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Remarks and Instructions

Please contact Tony Allen at 360-705-5450 or allent@wsdot.wa.gov with comments, questions, or suggestions for improvement to the manual.

For printed manuals, page numbers indicating portions of the manual that are to be removed and inserted are shown below.

Chapter	Remove Pages	Insert Pages
Title Page	i – ii	i–ii
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Appendix 15-D Preapproved Proprietary Wall Systems	15-D-1 – 15-D-2	15-D-1 – 15-D-2
Chapter 15 Preapproved Wall Appendix Specific Requirements and Details for SSL Concrete Panel Walls Specific Requirements and Details for Nelson Walls Specific Requirements and Details for Tensar Welded Wire Form Walls	117 – 172	117 – 164

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Washington State Department of Transportation
Geotechnical Services
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Tumwater, WA 98512-6951

Approved By

Signature

Washington State
Department of Transportation

Geotechnical Design Manual

M 46-03.07

April 2012

Environmental and Engineering Programs
Geotechnical Services

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Preapproved Wall Appendices

Preapproved Wall Appendix:	Specific Requirements and Details for LB Foster Retained Earth Concrete Panel Walls
Preapproved Wall Appendix:	Specific Requirements and Details for Eureka Reinforced Soil Concrete Panel Walls
Preapproved Wall Appendix:	Specific Requirements and Details for Hilfiker Welded Wire Faced Walls
Preapproved Wall Appendix:	Specific Requirements and Details for KeySystem I Walls
Preapproved Wall Appendix:	Specific Requirements and Details for Tensar MESA Walls
Preapproved Wall Appendix:	Specific Requirements and Details for T-WALL® (The Neel Company)
Preapproved Wall Appendix:	Specific Requirements and Details for Reinforced Earth (RECO) Concrete Panel Walls
Preapproved Wall Appendix:	Specific Requirements and Details for Tensar ARES Walls
Preapproved Wall Appendix:	Specific Requirements and Details for Nelson Walls
Preapproved Wall Appendix:	Specific Requirements and Details for Tensar Welded Wire Form Walls

In addition to the general design requirements provided in **Appendix 15-A**, the following specific requirements apply:

The detailed design methodology, design properties, and assumptions used by Tensar Earth Technologies for the ARES wall are summarized in the HITEC evaluation report for this wall system (**HITEC, 1997, *Evaluation of the Tensar ARES Retaining Wall System*, ASCE, CERF Report No. 40301**). The design methodology, which is based on the Standard Specifications for Highway Bridges (**2002**) is consistent with the general design requirements in **Appendix 15-A**, except as noted below. Interim approval is given for the continued use of the AASHTO Standard Specifications as the basis for design.

Reinforcement pullout shall be calculated based on the default values for geogrid reinforcement provided in the AASHTO Specifications. For LRFD based design, while it is recognized that product and soil type specific pullout interaction coefficients obtained in accordance with the AASHTO LRFD Specifications for the Tensar products used with this wall system are provided in the HITEC report for the ARES Wall system, pullout resistance design using these product and soil specific interaction coefficients has not been calibrated using the available product specific data statistics and reliability theory. Therefore, the specified resistance factors in the GDM and AASHTO LRFD Specifications should not be considered applicable to the product specific pullout interaction coefficients provided in the HITEC report.

The reinforcement long-term tensile strengths (T_{al}) provided in the WSDOT Qualified Products List (QPL) for the Tensar Geogrid product series, which are based on the 2003 version of the product series, shall be used for wall design, until such time that they are updated, and the updated strengths approved for WSDOT use in accordance with WSDOT Standard Practice T925. Until such time that the long-term reinforcement strengths are updated, it shall be verified that any material sent to the project site for this wall system is the 2003 version of the product. Furthermore, the short-term ultimate tensile strengths (ASTM D6637) listed in the QPL shall be used as the basis for quality assurance testing and acceptance of the product as shipped to the project site per the WSDOT Standard Specifications for Construction.

The HITEC report provided details and design criteria for a panel slot connector to attach the geogrid reinforcement to the facing panel. Due to problems with cracking of the facing panel at the location of the slot, that connection system has been discontinued and replaced with a full thickness panel in which geogrid tabs have been embedded into the panel. For this new connection system, the geogrid reinforcement is connected to the geogrid tab through the use of a Bodkin joint. Construction and fabrication inspectors should verify that the panels to be used for WSDOT projects do not contain the discontinued slot connector.

The Bodkin connection test results provided by letter to WSDOT dated September 28, 2004, were performed on the 2003 version of the Tensar geogrid product line. In that letter, it was stated that UMESA6 (UX1700HS) will typically be used for the connector tabs, regardless of the product selected for the reinforcement. If a lighter weight product is used for the connector tabs, the connection strength will need to be reduced accordingly. **Table 15-(Tensar ARES)-1** provides a summary of the connection strengths that are approved for use with the ARES wall system.

Tensar Soil Reinforcement Geogrid Product	Tensar Panel Connector Tab Geogrid Product	T_{ult} (MARV) for Geogrid Reinforcement per ASTM D6637 in WSDOT QPL (lbs/ft)	CR_u	RF	T_{ac} (lbs/ft)
UMESA3/ UX1400HS	UMESA6/ UX1700HS	4,820	1.0	3.6	1,340
UMESA4/ UX1500HS	UMESA6/ UX1700HS	7,880	1.0	3.5	2,250
UMESA5/ UX1600HS	UMESA6/ UX1700HS	9,870	1.0	3.4	2,900
UMESA6/ UX1700HS	UMESA6/ UX1700HS	12,200	0.91	3.3	3,360
UMESA3/ UX1400HS	UMESA3/ UX1400HS	4,820	0.85	3.6	1,140
UMESA4/ UX1500HS	UMESA4/ UX1500HS	7,880	0.79	3.5	1,780
UMESA5/ UX1600HS	UMESA5/ UX1600HS	9,870	0.87	3.4	2,530
UMESA6/ UX1700HS	UMESA6/ UX1700HS	12,200	0.91	3.3	3,360

Approved Connection Strength Design Values for Tensar Ares Walls
Table 15-(Tensar ARES)-1

T_{ac}, the long-term connection strength, shall be calculated as follows for the Tensar ARES wall:

$$T_{ac} = \frac{T_{MARV} \bullet CR_u}{RF} \qquad \text{(15-(Tensar ARES)-1)}$$

where,

$$RF = RF_{ID} \times RF_{CR} \times RF_D$$

and,

T_{MARV} = The minimum average roll value for the ultimate geosynthetic strength T_{ult}
CR_u = The ultimate connection strength $T_{ultconn}$ divided by the lot specific ultimate tensile strength, T_{lot} (i.e., the lot of material specific to the connection testing)
RF_{ID} = Reduction factor for installation damage
RF_{CR} = Creep reduction factor for the geosynthetic
RF_D = The durability reduction factor for the geosynthetic

Approved details for the Tensar ARES wall system are provided in the following plan sheets. Exceptions and additional requirements regarding these approved details are as follows:

- For all plan sheets, the full height panel details are not preapproved. Full height panels may be used by special design, with the approval of the State Bridge Design Engineer and the State Geotechnical Engineer, provided a complete wall design with detailed plans are developed and included in the construction contract (i.e., full height panel walls shall not be submitted as shop drawings in design-bid-build projects).
- In plan sheet 3 of 19, there should be a minimum cover of 4 inches of soil between the geogrid and the traffic barrier reaction slab.
- In plan sheet 8 of 19, the strength of the geogrid and connection available shall be reduced by 10% to account for the skew of the geogrid reinforcement. The skew angle relative to the perpendicular from the wall face shall be no more than 10^{o}.
- In plan sheets 10 and 14 of 19, regarding the filter fabric shown, WSDOT reserves the right to require the use WSDOT Standard Specification materials as specified in Standard Specification Section 9-33 that are similar to those specified in this plan sheet.
- In plan sheet 15 of 19, the guard rail detail, the guard rail post shall either be installed through precut holes in the geogrid layers that must penetrated, or the geogrid layers shall be cut in a manner that prevents ripping or tearing of the geogrid.
- The culvert penetration and obstruction avoidance details are preapproved up to a diameter of 2 ft for culvert penetration through the face and up to 4 ft for obstruction avoidance. Larger diameter culverts or obstructions are not considered preapproved. This wall is also preapproved for use with traffic barriers.

Tensar®

CONSTRUCTION DRAWINGS
Prepared For

STATE OF WASHINGTON
DEPARTMENT OF TRANSPORTATION

STANDARD ARES PRECAST PANEL RETAINING WALL DETAILS

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SHEET01.DWG

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(404) 250-1290

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Drawn by KJK
Checked by

STANDARD ARES PRECAST PANEL RETAINING WALL DETAILS

TITLE SHEET

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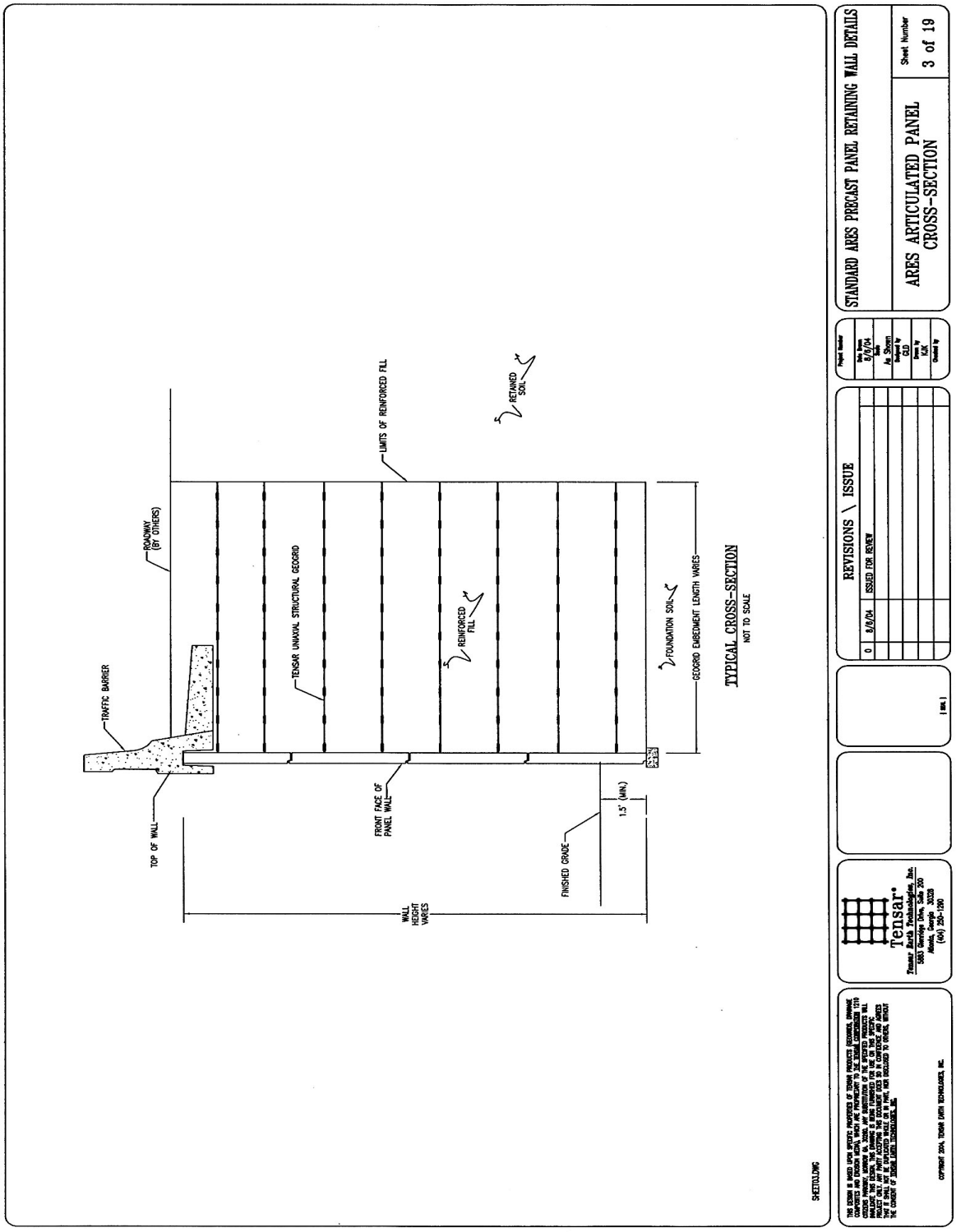
ROADWAY (BY OTHERS)
TRAFFIC BARRIER
TOP OF WALL
TENSAR UNIAXIAL STRUCTURAL GEOGRID
LIMITS OF REINFORCED FILL
RETAINED SOIL
REINFORCED FILL
FOUNDATION SOIL
GEOGRID EMBEDMENT LENGTH VARIES
FRONT FACE OF PANEL WALL
1.5' (MIN.)
FINISHED GRADE
WALL HEIGHT VARIES
TYPICAL CROSS-SECTION
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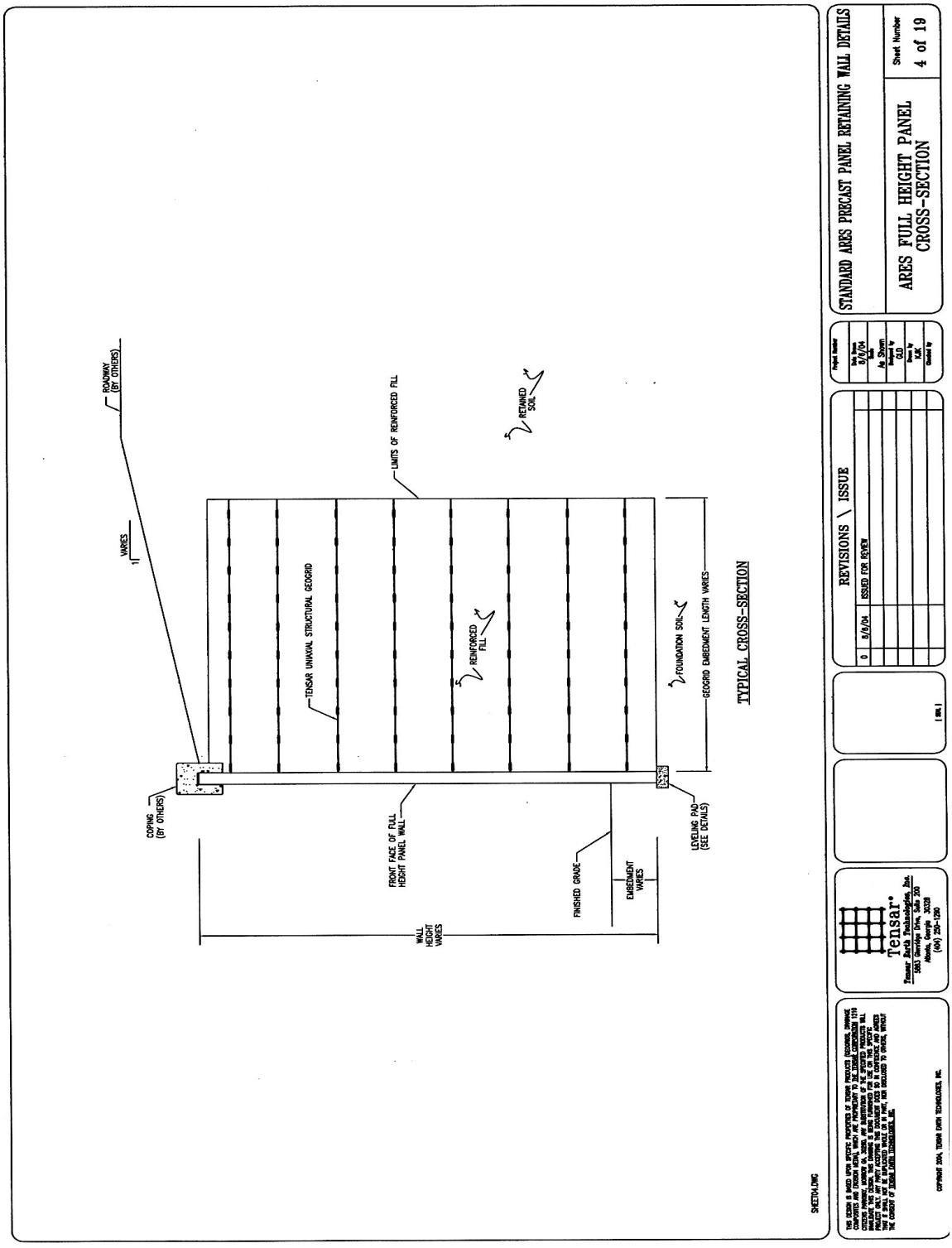
ROADWAY (BY OTHERS)
VARIES
LIMITS OF REINFORCED FILL
RETAINED SOIL
TENSAR UNIAXIAL STRUCTURAL GEOGRID
REINFORCED FILL
FOUNDATION SOIL
GEOGRID EMBEDMENT LENGTH VARIES
COPING (BY OTHERS)
FRONT FACE OF FULL HEIGHT PANEL WALL
FINISHED GRADE
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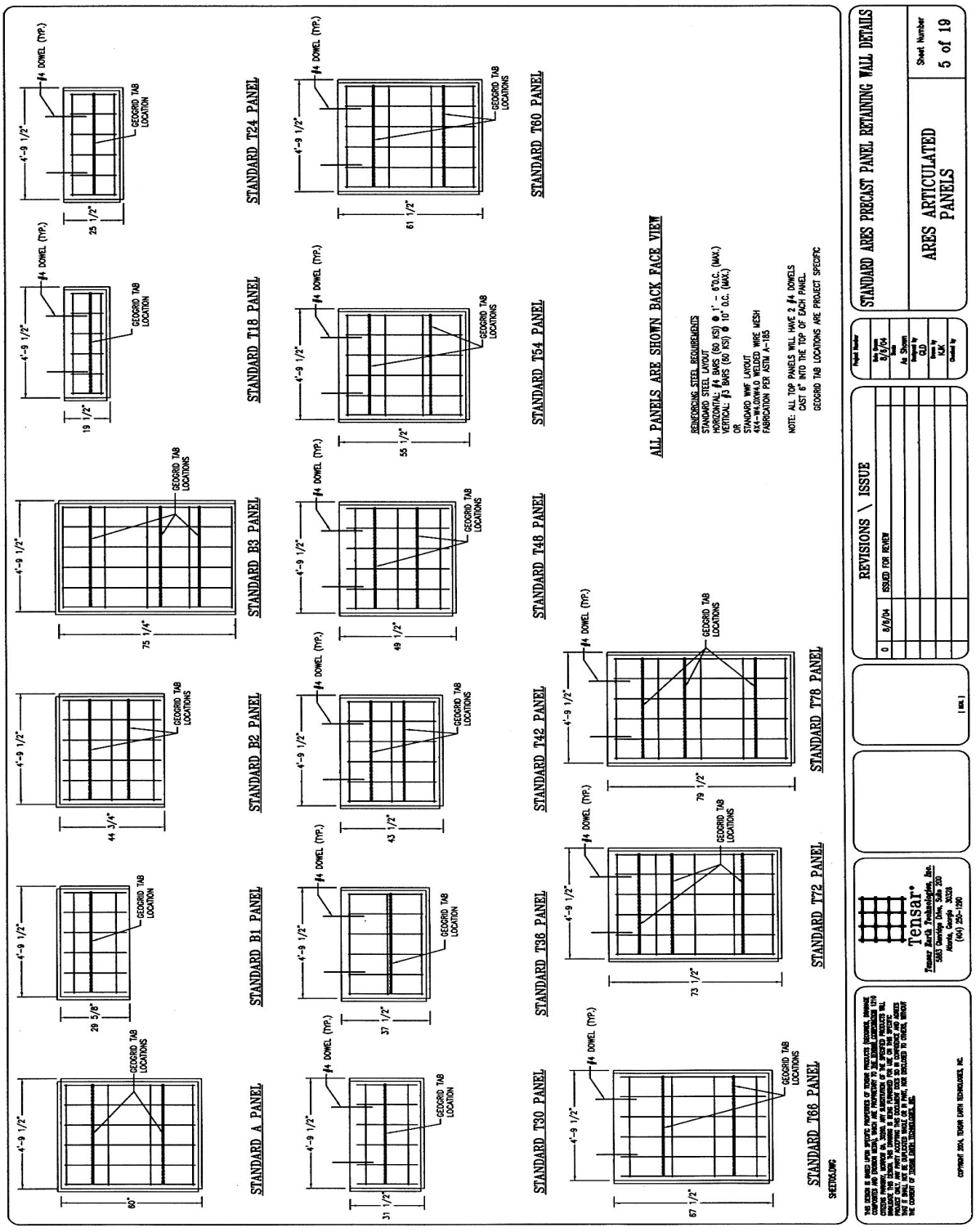
STANDARD A PANEL
STANDARD B1 PANEL
STANDARD B2 PANEL
STANDARD B3 PANEL
STANDARD T18 PANEL
STANDARD T24 PANEL
STANDARD T30 PANEL
STANDARD T36 PANEL
STANDARD T42 PANEL
STANDARD T48 PANEL
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STANDARD T60 PANEL
STANDARD T66 PANEL
STANDARD T72 PANEL
STANDARD T78 PANEL
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STANDARD STEEL LAYOUT
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OR
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FABRICATION PER ASTM A-185
NOTE: ALL TOP PANELS WILL HAVE 2 #4 DOWELS
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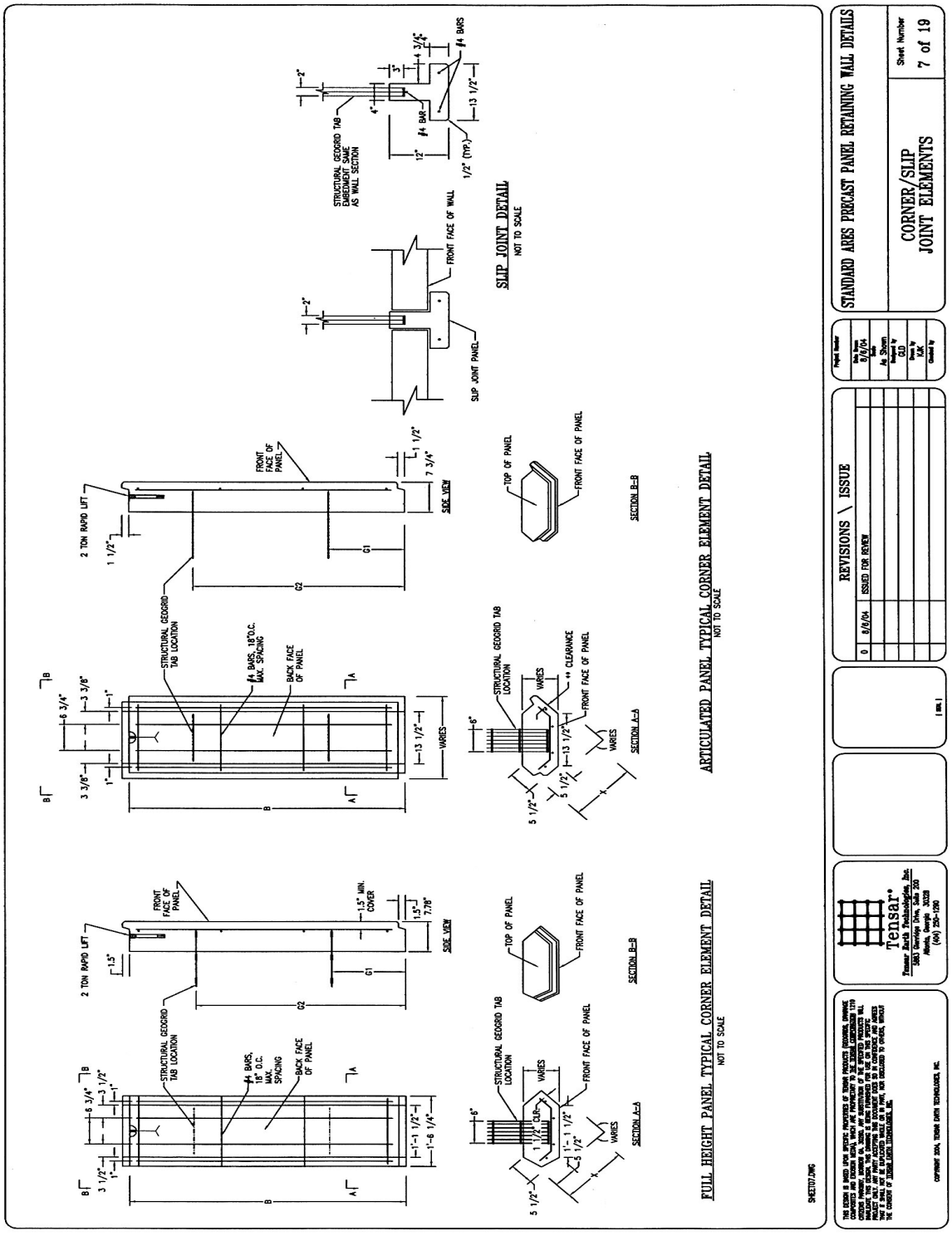
SLIP JOINT DETAIL
NOT TO SCALE
ARTICULATED PANEL TYPICAL CORNER ELEMENT DETAIL
NOT TO SCALE
FULL HEIGHT PANEL TYPICAL CORNER ELEMENT DETAIL
NOT TO SCALE
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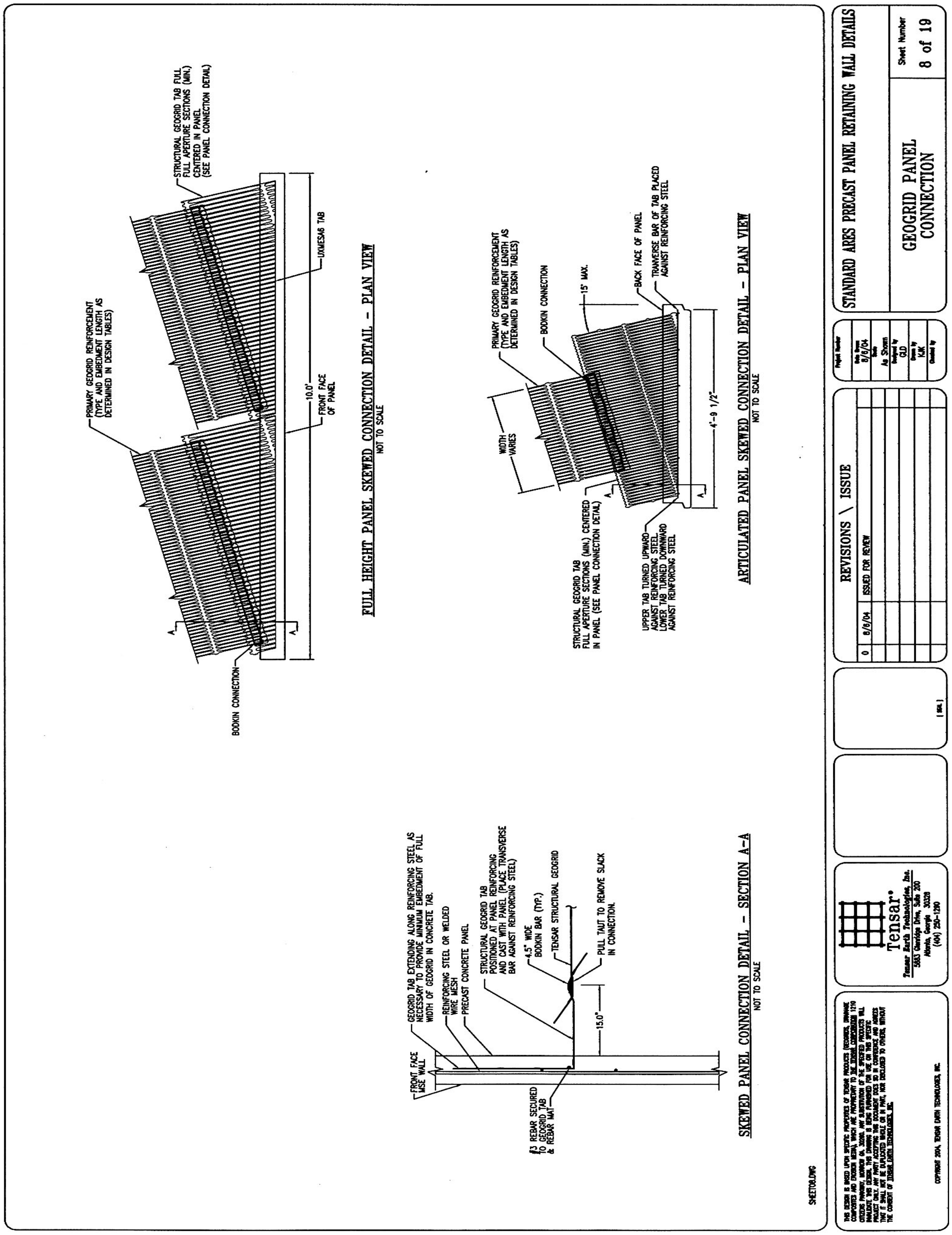
FULL HEIGHT PANEL SKEWED CONNECTION DETAIL – PLAN VIEW
NOT TO SCALE
PRIMARY GEOGRID REINFORCEMENT (TYPE AND EMBEDMENT LENGTH AS DETERMINED IN DESIGN TABLES)
STRUCTURAL GEOGRID TAB FULL FULL APERTURE SECTIONS (MIN.) CENTERED IN PANEL (SEE PANEL CONNECTION DETAIL)
BODKIN CONNECTION
10.0'
FRONT FACE OF PANEL
ARTICULATED PANEL SKEWED CONNECTION DETAIL – PLAN VIEW
NOT TO SCALE
WIDTH VARIES
15' MAX.
BACK FACE OF PANEL
TRANVERSE BAR OF TAB PLACED AGAINST REINFORCING STEEL
4'-9 1/2"
STRUCTURAL GEOGRID TAB FULL APERTURE SECTIONS (MIN.) CENTERED IN PANEL (SEE PANEL CONNECTION DETAIL)
UPPER TAB TURNED UPWARD AGAINST REINFORCING STEEL. LOWER TAB TURNED DOWNWARD AGAINST REINFORCING STEEL
SKEWED PANEL CONNECTION DETAIL – SECTION A-A
NOT TO SCALE
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GEOGRID TAB EXTENDING ALONG REINFORCING STEEL AS NECESSARY TO PROVIDE MINIMUM EMBEDMENT OF FULL WIDTH OF GEOGRID IN CONCRETE TAB.
REINFORCING STEEL OR WELDED WIRE MESH
PRECAST CONCRETE PANEL
STRUCTURAL GEOGRID TAB POSITIONED AT PANEL REINFORCING AND CAST WITH PANEL (PLACE TRANSVERSE BAR AGAINST REINFORCING STEEL)
4.5" WIDE BODKIN BAR (TYP.)
TENSAR STRUCTURAL GEOGRID
PULL TAUT TO REMOVE SLACK IN CONNECTION.
15.0"
#3 REBAR SECURED TO GEOGRID TAB & REBAR MAT
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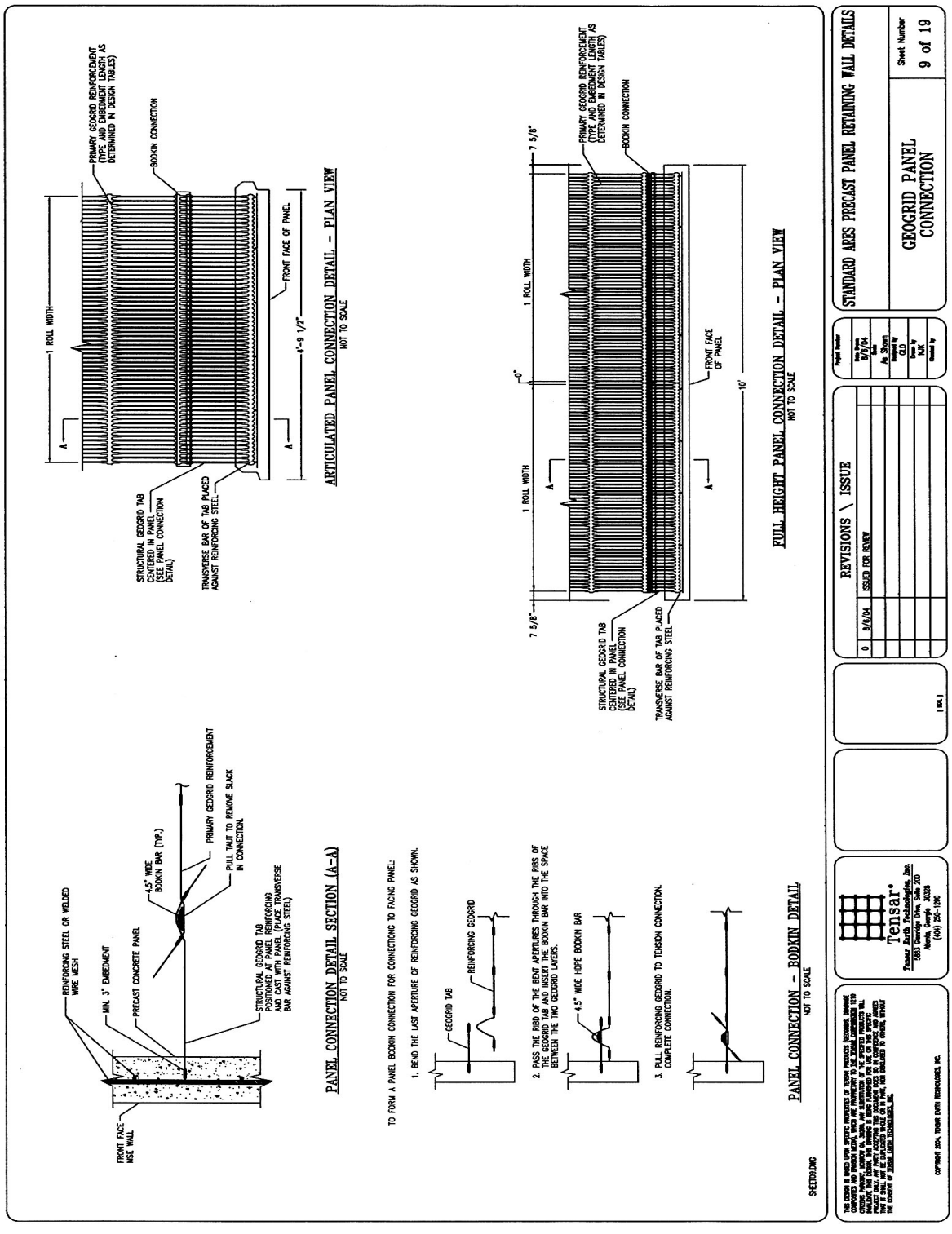
PANEL CONNECTION DETAIL (A-A)
NOT TO SCALE
REINFORCING STEEL OR WELDED WIRE MESH
MIN. 3" EMBEDMENT
PRECAST CONCRETE PANEL
4.5" WIDE BODKIN BAR (TYP.)
PRIMARY GEOGRID REINFORCEMENT
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STRUCTURAL GEOGRID TAB POSITIONED AT PANEL MIDHEIGHT AND CAST WITH PANEL (PLACE TRANSVERSE BAR AGAINST REINFORCING STEEL)
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NOT TO SCALE
1 ROLL WIDTH
A
PRIMARY GEOGRID REINFORCEMENT (TYPE AND EMBEDMENT LENGTH AS DETERMINED IN DESIGN TABLES)
BODKIN CONNECTION
STRUCTURAL GEOGRID TAB CENTERED IN PANEL (SEE PANEL CONNECTION DETAIL)
TRANSVERSE BAR OF TAB PLACED AGAINST REINFORCING STEEL
FRONT FACE OF PANEL
1'-9 1/2"
PANEL CONNECTION - BODKIN DETAIL
NOT TO SCALE
TO FORM A PANEL BODKIN CONNECTION FOR CONNECTING TO FACING PANEL:
1. BEND THE LAST APERTURE OF REINFORCING GEOGRID AS SHOWN.
GEOGRID TAB
REINFORCING GEOGRID
2. PASS THE RIBD OF THE BENT APERTURES THROUGH THE RIBS OF THE GEOGRID TAB AND INSERT THE BODKIN BAR INTO THE SPACE BETWEEN THE TWO GEOGRID LAYERS.
4.5" WIDE HDPE BODKIN BAR
3. PULL REINFORCING GEOGRID TO TENSION CONNECTION. COMPLETE CONNECTION.
FULL HEIGHT PANEL CONNECTION DETAIL - PLAN VIEW
NOT TO SCALE
7 5/8"
1 ROLL WIDTH
0"
7 5/8"
PRIMARY GEOGRID REINFORCEMENT (TYPE AND EMBEDMENT LENGTH AS DETERMINED IN DESIGN TABLES)
BODKIN CONNECTION
FRONT FACE OF PANEL
10'
STRUCTURAL GEOGRID TAB CENTERED IN PANEL (SEE PANEL CONNECTION DETAIL)
TRANSVERSE BAR OF TAB PLACED AGAINST REINFORCING STEEL
SHEET/BLDNG
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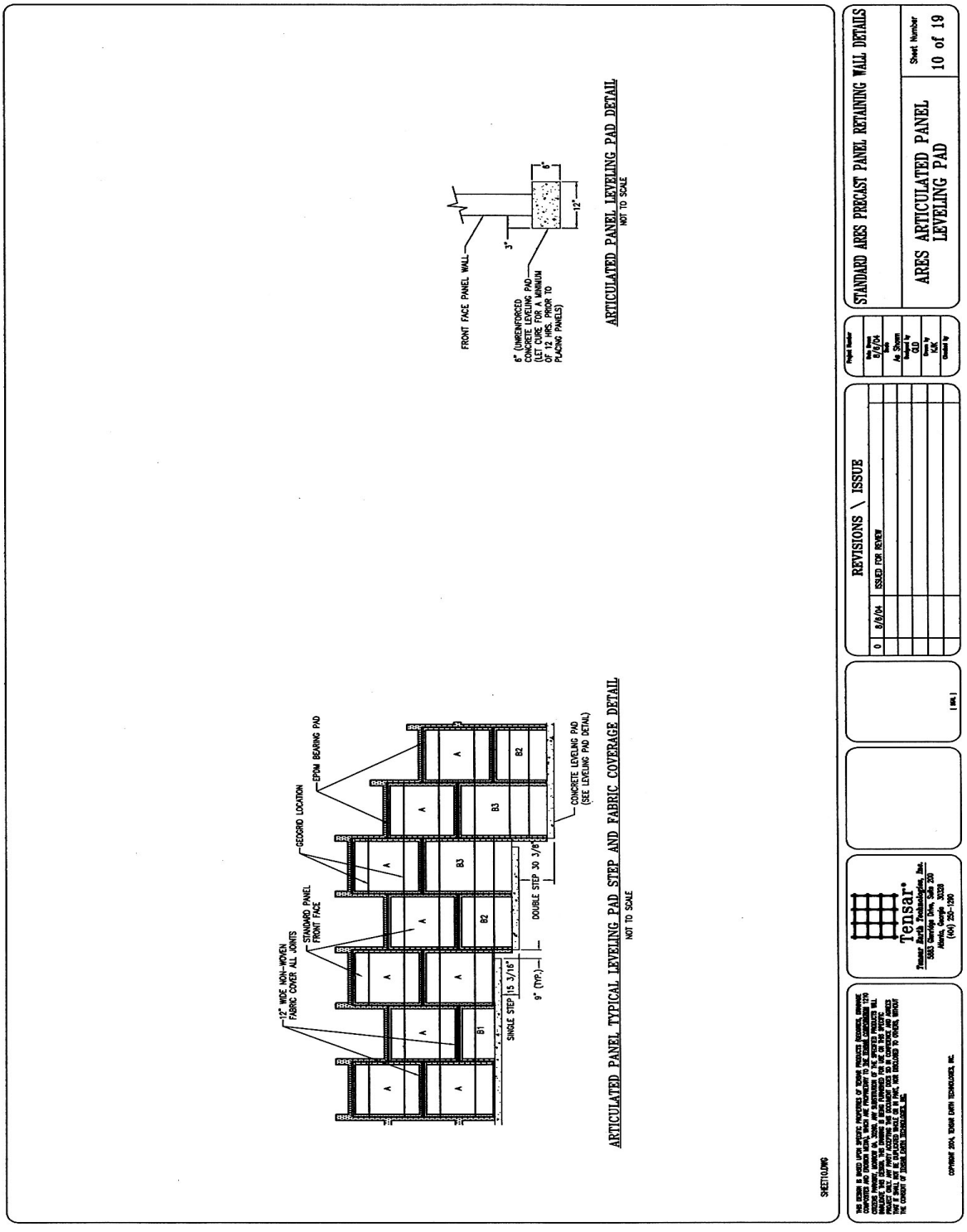
ARTICULATED PANEL LEVELING PAD DETAIL
NOT TO SCALE
FRONT FACE PANEL WALL
3"
6" (UNREINFORCED CONCRETE LEVELING PAD (LET CURE FOR A MINIMUM OF 12 HRS. PRIOR TO PLACING PANELS)
6"
12"
ARTICULATED PANEL TYPICAL LEVELING PAD STEP AND FABRIC COVERAGE DETAIL
NOT TO SCALE
12" WIDE NON-WOVEN FABRIC COVER ALL JOINTS
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SINGLE STEP 15 3/16"
9" (TYP.)
DOUBLE STEP 30 3/8"
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B2
B3
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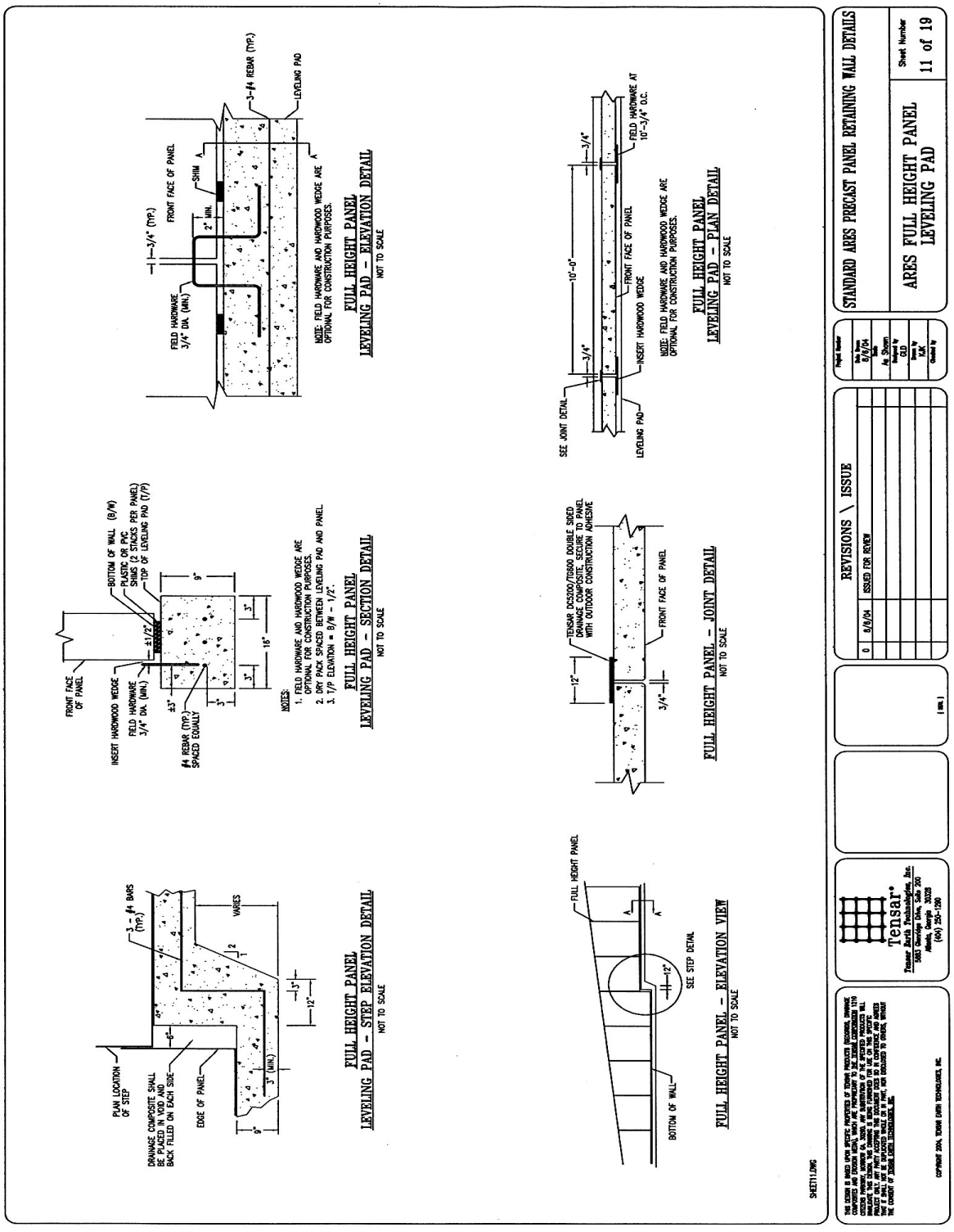
FULL HEIGHT PANEL
LEVELING PAD – ELEVATION DETAIL
NOT TO SCALE
FIELD HARDWARE 3/4" DIA. (MIN.)
1-3/4" (TYP.)
FRONT FACE OF PANEL
SHIM
2" MIN.
3-#4 REBAR (TYP.)
LEVELING PAD
NOTE: FIELD HARDWARE AND HARDWOOD WEDGE ARE OPTIONAL FOR CONSTRUCTION PURPOSES.
FULL HEIGHT PANEL
LEVELING PAD – SECTION DETAIL
NOT TO SCALE
FRONT FACE OF PANEL
INSERT HARDWOOD WEDGE
FIELD HARDWARE 3/4" DIA. (MIN.)
BOTTOM OF WALL (B/W)
PLASTIC OR PVC SHIMS (2 STACKS PER PANEL)
TOP OF LEVELING PAD (T/P)
±1/2"
±3"
#4 REBAR (TYP.) SPACED EQUALLY
9"
3"
16"
NOTES:
1. FIELD HARDWARE AND HARDWOOD WEDGE ARE OPTIONAL FOR CONSTRUCTION PURPOSES
2. DRY PACK SPACED BETWEEN LEVELING PAD AND PANEL.
3. T/P ELEVATION = B/W - 1/2".
FULL HEIGHT PANEL
LEVELING PAD – STEP ELEVATION DETAIL
NOT TO SCALE
PLAN LOCATION OF STEP
3 - #4 BARS (TYP.)
DRAINAGE COMPOSITE SHALL BE PLACED IN VOID AND BACK FILLED ON EACH SIDE
EDGE OF PANEL
VARIES
45°
12"
3" (MIN.)
9"
FULL HEIGHT PANEL – ELEVATION VIEW
NOT TO SCALE
FULL HEIGHT PANEL
SEE STEP DETAIL
BOTTOM OF WALL
FULL HEIGHT PANEL – JOINT DETAIL
NOT TO SCALE
TENSAR DCS200/TG800 DOUBLE SIDED DRAINAGE COMPOSITE, SECURE TO PANEL WITH OUTDOOR CONSTRUCTION ADHESIVE
12"
FRONT FACE OF PANEL
3/4"
FULL HEIGHT PANEL
LEVELING PAD – PLAN DETAIL
NOT TO SCALE
10'-0"
3/4"
FIELD HARDWARE AT 10'-3/4" O.C.
FRONT FACE OF PANEL
INSERT HARDWOOD WEDGE
NOTE: FIELD HARDWARE AND HARDWOOD WEDGE ARE OPTIONAL FOR CONSTRUCTION PURPOSES.
SEE JOINT DETAIL
LEVELING PAD
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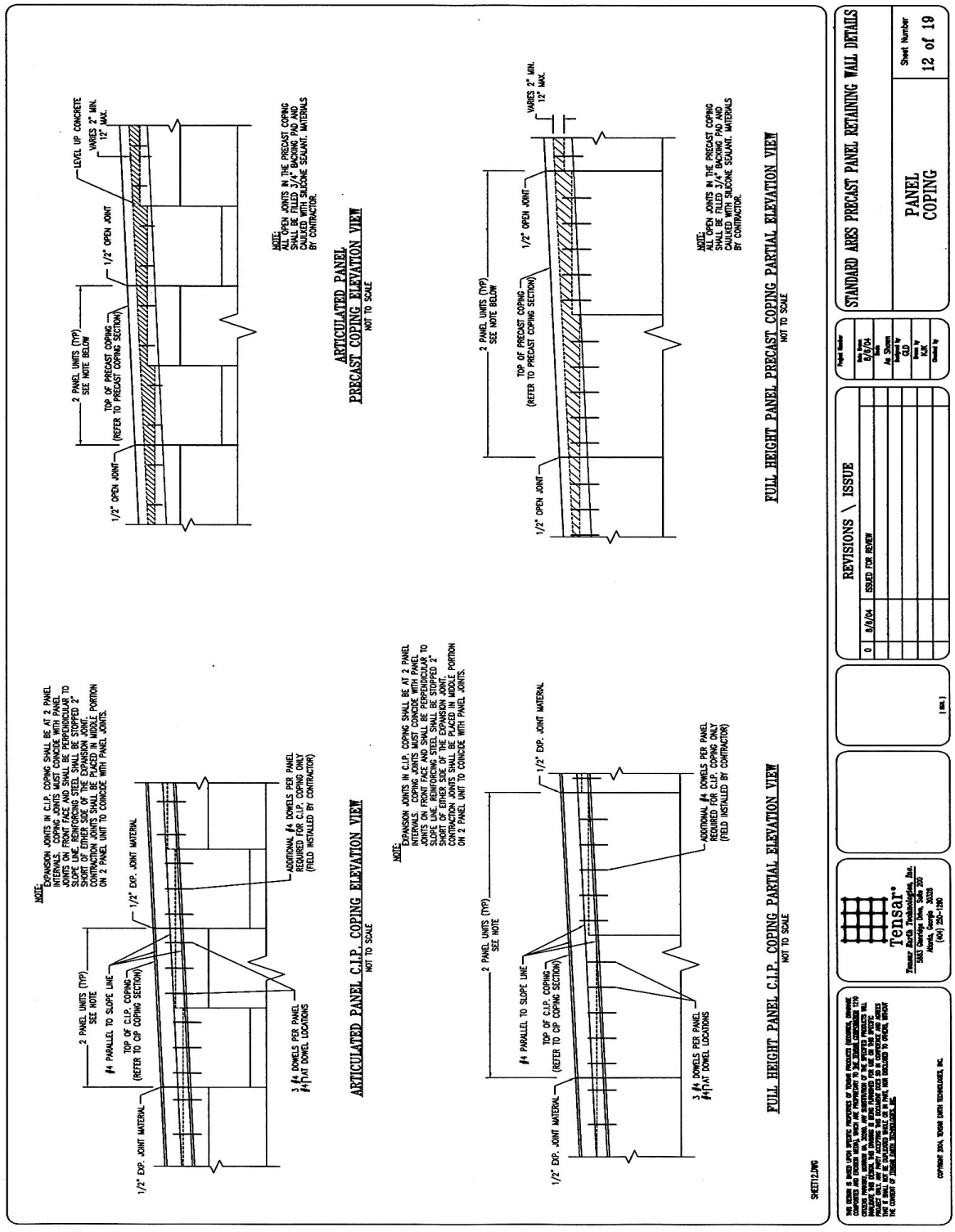
ARTICULATED PANEL
PRECAST COPING ELEVATION VIEW
NOT TO SCALE
2 PANEL UNITS (TYP)
SEE NOTE BELOW
TOP OF PRECAST COPING
(REFER TO PRECAST COPING SECTION)
1/2" OPEN JOINT
LEVEL UP CONCRETE
VARIES 2" MIN.
12" MAX.
NOTE:
ALL OPEN JOINTS IN THE PRECAST COPING
SHALL BE FILLED 3/4" BACKING PAD AND
CAULKED WITH SILICONE SEALANT. MATERIALS
BY CONTRACTOR.
ARTICULATED PANEL C.I.P. COPING ELEVATION VIEW
NOT TO SCALE
NOTE:
EXPANSION JOINTS IN C.I.P. COPING SHALL BE AT 2 PANEL
INTERVALS. COPING JOINTS MUST COINCIDE WITH PANEL
JOINTS ON FRONT FACE AND SHALL BE PERPENDICULAR TO
SLOPE LINE. REINFORCING STEEL SHALL BE STOPPED 2"
SHORT OF EITHER SIDE OF THE EXPANSION JOINT.
CONTRACTION JOINTS SHALL BE PLACED IN MIDDLE PORTION
ON 2 PANEL UNIT TO COINCIDE WITH PANEL JOINTS.
2 PANEL UNITS (TYP)
SEE NOTE
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TOP OF C.I.P. COPING
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(FIELD INSTALLED BY CONTRACTOR)
3 #4 DOWELS PER PANEL
#4 DOWEL LOCATIONS
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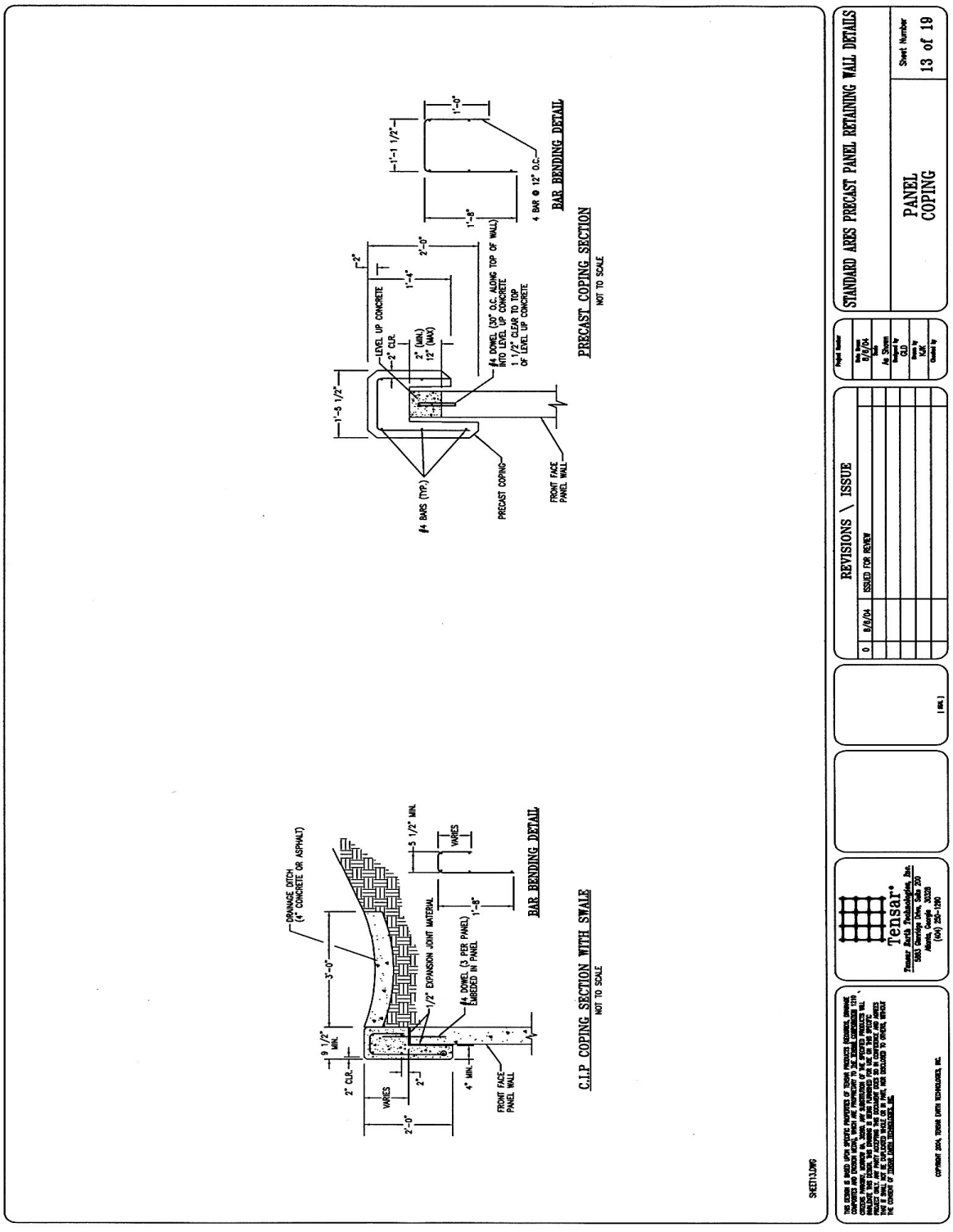
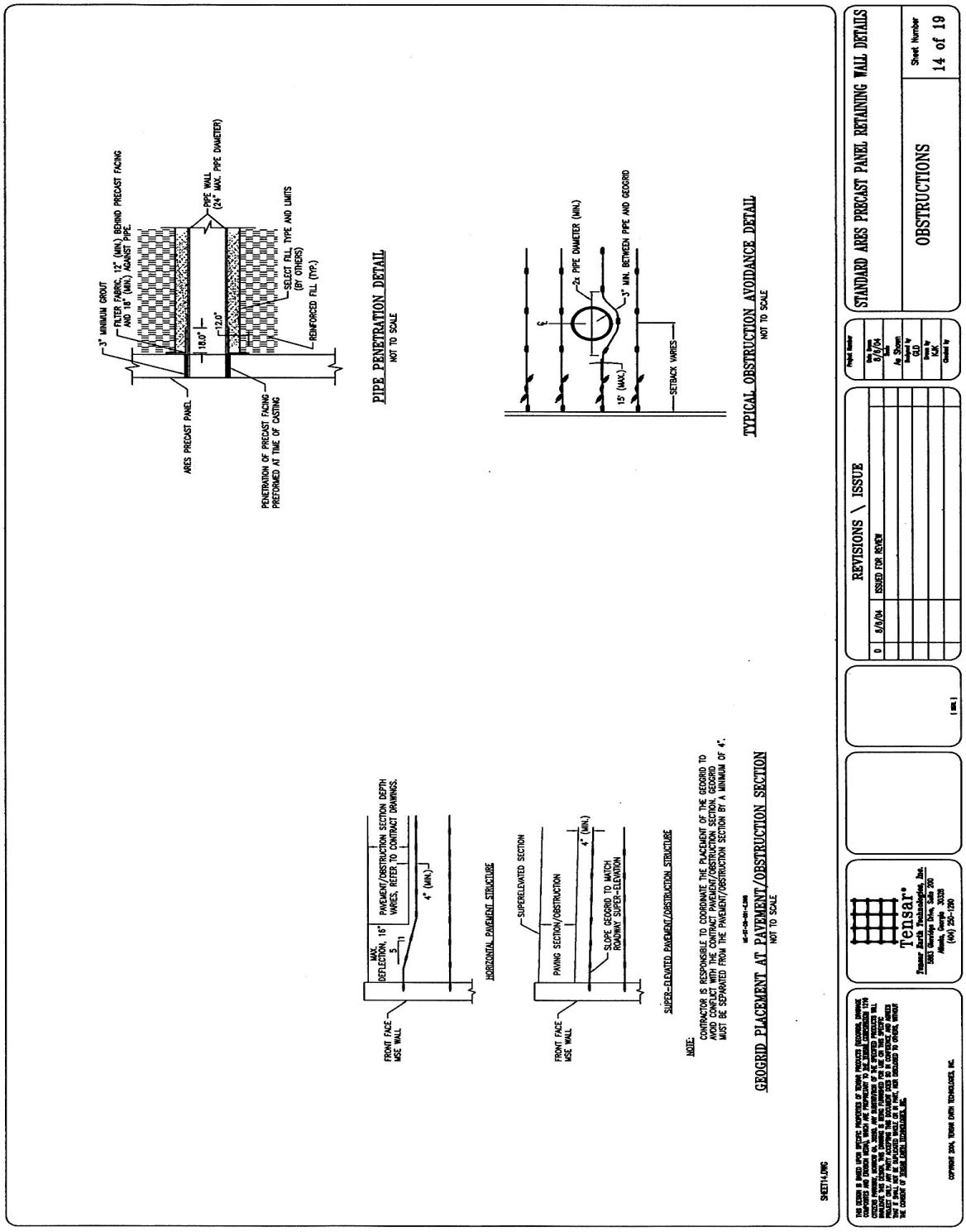
Drawn By
CLD
Design By
KJK
Checked By
STANDARD ARES PRECAST PANEL RETAINING WALL DETAILS
PANEL
COPING
Sheet Number
12 of 19
Tensar
Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250-1290
SHEET12.DWG


STANDARD ARES PRECAST PANEL RETAINING WALL DETAILS
PANEL COPING
Sheet Number 13 of 19
REVISIONS \ ISSUE
0 8/8/04 ISSUED FOR REVIEW
Tensar
PRECAST COPING SECTION
NOT TO SCALE
#4 BARS (TYP.)
PRECAST COPING
FRONT FACE PANEL WALL
#4 DOWEL (30" O.C. ALONG TOP OF WALL) INTO LEVEL UP CONCRETE 1 1/2" CLEAR TO TOP OF LEVEL UP CONCRETE
LEVEL UP CONCRETE
2" CLR.
2" (MIN.) 12" (MAX)
1'-5 1/2"
2"
1'-4"
2'-0"
BAR BENDING DETAIL
4 BAR @ 12" O.C.
1'-1 1/2"
1'-0"
1'-8"
C.I.P COPING SECTION WITH SWALE
NOT TO SCALE
DRAINAGE DITCH (4" CONCRETE OR ASPHALT)
3'-0"
9 1/2" MIN.
2" CLR.
VARIES
2'-0"
2"
4" MIN.
FRONT FACE PANEL WALL
#4 DOWEL (3 PER PANEL) EMBEDDED IN PANEL
1/2" EXPANSION JOINT MATERIAL
5 1/2" MIN.
VARIES
1'-8"
BAR BENDING DETAIL
SHEET13.DWG


3" MINIMUM GROUT
FILTER FABRIC, 12" (MIN.) BEHIND PRECAST FACING AND 18" (MIN.) AGAINST PIPE
PIPE WALL (24" MAX. PIPE DIAMETER)
18.0"
12.0"
SELECT FILL TYPE AND LIMITS (BY OTHERS)
REINFORCED FILL (TYP.)
ARES PRECAST PANEL
PENETRATION OF PRECAST FACING PREFORMED AT TIME OF CASTING
PIPE PENETRATION DETAIL
NOT TO SCALE
2x PIPE DIAMETER (MIN.)
3" MIN. BETWEEN PIPE AND GEOGRID
15' (MAX.)
SETBACK VARIES
TYPICAL OBSTRUCTION AVOIDANCE DETAIL
NOT TO SCALE
MAX. DEFLECTION, 15'
5
1
PAVEMENT/OBSTRUCTION SECTION DEPTH VARIES, REFER TO CONTRACT DRAWINGS.
4" (MIN.)
FRONT FACE MSE WALL
HORIZONTAL PAVEMENT STRUCTURE
SUPERELEVATED SECTION
PAVING SECTION/OBSTRUCTION
4" (MIN.)
SLOPE GEOGRID TO MATCH ROADWAY SUPER-ELEVATION
FRONT FACE MSE WALL
SUPER-ELEVATED PAVEMENT/OBSTRUCTION STRUCTURE
NOTE
CONTRACTOR IS RESPONSIBLE TO COORDINATE THE PLACEMENT OF THE GEOGRID TO AVOID CONFLICT WITH THE CONTRACT PAVEMENT/OBSTRUCTION SECTION. GEOGRID MUST BE SEPARATED FROM THE PAVEMENT/OBSTRUCTION SECTION BY A MINIMUM OF 4".
GEOGRID PLACEMENT AT PAVEMENT/OBSTRUCTION SECTION
NOT TO SCALE
SHEET-LIVING
REVISIONS \ ISSUE
0 8/8/04 ISSUED FOR REVIEW
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STANDARD ARES PRECAST PANEL RETAINING WALL DETAILS
OBSTRUCTIONS
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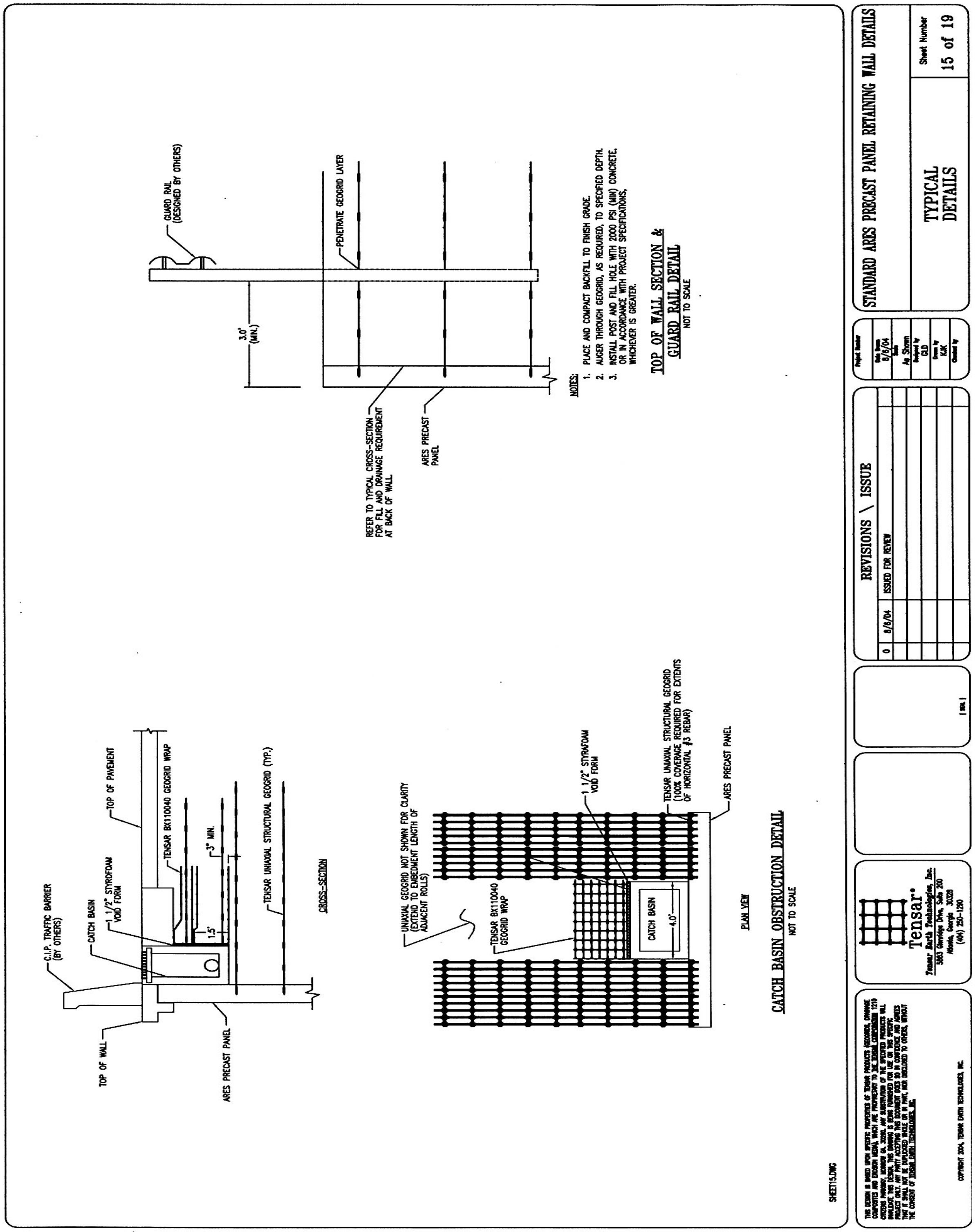
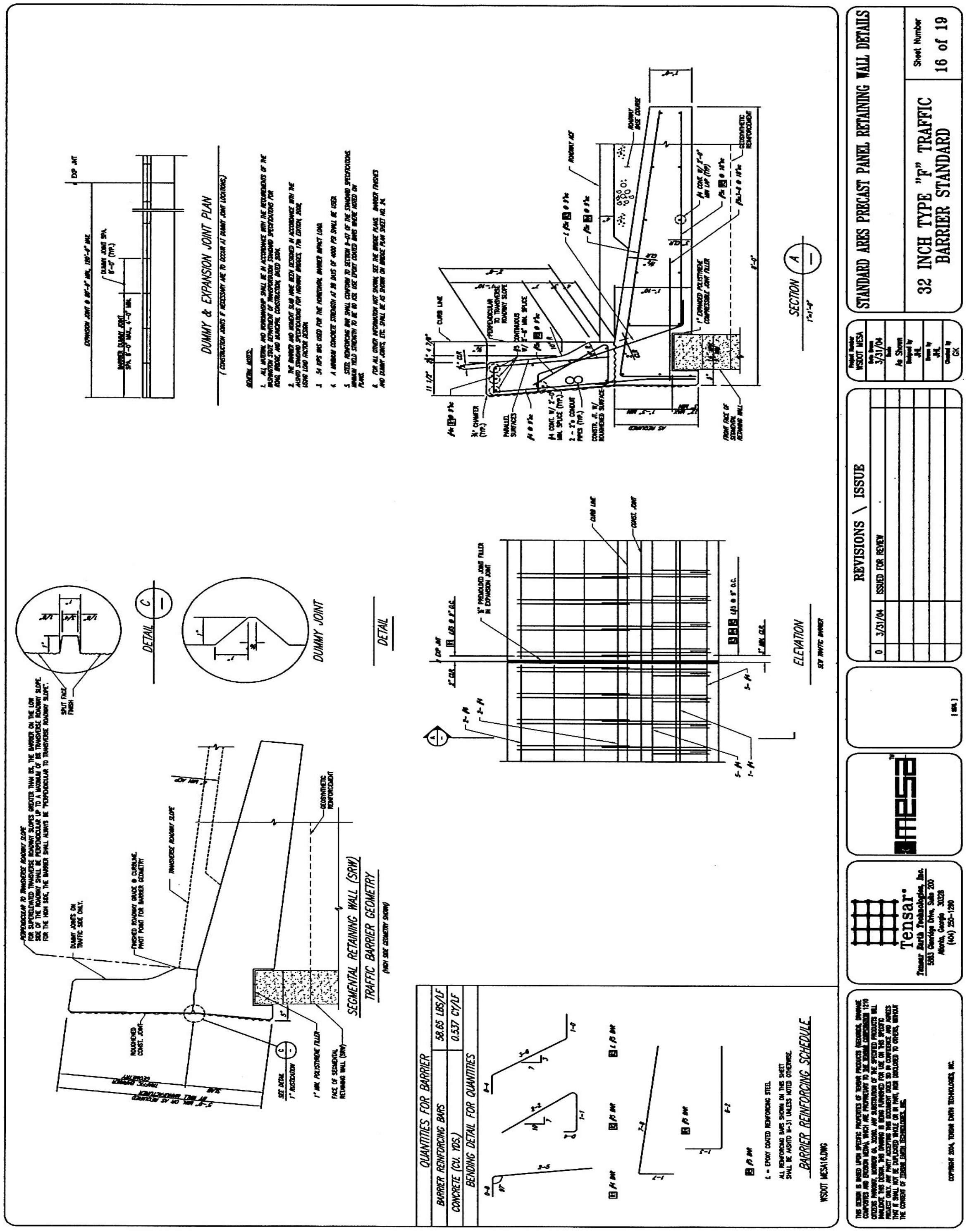
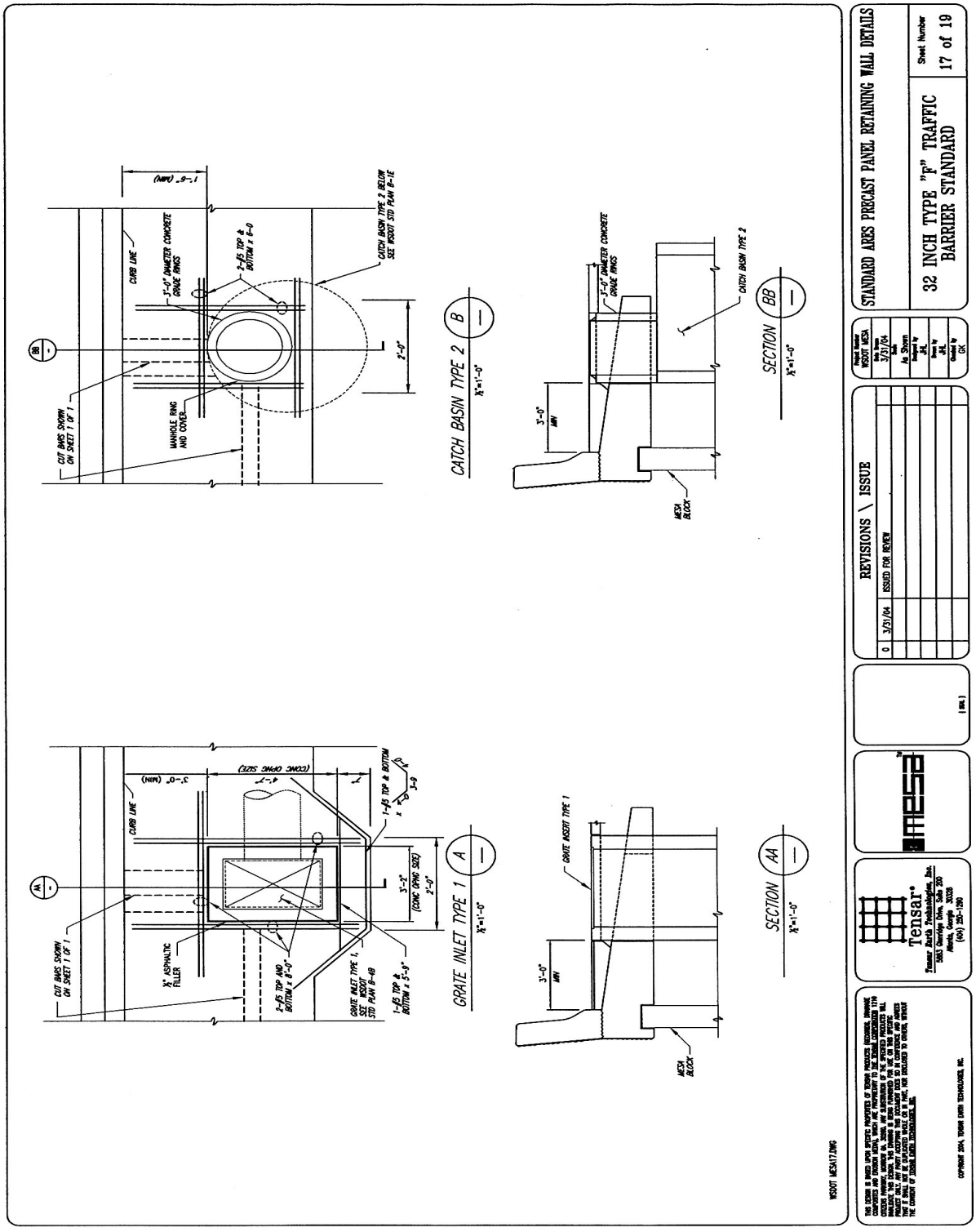

GUARD RAIL (DESIGNED BY OTHERS)
PENETRATE GEOGRID LAYER
3.0' (MIN.)
REFER TO TYPICAL CROSS-SECTION FOR FILL AND DRAINAGE REQUIREMENT AT BACK OF WALL
ARES PRECAST PANEL
NOTES:
1. PLACE AND COMPACT BACKFILL TO FINISH GRADE.
2. AUGER THROUGH GEOGRID, AS REQUIRED, TO SPECIFIED DEPTH.
3. INSTALL POST AND FILL HOLE WITH 2000 PSI (MIN) CONCRETE, OR IN ACCORDANCE WITH PROJECT SPECIFICATIONS, WHICHEVER IS GREATER.
TOP OF WALL SECTION & GUARD RAIL DETAIL
NOT TO SCALE
C.I.P. TRAFFIC BARRIER (BY OTHERS)
CATCH BASIN
1 1/2" STYROFOAM VOID FORM
TOP OF PAVEMENT
TENSAR BX110040 GEOGRID WRAP
3" MIN.
1.5'
TOP OF WALL
ARES PRECAST PANEL
TENSAR UNIAXIAL STRUCTURAL GEOGRID (TYP.)
CROSS-SECTION
UNIAXIAL GEOGRID NOT SHOWN FOR CLARITY (EXTEND TO EMBEDMENT LENGTH OF ADJACENT ROLLS)
TENSAR BX110040 GEOGRID WRAP
1 1/2" STYRAFOAM VOID FORM
TENSAR UNIAXIAL STRUCTURAL GEOGRID (100% COVERAGE REQUIRED FOR EXTENTS OF HORIZONTAL #3 REBAR)
ARES PRECAST PANEL
CATCH BASIN
4.0'
PLAN VIEW
CATCH BASIN OBSTRUCTION DETAIL
NOT TO SCALE
SHEET15.DWG
REVISIONS \ ISSUE
0 8/8/04 ISSUED FOR REVIEW
8/8/04
As Shown
Tensar
STANDARD ARES PRECAST PANEL RETAINING WALL DETAILS
TYPICAL DETAILS
Sheet Number
15 of 19


STANDARD ARES PRECAST PANEL RETAINING WALL DETAILS
32 INCH TYPE "F" TRAFFIC BARRIER STANDARD
Sheet Number
16 of 19
REVISIONS \ ISSUE
0 3/31/04 ISSUED FOR REVIEW
Tensar
mesa
SECTION A
ELEVATION
DUMMY JOINT
DETAIL C
DETAIL
DUMMY & EXPANSION JOINT PLAN
SEGMENTAL RETAINING WALL (SRW) TRAFFIC BARRIER GEOMETRY
QUANTITIES FOR BARRIER
BARRIER REINFORCING BARS 58.65 LBS/LF
CONCRETE (CU. YDS.) 0.537 CY/LF
BENDING DETAIL FOR QUANTITIES
BARRIER REINFORCING SCHEDULE


STANDARD ARES PRECAST PANEL RETAINING WALL DETAILS
32 INCH TYPE "F" TRAFFIC BARRIER STANDARD
Sheet Number 17 of 19
REVISIONS \ ISSUE
0 3/31/04 ISSUED FOR REVIEW
Project Name WSDOT MESA
Date 3/31/04
Scale As Shown
Designed by JHL
Drawn by JHL
Checked by GIK
CATCH BASIN TYPE 2
GRATE INLET TYPE 1
SECTION BB
SECTION AA
CURB LINE
CUT BARS SHOWN ON SHEET 1 OF 1
MANHOLE RING AND COVER
CATCH BASIN TYPE 2 BELOW SEE WSDOT STD PLAN B-1E
2'-0" DIAMETER CONCRETE GRADE RINGS
2-#5 TOP & BOTTOM x 6'-0
3'-0" MIN
MESH BLOCK
3" ASPHALTIC FILLER
2-#5 TOP AND BOTTOM x 6'-0"
GRATE INLET TYPE 1, SEE WSDOT STD PLAN B-4B
1-#5 TOP & BOTTOM x 5'-0"
GRATE INSERT TYPE 1
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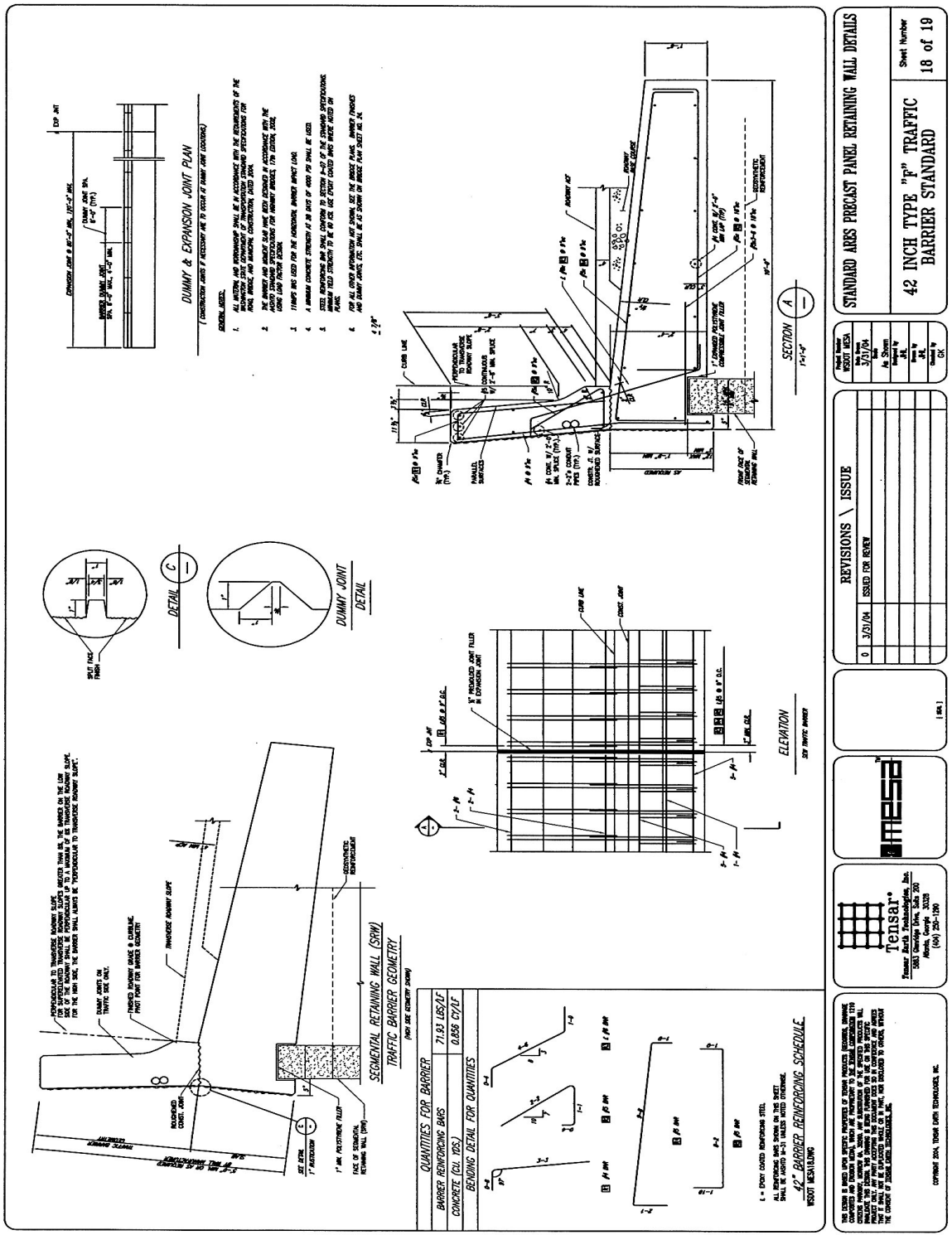
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250-1290
WSDOT MESA17.DWG
COPYRIGHT 2004, TENSAR EARTH TECHNOLOGIES, INC.


DUMMY & EXPANSION JOINT PLAN
DETAIL C
DUMMY JOINT DETAIL
SECTION A
ELEVATION
SEGMENTAL RETAINING WALL (SRW)
TRAFFIC BARRIER GEOMETRY
QUANTITIES FOR BARRIER
BARRIER REINFORCING BARS 71.93 LBS/LF
CONCRETE (CU. YDS.) 0.856 CY/LF
BENDING DETAIL FOR QUANTITIES
42" BARRIER REINFORCING SCHEDULE
WSDOT MESA RAILING
REVISIONS \ ISSUE
0 3/31/04 ISSUED FOR REVIEW
Tensar
STANDARD ARES PRECAST PANEL RETAINING WALL DETAILS
42 INCH TYPE "F" TRAFFIC BARRIER STANDARD
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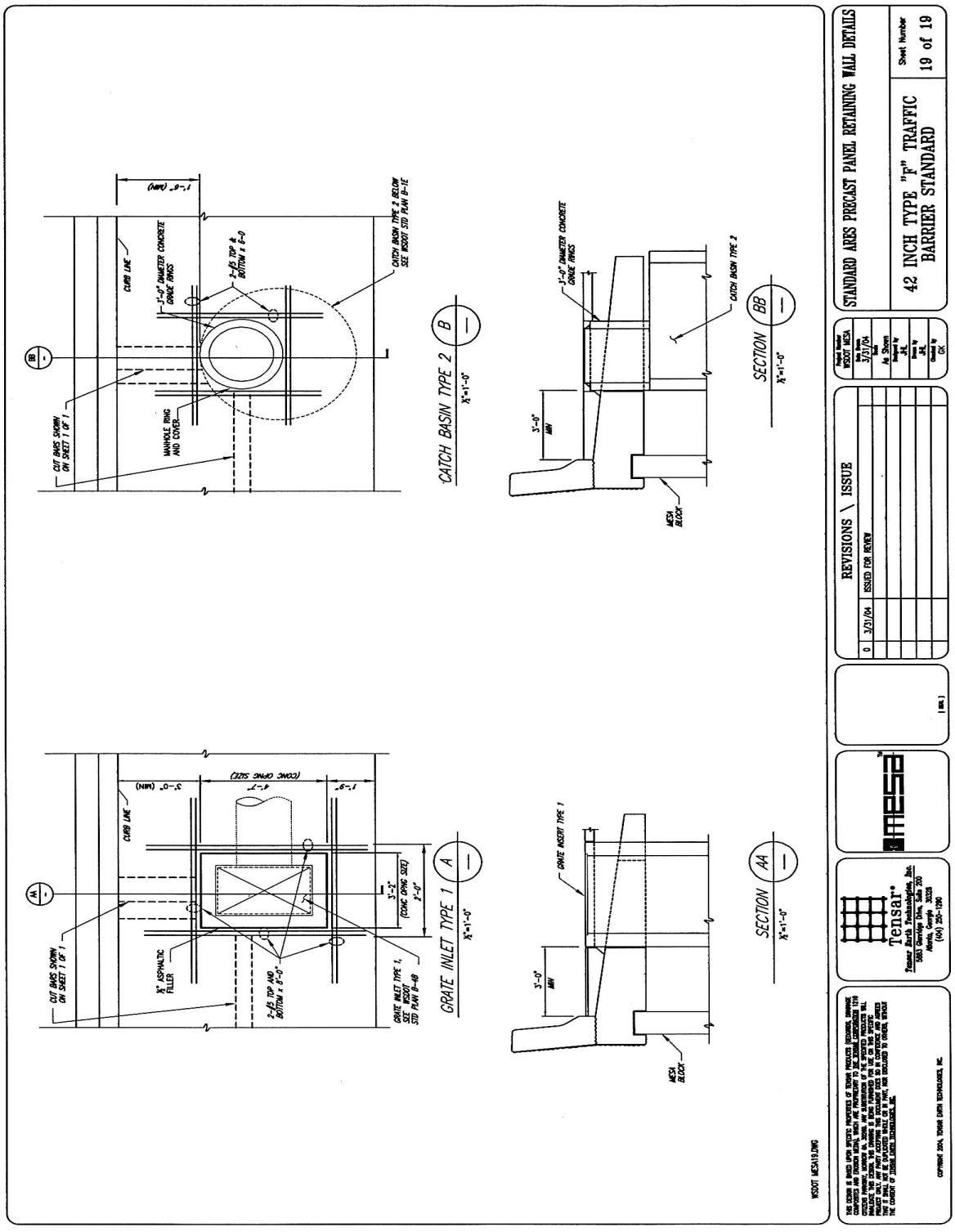
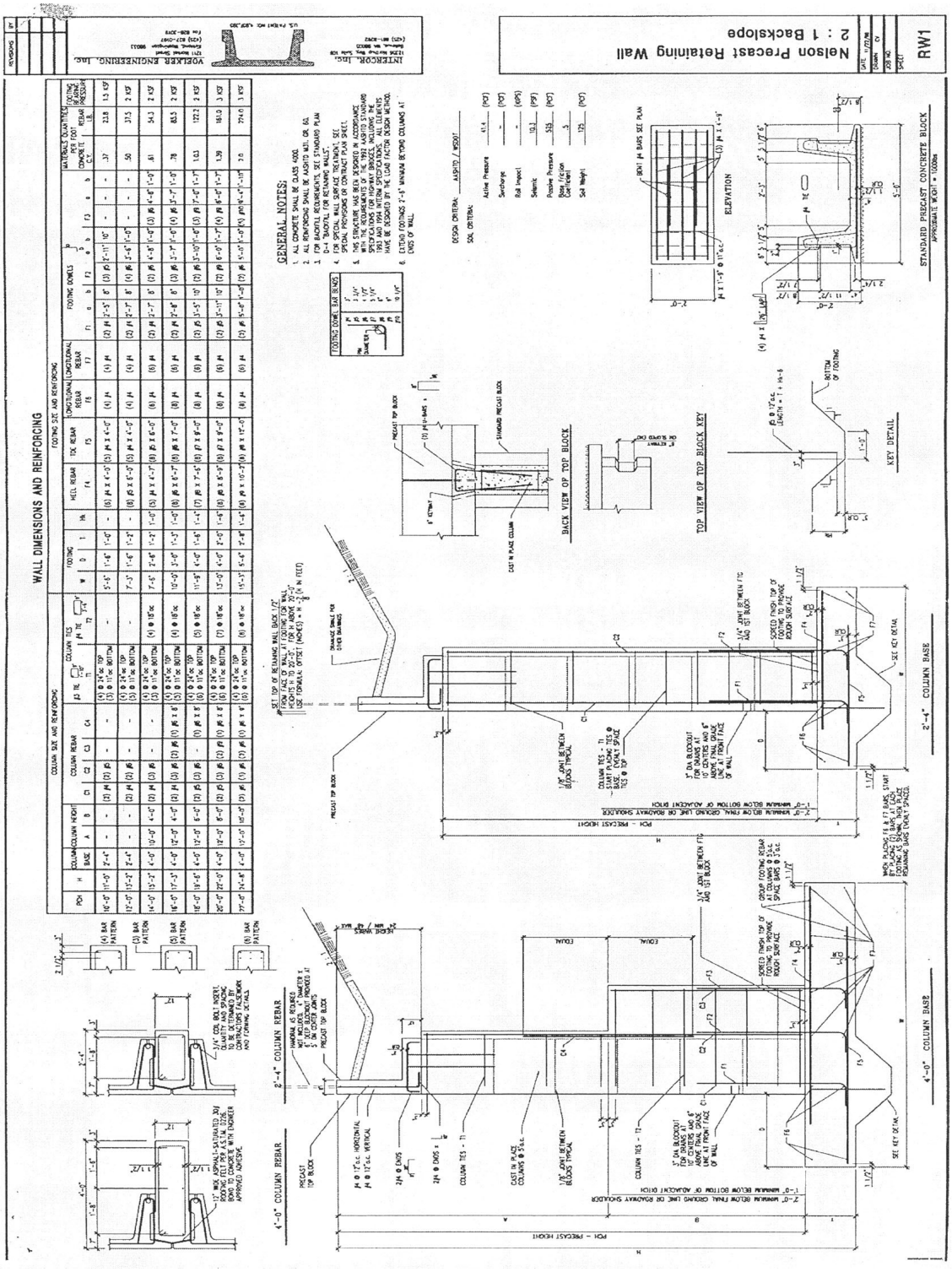

CATCH BASIN TYPE 2 B
1"=1'-0"
SECTION BB
1"=1'-0"
GRATE INLET TYPE 1 A
1"=1'-0"
SECTION AA
1"=1'-0"
CURB LINE
CUT BARS SHOWN ON SHEET 1 OF 1
MANHOLE RING AND COVER
CATCH BASIN TYPE 2 SEE WSDOT STD PLAN 8-11
GRATE INSERT TYPE 1
MESH BLOCK
WSDOT MESH10.DWG
REVISIONS \ ISSUE
ISSUED FOR REVIEW
STANDARD ARES PRECAST PANEL RETAINING WALL DETAILS
42 INCH TYPE "F" TRAFFIC BARRIER STANDARD
Sheet Number 19 of 19
Tensar
Tensar Earth Technologies, Inc.
5883 Glenridge Drive, Suite 200
Atlanta, Georgia 30328
(404) 250-1290

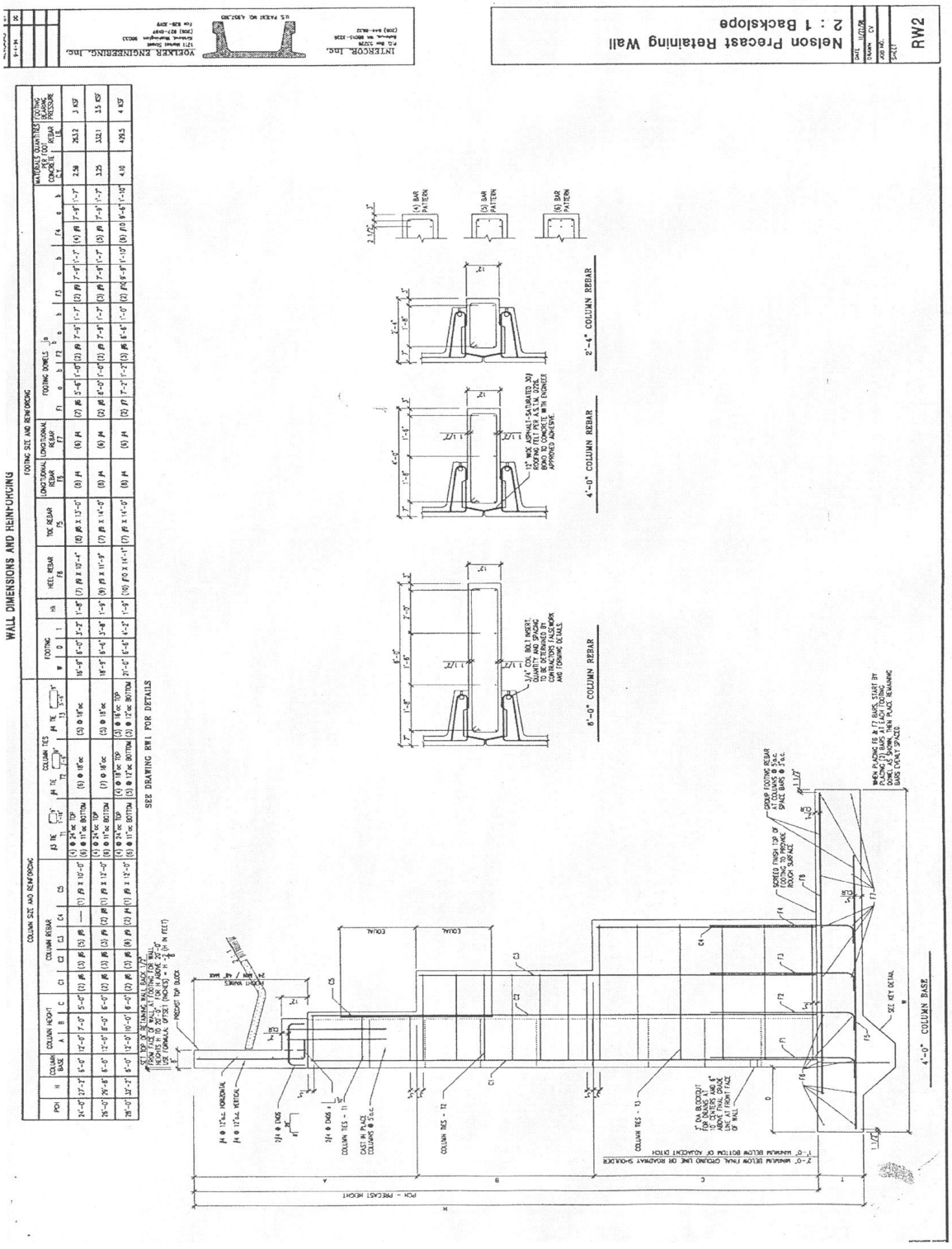
In addition to the general design requirements provided in **Appendix 15-A**, the following specific requirements apply to the design of the Nelson Wall:

No HITEC evaluation report is currently available for this wall system. However, in general, this wall system is used as a precast concrete substitute for the WSDOT Standard Plan Reinforced Concrete Cantilever Wall. The design procedures used for Nelson Walls are based on the AASHTO Standard Specifications for Highway Bridges (**2002**). Interim approval is given for the continued use of the AASHTO Standard Specifications as the basis for design.

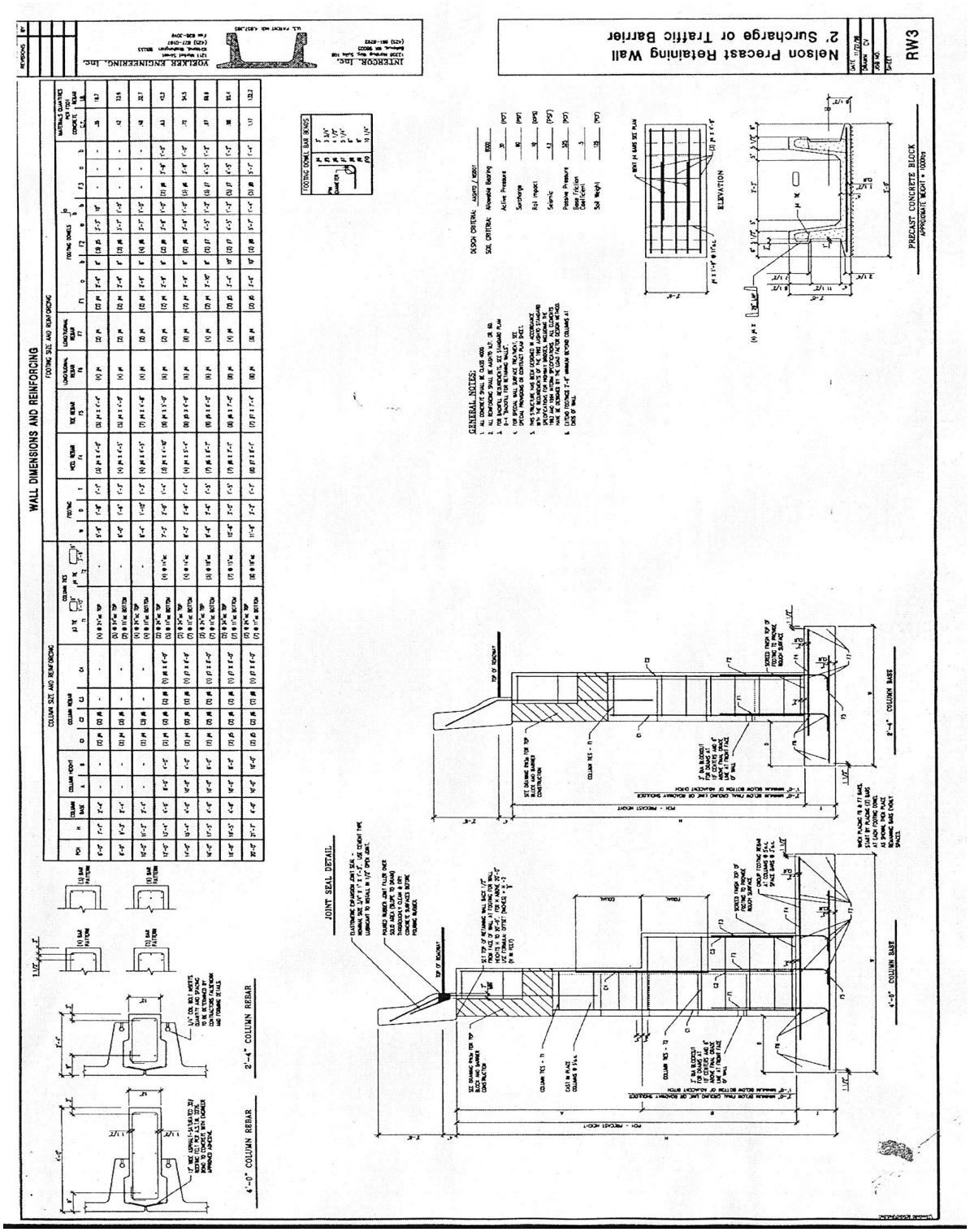
The preapproved height for this wall system (28 ft) is less than the standard preapproved height of 33 ft for proprietary wall systems. Use of this wall system for heights greater than 28 ft requires approval by the State Bridge Design Engineer and the State Geotechnical Engineer.

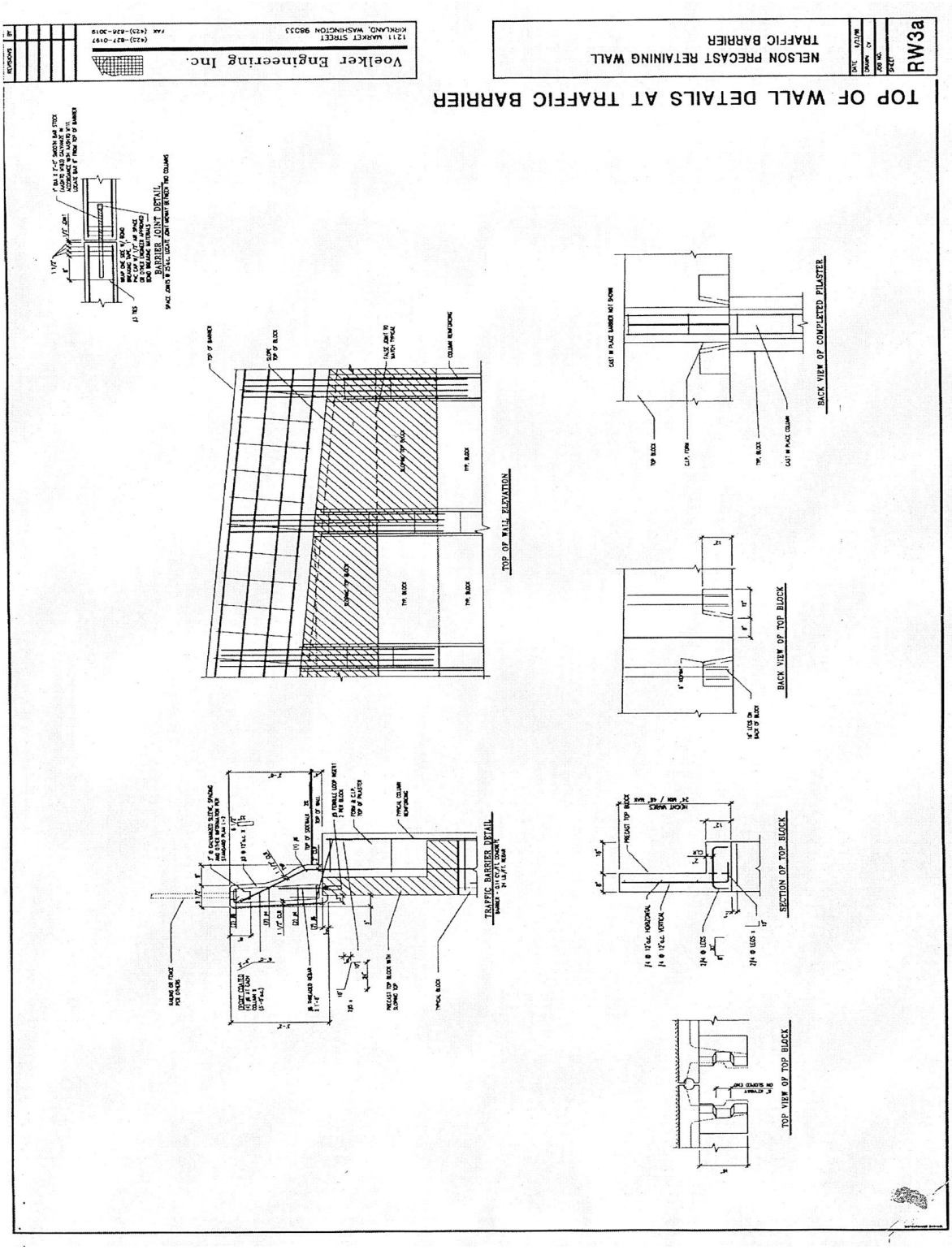
Approved details for the Nelson Wall system are provided in the following plan sheets. Note that no approved details for penetration of culverts or other objects through the wall face were provided. Therefore, this wall system is not preapproved for such situations. This wall system is preapproved for placement of traffic barriers on top of the wall.

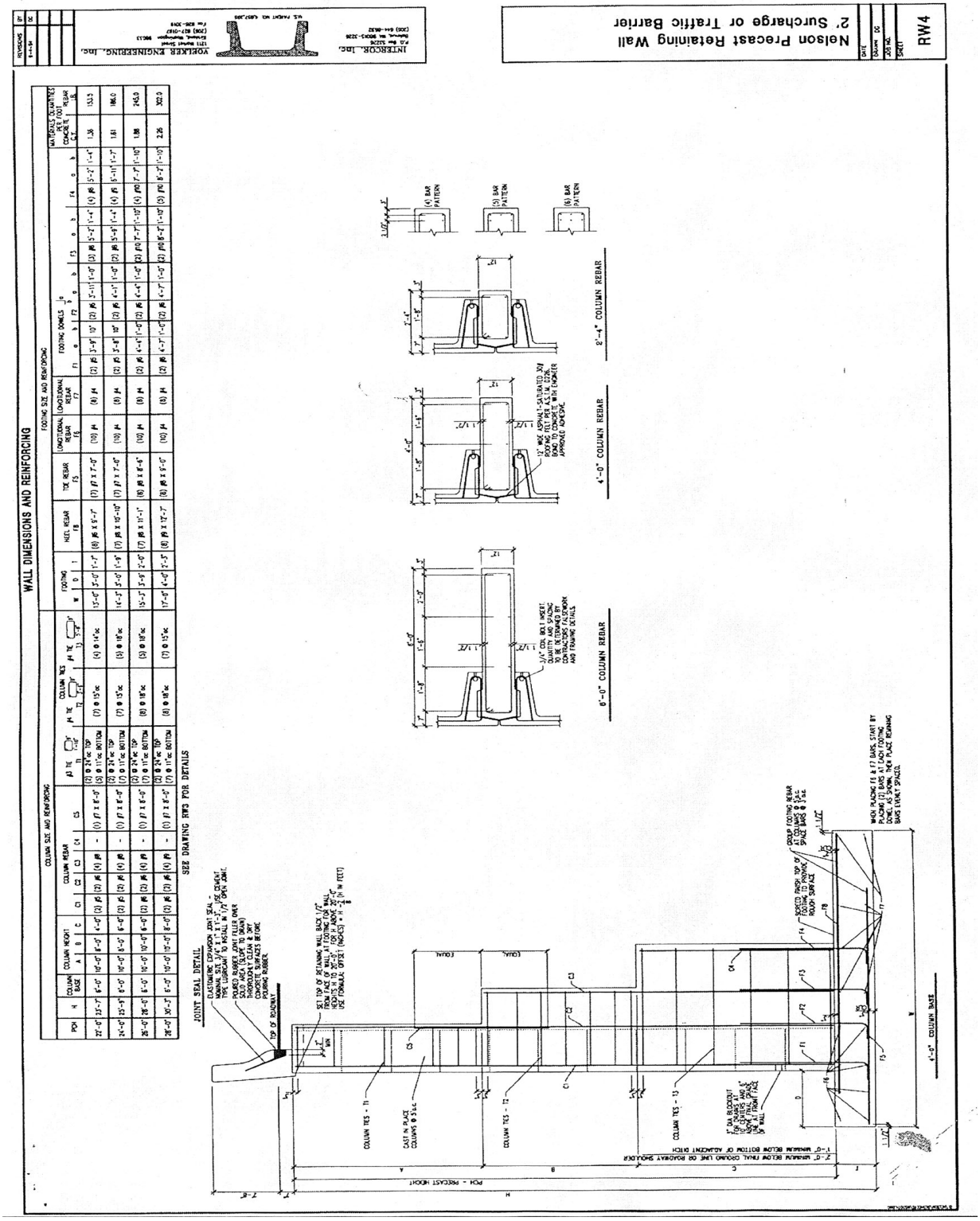

Nelson Precast Retaining Wall
2 : 1 Backslope
RW1
WALL DIMENSIONS AND REINFORCING
GENERAL NOTES:
STANDARD PRECAST CONCRETE BLOCK
ELEVATION
BACK VIEW OF TOP BLOCK
TOP VIEW OF TOP BLOCK KEY
KEY DETAIL
2'-4" COLUMN BASE
4'-0" COLUMN BASE
4'-0" COLUMN REBAR
2'-4" COLUMN REBAR
INTERCOR, Inc.
VOLKER ENGINEERING, Inc.



POH	H	COLUMN BASE	COLUMN HEIGHT A	B	C	COLUMN REBAR C1	C2	C3	C4	C5	J3 TIE T1	J4 TIE T2	COLUMN TIES J4 TIE T3	FOOTING W	L	H1	HEEL REBAR F6	TOE REBAR F5	LONGITUDINAL REBAR F8	LONGITUDINAL REBAR F7	FOOTING DOWELS a	b	F3	a	b	F4	a	b	MATERIALS QUANTITIES PER FOOT CONCRETE C.Y.	REBAR LBS.	FOOTING BEARING PRESSURE
24'-0"	23'-4"	4'-0"	12'-0"	7'-0"	5'-0"	(1) #8	(5) #8	(5) #8	—	(1) #8 x 10'-0"	(1) ● 24"oc TOP (6) ● 18"oc BOTTOM		(5) ● 18"oc	18'-0"	5'-0"	1'-0"	(7) #8 x 10'-4"	(8) #8 x 13'-0"	(8) #4	(6) #4	(7)	5'-6"	(2) #8	1'-7"	2'-6"	(4) #8	1'-7"	2'-6"	(4) #8	2.50	2532	3 KSF
26'-0"	25'-4"	4'-0"	13'-0"	8'-0"	6'-0"	(2) #8	(5) #8	(5) #8	(5) #8	(2) #8 x 12'-0"	(1) ● 24"oc TOP (4) ● 18"oc BOTTOM		(5) ● 18"oc	18'-0"	5'-0"	1'-0"	(9) #8 x 11'-8"	(7) #8 x 14'-0"	(8) #4	(6) #4	(6)	6'-0"	(3) #8	1'-7"	2'-6"	(5) #8	1'-7"	2'-6"	(5) #8	3.25	3321	3.5 KSF
28'-0"	27'-4"	4'-0"	14'-0"	9'-0"	7'-0"	(3) #8	(5) #8	(6) #8	(5) #8	(3) #8 x 13'-0"	(1) ● 24"oc TOP (3) ● 12"oc BOTTOM		(5) ● 18"oc TOP (3) ● 12"oc BOTTOM	21'-0"	6'-0"	1'-0"	(10) #8 x 14'-1"	(7) #8 x 14'-0"	(8) #4	(5) #4	(5)	6'-6"	(2) #8	1'-10"	2'-6"	(6) #8	1'-10"	2'-6"	(6) #8	4.10	4295	4 KSF


RW3
Nelson Precast Retaining Wall
2' Surcharge or Traffic Barrier
WALL DIMENSIONS AND REINFORCING
GENERAL NOTES:
JOINT SEAL DETAIL
PRECAST CONCRETE BLOCK
ELEVATION
4'-0" COLUMN REBAR
2'-4" COLUMN REBAR


Voelker Engineering Inc.
NELSON PRECAST RETAINING WALL
TRAFFIC BARRIER
RW3a
TOP OF WALL DETAILS AT TRAFFIC BARRIER
BARRIER JOINT DETAIL
TOP OF WALL ELEVATION
BACK VIEW OF COMPLETED PILASTER
BACK VIEW OF TOP BLOCK
TRAFFIC BARRIER DETAIL
SECTION OF TOP BLOCK
TOP VIEW OF TOP BLOCK


WALL DIMENSIONS AND REINFORCING
COLUMN SIZE AND REINFORCING
FOOTING SIZE AND REINFORCING
SEE DRAWING RW3 FOR DETAILS
JOINT SEAL DETAIL
Nelson Precast Retaining Wall
2' Surcharge or Traffic Barrier
RW4
INTERCOR, Inc.
VOELKER ENGINEERING, Inc.
6' - 0" COLUMN REBAR
4' - 0" COLUMN REBAR
2' - 4" COLUMN REBAR
4' - 0" COLUMN BASE

In addition to the general design requirements provided in Appendix 15-A, the following specific design requirements shall be met:

No HITEC evaluation report is currently available for this wall system. Design procedures for specific elements of the wall system have been provided to WSDOT in a submittal dated May 20, 2005, and final Wall Details submitted May 26, 2005. The design procedures used by Tensar Earth Technologies (TET) are in full conformance with the AASHTO LRFD Bridge Design Specifications **(2004)**.

This wall system consists of Tensar geogrid reinforcement that is connected to a welded wire facing panel. Regarding the welded wire facing panel, the minimum wire size acceptable for permanent walls is W4.5, and the welded wire shall be galvanized in accordance with the AASHTO LRFD specifications. The actual wire size submitted is W4.0. The exception regarding the wire size is allowed. Due to the smaller wire size, there is some risk that the welded wire form will not provide the full 75 year life required for the wall. Therefore, to insure internal stability of the wall, the geogrid reinforcement shall be wrapped fully behind the face to add the redundancy needed to insure the wall face system is stable for the required design life. The galvanization requirement for the welded wire form still applies, however, as failure of the welded wire form at some point during the wall design life could allow some local sagging of the wall face to occur. The minimum clear opening dimension of the facing panel, or backing mat if present, shall not exceed the minimum particle size of the wall facing backfill. The maximum particle size for the wall facing backfill shall be 4 inches. The maximum vertical spacing of soil reinforcement shall be 18 inches for vertical and battered wall facings.

The geogrid tensile strengths used for design for this wall system shall be aslisted in the WSDOT Qualified Products List (QPL).

The Bodkin connection shown in the typical cross-section (page 15-(Tensar WW)-1) may be used subject to the following conditions:

- No more than one Bodkin connection may be used within any given layer, and on no more than 50% of the layers in a given section of wall.
- If the Bodkin connection is located outside of the active zone for the wall as defined in the AASHTO LRFD Bridge Design Specifications plus 3 ft and is located at least 4 ft from the face, no reduction in design tensile strength due to the presence of the Bodkin connection is required.

- If the Bodkin connection is located closer to the wall face than as described immediately above, the design tensile strength of the reinforcement shall be reduced to account for the Bodkin connection. Table 15-(Tensar WW)-1 provides a summary of the reduction factors to be applied to account for the presence of the Bodkin connection.

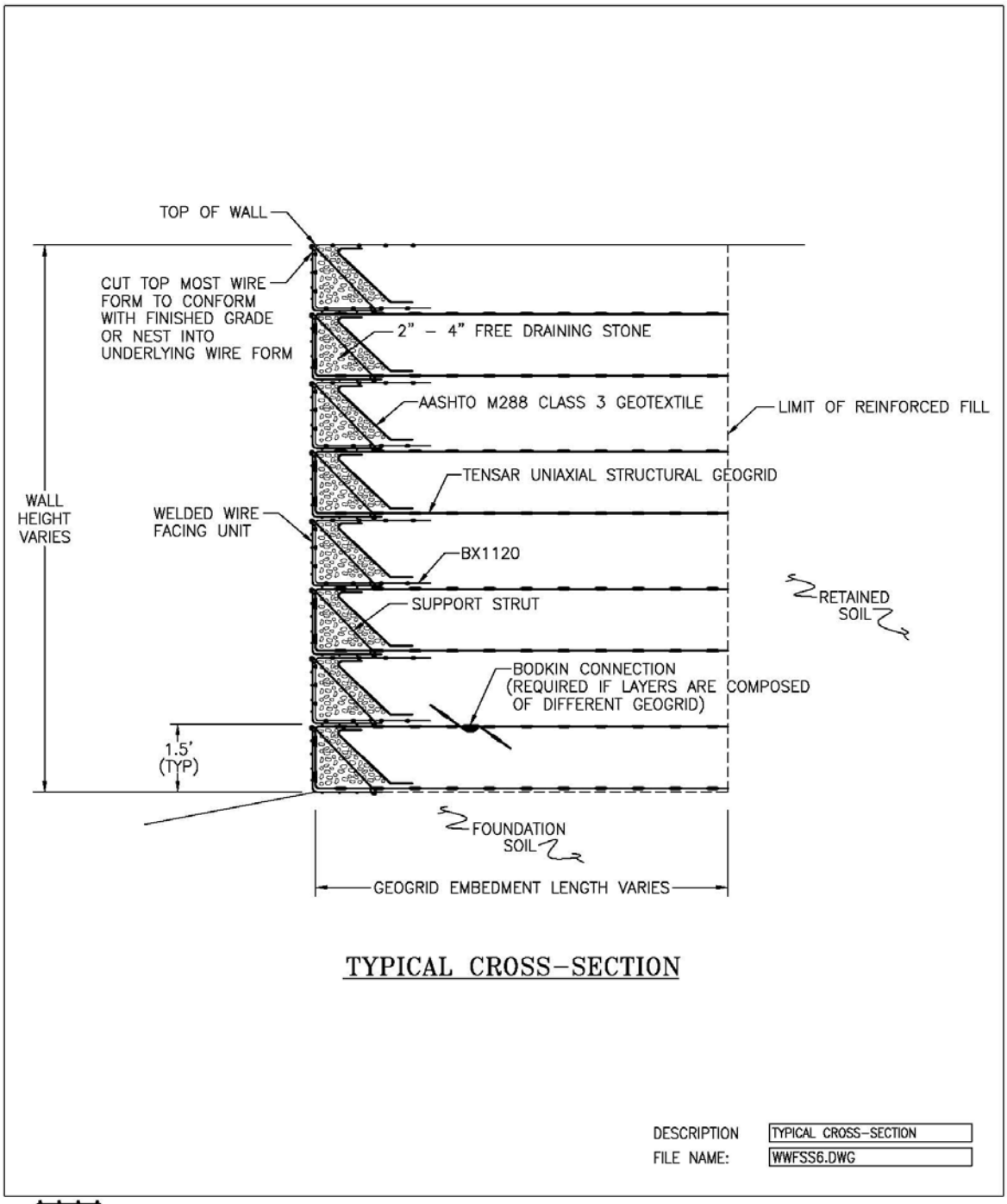
Tensar Primary Soil Reinforcement Geogrid Product	Tensar Product to Which Soil Reinforcement is Connected	Connection Strength Reduction Factor, CRu
UMESA3/UX1400HS	UMESA6/UX1700HS	1.0
UMESA4/UX1500HS	UMESA6/UX1700HS	1.0
UMESA5/UX1600HS	UMESA6/UX1700HS	1.0
UMESA6/UX1700HS	UMESA6/UX1700HS	0.91
UMESA3/UX1400HS	UMESA3/UX1400HS	0.85
UMESA4/UX1500HS	UMESA4/UX1500HS	0.79
UMESA5/UX1600HS	UMESA5/UX1600HS	0.87
UMESA6/UX1700HS	UMESA6/UX1700HS	0.91

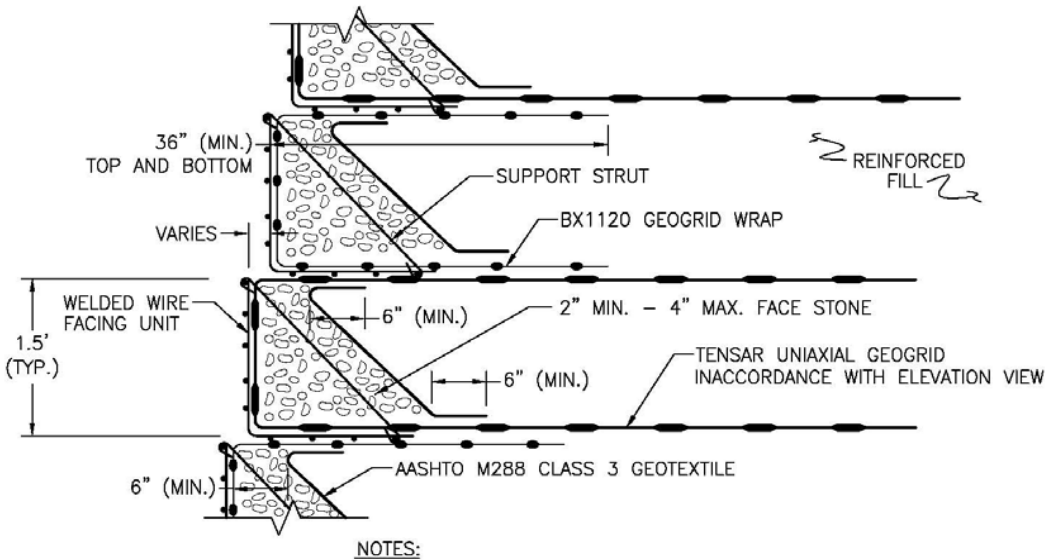
Approved Bodkin Connection Strength Reduction Factors for Tensar Welded Wire Form Walls
Table 15-(Tensar WW)-1

Approved details for the Tensar Welded Wire Form Wall system are provided in the following plan sheets. Exceptions and additional requirements regarding these approved details are as follows:

- Though not shown in the approved plan sheets, if guard rail is to be placed at the top of the wall, the guard rail post shall either be installed through precut holes in the geogrid layers that must penetrated, or the geogrid layers shall be cut in a manner that prevents ripping or tearing of the geogrid.
- In plan sheets on pages 3, 4, 5, and 13, regarding the geotextiles shown, WSDOT reserves the right to require the use WSDOT Standard Specification materials as specified in *Standard Specification* Section 9-33 that are similar to those specified in this plan sheet.
- Regarding the plantable face alternate plan details on page 6, this alternative shall only be considered approved if specifically called out in the contract specifications.
- Regarding the welded wire form and support strut details on page 7, galvanization is required per the contract specifications for all permanent walls.

- Regarding the geogrid penetration plan sheet detail on page 15, alternative 1 from Article 11.10.10.4 of AASHTO LRFD Bridge Design Specifications shall be followed to account for the portion of the geogrid layer cut through by the penetration. For penetration diameters larger than 30 inches or closer than 3 ft from the wall face, Alternative 2 in AASHTO LRFD Article 11.10.10.4 shall apply to accommodate the load transfer and to provide a stable wall face.
- The culvert penetration and obstruction avoidance details are preapproved up to a diameter of 4 ft for culvert penetration through the face and up to 2.5 ft for obstruction avoidance. Larger diameter culverts or obstructions are not considered preapproved. This wall is also preapproved for use with traffic barriers.
- This wall system is preapproved for both a welded wire/gravel fill face for vertical to near vertical facing batter, and welded wire vegetated face, provided a minimum horizontal step of 6 inches between each facing lift is used, effectively battering the wall face at 3V:1H or flatter. The horizontal step is necessary to reduce vertical stress on the relatively compressible topsoil placed immediately behind the facing so that settlement of the facing does not occur.


TOP OF WALL
CUT TOP MOST WIRE FORM TO CONFORM WITH FINISHED GRADE OR NEST INTO UNDERLYING WIRE FORM
2" – 4" FREE DRAINING STONE
AASHTO M288 CLASS 3 GEOTEXTILE
LIMIT OF REINFORCED FILL
TENSAR UNIAXIAL STRUCTURAL GEOGRID
WALL HEIGHT VARIES
WELDED WIRE FACING UNIT
BX1120
RETAINED SOIL
SUPPORT STRUT
BODKIN CONNECTION (REQUIRED IF LAYERS ARE COMPOSED OF DIFFERENT GEOGRID)
1.5' (TYP)
FOUNDATION SOIL
GEOGRID EMBEDMENT LENGTH VARIES
TYPICAL CROSS-SECTION
DESCRIPTION
TYPICAL CROSS-SECTION
FILE NAME:
WWFSS6.DWG
Tensar Earth Technologies Inc.
Tensar
TYPICAL CROSS-SECTION



NOTES:

1. SEE WELDED WIRE FACING UNIT DETAIL FOR MATERIAL AND DIMENSIONS.
2. ALL FACING UNITS SHALL BE GALVANIZED AS PER ASTM A123 AFTER FABRICATION.
3. OPTIONAL THIN LAYER OF FINER STONE MAY BE PLACED AT THE TOP OF EACH UNIT TO PROVIDE A LEVEL SURFACE FOR THE UNIT ABOVE.

ALTERNATE WELDED WIRE FACING DETAIL

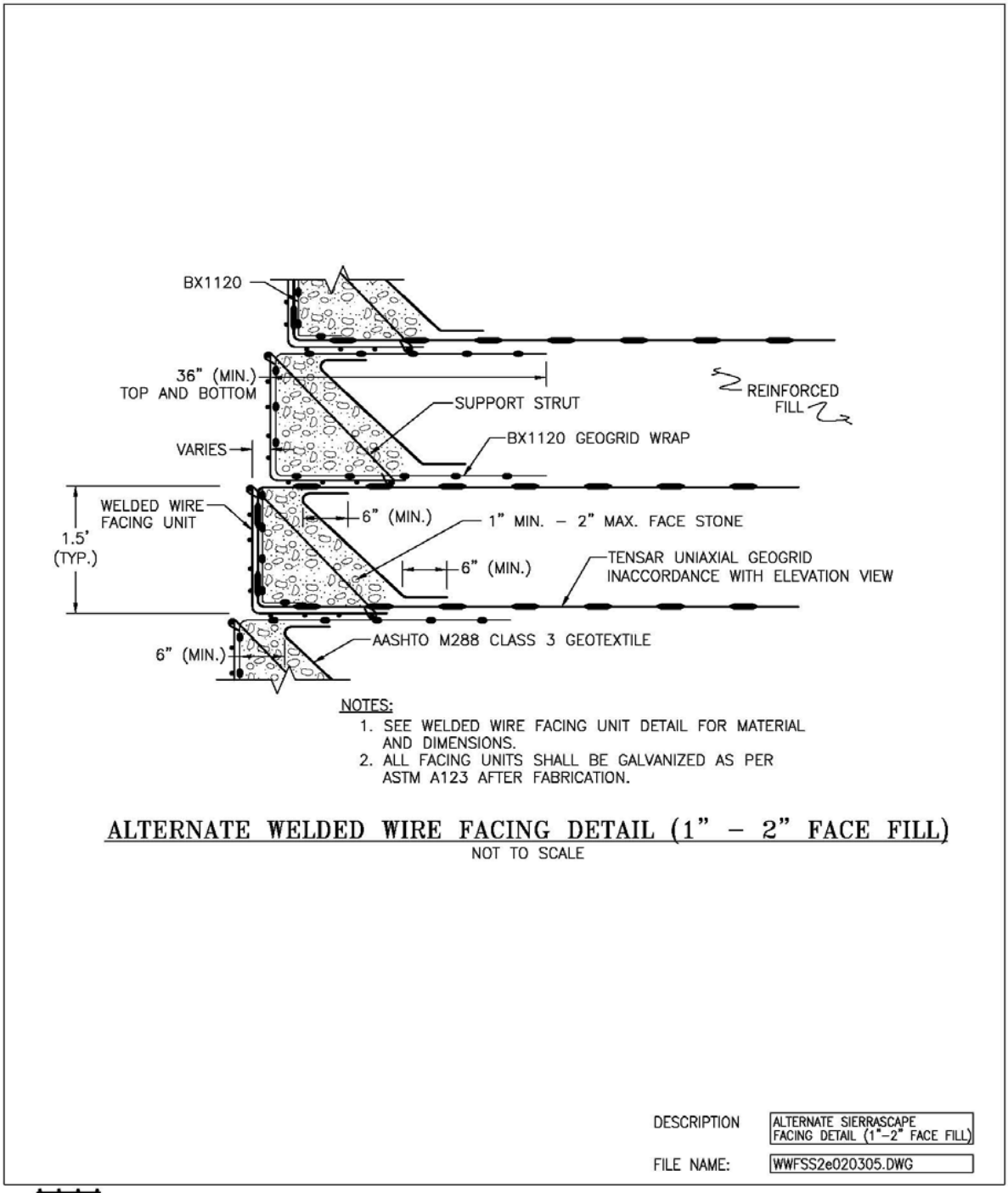
NOT TO SCALE

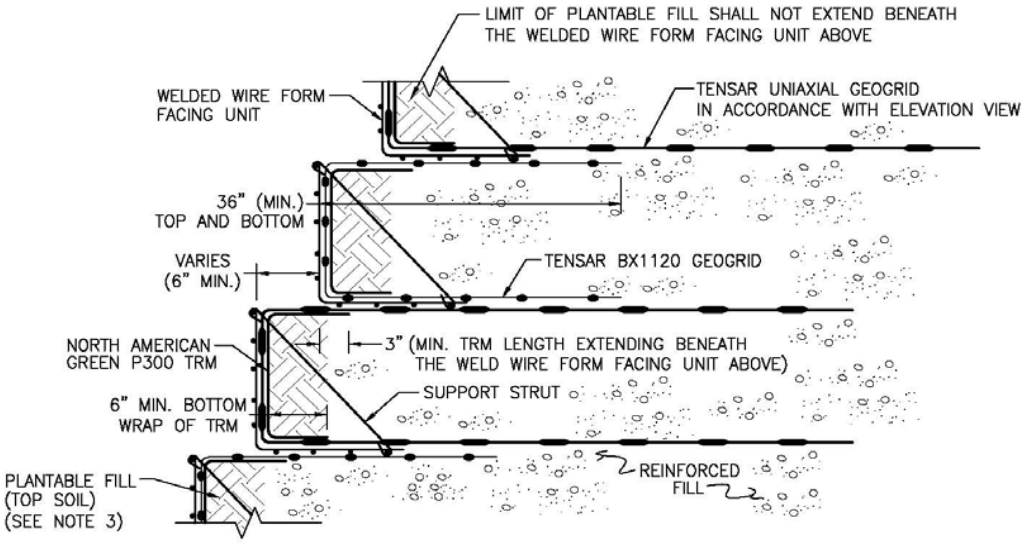
DESCRIPTION	ALTERNATE WELDED WIRE FACING DETAIL
FILE NAME:	WFD1e20305.DWG

Tensar Earth Technologies Inc.

Tensar

TYPICAL DETAIL


BX1120
36" (MIN.)
TOP AND BOTTOM
SUPPORT STRUT
REINFORCED
FILL
VARIES
BX1120 GEOGRID WRAP
WELDED WIRE
FACING UNIT
6" (MIN.)
1" MIN. – 2" MAX. FACE STONE
1.5'
(TYP.)
6" (MIN.)
TENSAR UNIAXIAL GEOGRID
INACCORDANCE WITH ELEVATION VIEW
AASHTO M288 CLASS 3 GEOTEXTILE
6" (MIN.)
NOTES:
1. SEE WELDED WIRE FACING UNIT DETAIL FOR MATERIAL AND DIMENSIONS.
2. ALL FACING UNITS SHALL BE GALVANIZED AS PER ASTM A123 AFTER FABRICATION.
ALTERNATE WELDED WIRE FACING DETAIL (1" – 2" FACE FILL)
NOT TO SCALE
DESCRIPTION
ALTERNATE SIERRASCAPE FACING DETAIL (1"–2" FACE FILL)
FILE NAME:
WWFSS2e020305.DWG
Tensar Earth Technologies Inc.
Tensar
TYPICAL DETAIL



NOTES:

1. SEE WELDED WIRE FORM FACING UNIT DETAIL FOR FACING MATERIAL AND DIMENSIONS.
2. FACING UNITS SHALL BE CONSTRUCTED FROM BLACK STEEL.
3. PLANTABLE FILL OR TOP SOIL MAY BE PLACED AT THE FACE TO SUPPORT VEGETATION GROWTH.

ALTERNATE WELDED WIRE FORM FACING DETAIL (PLANTABLE FACE FILL)

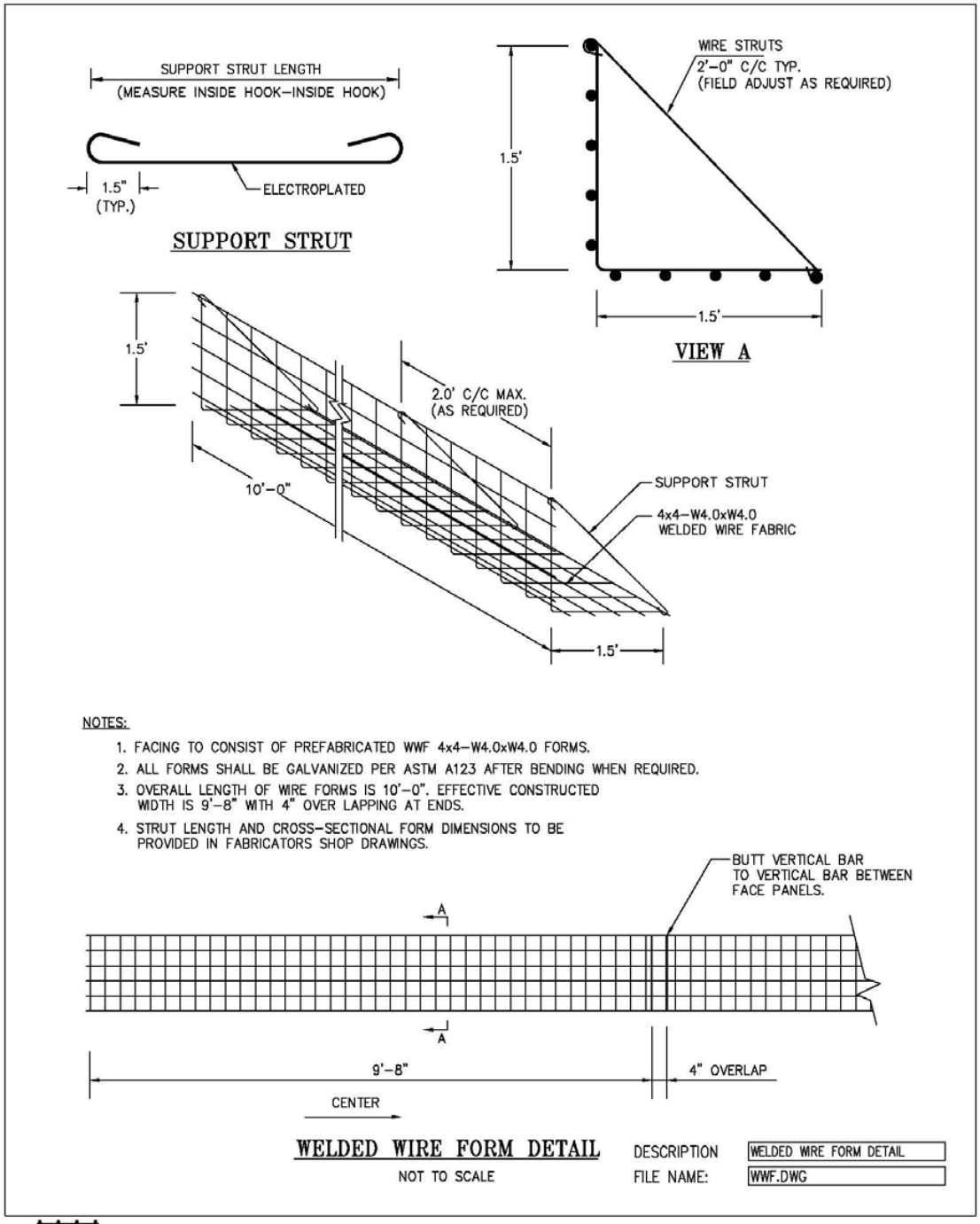
NOT TO SCALE

DESCRIPTION	SIERRASCAPE FACING DETAIL
FILE NAME:	WWFSS3e20305.DWG

Tensar Earth Technologies Inc.

Tensar

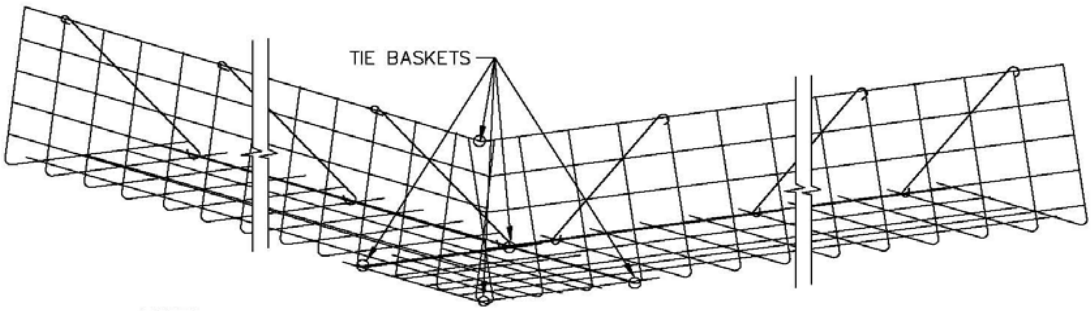
TYPICAL DETAIL



Tensar Earth Technologies Inc.

Tensar•

TYPICAL DETAIL



NOTES:

BEND OR CUT BASKETS TO FIT FIELD CONDITIONS
ENSURE THAT GEOTEXTILE AND BIAXIAL GEOGRID OVERLAP 1' MINIMUM

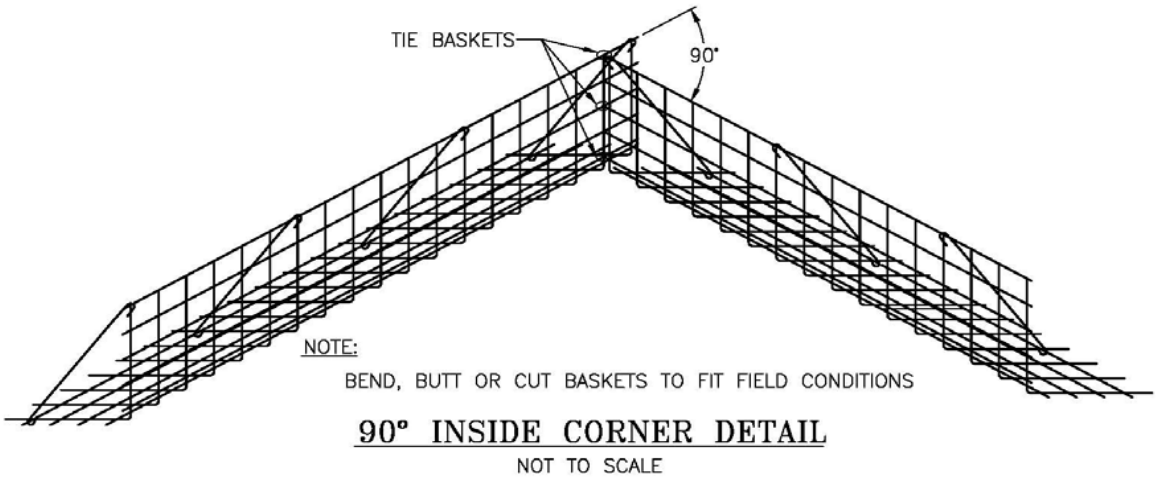
90° OUTSIDE CORNER DETAIL

NOT TO SCALE

DESCRIPTION	OUTSIDE CORNER DETAIL
FILE NAME:	WWFCD.DWG

Tensar Earth Technologies Inc.
Tensar

TYPICAL DETAIL



NOTE:
BEND, BUTT OR CUT BASKETS TO FIT FIELD CONDITIONS

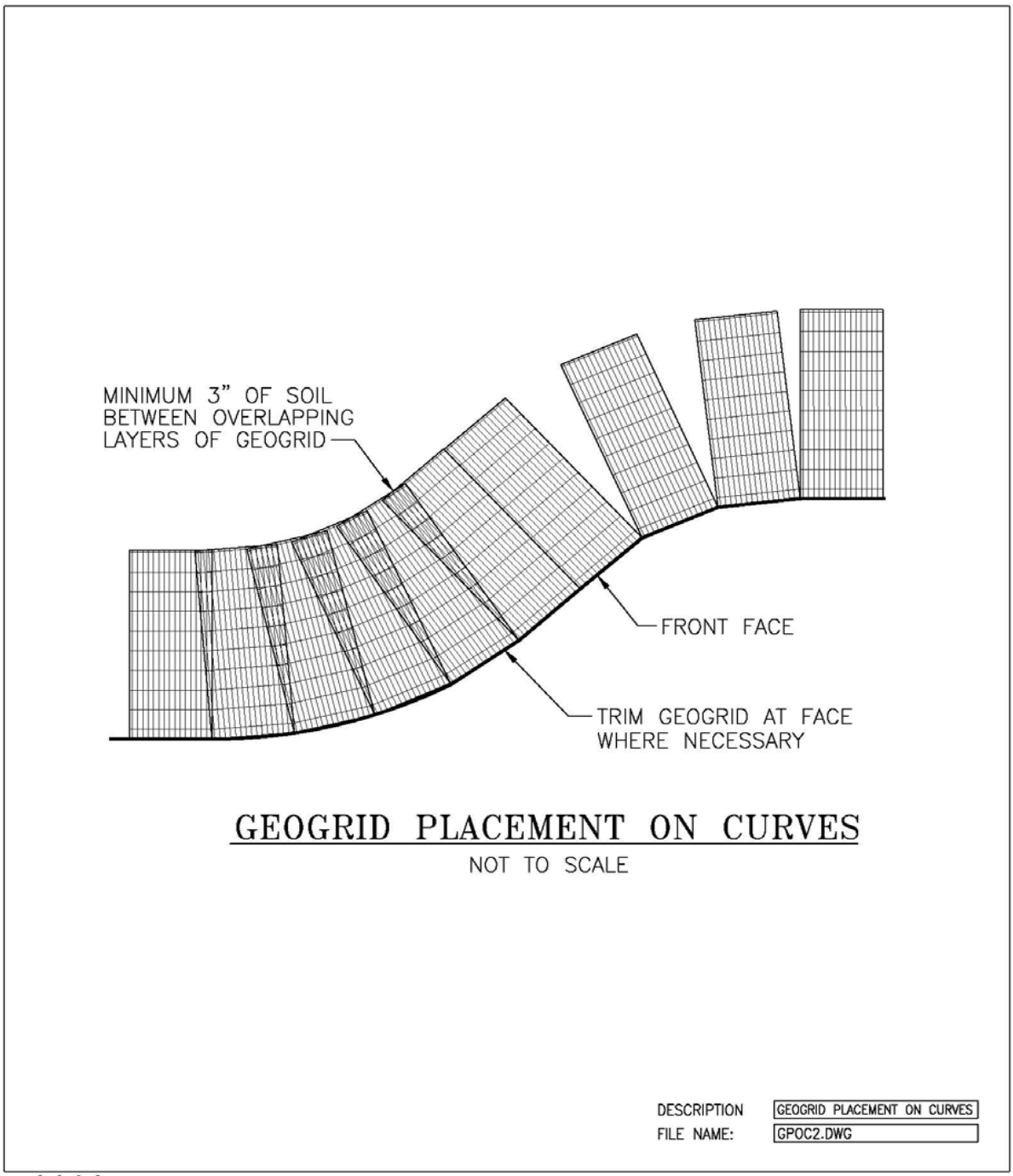
90° INSIDE CORNER DETAIL

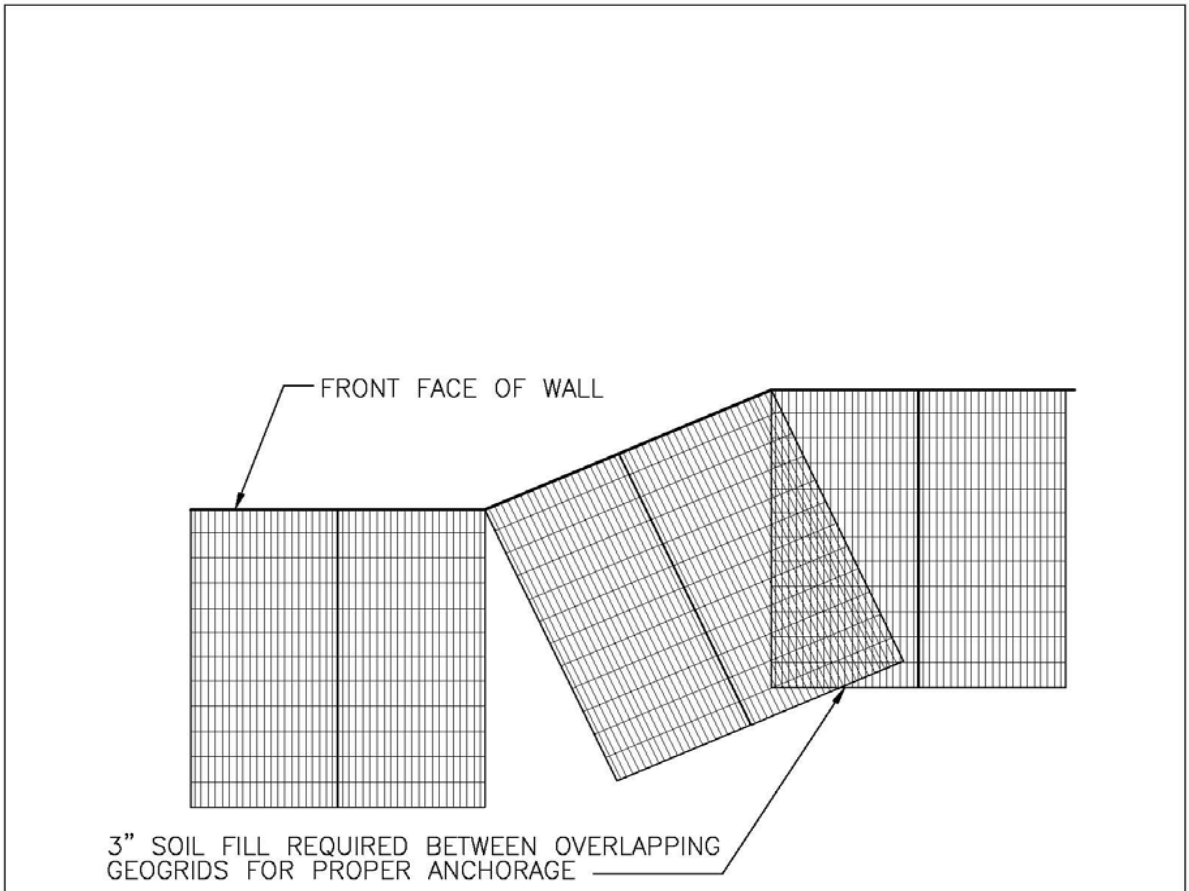
NOT TO SCALE

DESCRIPTION	INSIDE CORNER DETAIL
FILE NAME:	WWFCD2.DWG

Tensar Earth Technologies Inc.
Tensar

TYPICAL DETAIL


MINIMUM 3" OF SOIL
BETWEEN OVERLAPPING
LAYERS OF GEOGRID
FRONT FACE
TRIM GEOGRID AT FACE
WHERE NECESSARY
GEOGRID PLACEMENT ON CURVES
NOT TO SCALE
DESCRIPTION
GEOGRID PLACEMENT ON CURVES
FILE NAME:
GPOC2.DWG
Tensar Earth Technologies Inc.
Tensar
TYPICAL DETAIL



WALL CORNER DETAIL

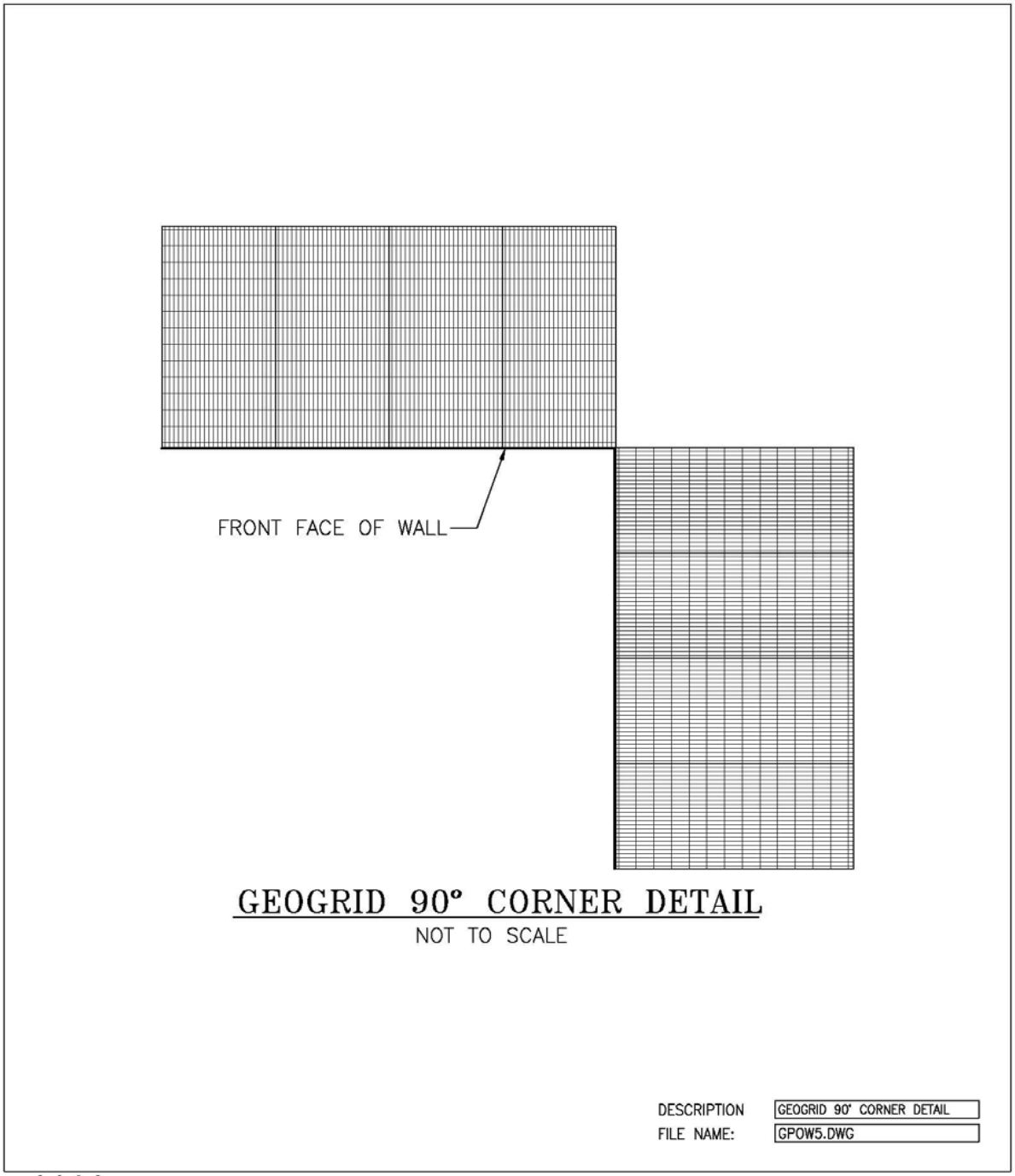
NOT TO SCALE

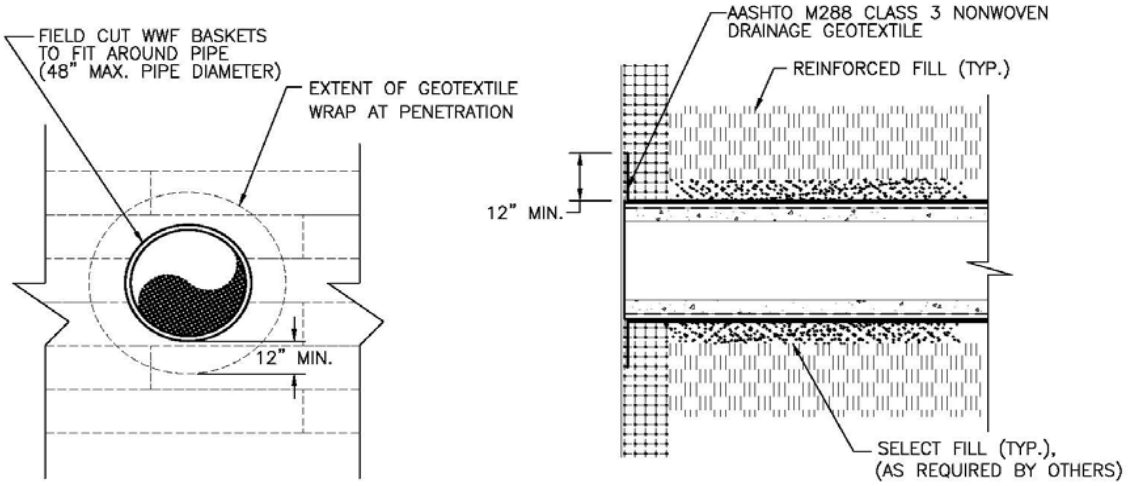
DESCRIPTION	WALL CORNER DETAIL
FILE NAME:	GPOW4.DWG

Tensar Earth Technologies Inc.

Tensar•

TYPICAL DETAIL


FRONT FACE OF WALL
GEOGRID 90° CORNER DETAIL
NOT TO SCALE
DESCRIPTION
GEOGRID 90° CORNER DETAIL
FILE NAME:
GPOW5.DWG
Tensar Earth Technologies Inc.
Tensar
TYPICAL DETAIL



ELEVATION VIEW

PLAN VIEW

NOTES:

1. CUT WIRE FACING AS CLOSE AS POSSIBLE TO PIPE PENETRATION.
2. CUT OR TERMINATE GEOGRIDS 3 INCHES OR LESS FROM PIPE.
3. WRAP ENTIRE PIPE WITH AASHTO M288 CLASS 3 NON-WOVEN DRAINAGE GEOTEXTILE. ENSURE THAT WRAP EXTENDS AT LEAST 12 INCHES BEHIND WIRE FACING AT PENETRATION TO ENSURE NO LOSS OF FILL.
4. FOR GEOGRID LAYOUT REFER TO ELEVATION VIEW FOR LENGTH, TYPE AND LOCATION

PIPE PENETRATION DETAIL AT WELDED WIRE FACE SYSTEM

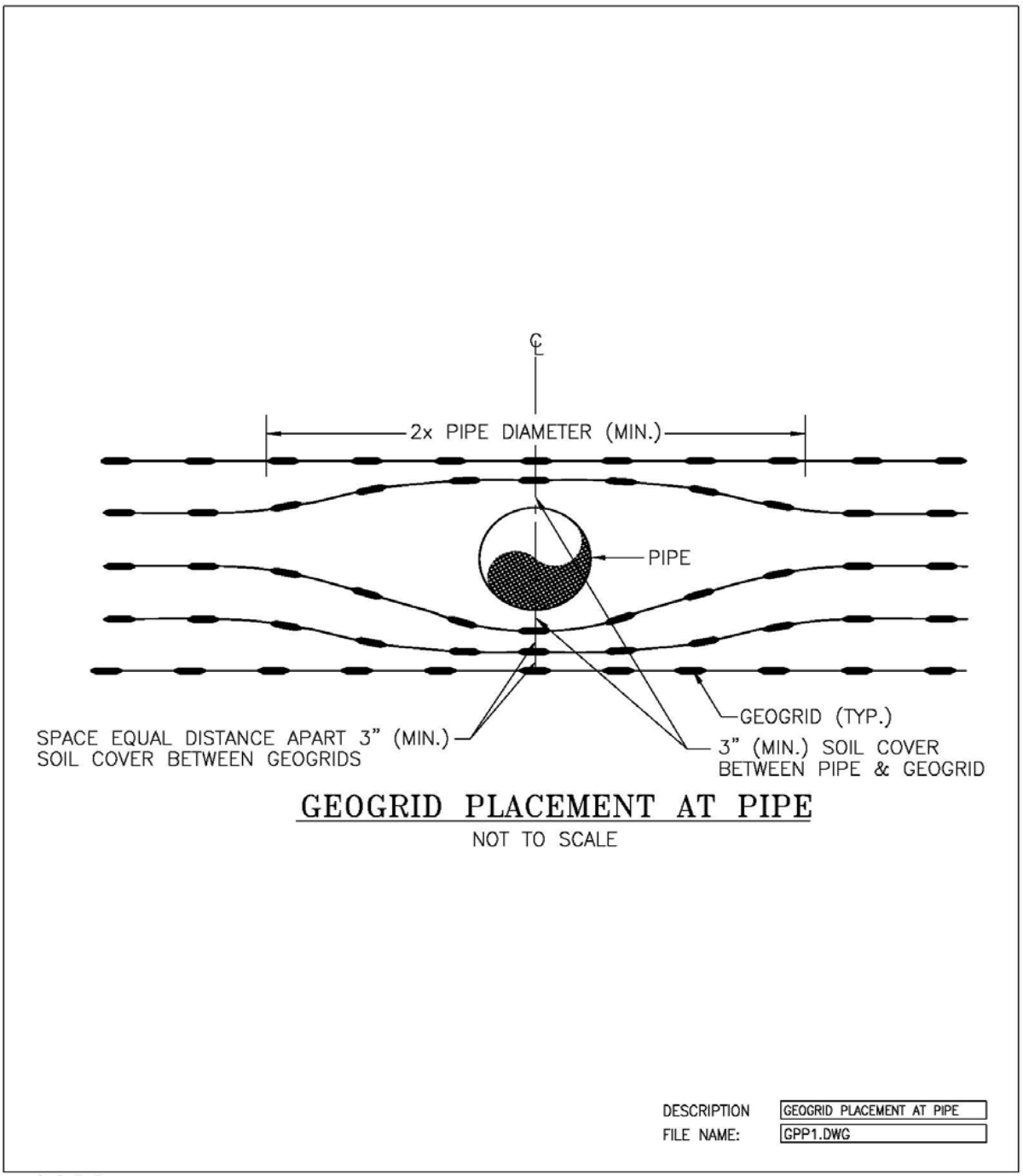
NOT TO SCALE

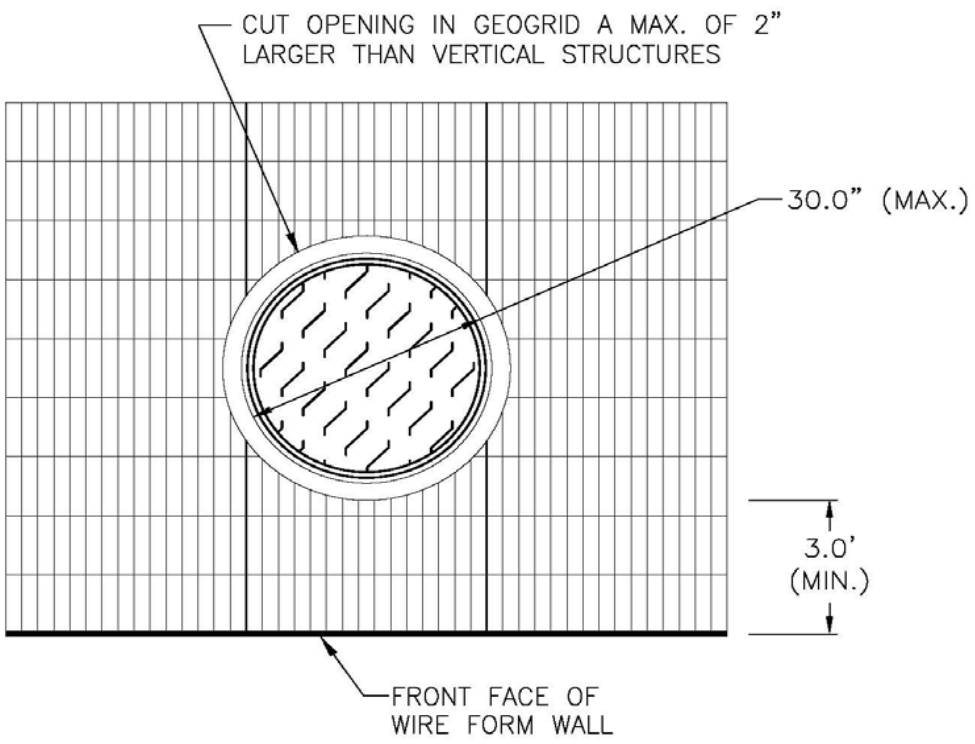
DESCRIPTION	PIPE PENETRATION DETAIL AT WELDED WIRE FACE SYSTEM
FILE NAME:	GPP10.DWG

Tensar Earth Technologies Inc.

Tensar

TYPICAL DETAIL


℄
2x PIPE DIAMETER (MIN.)
PIPE
GEOGRID (TYP.)
SPACE EQUAL DISTANCE APART 3" (MIN.)
SOIL COVER BETWEEN GEOGRIDS
3" (MIN.) SOIL COVER
BETWEEN PIPE & GEOGRID
GEOGRID PLACEMENT AT PIPE
NOT TO SCALE
DESCRIPTION
GEOGRID PLACEMENT AT PIPE
FILE NAME:
GPP1.DWG
Tensar Earth Technologies Inc.
Tensar
TYPICAL DETAIL



NOTE:
FOR OTHER CONDITIONS APPLY THE PROVISIONS OF ARTICLE 11.10.10.4 OF AASHTO LRFD SPECIFICATIONS.

GEOGRID PENETRATION

NOT TO SCALE

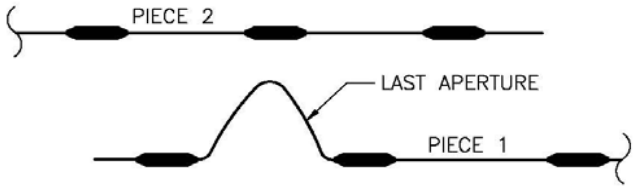
DESCRIPTION	GEOGRID PENETRATION
FILE NAME:	GP2.DWG

Tensar Earth Technologies Inc.
Tensar

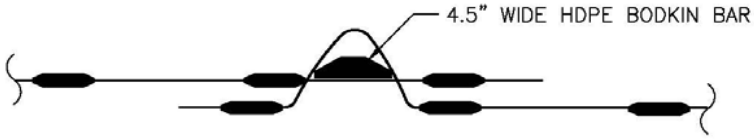
TYPICAL DETAIL

TO FORM A BODKIN CONNECTION:

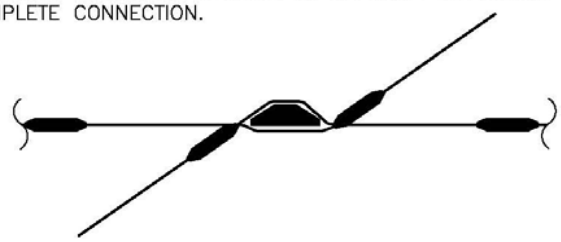
1. BEND THE LAST APERTURE OF ONE PIECE OF GEOGRID IN HALF.



2. PASS THE BENT APERTURES THROUGH THE APERTURES OF THE SECOND PIECE OF GEOGRID AND INSERT THE BODKIN BAR INTO THE CAVITY BETWEEN THE GEOGRIDS.



3. PULL BOTH PIECES OF GEOGRID IN OPPOSITE DIRECTIONS TO COMPLETE CONNECTION.



NOTE:

THE SPLICED GEOGRID PIECE ON EITHER SIDE OF THE BODKIN CONNECTION BE AT LEAST 6 FEET LONG UNLESS THE GEOGRID TERMINATES IN A FIXED CONNECTION.

BODKIN CONNECTION

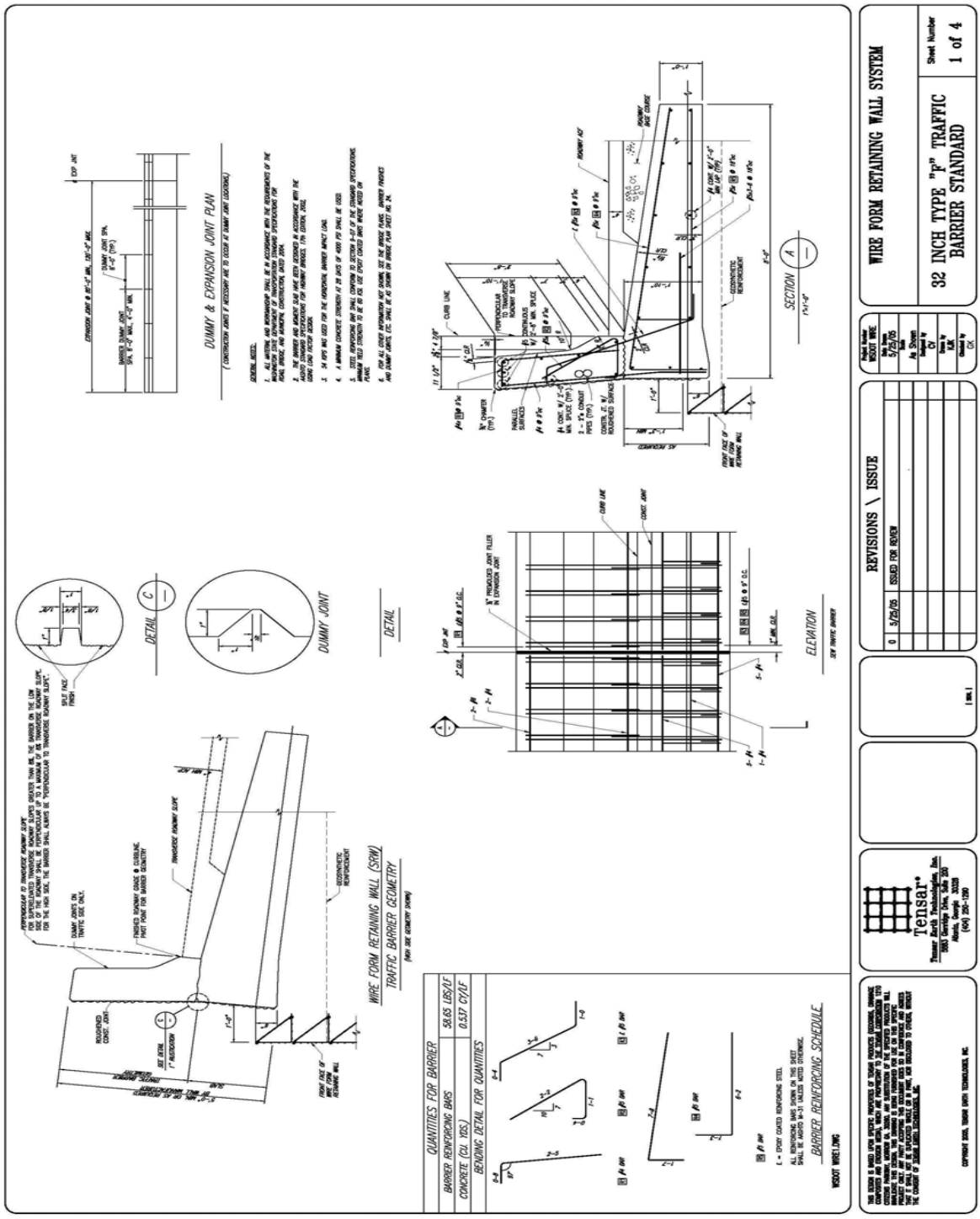
NOT TO SCALE

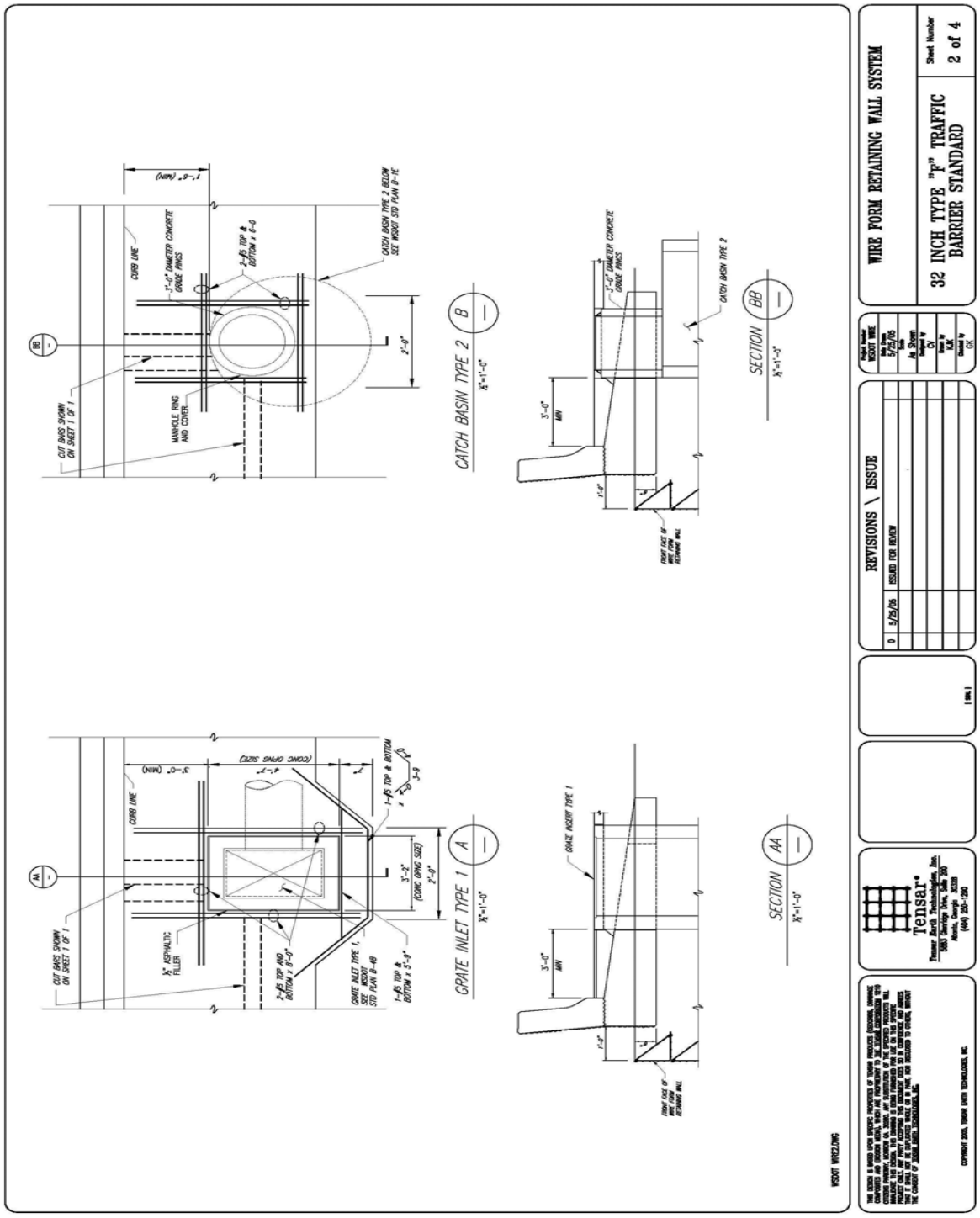
DESCRIPTION	BODKIN CONNECTION
FILE NAME:	BC.DWG

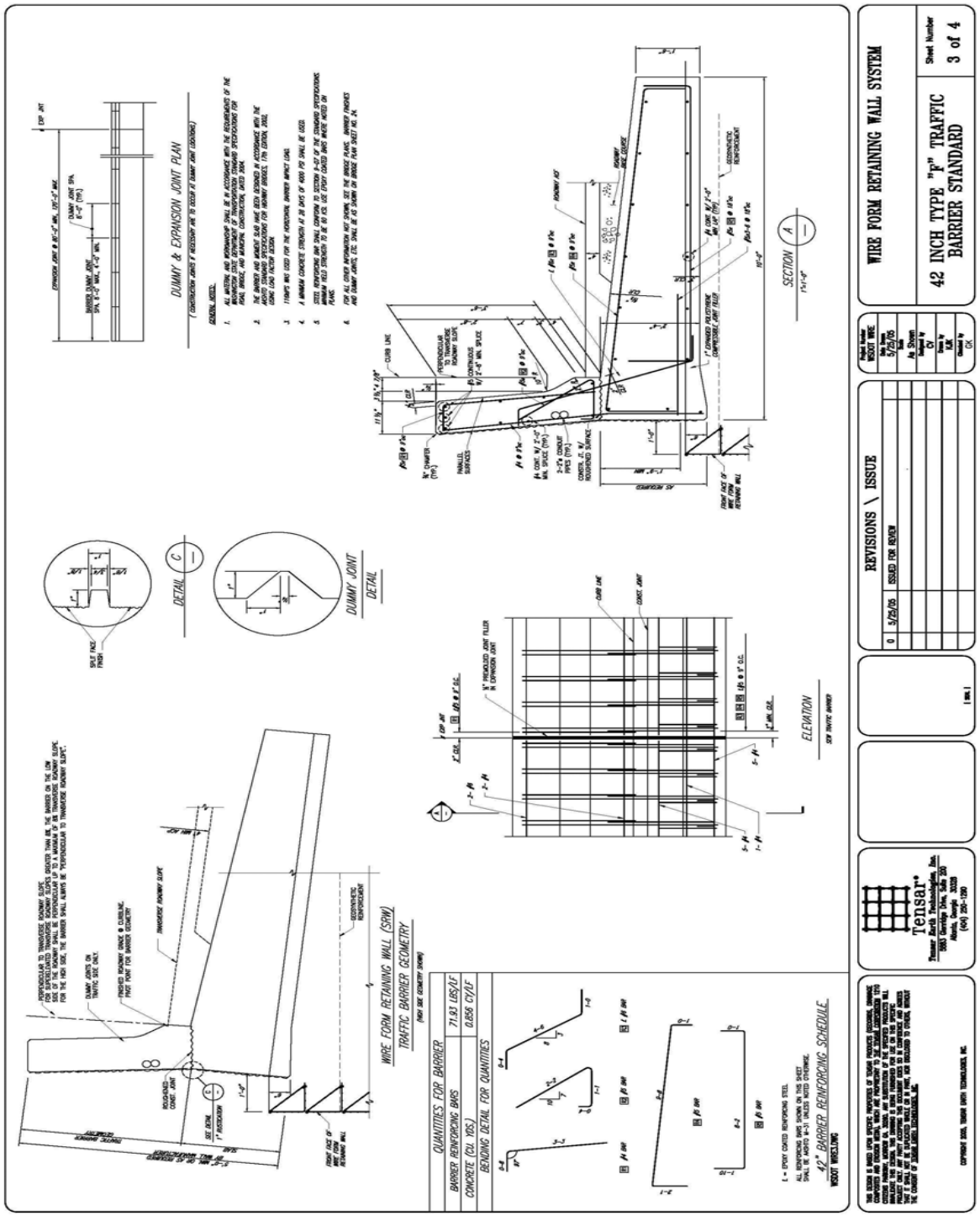
Tensar Earth Technologies Inc.

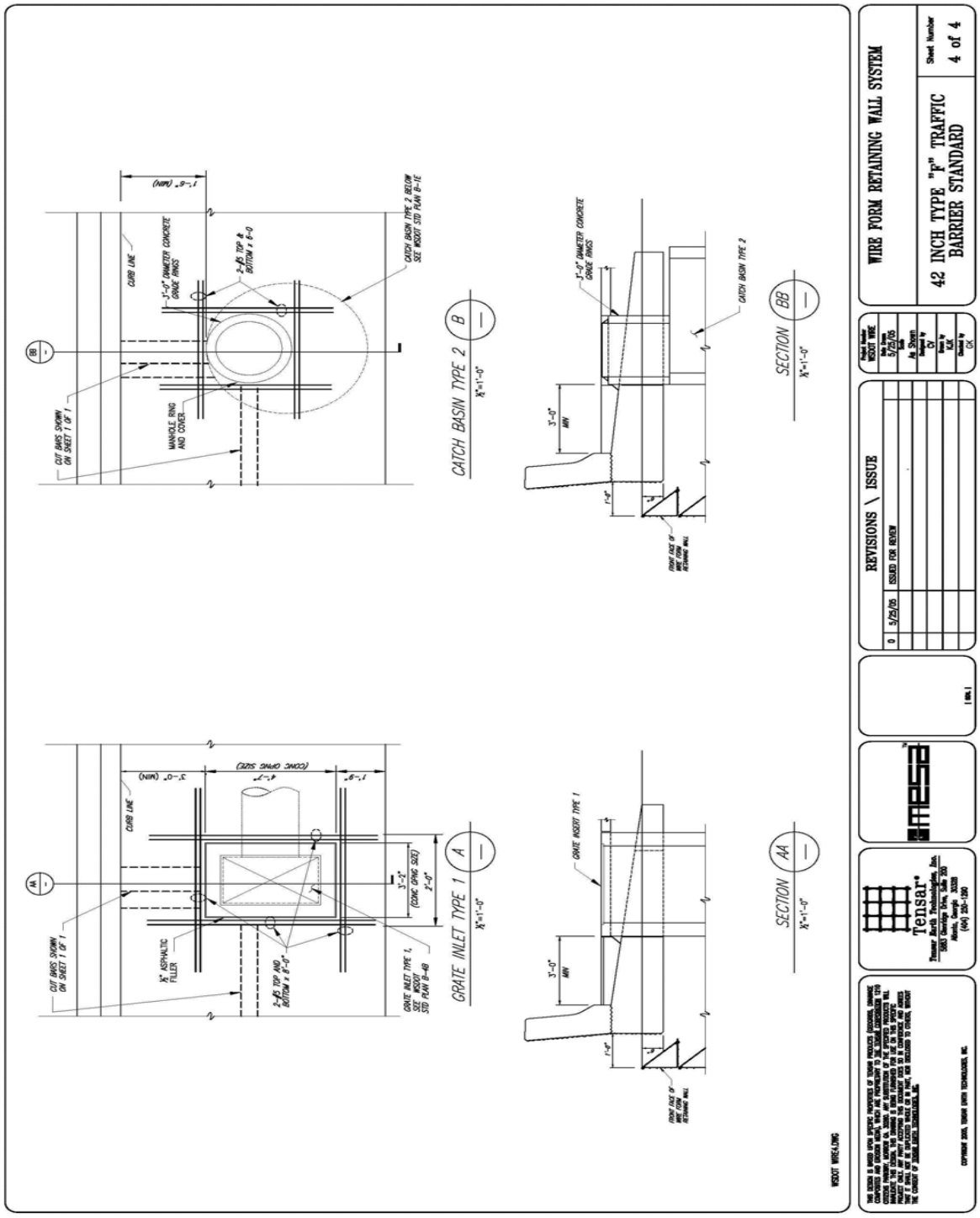
Tensar

TYPICAL DETAIL


WIRE FORM RETAINING WALL SYSTEM
32 INCH TYPE "P" TRAFFIC BARRIER STANDARD
Sheet Number 1 of 4
REVISIONS \ ISSUE
0 3/25/05 ISSUED FOR REVIEW
Tensar
DUMMY & EXPANSION JOINT PLAN
DETAIL
DUMMY JOINT
SECTION
ELEVATION
WIRE FORM RETAINING WALL (SRW)
TRAFFIC BARRIER GEOMETRY
QUANTITIES FOR BARRIER
BARRIER REINFORCING BARS 58.65 LBS/LF
CONCRETE (CU. YDS.) 0.537 CY/LF
BENDING DETAIL FOR QUANTITIES
BARRIER REINFORCING SCHEDULE
WSDOT WIRE LONG


WIRE FORM RETAINING WALL SYSTEM
32 INCH TYPE "P" TRAFFIC BARRIER STANDARD
Sheet Number 2 of 4
REVISIONS \ ISSUE
5/25/05 ISSUED FOR REVIEW
Tensar
CATCH BASIN TYPE 2
GRATE INLET TYPE 1
SECTION BB
SECTION AA
CURB LINE
CUT BARS SHOWN ON SHEET 1 OF 1
MANHOLE RING AND COVER
3'-0" DIAMETER CONCRETE GRADE RINGS
CATCH BASIN TYPE 2 SEE WSDOT STD PLAN B-1E
GRATE INSERT TYPE 1
GRATE INLET TYPE 1, SEE WSDOT STD PLAN B-4B
½" ASPHALTIC FILLER
FRONT FACE OF WIRE FORM RETAINING WALL
WSDOT WIRE2.DWG


DUMMY & EXPANSION JOINT PLAN
DETAIL C
DUMMY JOINT DETAIL
WIRE FORM RETAINING WALL (SRW)
TRAFFIC BARRIER GEOMETRY
ELEVATION
SECTION A
QUANTITIES FOR BARRIER
BARRIER REINFORCING BARS 71.93 LBS/LF
CONCRETE (CU. YDS.) 0.656 CY/LF
BENDING DETAIL FOR QUANTITIES
42" BARRIER REINFORCING SCHEDULE
REVISIONS \ ISSUE
0 3/25/05 ISSUED FOR REVIEW
WIRE FORM RETAINING WALL SYSTEM
42 INCH TYPE "F" TRAFFIC BARRIER STANDARD
Sheet Number 3 of 4
Tensar
Tensar Earth Technologies, Inc.
2500 Cantrup Drive, Suite 300
Alpharetta, Georgia 30339
(404) 250-1290


CATCH BASIN TYPE 2
GRATE INLET TYPE 1
SECTION
SECTION
CURB LINE
CUT BARS SHOWN ON SHEET 1 OF 1
MANHOLE RING AND COVER
CATCH BASIN TYPE 2 BELOW SEE WSDOT STD PLAN 8-1E
GRATE INLET TYPE 1, SEE WSDOT STD PLAN 8-4B
WSDOT WIRELONG
REVISIONS \ ISSUE
ISSUED FOR REVIEW
WIRE FORM RETAINING WALL SYSTEM
42 INCH TYPE "P" TRAFFIC BARRIER STANDARD
4 of 4

Appendix 15-D Preapproved Proprietary Wall Systems

The following wall systems are preapproved for use in WSDOT projects:

Wall Supplier	System Name	System Description	ASD/LFD or LRFD?	Height, or Other Limitations	Year Initially Approved	Last Approved Update
The Reinforced Earth Co. 8614 Westwood Center Dr. Suite 1100 Vienna, VA 22182 703-821-1175	Reinforced Earth Wall	Precast concrete 5'×5' facing panels and steel strip soil reinforcement	ASD/LFD	33 ft	1987	Approved 11/9/04 (submitted 3/29/04)
L.B. Foster Company Foster Geotechnical 1660 Hotel Circle North, Suite 304 San Diego, CA 92108-2803 619-688-2400	Retained Earth Wall	Precast concrete 5'×5' facing panels and steel bar mat soil reinforcement	ASD/LFD	33 ft	Unknown	Approved 11/9/04 (submitted 12/11/03)
Tensar Earth Technologies, Inc. 5883 Glenridge Drive, Suite 200 Atlanta, GA 30328 404-250-1290	ARES Wall	Precast concrete 5'×5' facing panels and Tensar geogrid soil reinforcement	ASD/LFD	33 ft	1998	Approved 11/9/04 (submitted 8/6/04)
Hilfiker Retaining Walls 3900 Broadway PO Box 2012 Eureka, CA 95503-5707 707-443-5093	Eureka Reinforced Soil Wall	Precast concrete 5'×5' facing panels and welded wire mat soil reinforcement	ASD/LFD	33 ft	Unknown	Approved 11/9/04 (submitted 10/5/04)
Hilfiker Retaining Walls 3900 Broadway P.O. Box 2012 Eureka, CA 95503-5707 707-443-5093	Welded Wire Retaining Wall	Welded wire facing that is continuous with welded wire soil reinforcement	ASD/LFD	33 ft*	Unknown	Approved 11/9/04 (submitted 9/15/03)
Keystone Retaining Wall Systems, Inc. 4444 West 78th Street Minneapolis, MN 55435 952-897-1040	Key System I Wall	Modular dry cast concrete block facing with steel welded wire ladder strip soil reinforcement	ASD/LFD	33 ft	2001	Approved 11/9/04 (submitted 3/31/04)
Tensar Earth Technologies, Inc. 5883 Glenridge Drive, Suite 200 Atlanta, GA 30328 404-250-1290	MESA Wall	Modular dry cast concrete block facing with Tensar geogrid soil reinforcement	ASD/LFD	33 ft	2000	Approved 11/9/04 (submitted 4/19/04 and 9/22/04)

Wall Supplier	System Name	System Description	ASD/LFD or LRFD?	Height, or Other Limitations	Year Initially Approved	Last Approved Update
Nelson Wall 12356 Northup Way, Suite 109 Bellevue, WA 98005 425-861-8292	Nelson Wall	Precast concrete gravity wall (similar to Standard Plan Concrete cantilever wall)	ASD/LFD	28 ft	1995	Approved 11/9/04 (submitted 9/12/03)
The Neel Company	T-WALL	Precast concrete modular wall	ASD/LFD	25 ft	1994	Approved 11/9/04 (submitted 11/05/04)
Tensar Earth Technologies, Inc. 5883 Glenridge Drive, Suite 200 Atlanta, GA 30328 404-250-1290	Welded Wire Form Wall	Tensar geogrid wrapped face wall with welded wire facing form	ASD/LFD	33 ft*	2006	Approved 3/3/06 (submitted 11/26/05)

*If the vegetated face option is used for the Hilfiker Welded Wire Retaining Wall or the Tensar Welded Wire Form Wall, the maximum wall height shall be limited to 20 ft. Greater wall heights for the vegetated face option for these walls may be used on a case by case basis as a special design if approved by the State Geotechnical Engineer and the State Bridge Engineer.