TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO. ---

TYPE	YEAR	PROJECT NO.	SHEET NO.
CONST.	2014	NH-29(86)	

CONST. NO. 65001-3268-14

RETAINING WALL DESIGN NOTES

UNLESS SPECIFICALLY STATED OTHERWISE IN THE CONTRACT PLANS, THE BIDDING FOR, THE DESIGN OF AND THE CONSTRUCTION OF RETAINING WALLS SHOWN IN THE PLANS SHALL BE GOVERNED BY THE TENNESSEE DEPARTMENT OF TRANSPORTATION SPECIAL PROVISION 624 REGARDING RETAINING WALLS. THIS SPECIAL PROVISION SHALL BE CONSIDERED AS ONE OF THOSE DOCUMENTS WHICH THE BIDDER/CONTRACTOR HAS EXAMINED AND MADE HIMSELF FAMILIAR WITH AS DESCRIBED IN SECTION 102.04 - EXAMINATION OF THE SITE, THE WORK, THE PLANS, AND THE SPECIFICATIONS IN THE TDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.

EXCAVATION FOR THE WALLS AND/OR THEIR FOOTINGS SHALL NOT BE ACCOMPLISHED UNTIL THE CONTRACTOR HAS SUBMITTED WALL DESIGNS AND CALCULATIONS AND HAS BEEN ISSUED AN APPROVED SET OF WALL PLANS AND HAS LABOR AND MATERIAL RESOURCES AVAILABLE TO BEGIN AND CONTINUE WALL CONSTRUCTION IMMEDIATELY AFTER EXCAVATION.

THESE WALLS SHALL BE DESIGNED IN ACCORDANCE WITH LRFD DESIGN PROCEDURES AND REQUIREMENTS AS DESCRIBED IN AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 2012 AND INTERIMS.
FOR PROPRIETARY WALL SYSTEMS THAT HAVE BEEN APPROVED AS SHOWN IN SPECIAL PROVISION 624, THE WALL DESIGNER SHALL BE RESPONSIBLE FOR PROVIDING WALL DESIGNS INCORPORATING MATERIALS AND COMPONENTS AS WAS ORIGINALLY SUBMITTED AND APPROVED BY TDOT. IF A MATERIAL AND/OR COMPONENT OF THE WALL SYSTEM HAVE BEEN MODIFIED FROM THE ORIGINALLY APPROVED SYSTEM, A WALL DESIGN AND SET OF PLANS AND CALCULATIONS FOR THIS WALL SYSTEM CANNOT BE SUBMITTED FOR REVIEW AND APPROVAL UNTIL THE WALL SYSTEM DESIGNER WHO ORIGINALLY SUBMITTED THE WALL SYSTEM FOR APPROVAL BY TDOT SUBMITS A REQUEST FOR RE-APPROVAL UTILIZING THE MODIFIED ELEMENTS OF THE WALL. THIS SUBMITTAL DOES NOT GUARANTEE APPROVAL OF THE MODIFIED SYSTEM. IF THIS RE-APPROVAL PROCESS DOES NOT MEET THE CONTRACTOR'S SCHEDULE OR IF THE MODIFIED SYSTEM IS NOT APPROVED, THE CONTRACTOR/WALL DESIGNER SHALL PROVIDE A WALL DESIGN FOR ONE OF THE APPROVED SYSTEMS AT NO CHANGE IN CONTRACT PRICE FOR THE RETAINING WALL AND NO CHANGE IN PROJECT SCHEDULE REQUIREMENTS WILL BE ALLOWED.

THE WALL DESIGNER SHALL PROVIDE RETAINING WALL PLANS, DETAILS AND CALCULATIONS AS REQUIRED BY SPECIAL PROVISION 624 AND AS REQUIRED HEREIN.

- THE WALL DESIGNER SHALL UTILIZE THE GEOTECHNICAL PARAMETERS AND RESISTANCE FACTORS AS PROVIDED FOR EACH PROJECT RETAINING WALL ON THE WALL CONCEPT SHEET AND RELATED RETAINING WALL SHEETS TO PREPARE AND SUBMIT DESIGN CALCULATIONS. LOAD FACTORS AND OTHER PERTINENT DESIGN REQUIREMENTS PROVIDED IN AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 2012 AND INTERIMS SHALL BE USED.
- CALCULATIONS FOR BOTH INTERNAL (BEARING CAPACITY, SLIDING, SETTLEMENT) AND EXTERNAL (GLOBAL) STABILITY SHALL BE PROVIDED FOR EACH CRITICAL WALL SECTION WHICH DEMONSTRATES THE REQUIRED CAPACITY TO DEMAND RATIO OF 1.0 IS MET UTILIZING THE DESIGN PARAMETERS PROVIDED. THE WALL DESIGNER/CONTRACTOR PLANS MUST INCLUDE ANY FOUNDATION IMPROVEMENTS AS REQUIRED HEREIN ON THE WALL DESIGNER/CONTRACTOR'S WALL ELEVATION VIEWS AND ANY CROSS-SECTIONAL DETAIL DRAWINGS.
- LOAD COMBINATIONS AS GIVEN IN AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 2012 AND INTERIMS, SHALL BE EVALUATED FOR EACH WALL.

NOTE REGARDING CONSTRUCTION SLOPES

THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAKING THE EXCAVATION IN ACCORDANCE WITH OSHA AND OTHER APPLICABLE STATE AND LOCAL REGULATIONS REGARDING CONSTRUCTION SLOPES AND TRENCHES, IN ADDITION TO THE FOLLOWING APPLICABLE REGULATORY REQUIREMENTS: AS A MINIMUM REQUIREMENT, ALL TEMPORARY CONSTRUCTION SLOPES REQUIRED FOR SITE ACCESS SHALL NOT EXCEED THREE (3) VERTICAL FEET. THE CONTRACTOR BUILDING THE WALL SHALL ENSURE THAT THESE TEMPORARY BACK SLOPES ARE NOT AND DO NOT BECOME UNSTABLE. IF THE SLOPE IS UNSTABLE, BECOMES UNSTABLE, IS CUT STEEPER THAN A 1:1 SLOPE OR IS UNACCEPTABLE FOR ANOTHER REASON, THEN TEMPORARY SHORING SHALL BE USED. ANY UNUSUAL SOIL CONDITIONS OTHER THAN THOSE ESTIMATED SHOULD BE REPORTED TO THE PROJECT ENGINEER.

ACCEPTABLE WALL TYPES

THE RETAINING WALL SHALL BE THE WALL TYPE LISTED BELOW. THE SPECIFIC WALL SYSTEM SUPPLIER/INSTALLER SHALL BE ONE OF THOSE LISTED AS PRE-APPROVED IN SPECIAL PROVISION 624.

ANCHOR WALL

TABLE 1-DESIGN REQUIREMENTS AND PARAMETERS

DESCRIPTION	VALUE-ANCHOR WALLS	NOTE *
DESIGN LIFE	75 YEARS	
SEISMIC ACCELERATION COEFFICIENT (As)	0.15	
PULLOUT RESISTANCE OF ANCHORS		
COHESIONLESS (GRANULAR) SOILS	0.65	1
COHESIVE SOILS	0.70	1
ROCK	0.50	1
WHERE PROOF TESTS ARE CONDUCTED	1.0	2
TENSILE RESISTANCE OF ANCHOR TENDON		
MILD STEEL, (E.G., ASTM A615 BARS)	0.90	3
HIGH STRENGTH STEEL (E.G., ASTM A722 BARS)	0.80	3
FLEXURAL CAPACITY OF VERTICAL ELEMENTS	0.90	
RESISTANCE FACTORS OF A SINGLE DRIVEN PILE STATIC ANALYSIS METHODS		
SIDE RESISTANCE AND END BEARING: CLAY AND MIXED SOILS		
α-METHOD (TOMLINSON, 1987; SKEMPTON, 1951)	0.35	
β-METHOD (ESRIG & KIRBY, 1997; SKEMPTON, 1951)	0.25	
λ-METHOD (VIJAYVERGIYA & FOCHT, 1972; SKEMPTON, 1951)	0.40	
SIDE RESISTANCE AND END BEARING: SAND		
NORDLUND/THURMAN METHOD (HANNIGAN ET AL, 2005)	0.45	
SPT-METHOD (MEYERHOF)	0.30	
CPT-METHOD (SCHMERTMANN)	0.50	
END BEARING IN ROCK (CANADIAN GEOTECH SOCIETY, 1985)	0.45	
LATERAL GEOTECHNICAL RESISTANCE OF A SINGLE PILE		
ALL SOILS AND ROCK	1.0	
RESISTANCE FACTORS OF A SINGLE DRILLED PILE/SHAFT		
SIDE RESISTANCE IN CLAY		
α-METHOD (O'NEILL AND REESE, 1999)	0.45	
TIP RESISTANCE IN CLAY		
TOTAL STRESS (O'NEILL AND REESE, 1999)	0.40	
SIDE RESISTANCE IN SAND		
β-METHOD (O'NEILL AND REESE, 1999)	0.55	
TIP RESISTANCE IN SAND		
O'NEILL AND REESE, 1999	0.50	
SIDE RESISTANCE IN INTERMEDIATE GEOMATERIALS (IGMs)		
O'NEILL AND REESE, 1999	0.60	
TIP RESISTANCE IN INTERMEDIATE GEOMATERIALS (IGMs)		
O'NEILL AND REESE, 1999	0.55	
SIDE RESISTANCE IN ROCK		
HORVATH AND KENNEY (1979), O'NEILL AND REESE (1999)	0.55	
CARTER AND KULHAWY (1988)	0.50	
TIP RESISTANCE IN ROCK		
CANADIAN GEOTECH. SOCIETY (1985), O'NEILL AND REESE (1999)	0.50	
LATERAL GEOTECHNICAL RESISTANCE OF A SINGLE PILE/SHAFT		
ALL MATERIALS	1.0	

*REFER TO TABLE 1.1 FOR NOTES.

TABLE 1.1

NOTES FOR TABLE 1

NO.	NOTE
1	APPLY TO PRESUMPTIVE ULTIMATE UNIT BOND STRESSES FOR PRELIMINARY DESIGN ONLY.
2	APPLY WHERE PROOF TEST(S) ARE CONDUCTED ON EVERY PRODUCTION ANCHOR TO A LOAD OF 1.0 OR GREATER TIMES THE FACTORED LOAD ON THE ANCHOR.
3	APPLY TO MAXIMUM PROOF TEST FOR ANCHORS.
	UNLESS OTHERWISE SPECIFIED, ALL RESISTANCE FACTORS SHALL BE TAKEN AS 1.0 WHEN INVESTIGATING AN EXTREME EVENT LIMIT STATE.

OTHER DESIGN REQUIREMENTS

SOLDIER PILE/TIE BACK WALLS SHALL HAVE PERMANENT STRUCTURAL CONCRETE WALL FACING CAPABLE OF RESISTING ALL DESIGN LOADS EXERTED ON THE WALL COMPONENTS BY THE RETAINED MATERIAL. THE MECHANISM CONNECTING THE SOLDIER PILES TO THE STRUCTURAL CONCRETE FACING SHALL HAVE ADEQUATE CAPACITY TO TRANSMIT ALL LOADS FROM THE FACING, INCLUDING SELF-WEIGHT, TO THE SUPPORTING SOLDIER PILES. CONCRETE LAGGING CAN BE DESIGNED/USED WITHOUT APPLICATION OF PERMANENT CAST IN PLACE FACING.

TIMBER LAGGING SHALL ONLY BE USED TO TEMPORARILY SUPPORT MATERIAL TO ALLOW FOR TOP DOWN CONSTRUCTION. TIMBER LAGGING IS NEITHER AN ACCEPTABLE PERMANENT WALL FACING NOR AN ACCEPTABLE PERMANENT STRUCTURAL WALL ELEMENT.

THE WALL SHALL HAVE A CONCRETE DRAINAGE DITCH AT THE TOP DESIGNED TO CARRY SURFACE RUNOFF TO EITHER OR BOTH ENDS OF WALLS. SEE THE ROADWAY CONSTRUCTION PLANS FOR DETAILS OF THIS CONCRETE DRAINAGE DITCH.

THE WALL DESIGNER/CONTRACTOR'S WALL DESIGN PLANS SHALL INCLUDE DETAILS FOR DRAINAGE BEHIND THE WALL FACING. WEEP HOLES SHALL NOT BE ALLOWED.

CONSTRUCTION NOTES

ASSUME DRILLING THROUGH IN-PLACE ROCK OR COLLUVIUM REQUIRED FOR INSTALLATION OF SOLDIER PILES.

DUE TO THE SITE GEOLOGY AND THE POTENTIAL CORROSIVE ENVIRONMENT AT THE ANCHOR AREA, IT IS RECOMMENDED THAT THE TENDON BOND LENGTH BE ENCAPSULATED TO PROVIDE ADDITIONAL CORROSION PROTECTION (DOUBLE CORROSION PROTECTION). THE ENCAPSULATION SHALL BE FABRICATED FROM ONE THE FOLLOWING:

i. HIGH DENSITY CORRUGATED POLYETHYLENE TUBING CONFORMING TO THE REQUIREMENTS OF AASHTO M 252 AND HAVING A MINIMUM WALL THICKNESS OF 0.06 INCH EXCEPT PREGROUTED TENDONS, WHICH MAY HAVE A MINIMUM WALL THICKNESS OF 0.04 INCH.

ii. CORRUGATED POLYVINYL CHLORIDE TUBES MANUFACTURED FROM RIGID PVC COMPOUNDS CONFORMING TO ASTM D 1784, CLASS 13646-B.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

RETAINING WALL
DESIGN REQUIREMENTS

RETAINING WALLS
NOS. 1, 2, 3, AND 4
STATE ROUTE 29
MORGAN COUNTY, TENNESSEE
2014

U-58-190