STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION

REPORT

ON

EXPERIMENTAL NOISE BARRIER WALL

US-59 SOUTHWEST FREEWAY

RICE AVENUE TO CHIMNEY ROCK ROAD

LARCHMONT SUBDIVISION

February 1991

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US-59 SOUTHWEST FREEWAY
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by

John B. Stokes, Jr., P.E.
Supervising Designing Engineer

Construction Project Manager
Lonnie B. Beckham, P.E.
Supervising Resident Engineer

Photographs by
Mark G. Anthony
Engineering Specialist

and

E. B. L., Inc.
General Contractor

FEBRUARY 1991

NOISE BARRIER WALL
US 59 SOUTHWEST FREEWAY
RICE AVENUE TO CHIMNEY ROCK ROAD
LARCHMONT SUBDIVISION

The Southwest Freeway, US 59 South, is located in the southwestern part of the City of Houston, Texas. This freeway was constructed in the early to middle sixties and consisted of four lanes inside IH 610 West Loop and three lanes outside of the West Loop.

With the construction of the Southwest Freeway, residential and commercial development accelerated in the southwestern portion of Houston and Harris County and in the eastern portion of adjoining Fort Bend County. With this development came increased traffic volumes and before long the freeway was operating at capacity. As the years passed, traffic demands became so great that the outside shoulders were converted into traffic lanes. Because of age and very high traffic volumes, the Southwest Freeway pavement began deteriorating and in the late seventies, the Texas State Department of Highways and Public Transportation (SDHPT) began planning for reconstructing the Southwest Freeway to add greater capacity and provide for mass transit.

The State legislature charged SDHPT with responsibility of coordinating with local public transportation agencies in order to enhance public transportation. The Harris County Metropolitan Transit Authority (Metro) is the local public transportation agency for Houston and Harris County. Therefore, SDHPT and Metro cooperated together in planning for, designing, and reconstructing the Southwest Freeway. The reconstructed freeway provides for four to seven lanes with a mass transit one way reversible lane in the median outside of IH 610 West Loop and provides for five and six lanes with a mass transit lane inside West Loop.

Planning and environmental studies were begun in August 1977 and completed and approved in October 1985. As a result of environmental studies, noise walls were considered for residential neighborhood noise mitigation and public meetings were held within each affected neighborhood to explain the purpose for and expected benefits from noise walls. The property owners adjacent to the right of way were then asked to choose whether or not they wanted a noise wall constructed along the right of way line, between their property and the freeway, in order to reduce noise impact on their homes. Several residential neighborhoods along the Southwest Freeway corridor chose to have noise walls constructed. The residential neighborhood known as Larchmont is one of the areas that requested a noise wall be constructed.

As part of the cooperative agreement between SDHPT and Metro, Metro and SDHPT chose a consulting engineering firm, 3D/Post, to prepare designs and plans for a portion of US 59 Southwest Freeway which included the Larchmont area. The Larchmont Noise Wall was included in the project, therefore, 3d/Post prepared designs, plans, and details for the noise wall and included these in the freeway project reconstruction plans. After the plans were submitted to SDHPT, there was a long delay because of difficulties in obtaining all right of way required for the project. However, the right of way in the Larchmont subdivision was acquired earlier than the rest of the project right of way; therefore, the noise wall portion of the plans was removed from the freeway project and made into an independent project. The decision was made by SDHPT's Houston District Office to permit commercial alternate noise barrier wall designs to be bid and constructed in lieu of the consultant's design. This decision required the consultant's plans to be revised by SDHPT. During the process of revising the plans, close coordination with the Federal Highway Administration (FHWA) was maintained. As a result of coordination with the FHWA the noise barrier wall details prepared by SDHPT were included in the plans along with details prepared by "the fanwall corporation." Although "fanwall's" details were added to the plans, provisions were included to permit other commercial noise wall designs if those designs were acceptable to the project engineer.

The successful contractor, EBL, Inc., chose a commercial alternate design from First Technology, Inc., with structural design done by Macon Engineering, Inc. Shop drawings and calculations were submitted to SDHPT for review and approval. Because this was the Houston District's first commercial alternate noise wall project, close coordination with FHWA was maintained during the shop drawing review and approval process and also during project construction.

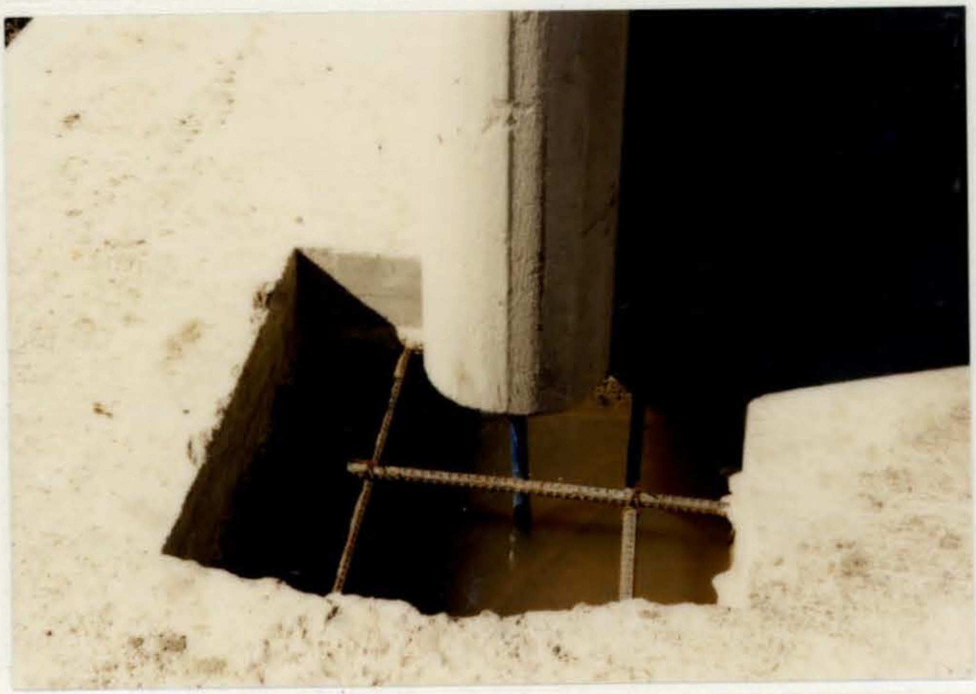
The wall system is a stacked panel, trapezoidal pattern attached to a spread footing by means of one half inch, epoxy coated, post-tensioned cables which are cast into the footing and anchored at the top of the wall. The wall is continuous with a total length of 2620 feet and consists of 940 feet of 20 foot high wall and 1680 feet of 22 foot high wall. Surface finish is exposed aggregate on both sides. The wall is designed to withstand a 40 pound per square foot wind loading and has a 1.5 factor of safety against overturning. The spread footing consisted of two sizes; one was four feet, six and one half inches wide by six and five eighths inches thick and the other is nine feet wide by two feet thick. Blockouts for the post-tensioned cable anchorage were cast into the footings and were later filled with concrete after the bottom panels were placed and plumbed. Photo numbers 1, 2, and 3 show foundation forms, poured footing, and post-tensioned cable blockouts respectively. Bearing capacity calculations, which a geotechnical consultant performed on soil data

1

FORMS FOR SPREAD FOOTING

2

SPREAD FOOTING FOR NOISE WALL



3

BLOCKOUT IN SPREAD FOOTING FOR PRESTRESSING STRAND ANCHORAGE provided by SDHPT, indicated that soil bearing capacity was at least 3300 pounds per square foot (psf) at each end of the project. No data were provided for the internal part of the project (see Appendix for Lone Star Geotechnical Services calculations). The minimum allowable soil bearing capacity required was 2500 psf.

The wall panels were cast off site in two and four foot heights, transported to the construction site and erected. During the casting process, the fabricator used vertical forms, and encountered several problems with this casting method. First, hand finishing was required for the top edge of the panel, and any high spots on the edge prevented the panels from seating properly when they were erected. Second, forming tolerances were critical because of the protruding trapezoidal wings (see shop drawings in Appendix A). If the form or wing headers were not plumb, or if the top and bottom of the panel were not parallel, the panels would not fit properly with adjacent panels when erected. The prime contractor did experience problems with wall erection because casting tolerances were not rigidly maintained. To solve those problems, the contractor used shims and grout to plumb the walls, and silicone seal was used to seal the horizontal and vertical joints.

The contractor threaded the epoxy coated cable through holes in each panel and after all the panels were in place, he placed a calibrated jack and gauge on top of the wall and applied the post tension required by the plans. Photo No. 4 shows an epoxy coated cable projecting through the end of a wall panel. Photo No. 5 shows a partially erected wall, and Photo No. 6 shows a completed wall section prior to post-tensioning operations.

4

PRESTRESSING STRAND PROJECTING THROUGH END (BULL NOSE) OF WALL PANEL

5

NOISE WALL SHOWING PARTIAL WALL ERECTION

6

NOISE WALL BEFORE POST-TENSIONING

Photo Numbers 4 and 5 show six inches wide by three inches high drainage slots through the wall. These slots were added in addition to the drainage system which the design consultant had provided. Designers and planners had no data relating to the effects these openings would have on noise mitigation; therefore, noise readings were obtained in order to evaluate the amount of noise that would pass through the openings. There is an insignificant difference in the noise levels behind panels with the openings when compared with panels which had the openings plugged. Refer to February 13, 1990, memorandum from Mr. William E. Neyland, P.E. to Mr. Donald R. Garrison, P.E. which is contained in the Appendix. As construction on the project progressed, several residents became concerned about drainage in one section where a street was blocked by the wall. After re-evaluating the situation the Department concurred with those concerns and provided eight large openings beneath the wall. Each opening is five feet wide by one foot eight inches high. Noise readings were obtained at those openings and the noisemeter readings indicate that the large openings conduct insignificant amounts of noise. Refer to Appendix to Mr. Neyland's October 9, 1990, memorandum to Mr. Garrison.

This project is the Houston District's first experience with commercial alternate noise wall designs and was therefore a new experience for designers and for the resident engineer's personnel. Because of this new experience and the lessons which have been learned, following are several items which designers should consider when commercial alternate noise walls are permitted by the project plans.

1. Design specifications that are to be used for commercial alternates should be clearly set out in the plans.

2. Design wind loading and exposure type should be shown in the plans. (See AASHTO Guide Specifications for Structural Design of Sound Barriers)
3. Include notes in the plans which require commercial alternates to meet plan alignments, color, and texture or state what exceptions to these requirements will be permitted.
4. Require contractor to submit design calculations and detailed shop drawings for approval prior to fabrication.
5. Designer must provide soil data or he must tell contractor to obtain soil data needed for any commercial alternate foundation design.
6. Drainage must be provided through, under, or around the wall.
7. Utilities must be considered, and adjusted if necessary.
8. If foundation types (e.g. drilled shaft, spread footing, piling, etc.) are restricted, state which type is acceptable.
9. If form liners are to be used, determine if seams where liner sections are joined together are acceptable, or state if a one-piece (without seams) form liner is required.
10. Require reproducible tracing of approved commercial alternate shop drawings for inclusion in final plans.
11. If wall must be designed to withstand a vehicle impact, state those requirements in the plans.

APPENDICES

APPENDICES A - F

APPENDIX A

A-1 Vicinity map showing project location

APPENDIX B

B-1 Lone Star Geotechnical Services letter to Macon Engineering, Inc.

APPENDIX C

C-1 3D/Post Noise wall details
C-5 Fanwall Noise wall details
C-6 SDHPT Noise wall details
C-7 Approved shop drawings for commercial alternate noise wall

APPENDIX D

D-1 Memoranda from William E. Neyland, P.E. to Donald R. Garrison, P.E.

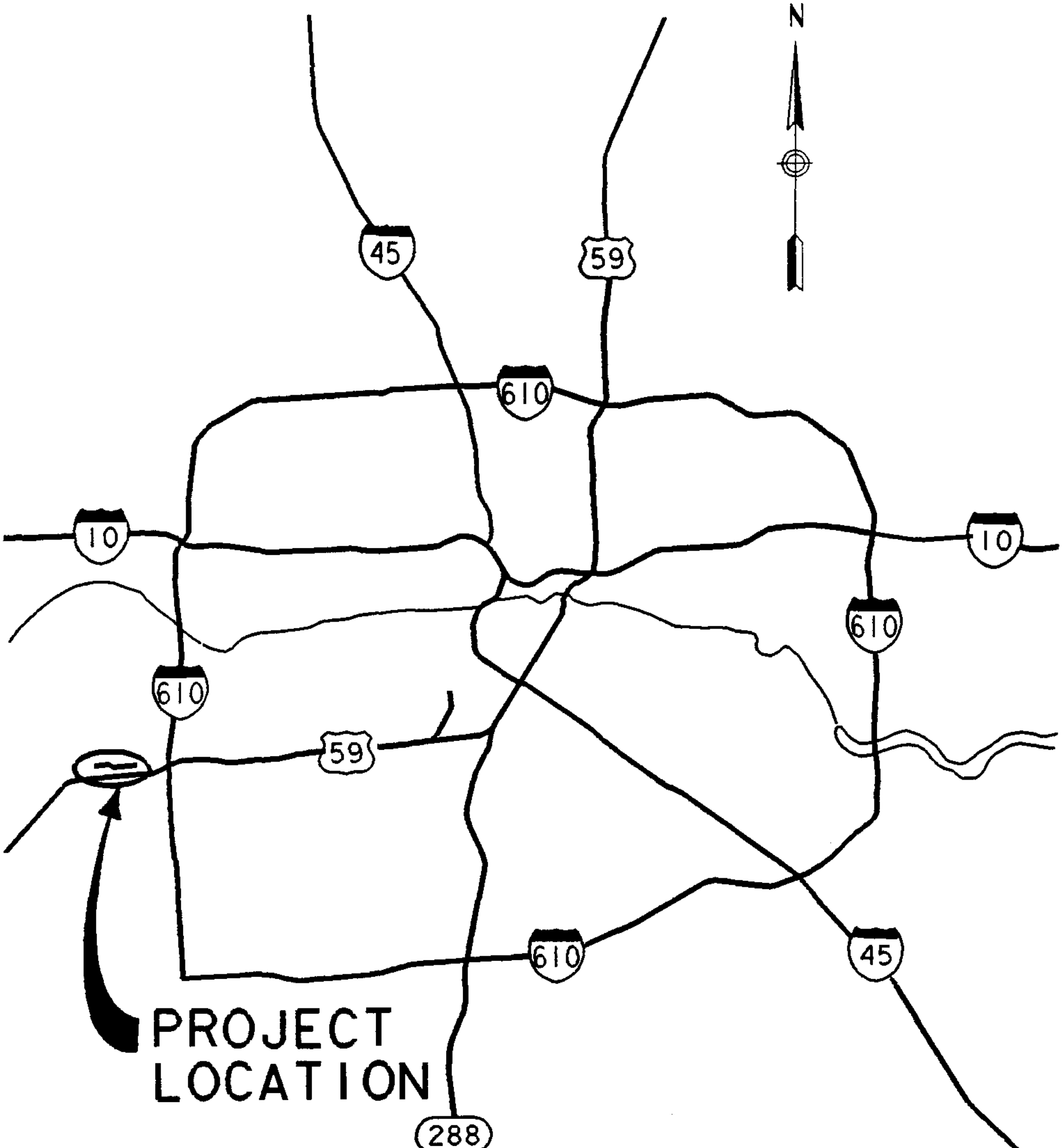
APPENDIX E

E-1 E.B.L., Inc. letter to Mr. Lonnie B. Beckham, P.E.

APPENDIX F

F-1 Work Plan for evaluating experimental wall

APPENDIX A



HOUSTON

VICINITY MAP

APPENDIX B

LO.‌.E STAR GEOTECHNICAL S‌.RVICES
P.O. BOX 820125 • HOUSTON, TEXAS 77282-0125
(713) 666-6030
LSGS

July 26, 1989

Macon Engineering, Inc.
15422 El Padre
Houston, Texas 77083

Attn: Mr. James D. Maberry, P.E.

Re: Sound Barrier Wall
T.S.D.H.P.T. Project No. F 514(90)

Dear James:

In compliance with your request, the writer has studied the documents presented to determine the frictional shear resistance of the soil for the project referred to above.

Four (4) logs of borings furnished by the Texas State Department of Highways & Public Transportation (TSDPHT) were examined for soil characteristics in the surface or surficial stratum to use for determining the friction resistance or shear strength of the soil to overcome the wind loads on the sound barrier wall. Logs of borings 101 & 102 were labeled CHIMNEY ROCK OVERPASS - HIGHWAY U. S. 59, and dated 3/23/59 and 3/24/59, respectively. Logs of borings 103 & 104 were labeled RICE AVENUE OVERPASS - HIGHWAY U. S. 59 and dated 7/13/59 and 8/14/59, respectively. The following is a summary of information used from the logs.

LOG #	DESCRIPTION	ELEVATION, Ft.	COHESION, P.S.I.	FRICTION ANGLE, °
101	Med. Stiff Dark Gray Silty Clay	68.0	3	8
102	Stiff Dk. Gray Silty Clay	69.0	8	9
103	Stiff Dk. Gray Silty Clay	68.0	5	19
104	Med. Stiff Lt. Gray Tan Silty Clay		4	10

To determine the soil resistance to the wind load, the cohesion and angle of internal friction have to be taken into account as the founding soil is a "mixed" soil and not a pure silt or a pure clay.

Coulomb's Law is applicable in this situation. It is expressed as follows:

$$s = c + p(\tan \phi) \; *$$

in which s = unit shear strength
c = unit cohesion
p = normal stress on surface of sliding
ϕ = angle of internal friction

Using the lowest values provided (Log of Boring 101), the soil resistance is calculated as follows:

a = area of footing = 4.54'X56.56' = 257 S.F.
c = 432 PSF (3 P.S.I.)

$$p = \frac{93324\#(\text{Wall Wt.}) + 19259\#(\text{Footing Wt.})}{257 \text{ S.F.}(\text{Area of Footing})} = 438.1 \text{ PSF}$$

ϕ = 8°
tanϕ = .140541
s = 432 + 438.1(0.140541) = 493.57 PSF
r = resistance = s X a = 493.57 PSF X 257 SF = 126,847 #
W.L. = Wind Load = 26 PSF X 22'X48.28'= 27,616 # **
S.F. = safety factor = r ÷ W.L. = 126,847 ÷ 27,616 = 4.6

A value of 0.4 for the coefficient of friction for concrete on concrete appears to be a very reasonable value. The value for concrete masonry units is 0.5 to 0.7, as noted on p. 147, paragraph preceeding equation (H.5), Structural Masonry by Sven Sahlin, 1971, Prentis-Hall, Inc.

* Coulomb's Law, equation (6-8), P. 194, Basic Soil Engineering by B. K. Hough, 2nd Edition, 1969, The Ronald Press.

** James D. Maberry, P.E. #13842 notes dated July 1, 1989 on Sound Barrier Wall, 10' Offset, S.D.H.P.T. Project F 514(90).

The bearing capacity of the soil is determined from the general bearing capacity equation derived by Dr. Karl Terzaghi, taking into account local shear in loose soil. This equation using bearing capacity factors has been modified by several soil engineers. Meyerhof, Bell, Peck, Hanson, & Thornburg to name a few. We are inclined to use the curves derived by W.A Taylor as shown on page 337, Figure 9-12, Basic Soils Engineering, B. K. Hough, 1969.

The equation is as follows:

$$q(ult) = cNc + q'Nq + o.5\alpha BN\alpha$$

where
- $q(ult)$ = bearing capacity, psf
- c = cohesion, psf
- Nc = cohesion factor
- q' = surcharge (density X depth), psf
- Nq = surcharge factor
- α = wet unit weight, pcf
- B = width of footing, feet
- $N\alpha$ = solid friction factor

From Log of Boring 101: Dry Unit Weight = 107 pcf
Moisture Content = 20.0
So, α, Wet Unit Weight = 128.4 pcf

From Curves:
Nc = 7
Nq = 2
$N\alpha$ = 1

Since depth of footing is 1 foot, q' = 128.4 psf
Width of footing, B = 4.54 feet
Cohesion, c = 432 psf

$q(ult)$ = 432(7)=(128.4x1)(2)+0.5(128.4)(1)
$q(ult)$ = 3345 psf
Load capacity = $q(ult)$ x Area
= 3345 psf x 257 sf
= 859665 lbs.
Safety Factor = Load Capacity ÷ Load (Dead Load Only)
= 859665 ÷ 112583 = 7.6

For overturning moments, use 150 pcf for the unit weight of the concrete and 3345 psf passive resistance for the soil.

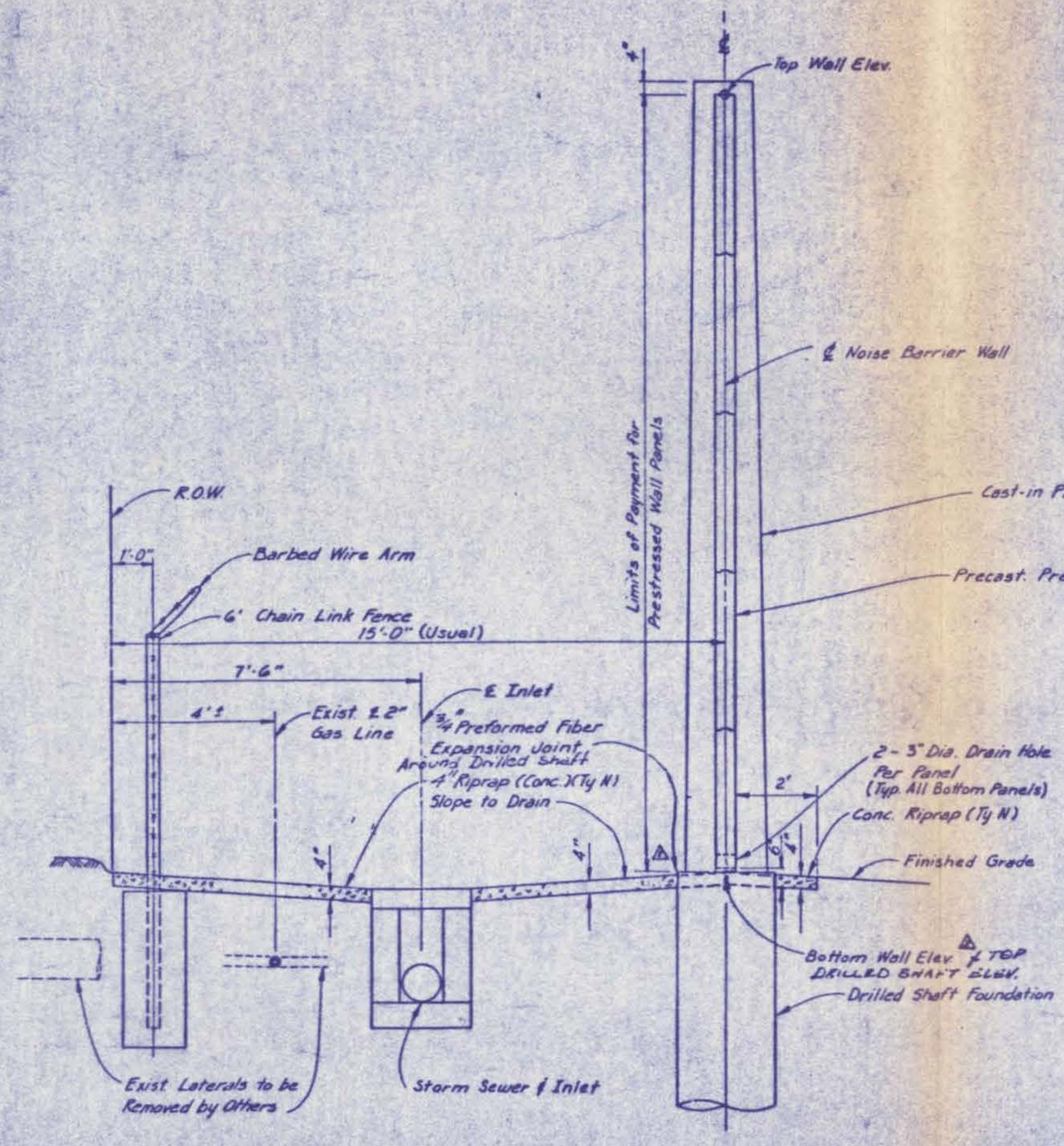
It has been a pleasure serving you on this project, if we may be of further service on this or other projects, please call.

Sincerely,

James L. Hickey, P.E.
Senior Engineer

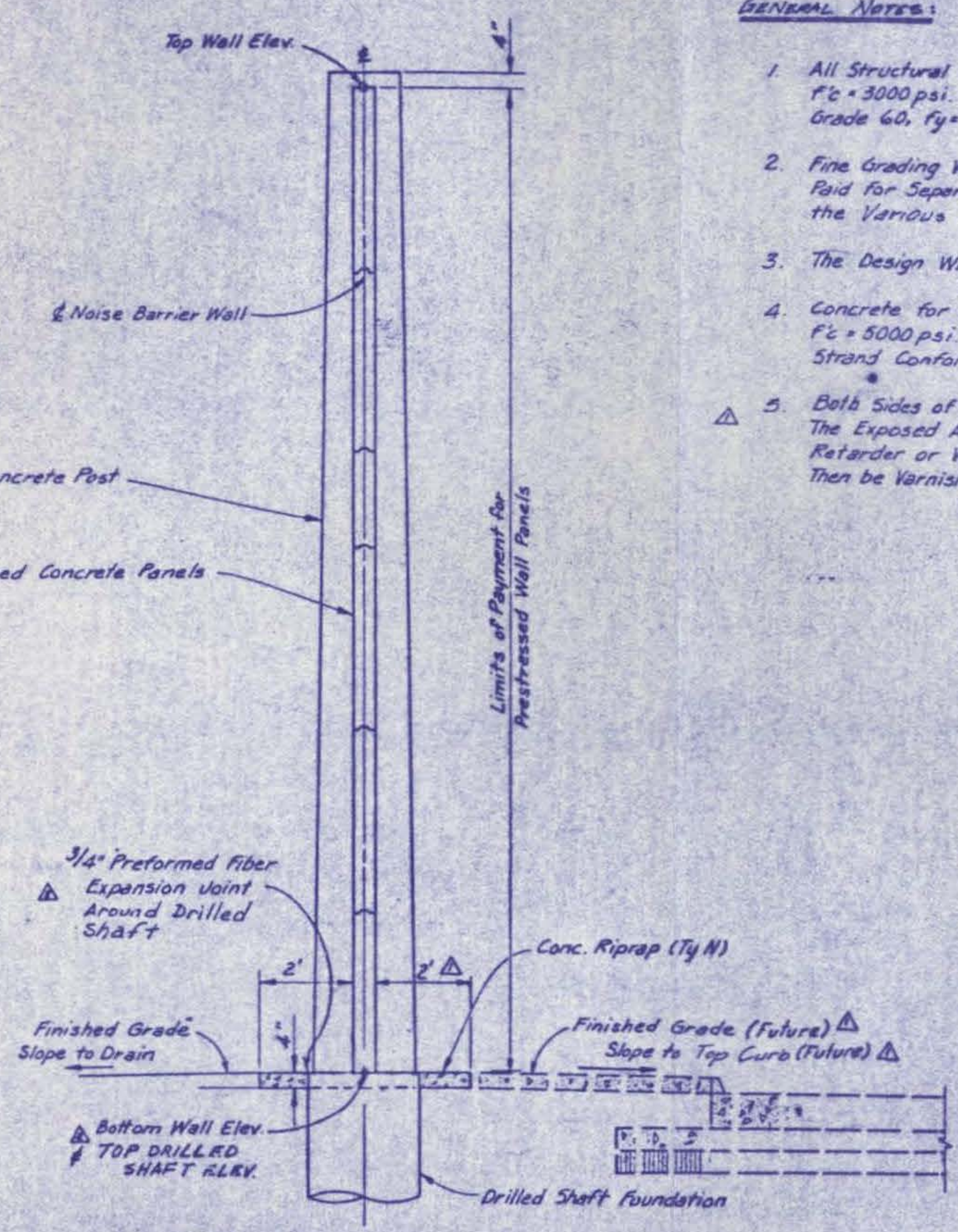
JLH/ohr

APPENDIX C



TYPICAL SECTION

CHIMNEY ROCK TO BARRINGTON



TYPICAL SECTION

BARRINGTON TO RICE

GENERAL NOTES:

1. All Structural Reinforced Concrete Shall be Class "A" Concrete f'c = 3000 psi. All Reinforcing Steel Shall be ASTM A615 Grade 60, fy = 60,000 psi.
2. Fine Grading With Local Topsoil Along the Wall Shall Not be Paid for Seperately, but Shall be Considered Incidental to the Various Pay Items.
3. The Design Wind Load for the Wall is 40 lbs. per Sq. Ft.
4. Concrete for Prestressed Panels Shall be Class H Concrete, f'c = 5000 psi. Prestressing Tendons Shall be Seven Wire Strand Conforming to ASTM Designation A416, fpu = 270 ksi.
5. Both Sides of Panels Shall Have 3/4"± Exposed Aggregate. The Exposed Aggregate Shall be Done by Sandblasting, Retarder or Water Washing Off Method. The Surfaces Shall Then be Varnished With Clear Acrylic.

Rev 3/13/89
REV 3/10/89

State Department of Highways and Public Transportation

METRO Metropolitan Transit Authority Of Harris County

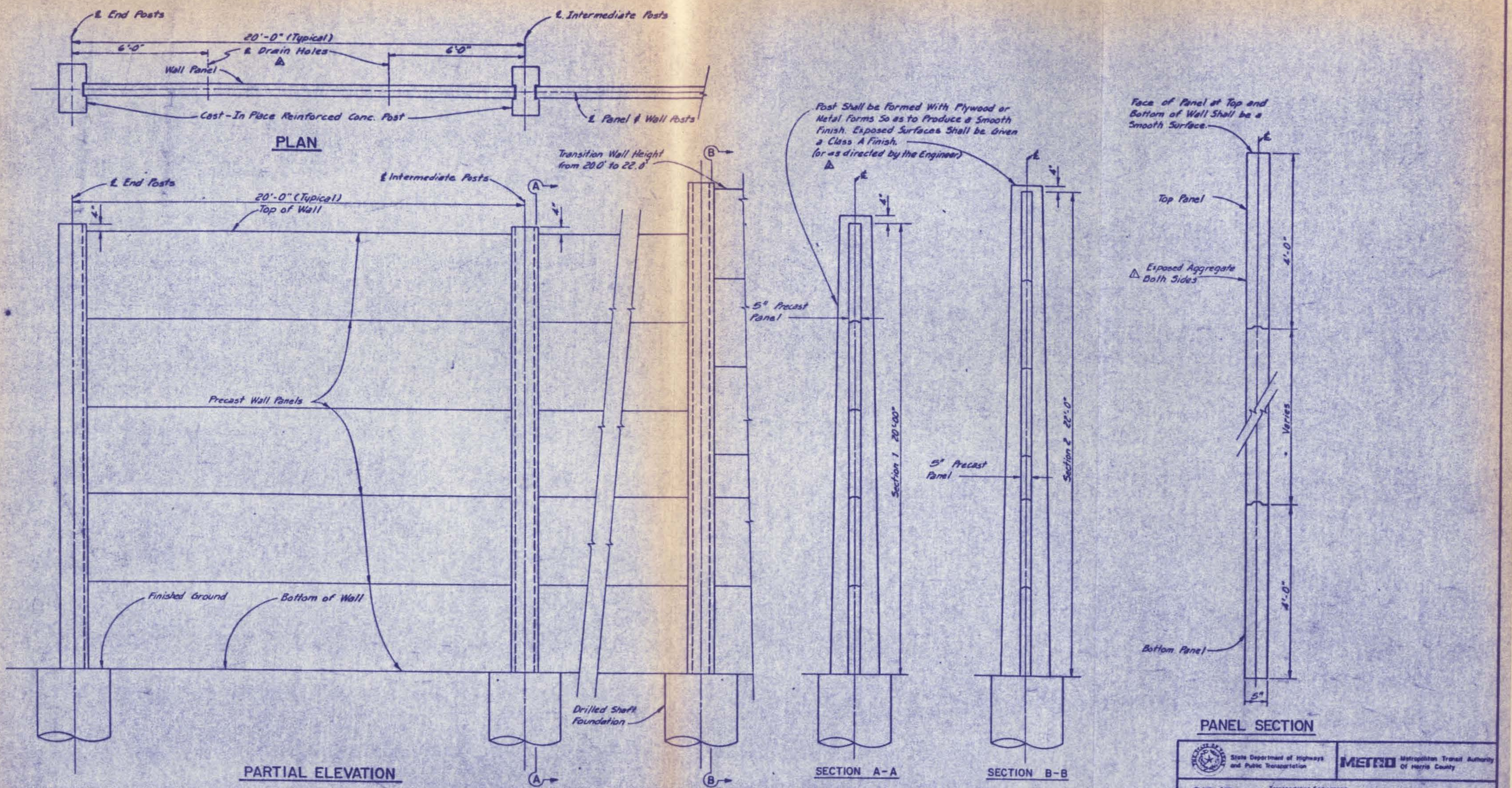
3D/Post

U.S. 59 SOUTHWEST FREEWAY/TRANSITWAY

NOISE BARRIER
TYPICAL SECTIONS

Dn. HP	Drawing	Date		State	Federal Aid Project No.	Highway No.
Ck. Dn. RP	ORIGINAL	AUG 1986	6	TEXAS	F 514 (90)	U.S. 59
Dn. DM	Rev 12/88 - SDHPT		State Dist. No.	County	Control 27 / Section 13 / Job 149	Sheet No.
Ck. Dn. RP	Rev. 3/89 - SDHPT		12	HARRIS	27 / 13 / 149	16
Tr.						
Ck. Tr.						

C-1



State Department of Highways and Public Transportation

METRO Metropolitan Transit Authority Of Harris County

3D/Post Transportation Engineering 1900 West Loop South Houston Texas

Joint Venture 3D/International and Post Buckley Schuh & Jernigan Inc.

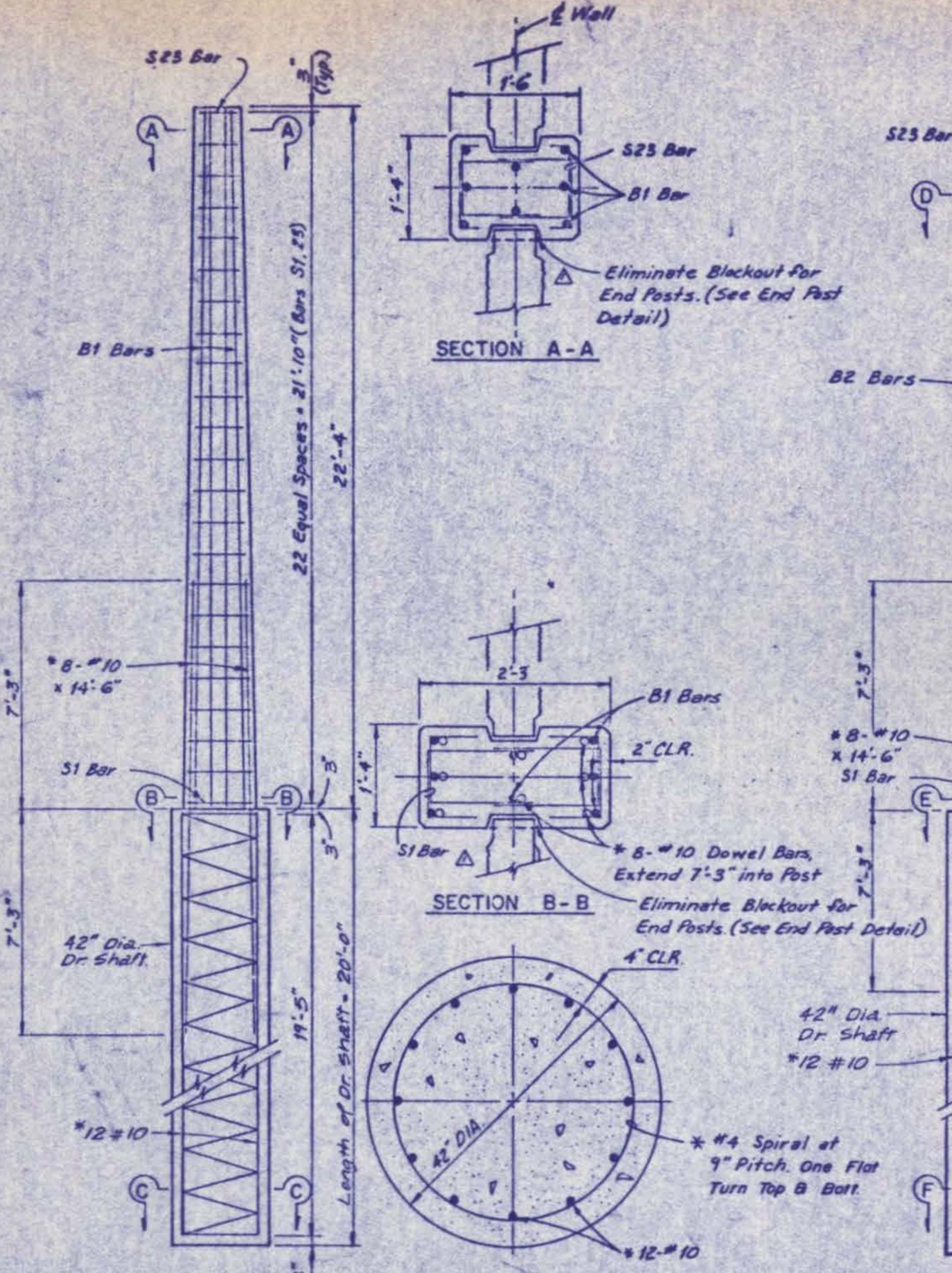
U.S. 59 SOUTHWEST FREEWAY / TRANSITWAY

NOISE BARRIER
WALL ELEVATION & DETAILS

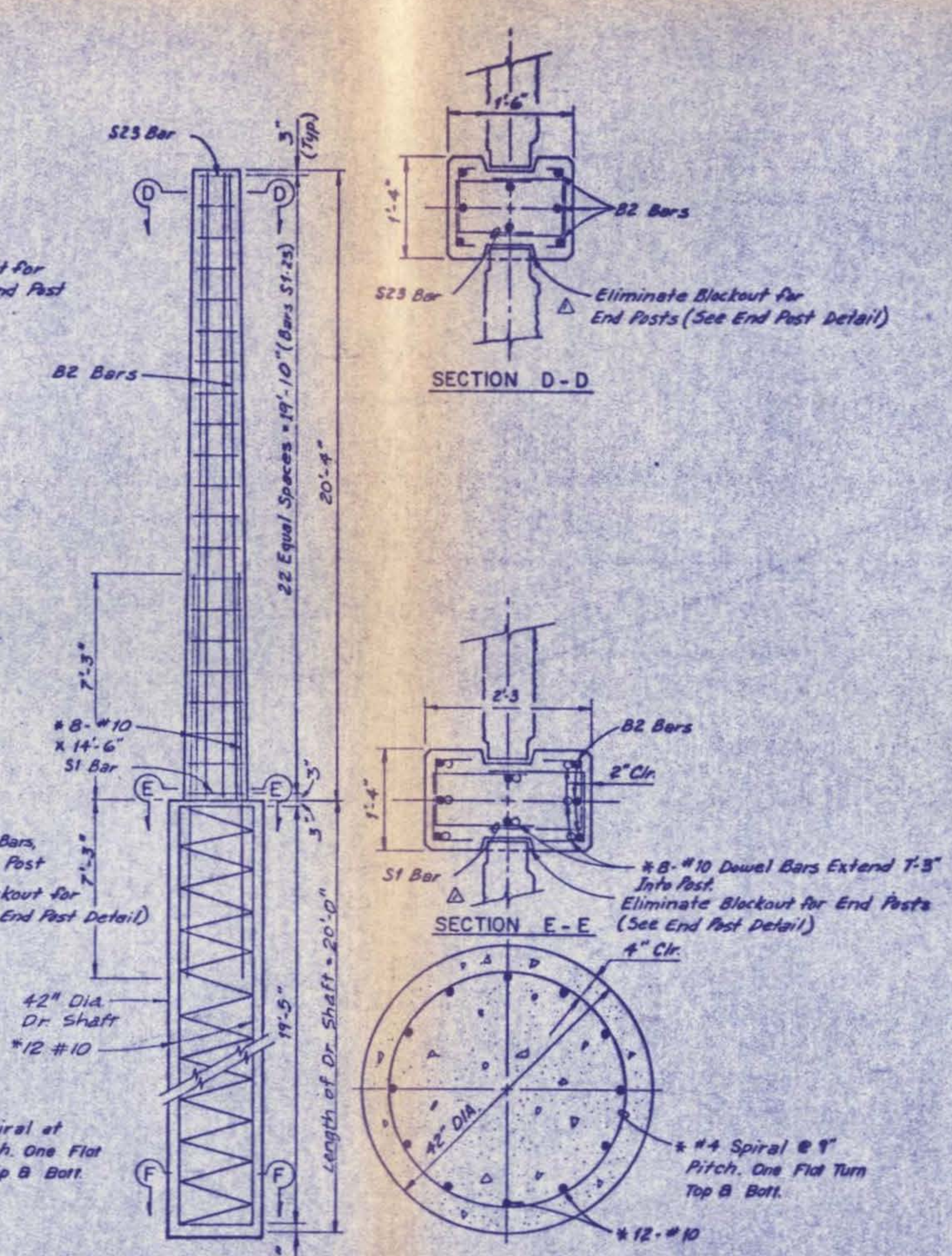
Dn. HRP	Drawing	Date		State	Federal Aid Project No.			Highway No.
Ck Dn. HRP	ORIGINAL	AUG 1986	6	TEXAS	F 514 (90)			U.S. 59
Dw. DSM	Rev 1/89 - SDHPT		State Dist. No.	County	Control No.	Sect. No.	Job No.	Sheet No.
Ck Dw.	Rev. 4/89 - SDHPT		12	HARRIS	27	13	149	17
Tr.								
Ck Tr.								

C-2

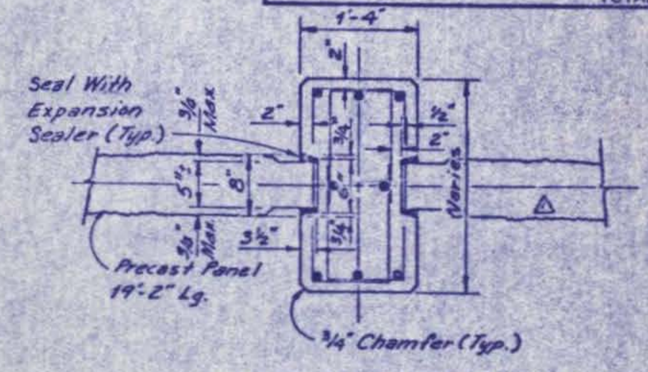
BILL OF REINFORCING STEEL				
BAR	SIZE(#)	NO.	LENGTH	WEIGHT
22' POST				
B1	10	648	22'-2"	61,808
S1-23	5	7,452	2'-2" AVG.	16,840
			SUBTOTAL	78,648 LBS
20' POST				
B2	10	392	20'-2"	34,017
S1-23	5	4,508	2'-2" AVG	10,187
			SUBTOTAL	44,204 LBS.
22' CORNER POST				
A4	10	20	22'-2"	1908
U4	5	46	6'-9"	324
			SUBTOTAL	2232 LBS.
20' CORNER POST				
A5	10	8	20'-2"	694
T5	5	23	6'-6"	156
			SUBTOTAL	850 LBS.
			TOTAL	125,934 LBS.



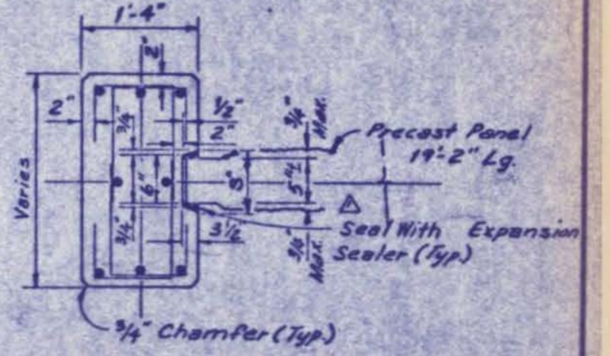
22' POST & FOUNDATION DETAIL



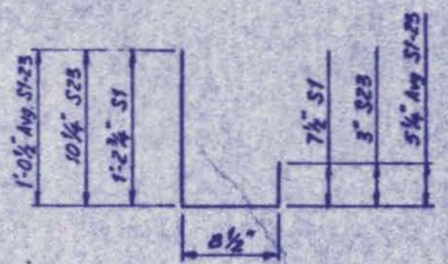
20' POST & FOUNDATION DETAIL



INTERMEDIATE POST DETAIL



END POST DETAIL



S BARS

* INCLUDED IN PRICE BID FOR *ITEM 5068*

State Department of Highways and Public Transportation

METRO Metropolitan Transit Authority Of Harris County

3D/Post

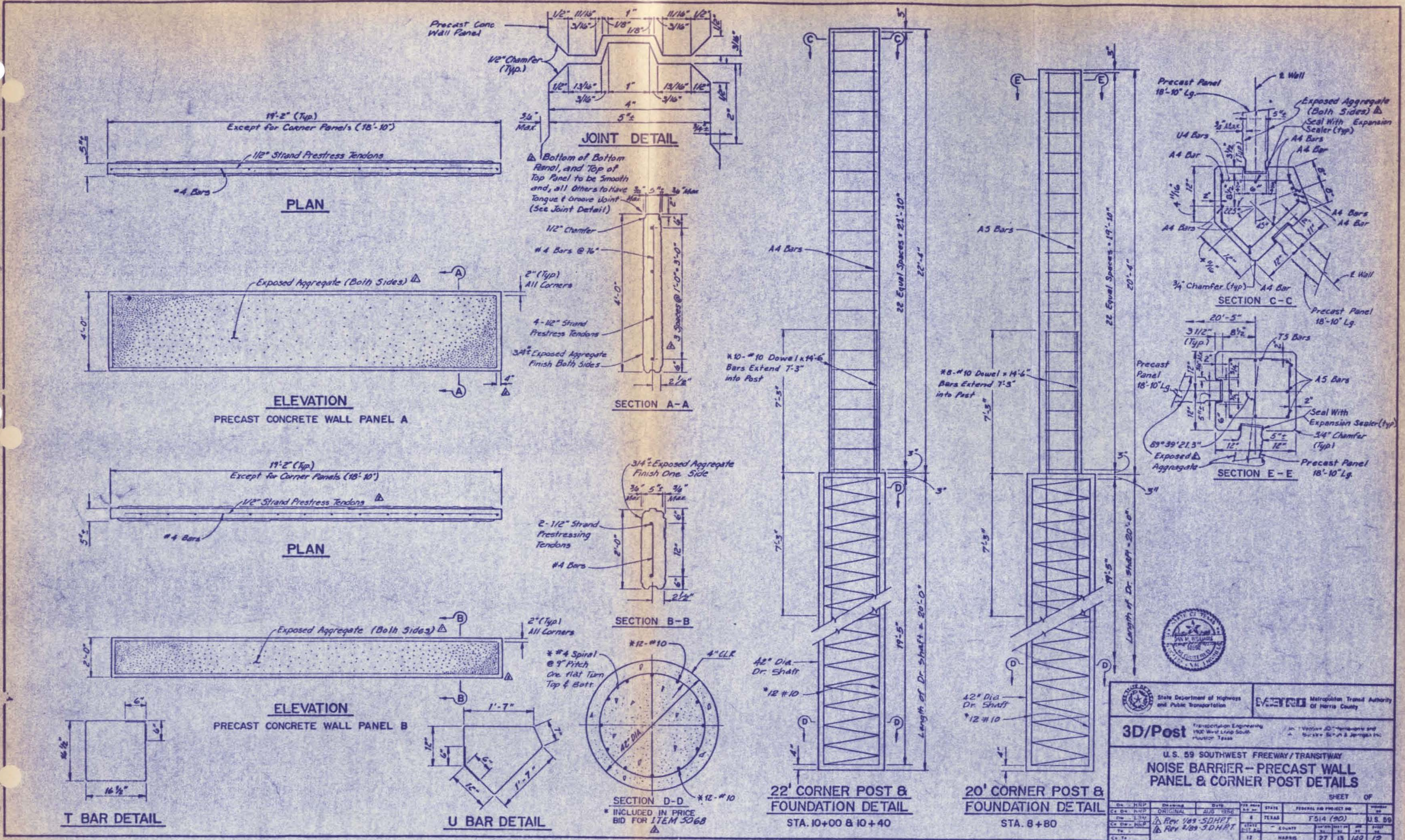
U.S. 59 SOUTHWEST FREEWAY/TRANSITWAY

NOISE BARRIER
POST AND FOUNDATION DETAILS

SHEET OF

Dn HRP	Drawing	Date		STATE	FEDERAL AID PROJECT NO	
Ck Dn HRP	ORIGINAL	AUG 1986				
Dn DBM	Rev. 2/89 SDHPT		6	TEXAS	F 514.(90)	U.S. 59
Ck Dn HRP			STATE DIST NO	COUNTY	27 / 13 / 149	18
Tr			12	HARRIS		
Ck Tr						

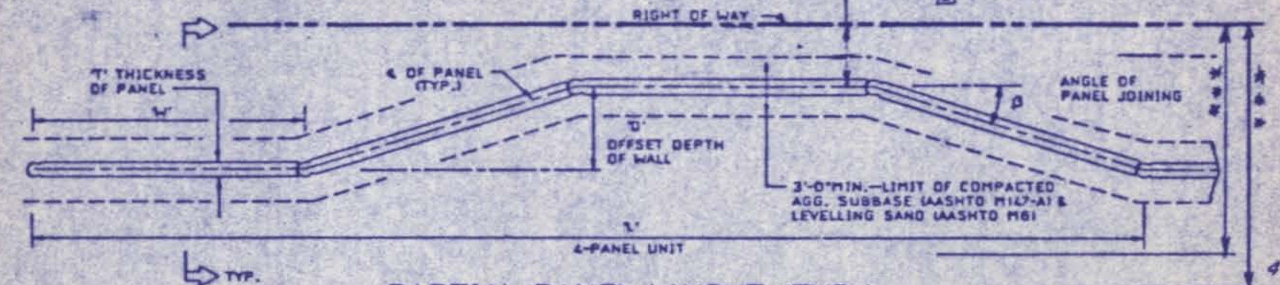
C-3



PLAN
19'-2" (Typ) Except for Corner Panels (18'-10")
1/2" Strand Prestress Tendons
#4 Bars
ELEVATION
PRECAST CONCRETE WALL PANEL A
Exposed Aggregate (Both Sides)
2" (Typ) All Corners
ELEVATION
PRECAST CONCRETE WALL PANEL B
JOINT DETAIL
Precast Conc Wall Panel
1/2" Chamfer (Typ.)
Bottom of Bottom Panel, and Top of Top Panel to be Smooth and, all Others to Have Tongue & Groove Joint (See Joint Detail)
SECTION A-A
#4 Bars @ 16"
4-1/2" Strand Prestress Tendons
3/4"± Exposed Aggregate Finish Both Sides
SECTION B-B
3/4"± Exposed Aggregate Finish One Side
2-1/2" Strand Prestressing Tendons
SECTION D-D
* #4 Spiral @ 9" Pitch One Flat Turn Top & Bott.
*12-#10
4" CLR
42" DIA
* INCLUDED IN PRICE BID FOR ITEM 5068
T BAR DETAIL
U BAR DETAIL
22' CORNER POST & FOUNDATION DETAIL
STA. 10+00 & 10+40
A4 Bars
*10-#10 Dowel x 14'-6" Bars Extend 7'-3" into Post
42" Dia Dr. Shaft
22 Equal Spaces = 21'-10"
Length of Dr. Shaft = 20'-0"
20' CORNER POST & FOUNDATION DETAIL
STA. 8+80
A5 Bars
*8-#10 Dowel x 14'-6" Bars Extend 7'-3" into Post
22 Equal Spaces = 19'-10"
Length of Dr. Shaft = 20'-0"
SECTION C-C
Precast Panel 18'-10" Lg.
℄ Wall
Exposed Aggregate (Both Sides)
Seal With Expansion Sealer (typ)
U4 Bars
A4 Bar
3/4" Chamfer (typ)
SECTION E-E
T5 Bars
A5 Bars
Seal With Expansion Sealer (typ)
3/4" Chamfer (Typ)
Exposed Aggregate
State Department of Highways and Public Transportation
METRO Metropolitan Transit Authority Of Harris County
3D/Post
U.S. 59 SOUTHWEST FREEWAY/TRANSITWAY
NOISE BARRIER – PRECAST WALL PANEL & CORNER POST DETAILS
SHEET OF
ORIGINAL AUG 1986
Rev 1/89-SDHPT
Rev 2/89-SDHPT
TEXAS
F514 (90)
U.S. 59
HARRIS
27 13 149 19

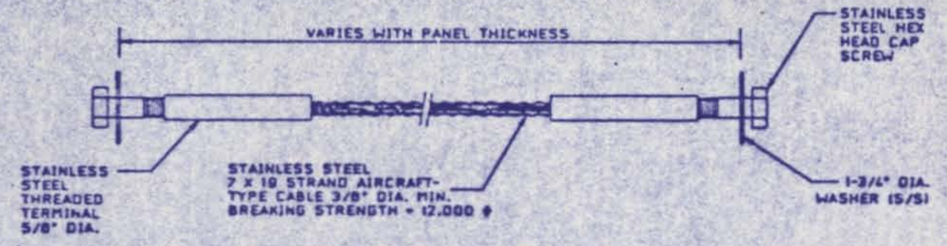
C-4

△ *Where Regular Fanwall Pattern Cannot Be Constructed, The Manufacturer Shall Design A Wall That Will Fit Within The Right-Of-Way.*

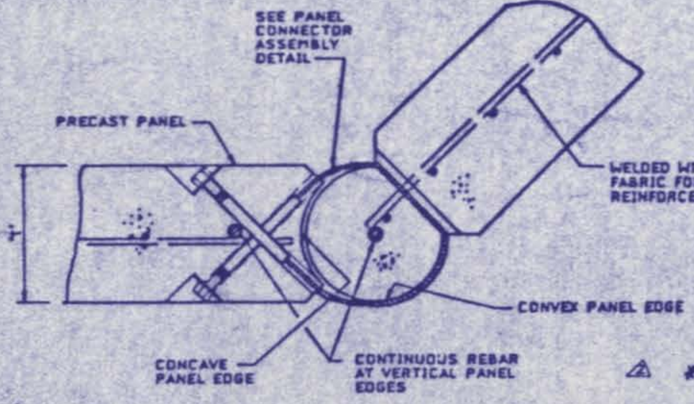


PARTIAL PANEL LAYOUT (TYP.)

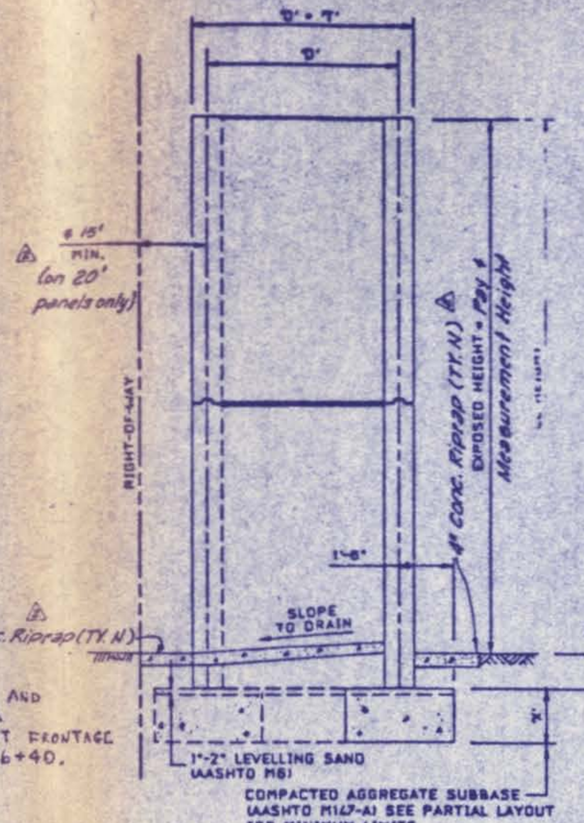
* ** OFFSETS SHOWN ON NOISE BARRIER PLAN AND PROFILE LAYOUTS SHALL BE THE MINIMUM DISTANCE FROM ℄ OF WALL TO ℄ OF THE LEFT FRONTAGE STREET FROM WALL, STA 10+40 to STA 26+40.



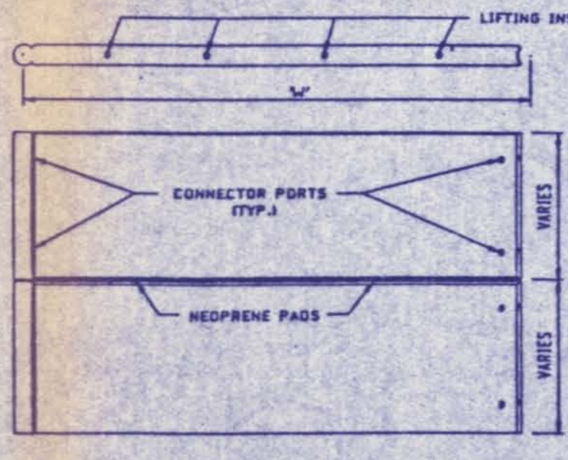
FANWALL PANEL CONNECTOR ASSEMBLY



FANWALL PANEL JOINT



TYPICAL SECTION
STACKED PANELS



FANWALL STACKED PANELS

SHOWN STACKED TWO PANELS HIGH UP TO 18'. FOR WALL HEIGHTS GREATER THAN 18', STACK THREE PANELS HIGH

△ * *For Construction Purposes, The Alignment Shown In The Plan And Profile Shall Coincide With The ℄ of Fanwall Located Closest To Right-of-Way Line.*

\#\# *Granular Material Shall Meet The Following Grading Requirements, And/or As Approved By The Engineer.*

Smaller Than 6"	*100%*
Finer Than 3"	*75-100%*
Finer Than No. 200 Sieve	*25% Max.*

GENERAL NOTES

1. CONCRETE PANELS - FANWALL PANELS SHALL BE MODULAR, RECTANGULAR, PRECAST CONCRETE. CONCRETE f_c' = 4000 PSI. PANELS SHALL BE MANUFACTURED TO THE THICKNESS AND SIZE SHOWN ON FINAL DRAWINGS. PERMISSIBLE TOLERANCES ARE AS FOLLOWS: HEIGHT - ± 1/4", WIDTH - ±1/4", THICKNESS- ±1/4".
2. PANEL FINISH - IN ACCORDANCE WITH SPECIFICATIONS, BOTH *SIDES OF PANELS SHALL BE 3/4" EXPOSED AGGREGATE.*
3. REINFORCEMENT - WELDED WIRE FABRIC SHALL CONFORM TO AASHTO M55. REINFORCING BAR SHALL CONFORM TO AASHTO M31 GRADE 60.
4. PANEL CONNECTOR ASSEMBLY - MILITARY SPECIFICATIONS COVERING FANWALL PANEL CONNECTOR ASSEMBLIES ARE AS FOLLOWS:

   MIL - W - 83420B - WIRE ROPE, FLEXIBLE. FOR AIRCRAFT CONTROL.
   MIL - T - 6117 - TERMINAL CABLE ASSEMBLY, SWAGED TYPE.

△ 5. *FOUNDATION PREPARATION - THE AGGREGATE SUBBASE SHALL BE PLACED IN LIFTS NOT EXCEEDING 8" (LOOSE) AND SHALL BE COMPACTED TO NOT LESS THAN 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY TEST METHOD TEX-114-E.*

THE EXISTING FOUNDATION MATERIAL BELOW THE AGGREGATE SUBBASE SHALL HAVE A MINIMUM ALLOWABLE SOIL BEARING CAPACITY OF 2500 PSF. WHEN EXISTING FOUNDATION MATERIAL FAILS TO MEET THIS REQUIREMENT THE CONTRACTOR SHALL REMOVE THE UNSUITABLE MATERIAL TO A MINIMUM DEPTH OF 1'-0" OR AS DETERMINED BY THE ENGINEER. THEN THE CONTRACTOR SHALL EITHER REPLACE AND COMPACT THE EXCAVATED MATERIAL OR BACKFILL WITH APPROVED GRANULAR MATERIAL ##. COMPACTION SHALL MEET AT LEAST 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY TEST METHOD TEX-114-E. FAILURES SHALL BE RETESTED TO INSURE MINIMUM BEARING CAPACITY AS DETERMINED BY THE ENGINEER.

WITHIN 14 DAYS OF ERECTION OF ANY FANWALL PANEL, THE ADJACENT EMBEDMENT BACKFILL SHALL BE PLACED TO THE LINES AND GRADES AS SHOWN ON THE DRAWINGS. THE EMBEDMENT BACKFILL SHALL BE PLACED IN LIFTS NOT EXCEEDING 8" (LOOSE) AND SHALL BE COMPACTED TO NOT LESS THAN 90% OF THE MAXIMUM DRY DENSITY AS *DETERMINED BY TEST METHOD TEX-114-E.*

6. INSTALLATION - THE CONCRETE PANELS SHALL BE INSTALLED ON THE PREPARED GRADES WITH PANEL JOINTS SET NORMAL TO THE SLOPE. FACES OF THOSE PANELS WHICH ARE PARALLEL TO THE CENTERLINE OF THE WALL SHALL BE VERTICAL. THE TOPS OF THE PANELS SHALL BE AS SHOWN ON DESIGN DRAWINGS. PANELS SHALL NOT BE 'STEPPED' EXCEPT WHERE REQUIRED AND APPROVED. PANELS SHALL BE INSTALLED IN A SEQUENTIAL OPERATION. PANEL CONNECTOR ASSEMBLIES SHALL BE INSERTED AND TENSIONED WHILE THE PANEL IS STILL SUPPORTED BY THE CRANE, IN PROPER POSITION, WITH ONE VERTICAL EDGE NESTED INTO THE PRECEDING PANEL AND WITH ITS BOTTOM EDGE JUST TOUCHING THE PANEL BELOW OR THE GROUND IF BOTTOM PANEL. AFTER THE CONNECTORS ARE TENSIONED, THE CRANE MAY THEN BE EASED OFF FOR ATTACHMENT TO THE NEXT PANEL. CONCURRENT WITH THE SEQUENTIAL INSTALLATION OF PANELS, THE PANEL LIFTING INSERTS IN THE TOP EDGE OF THE UPPERMOST PANEL SHALL BE PARTIALLY FILLED WITH SAND AND SEALED WITH NON-SHRINK GROUT.
7. PANEL LIFTING INSERTS - INSERTS USED SHALL BE OF A CAPACITY GREATER THAN 2 TIMES THE WEIGHT OF THE PANEL. NUMBER AND LOCATION OF LIFTING INSERTS SHALL BE DETERMINED BY THE PRECASTER.

△ 8 *TYPE N RIPRAP SHALL BE PAID UNDER ITEM 432 (SEE THE "NOISE BARRIER PLAN + PROFILE LAYOUTS" FOR DETAILS.) ALL EXCESS CONCRETE RIPRAP (TYPE N) REQUIRED OVER THE ESTIMATED QUANTITY SHALL BE INCIDENTAL TO THE BID ITEM 432 "RIPRAP (CONC.)(TY. N)".*

DESIGN CRITERIA

1. DESIGN SPECIFICATIONS - "AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS", 1975 EDITION, EXCEPT THAT THE 1.3V GUST FACTOR HAS BEEN ELIMINATED IN CALCULATIONS FOR WALLS WITH LENGTH-TO-HEIGHT RATIOS GREATER THAN 15.
2. PANEL REINFORCEMENT - THE MINIMUM REINFORCEMENT TO PROVIDE FOR TEMPERATURE STRESSES IN THE PANEL IS ONE LAYER OF 4 X 4 - W4/W4 WELDED WIRE FABRIC, EMBEDDED AT MID-DEPTH OF THE PANEL. ADDITIONAL REINFORCEMENT MAY BE PROVIDED AS REQUIRED FOR FABRICATION, HANDLING, TRANSPORTATION AND ERECTION.
3. PANEL CONNECTOR ASSEMBLY - SHALL BE OF ALL STAINLESS STEEL CONSTRUCTION, COMPRISED OF 7 X 19 STRAND AIRCRAFT - TYPE CABLE AND COMPRESSION FITTINGS. CABLE SHALL BE MINIMUM 3/8" DIAMETER, WITH A MINIMUM RATED BREAKING STRENGTH OF 12,000 POUNDS. COMPRESSION FITTINGS SHALL HAVE A RATED STRENGTH EQUAL TO OR EXCEEDING THAT OF THE CABLE.
4. DESIGN WIND PRESSURE - 40 PSF.

△ 5. DIMENSIONS W.T.D.L.B. AND X TO BE DESIGNED BY THE MANUFACTURER. *W WILL AVERAGE 15' WITH VARIATIONS TO SIGHT CONDITIONS. D WILL HAVE A 7' TO 10' RANGE. D SHALL BE MODIFIED WHEN SIGHT CONDITIONS REQUIRE LESS THAN 7'.*

Rev 3/13/89
Rev 3/10/89

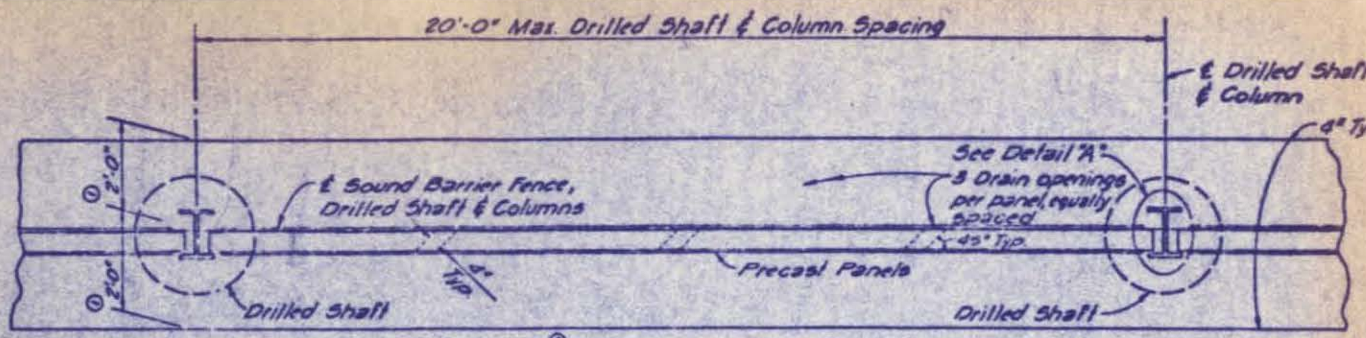
STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION
U.S. 59 SOUTHWEST FWY.

FANWALL NOISE BARRIER (OPTION)

fanwall — the fanwall corporation

DRAWING	DATE	FED. RD. DIV. NO.	STATE	FEDERAL PROJECT NO.	HIGHWAY NO.
Rev. per S.D.H.P.T.	SEPT. 1988	6	TEXAS	F 514 (90)	US 59

STATE DIST. NO.	COUNTY	CONT.	SECT.	JOB	SHEET NO.
12	HARRIS	27	13	149	20

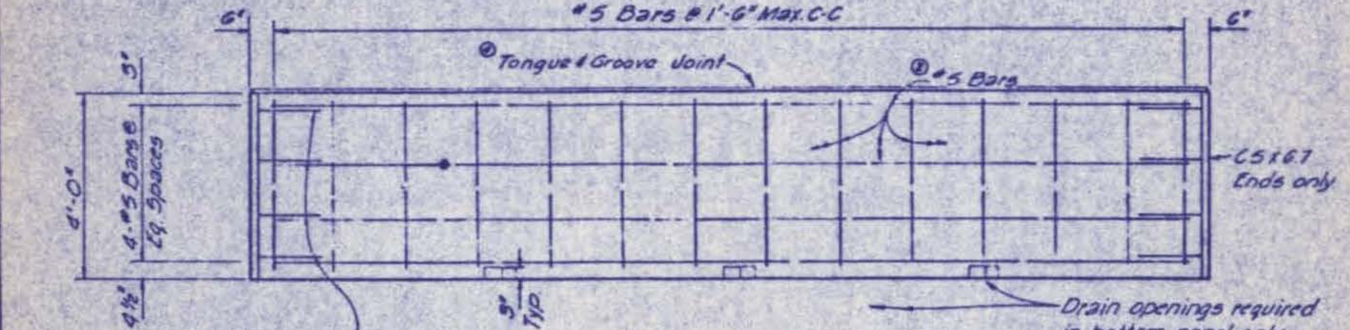


® If traffic direction is reversed then reverse the direction of the drain openings.

® Direction of Traffic

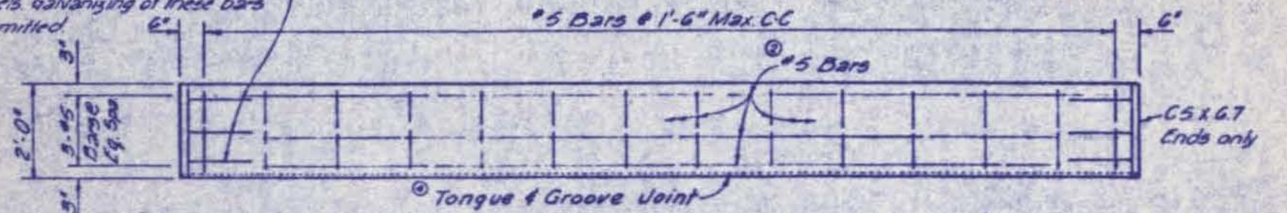
PLAN

① These distances may vary between columns due to curved or irregular ROW in which case the precast panels shall parallel the chord between columns. Distances shown at the columns shall not vary.



4 FT. PANEL ELEVATION

#5 x 1'-6" Bar Anchors spaced with horizontal reinforcing. Welded to end channels. Galvanizing of these bars is permitted.

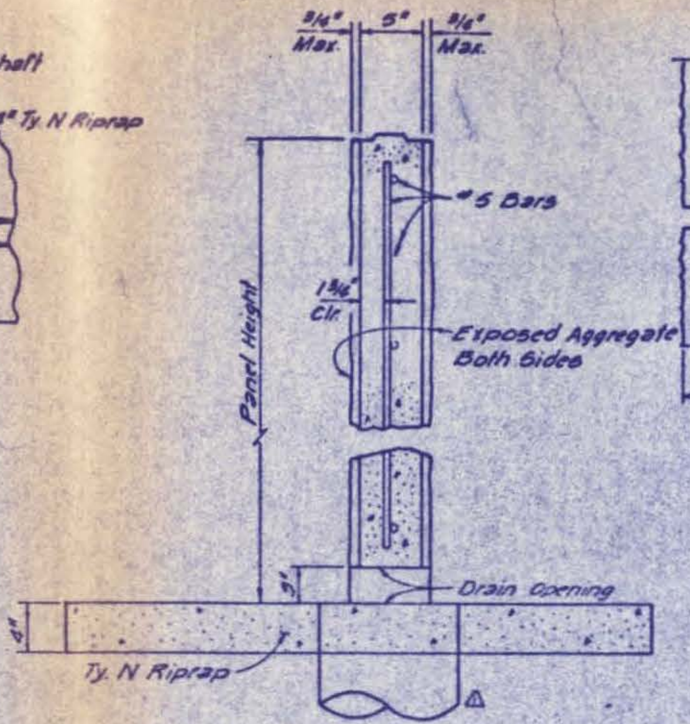


④ Top of top panel and bottom of bottom panel to be smooth, all others to have Tongue & Groove Joint. See "Joint Detail."

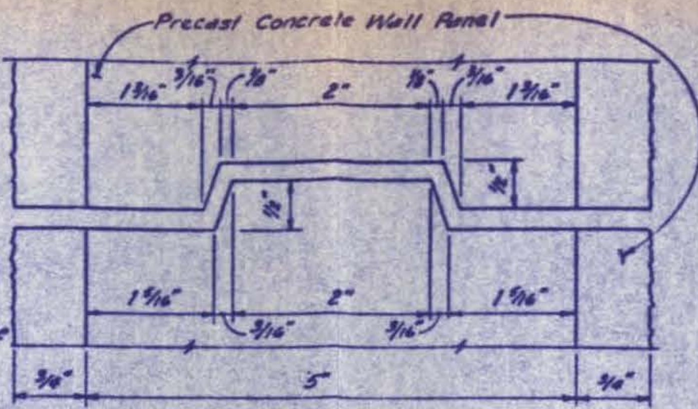
2 FT. TOP PANEL ELEVATION

PRECAST PANEL DETAILS

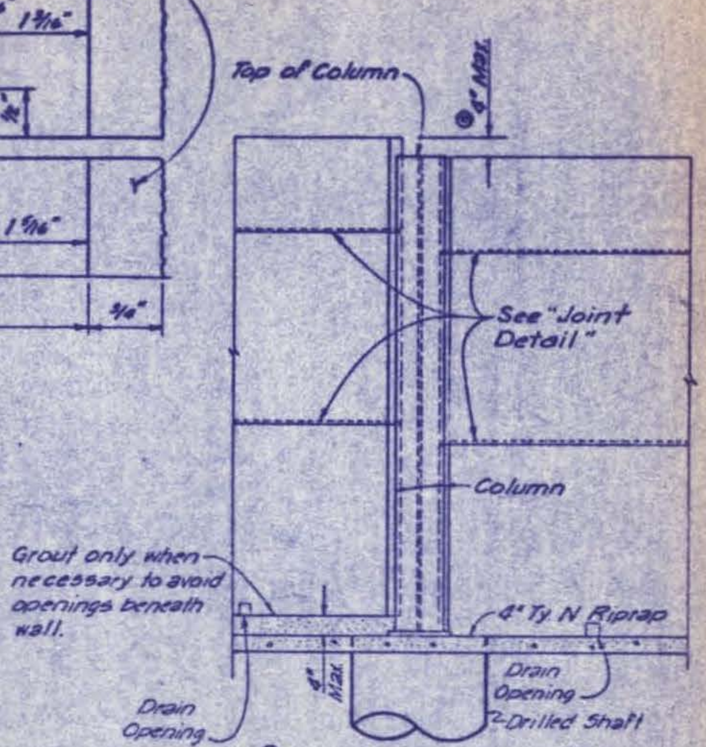
② Wire mesh may be used in lieu of deformed bars. If deformed bars are used, splices will not be permitted.



TYPICAL SECTION

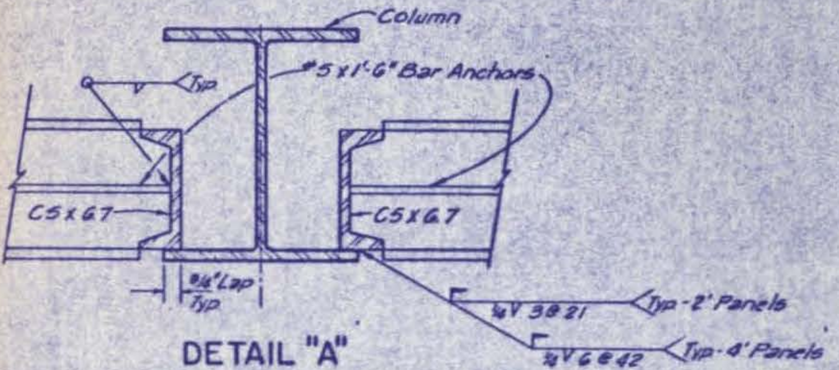


JOINT DETAIL



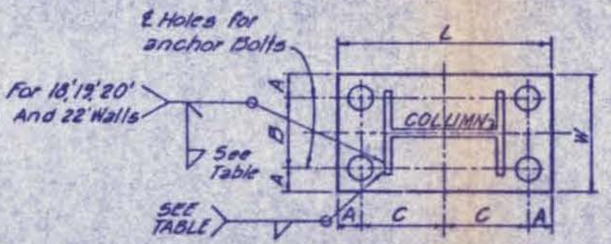
③ This is allowed due to uneven terrain. If area is relatively level, it is preferred this distance be held to 0".

TYPICAL ELEVATION

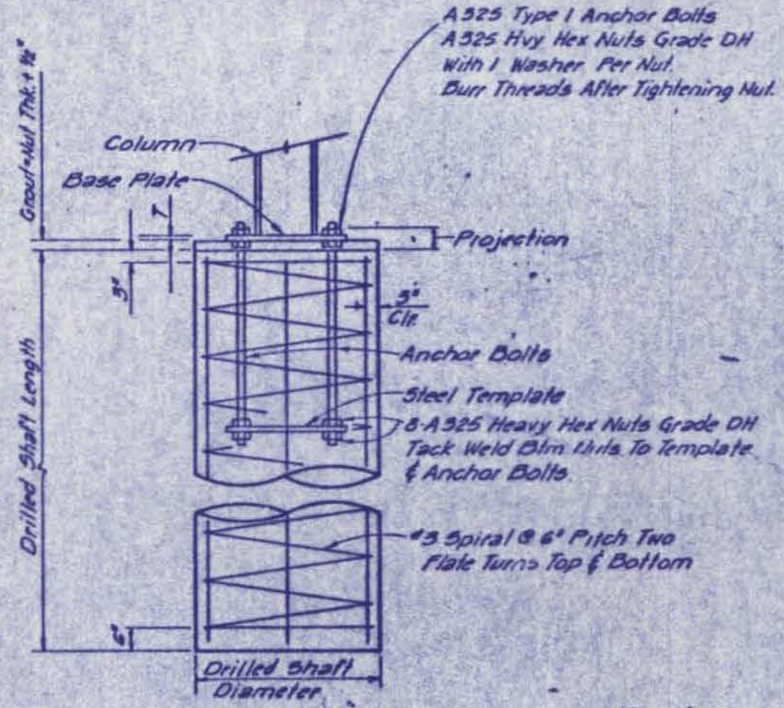


DETAIL "A"

Notes:
Columns, C5 x 6.7, base plates, anchor bolts nuts and washers shall be galvanized in accordance with item 442.
All steel not embedded in concrete shall be painted in accordance with item 446.
Anchor bolts and base plates shall be painted after erection of fence.
All concrete shall be class "C" concrete.
In determining which panel heights (2' or 4') to use the Contractor shall use only 4' panels unless a 2' panel is required to establish the wall height. 2' panels shall be placed only on the top of the wall.



BASE PLATE



COLUMN CONNECTION TO DRILLED SHAFT

PRECAST PANEL & FOUNDATION DESIGN

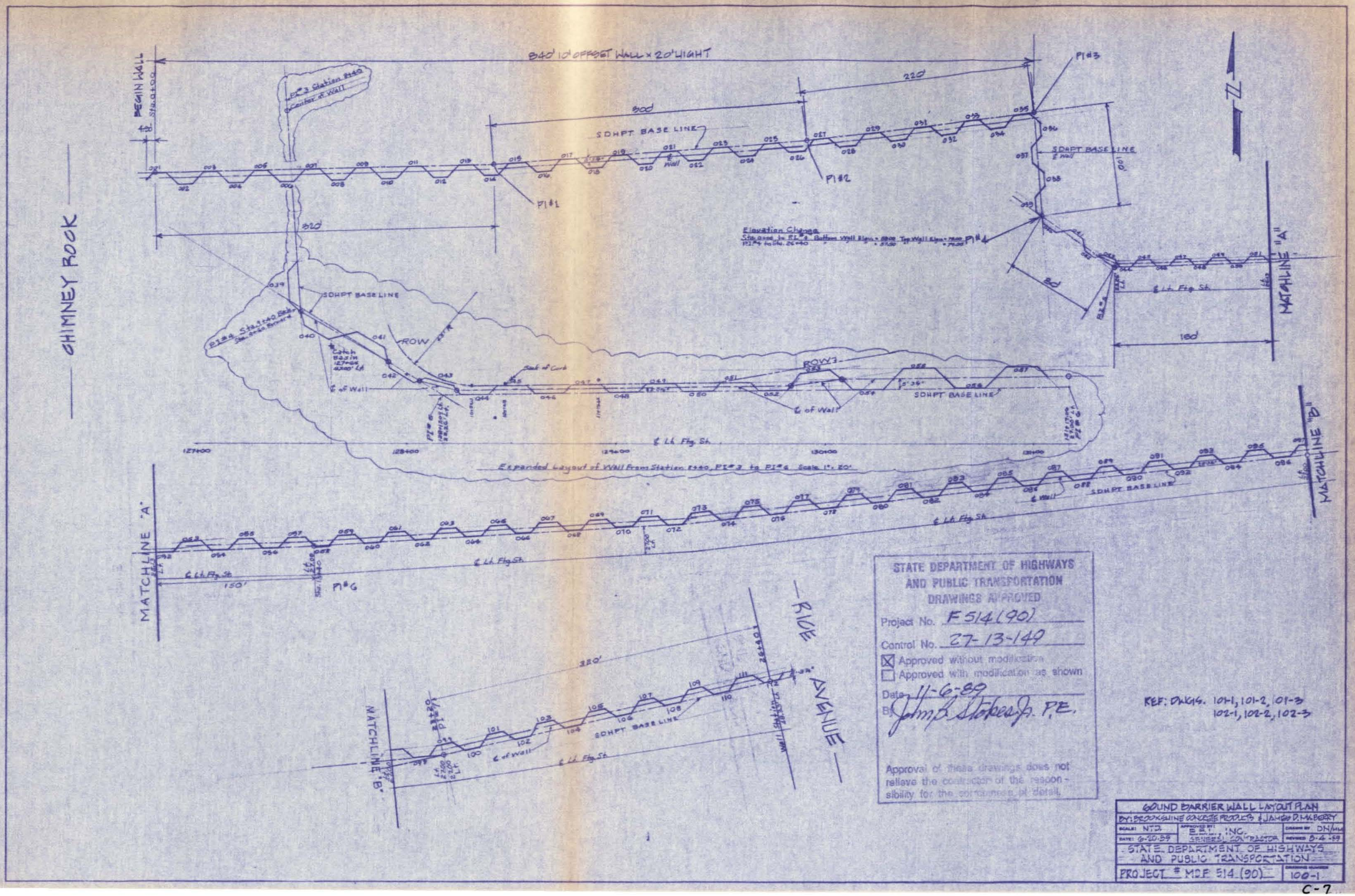
WALL HEIGHT	COLUMN SIZE	FOUNDATION DRILLED SHAFTS			BOLTED BASE PLATE DETAILS							ANCHOR BOLTS			
		DIA.	VERT. REINF.	LENGTH	A	B	C	L	T	W	WELD SIZE	DIA.	BOLT LENGTH	THREAD LENGTH TOP & BOT.	PROJ.
~~8'~~	~~W8 21~~	~~30"~~	~~8 #6~~	~~16'~~	~~2 1/2"~~	~~4 1/2"~~	~~6 3/4"~~	~~18"~~	~~1 3/16"~~	~~9"~~	~~1/2"~~	~~1 1/4"~~	~~34 1/2"~~	~~4 3/4"~~	~~4 3/4"~~ △
~~10'~~	~~W10 26~~	~~30"~~	~~8 #6~~	~~17'~~	~~2 1/2"~~	~~4 1/2"~~	~~7 3/4"~~	~~20"~~	~~1 3/4"~~	~~9"~~	~~9/16"~~	~~1 1/4"~~	~~34 1/2"~~	~~4 5/8"~~	~~4 5/8"~~
~~12'~~	~~W12 30~~	~~30"~~	~~8 #6~~	~~18'~~	~~2 3/8"~~	~~5 1/2"~~	~~9 1/8"~~	~~23"~~	~~1 9/16"~~	~~10"~~	~~5/8"~~	~~1 3/8"~~	~~37 1/2"~~	~~5"~~	~~5"~~
~~14'~~	~~W12 60~~	~~36"~~	~~8 #7~~	~~17'~~	~~2 3/8"~~	~~7 1/4"~~	~~9 1/8"~~	~~23"~~	~~1 9/16"~~	~~12"~~	~~5/8"~~	~~1 3/8"~~	~~37 1/2"~~	~~5"~~	~~5"~~
~~16'~~	~~W12 72~~	~~36"~~	~~8 #7~~	~~18'~~	~~2 3/8"~~	~~11 1/4"~~	~~9 1/8"~~	~~23"~~	~~1 3/4"~~	~~16"~~	~~5/8"~~	~~1 3/8"~~	~~37 1/2"~~	~~5"~~	~~5"~~
~~18'~~	~~W12 96~~	~~36"~~	~~8 #7~~	~~19'~~	~~2 5/8"~~	~~10 3/4"~~	~~9 3/8"~~	~~24"~~	~~1 3/4"~~	~~16"~~	~~11/16"~~	~~1 3/4"~~	~~45 3/4"~~	~~5 3/8"~~	~~5 3/8"~~
20'	W12 120	36"	8 #7	19'	2 5/8"	10 3/4"	9 7/8"	25"	2"	16"	13/16"	1 3/4"	46"	5 1/2"	5 1/2"
22'	W14 132	42"	8 #8	19'	2 7/8"	13 3/4"	11 1/8"	28"	2"	19"	13/16"	2"	52"	6"	6"

STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION

SOUND BARRIER FENCE DETAILS (OPTION)

DN. M.G.A. / CK. DN. / TR. A.R.E. / CK. TR. M.G.A.	ORIGINAL DEC., 1988 / Rev. Jan., 1989	TEXAS / F 514 (90) / US 59
		27 13 149 20A

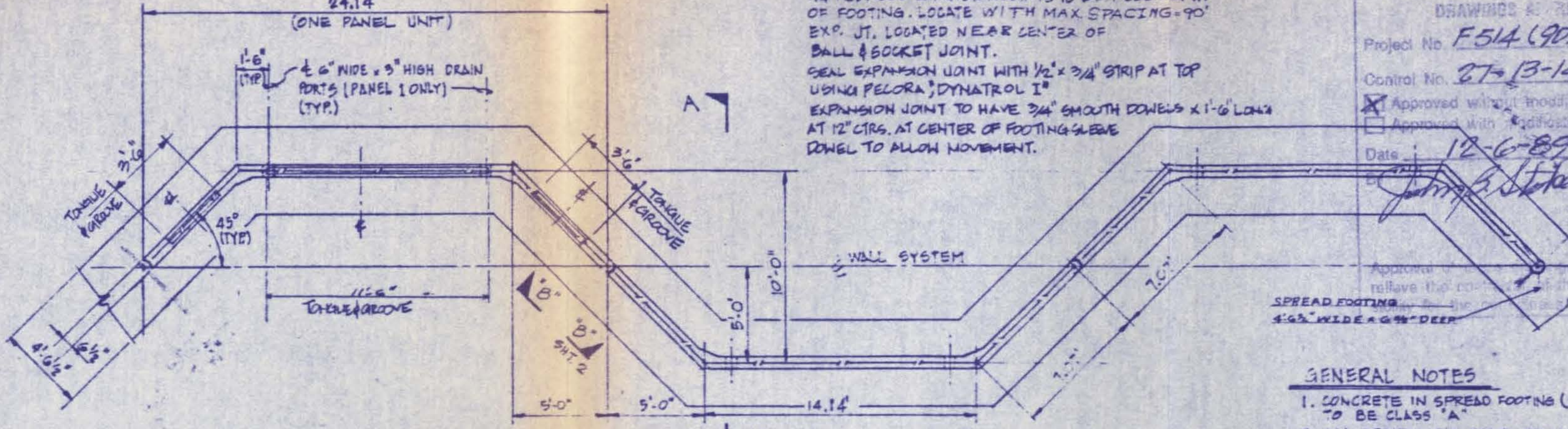
C-6



840' 10' OFFSET WALL x 20' HIGHT
BEGIN WALL
CHIMNEY ROCK
SDHPT BASE LINE
PI#1
PI#2
PI#3
PI#4
PI#6
220'
300'
320'
100'
80'
180'
150'
320'
MATCHLINE "A"
MATCHLINE "B"
ROW
Catch Basin
℄ of Wall
℄ Lt. Ftg. St.
Elevation Change
Expanded Layout of Wall From Station 8+40, PI#3 to PI#6 Scale 1" = 20'
RICE AVENUE
REF: DWGS. 101-1, 101-2, 101-3
102-1, 102-2, 102-3
STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
DRAWINGS APPROVED
Project No. F514(90)
Control No. 27-13-149
Approved without modification
Approved with modification as shown
Date 11-6-89
By John B. Stokes Jr. P.E.
Approval of these drawings does not relieve the contractor of the responsibility for the correctness of detail.
SOUND BARRIER WALL LAYOUT PLAN
STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION
PROJECT # MDF 514 (90)
100-1
C-7

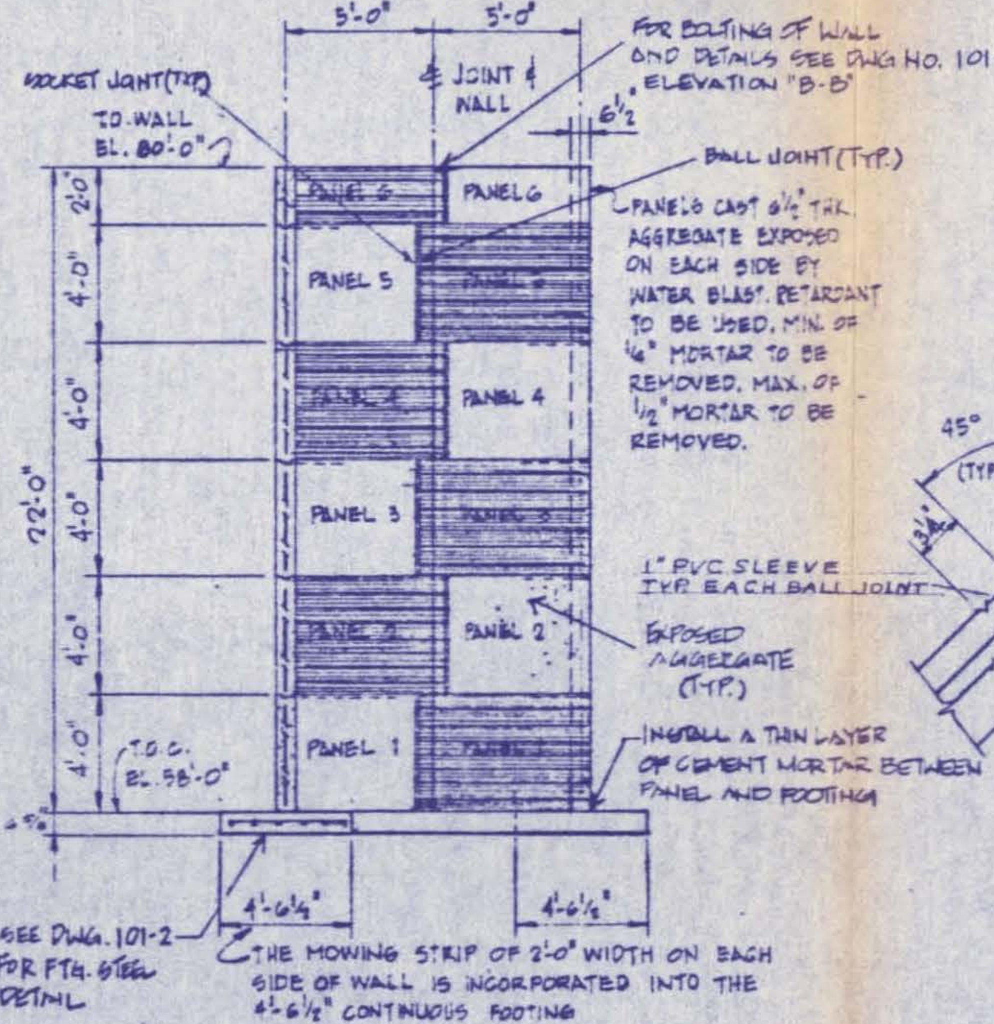
* NOTE
3/4" REDWOOD EXPANSION JOINTS TO BE FULL DEPTH OF FOOTING. LOCATE WITH MAX. SPACING = 90' EXP. JT. LOCATED NEAR CENTER OF BALL & SOCKET JOINT.
SEAL EXPANSION JOINT WITH 1/2" x 3/4" STRIP AT TOP USING PECORA "DYNATROL I"
EXPANSION JOINT TO HAVE 3/4" SMOOTH DOWELS x 1'-6" LONG AT 12" CTRS. AT CENTER OF FOOTING SLEEVE DOWEL TO ALLOW MOVEMENT.

STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION DRAWINGS APPROVED
Project No. F514 (90)
Control No. 27-13-149
[X] Approved without modification
[ ] Approved with modifications as shown
Date 12-6-89
By John G. Stokes Jr. P.E.
Approval of these drawings does not relieve the contractor of the responsibility for the correctness of detail.

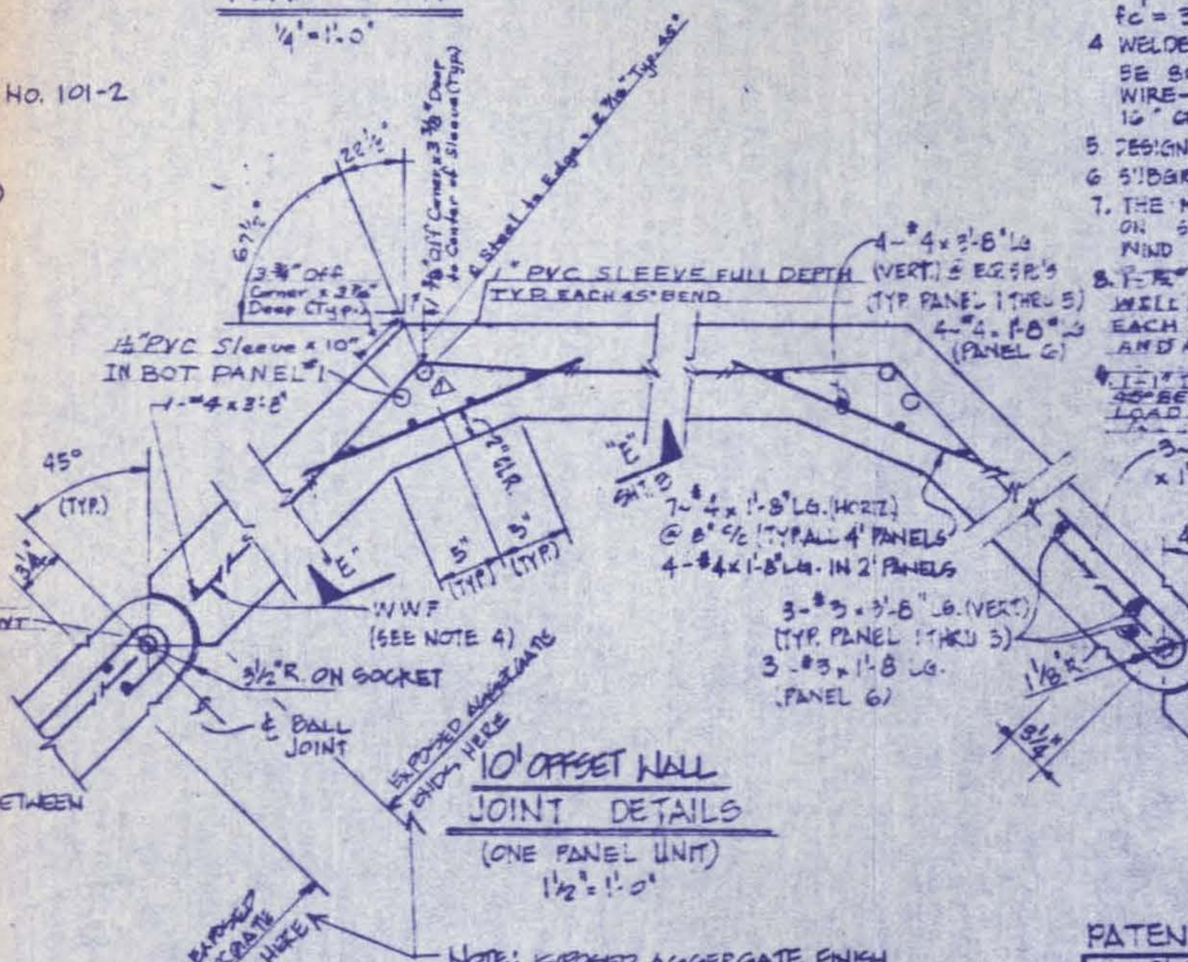


10' OFFSET WALL
PLAN VIEW
1/4" = 1'-0"

GENERAL NOTES
1. CONCRETE IN SPREAD FOOTING (54½" x 6⅝") TO BE CLASS "A"
2. ALL REINFORCING STEEL SHALL BE ASTM A-615, GRADE 60, f_y = 60,000 PSI.)
3. CONCRETE IN WALL PANELS SHALL BE CLASS "C", f'_c = 3,000 P.S.I. IN 28 DAYS.
4. WELDED WIRE FABRIC IN WALL PANELS SHALL BE 80,000 P.S.I. YIELD STRENGTH. LONGITUDINAL WIRE - W 9.6 x 4" CTR'S, VERTICAL WIRE - W 4.0 x 16" CTR'S.
5. DESIGN WIND LOAD SHALL BE 40 #/SF.
6. SUBGRADE TO BE COMPACTED TO 95% STD PROCTOR PRIOR TO POURING
7. THE MAXIMUM DEAD LOAD AND WIND LOAD BEARING ON SUBGRADE IS 602 #/S.F. THIS OCCURS WHEN WIND LOAD IS 60 #/S.F. OF PROJECTED WALL SURFACE
8. 1-⅝" PRESTRESS STRAND WITH EPOXY COATING WILL BE INSTALLED AT EACH 45° BEND PLUS AT EACH BALL JOINT TO TIE ALL PANELS TOGETHER AND ANCHOR TO FOOTING.
9. 1-1" DOWEL BAR WILL BE INSTALLED AT EACH 45° BEND TO PREVENT SLIDING WHEN WIND LOAD REACHES 60 #/SF



ELEVATION "A-A"
1/4" = 1'-0"



10' OFFSET WALL
JOINT DETAILS
(ONE PANEL UNIT)
1½" = 1'-0"

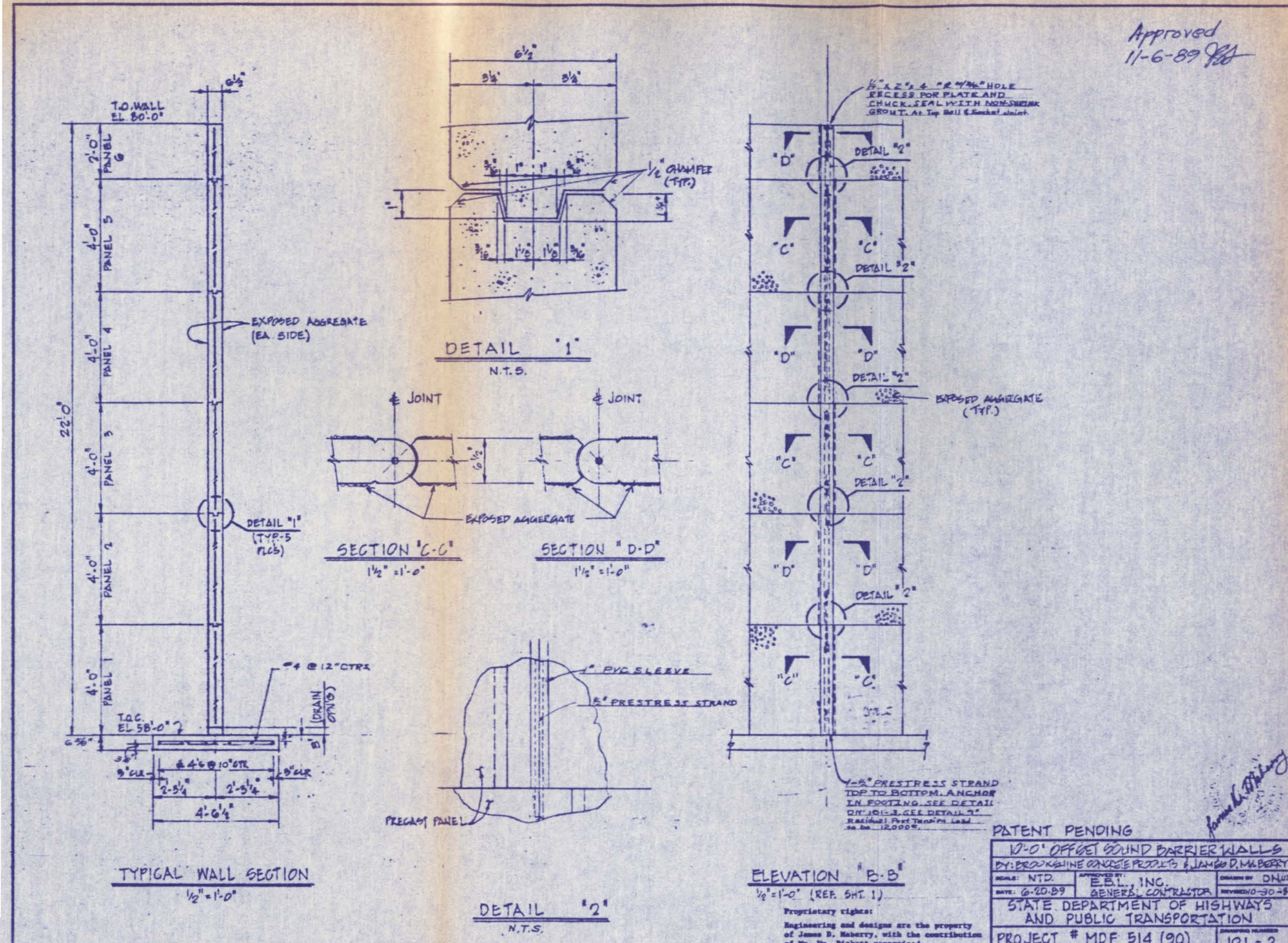
NOTE: EXPOSED AGGREGATE FINISH ALSO ENDS AT BEGINNING OF CHAMFER STRIP AT TOP AND BOTTOM OF PANELS

PATENT PENDING

10'-0" OFFSET SOUND BARRIER WALLS		
BY BROOKSHIRE CONCRETE PRODUCTS & JAMES D. MABERRY		
SCALE: NTS.	APPROVED BY: E.B.L. INC. GENERAL CONTRACTOR	DRAWN BY CH/JDM
DATE: 6-20-89		REVISED 10-30-89
STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION		
PROJECT # MDF 514 (90)		DRAWING NUMBER 101-1

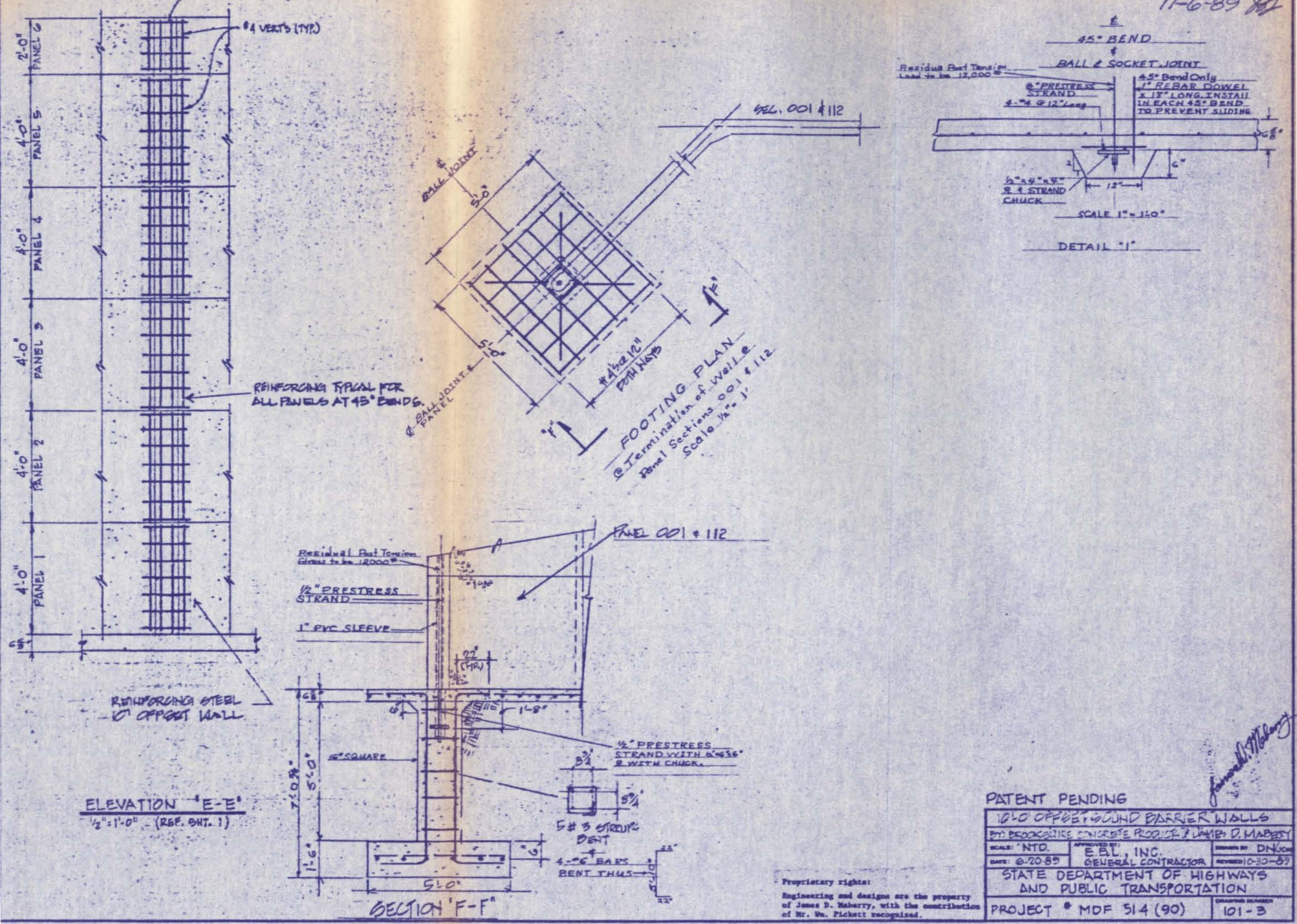
△ 11-28-89 Rev. steel and sleeve spacing in 45° Bend

C-8



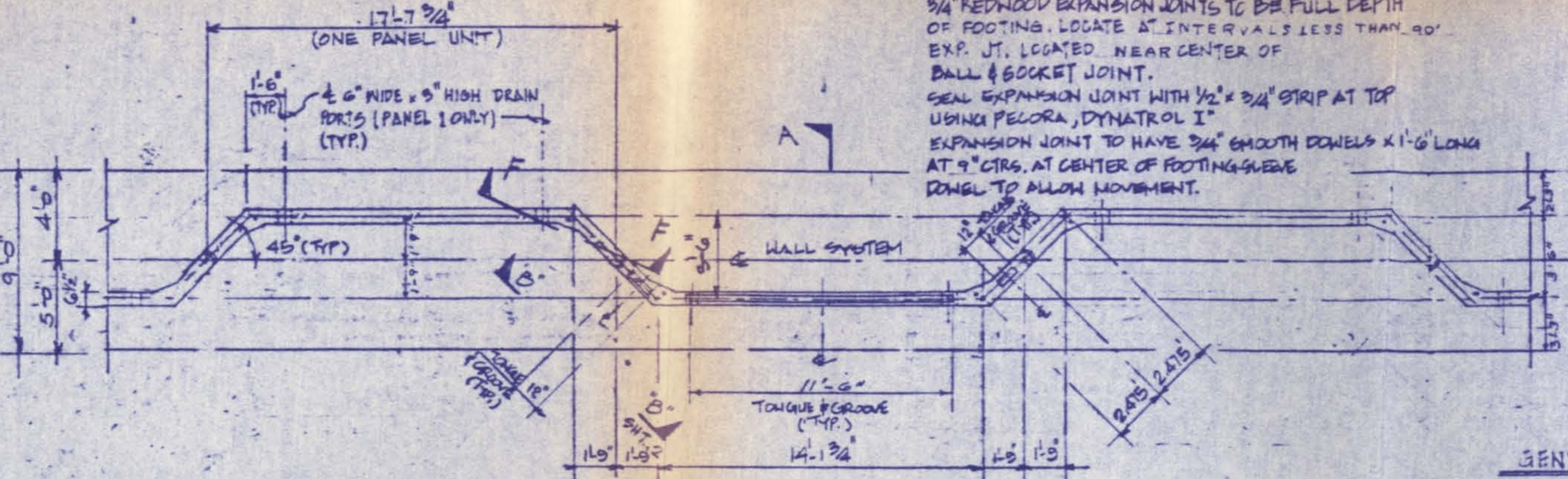
Approved
11-6-89
T.O. WALL
EL. 80'-0"
PANEL 6
PANEL 5
PANEL 4
PANEL 3
PANEL 2
PANEL 1
22'-0"
EXPOSED AGGREGATE
(EA. SIDE)
DETAIL "1"
(TYP. 5 PLCS)
#4 @ 12" CTRS
T.O.C.
EL 58'-0"
DRAIN
4'-6¼"
TYPICAL WALL SECTION
½" = 1'-0"
½" CHAMFER
(TYP.)
DETAIL "1"
N.T.S.
℄ JOINT
EXPOSED AGGERGATE
SECTION "C-C"
1½" = 1'-0"
SECTION "D-D"
1½" = 1'-0"
1" PVC SLEEVE
½" PRESTRESS STRAND
PRECAST PANEL
DETAIL "2"
N.T.S.
RECESS FOR PLATE AND
CHUCK. SEAL WITH NON-SHRINK
GROUT.
EXPOSED AGGREGATE
(TYP.)
1-½" PRESTRESS STRAND
TOP TO BOTTOM. ANCHOR
IN FOOTING. SEE DETAIL
ON 101-3. SEE DETAIL "1"
ELEVATION "B-B"
⅛" = 1'-0" (REF. SHT. 1)
Proprietary rights:
Engineering and designs are the property of James D. Maberry, with the contribution of Mr. Wm. Pickett recognized.
PATENT PENDING
10'-0" OFFSET SOUND BARRIER WALLS
BY: BROOKLINE CONCRETE PRODUCTS & JAMES D. MABERRY
SCALE: NTD.
DATE: 6-20-89
E.B.L., INC.
GENERAL CONTRACTOR
DH
REVISED 10-30-89
STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
PROJECT # MDF 514 (90)
101 - 2

Approved
11-6-89



* NOTE

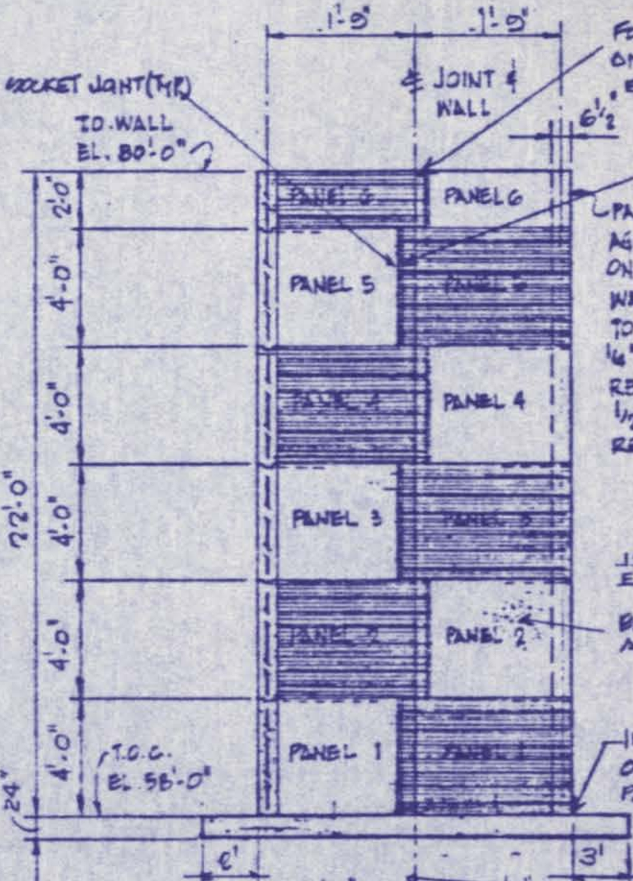
3/4" REDWOOD EXPANSION JOINTS TO BE FULL DEPTH OF FOOTING. LOCATE AT INTERVALS LESS THAN 90' EXP. JT. LOCATED NEAR CENTER OF BALL & SOCKET JOINT.
SEAL EXPANSION JOINT WITH 1/2" x 3/4" STRIP AT TOP USING PECORA, DYNATROL I"
EXPANSION JOINT TO HAVE 3/4" SMOOTH DOWELS x 1'-6" LONG AT 9" CTRS. AT CENTER OF FOOTING-SLEEVE DOWEL TO ALLOW MOVEMENT.



A 3'-6" OFFSET WALL
PLAN VIEW
1/4" = 1'-0"

GENERAL NOTES

1. CONCRETE IN SPREAD FOOTING (9'-0" x 24") TO BE CLASS "A"
2. ALL REINFORCING STEEL SHALL BE ASTM A-615, GRADE 60, f_y = 60,000 PSI.
3. CONCRETE IN WALL PANELS SHALL BE CLASS "C", f'c = 3,600 PSI IN 28 DAYS.
4. WELDED WIRE FABRIC IN WALL PANELS SHALL BE 80,000 P.S.I. YIELD STRENGTH. LONGITUDINAL WIRE - W 5.6, 4" CTRS, VERTICAL WIRE - W 4.0 x 16" CTRS.
5. DESIGN WIND LOAD SHALL BE 40 #/SF.
6. SUBGRADE TO BE COMPACTED TO 95% STD PROCTOR PRIOR TO POURING.
7. THE MAXIMUM DEAD LOAD AND WIND LOAD BEARING ON SUBGRADE IS 1452#/S.F. THIS OCCURS WHEN WIND LOAD IS 60#/S.F. OF PROJECTED WALL SURFACE.
8. 1 - 1/2" Prestress Strand With Epoxy Coating Will Be Installed At Each 45° Bend Plus At Each Ball Joint. This Will Tie All Panels Together And Anchor To Footing.
9. 1 - 1" Dowel Bar Will Be Installed At Each 45° Bend To Prevent Sliding When Wind Load Reaches 60#/SF.



FOR BOLTING OF WALL END DETAILS SEE DWG NO. 101-2 ELEVATION "B-B"

PANELS CAST 6 1/2" THK. AGGREGATE EXPOSED ON EACH SIDE BY WATER BLAST. RETARDANT TO BE USED. MIN. OF 1/4" MORTAR TO BE REMOVED. MAX. OF 1/2" MORTAR TO BE REMOVED.

1" PVC Sleeve Typ. Each Ball Joint

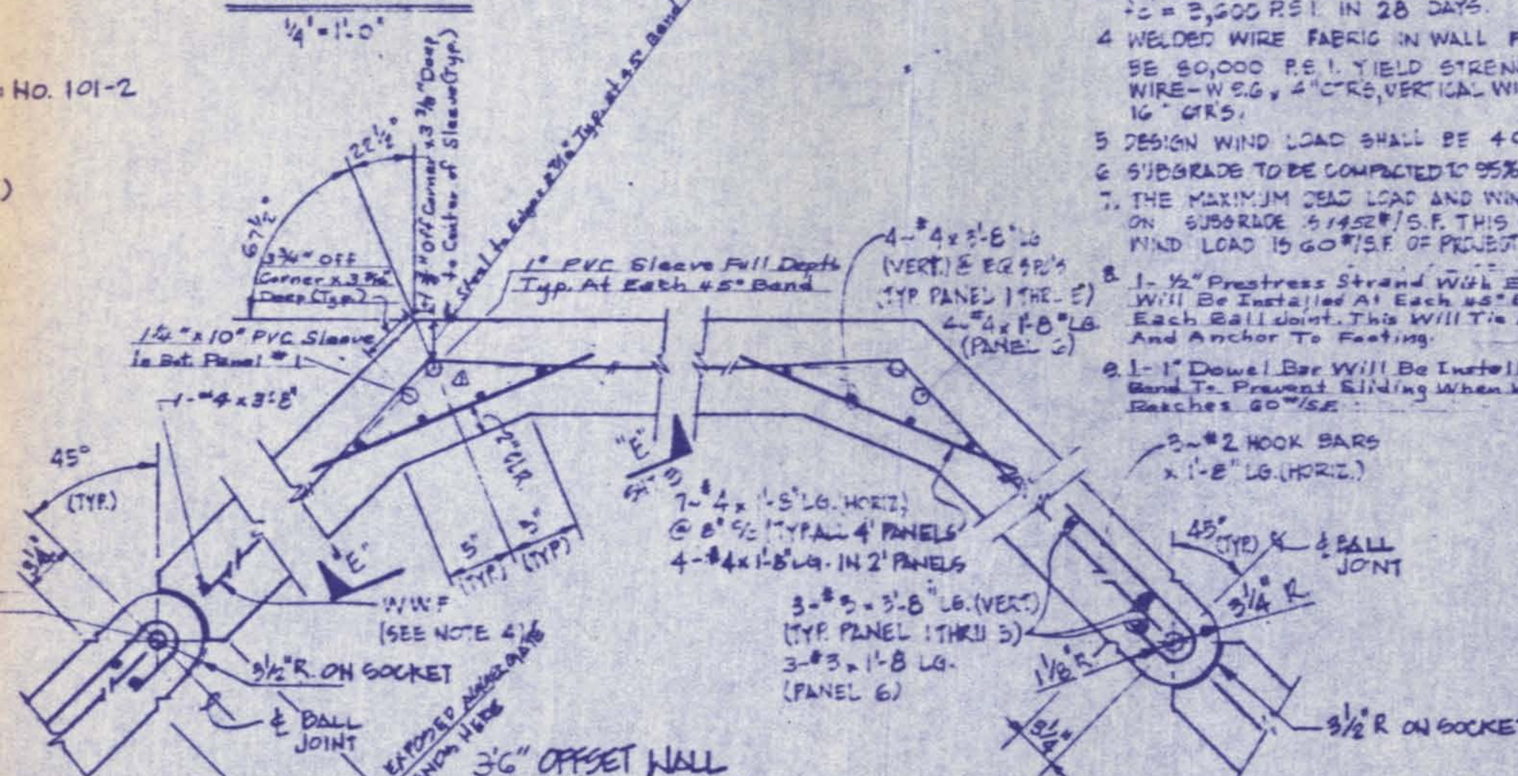
EXPOSED AGGREGATE (TYP.)

INSTALL A THIN LAYER OF CEMENT MORTAR BETWEEN PANEL AND FOOTING

THE MOWING STRIP OF 2'-0" WIDTH ON EACH SIDE OF WALL IS INCORPORATED INTO THE 9'-0" CONTINUOUS FOOTING

ELEVATION "A-A"
NTS.

NOTE: FOR FOOTING REINFORCING STEEL AND ANCHOR BOLTS SEE DWG. SHT. NO. 2



3'-6" OFFSET WALL
JOINT DETAILS
(ONE PANEL UNIT)
1 1/2" = 1'-0"

EXPOSED AGGREGATE ENDS HERE

NOTE: EXPOSED AGGREGATE FINISH ALSO ENDS AT BEGINNING OF CHAMFER STRIP AT TOP AND BOTTOM OF PANELS

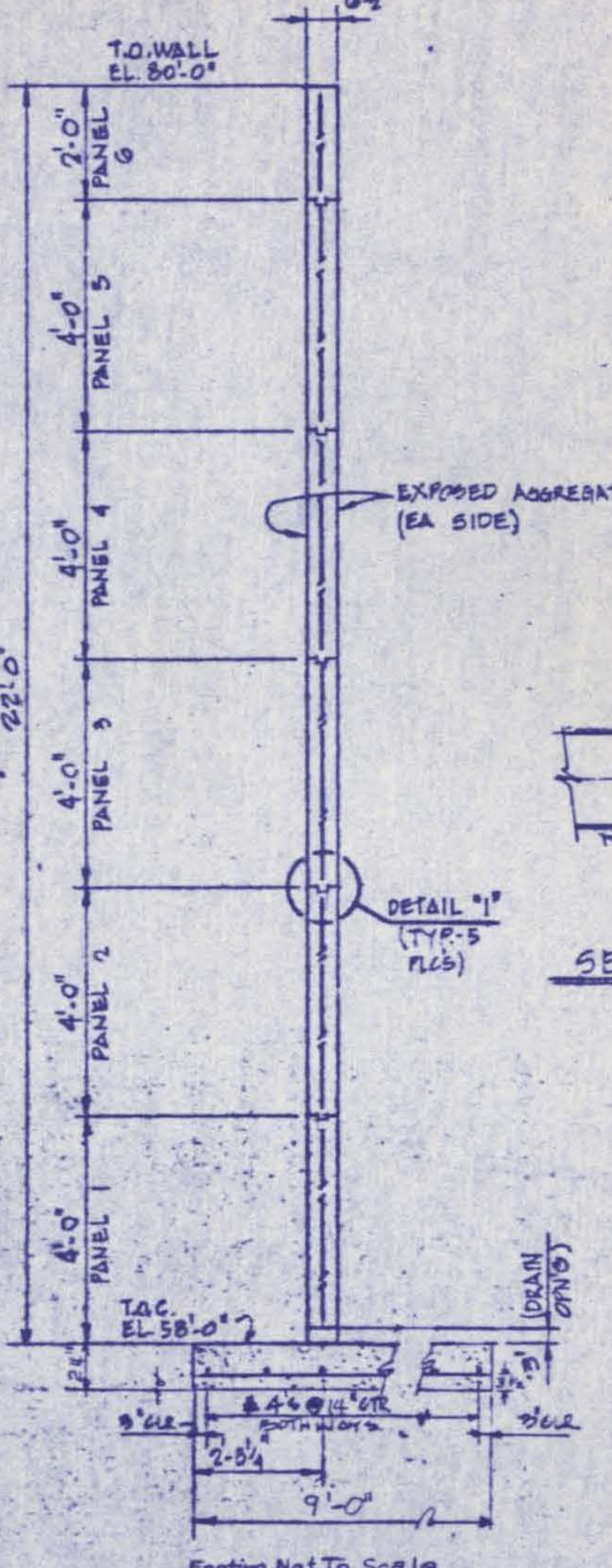
PATENT PENDING

3'-6" OFFSET SOUND BARRIER WALL	
BY: BROOKSHIRE CONCRETE PRODUCTS & JAMES D. MABERRY	
SCALE: NTS. / DATE: 6-20-89	APPROVED BY: E.B.L. INC. GENERAL CONTRACTOR
DRAWN BY: DN/JDM	REVISED 10-30-89
STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION	
PROJECT # MDF 514 (90)	DRAWING NUMBER 102 - 1

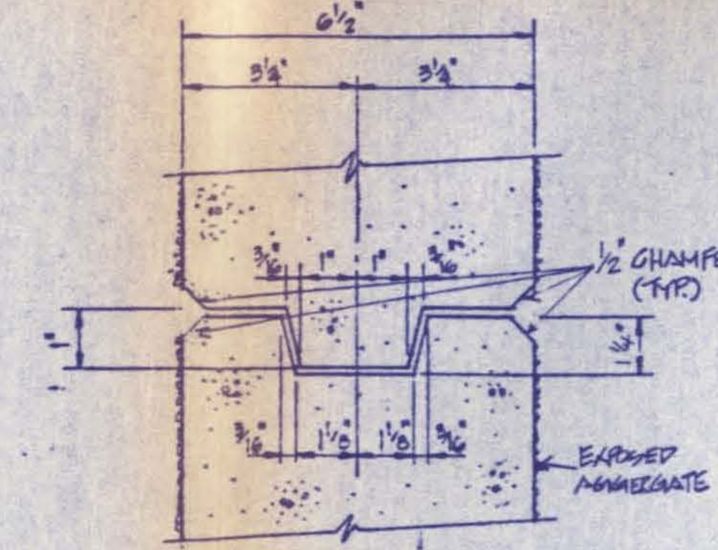
△ 11-28-89 Rev. Steel and Sleeve Spacing at 45° Bends

C-11

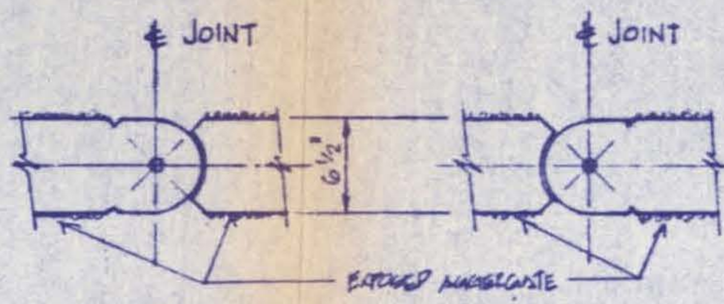
Approved
11-6-89



TYPICAL WALL SECTION
1/2" = 1'-0"

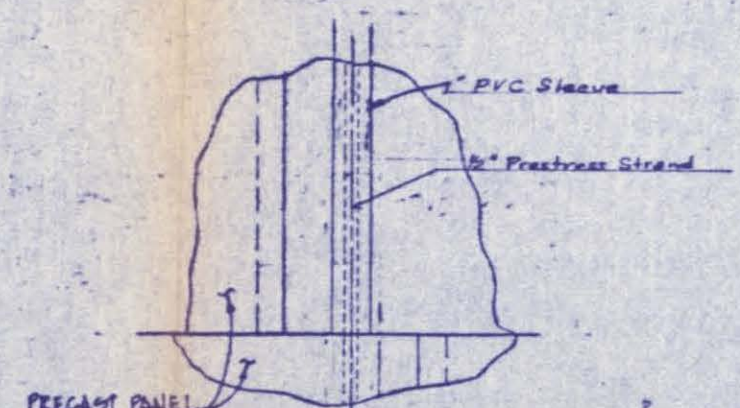


DETAIL "1"
N.T.S.



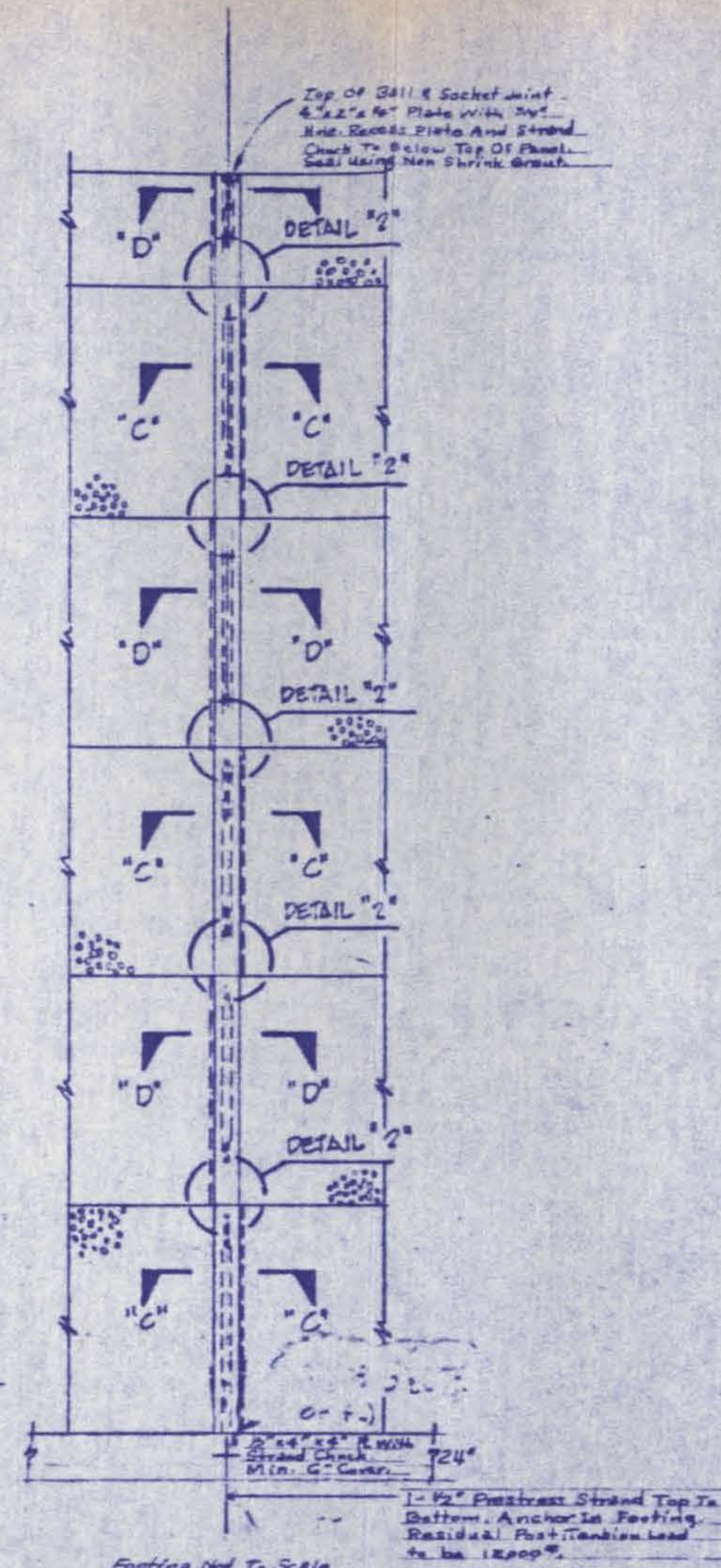
SECTION "C-C"
1 1/2" = 1'-0"

SECTION "D-D"
1 1/2" = 1'-0"



NTS

DETAIL "2"



ELEVATION "B-B"
1/4" = 1'-0" (REF. SHT. 1)

*Proprietary rights:

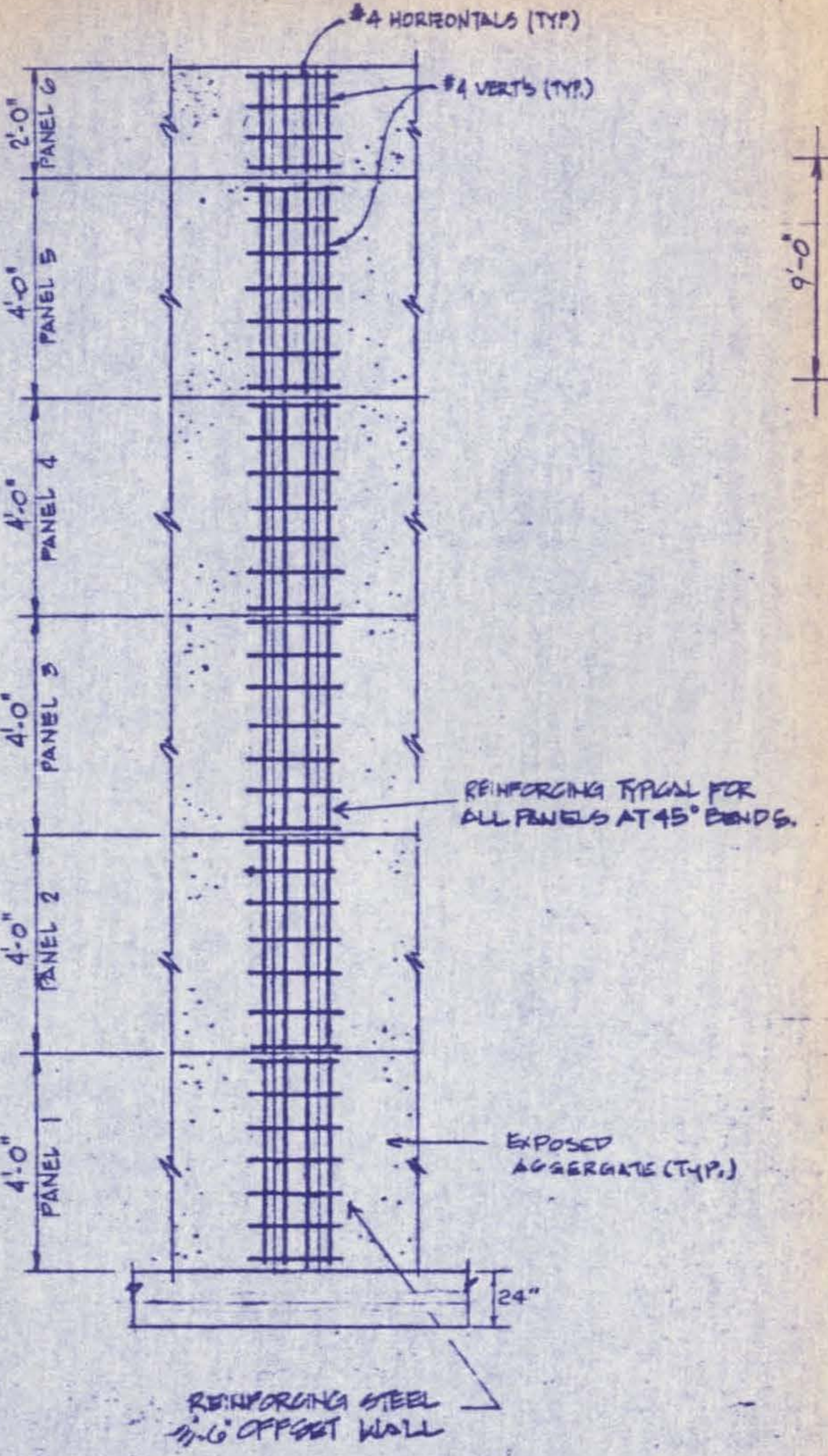
Engineering and designs are the property of James D. Maberry, with the contribution of Mr. Wm. Pickett recognized.

PATENT PENDING

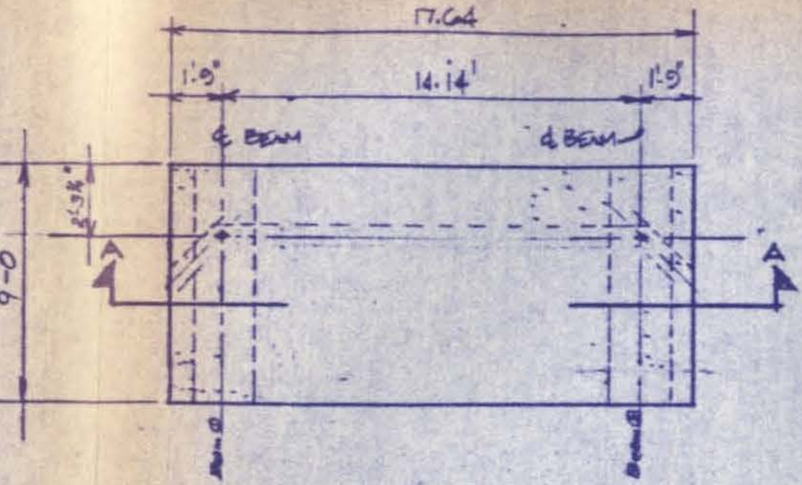
3'-6" OFFSET SOUND BARRIER WALLS	
BY: BROOKSHIRE CONCRETE PRODUCTS & JAMES D. MABERRY	
SCALE: NTS. / DATE: 6-20-89	APPROVED BY: E.B.L., INC. GENERAL CONTRACTOR
DRAWN BY: DN/JDM	REVISED: 10-30-89
STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION	
PROJECT # MDF 514 (90)	DRAWING NUMBER 102 - 2

C-12

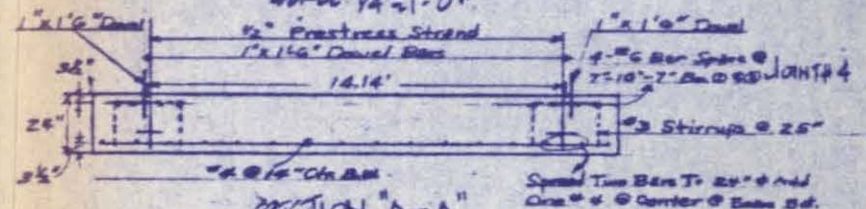
Approved 11-6-89



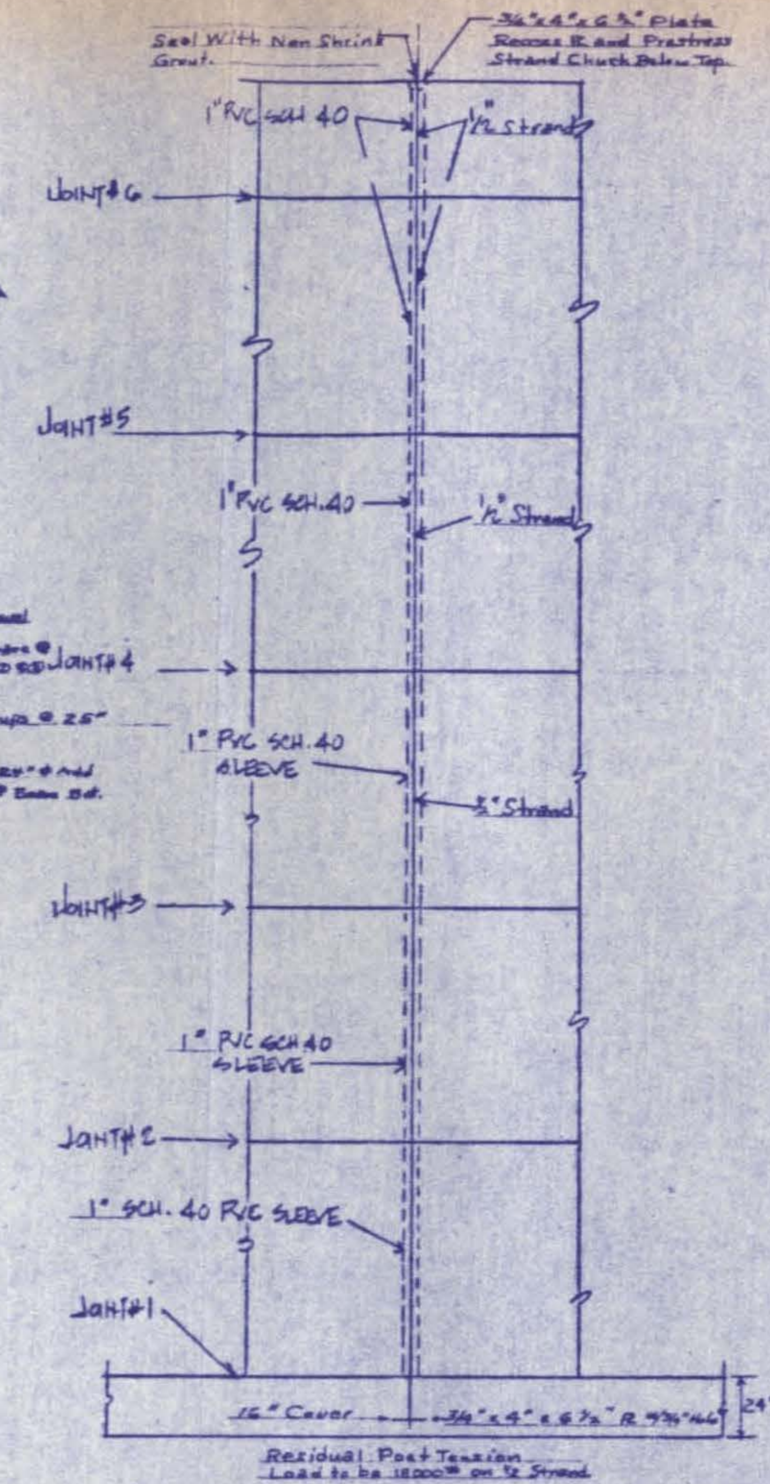
ELEVATION "E-E"
1/2"=1'-0" (REF. SHT. 1)



3'-6" OFFSET WALL FOOTING PLAN
SCALE: 1/4"=1'-0"



SECTION "A-A"
SCALE: 1/4"=1'-0"



ELEVATION @ 45° BEND W/ BOLTING DETAIL
SECTION "F-F"

PATENT PENDING

3'-6" OFFSET SOUND BARRIER WALLS		
BY: FROSTSHIELD CONCRETE PRODUCTS & JAMES D. MABERRY		
SCALE: NTD	APPROVED BY: E.B.L., INC. GENERAL CONTRACTOR	DRAWN BY DNUDH
DATE: 6-20-89		REVISED 10-30-89
STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION		
PROJECT # MDF 514 (90)		DRAWING NUMBER 102-3

Proprietary rights:

Engineering and designs are the property of James D. Maberry, with the contribution of Mr. Wm. Pickett recognized.

APPENDIX D

MEMORANDUM

TO: Mr. Donald R. Garrison, P.E.

Date: February 13, 1990

FROM: William E. Neyland, P.E. WEN

Originating Office
DDE-SD

SUBJECT: Investigation of Effect of Noise through Drainage Holes in Existing Noise Barrier
US 59: SW Freeway @ Chimney Rock,
At Larchmont Subdivision
CSJ 0027-13-149

On February 9, 1990, the above investigation was made. Drainage holes in one bay of the fan wall were closed by means of stuffing them with rags and placing wooden boards behind them. Drainage holes in the adjacent bay were left open. Noisemeters were placed on wooden blocks in the locations shown in the enclosed sketch. The portion of the barrier chosen was located far enough from Chimney Rock and Barrington to preclude cross street noise as a factor in the investigation. The following readings were observed:

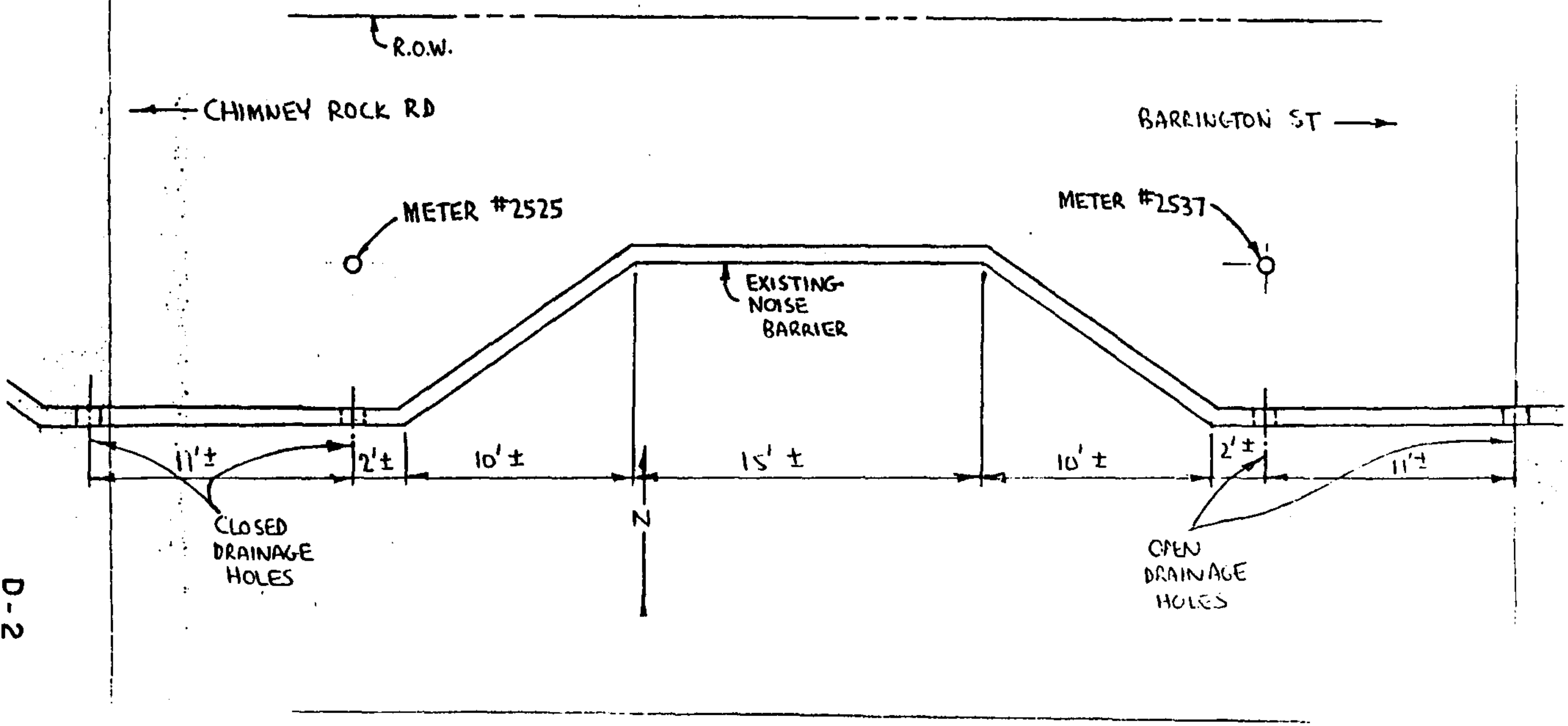
TIME	READING METER #2525	READING METER #2537
4:00-4:15 PM	55.7 dBA	56.0 dBA
4:15-4:30 PM	57.6 dBA	56.8 dBA
4:30-4:45 PM	56.7 dBA	57.3 dBA
4:45-5:00 PM	59.2 dBA	58.8 dBA
5:00-5:15 PM	57.9 dBA	58.3 dBA
5:15-5:30 PM	56.6 dBA	57.3 dBA
5:30-5:45 PM	57.4 dBA	57.7 dBA
5:45-6:00 PM	56.6 dBA	57.9 dBA
AVERAGE	57.2 dBA	57.5 dBA

Based on the above, the conclusion is made that the open drainage holes conduct insignificant noise.

WEN:jcl
Attachment

NOISE BARRIER AT LARCHMONT SUBDIVISION
CHIMNEY ROCK AT SOUTHWEST FREEWAY
POSITION OF NOISEMETERS

2/12/90



M E M O R A N D U M

TO: Mr. Donald R. Garrison, P.E.

Date: October 9, 1990

FROM: William E. Neyland, P.E. WEN

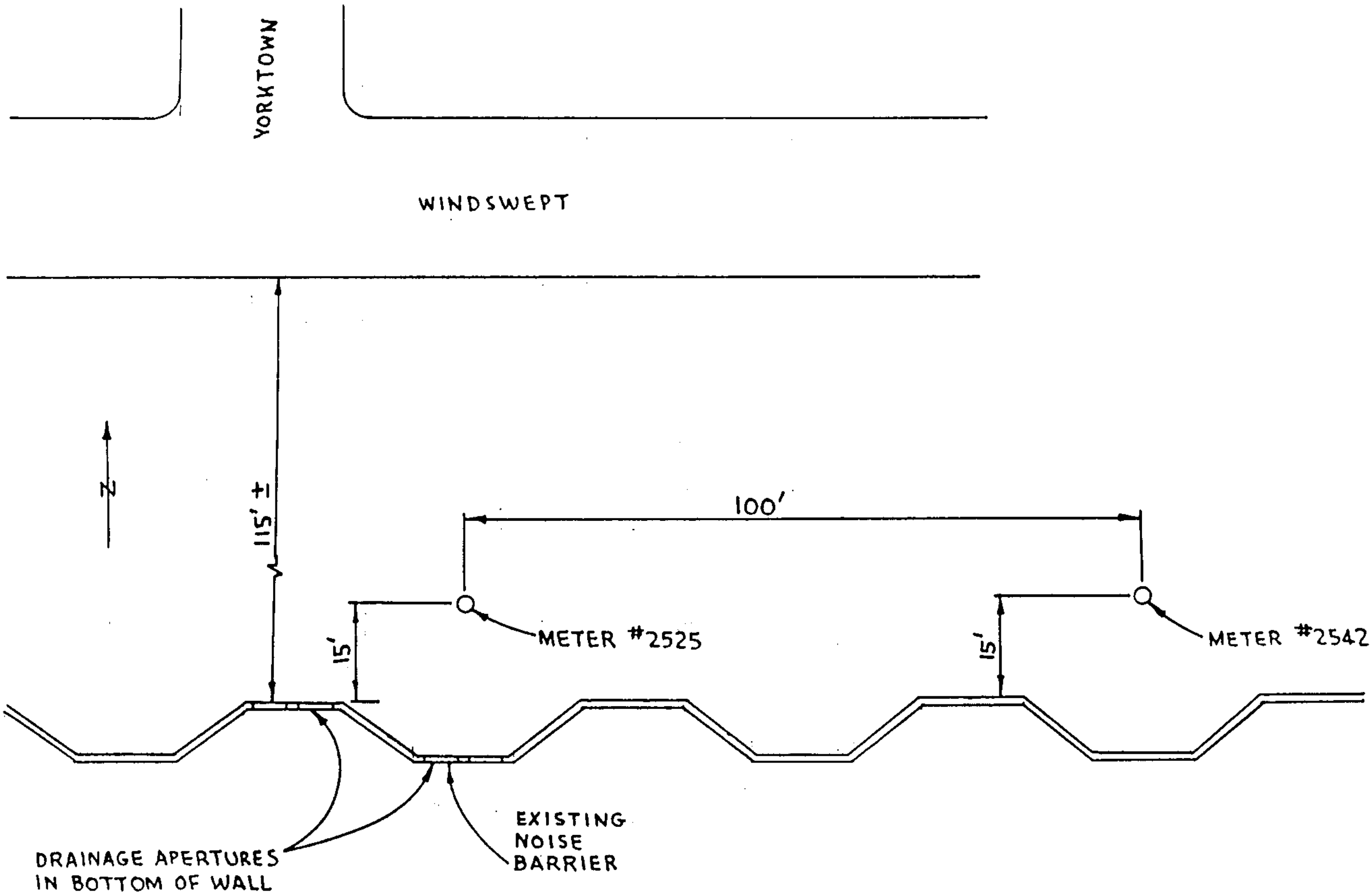
Originating Office
District 12
DDE-SD

SUBJECT: Investigation of Effect of Noise through Drainage Apertures in Existing Noise Barrier
US 59: SW Freeway at Larchmont Subdivision
(Near Chimney Rock)
CSJ 0027-13-149

On Monday, October 8, 1990, the above investigation was made. Noisemeters were placed on tripods (meter about 5' above ground) at the locations shown in the sketch. The follwing readings were observed:

TIME	READING (Leq) METER # 2525	READING (Leq) METER # 2542
9:00 - 9:15 AM	59.1 dBA	58.7 dBA
9:15 - 9:30	59.0	57.6
9:30 - 9:45	59.0	57.2
9:45 - 10:00	58.6	57.8
10:00 - 10:15	58.4	57.3
10:15 - 10:30	58.9	57.6
10:30 - 10:45	58.3	57.4
10:45 - 11:00	57.9	57.2
AVERAGE	58.7 dBA	57.6 dBA

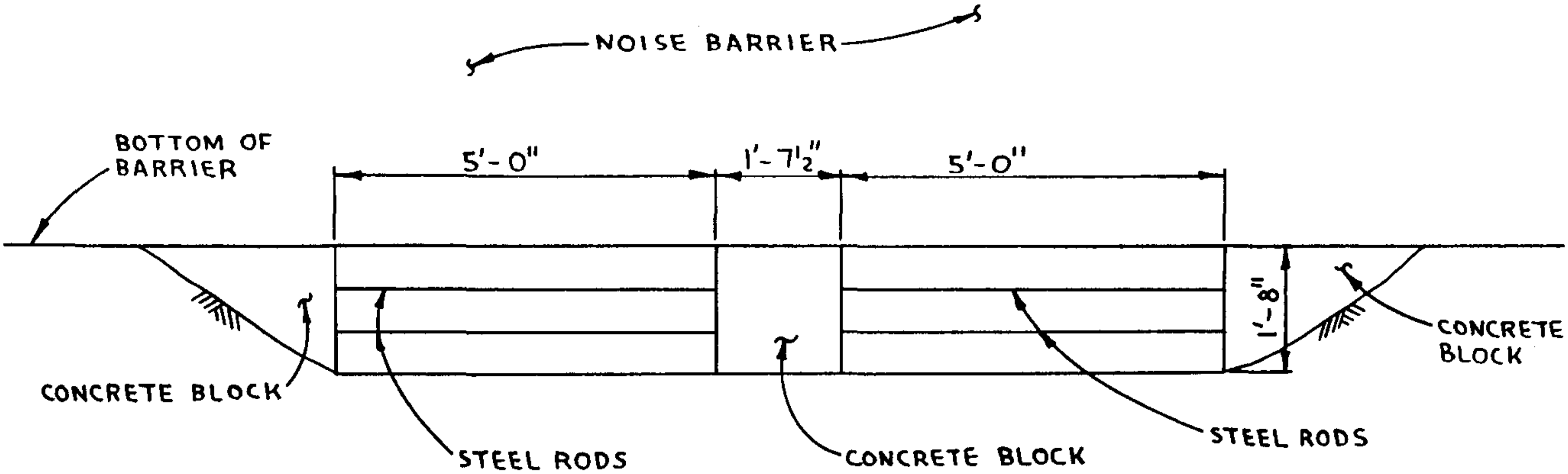
Based on the above, the conclusion is made that the drainage apertures conduct insignificant noise.



SCALE: 1" = 20'

LARCHMONT SUBDIVISION
NOISE BARRIER
INVESTIGATION OF DRAINAGE APERTURES

wcr 10/9/90



SECTION OF DRAINAGE APERTURE
LARCHMONT SUBDIVISION NOISE BARRIER

WEN 10/9/90

APPENDIX E

John Stokes

E.B.L., Inc.
General Contractor
9702 Synott Road
Houston, Texas 77083
(713) 495-0842

9/21/90

State Department Of Highways
And Public Transportation
P.O. Box 1386
Houston, Texas 77251-1386

DEPT., HWYS. RECEIVED SEP 26 1990 DIST. 12 HOUSTON

Attention: Mr. Lonnie B. Beckham P.E.

Reference:	Contract No.	0027-13-149
	Project	MA-F 514(90)
	Name	US 59
	County	Harris

Gentlemen;

Per the request of Mr. John Stokes and yourself, below you will find the report on the precasting and erection of our alternate design on the above referenced project.

The Sound Attenuating Barrier Fence was built with a trapezoidal pattern that used both a ten foot and three and one half foot offset. The wall was post-tensioned to a cast-in-place footing with one half inch epoxy coated strand. The panels were cast by Brookshire Concrete Products (BCP) in four and two foot heights. The panels had a 14.14 foot flat side and two wings projecting 7.07 feet or 2.47 feet depending on the offset.The panels were cast in the vertical position. BCP used a form release agent, a concrete kill and water blasting to achieve the exposed aggregate finish. The appearance of the panels was acceptable and improved with experience and when Mr. Beckham modified the mix design of the concrete.

We encountered several problems with the vertical casting of the panels. First since the top edge had to be finished by hand any high spot kept the next panels from seating properly. Secondly, the forming tolerances were very important because of the two protruding wings. If the form was not plumb, if the wing header was not plumb, or if the bottom and top of the panel were not parallel the panels would not properly line-up with the adjacent panels. At times BCP found it difficult to keep all the tolerances perfect and this resulted in some erection problems. The erection problems were solved with a joint seal, shims or grouting the horizontal joints. In the vertical joints we used a silicone sealer to match-up the ball and socket. Knowing what we know now , I doubt BCP or ourselves would cast the panels vertically with the two wings.

To Stokes

DDE Rec'd (1) Ltr only

The footing was poured with block-outs in the strand locations. We provided the block-outs to ensure the proper location of the post tension strand. The block-outs were filled in after the first couple panels were set. This proved to be helpful as the wall grew as it was set.

The setting of the panels was slower than anticipated due to trying to get the panels both horizontal and vertical, while at the same time trying to get the ball and socket to look acceptable.

The threading of the epoxy coated strand and the tensioning went extremely smooth. Using a calibrated jack and gauge we were assured of a positive connection with the proper tension.

In conclusion, in spite of the initial design problems, a new precaster and other challenges inherent in a new product, we are confident that the State Department of Highways and Public Transportation and the public received an structurally sound and an aesthetically pleasing Sound Attenuating Barrier Fence.

We would like to take this opportunity to make a few comments on Commercial Alternate Designs. The building of the first commercial alternate sound wall has been a learning experience for us. Since bidding and building the sound wall many more jobs have been let, with suppliers proposing many new sound wall systems. These systems are approved "in concept only" and it is our actual experience that the details of a system are often incomplete even with approved designs. It is these incomplete details that leave field personnel (both SDH&PT and Contractor) without proper information to finish the project. We would recommend that the SDH&PT would pre-approve the sound wall systems with complete details so the contractor and the SDH&PT knows what is expected of the finished product.

If additional information is required please contact us.

Sincerely,

David E. Boehm

David E. Boehm Vice President.
E.B.L., Inc.

CC: Mr. John Stokes P.E.

APPENDIX F

WORK PLAN

EXPERIMENTAL FEATURE

PROJECT: MA-F514(90)
CONTROL: 0027-13-149
HIGHWAY: US 59
COUNTY: Harris

Experimental Feature:	Trapezoidal (zig-zag) noise wall installed on spread footing.
Construction Report:	A report will be transmitted at completion of construction detailing the construction procedure and identifying any specific problems.
Annual Report:	A report will be transmitted annually for three years after construction is completed detailing wall and foundation conditions. The report will include information on wall deviation from the vertical condition, exterior finish condition, and foundation cracking and settlement.
	Mr. John Stokes, P.E. in Central Design "A" will coordinate with the Resident Engineer, Mr. Lonnie Beckham, P.E., in preparing the post construction report. Mr. Stokes will also prepare the annual follow-up reports.