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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

HARDWOOD GLULAM TIMBER BRIDGE DESIGN
INDEX OF SHEETS

RECOMMENDED APR. 23, 2013
RECOMMENDED APR. 23, 2013
SHEET 1 OF 3
BLC-560M

- USE THIS SERIES OF STANDARD DRAWINGS TO PROVIDE A RAPID MEANS OF PRODUCING DESIGN DRAWINGS FOR SINGLE SPAN TIMBER BRIDGES IN THE 18'-0" TO 98'-5" SPAN RANGE. BY SELECTING THE APPROPRIATE STANDARD FORMAT PLAN SHEETS AND INSERTING BASIC GEOMETRY AND JOB SPECIFIC INFORMATION, THE DESIGNER GENERATES A COMPLETE SET OF CONTRACT DRAWINGS READY FOR CONSTRUCTION.
- THE BRIDGES PROVIDED FOR IN THIS SERIES UTILIZE HARDWOOD GLULAM TIMBER COMPONENTS AS BASIC ELEMENTS OF THE SUPERSTRUCTURE. STANDARDIZED ABUTMENTS ARE PROVIDED WITH HEIGHTS (BOTTOM OF FOOTING TO TOP OF STEM) RANGING FROM 3'-3" MINIMUM TO 20'-0" MAXIMUM. WITH THREE TYPES OF SUPERSTRUCTURES AND VARIOUS COMPATIBLE AND INTERCHANGEABLE ABUTMENTS FROM WHICH TO CHOOSE, THE DESIGNER SHOULD BE ABLE TO ADAPT THE STANDARDS TO FIT MOST SINGLE SPAN APPLICATIONS.
- THE LAMINATION PROCESS UTILIZED IN HARDWOOD GLULAM PRODUCTION ENHANCES THE STRUCTURAL EFFICIENCY OF THE TIMBER BRIDGE DESIGN. THE PROCESS PERMITS OPTIMUM USE OF HIGHER GRADE LUMBER MATERIAL IN THE BEAM'S HIGHLY STRESSED CROSS-SECTIONAL ZONES. USE OF EFFECTIVE CREOSOTE TREATMENTS MAINTAINS MAXIMUM SERVICE LIFE OR EXPOSURE DURABILITY BY RESISTING AND CONTROLLING DECAY, INSECT ATTACK, AND OTHER ENVIRONMENTAL WEATHERING FACTORS. FURTHERMORE, A BITUMINOUS WEARING SURFACE PROLONGS HARDWOOD GLULAM TIMBER DECK LIFE BY MINIMIZING ADVERSE ABRASION AND MECHANICAL WEAR, AND PROVIDES ADDED VEHICLE TRACTION UPON WET OR ICY DECK SURFACES.
- USE THESE HARDWOOD GLULAM TIMBER STANDARDS FOR SECONDARY ROADWAY STREAM CROSSINGS WITH THE FOLLOWING GENERAL LIMITATIONS.
 - AVERAGE DAILY TRAFFIC (ADT) LESS THAN 750 VEHICLES OR AVERAGE DAILY TRUCK TRAFFIC (ADTT) OF LESS THAN 25 VEHICLES. FOR TIMBER DECKS ON STEEL BEAM SUPERSTRUCTURE, ADTT LESS THAN 100 VEHICLES.
 - ROADWAY WIDTHS OF 23'-7" TO 31'-6".
 - ANGLES OF INTERSECTION (SKEW) NOT LESS THAN 45 DEGREES
 - DO NOT EXCEED 10'-0" OF EXPOSED HEIGHT FOR ABUTMENT TIMBER PILES. USE STEEL PILES FOR ANY HEIGHT, BUT DESIGN STEEL PILES ACCORDINGLY.
 - SPANS 18'-0" TO 98'-5".
- SELECT ONE OF THE THREE POSSIBLE ASSEMBLY TYPES FOR THE BRIDGE SUPERSTRUCTURE: GLULAM BEAM WITH TRANSVERSE GLULAM DECK (BLC-562M), GLULAM LONGITUDINAL PANEL (BLC-563M), OR STEEL BEAM WITH TRANSVERSE GLULAM DECK (BLC-564M).

USE THE FIRST BRIDGE SUPERSTRUCTURE, GLULAM BEAM, FOR SPANS 18'-0" TO 98'-5". THIS SUPERSTRUCTURE COMPOSITION CONSISTS OF HARDWOOD GLULAM TIMBER BEAMS AND A TRANSVERSE HARDWOOD GLULAM TIMBER DECK. THE GLULAM BEAM SYSTEM CHARACTERISTICALLY HAS A LARGE DEPTH-TO-SPAN RATIO DUE TO THE RELATIVELY LOW BENDING STRENGTH OF WOOD COMPARED TO STEEL. IN SOME CASES, VERTICAL CLEARANCE RESTRICTIONS MAY RULE OUT THE USE OF THIS STRUCTURE TYPE BECAUSE OF THE EXCESSIVE SUPERSTRUCTURE DEPTH. WHERE VERTICAL CLEARANCE IS A PROBLEM, CONSIDER THE USE OF THE STEEL BEAM OR GLULAM PANEL SUPERSTRUCTURES.

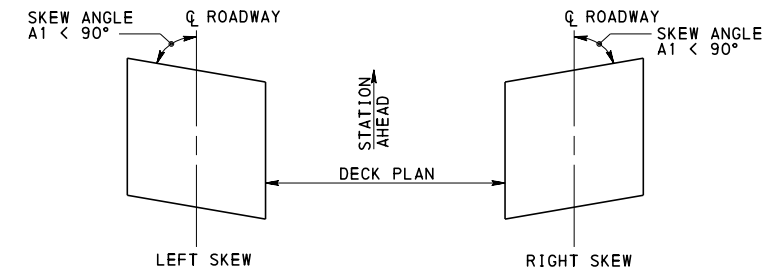
FOR SHORT SPANS OF 18'-0" TO 23'-0", USE THE SECOND TYPE OF BRIDGE SUPERSTRUCTURE, A LONGITUDINAL HARDWOOD GLULAM PANEL, TO EFFECTIVELY REDUCE THE DEPTH OF THE TIMBER SUPERSTRUCTURE. THE LONGITUDINAL PANEL ACTS AS A TIMBER SLAB STRUCTURE WITH A RELATIVELY SHALLOW PROFILE.
- USE THE POST AND RAILS, OR SAFETY PARAPETS (SOLID SAWN LUMBER, GLULAM, OR STEEL) WHICH ARE SHOWN ON THE DRAWINGS. USE AN ALTERNATE SAFETY PARAPET ONLY UPON APPROVAL OF THE PENNDOT DISTRICT BRIDGE ENGINEER.
- THE PILE SUBSTRUCTURE DESIGNS PROVIDED WITH THESE STANDARD DRAWINGS SUPPLY SAFE, LOW COST BRIDGE ABUTMENTS IN MANY CASES. UNFORTUNATELY, FOUNDATION CONDITIONS ARE NOT ALWAYS SUITABLE FOR THIS ABUTMENT TYPE, THEREFORE, CONSIDER AN ALTERNATE SUBSTRUCTURE DESIGN. BE AWARE OF REQUIRED PILE EMBEDMENT LENGTH IN SELECTING PILE ABUTMENT SITES. FAILURE TO ATTAIN THE REQUIRED PILE EMBEDMENT LENGTH DUE TO BEDROCK OR A VERY DENSE SOIL STRATUM CLOSE TO THE GROUND SURFACE CAUSES AN UNACCEPTABLE LATERAL PILE MOVEMENT. TO AVOID SUCH PROBLEMS, VERIFY THE ABILITY TO REACH THE MINIMUM REQUIRED EMBEDMENT LENGTH.
- CONSIDER THE POTENTIAL FOR PILE DAMAGE DURING DRIVING IN DETERMINING SUITABILITY OF TIMBER PILE ABUTMENTS. USE TIMBER PILES IDEALLY AS FRICTION PILES IN AREAS FREE OF BOULDERS OR OTHER SUCH OBSTRUCTIONS DURING DRIVING. EMPLOY TIMBER PILES WITH CAUTION WHERE PILE TIPS REACH BEDROCK OR A VERY DENSE STRATUM BEFORE ATTAINING THE REQUIRED FRICTION EMBEDMENT LENGTH. WHEN SUCH CONTACT OCCURS, DRIVING RESISTANCE AND THE RISK OF PILE DAMAGE INCREASES RAPIDLY. TO MINIMIZE THE POSSIBILITY OF PILE DAMAGE, DRIVE TIMBER PILES TO THE MAXIMUM PERMITTED DRIVING RESISTANCE (MPDR) AS DEFINED IN PENNDOT PUBLICATION 408. DO NOT DRIVE BEYOND THE MPDR. OBTAIN APPROVAL OF A PILE HAMMER SIZE AND CONTROL OF DRIVING FROM THE DEPARTMENT PRIOR TO THE START OF CONSTRUCTION.
- SUBMIT A COMPLETED SET OF DRAWINGS ASSEMBLED FROM THESE STANDARDS TO A REGISTERED PROFESSIONAL ENGINEER FOR REVIEW AND APPROVAL TO ENSURE ADEQUATE DESIGN, AND PERFORM A SUBSURFACE INVESTIGATION PRIOR TO BEGINNING THE FOUNDATION DESIGN. PREPARE FULL SIZE 34"x22" REPRODUCIBLE DRAWINGS USING THESE STANDARDS.

BEFORE USING THESE STANDARDS, OBTAIN BASIC SURVEY, GEOMETRIC DATA, AND SOILS INFORMATION FOR THE PROPOSED CONSTRUCTION SITE. IF THE SITE IS SUITABLE FOR A TIMBER BRIDGE, CHOOSE ONE OF THE AVAILABLE TIMBER SUPERSTRUCTURE TYPES. IF VERTICAL CLEARANCE IS A PROBLEM, USE THE LONGITUDINAL PANEL OR STEEL BEAM TYPE, IF FEASIBLE.

DESIGN OF SUBSTRUCTURE UNITS IS BASED ON THE MATERIAL PARAMETERS AND SOIL CONDITIONS SHOWN ON BLC-560M, SHEET 3. COMPUTE SCOUR DEPTH WHEN SUBSTRUCTURE UNITS ARE EXPOSED TO STREAM CURRENTS. PROVIDE ADEQUATE EMBEDMENT FOR SUBSTRUCTURE UNITS TO RESIST THE EFFECTS OF SCOUR AND FROST.

REFERRING TO THE INDEX OF SHEETS (SEE SHEET 1) STANDARDS ARE SEPARATED INTO DESIGN SHEETS AND CONSTRUCTION SHEETS. IN ADDITION TO INFORMATIONAL AND INSTRUCTIONAL MATERIAL, THE DESIGN SHEETS INCLUDE DATA ASSEMBLY SHEETS FOR THE STANDARDIZED TYPES OF SUBSTRUCTURES AND SUPERSTRUCTURES. THESE SHEETS CONTAIN THE BASIC DATA AND THE EQUATIONS NECESSARY TO GENERATE THE INFORMATION REQUIRED FOR THE FILL-IN TYPE CONSTRUCTION SHEETS. SELECT THE APPROPRIATE DATA ASSEMBLY SHEET AND THE APPROPRIATE CONSTRUCTION SHEETS FOR THE SELECTED STRUCTURE TYPE.

SELECT THE APPROPRIATE CONSTRUCTION SHEETS FOR LEFT, 90°, & RIGHT SKEWED STRUCTURES. THE SKEW ANGLE FOR A LEFT SKEWED STRUCTURE IS MEASURED TO THE LEFT OF THE ROADWAY CENTERLINE WHILE A RIGHT SKEW ANGLE IS MEASURED TO THE RIGHT OF THE CENTERLINE. SEE THE FOLLOWING SKETCH.



AFTER SELECTING THE NECESSARY DATA ASSEMBLY AND CONSTRUCTION SHEETS, PRODUCE FINAL CONTRACT DRAWINGS.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
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HARDWOOD GLULAM TIMBER BRIDGE DESIGN
GENERAL INFORMATION & INSTRUCTIONS

RECOMMENDED APR. 23, 2013

Thomas P. Macisosa
CHIEF BRIDGE ENGINEER

RECOMMENDED APR. 23, 2013

George P. Kelly
ACTING DIR. BUR. OF PROJECT DELIVERY

SHEET 2 OF 3

BLC-560M

DESIGN CRITERIA

DESIGN SPECIFICATIONS - 2010 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, AND AS SUPPLEMENTED BY THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION DESIGN MANUAL, PART 4, MAY 2012 EDITION, AND AS NOTED HEREIN WERE USED TO DEVELOP THESE STANDARD DRAWINGS.

SUPERSTRUCTURE

- LIVE LOAD
PHL-93 DESIGN LOADING AT STRENGTH I LOAD COMBINATION,
P82 DESIGN PERMIT LOADING AT STRENGTH II LOAD COMBINATION
- LIVE LOAD DEFLECTION
125% OF THE LARGER OF:
A. ONE DESIGN TRUCK WITH THE VARIABLE AXLE SPACING SPECIFIED IN AASHTO 3.6.1.2.2
B. 25% FOR ONE DESIGN TRUCK WITH THE VARIABLE AXLE SPACING COMBINED WITH THE EFFECT OF THE DESIGN LANE.
- DEAD LOADS
-BITUMINOUS SURFACE OF 140 lb/ft³
-FUTURE WEARING SURFACE 30 lb/ft²
-TIMBER BRIDGE COMPONENTS
NORTHERN RED OAK 55 lb/ft³
RED MAPLE 50 lb/ft³
YELLOW POPLAR 50 lb/ft³
STEEL BRIDGE COMPONENTS 490 lb/ft³

4. TIMBER DESIGN CRITERIA

A. TRANSVERSE DECK DESIGN

- DECK THICKNESS IN ACCORDANCE WITH AASHTO 4.6.2.1 (MIN. DECK THICKNESS OF 6" NOMINAL, AASHTO 9.9.2)
- DESIGN VALUES¹ (ksi)

	NORTHERN RED OAK (NRO)	RED MAPLE (RM)	YELLOW POPLAR (YP)
BENDING (F _{by}) (4 OR MORE LAMS)	1.700	1.450	1.200
SHEAR (F _{vy}) (4 OR MORE LAMS)	0.175	0.160	0.135
COMP. PERP. TO THE GRAIN (F _{c⊥})	0.835	0.590	0.405
MODULUS OF ELASTICITY (E)	1500	1300	1200

1.) DESIGN VALUES BASED ON AITC 119-96 (TABLE 2). VALUES REFLECT H2, H6, AND H10 GLULAM COMBINATIONS OF NO. 2 (N2) GRADE LUMBER FOR NRO, RM, AND YP, RESPECTIVELY.

- NOMINAL RESISTANCES AND MODULUS OF ELASTICITY VALUES OBTAINED BY ADJUSTING DESIGN VALUES WITH ALL APPLICABLE MODIFICATION FACTORS ACCORDING TO AASHTO 8.4.4. ASSUME MOISTURE CONTENT >16%.
- DEFLECTION LESS THAN OR EQUAL TO SPAN/425 AND EXTREME RELATIVE DEFLECTION BETWEEN ADJACENT DECK PANEL EDGES LESS THAN OR EQUAL TO 3/32".
- MAXIMUM DECK OVERHANG IS 2'-3".

B. BEAM DESIGN

- LIVE LOAD DISTRIBUTION FOR MOMENT AND SHEAR IN EXTERIOR BEAMS WITH WOOD DECKS IS BASED ON THE LEVER RULE PER AASHTO TABLE 4.6.2.2.
- LIVE LOAD DISTRIBUTION FACTOR (DEFLECTION) = NO. OF LANES / NO. OF BEAMS

- DESIGN VALUES¹ (ksi)

	NORTHERN RED OAK (NRO)	RED MAPLE (RM)	YELLOW POPLAR (YP)
BENDING (F _{bx})	2.400	2.400	2.400
SHEAR (F _{vx})	0.235	0.220	0.155
COMP. PERP. TO THE GRAIN (F _{c⊥})	1.075	0.895	0.590
MODULUS OF ELASTICITY (E _x)	1800	1800	1800

1.) DESIGN VALUES BASED ON AITC 119-96 (TABLE 1) FOR 24F-1.8E GLULAM COMBINATIONS.

- DEFLECTION LESS THAN OR EQUAL TO SPAN/425.
- NOMINAL RESISTANCES AND MODULUS OF ELASTICITY VALUES OBTAINED BY ADJUSTING DESIGN VALUES WITH ALL APPLICABLE MODIFICATION FACTORS ACCORDING TO AASHTO 8.4.4. ASSUME MOISTURE CONTENT >16%.

C. LONGITUDINAL PANEL DESIGN

- LIVE LOAD DISTRIBUTION FOR MOMENT IS BASED ON EQUIVALENT STRIP WIDTHS PER AASHTO 4.6.2.3.

- DESIGN VALUES¹ (ksi)

	NORTHERN RED OAK (NRO)	RED MAPLE (RM)	YELLOW POPLAR (YP)
BENDING (F _{by}) (4 OR MORE LAMS)	1.700	1.450	1.200
SHEAR (F _{vy}) (4 OR MORE LAMS)	0.175	0.160	0.135
COMP. PERP. TO THE GRAIN (F _{c⊥})	0.835	0.590	0.405
MODULUS OF ELASTICITY (E)	1500	1300	1200

1.) DESIGN VALUES BASED ON AITC 119-96 (TABLE 2). VALUES REFLECT H2, H6, AND H10 GLULAM COMBINATIONS OF NO. 2 (N2) GRADE LUMBER FOR NRO, RM, AND YP, RESPECTIVELY.

- NOMINAL RESISTANCE AND MODULUS OF ELASTICITY VALUES OBTAINED BY ADJUSTING DESIGN VALUES WITH ALL APPLICABLE MODIFICATION FACTORS ACCORDING TO AASHTO 8.4.4. ASSUME MOISTURE CONTENT > 16%.
- DEFLECTION LESS THAN OR EQUAL TO SPAN/425 AND EXTREME RELATIVE DEFLECTION BETWEEN ADJACENT EDGES LESS THAN OR EQUAL TO 3/32".

D. NET DIMENSIONS OF NORTHERN RED OAK, RED MAPLE, & YELLOW POPLAR GLUED LAMINATED TIMBER

NOMINAL DIMENSION	(1)	(2)
	NET MINIMUM FINISHED DIMENSION IN	NET MINIMUM FINISHED DIMENSION IN
4	3 7/8	-
6	5 7/8	-
8	6 7/8	-
10	-	8 5/8
12	-	10 3/8
14	-	12 3/8
16	-	14 3/8
18	-	16 7/8

- SINGLE MEMBER LAY-UP
- COMBINATION LAY-UP

E. PILOT HOLE RECOMMENDATIONS FOR 3/4" Ø LAG SCREWS¹

CORRESPONDING SPECIES	PILOT HOLE DIAMETER IN
NORTHERN RED OAK	5/8
RED MAPLE	3/16
YELLOW POPLAR	1/2

- SWAB PILOT HOLES WITH BITUMINOUS ASPHALT BASED ROOF CEMENT, COPPER NAPHTHENATE PASTE, OR APPROVED PRESERVATIVE SYSTEM.

F. RECOMMENDED TORQUES FOR 3/4" Ø LAG SCREWS AND THROUGH BOLTS¹

CORRESPONDING SPECIES	USE	CONNECTOR TYPE	CONNECTOR LENGTH IN	TORQUE ² GUIDELINES lb-ft
NORTHERN RED OAK	DECK TO BEAM	LAG SCREW	12	184
	ALUMINUM DECK CLIP	LAG SCREW	5	184
	DIAPHRAGM	LAG SCREW	VARIABLE	162
	STEEL CROSS BRACE	THROUGH BOLT	VARIABLE	125
	STIFFENER BEAM	ENLARGED DOME HEAD BOLT	VARIABLE	250
	BACKWALL TO BEAM	LAG SCREW	9	140
RED MAPLE	DECK TO BEAM	LAG SCREW	12	140
	ALUMINUM DECK CLIP	LAG SCREW	5	184
	DIAPHRAGM	LAG SCREW	VARIABLE	140
	STEEL CROSS BRACE	THROUGH BOLT	VARIABLE	110
	STIFFENER BEAM	ENLARGED DOME HEAD BOLT	VARIABLE	220
	BACKWALL TO BEAM	LAG SCREW	9	110
YELLOW POPLAR	DECK TO BEAM	LAG SCREW	12	118
	ALUMINUM DECK CLIP	LAG SCREW	5	134
	DIAPHRAGM	LAG SCREW	VARIABLE	104
	STEEL CROSS BRACE	THROUGH BOLT	VARIABLE	82
	STIFFENER BEAM	ENLARGED DOME HEAD BOLT	VARIABLE	162
	BACKWALL TO BEAM	LAG SCREW	9	96
YELLOW POPLAR	OFFSET SHOE	LAG SCREW	5	118
	OFFSET SHOE	LAG SCREW	6	148

- PLACE COMPONENTS IN CONTACT WITH EACH OTHER BEFORE TORQUE IS APPLIED.
- TORQUE GUIDELINES INTENDED ONLY FOR ESTIMATING EQUIPMENT REQUIREMENTS. ALL LAGS SHOULD BE TORQUED UNTIL LAG WASHER IS MATED WITH THE SIDE MEMBER. AVOID WOOD CRUSHING.

5. STEEL BEAM DESIGN CRITERIA

A. MATERIAL

- STRUCTURAL STEEL - ASTM A709, GRADE 36 FOR ALL STEEL UNLESS NOTED OTHERWISE
- BOLTS - ASTM A325

B. CONTROL PERMANENT DEFLECTIONS THROUGH FLANGE STRESS CONTROLS AS PER AASHTO 6.10.3.

6. ELASTOMERIC BEARING PADS

A. MATERIAL

- ELASTOMER - 50 DUROMETER HARDNESS ON SHORE A SCALE

7. MAXIMUM ALLOWABLE DECK OVERHANG OF 2'-3" USED FOR DECK AND BEAM DESIGN SHOWN HEREIN.

SUBSTRUCTURE

- DESIGN DATA
-DENSITY OF BACKFILL MATERIAL = 120 lb/ft³
-DENSITY OF CONCRETE = 150 lb/ft³
-EQUIVALENT FLUID EARTH PRESSURE = 35 lb/ft²/ft OF DEPTH
-LIVE LOAD SURCHARGE = REFER TO DESIGN MANUAL, PART 4, D3.11.
-NEGLECT THE EFFECT OF PASSIVE PRESSURE DUE TO SOIL IN FRONT OF WALL.
- CONCRETE DESIGN CRITERIA
-CLASS A CEMENT CONCRETE (ABUTMENTS BELOW BRIDGE SEAT, WINGWALLS, AND FOOTINGS). CLASS AA CEMENT CONCRETE (CHEEKWALLS).
-GRADE 60 REINFORCING STEEL BARS
- TIMBER SILL SUBSTRUCTURE DESIGN CRITERIA
-DESIGN AND CONSTRUCT TIMBER SUB-STRUCTURE OUT OF SOFTWOOD, EXCEPT FOR CRIBBING & BEARING SILL WHICH MAY BE CONSTRUCTED OUT OF HARDWOODS.

A. BEARING SILL

- DESIGN TIMBER BEARING SILL TO ACT AS A CONTINUOUS BEAM OVER THE TIMBER PILES. THE PROPOSED METHOD OF TIMBER PILE PLACEMENT IS TO PROVIDE A TIMBER PILE AT EACH ABUTMENT/WINGWALL INTERSECTION AND THEN PLACE THE NECESSARY NUMBER OF INTERIOR PILES AT EQUAL SPACES (SEE PILE DESIGN CRITERIA).

- FOR SOLID SAWN LUMBER USE WET-USE BASE RESISTANCE & MOE FROM AASHTO TABLE 8.4.1.1.4-1

HARDWOOD GLULAM WET-USE BASE RESISTANCE & MOE: ksi ^{a, b}	NORTHERN RED OAK (NRO)	RED MAPLE (RM)	YELLOW POPLAR (YP)
BENDING (F _{bx})	5.28	5.28	5.28
SHEAR (F _{vx})	0.647	0.605	0.426
COMP. PERP. TO THE GRAIN (F _{c⊥})	1.45	1.21	0.796
MODULUS OF ELASTICITY (E _x)	1500	1500	1500

- IN-SERVICE MOISTURE CONTENT > 16%
- DESIGN VALUES BASED ON PUBLISHED AITC 119-96 STRESSES FOR 24F-1.8E GLULAM COMBINATIONS

- OBTAIN NOMINAL RESISTANCE AND MODULUS OF ELASTICITY VALUES BY ADJUSTING WET-USE BASE RESISTANCE VALUES WITH APPLICABLE MODIFICATION FACTORS ACCORDING TO AASHTO 8.4.4.

B. TIMBER LAGGING

- USE WET-USE BASE RESISTANCE & MOE FROM AASHTO TABLE 8.4.1.1.4-1
- OBTAIN NOMINAL RESISTANCE AND MODULUS OF ELASTICITY VALUES BY ADJUSTING WET-USE BASE RESISTANCE VALUES WITH APPLICABLE MODIFICATION FACTORS ACCORDING TO AASHTO 8.4.4.

C. TIMBER PILES

- PROVIDE PILES IN ACCORDANCE WITH PENNDOT PUBLICATION 408 SECTION 1005.2(c)
- USE WET-USE BASE RESISTANCE & MOE FROM AASHTO TABLE 8.4.1.3-1
- OBTAIN NOMINAL RESISTANCE AND MODULUS OF ELASTICITY VALUES BY ADJUSTING WET-USE BASE RESISTANCE VALUES WITH APPLICABLE MODIFICATION FACTORS ACCORDING TO AASHTO 8.4.4.
- ALL PILES ARE 14" DIAMETER TIMBER (DIA. MEASURED 36" FROM BUTT.)
- DRIVE PILES IN ACCORDANCE WITH PENNDOT PUBLICATION 408 SECTION 1005. OBTAIN APPROVAL OF PILE DRIVING CRITERIA FROM PENNDOT PRIOR TO CONSTRUCTION
- PROVIDE APPLICABLE PILE DRIVING NOTES IN ACCORDANCE WITH PENNDOT DESIGN MANUAL PART 4 SECTION PPI.7.5.

D. STEEL PILES

- PROVIDE PILES IN ACCORDANCE WITH PENNDOT PUBLICATION 408 SECTION 1005.2(c)
- DESIGN PILES IN ACCORDANCE WITH THE PENNDOT DESIGN MANUAL, PART 4, D6.15P.
- ALL PILES ARE HP 10x42
- DRIVE PILES IN ACCORDANCE WITH PENNDOT PUBLICATION 408 SECTION 1005. OBTAIN APPROVAL OF PILE DRIVING CRITERIA FROM PENNDOT PRIOR TO CONSTRUCTION.
- PROVIDE APPLICABLE PILE DRIVING NOTES IN ACCORDANCE WITH PENNDOT DESIGN MANUAL PART 4 SECTION PPI.7.5.

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**HARDWOOD GLULAM TIMBER BRIDGE DESIGN
DESIGN CRITERIA**