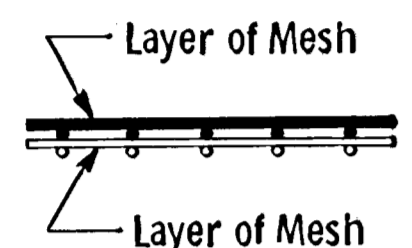
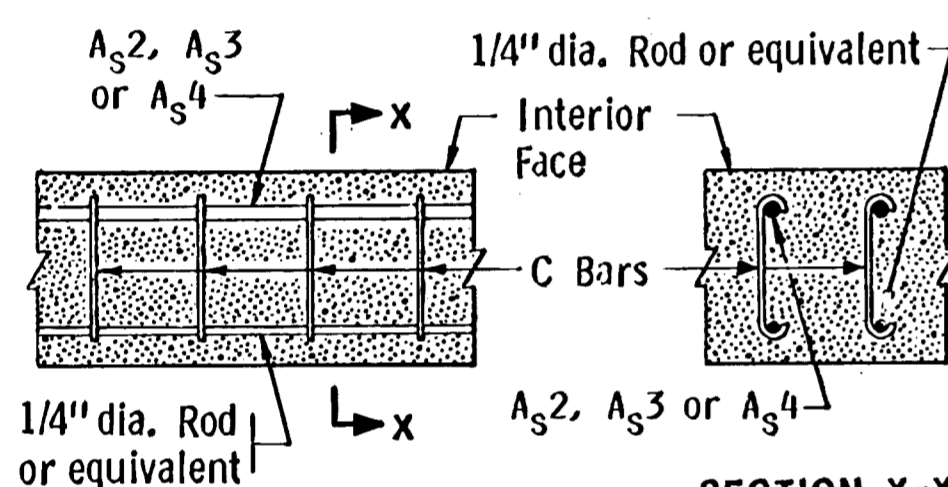


TONGUE AND GROOVE JOINT DETAIL



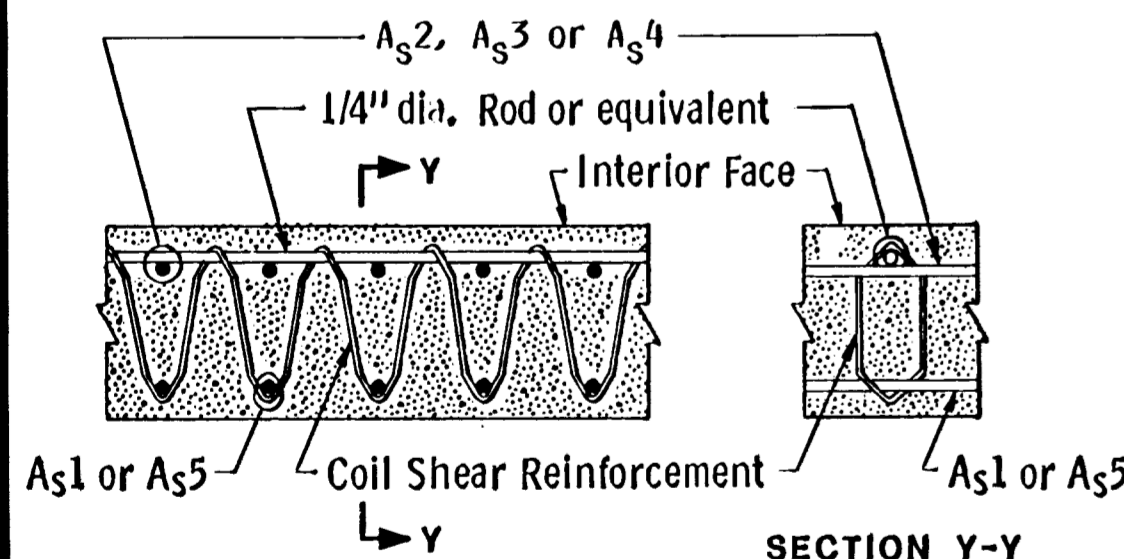
FABRIC LAYER DETAIL

When more than one layer of steel fabric is used to obtain the required reinforcement areas, the wires of the steel fabric shall be placed as shown in the Fabric Layer Detail.



SHEAR REINFORCEMENT DETAIL C BAR OPTION

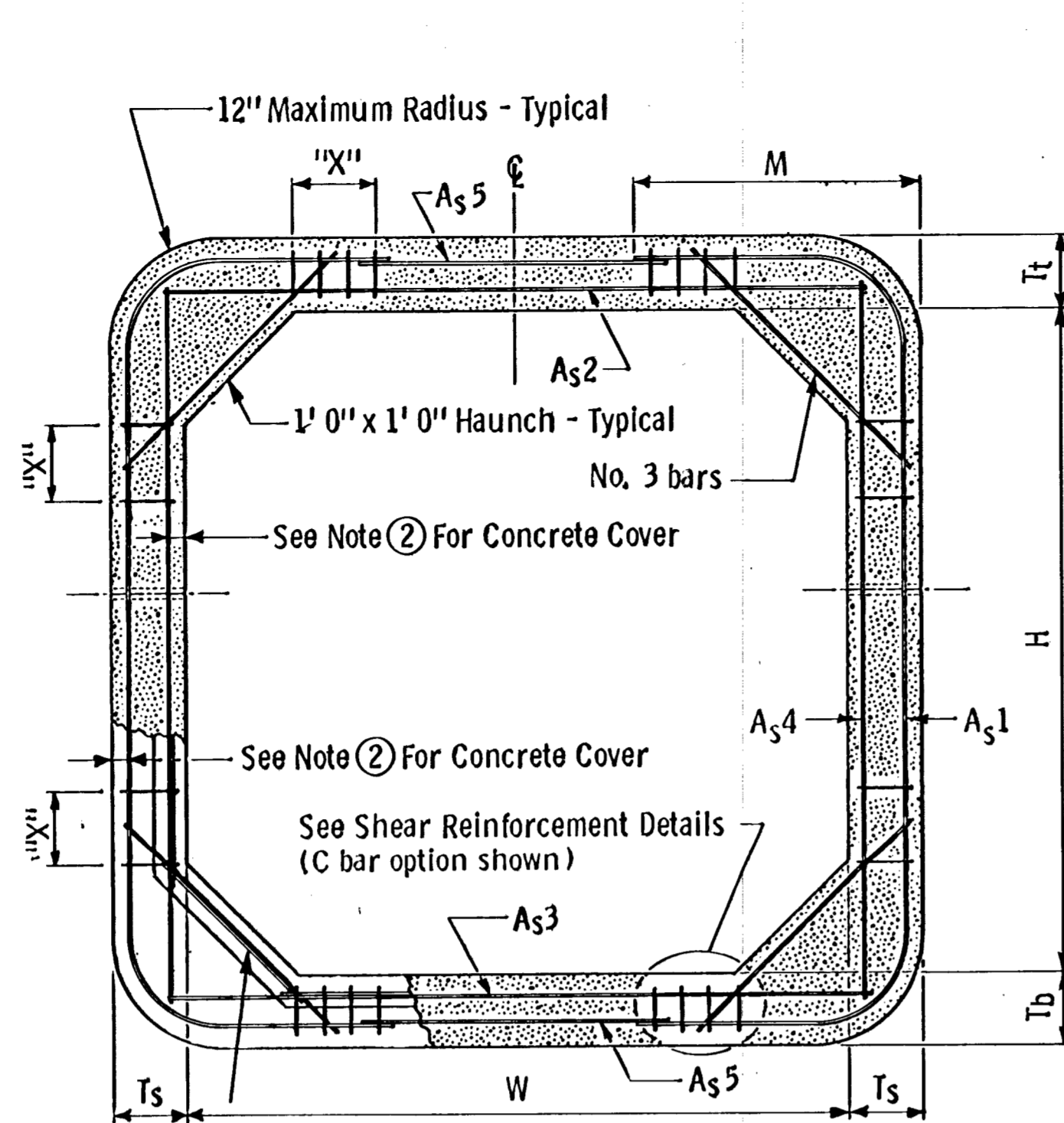
C Bars shall have 135° Min. and 180° Max. hooks



SHEAR REINFORCEMENT DETAIL COIL OPTION

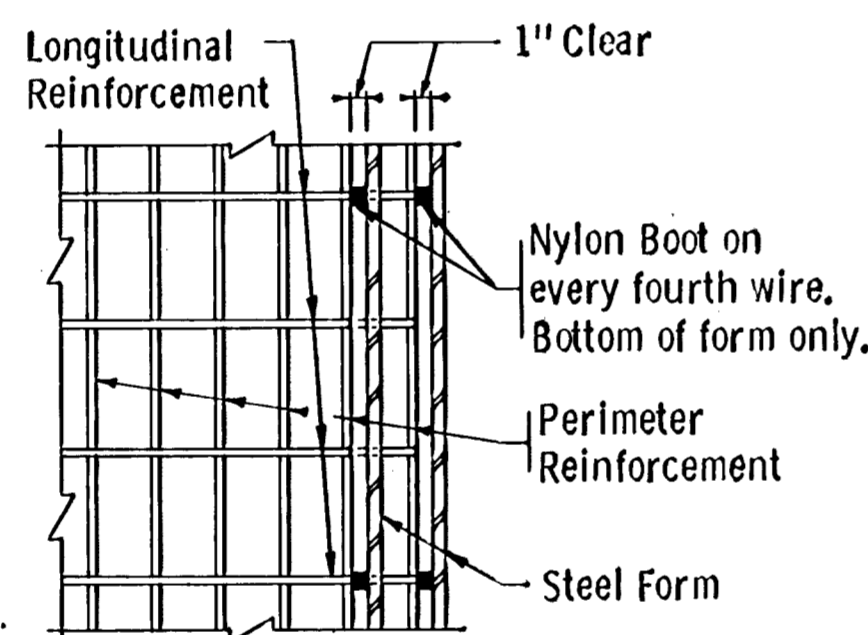
DIMENSION TABLE

Dimensions	Height of Overfill (F)		
	6'	8'	10'
"W" (in Ft.)	8		
"H" (in Ft.)	6		
Tt (in Inches)	9		
Tb (in Inches)	10		
Ts (in Inches)	8		
"M" (in Inches)	29		
Weight (lbs./ft.)	3590		

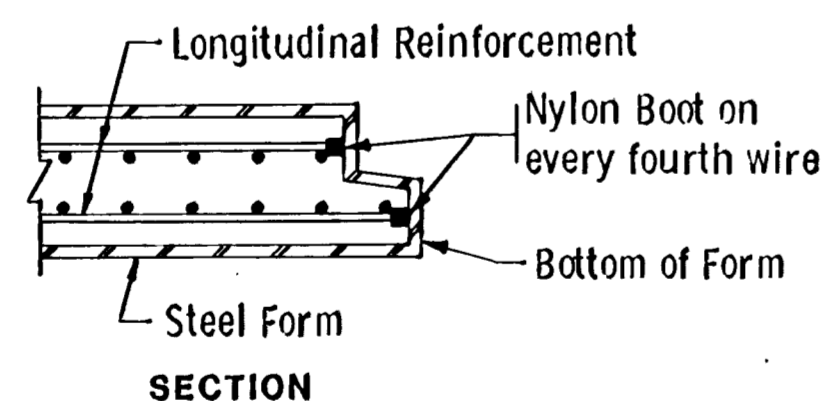


TRANSVERSE BARREL SECTION

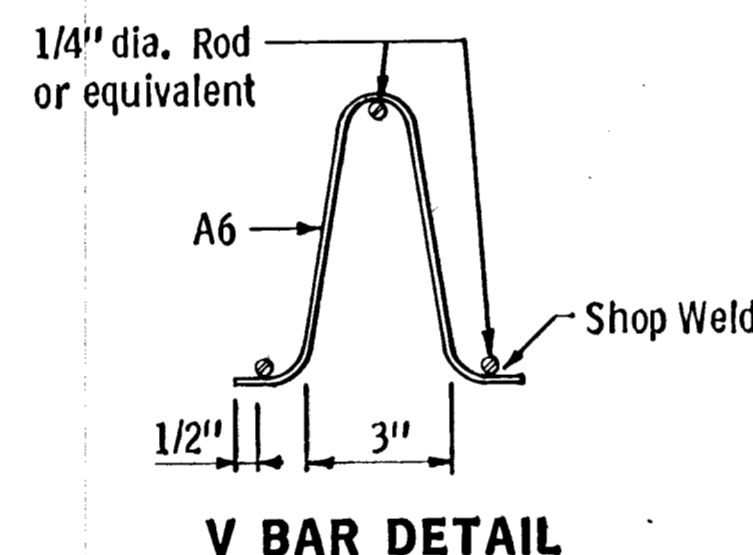
(Bar Reinforcement Option Shown)



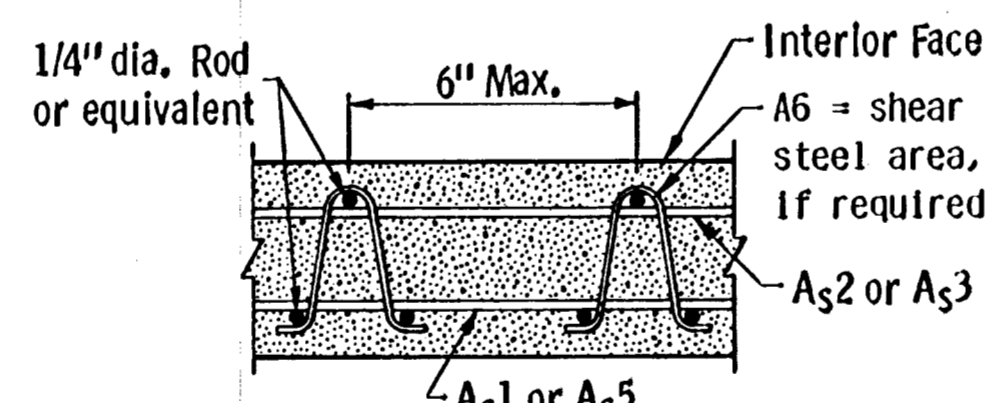
PLAN



FORMING DETAIL



V BAR DETAIL

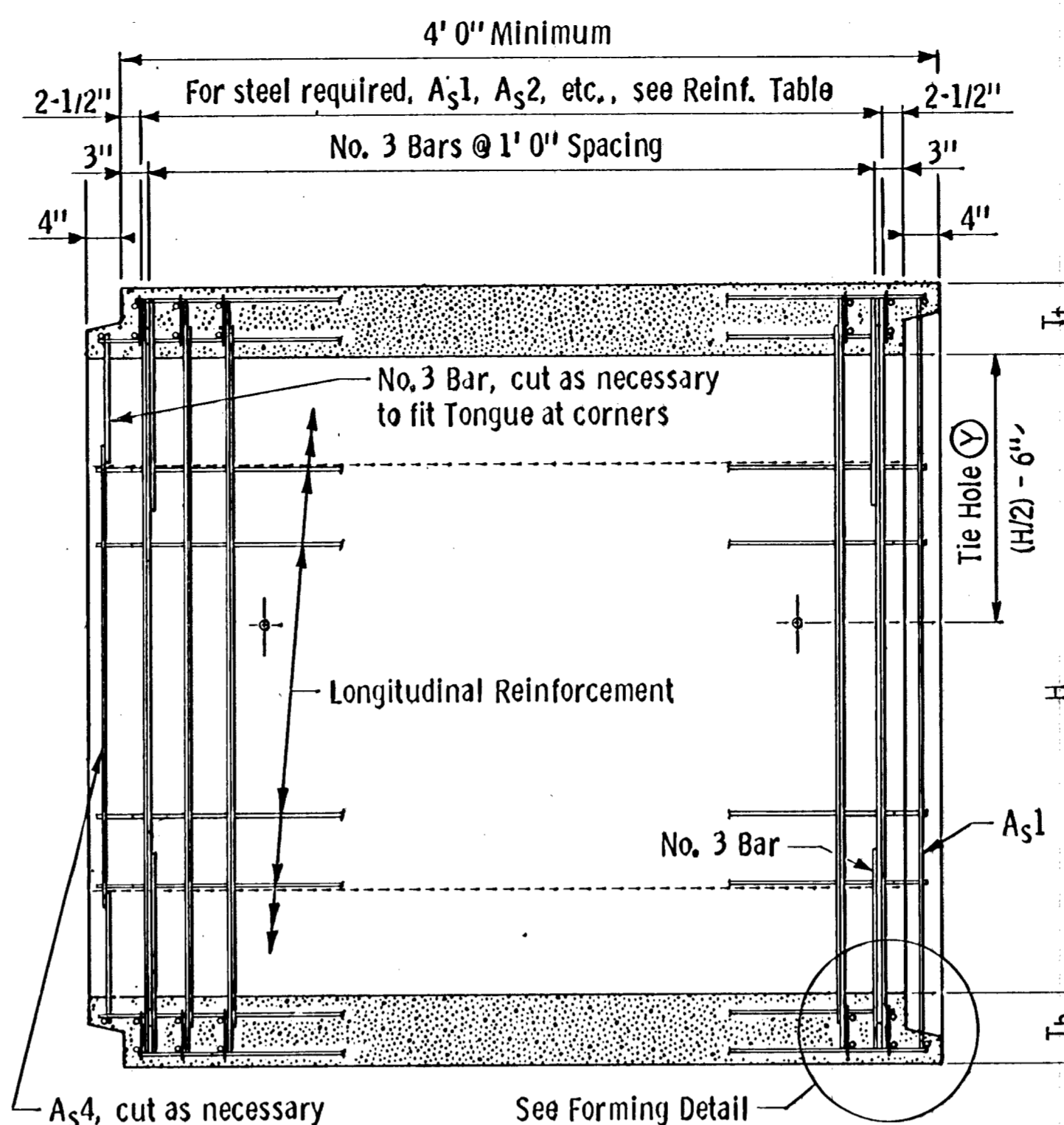


SHEAR REINFORCEMENT DETAIL V BAR OPTION

REINFORCEMENT TABLE

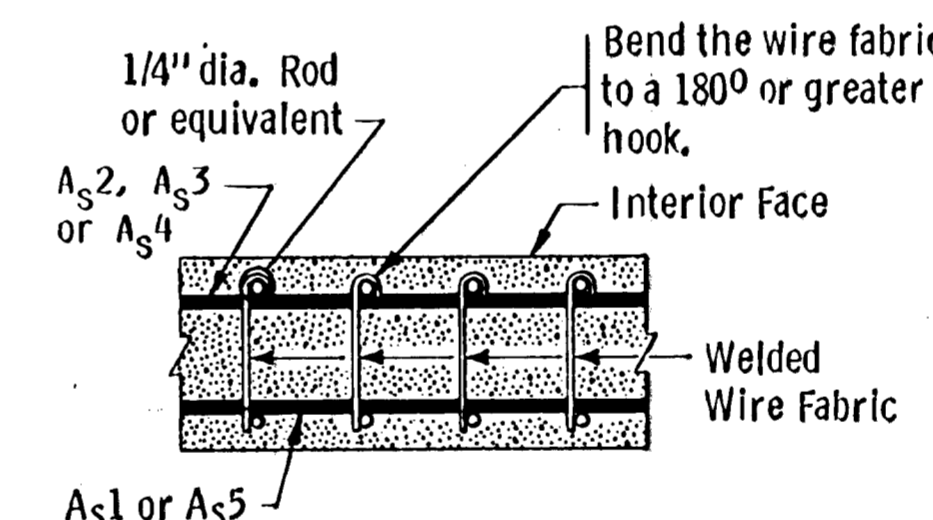
Reinforcement	Height of Overfill (F)							
	6'		8'		10'		12'	
	*Area	Length	*Area	Length	*Area	Length	*Area	Length
A51	.240	11'-4"						
A52	.292	8'-3"						
A53	.330	8'-3"						
A54	.192	6'-3"						
A55	.192	6'-0"						

* Square inches per lineal foot of barrel



LONGITUDINAL BARREL SECTION

(Bar Reinforcement Option Shown)



SHEAR REINFORCEMENT DETAIL J BAR OPTION

SHEAR REINFORCEMENT TABLE

Height of Overfill (F)	Shear Reinforcement Requirements ☆									
	NONE REQ'D.		Top of Culvert				Bottom of Culvert		Side of Culvert	
	**Area	Maximum Spacing	Maximum Spacing	"X" (in inches)	**Area	Maximum Spacing	Maximum Spacing	"X" (in inches)	**Area	Maximum Spacing

☆ When shear reinforcement is needed, a minimum shear steel of 0.06 sq. in. per sq. ft. shall be used.

** Square inches per lineal foot of barrel.

"X" = Distance from end of haunch.

Fy = 65,000 psi
Mesh Reinf.

BARREL DETAILS

State Proj. No.

NOTES:

CONSTRUCTION

- The steel fabric, shear reinforcement and reinforcement bars used shall conform to applicable requirements of AASHTO M 259.
- 1-1/2" min. and 2" max. concrete cover on all reinforcement, including the shear reinforcement, except for tongue and groove detail.
- One of the following combinations of steel reinforcement may be used:
 - 1 or 2 layers of mesh or
 - 1 layer of mesh and 1 layer of reinforcement bars or
 - 1 layer of reinforcement bars.
 The reinforcement shall be developed in accordance with applicable parts of sections 8.21 thru 8.33 of the AASHTO "Standard Specifications for Highway Bridges".
- Longitudinal reinforcement parallel to the axis of the culvert shall have a min. of 0.06 square inches per peripheral foot on all faces of the barrel, except in tongue and groove.
- The max. shear reinforcement spacing in the longitudinal direction shall be 6 inches.
- The transverse steel areas in each face shall be a minimum of 0.192 sq. in. per linear feet of barrel.
- The maximum size of reinforcement bars shall be No. 6. The maximum mesh size shall be 1/2" dia. per layer (maximum of 2 layers).
- The spacing center to center of the circumferential wires shall not be less than 2 inches nor more than 4 inches. The spacing center to center of the longitudinal wires shall not be more than 8 inches.
- Welding will not be allowed on reinforcement bars or steel fabric, except that the original welding required to manufacture wire fabric is acceptable.
- When reinforcement bars are cut, additional reinforcement shall be added on both sides of the cut member to replace or exceed the steel area removed.
- Barrel sections which are cast with a draft in the forms shall be laid with the narrowest part of the section downstream.

BASIS OF DESIGN

- The design shall be in accordance with 1983 and Interim AASHTO Design Specifications.
- Live loads are based on HS20 or Military Loading as designated in FHWA PPM 20-4 Section 4C.
- Maximum allowable Design Stresses
 - F'c = 5000 P.S.I., N = 6
 - Fy = 60,000 P.S.I. reinforcement bars
 - Fy = 65,000 P.S.I. steel fabric
- Load factor design according to AASHTO standard specification Group X = 1.3 [B₀D + B_L(L+I) + B_EE_V + B_EE_L] shall be used where B₀ = 1.00, B_E = 1.00, B_L = 1.67 E_V = Vertical earth pressure and E_L = Lateral earth pressure. The following values have been used for this structure:
 - Unit Soil Weight 120 lbs. per cu. ft.
 - Maximum lateral Pressure Coefficient 75 % of soil weight
 - Minimum lateral Pressure Coefficient 10 % of soil weight
- Concrete shall be Mix No. 3W36 with no calcium chloride allowed.
- Minimum overfill shall be two (2) feet.

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

SIGNED: _____

DATE: _____ REG. NO. _____

_____ HIGHWAY NO.
MINNESOTA
DEPARTMENT OF TRANSPORTATION

Bridge No.

IDENTIFICATION NO. 113
PRECAST CONCRETE BOX CULVERT

SEC. _____ T. _____ N. _____ R. _____
TOWNSHIP _____ COUNTY _____

APPROVED: _____

BRIDGE ENGINEER _____ ASSISTANT DIVISION DIRECTOR _____

DES. _____ DR. _____
CHK. _____ CHK. _____

FIG. 5-397.701
Approved: September 18, 1985