

ADOT Specific Requirements for Tensor ARES Wall System

ADOT Vendor	Tensor International Corporation 2500 Northwinds Pkwy., Suite 500 Alpharetta, GA 30009
General Information	ADOT Product ID No. 10035 Approval Date: 05/2011 Approval Renewed Date: 5/2016 Re-evaluation due: 05/2021
Design Standards	More Stringent of the following: <ol style="list-style-type: none"> 1. 2008 ADOT Standard Specifications for Road and Bridge Construction 2. Latest ADOT MSE Wall LRFD Based Special Provisions [Contact ADOT for latest version at the time of the application of the system to a given project.] 3. FHWA (2009), "Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes," Publication No. FHWA-NHI-09-083; Authors: Berg, R.R., Christopher, B.R. and Samtani, N.C. 4. AASHTO (2012 or latest Specification or Interims) LRFD Bridge Design Specifications
HITEC Evaluation	Highway Innovative Technology Evaluation Center (HITEC) evaluation was completed in 1997. Civil Engineering Research Foundation (CERF) Report No. 40301. Report Available on file.
Facing Evaluated	<ul style="list-style-type: none"> • 5 ft. wide x 5 ft. tall and 9 ft. wide x 5 ft. tall wet pre-cast steel reinforced panels with a minimum thickness of 6 inches. See Sheet SD-04 of attached drawings for details.
Facing Connector	<ul style="list-style-type: none"> • Spliced (Bodkin) connection between UX1700MSE geogrid tab embedded in precast concrete panels with various UX series geogrids (Table 1) used for soil reinforcements.
Soil Reinforcement Evaluated	<ul style="list-style-type: none"> • Tensor "UX" series: UX1400MSE, UX1500MSE, UX1600MSE, UX1700MSE
Panel Geogrid Connection Strength	See Table 1
Notes/Constrains	<p>In addition to the general design requirements provided in the Design Standards listed above, the following specific requirements apply:</p> <ul style="list-style-type: none"> • For any project, use of the system evaluated herein is subject to ADOT approval based on project and site specific evaluation. • Only the system components evaluated as noted above are to be used. Details in the HITEC report are considered to be superseded by the figures, tables and typical details in this evaluation. Tolerances shall be the more stringent of those noted in Tensor's attached drawings and the Design Standards listed above. • Maximum wall height of 50 feet based on data provided in the vendor's submittal

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- Provided that the maximum particle size in the reinforced soil backfill is 3/8 inch or smaller, then based on detailed installation damage test data developed and provided in the submittal, a value of 1.15 can be used for the reduction factor due to installation damage instead of the default value of 1.5 required by design standard 2 listed above, i.e., ADOT Special Provisions.
 - For skewed panel connection, a splay angle more than 5 degrees is not allowed. Splay angle is defined as the deviation from the normal to the face of the wall in the horizontal plane at a reinforcing level. Reduction in tensile capacity perpendicular to the wall face due to splay shall be accounted for in the analysis.
 - Acute angle corner detail is not approved on a standard basis but shall be reviewed on a project specific basis.
 - The longitudinal and transverse ribs of the geogrid shall be perpendicular to one another. The maximum deviation of the cross-rib (bow) from being perpendicular to the longitudinal rib, i.e. skew, shall be manufactured to be no more than 1 inch in 5 feet of geogrid width. The maximum deviation of the cross-rib at any point from a line perpendicular to the longitudinal ribs located at the cross-rib (bow) shall be 0.5 inches.
 - The geotextile across the joints at the backface of the facing panels shall meet the requirements of AASHTO M 288.
 - The number of bearings pads between panels shall be in accordance with the requirements of the design standard 2 listed above, i.e. ADOT Special Provisions.
 - The long-term nominal connection strength, T_{alc} , in Tables 1 shall be multiplied by the resistance factor for connection strength as specified in the latest AASHTO specification (design standard 4 listed above) to obtain the long-term factored connection strength.
 - The bar in the Bodkin connection shall have a minimum width of 4.5 inches and a maximum thickness of 0.25 inches.
 - Reinforcement pullout shall be calculated based on the default values for steel grid reinforcement provided in the latest AASHTO specification (design standard 4 listed above).
 - A detail of how geogrid embedment depth and alignment in the concrete panel and horizontal alignment will be maintained during casting shall be submitted with shop drawings for each project.
 - All details for penetration of culvers or other objects through the wall face shall be evaluated on a project and site specific basis.
 - All details for penetration of vertical and horizontal obstructions through the reinforced soil zone shall be evaluated on a project and site specific basis. Examples of these obstructions include foundation elements, catch basins, slotted drains, etc. In all cases, the vertical obstruction shall either be installed through precut holes in geogrid layers that must be penetrated or the geogrid the layers shall be cut in a manner that prevents ripping or tearing of the geogrid.
-

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	<ul style="list-style-type: none"> • Drainage details shall be modified as appropriate to meet project and site specific requirements. • End-bent details shall be modified as appropriate to meet project and site specific requirements. • Facing construction tolerances for precast facing panels in design standard 2 listed above shall be applicable to ARES wall systems. • Full height panels are not approved on a standard basis but may be considered on a project specific basis with the approval of the State Geotechnical Engineer.
Assumptions	<ul style="list-style-type: none"> • Vendor will submit a copy of this Specific Requirements with its project and site specific design to ADOT and its representatives for review and approval consideration for a specific construction project. • Vendor submittals shall be in accordance with the design standards and other requirements listed herein. • ADOT and its design representatives will evaluate the project and site specific application of Tensor's ARES wall system and review submittals for approval consideration in strict accordance with the design standards, limitations, and requirements listed herein. Typical details in this package may not be applicable to a given project and will be modified, based on the site specific considerations, as necessary by the designer in consultation with the vendor. • During construction of the Tensor's ARES wall system, ADOT and its representatives will enforce project and site specific acceptance requirements in accordance with the plans and specifications.

Table 1

Long-term Nominal Connection Strength Requirements for Tensor "UX" Series Geogrid Reinforcements with UX1700 Geogrid Embedded Tab Connection

Geogrid	Long-term Nominal Connection Strength, T_{alc}
UX1400MSE	1,600 lb/ft
UX1500MSE	2,600 lb/ft
UX1600MSE	3,300 lb/ft
UX1700MSE	3,500 lb/ft

TYPICAL DETAILS

(24 pages)

Typical details submitted to ADOT as part of the product approval process are attached. These represent generic details that must be evaluated by the designer based on project and site specific requirements. The designer shall also be responsible for ensuring conformance to the constraints and design standards noted in this evaluation.

Tensor[®]



ARES®
RETAINING WALL SYSTEMS

ARES (5' X 5') RETAINING WALL SYSTEM

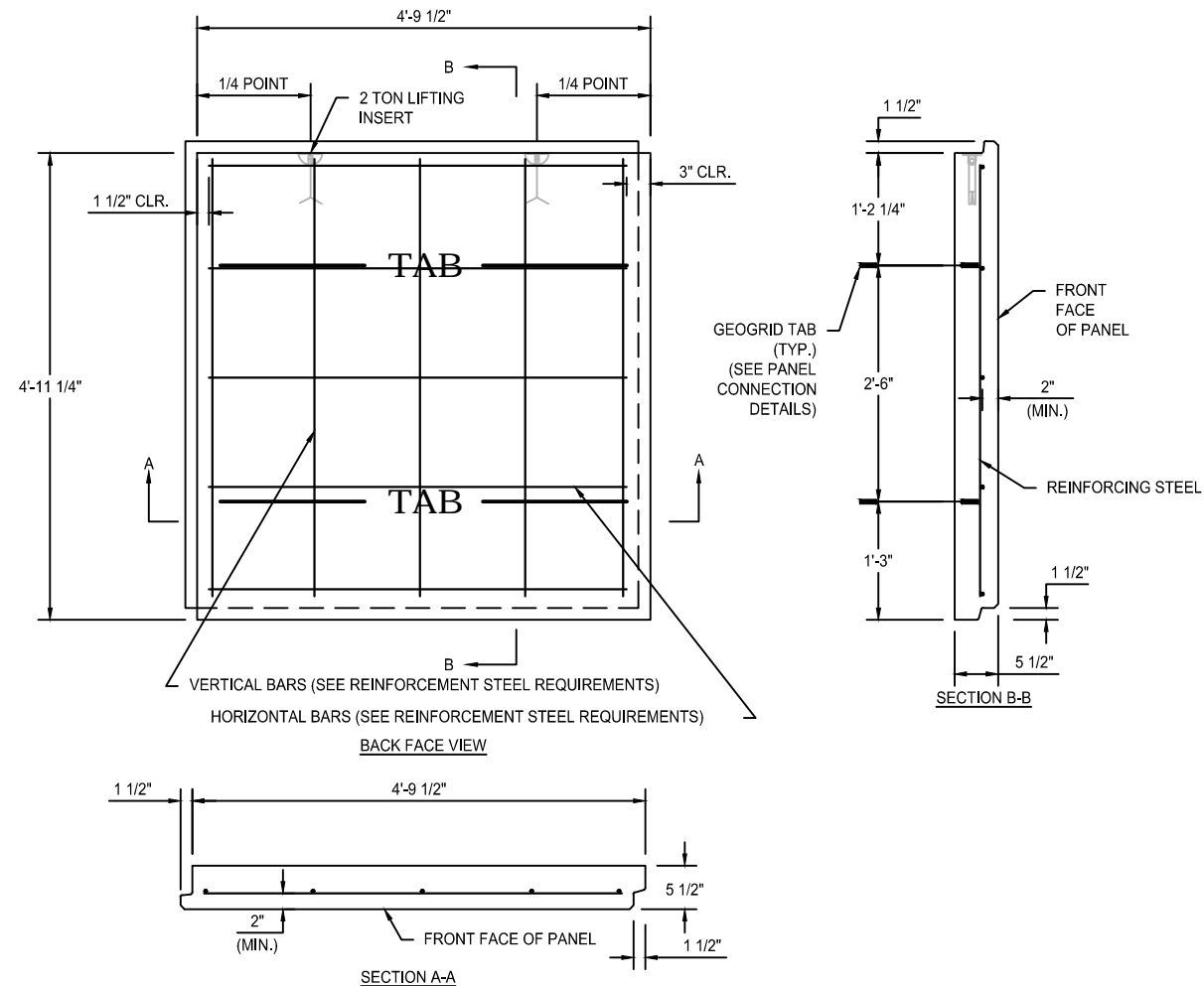
STANDARD DETAILS

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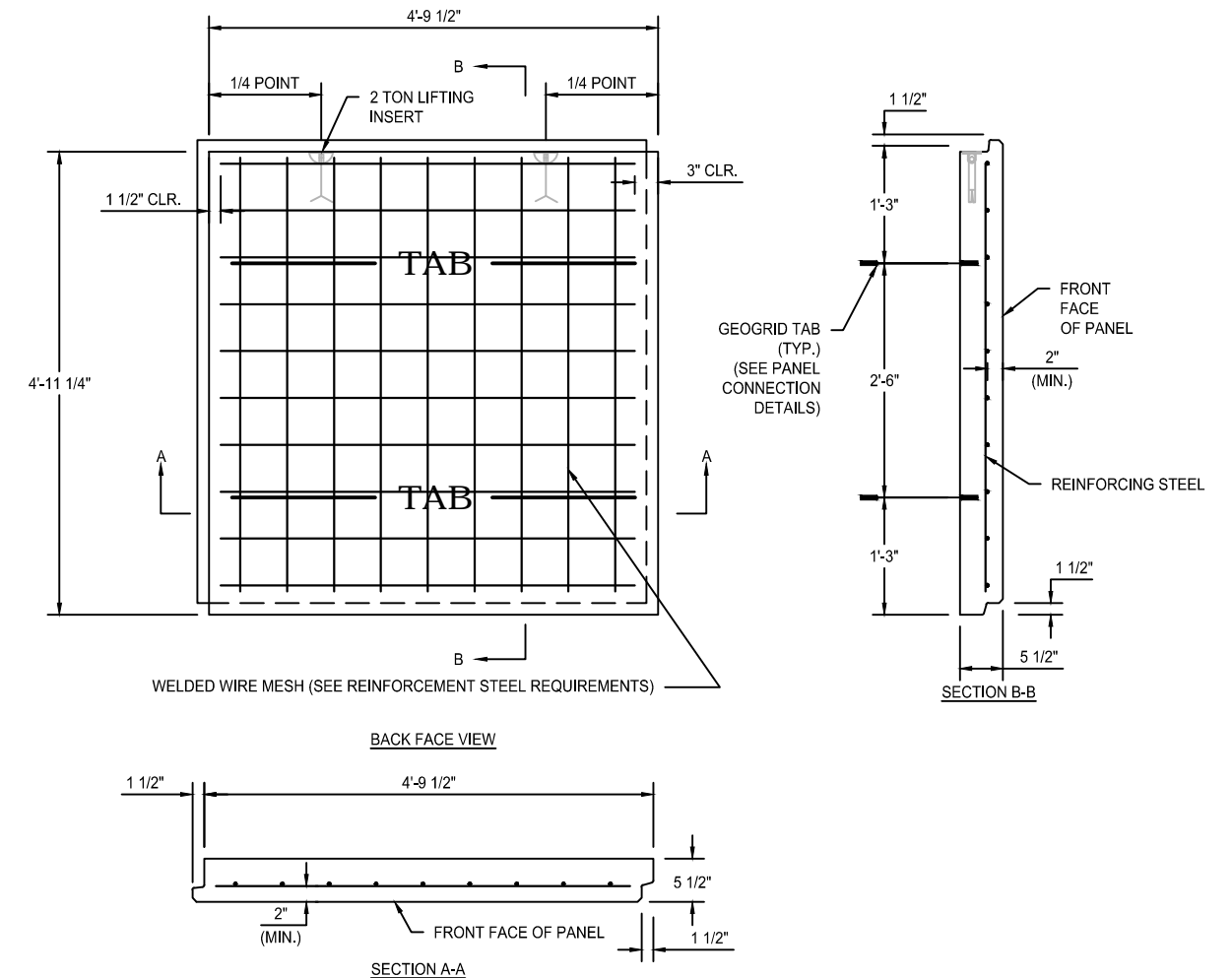


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	DESIGNED BY	JL	1/5/16	SHEET 1 OF 12
	CHECKED BY	WL	1/5/16	



STANDARD PANEL DETAILS - STANDARD A PANEL SHOWING REBAR REINFORCING



STANDARD PANEL DETAILS - STANDARD A PANEL SHOWING MESH REINFORCING

NOTES:

1. ALL PANELS SHALL HAVE 28-DAY MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI.
2. ALL BARS MUST BE PER ASTM A-615 GRADE 60 REINFORCING STEEL AND SHALL BE SPACED AS NOTED:

FOR 5 1/2" PANEL:
HORIZONTAL: #4 BARS @ 1'-4" O.C. (MAX.)
VERTICAL: #4 BARS @ 1'-2" O.C. (MAX.)
OR
6"x6" W8.5xW8.5 WELDED WIRE MESH
3. REINFORCING STEEL SHALL HAVE A MINIMUM CLEAR COVER OF 1-1/2" FROM ALL PANEL EDGES UNLESS OTHERWISE NOTED.

PANEL TOLERANCES:

ALL DIMENSIONS:	1/5-INCH
GEOGRID LOCATION:	1-INCH
LIFTING INSERT LOCATION:	1/8-INCH
ELEMENT SQUARENESS:	1/2-INCH BETWEEN DIAGONALS
ANGULAR DISTORTION:	1/54 INCH OVER 5 FT IN HEIGHT
REAR FACE DISTORTIONS:	1/4-INCH
SURFACE FINISH:	1/10-INCH IN 5FT

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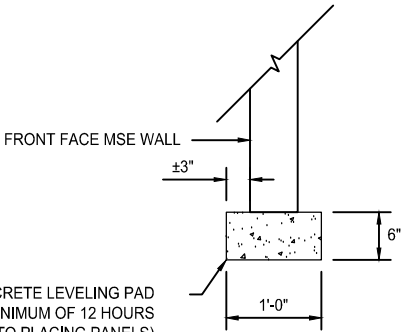
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ARES (5'X5') RETAINING WALL SYSTEM

SHEET TITLE

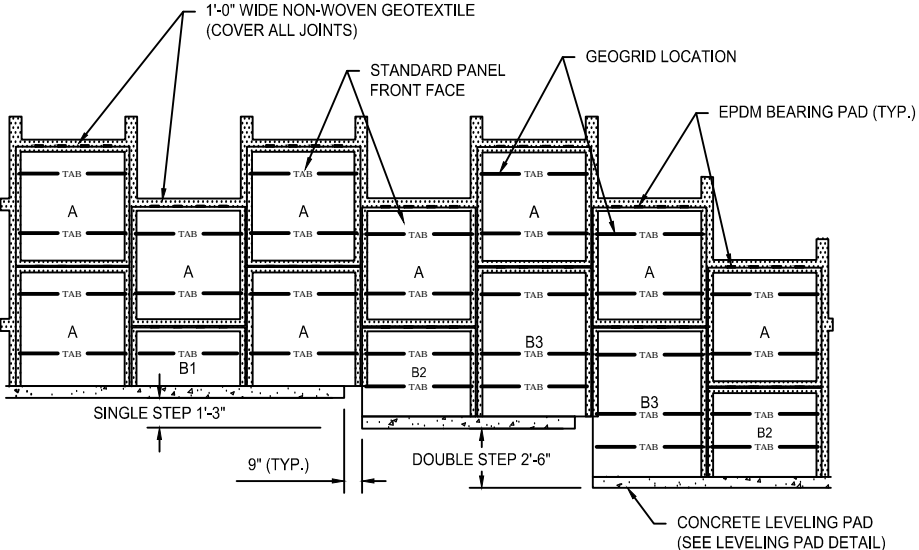
TYPICAL DETAILS

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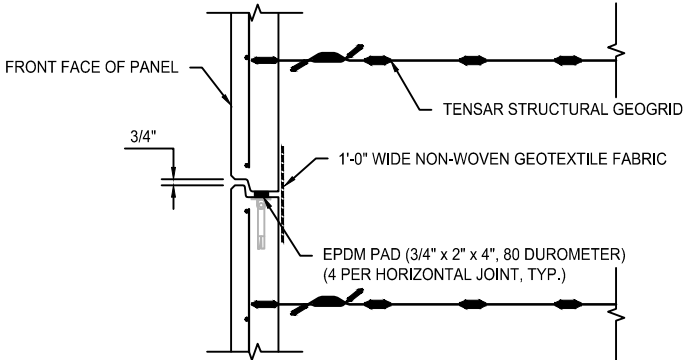
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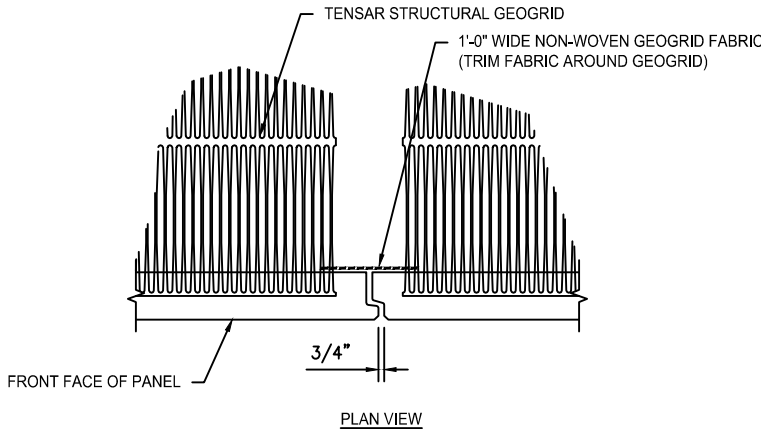
TYPICAL LEVELING PAD STEP AND GEOTEXTILE COVERAGE DETAIL

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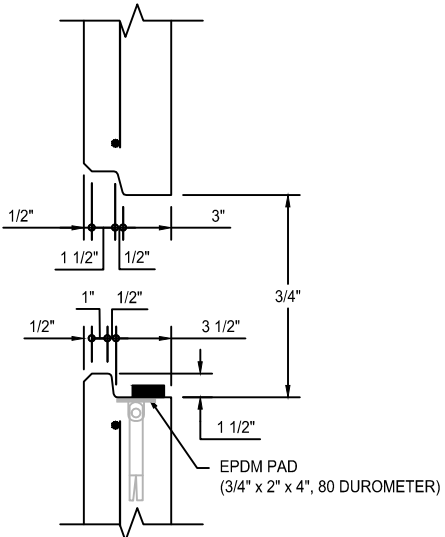
HORIZONTAL JOINT DETAIL

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VERTICAL JOINT DETAIL

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PANEL JOINT DETAIL

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ARES (5'X5') RETAINING WALL SYSTEM

PROJECT LOCATION

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C



A



STANDARD T66 PANEL



STANDARD T72 PANEL



STANDARD T78 PANEL



STANDARD T54 PANEL

NOTE: REFER TO SHEET 2 FOR CONCRETE AND STEEL REQUIREMENT.



STANDARD T60 PANEL

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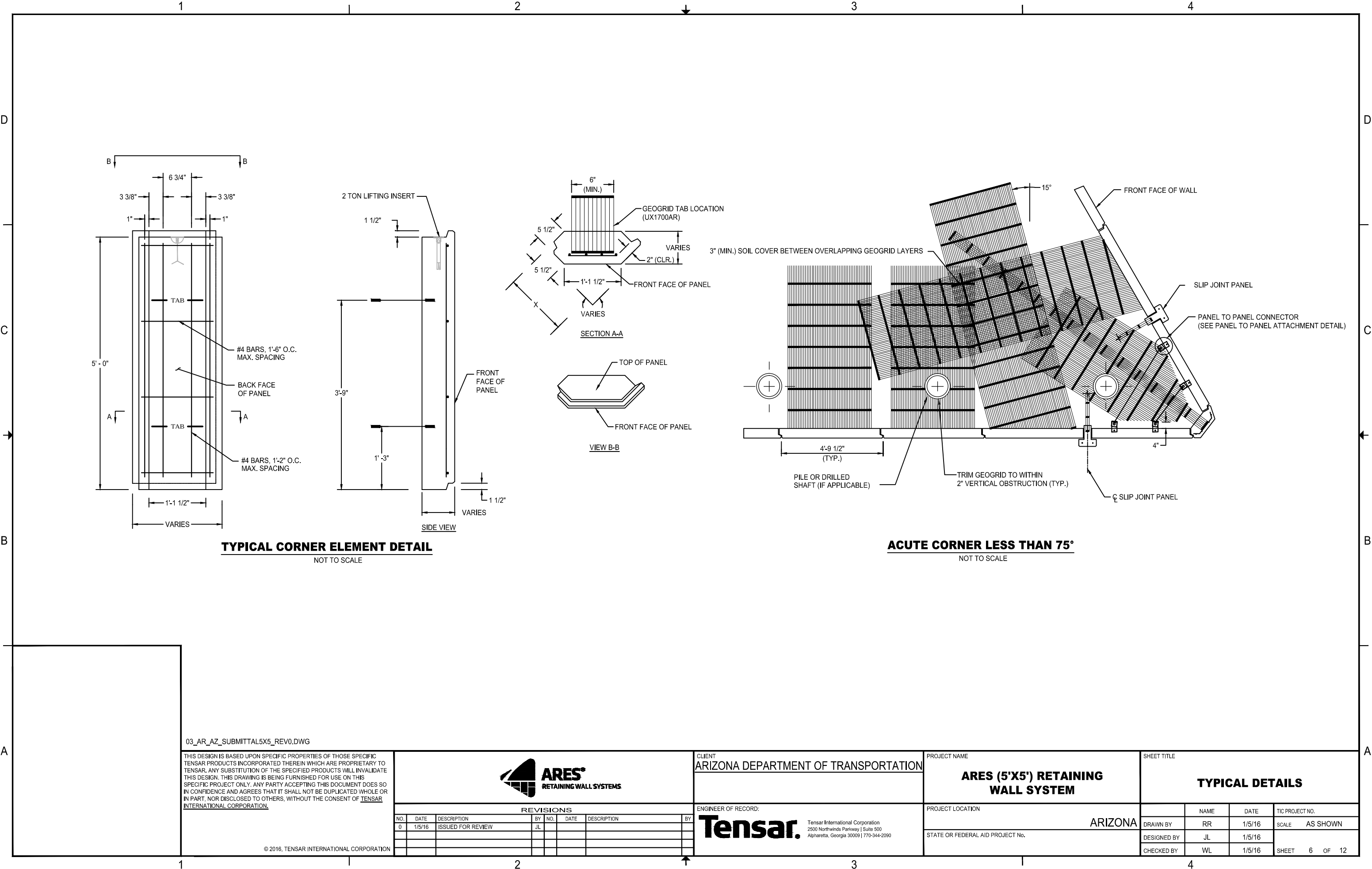
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TYPICAL CORNER ELEMENT DETAIL
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ACUTE CORNER LESS THAN 75°
NOT TO SCALE

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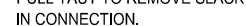
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VIEW A-A



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FABRICATION ATTACHMENT STEEL NOTES:

1. ALL STEEL ANGLES AND PLATES SHALL BE PER ASTM A36.
2. ALL FABRICATED STEEL PARTS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.
3. ALL DIMENSIONS ARE MINIMUM REQUIRED.

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PROJECT NAME	
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ARES (5'X5') RETAINING WALL SYSTEM

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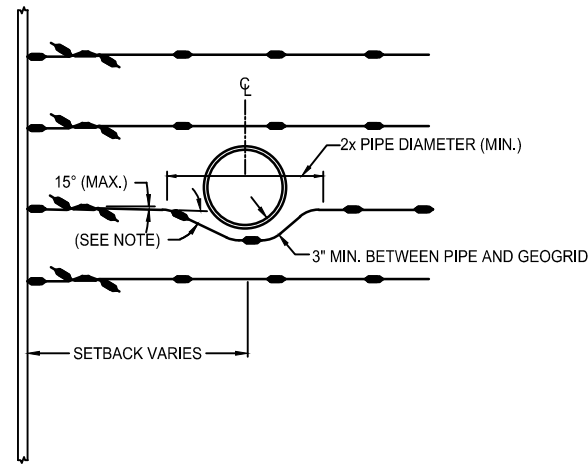
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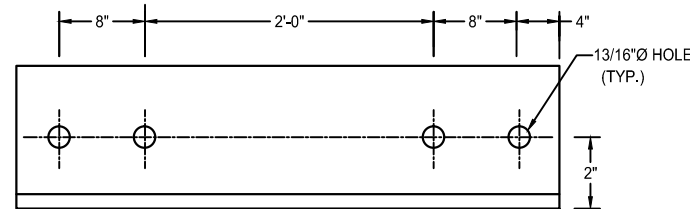
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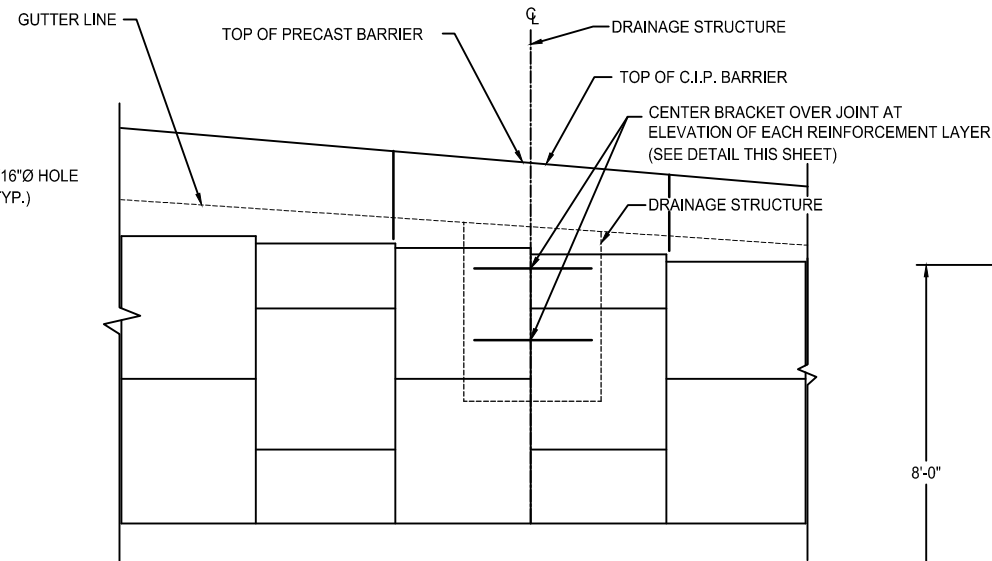


NOTE:
IF GEOGRID MUST BE MORE THAN 15°
FROM HORIZONTAL, EXTEND GEOGRID 4'-0"
LONGER THAN SHOWN ON CONSTRUCTION
DRAWINGS.

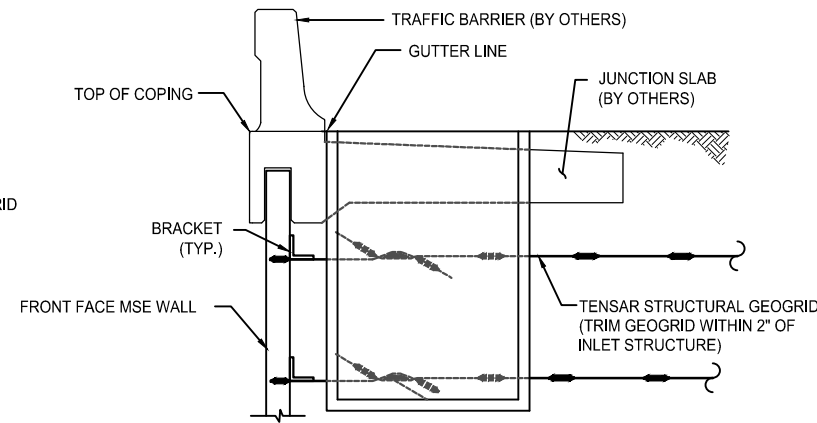


1. ALL FABRICATED STEEL PARTS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.
2. ANCHOR SHALL BE Ø 5/8" KIWIK BOLT 3 HOT-DIP GALVANIZED (HDG) EXPANSION ANCHOR OR APPROVED EQUAL.

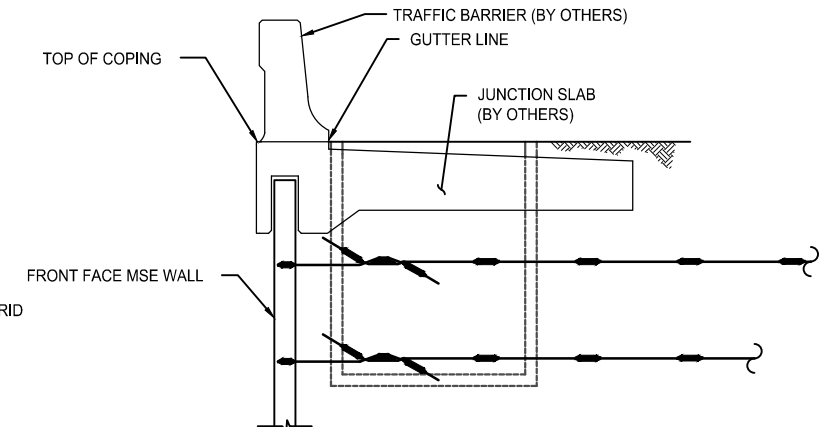
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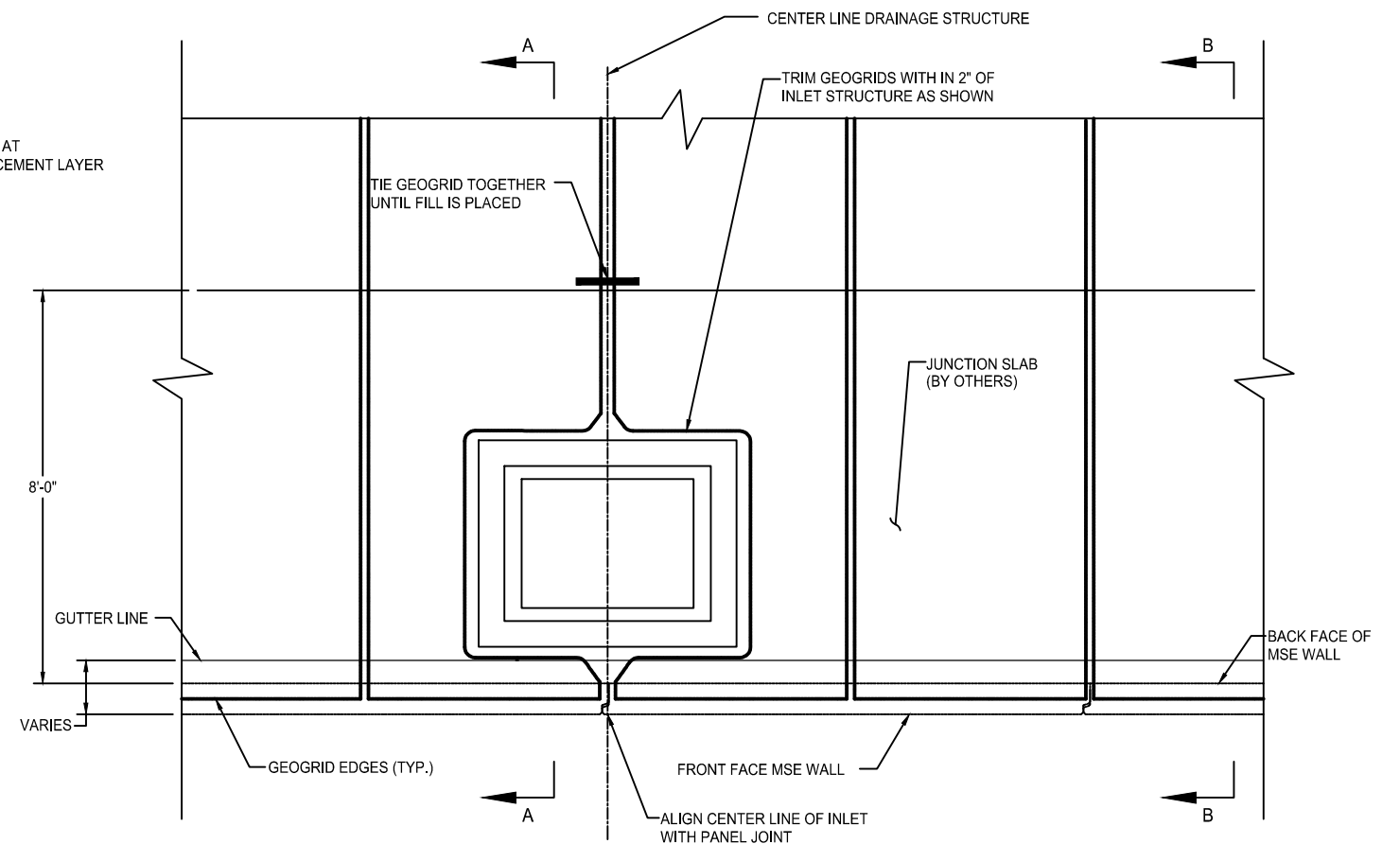
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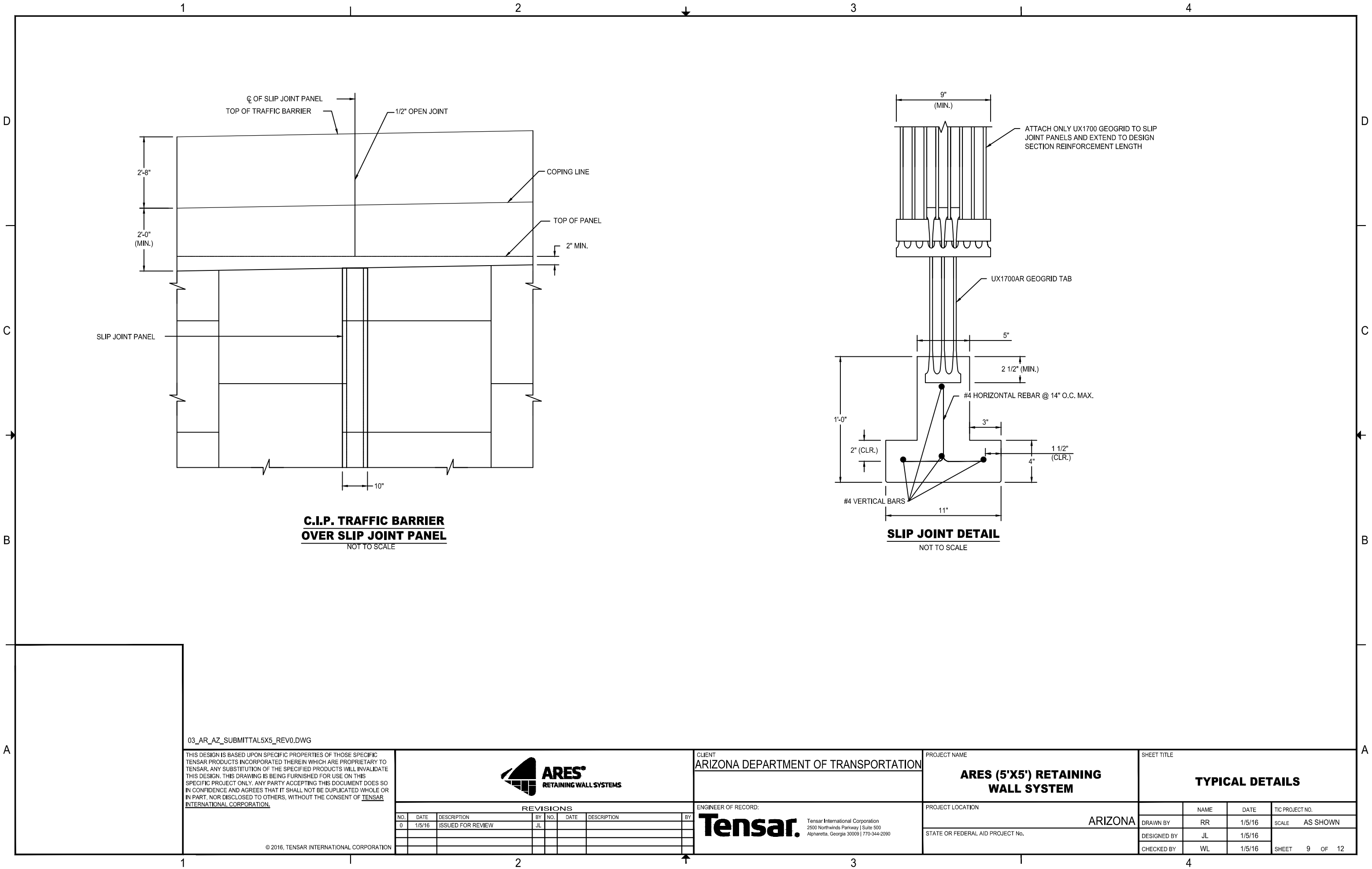


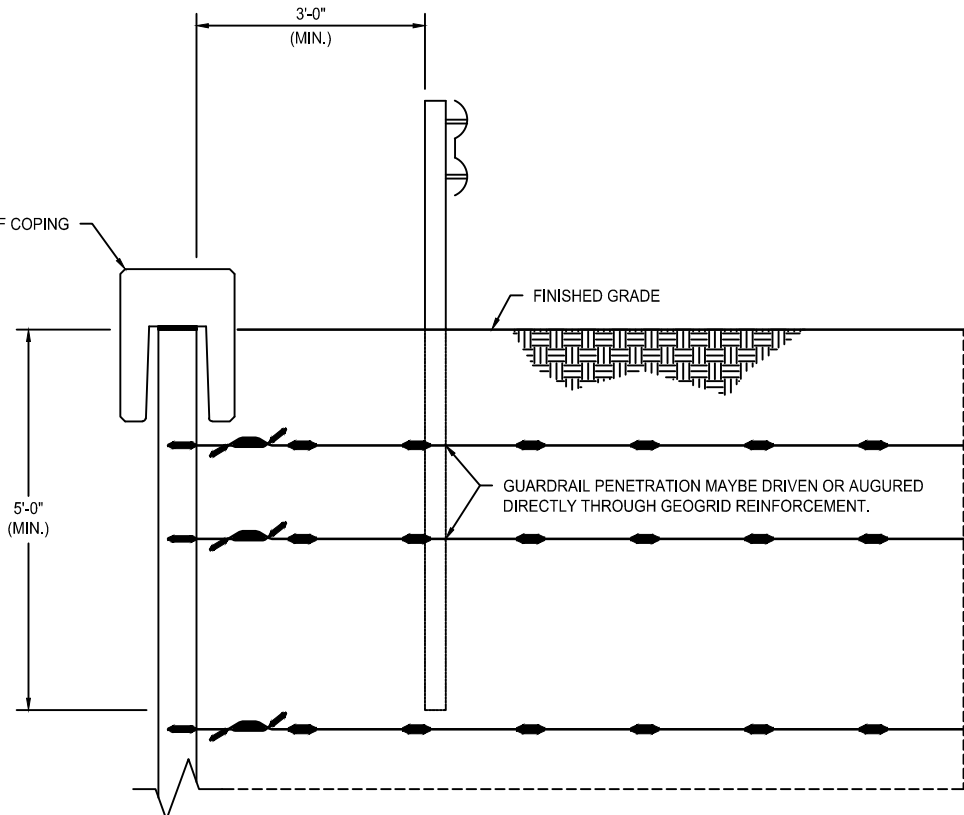
ARES (5'X5') RETAINING WALL SYSTEM

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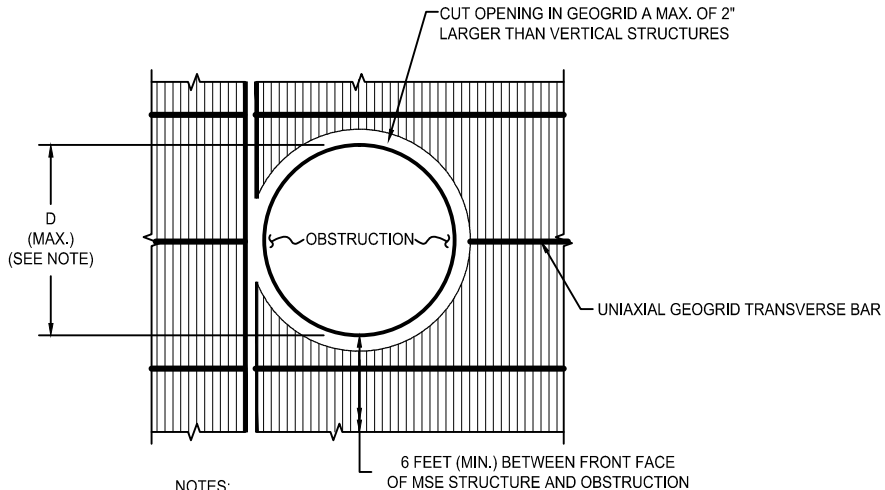
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GUARDRAIL PENETRATION DETAIL

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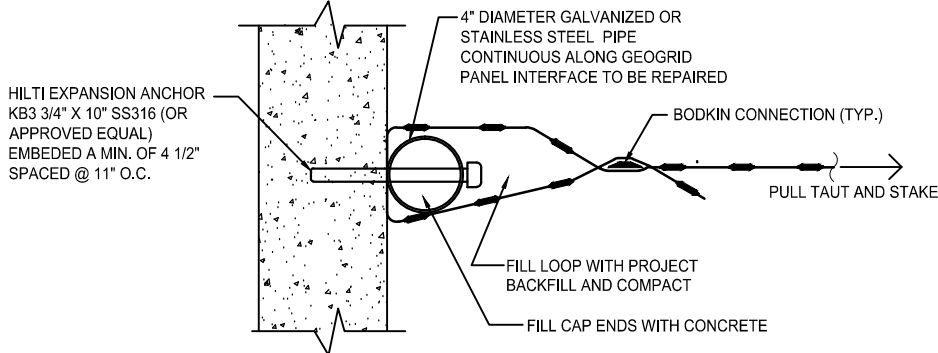


NOTES:

1. ADDITIONAL PROVISIONS SHALL BE MADE WHEN I EXCEEDS 24".
2. ADDITIONAL PROVISIONS SHALL BE MADE IF REGULARLY SPACED OBSTRUCTIONS ARE PLACED CLOSER THAN 10D

GEOGRID PENETRATION DETAIL-PLAN VIEW

NOT TO SCALE

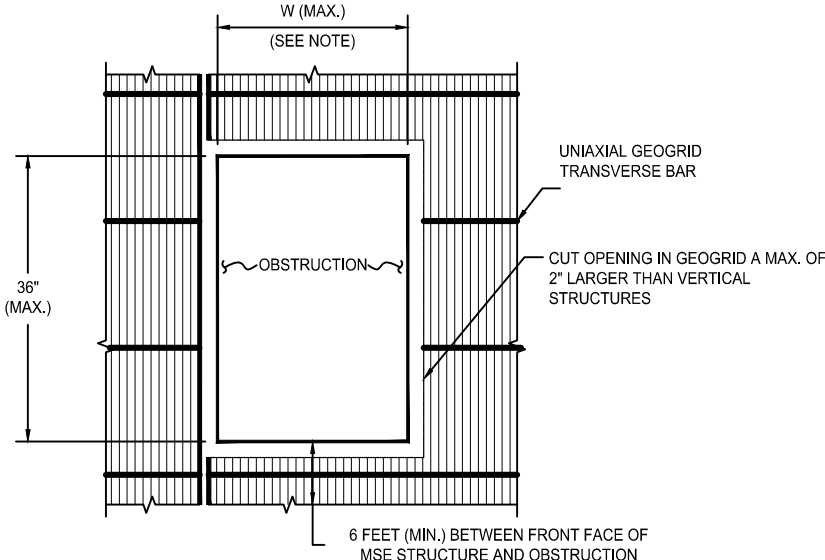


NOTE:

ONLY DAMAGED SECTIONS NEED TO BE REPAIRED.
MINIMUM SECTION LENGTH = 11" - 2 BOLTS MINIMUM
REQUIRED PER SECTION.

REPAIR OF DAMAGED GEOGRID CONNECTION

NOT TO SCALE



NOTES

1. ADDITIONAL PROVISIONS SHALL BE MADE WHEN W EXCEEDS 24".
2. ADDITION PROVISIONS SHALL BE MADE IF REGULARLY SPACED OBSTRUCTIONS ARE PLACED CLOSER THAN 10W.

GEOGRID PENETRATION DETAIL-PLAN VIEW

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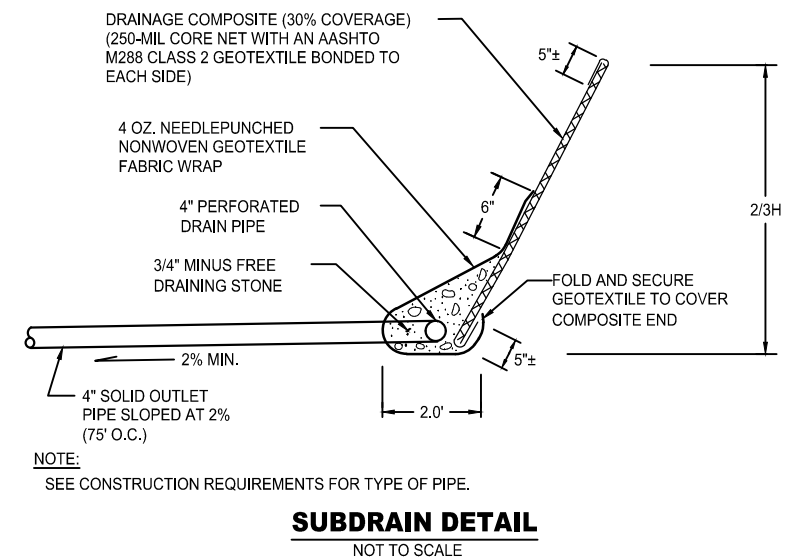
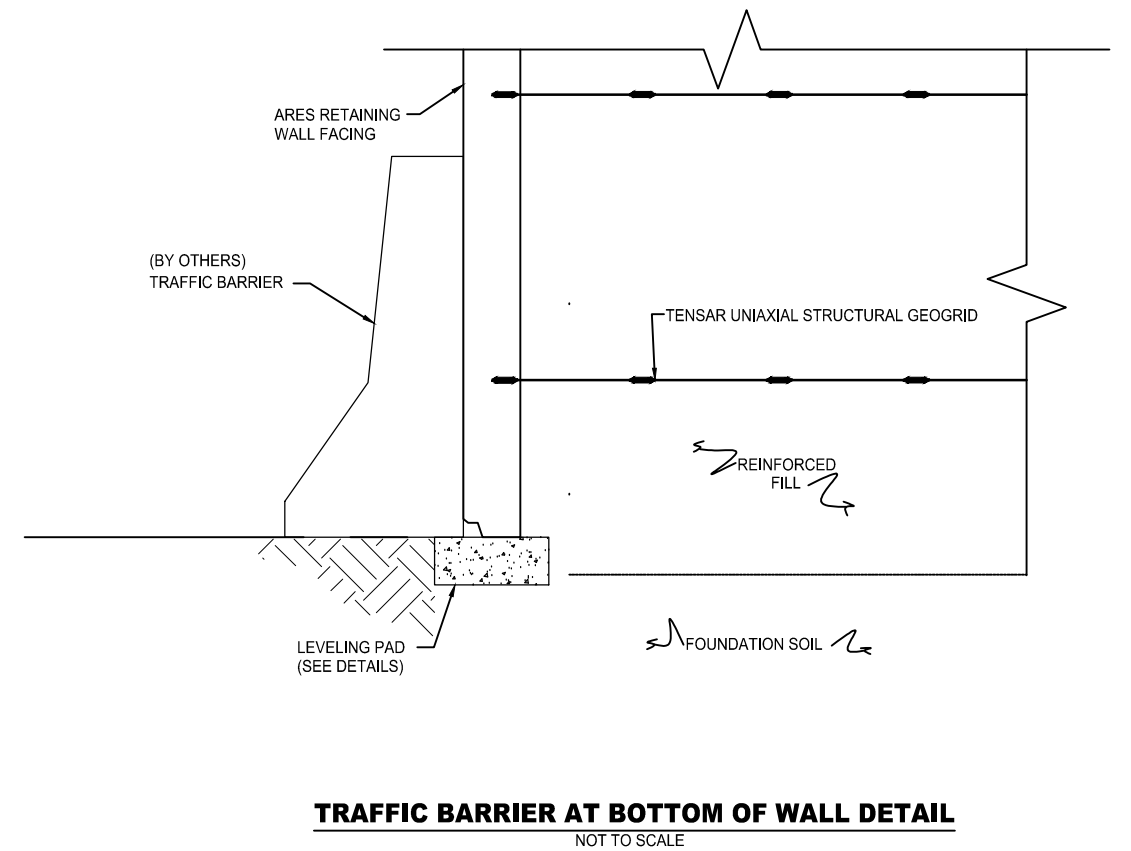
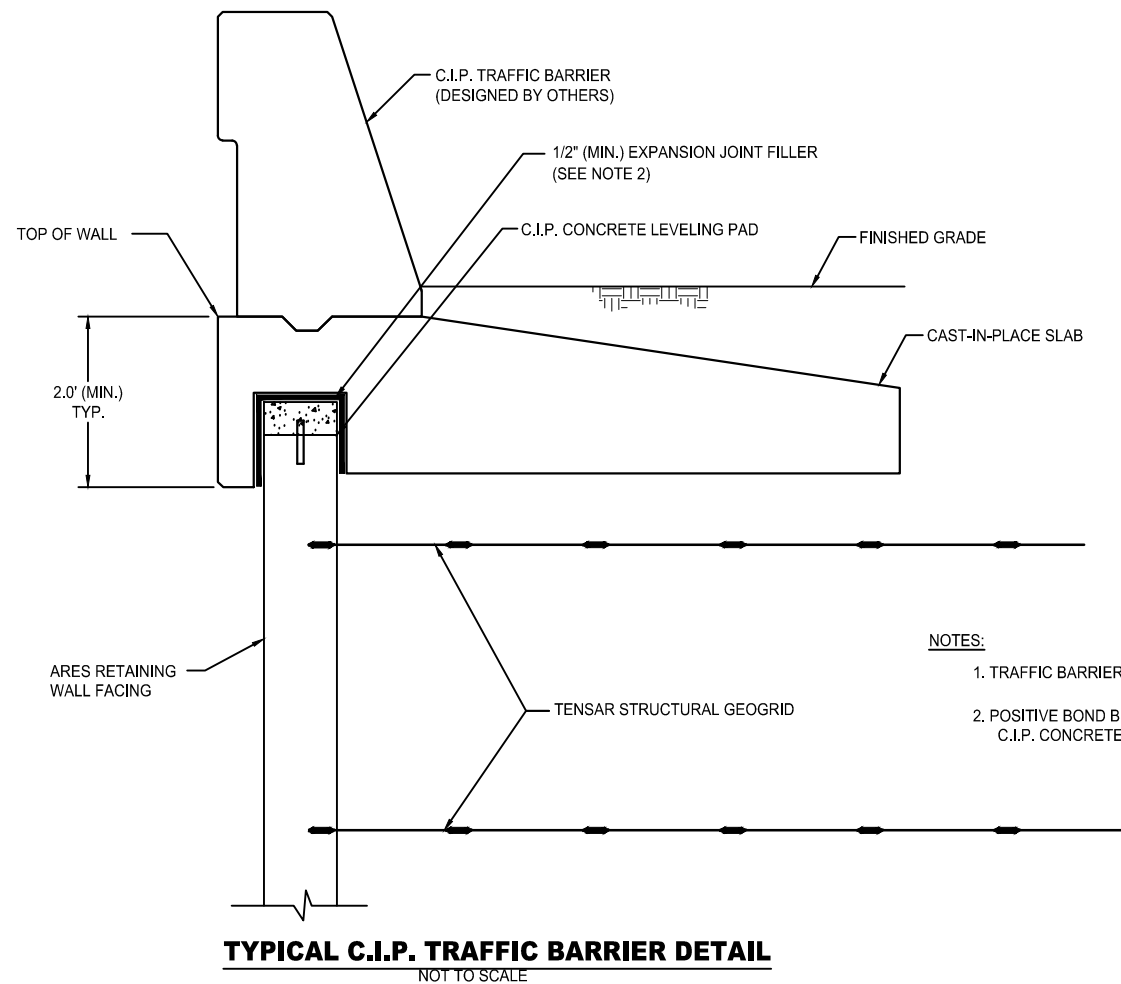
PROJECT NAME

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SHEET TITLE

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PROJECT LOCATION	ARIZONA
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TYPICAL DETAILS			
	NAME	DATE	TIC PROJECT NO.
DRAWN BY	RR	1/5/16	SCALE AS SHOWN
DESIGNED BY	JL	1/5/16	SHEET 12 OF 12
CHECKED BY	WL	1/5/16	



MSE STRUCTURE SHOP DRAWINGS
Prepared For

ARIZONA
DEPARTMENT OF TRANSPORTATION



ARES (5' X 9') RETAINING WALL SYSTEM
STANDARD DETAILS

01_AR_AZ_SUBMITTAL5X9_REV0.DWG

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ENGINEER OF RECORD:
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Alpharetta, Georgia 30009 | 770-344-2090

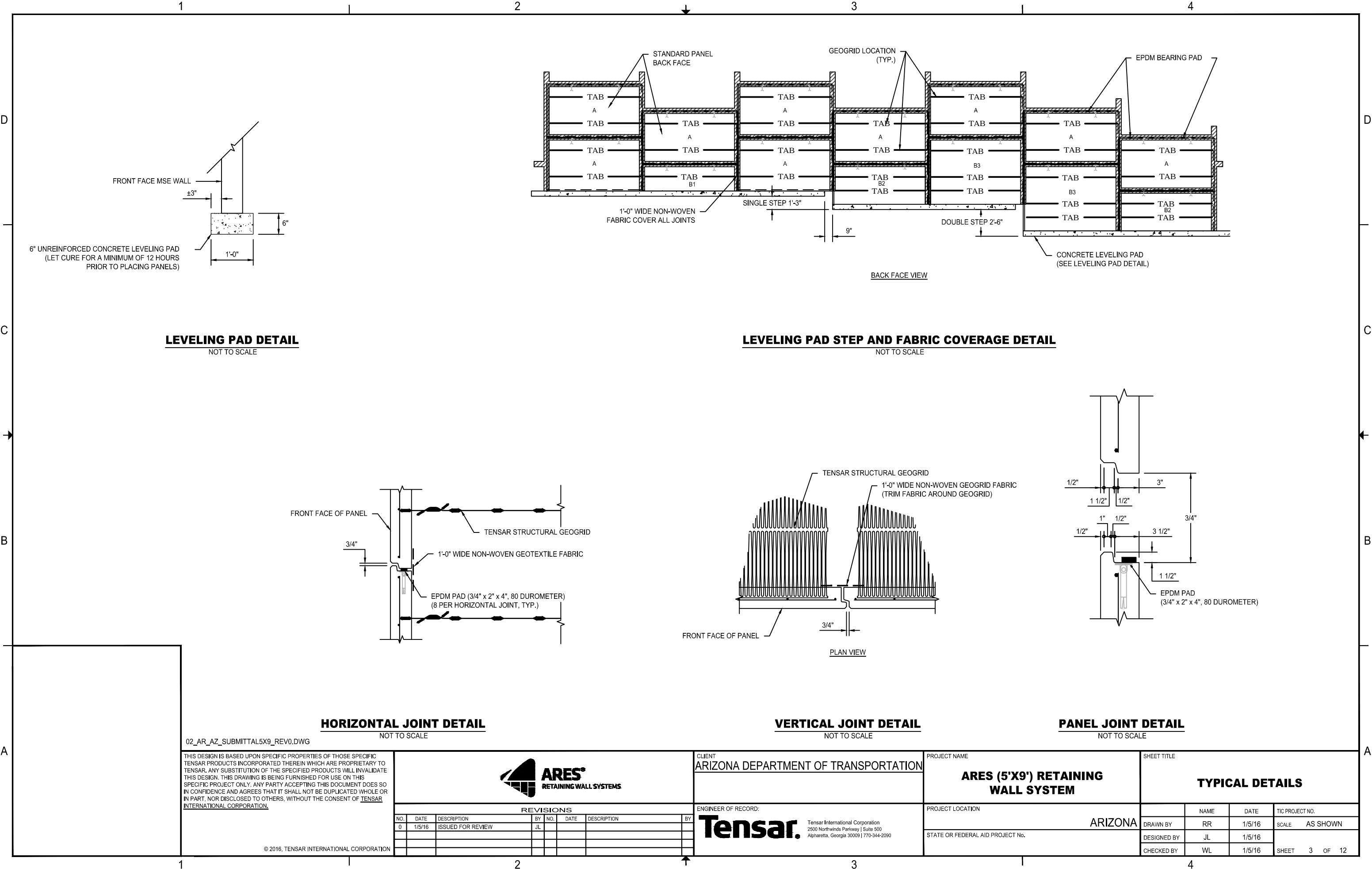
PROJECT NAME
ARES (5'X9') RETAINING WALL SYSTEM

PROJECT LOCATION
ARIZONA

STATE OR FEDERAL AID PROJECT No.

SHEET TITLE
TITLE SHEET

	NAME	DATE	TIC PROJECT NO.
DRAWN BY	RR	1/5/16	SCALE AS SHOWN
DESIGNED BY	JL	1/5/16	
CHECKED BY	WL	1/5/16	SHEET 1 OF 12



02_AR_AZ_SUBMITTAL5X9_REV0.DWG

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PROJECT NAME

**ARES (5'X9') RETAINING
WALL SYSTEM**

PROJECT LOCATION

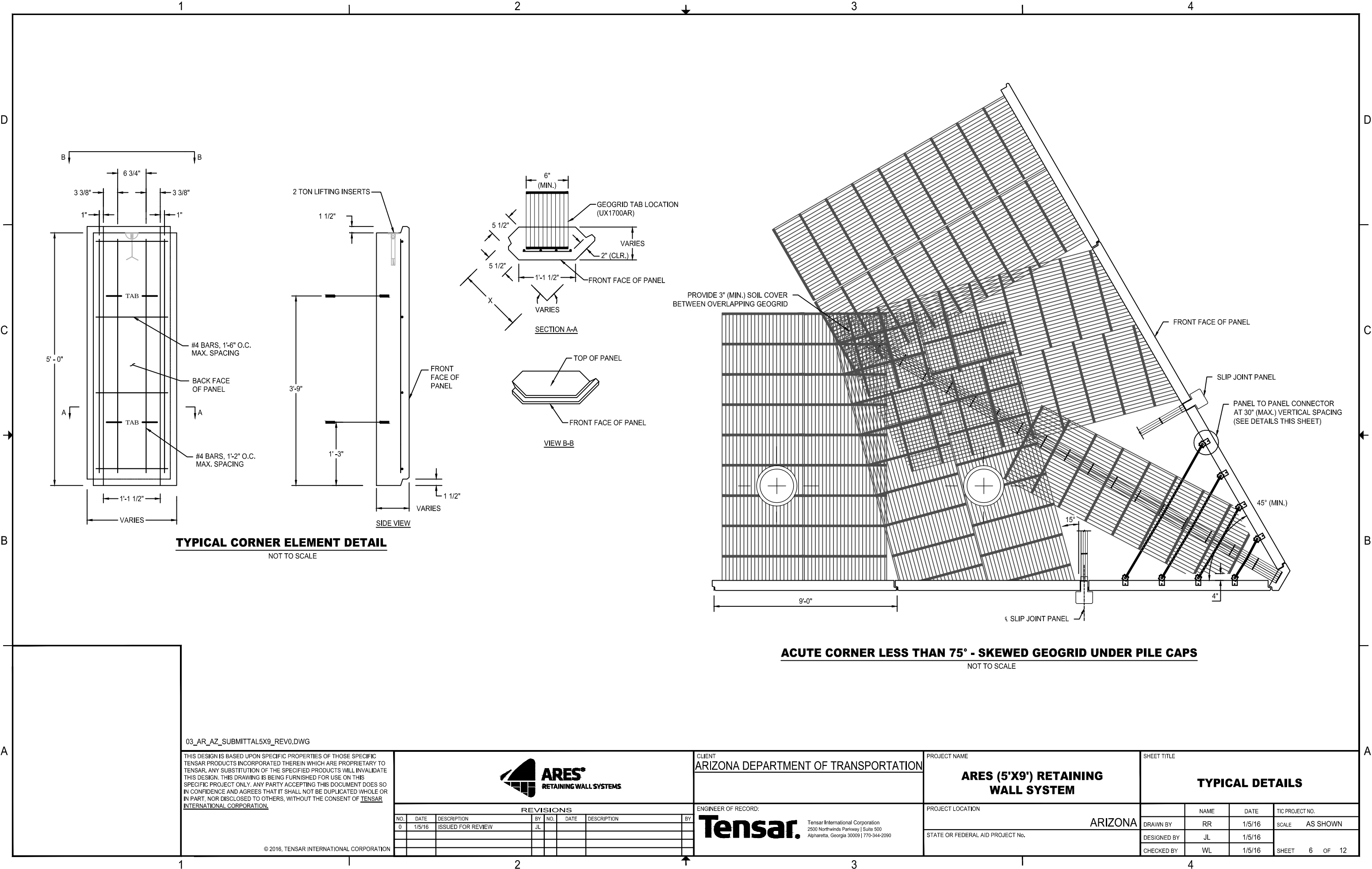
ARIZONA

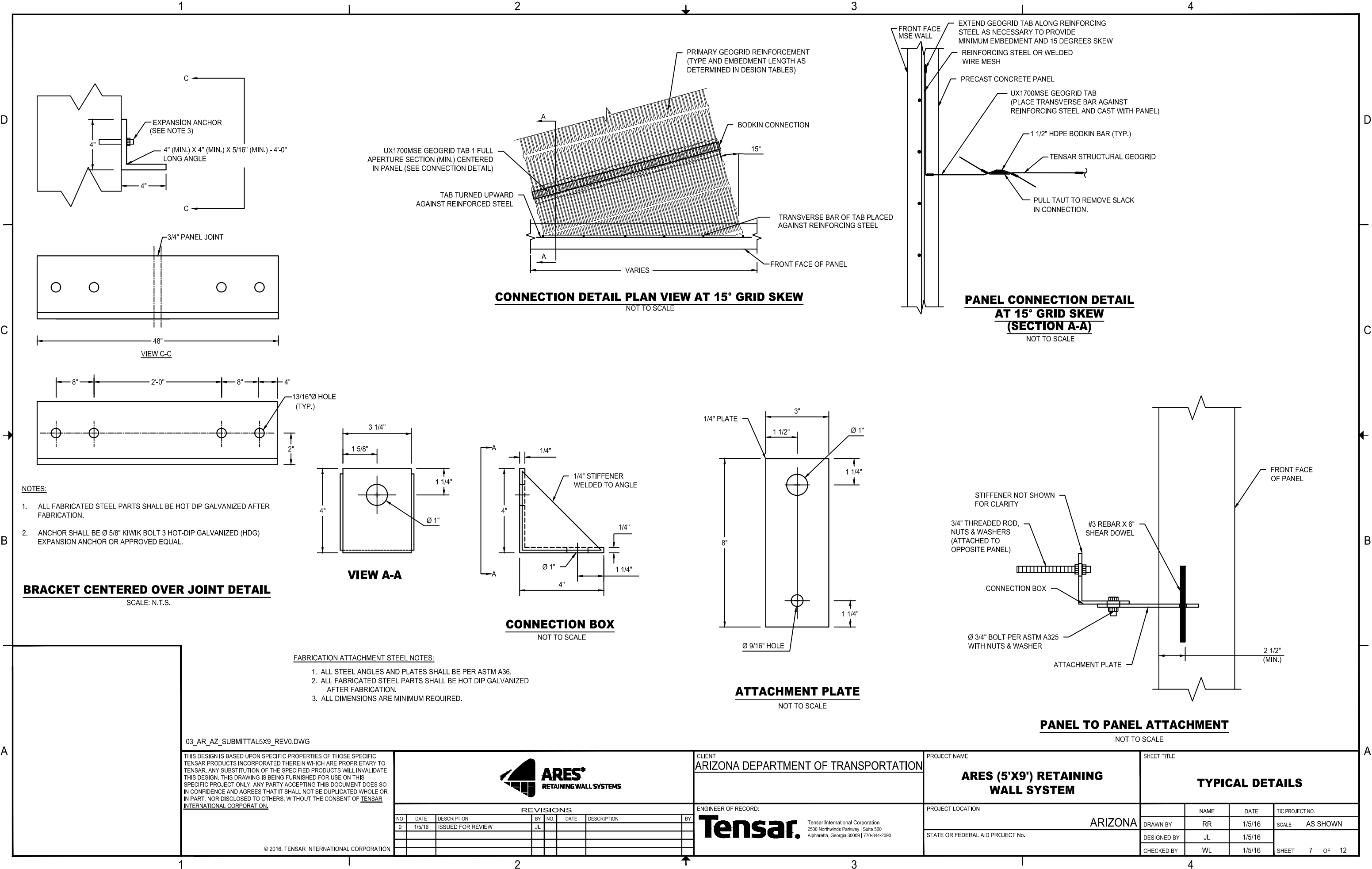
STATE OR FEDERAL AID PROJECT No.

SHEET TITLE

TYPICAL DETAILS

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PROJECT NAME
ARES (5'X9') RETAINING WALL SYSTEM

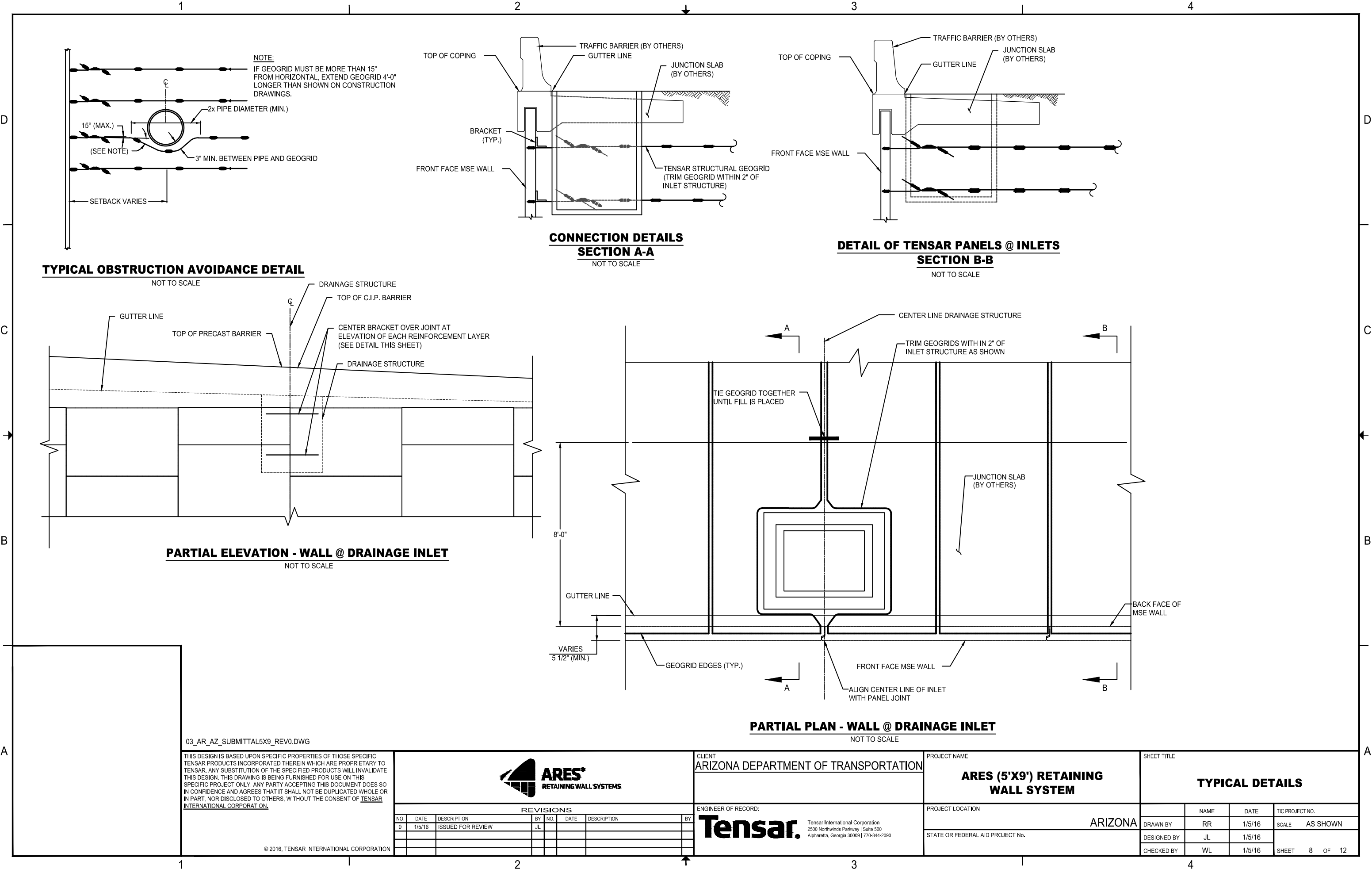
SHEET TITLE
TYPICAL DETAILS

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PROJECT LOCATION
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PROJECT NAME

ARES (5'X9') RETAINING WALL SYSTEM

PROJECT LOCATION

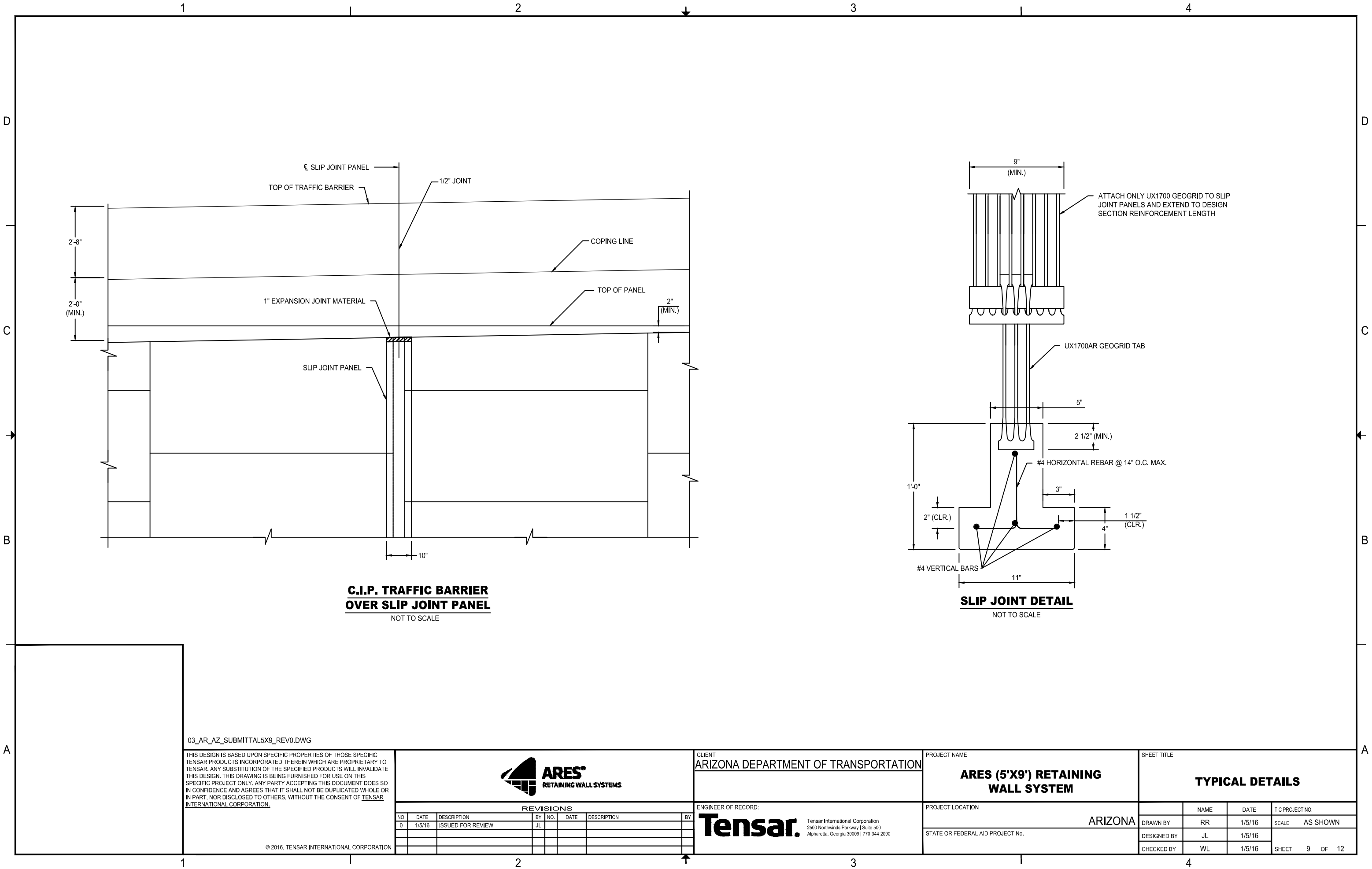
ARIZONA

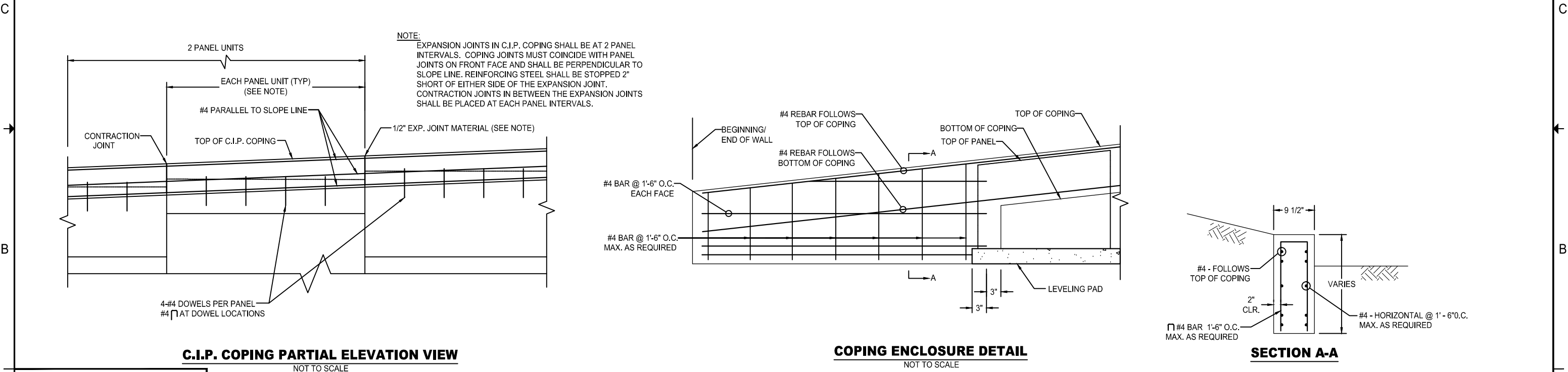
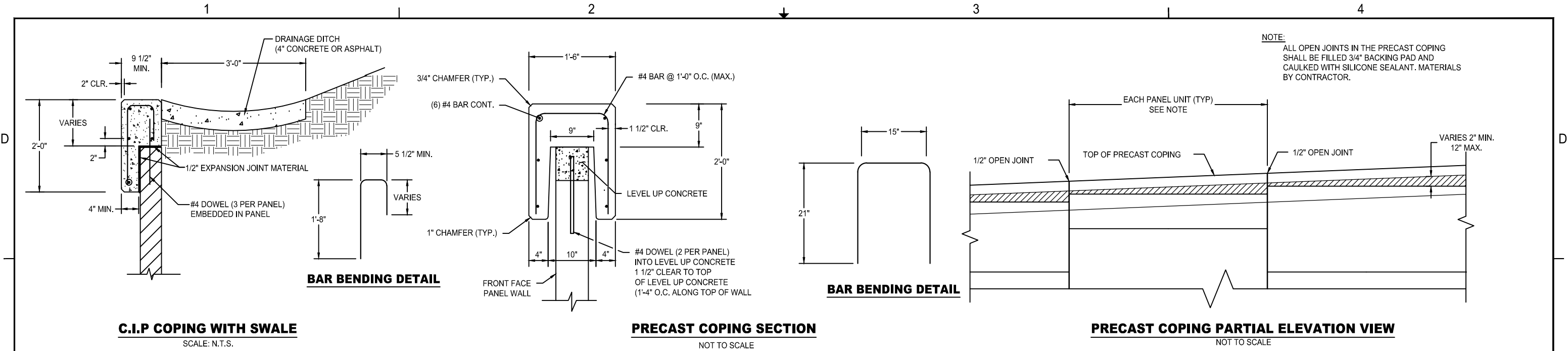
STATE OR FEDERAL AID PROJECT No.

SHEET TITLE

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A

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ARES

RETAINING WALL SYSTEMS

REVISIONS

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PROJECT NAME

ARES (5'X9') RETAINING WALL SYSTEM

PROJECT LOCATION

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SHEET TITLE

TYPICAL DETAILS

	NAME	DATE	TIC PROJECT NO.
DRAWN BY	RR	1/5/16	SCALE AS SHOWN
DESIGNED BY	JL	1/5/16	SHEET 10 OF 12
CHECKED BY	WL	1/5/16	

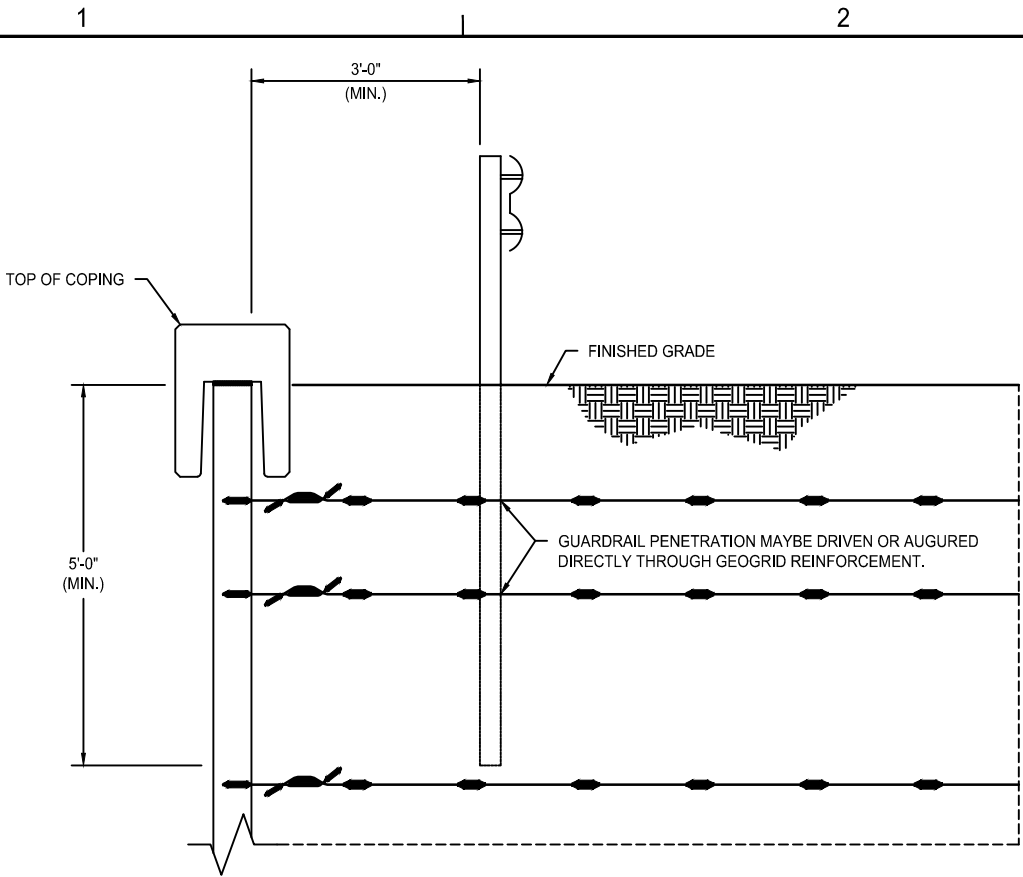
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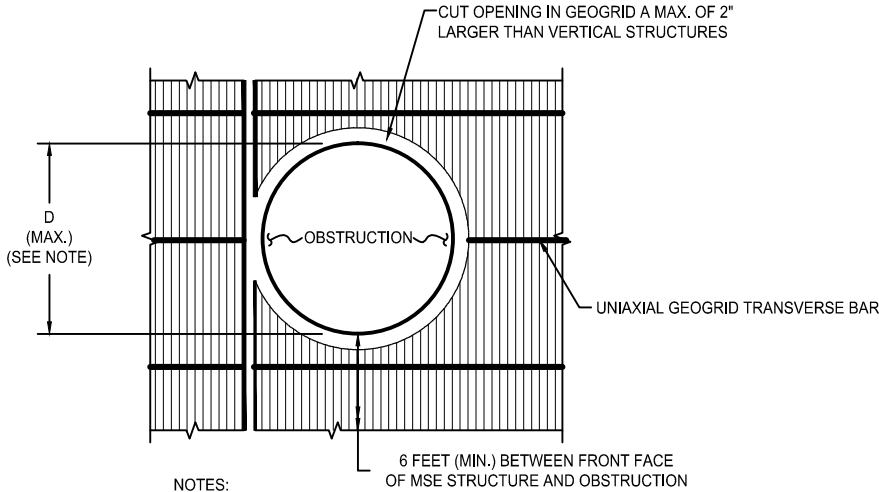
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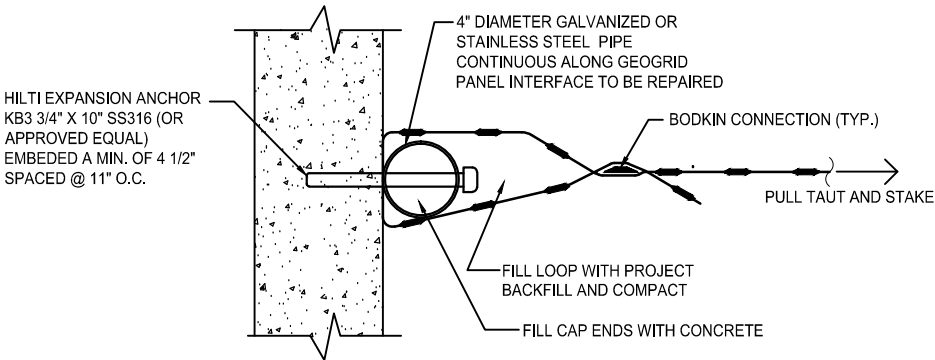


GUARDRAIL PENETRATION DETAIL
NOT TO SCALE



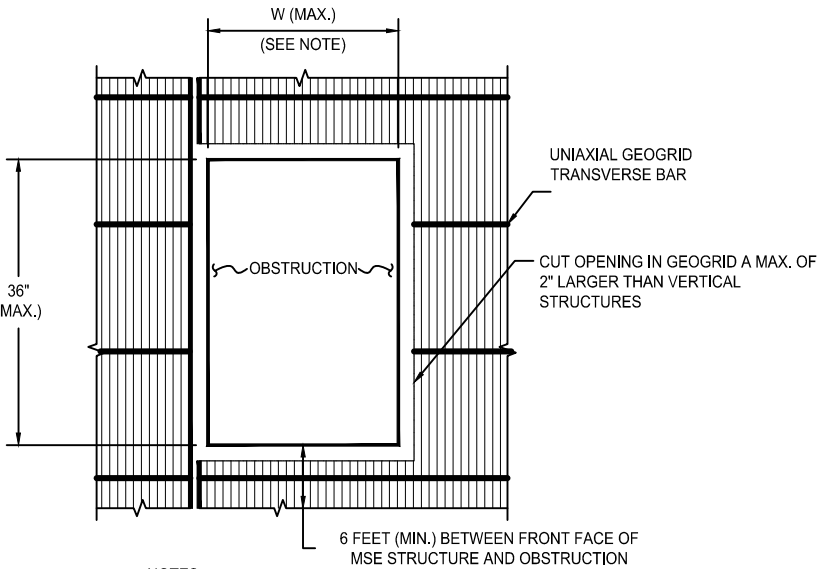
- NOTES:**
1. ADDITIONAL PROVISIONS SHALL BE MADE WHEN D EXCEEDS 24".
 2. ADDITIONAL PROVISIONS SHALL BE MADE IF REGULARLY SPACED OBSTRUCTIONS ARE PLACED CLOSER THAN 10D

GEOGRID PENETRATION DETAIL-PLAN VIEW
NOT TO SCALE



NOTE:
ONLY DAMAGED SECTIONS NEED TO BE REPAIRED.
MINIMUM SECTION LENGTH = 11" - 2 BOLTS MINIMUM
REQUIRED PER SECTION.

REPAIR OF DAMAGED GEOGRID CONNECTION
NOT TO SCALE



- NOTES:**
1. ADDITIONAL PROVISIONS SHALL BE MADE WHEN W EXCEEDS 24".
 2. ADDITION PROVISIONS SHALL BE MADE IF REGULARLY SPACED OBSTRUCTIONS ARE PLACED CLOSER THAN 10W.

GEOGRID PENETRATION DETAIL-PLAN VIEW
NOT TO SCALE

03_AR_AZ_SUBMITTAL5X9_REV0.DWG

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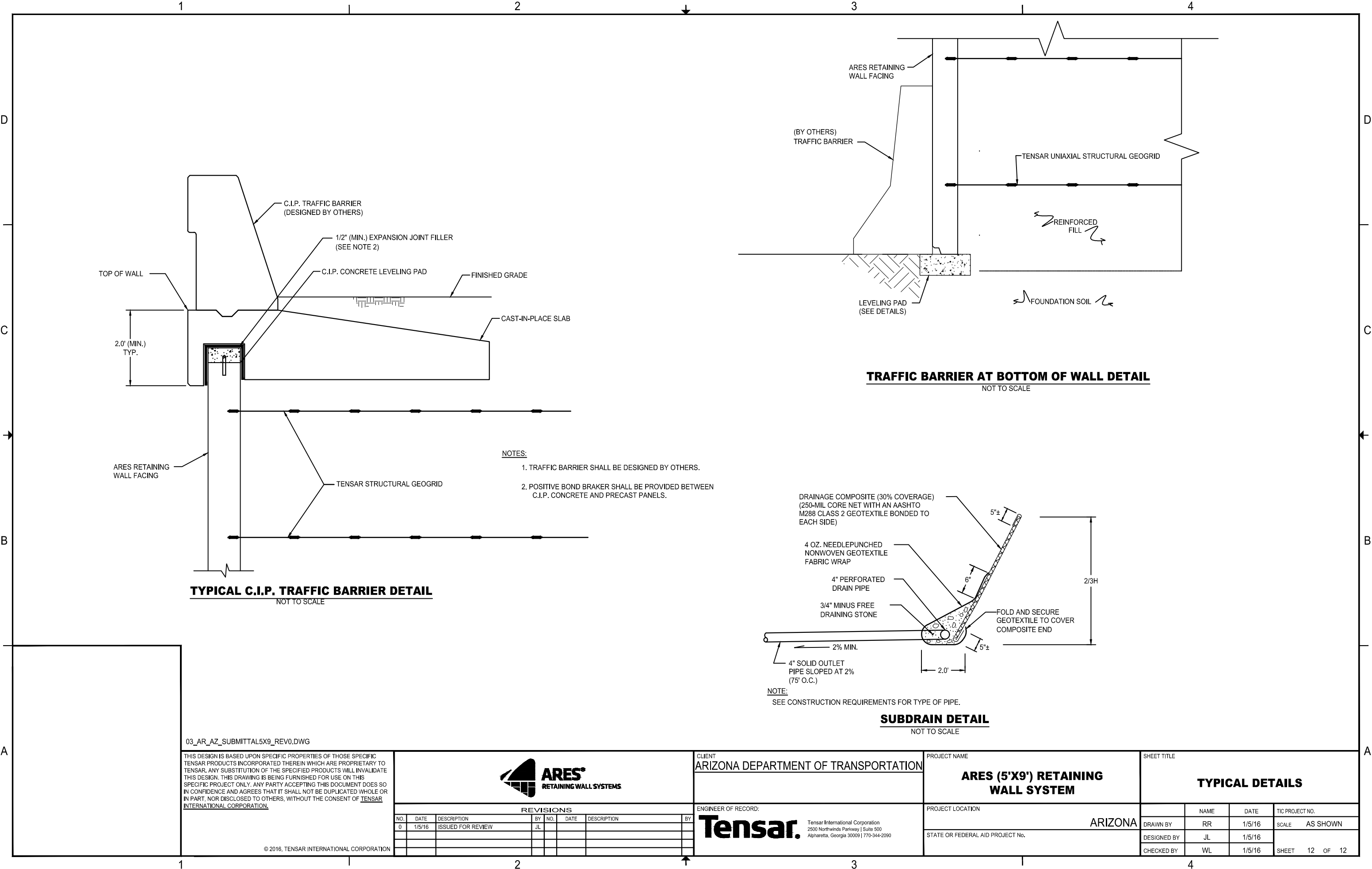
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PROJECT NAME
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WALL SYSTEM**

PROJECT LOCATION
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STATE OR FEDERAL AID PROJECT No.

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CHECKED BY	WL	1/5/16	SHEET 11 OF 12



TYPICAL C.I.P. TRAFFIC BARRIER DETAIL
NOT TO SCALE

TRAFFIC BARRIER AT BOTTOM OF WALL DETAIL
NOT TO SCALE

SUBDRAIN DETAIL
NOT TO SCALE

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