product at the date the said product leaves the production facility.

Examples

ABC MATTING

GREENVILLE

NAMA NONSTRUCTURAL

UTILITY

ABC MATTING

GREENVILLE

STRUCTURAL

1800F 1.8E

Non Mandatory Commentary:

If one needs allowable strength and stiffness values (STRUCTURAL) for a given application, one is directed toward mats from Section 4.0.

If one needs general purpose mats from documented manufacturing practices and documented quality programs, then one is directed toward mats from section(s) 3.0 (NON STRUCTURAL) and 4.0 (STRUCURAL).

References:

American Society for Testing and Materials. 2011. ASTM D-245-06 Standard practice for establishing structural grades and related allowable properties for visually graded lumber. Conshohocken, PA.

American Society for Testing and Materials. 2016. ASTM D-2555-16 Standard practice for establishing clear wood strength values. Conshohocken, PA.

American Society for Testing and Materials. 2017. ASTM D-5456-17 Standard specification for evaluation of structural composite lumber products. Conshohocken, PA

Forest Products Laboratory. 2020. Wood Handbook – wood as an engineering material. General Technical Report FPL-GTR-190. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 508 pages.

National Design Specifications for Wood. Allowable Stress Design. Load Duration Factor Adjustment, Appendix B, Figure B1. 2018. American Wood Council.

Northeastern Lumber Manufacturer's Association. 2017. Standard grading rules for Northeastern lumber. Cumberland Center, Maine.

PS-20. 2020. Voluntary Products Standard. American Softwood Lumber Standard. National Institute of Standards and Technology. U.S. Department of Commerce. Washington, DC.

Southern Pine Inspection Bureau. 2021. Standard grade rules for southern pine lumber. Pensacola, FL

Western Wood Products Association. 2021. Western Lumber Grading Rules. Portland, OR.

Appendix A

List of important North American softwood species

Common name(s)	Scientific name	Specific gravity (green)*
Douglas fir	*Pseudotsuga menzeisii*	0.43-0.45
Hemlock, Western or Mountain	*Tsuga heterophylla or mertensiana*	0.42
Larch, Western	*Larix occidentalis*	0.48
Pine, Southern	*Pinus* spp	0.47-0.54

* Forest Products Laboratory 2010. Table 5-3b.

Appendix B

List of important North American hardwood species

Common name(s)	Scientific name	Specific gravity (green)*
Ash, Black	*Fraxinus nigra*	0.45
Ash, Green	*Fraxinus pennsylvanica*	0.53
Ash, White	*Fraxinus americana*	0.55
Beech, American	*Fagus grandifolia*	0.56
Birch, Sweet	*Betula lenta*	0.60
Birch, Yellow	*Betula alleghaniensis*	0.55
Elm, American	*Ulmus americana*	0.46
Elm, Rock	*Ulmus thomasii*	0.57
Elm, Slippery	*Ulmus rubra*	0.48
Hackberry	*Celtis occidentalis*	0.49
Hickory, Bitternut	*Carya cordiformis*	0.60
Hickory, Mockernut	*Carya tomentosa*	0.64
Hickory, Nutmeg	*Carya myristicaeformis*	0.56
Hickory, Pecan	*Carya illinoensis*	0.60
Hickory, Pignut	*Carya glabra*	0.66
Hickory, Shagbark	*Carya, ovata*	0.64
Hickory, Shellbark	*Carya lacinosa*	0.62
Hickory, Water	*Carya aquatic*	0.61
Magnolia, Southern	*Magnolia grandiflora*	0.46
Maple, Black	*Acer nigrum*	0.52
Maple, Red	*Acer rubra*	0.49
Maple, Silver	*Acer saccharinum*	0.44
Maple, Sugar	*Acer saccharum*	0.56
Oak, Black	*Quercus velutina*	0.56
Oak, Bur	*Quercus macrocarpa*	0.58
Oak, Cherrybark	*Quercus falcate var. pagodaefolia*	0.61
Oak, Chestnut	*Quercus prinus*	0.57
Oak, Laurel	*Quercus laurifolia*	0.56
Oak, Live	*Quercus virginiana*	0.80
Oak, Northern red	*Quercus rubra*	0.56
Oak, Overcup	*Quercus lyrata*	0.57
Oak, Pin	*Quercus palustris*	0.58
Oak, Post	*Quercus stellate*	0.60
Oak, Scarlet	*Quercus coccinea*	0.60
Oak, Southern red	*Quercus falcate*	0.52
Oak, Swamp chestnut	*Quercus michauxii*	0.60
Oak, Swamp white	*Quercus bicolor*	0.64
Oak, Water	*Quercus nigra*	0.56
Oak, White	*Quercus alba*	0.60
Sassafras	Sassafras albidum	0.42
Sweetgum	Liquidambar styraciflua	0.46
Sycamore	Platanus occidentalis	0.46
Tupelo gum, Black or Water	Nyssa sylvatica	0.46

* Forest Products Laboratory 2010. Table 5-3b.

Appendix C

Various species and species groups and their mechanical properties, Posts and (Timbers (5-inches by 5 inches and Larger) in visual grades Select Structural, 1, and 2[67].

Species group	Rules writing agency	Grade	Fb (psi)[7]	MOE (million psi)[8**]	Fc, perp (psi)[9]	Fc, par (psi)[10]	Fv (psi)[11]
Mixed oak[12]	NeLMA	SS	1375	1.0	536	876	171
		#1	1100	1.0	536	776	171
		#2	633	0.8	536	350	171
Mixed hardwood[13]	NeLMA	SS	1210	1.1	415	751	198
		#1	963	1.1	415	651	198
		#2	550	0.9	415	300	198
Southern Pine	SPIB	SS	1650	1.5	251	951	182
		#1	1485	1.5	251	826	182
		#2	935	1.2	251	526	182
Douglas-fir Larch	WWPA	SS	1650	1.6	419	1151	187
		#1	1320	1.6	419	1001	187
		#2	825	1.3	419	701	187
Douglas-fir South	WWPA	SS	1595	1.2	348	1051	182
		#1	1265	1.2	348	926	182
		#2	743	1.0	348	651	182

[6] Allowable design values are for green (19% MC or above), single members, adjusted from 10-year to 1-year duration of load at design stress (CD=1.1 estimated from National Design Specifications (2018)). Single member values may be adjusted to account for size, load sharing among adjacent and multiple members, and/or other mat or application specific factors as recommended by a qualified person.

[7] Allowable fiber stress in bending for design. Pounds per square inch.

[8] Modulus of Elasticity. Million pounds per square inch.

[9] Allowable fiber stress in compression, perpendicular to grain, for design. Pounds per square inch.

[10] Allowable fiber stress in compression, parallel to grain, for design. Pounds per square inch.

[11] Allowable shear stress, parallel to the grain. Pounds per square inch.

[12] Mixed oak (including: black, cherrybark, Northern red, Southern red, laurel, pin, scarlet, water, chestnut, live, post, swamp, white, bur, overcup, swamp white).

[13] Mixed hardwood group, including only: American beech, birch (including sweet and yellow), maple (including black, red, silver, sugar), hickory (including bitternut, mockernut, nutmeg, pecan, pignut, shagbark, shellback, and water), red and white oak group.

Appendix D

List of important imported species

Common name(s)	Scientific name	Specific gravity (green)
Eucalyptus	*Eucalyptus grandis*	0.60
Ekki or Azobe	*Lophira alata*	0.87
Mora	*Mora excelsa, M. gonggrijpii*	0.78
Dahoma or Debema	*Piptadeniastrum africanum*	0.56
Greenheart	*Chlorocardium rodiei*	0.80
Tonka, Cumaru, Brazilian Teak	*Dipteryx odorata*	0.55
Wamara or Guyana Rosewood	*Swartzia* spp	0.92