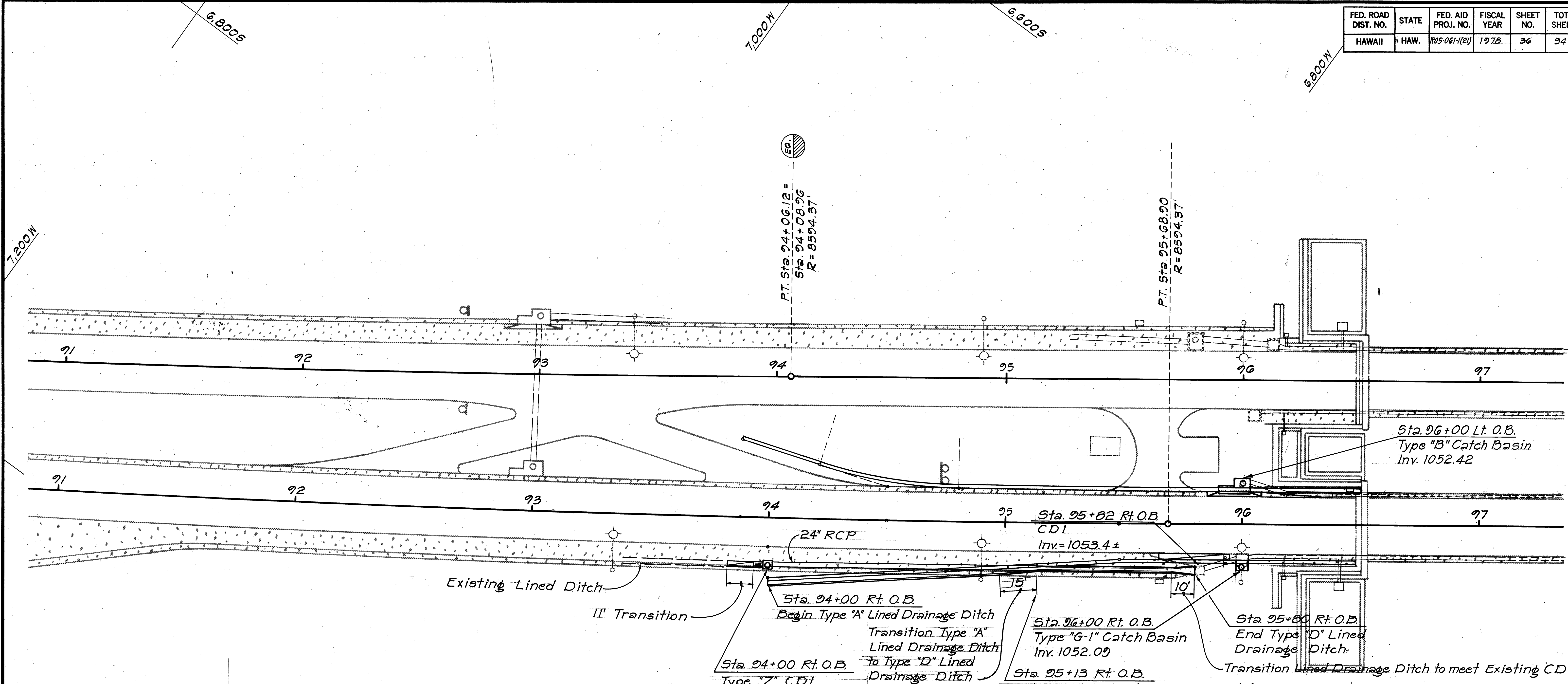


| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061-1(2)       | 1978        | 36        | 94           |



|                                |          |                                        |           |
|--------------------------------|----------|----------------------------------------|-----------|
| Sta. 95+82 Rt. O.B.            |          | Sta. 94+00 Rt. O.B.                    |           |
| Reconstruct Existing CD1       |          | Construct: Type "Z" CD1                |           |
| (For Details, See Sht. No. 46) |          | (For Details, See Sht. No. 45)         |           |
| <u>Estimated Quantities</u>    |          | <u>Estimated Quantities</u>            |           |
| Class "A" Concrete             | 0.5 C.Y. | Class "A" Concrete                     | 2.5 CY    |
| Reinforcing Steel              | 15.0 Lb. | Reinforcing Steel                      | 185.0 Lb. |
| Structure Excavation           | 1.0 C.Y. | Structure Excavation                   | 158.0 CY  |
|                                |          | Type "A" C.I. Frame & Cover            | 1 Ea.     |
|                                |          | Type "7" Grate                         | 1 Ea.     |
|                                |          | 24" Reinforced Concrete Pipe Class III | 180 LF    |

|                                                  |          |
|--------------------------------------------------|----------|
| Sta. 96+00 Lt. O.B.                              |          |
| Reconstruct Existing Type "B" Catch Basin        |          |
| (For Details, See Sht. No. 47 & 48)              |          |
| <u>Estimated Quantities</u>                      |          |
| Class "A" Concrete                               | 1.5 CY   |
| Reinforcing Steel                                | 75.0 Lb. |
| Structure Excavation                             | 2.0 CY   |
| Reinstalling existing Type "B"                   |          |
| Cast Iron Frame and Cover                        | 1 Ea.    |
| Sta. 93+82.83 Rt. O.B. to Sta. 93+97.83 Rt. O.B. |          |
| Transition Section                               |          |
| (For Details, See Sht. No. 45)                   |          |

|                                       |        |
|---------------------------------------|--------|
| <u>Estimated Quantities</u>           |        |
| 1 1/2 x 1 1/2 Lined Trapezoidal Ditch | 11 LF  |
| Ditch and Channel Excavation          | 2.0 CY |

|                                             |           |
|---------------------------------------------|-----------|
| Sta. 96+00 Rt. O.B.                         |           |
| Reconstruct Existing Type "G-1" Catch Basin |           |
| (For Details, See Sht. No. 54)              |           |
| <u>Estimated Quantities</u>                 |           |
| Class "A" Concrete                          | 2.0 CY    |
| Reinforcing Steel                           | 160.0 Lb. |
| Structure Excavation                        | 5.0 CY    |
| Type "B" Cast Iron                          |           |
| Frame and Cover                             | 1 Ea.     |

|                                            |  |
|--------------------------------------------|--|
| Sta. 95+13 Rt. O.B. to Sta. 95+80 Rt. O.B. |  |
| Type "D" Lined Drainage Ditch              |  |

|                               |         |
|-------------------------------|---------|
| <u>Estimated Quantities</u>   |         |
| Type "D" Lined Drainage Ditch | 67 L.F. |
| Ditch and Channel Excavation  | 8 CY    |

|                                            |          |
|--------------------------------------------|----------|
| Sta. 94+00 Rt. O.B. to Sta. 95+13 Rt. O.B. |          |
| Type "A" Lined Drainage Ditch              |          |
| <u>Estimated Quantities</u>                |          |
| Type "A" Lined Drainage Ditch              | 113 L.F. |
| Ditch and Channel                          |          |
| Excavation                                 | 10 C.Y.  |

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**DRAINAGE PLAN**

PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnel to Kamehameha Hwy.  
F.A. Project No. ROS-061-1(21)

Scale: 1" = 20' Date: Sept. 1977

SHEET NO. 1 OF 25 SHEETS

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061-1(21)      | 1978        | 37        | 94           |

Sta. 106+79 Rt. I.B.  
Reconstruct Existing Type "C" Catch Basin  
(For Details, See Sht. No. 56)

Estimated Quantities  
Class "A" Concrete 2.5 CY  
Reinforcing Steel 230 Lb.  
Structure Excavation 4.0 CY  
Installing salvaged Cast Iron Frame and Cover 1 Ea.

Sta. 108+10 Rt. I.B.  
Reconstruct Existing Type "C" Catch Basin  
(For Details, See Sht. No. 55)

Estimated Quantities  
Class "A" Concrete 1.0 CY  
Reinforcing Steel 40.0 Lb.  
Structure Excavation 2.0 CY

Sta. 109+80 Rt. I.B.  
Reconstruct Existing Type "C" Catch Basin  
(For Details, See Sht. No. 55)

Estimated Quantities  
Class "A" Concrete 1.0 CY  
Reinforcing Steel 40.0 Lb.  
Structure Excavation 2.0 CY

Sta. 108+10 Rt. I.B.  
Type "C" Catch Basin  
Inv. = 972.32

Sta. 109+80 Rt. I.B.  
Type "C" Catch Basin  
Inv. 961.90

Sta. 106+79 Rt. I.B.  
Type "C" Catch Basin  
Inv. 982.29

Sta. 109+70.5 Rt. O.B.  
Type "C" Catch Basin  
Inv. 963.43

Sta. 107+57.5 Rt. O.B.  
Begin Type "A" Lined Drainage Ditch

Transition Lined Drainage Ditch to existing C.D.I.

Sta. 109+47.5 Rt. O.B.  
End Type "A" Lined Drainage Ditch

Sta. 107+57.5 Rt. O.B. to Sta. 109+47.5 Rt. O.B.  
Type "A" Lined Drainage Ditch

Estimated Quantities  
Type "A" Lined Drainage Ditch 190 LF  
Ditch and Channel Excavation 10 CY

Sta. 109+70.5 Rt. O.B.  
Reconstruct Existing Type "C" Catch Basin  
(For Details, See Sht. No. 57)

Estimated Quantities  
Class "A" Concrete 1.0 CY  
Reinforcing Steel 75.0 Lb.  
Structure Excavation 2.0 CY  
Reinstalling existing Type "B" Cast Iron Frame and Cover 1 Ea.

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**DRAINAGE PLAN**

PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kamehameha Hwy.  
F.A. Project No. ROS-061-1(21)

Scale: 1" = 20' Date: Sept. 1977  
SHEET NO. 2 OF 25 SHEETS

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061-1(21)      | 1978        | 30        | 34           |

Sta 115+50 Lt. I.B.  
Reconstruct Existing Type "G-1" Catch Basin  
(For Details, See Sht. No. 54)

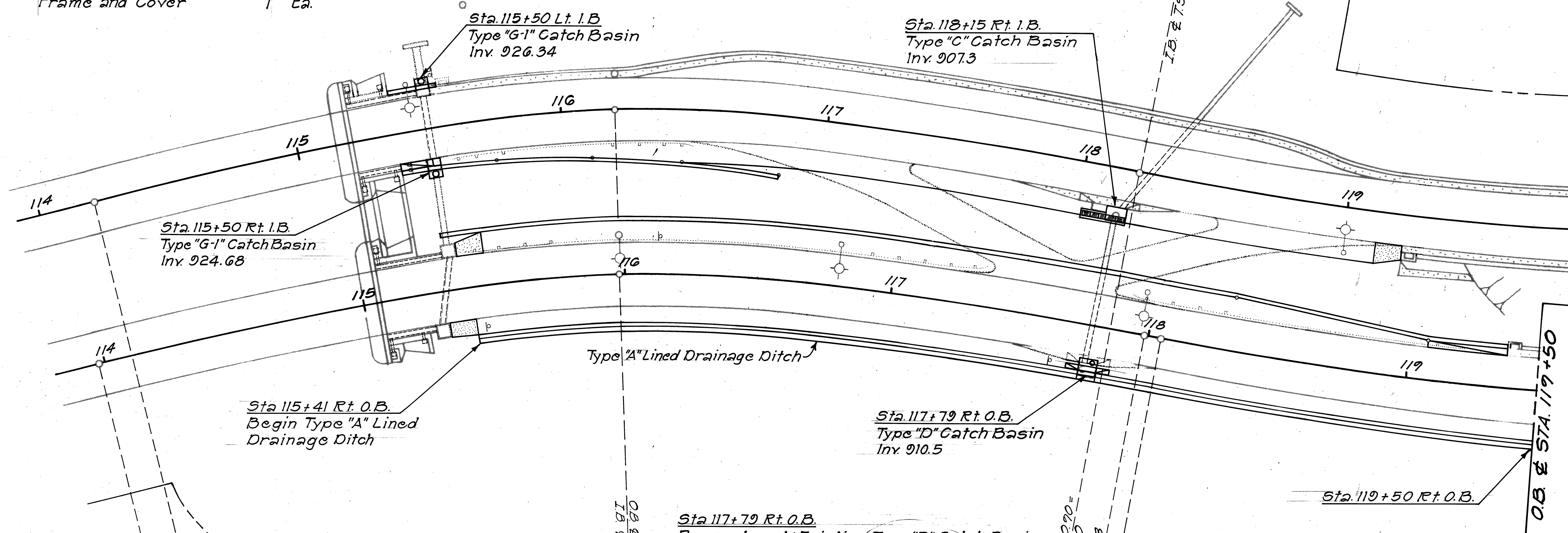
Estimated Quantities  
Class "A" Concrete 2.5 CY  
Reinforcing Steel 170.0 Lb  
Structure Excavation 6.0 CY  
Installing salvaged Cast Iron Frame and Cover 1 Ea.

Sta 115+50 Rt. I.B.  
Reconstruct Existing Type "G-1" Catch Basin  
(For Details, See Sht. No. 56)

Estimated Quantities  
Class "A" Concrete 3.0 CY  
Reinforcing Steel 260.0 Lb  
Structure Excavation 5.0 CY  
Installing salvaged Cast Iron Frame and Cover 1 Ea.

Sta 118+15 Rt. I.B.  
Reconstruct Existing Type "C" Catch Basin  
(For Details, See Sht. No. 50)

Estimated Quantities  
Class "A" Concrete 4.0 CY  
Reinforcing Steel 350.0 Lb  
Structure Excavation 8.5 CY  
Type "A-12" Steel Frame and Grate 5 Ea.



Sta 117+79 Rt. O.B.  
Reconstruct Existing Type "D" Catch Basin  
(For Details, See Sht. No. 49)

Estimated Quantities  
Class "A" Concrete 2.0 CY  
Reinforcing Steel 225.0 Lb  
Structure Excavation 5.0 CY  
Type "A" Cast Iron Frame and Cover 1 Ea.

Sta 115+41 Rt. O.B. to Sta 119+50 Rt. O.B.  
Type "A" Lined Drainage Ditch

Estimated Quantities  
Type "A" Lined Drainage Ditch 409 LF  
Ditch and Channel Excavation 22 CY

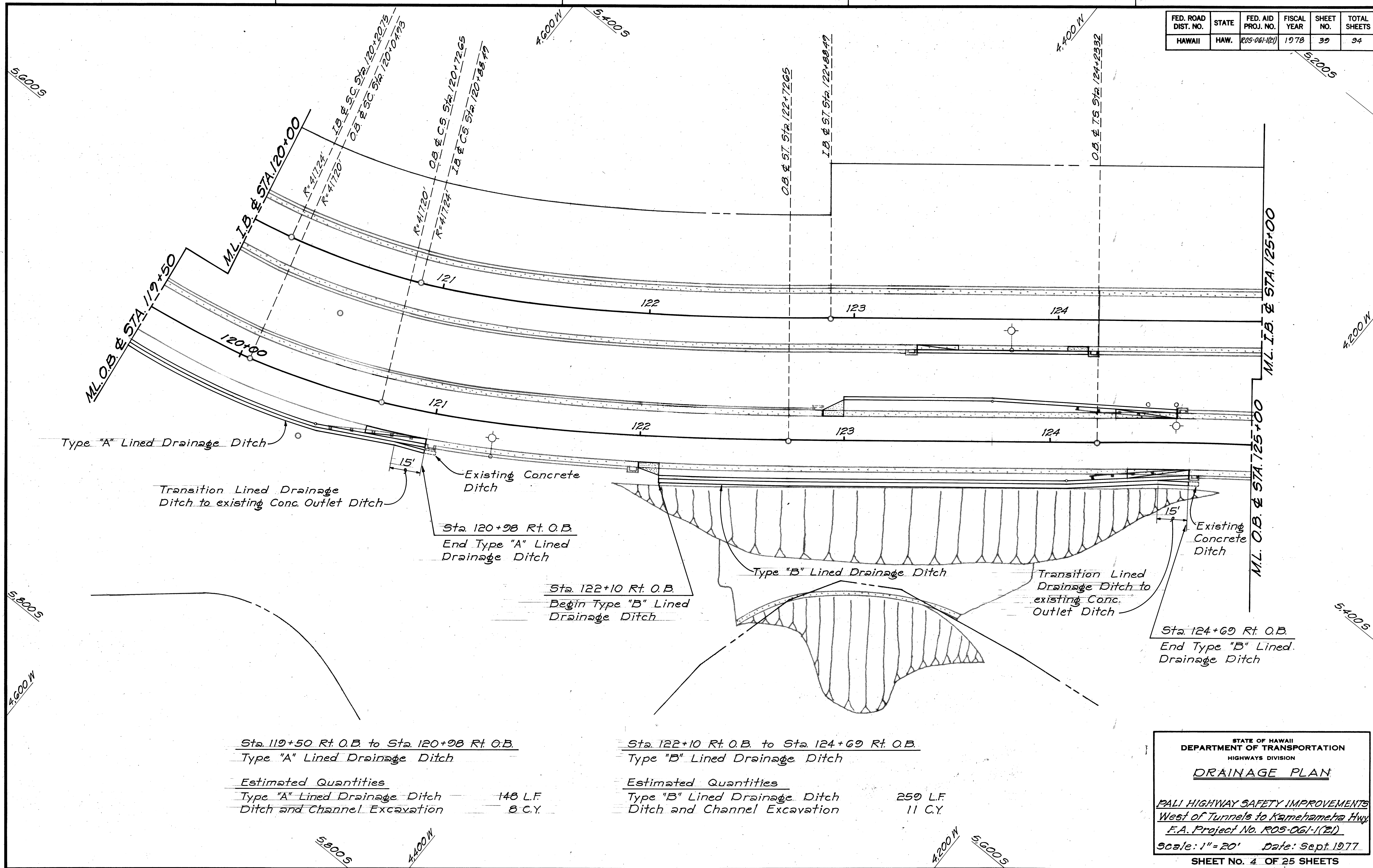
|                   |       |
|-------------------|-------|
| DATE              | _____ |
| SURVEY PLOTTED BY | _____ |
| DRAWN BY          | _____ |
| DESIGNED BY       | _____ |
| CHECKED BY        | _____ |
| NOTE BOOK         | _____ |
| NO.               | _____ |

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

DRAINAGE PLAN

PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnel to Kamehameha Hwy.  
F.A. Project No. ROS-061-1(21)  
Scale: 1"=20'      Date: Sept. 1977  
SHEET NO. 3 OF 25 SHEETS

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | R05-061-1(21)      | 1978        | 39        | 94           |



|                   |       |
|-------------------|-------|
| DATE              | _____ |
| SURVEY PLOTTED BY | _____ |
| DRAWN BY          | _____ |
| DESIGNED BY       | _____ |
| CHECKED BY        | _____ |
| NOTE BOOK         | _____ |
| QUANTITIES BY     | _____ |
| NO.               | _____ |

Sta. 119+50 Rt. O.B. to Sta. 120+98 Rt. O.B.  
Type "A" Lined Drainage Ditch

Estimated Quantities  
Type "A" Lined Drainage Ditch 148 L.F.  
Ditch and Channel Excavation 8 C.Y.

Sta. 122+10 Rt. O.B. to Sta. 124+69 Rt. O.B.  
Type "B" Lined Drainage Ditch

Estimated Quantities  
Type "B" Lined Drainage Ditch 259 L.F.  
Ditch and Channel Excavation 11 C.Y.

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**DRAINAGE PLAN**

PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kamehameha Hwy.  
F.A. Project No. R05-061-1(21)  
Scale: 1"=20' Date: Sept. 1977

SHEET NO. 4 OF 25 SHEETS

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061-1(2)       | 1978        | 40        | 94           |

Sta. 129+20 Rt. I.B.  
Reconstruct Existing Type "C" Catch Basin  
(For Details, See Sht. No. 51 & 52)

Estimated Quantities  
 Class "A" Concrete 4.5 CY  
 Reinforcing Steel 475.0 Lb.  
 Structure Excavation 9.0 CY  
 Reinstalling existing Type "B"  
 Cast Iron Frame and Cover 1 Ea.

Sta. 129+20 Rt. I.B.  
Type "C" Catch Basin  
Inv. 831.5

Sta. 129+30 Rt. O.B.  
Type "C" Catch Basin  
Inv. 827.2

Sta. 129+30 Rt. O.B.  
Reconstruct Existing Type "C" Catch Basin  
(For Details, See Sht. No. 57)

Estimated Quantities  
 Class "A" Concrete 1.0 CY  
 Reinforcing Steel 75.0 Lb.  
 Structure Excavation 2.0 CY  
 Reinstalling existing Type "B"  
 Cast Iron Frame and Cover 1 Ea.

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

# DRAINAGE PLAN

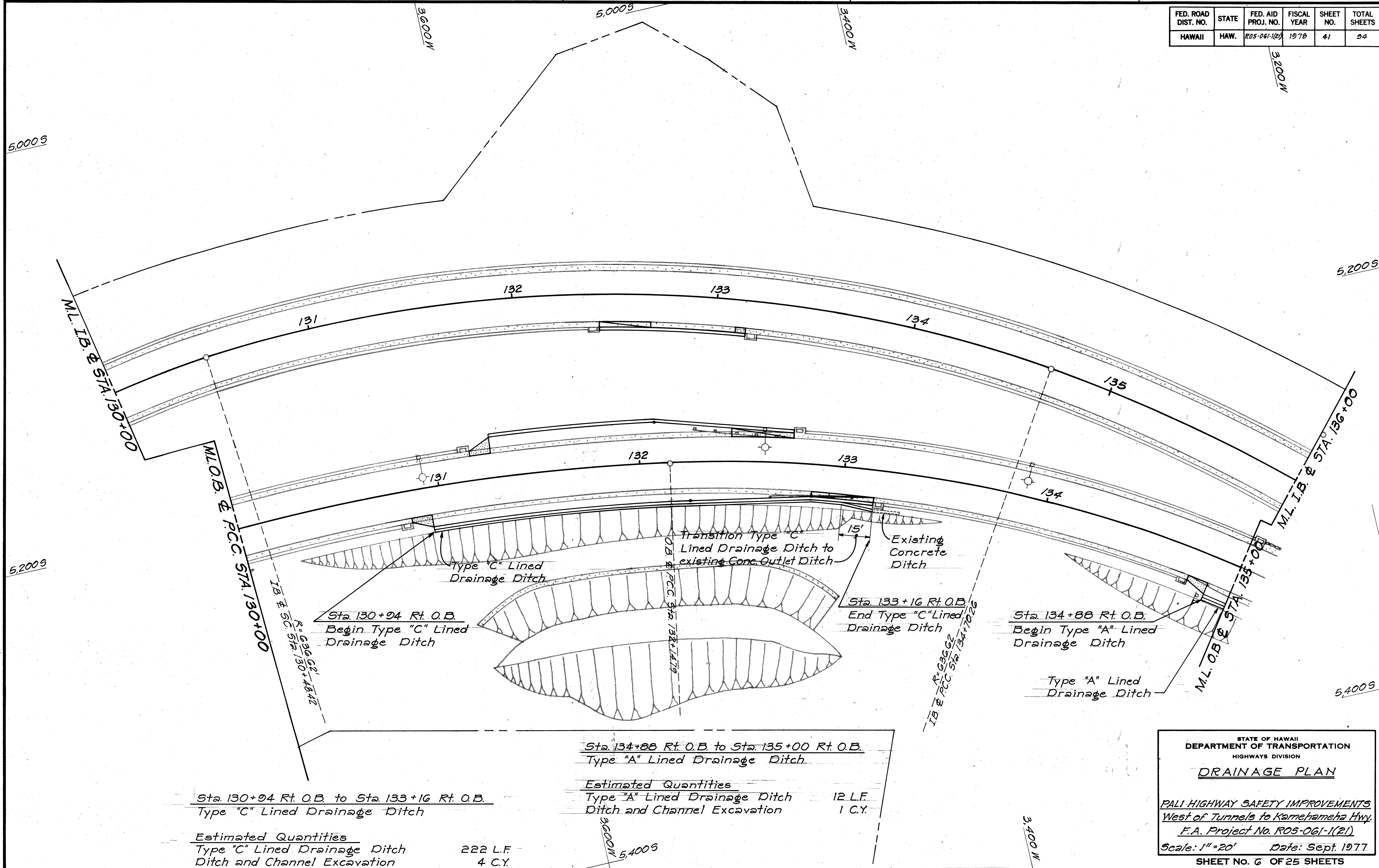
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kamehameha Hwy.

F.A. Project No. ROS-061-1(2)

Scale: 1"=20' Date: Sept. 1977

SHEET No. 5 OF 25 SHEETS

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061-1(21)      | 1978        | 41        | 94           |



|                   |       |
|-------------------|-------|
| DATE              | _____ |
| SURVEY PLOTTED BY | _____ |
| DRAWN BY          | _____ |
| DESIGNED BY       | _____ |
| QUANTITIES BY     | _____ |
| CHECKED BY        | _____ |
| ORIGINAL PLAN     | _____ |
| NOTE BOOK         | _____ |
| NO.               | _____ |

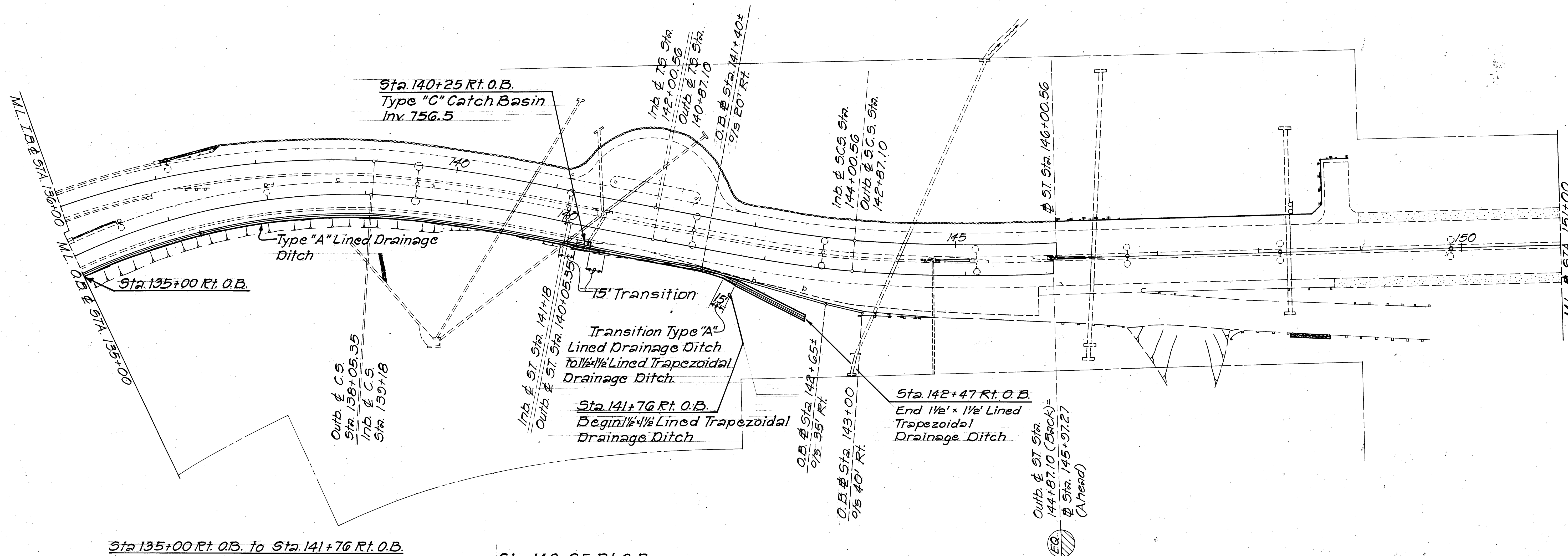
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**DRAINAGE PLAN**

PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kanehameha Hwy.  
F.A. Project No. ROS-061-1(21)  
Scale: 1"=20' Date: Sept. 1977  
SHEET NO. 6 OF 25 SHEETS

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061-(21)       | 1978        | 42        | 94           |

True North  
Scale: 1" = 50'



Sta. 135+00 Rt. O.B. to Sta. 141+76 Rt. O.B.  
Type "A" Lined Drainage Ditch

Estimated Quantities

Type "A" Lined Drainage Ditch 676 LF  
Ditch and Channel Excavation 36.0 CY

Sta. 140+25 Rt. O.B.

Reconstruct Existing Type "C" Catch Basin  
(For Details, See Sht. No. 53)

Estimated Quantities

Class "A" Concrete 4.5 CY  
Reinforcing Steel 350.0 Lb.  
Structure Excavation 9.5 CY  
Type "A" Cast Iron  
Frame and Cover 1 Ea.

Sta. 141+76 Rt. O.B. to Sta. 142+47 Rt. O.B.

1 1/2' x 1 1/2' Lined Trapezoidal Drainage Ditch  
(Alignment of ditch shall be determined  
by the Engineer)

Estimated Quantities

1 1/2' x 1 1/2' Lined Trapezoidal Ditch 75 LF  
Ditch and Channel Excavation 16.0 CY

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

DRAINAGE PLAN

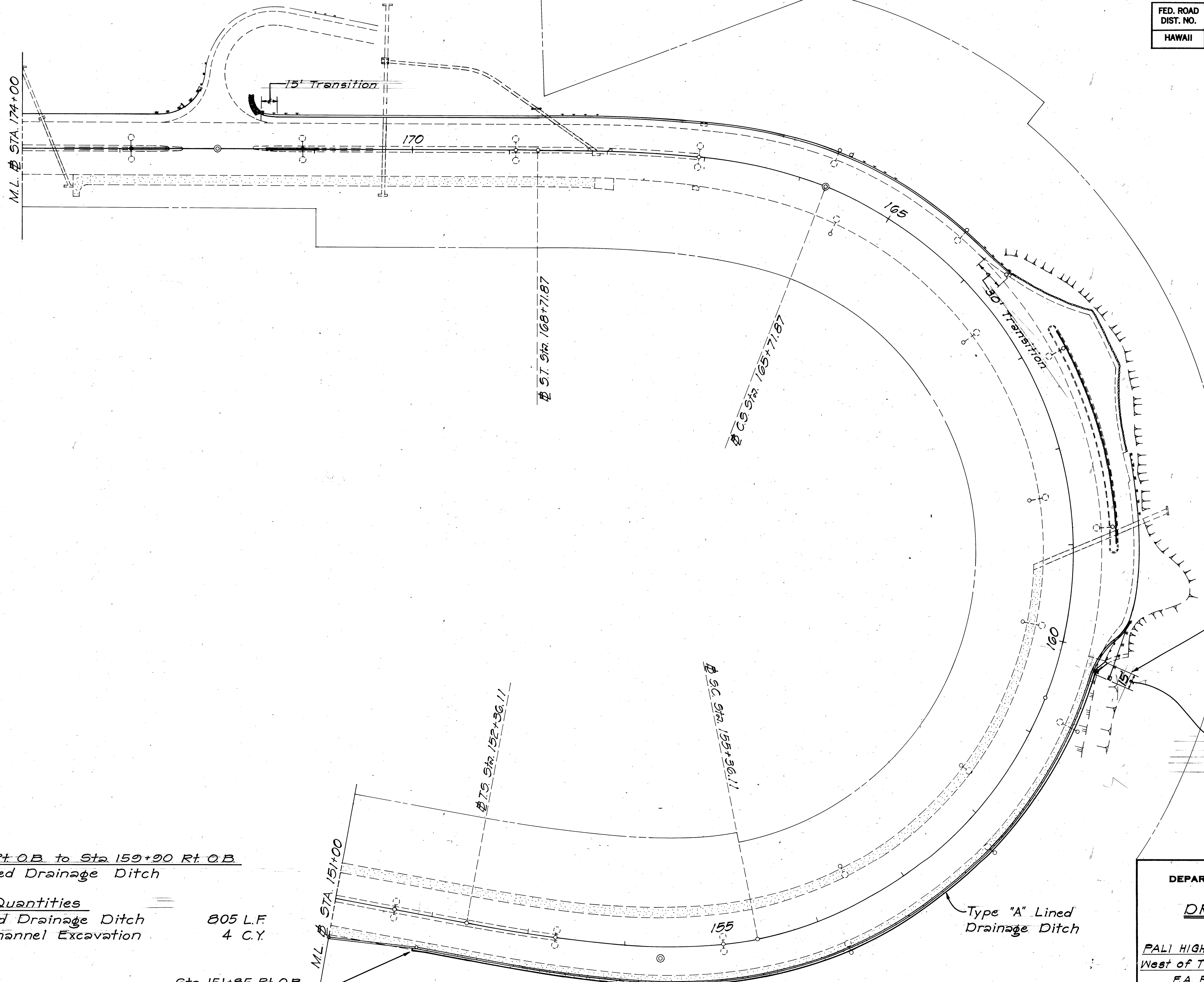
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kamehameha Highway  
F.A. Project No. ROS-061-(21)

Scale: 1" = 50' Date: Sept. 1977

SHEET NO. 7 OF 25 SHEETS

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | R05-061-1(21)      | 1978        | 43        | 94           |

True North  
Scale: 1"=50'



Sta. 151+85 Rt. O.B. to Sta. 159+90 Rt. O.B.  
Type "A" Lined Drainage Ditch

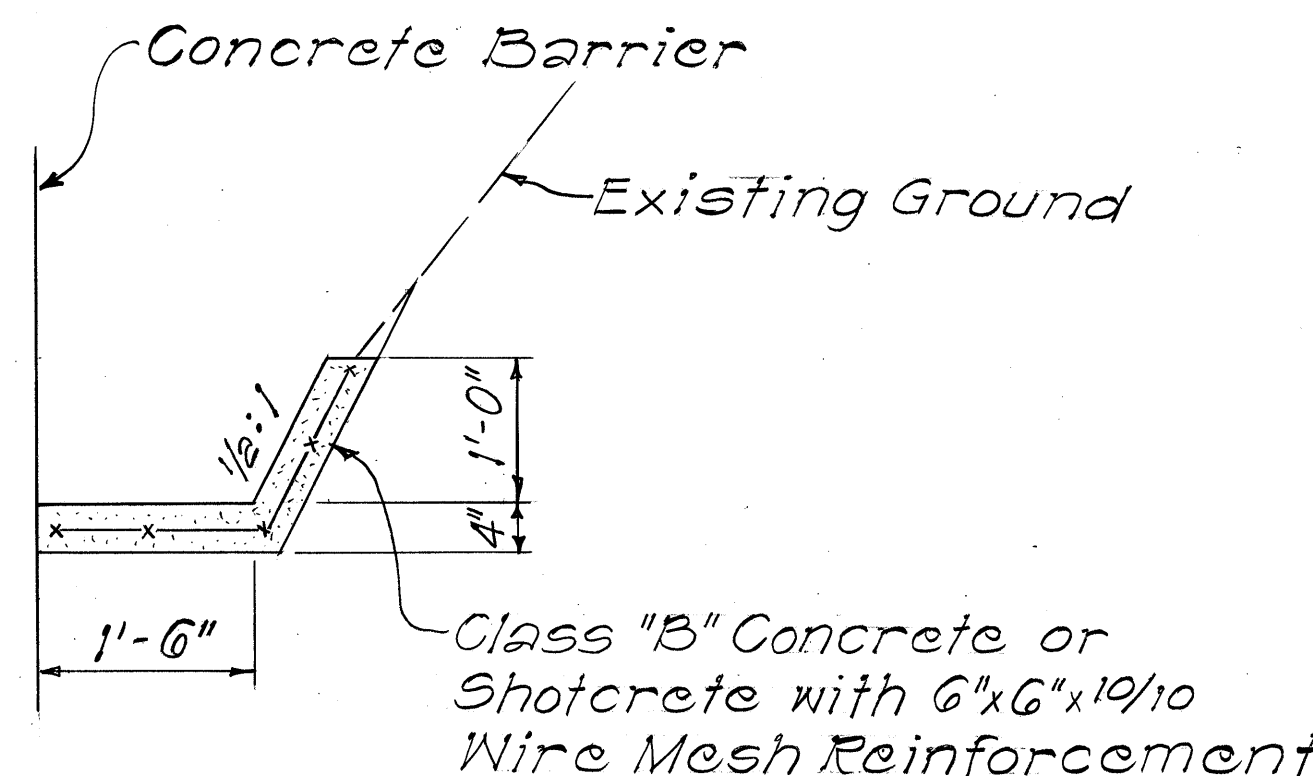
Estimated Quantities  
Type "A" Lined Drainage Ditch 805 L.F.  
Ditch and Channel Excavation 4 C.Y.

Sta. 151+85 Rt. O.B.  
Begin Type "A" Lined  
Drainage Ditch

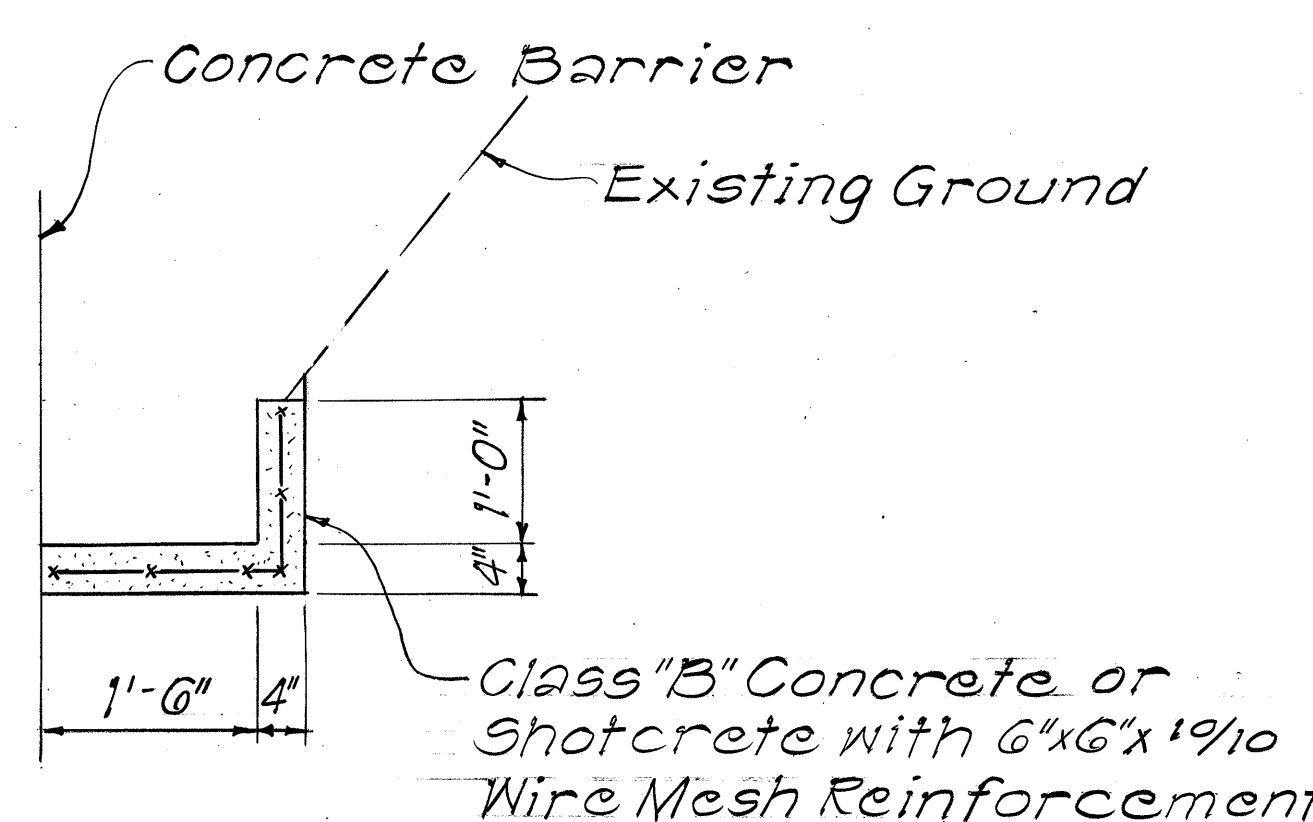
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
DRAINAGE PLAN  
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kamehameha Highway  
F.A. Project No. R05-061-1(21)  
Scale: 1"=50'      Date: Sept. 1977  
SHEET NO. 8 OF 25 SHEETS

|               |                   |      |
|---------------|-------------------|------|
| ORIGINAL PLAN | SURVEY PLOTTED BY | DATE |
| TRACED BY     |                   |      |
| NOTE BOOK     |                   |      |
| QUANTITIES BY |                   |      |
| CHECKED BY    |                   |      |
| No.           |                   |      |

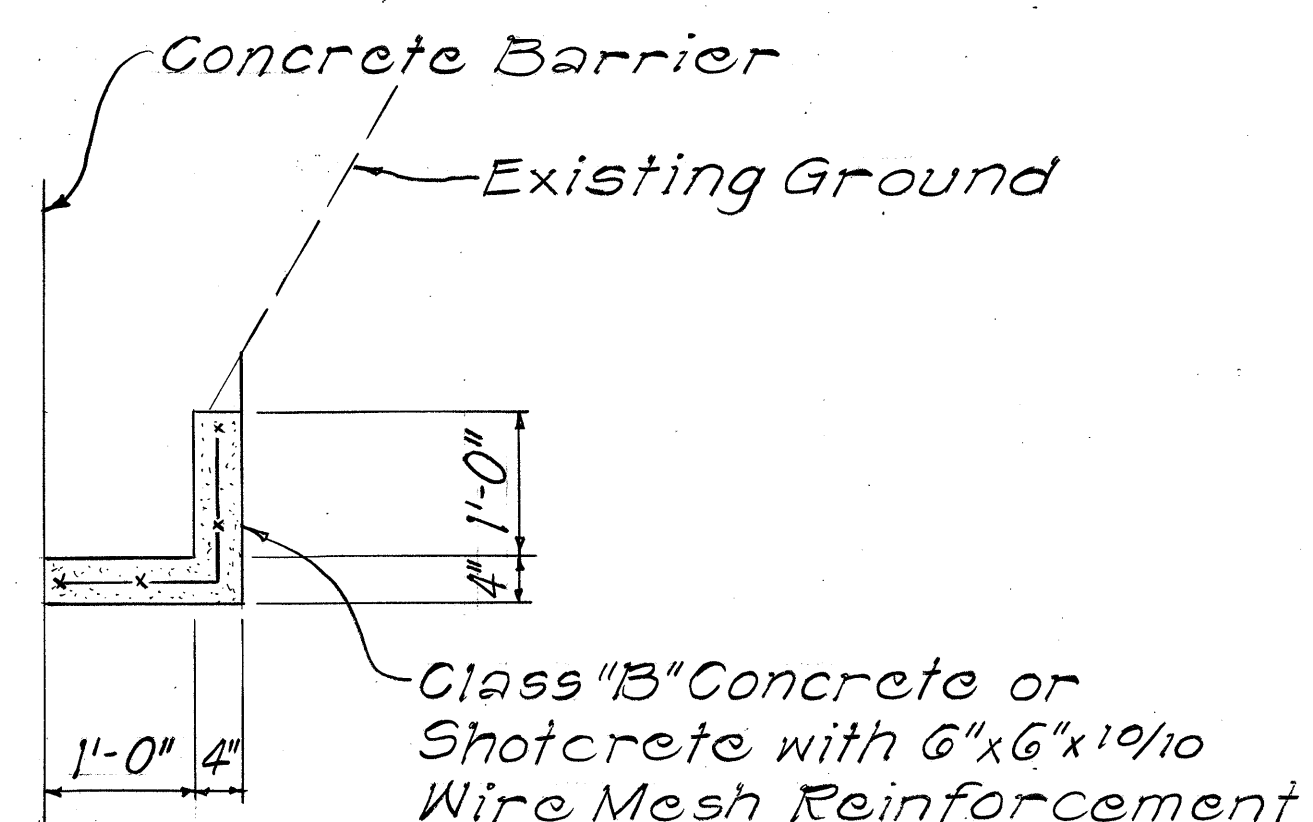
| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061(2)         | 1978        | 44        | 94           |



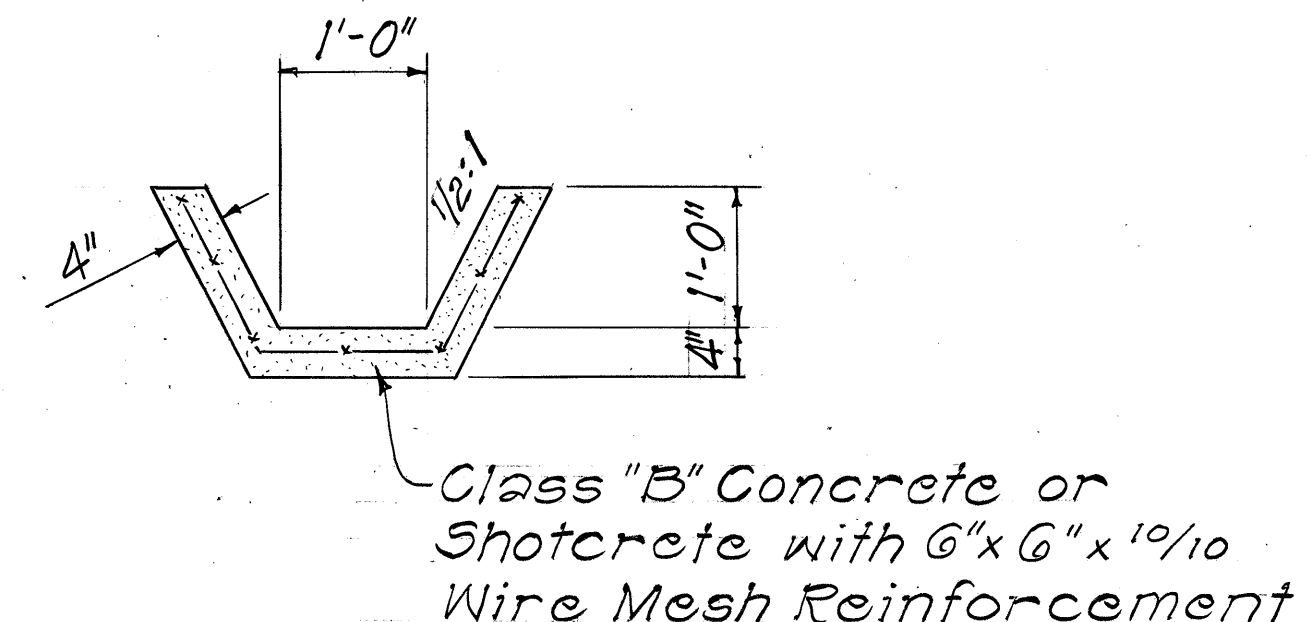
TYPE "A" LINED DRAINAGE DITCH



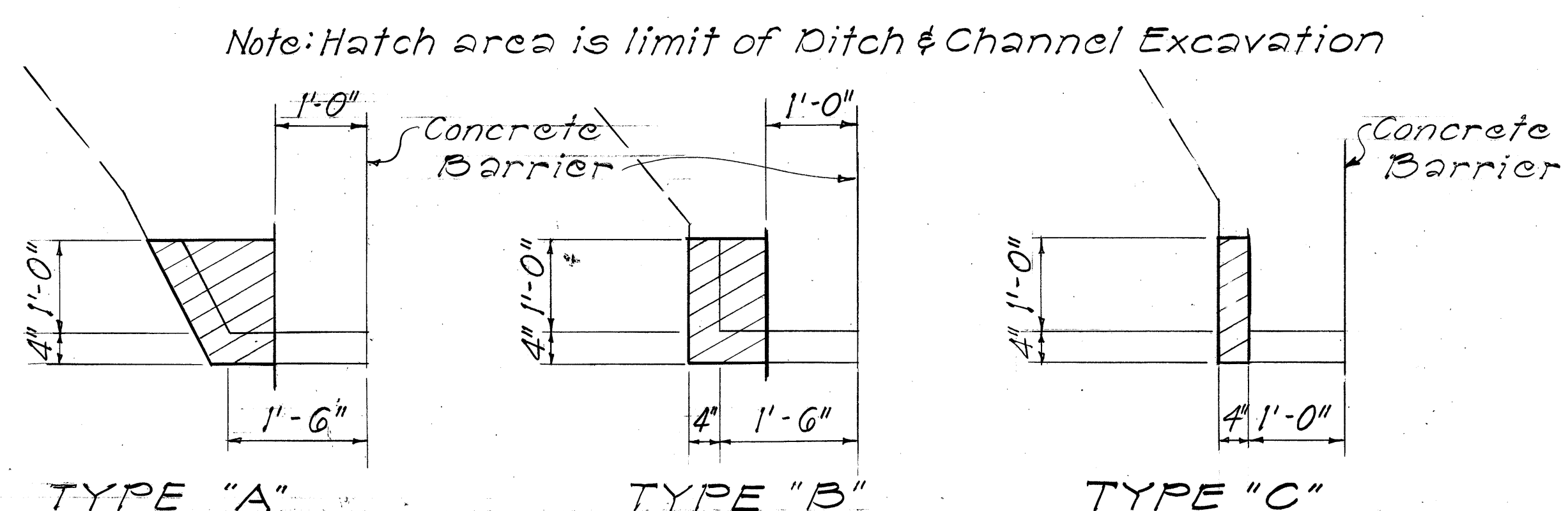
TYPE "B" LINED DRAINAGE DITCH



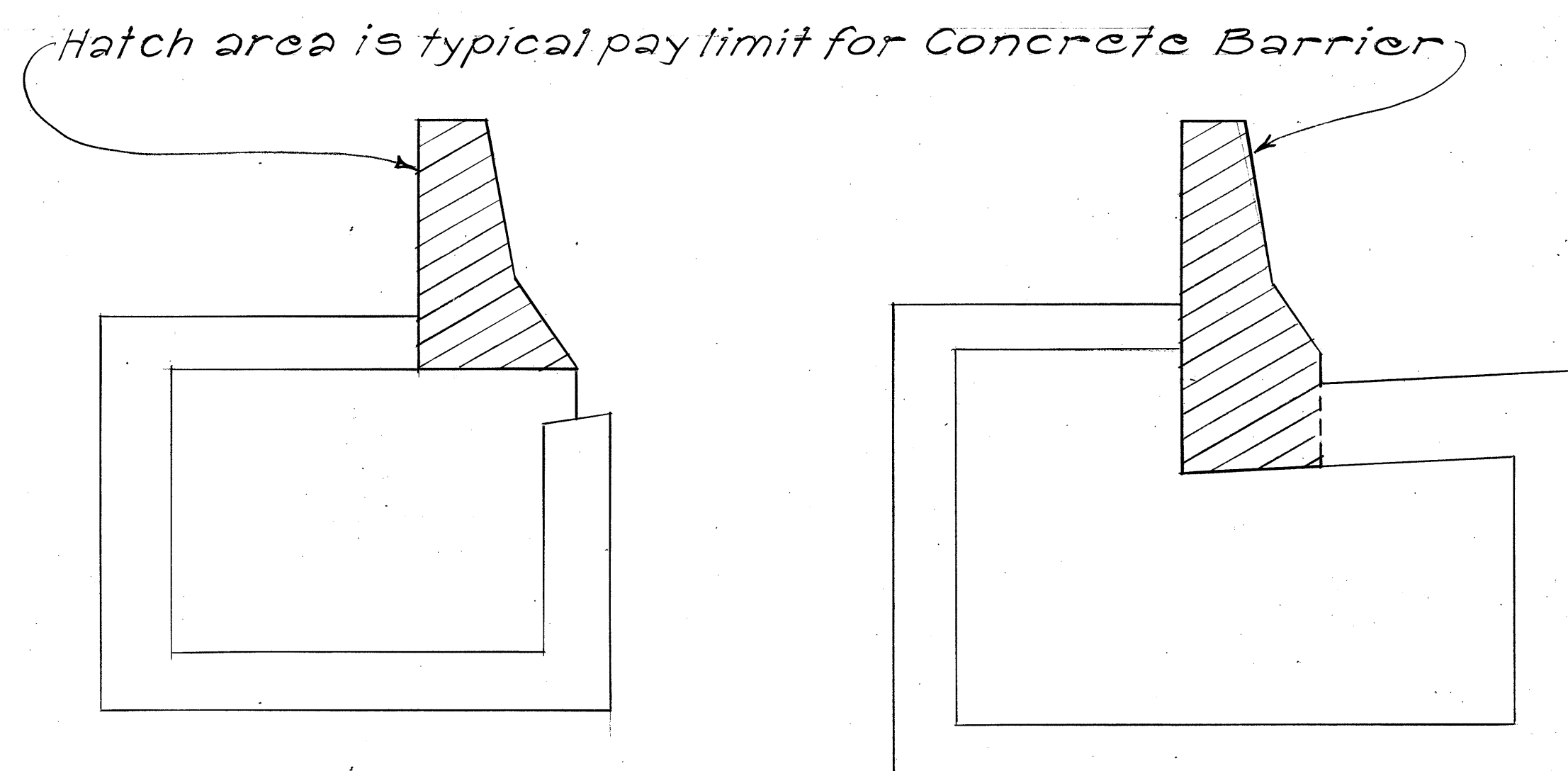
TYPE "C" LINED DRAINAGE DITCH



TYPE "D" LINED DRAINAGE DITCH

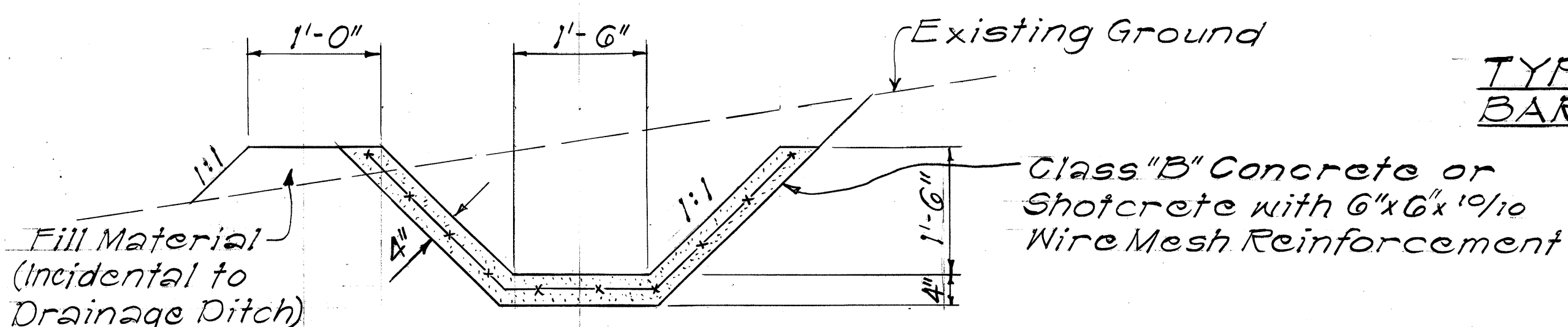


LIMITS OF DITCH & CHANNEL EXCAVATION FOR LINED DRAINAGE DITCH



TYPICAL PAY LIMITS FOR CONCRETE BARRIERS OVER DRAINAGE STRUCTURES

Not to Scale



1 1/2' x 1 1/2' LINED TRAPEZOIDAL DRAINAGE DITCH

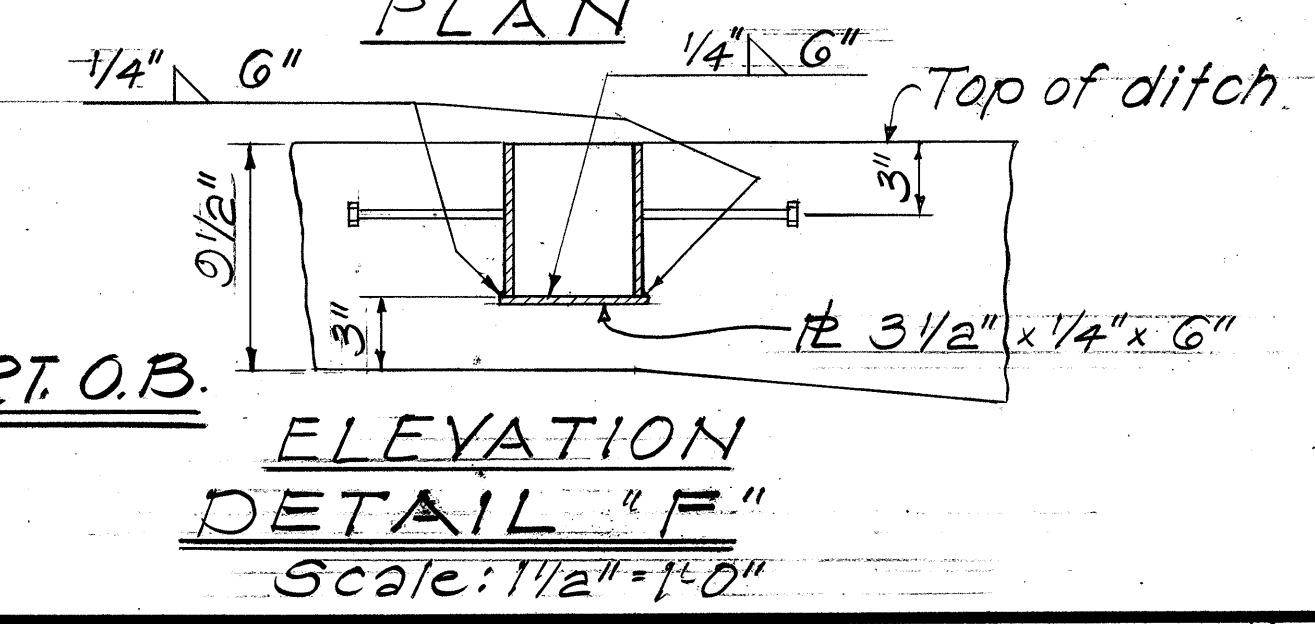
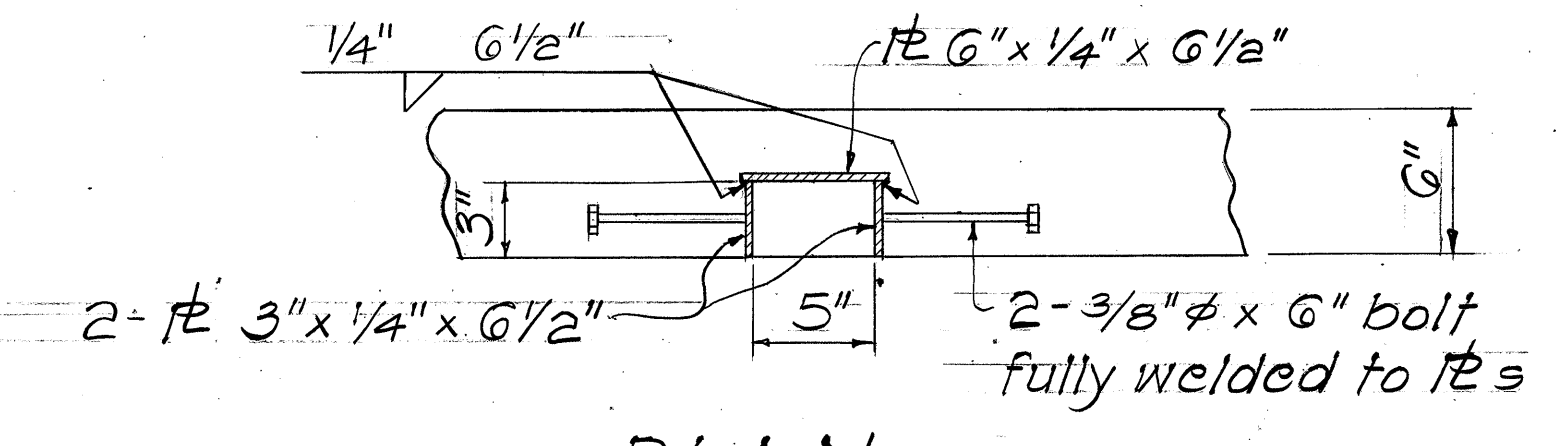
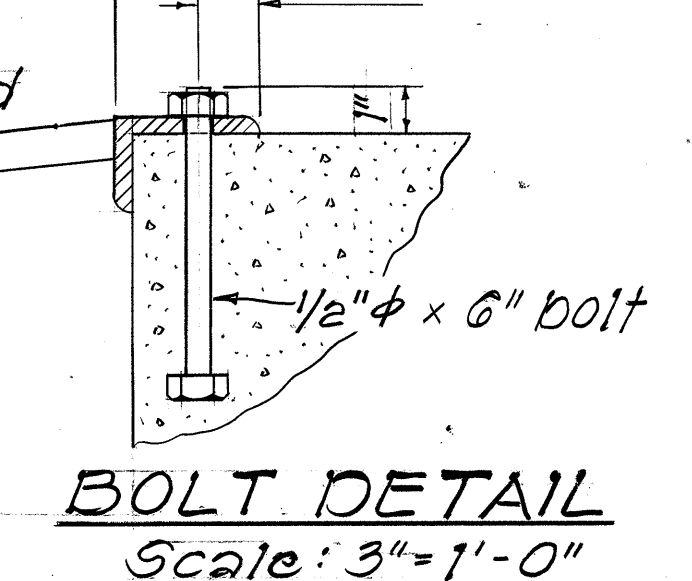
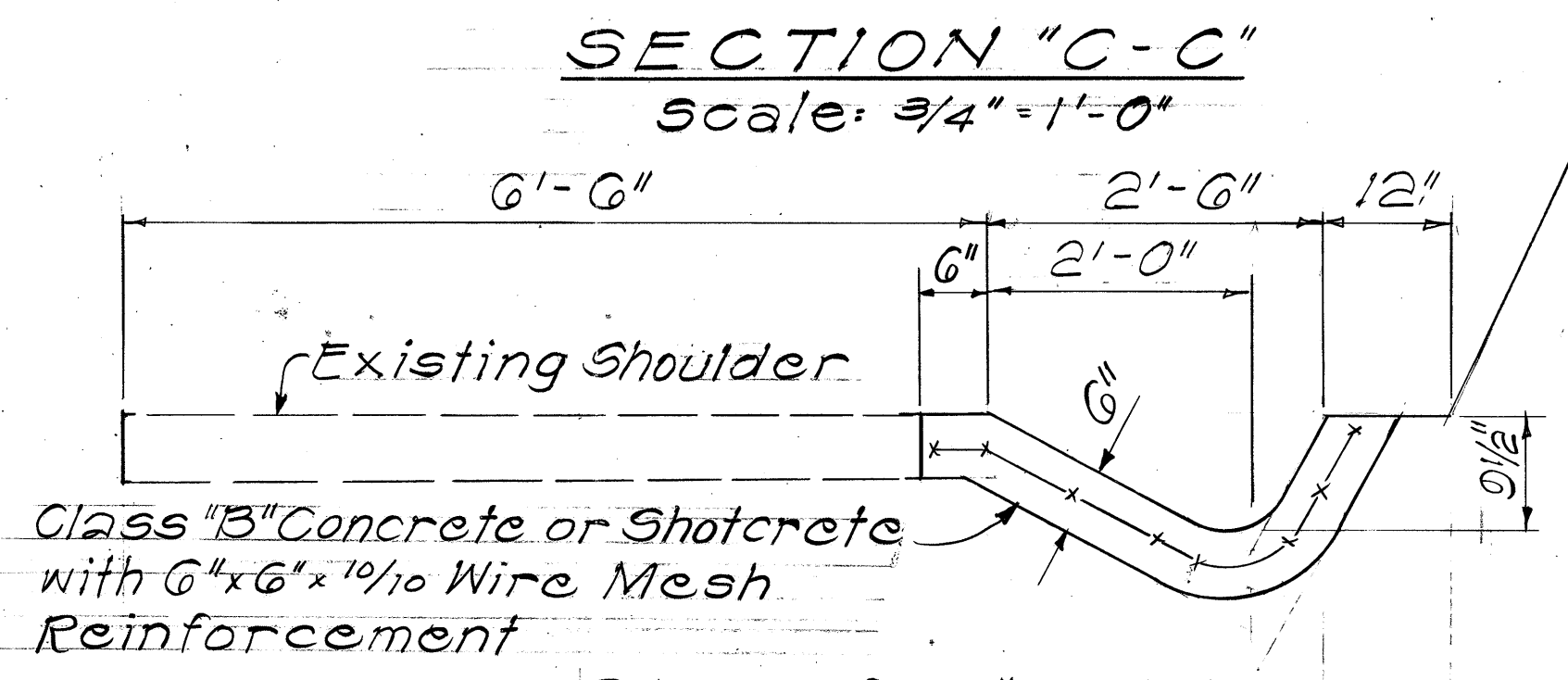
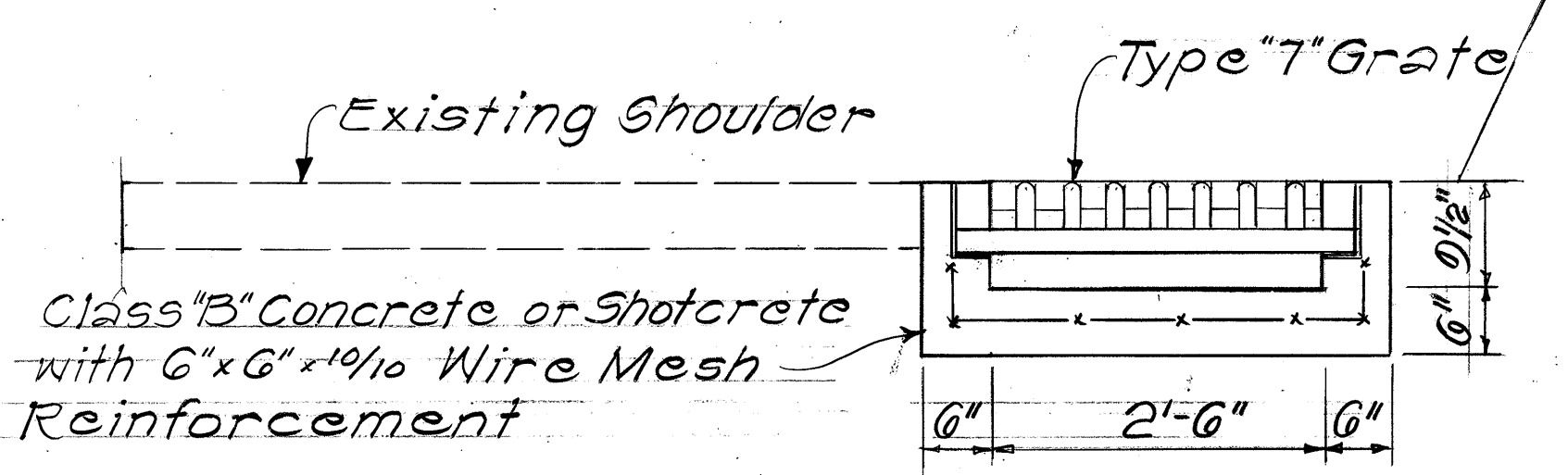
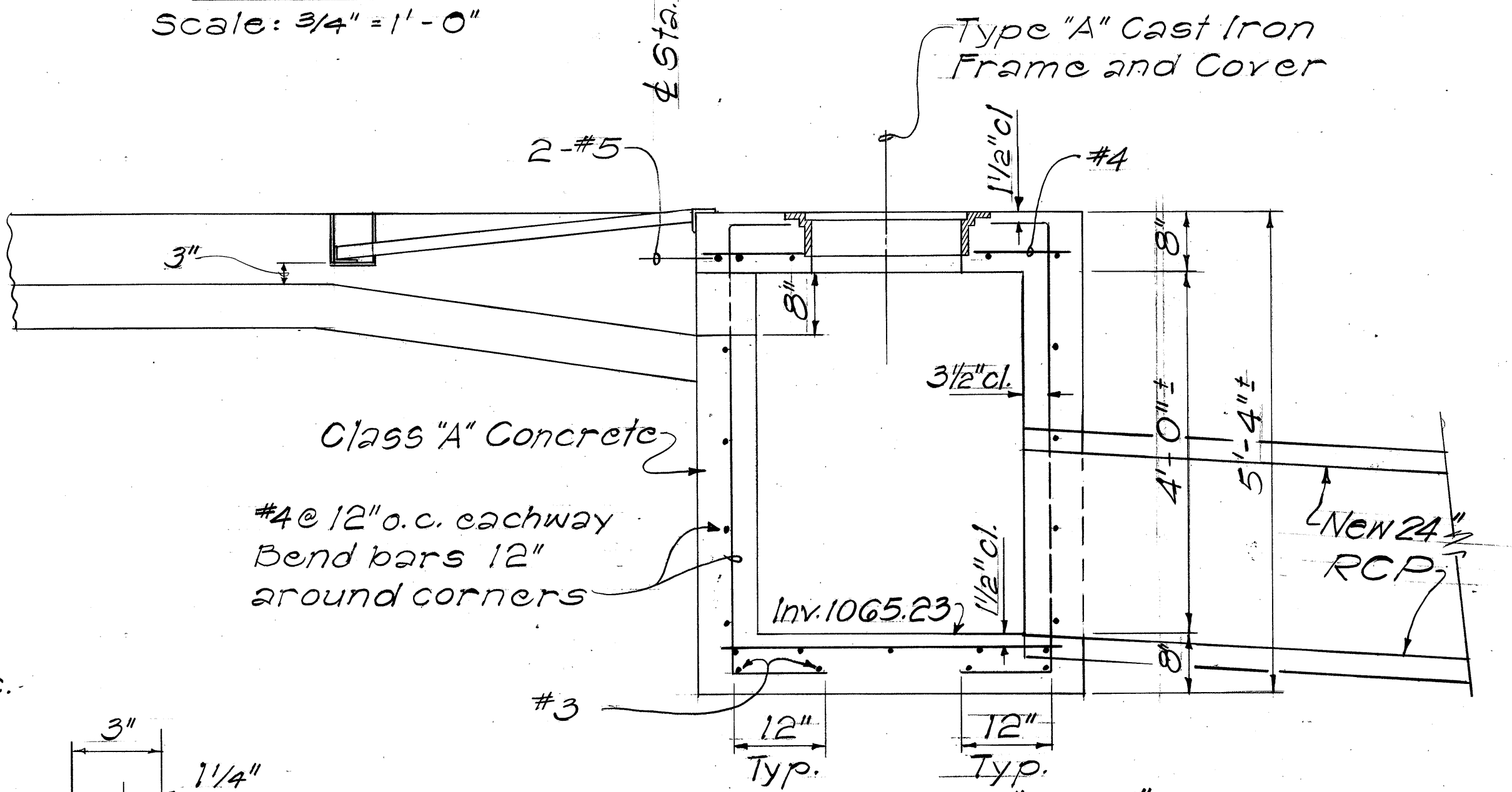
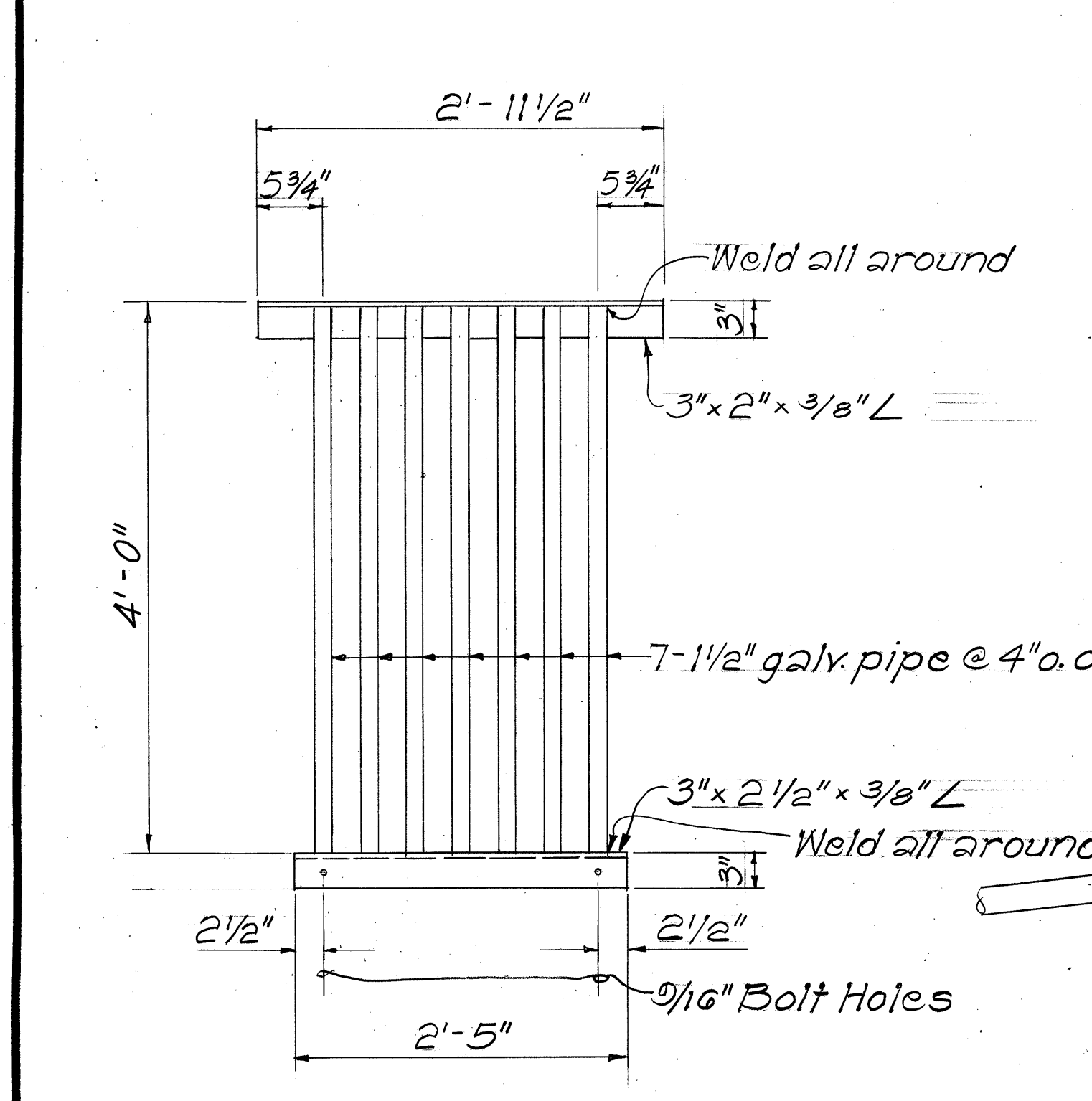
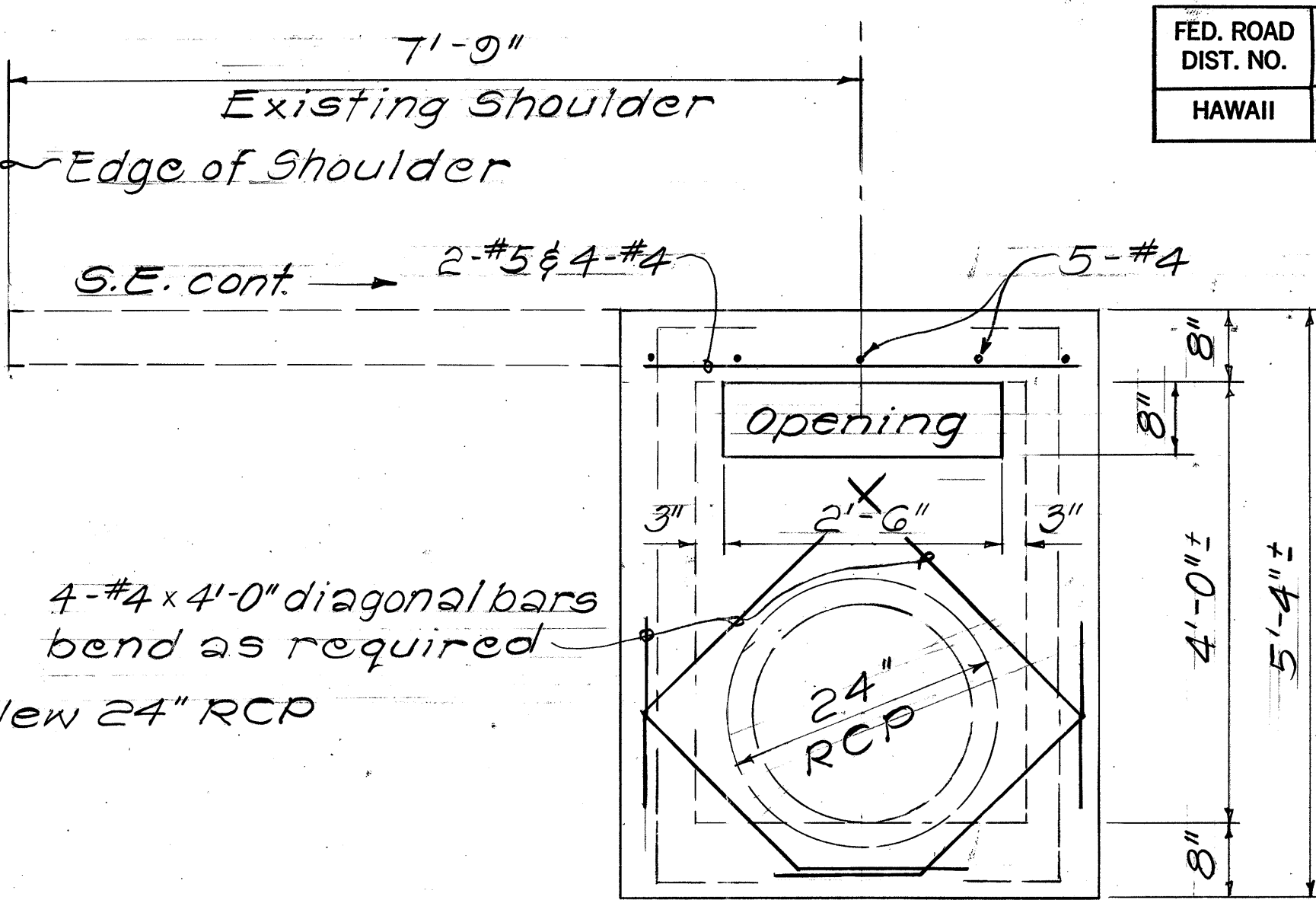
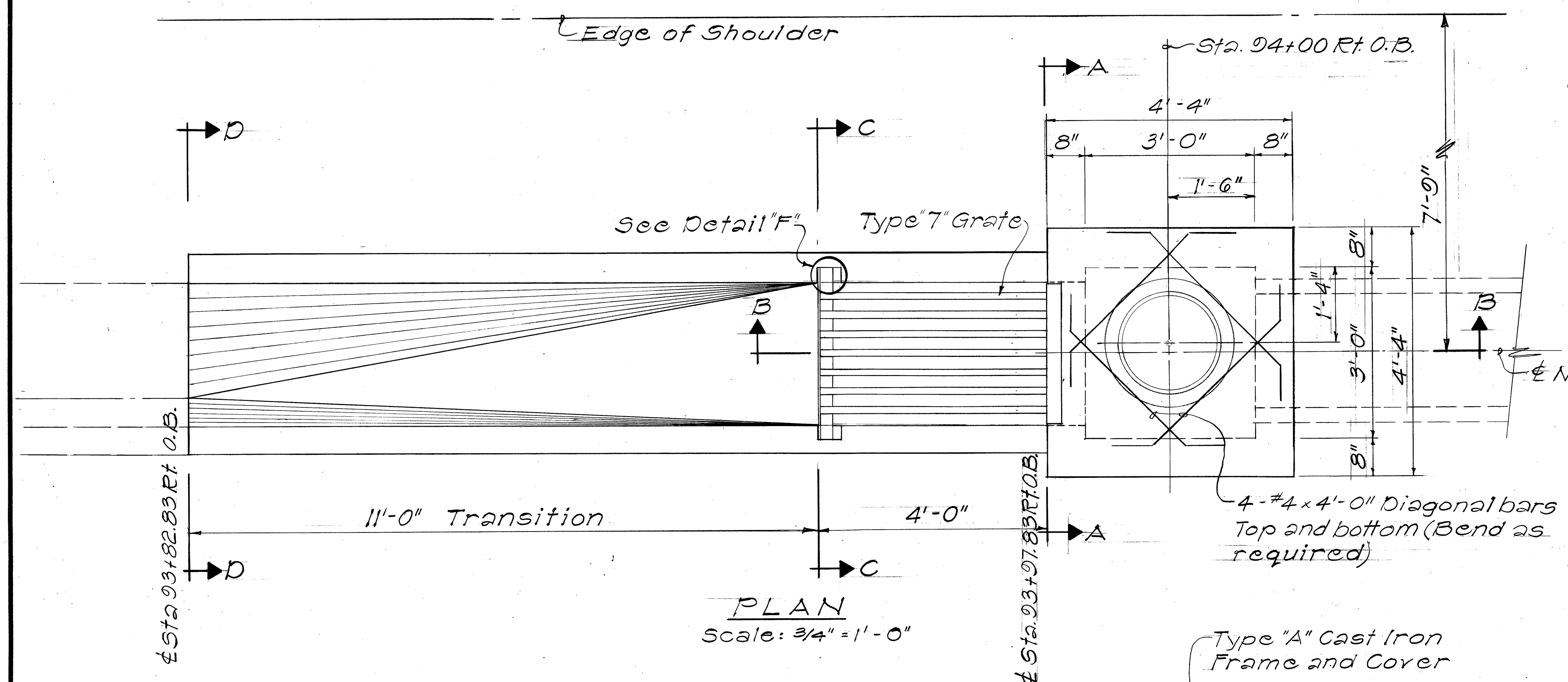
GENERAL NOTES

1. Demolishing and removing a portion of the existing structure shall not be paid for separately, but shall be considered incidental to the various contract items.
2. Culverts within the catch basins, grated drop intakes and storm drain manholes shall be cut flush with the inside face of the wall. Above work shall be considered incidental to the various contract items.
3. Manhole Rungs (12" o.c.) are required when "H" is greater than 4 feet 6 inches. Only one rung (16 inches from the bottom) is required if "H" is 4 feet 6 inches or less. For details of Manhole Rung, see sheet no. 59. Manhole Rungs may be placed at any location as ordered by the Engineer. Manhole Rungs shall be considered incidental to Class "A" Concrete.
4. Location of C.I. Frame and Cover for drain manholes or catch basins shall be determined by the Engineer in the field.
5. Contractor shall verify the locations of all culverts in the field. Any culvert damaged during construction shall be repaired or replaced by the Contractor at his expense.
6. Only non-pneumatic type of drill as approved by the Engineer will be permitted for drilling holes in concrete. Where indicated on plans, the approximate diameter of drilled holes for installation of dowels shall be 1 1/2 inches, after installing dowels, the voids shall be filled with epoxy grout as directed by the Engineer. Above work shall be considered incidental to the various contract items.
7. Concrete for grated drop intakes, drain manholes and catch basins shall be Class "A".
8. Premolded joint filler shall be considered incidental to Class "A" Concrete.
9. Quantities for concrete gutter aprons shall be considered as part of structure.
10. Expansion bolts shall be considered incidental to reinforcing steel.
11. Existing cast iron frame and covers shall be cleaned and painted before installation. Above work shall be considered incidental to the various contract items.

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
LAND TRANSPORTATION FACILITIES DIVISION  
**DRAINAGE DETAIL**  
Lined Drainage Ditch

PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kamehameha Hwy.  
F.A. Project No. ROS-061-1(21)  
Scale: 3/4"=1'-0" Date: Sept, 1977  
SHEET No. 9 OF 25 SHEETS

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-161-1(21)      | 1978        | 45        | 94           |



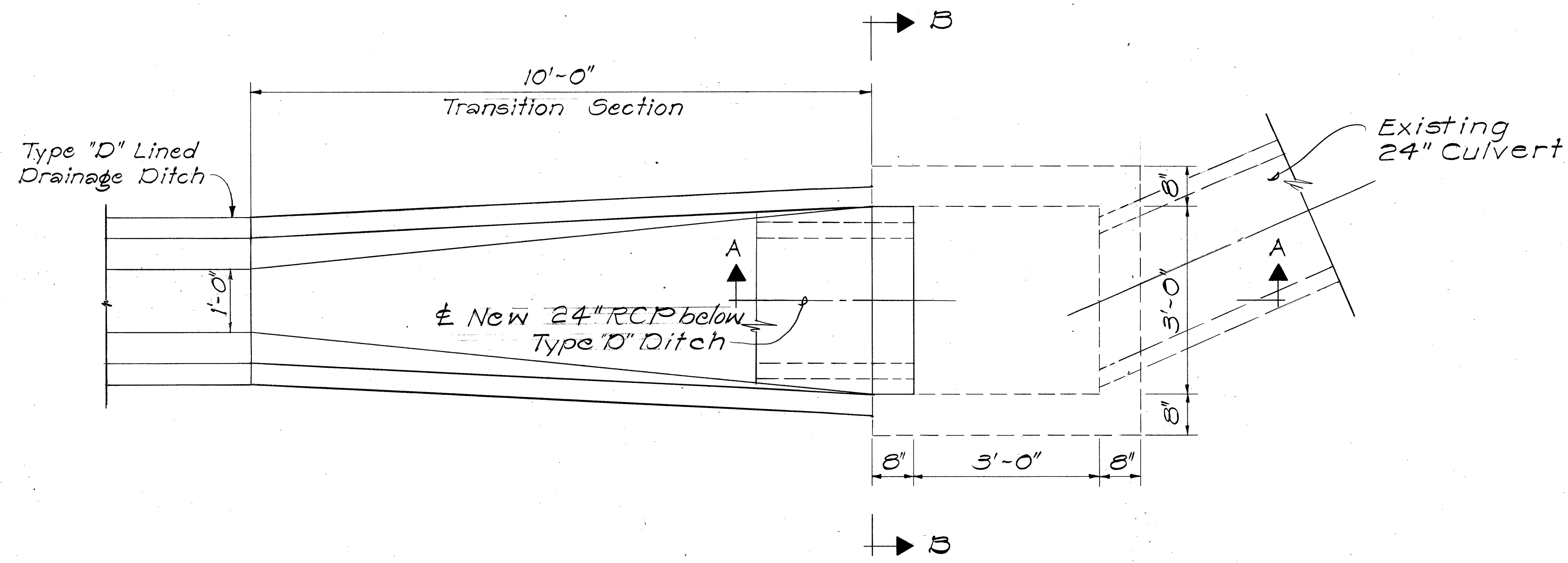
- GENERAL NOTES:**
- The grate shall be installed in a manner in which it is removable.
  - Grate shall be hot dip galvanized after fabrication, see specifications.
  - Grate materials shall conform to the specifications of ASTM Designation Structural Steel A283, Grade D and Standard Specifications.
  - Transition Section from Sta. 93+82.83 Rt. O.B. to Sta. 93+97.83 Rt. O.B. shall be paid as 1 1/2" x 1 1/2" (S/S: 1/1) Lined Drainage Ditch.

TYPE "Z" CONCRETE DROP INTAKE AT STA 94+00 RT. O.B.

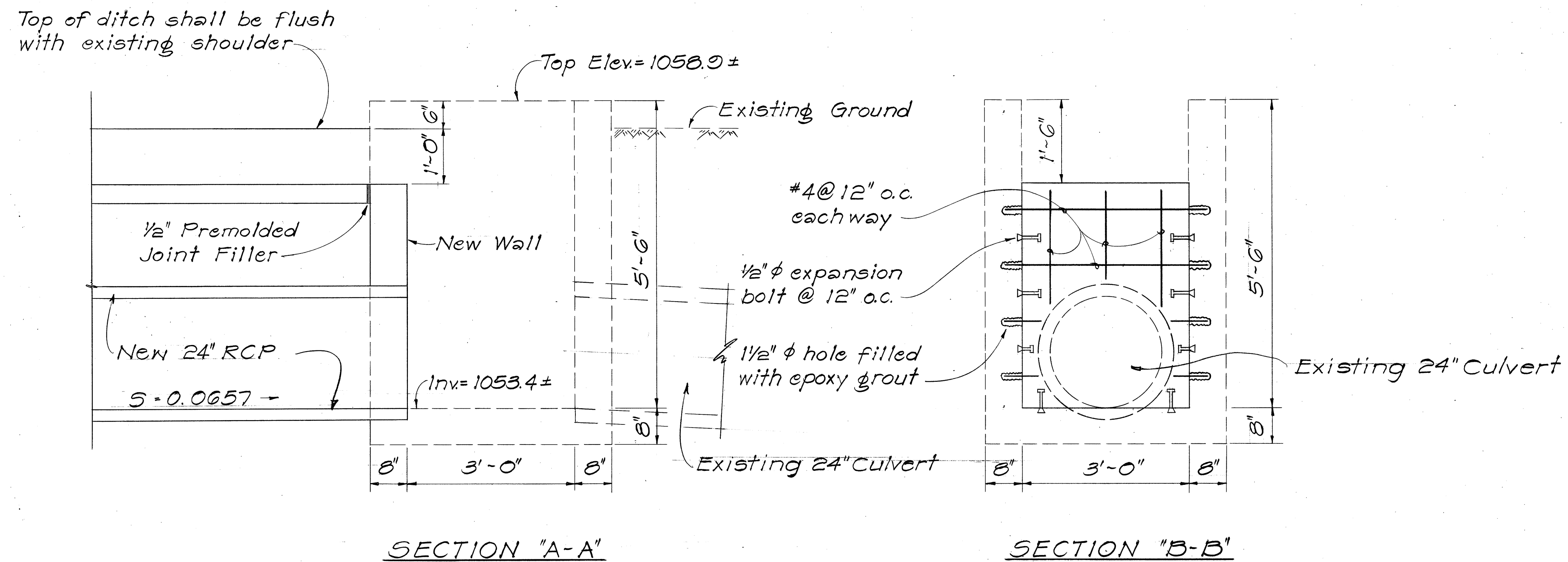
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
LAND TRANSPORTATION FACILITIES DIVISION  
**DRAINAGE DETAIL**  
Type "Z" Concrete Drop Intake at  
Sta. 94+00 Rt. O.B.  
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kamehameha Hwy.  
F.A. Project No. ROS-061-1(21)  
Scale: As Shown Date: Sept. 1977  
SHEET NO. 10 OF 25 SHEETS

ORIGINAL  
PLAN  
DATE  
SURVEY PLOTTED BY  
DRAWN BY  
DESIGNED BY  
NOTE BOOK  
QUANTITIES BY  
CHECKED BY

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061-1(21)      | 1978        | 46        | 94           |



PLAN

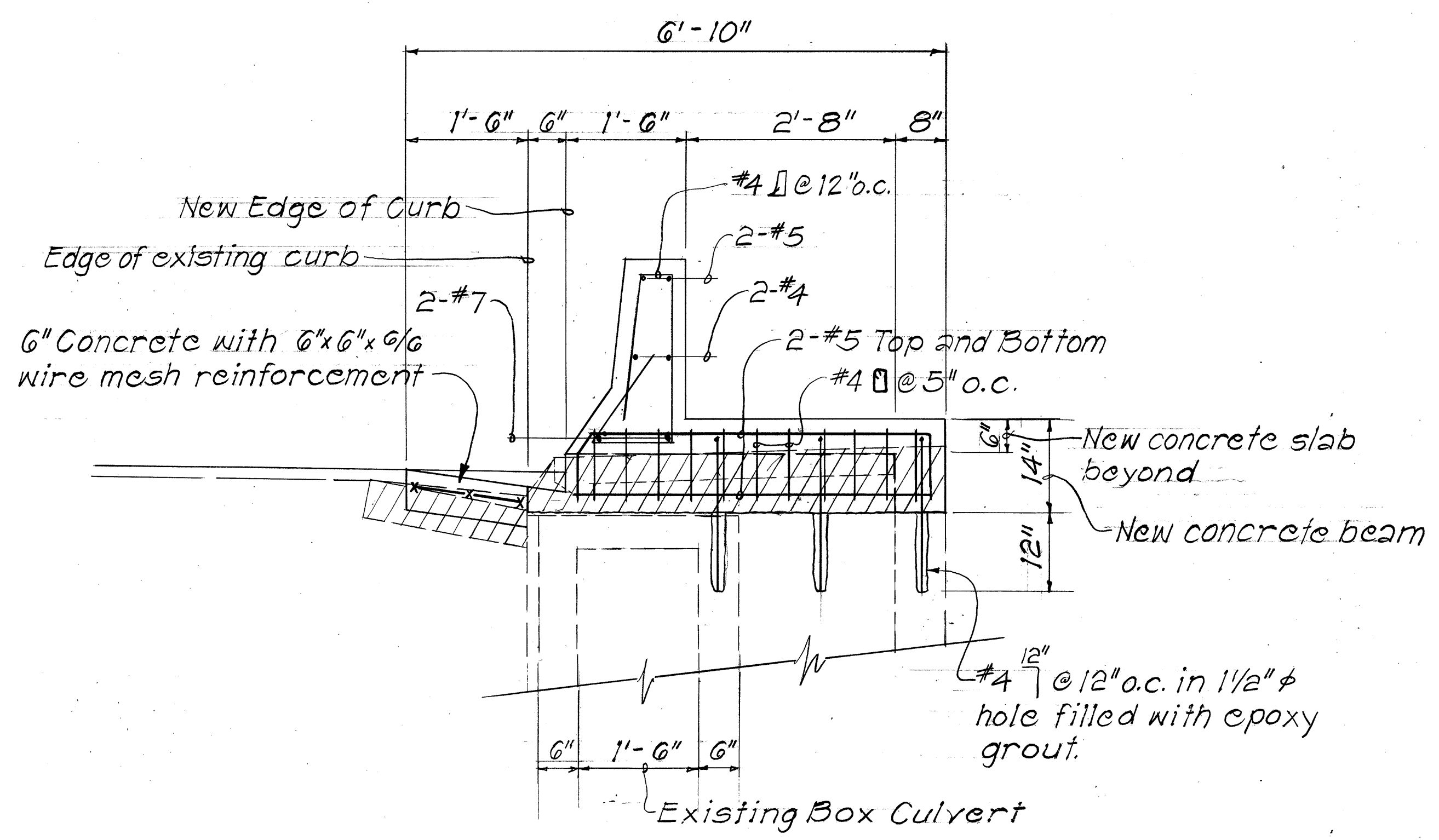


CONCRETE DROP INTAKE AT ± STA. 95+82 RT. O.B.

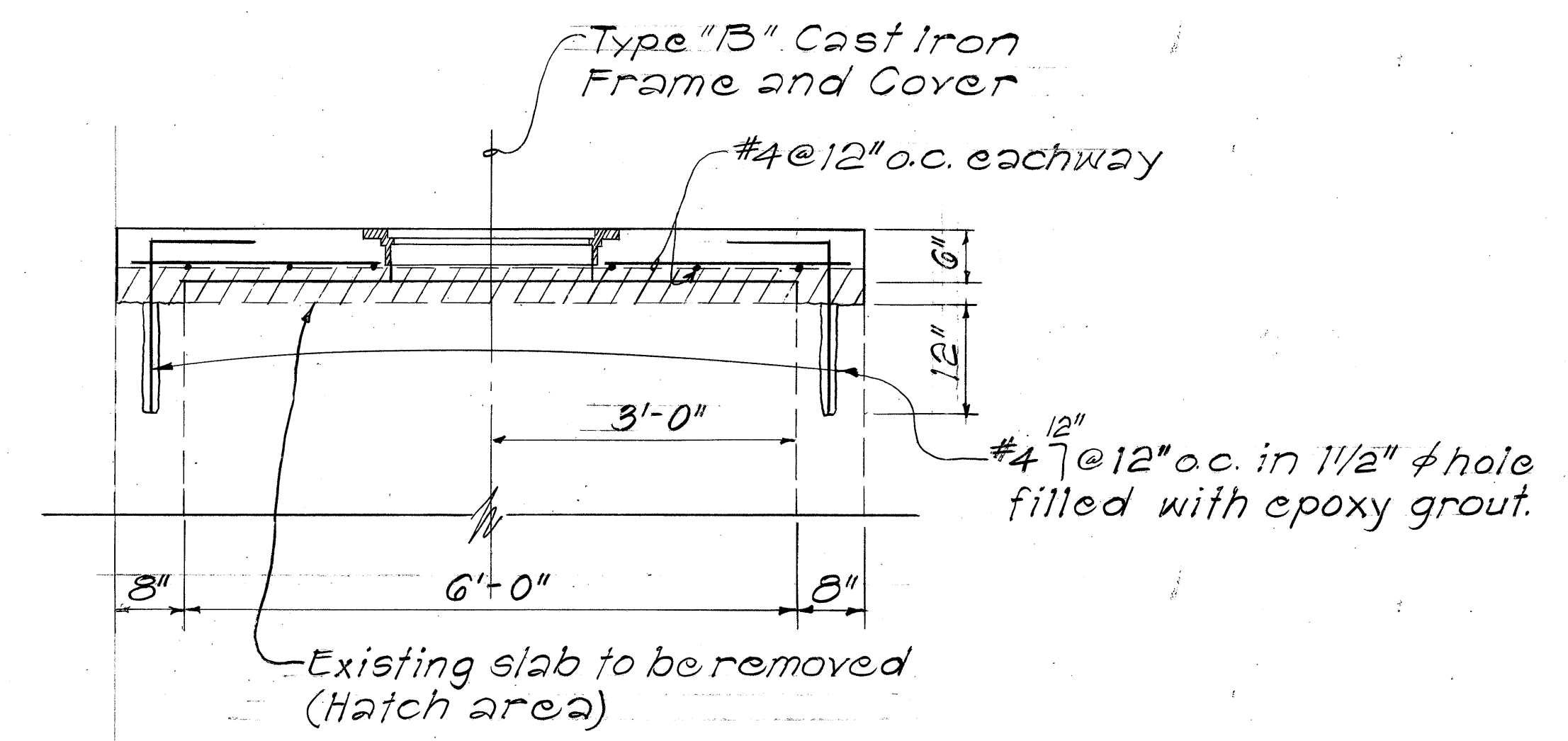
|                                         |                  |
|-----------------------------------------|------------------|
| STATE OF HAWAII                         |                  |
| DEPARTMENT OF TRANSPORTATION            |                  |
| LAND TRANSPORTATION FACILITIES DIVISION |                  |
| DRAINAGE DETAIL                         |                  |
| Concrete Drop Intake at                 |                  |
| ± Sta 95+82 Rt. O.B.                    |                  |
| PALI HIGHWAY SAFETY IMPROVEMENTS        |                  |
| West of Tunnels to Kamehameha Hwy.      |                  |
| F.A. Project No. ROS-061-1(21)          |                  |
| Scale: 3/4" = 1'-0"                     | Date: Sept. 1977 |
| SHEET NO. 11 OF 25 SHEETS               |                  |



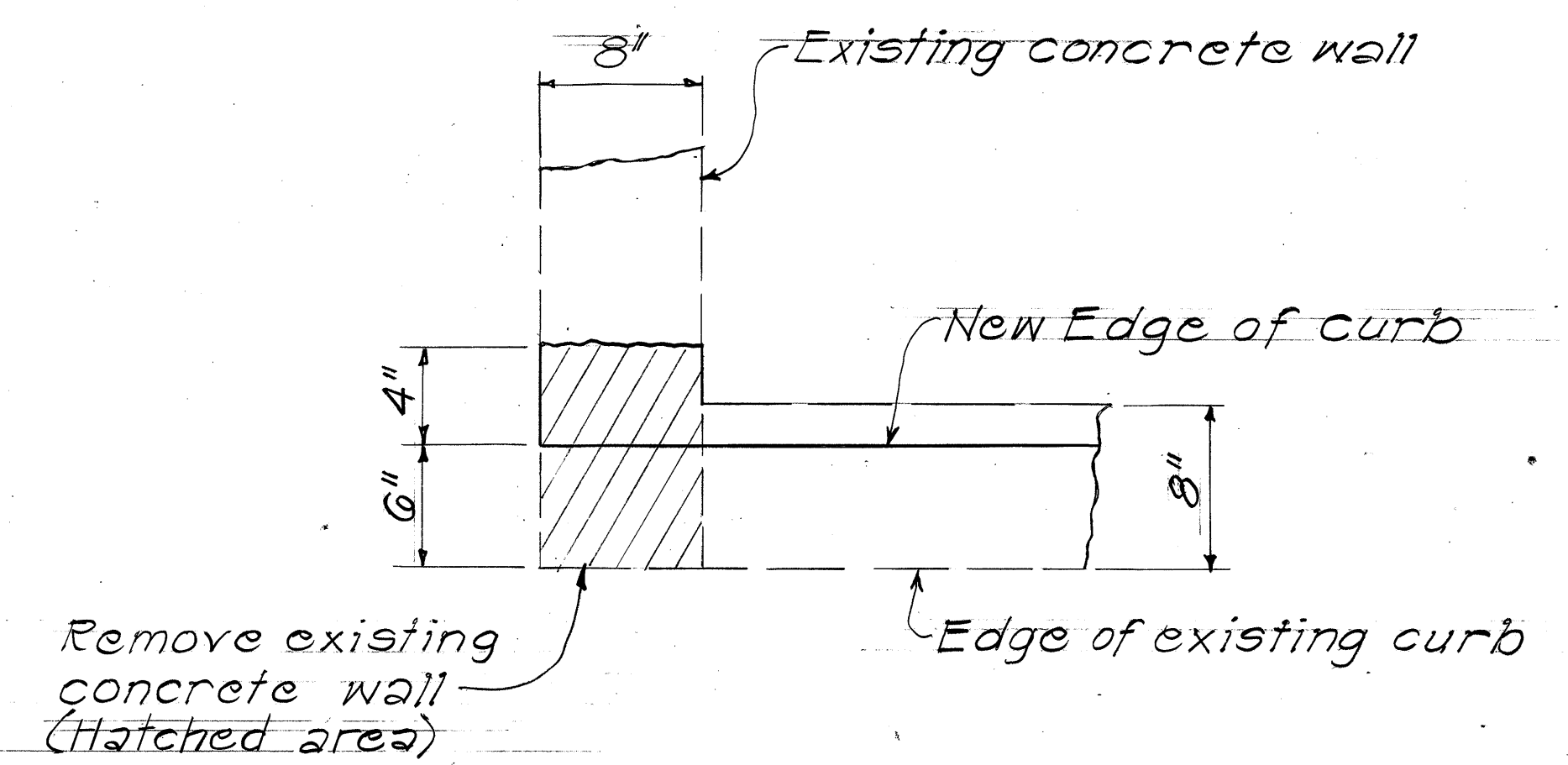
| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061-1(21)      | 1978        | 48        | 94           |



**SECTION "D-D"**  
Scale: 3/4" = 1'-0"



**SECTION "E-E"**  
Scale: 3/4" = 1'-0"



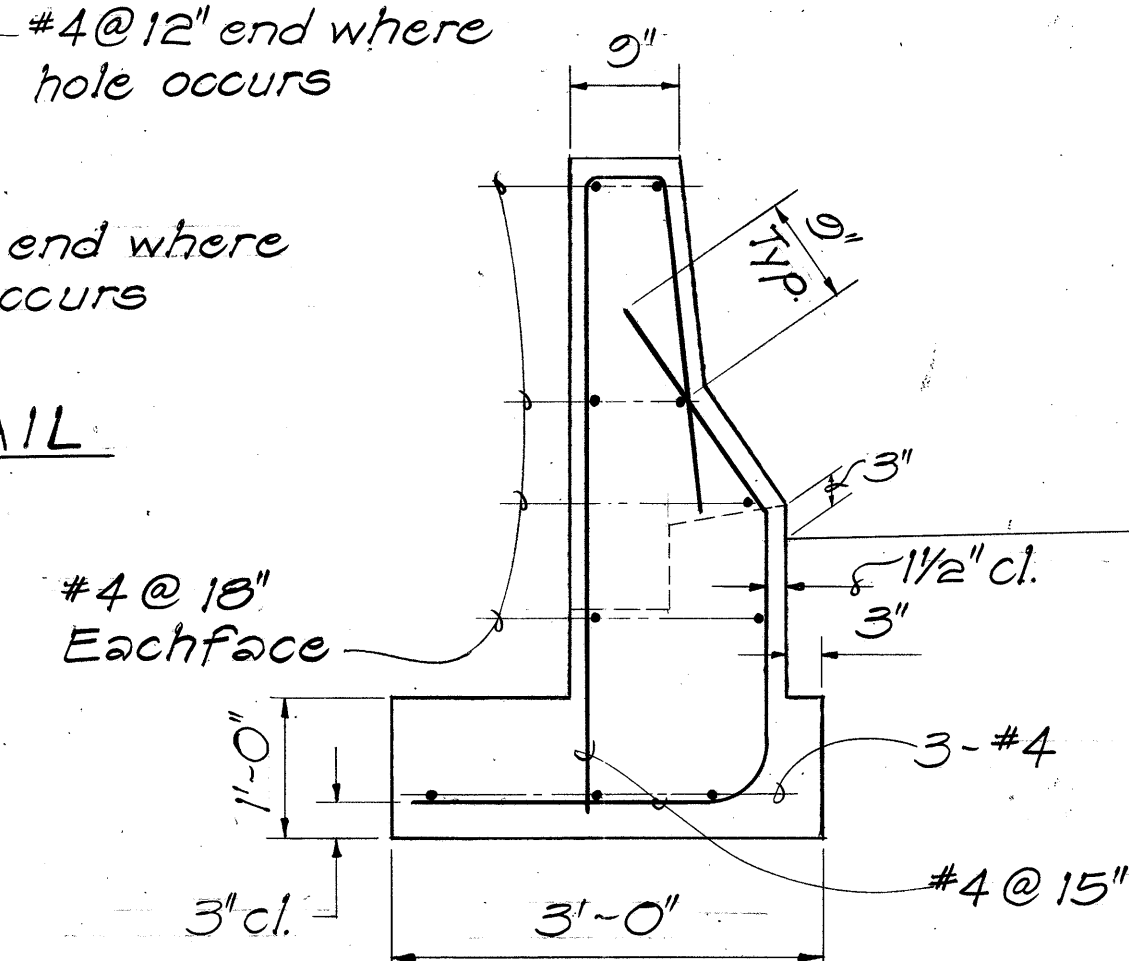
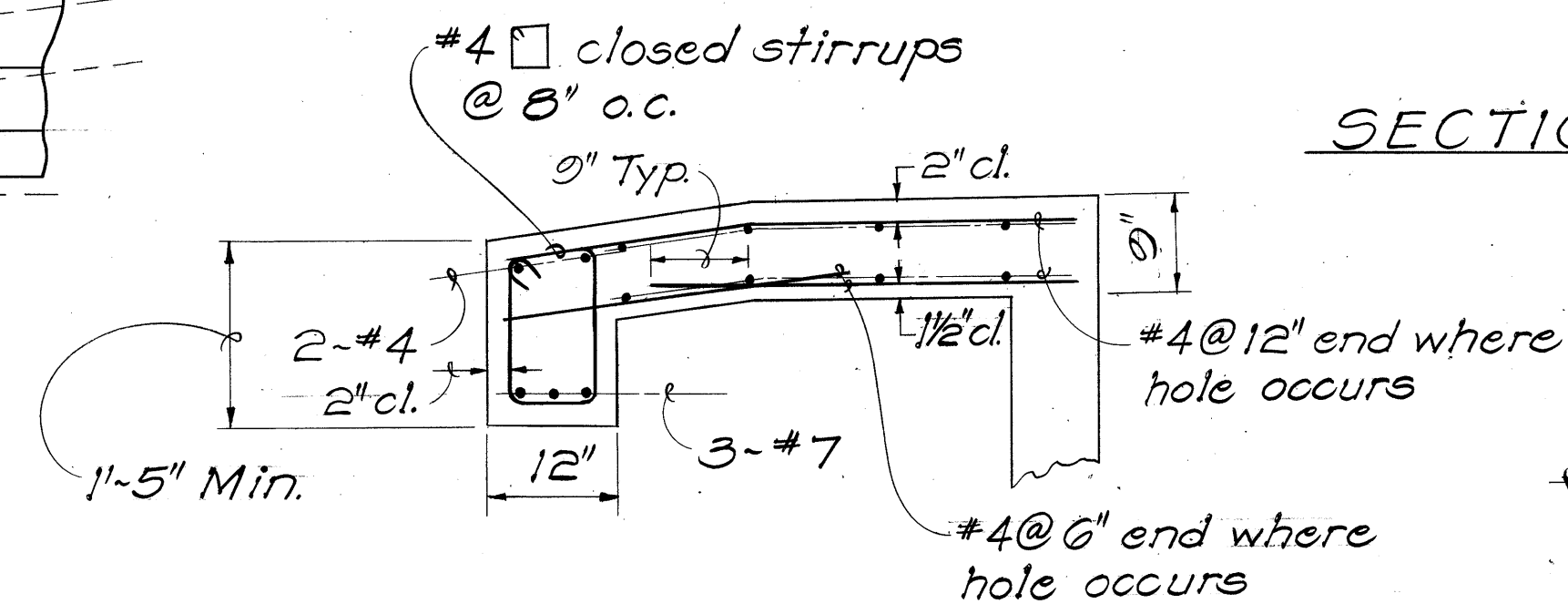
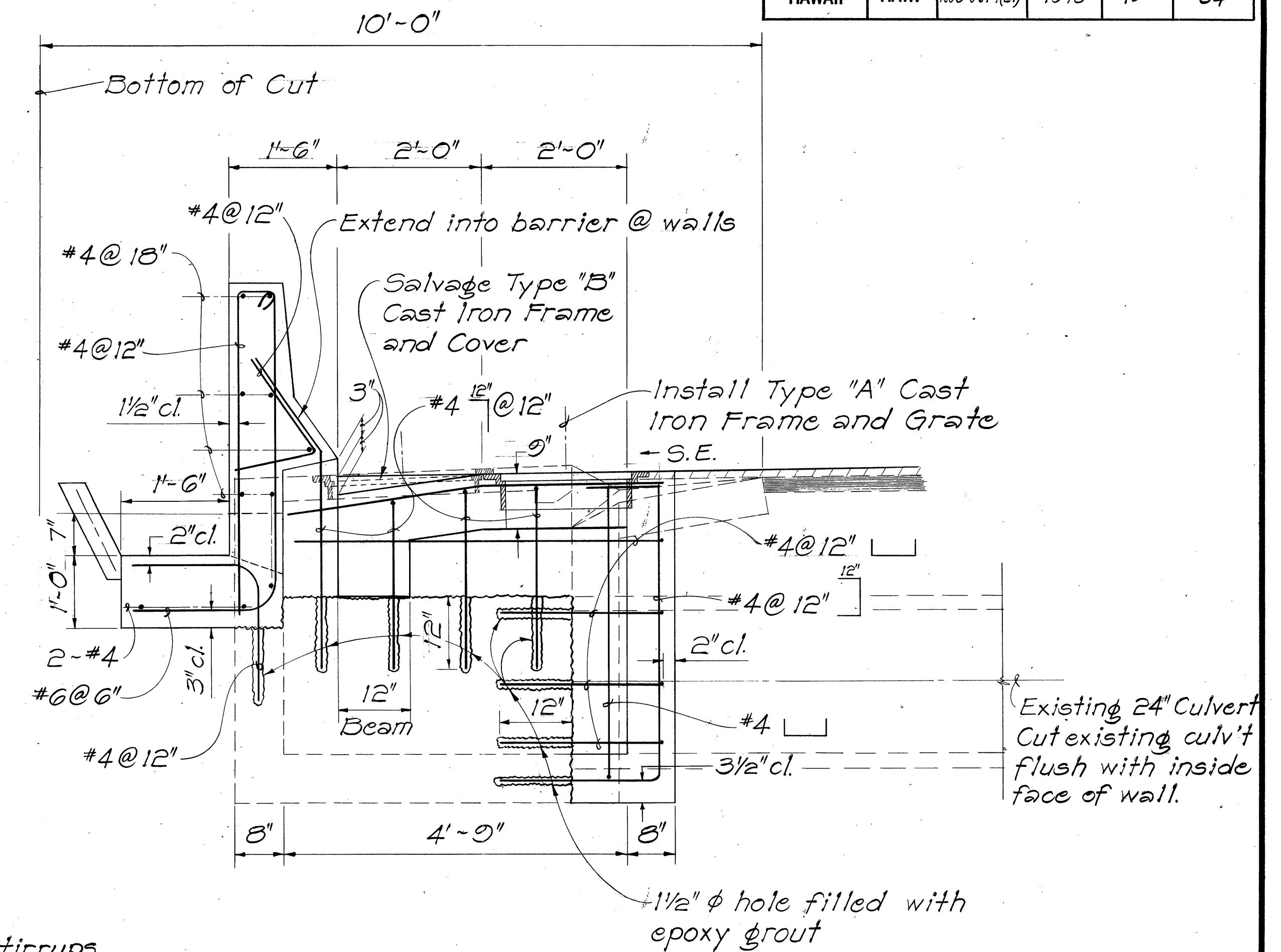
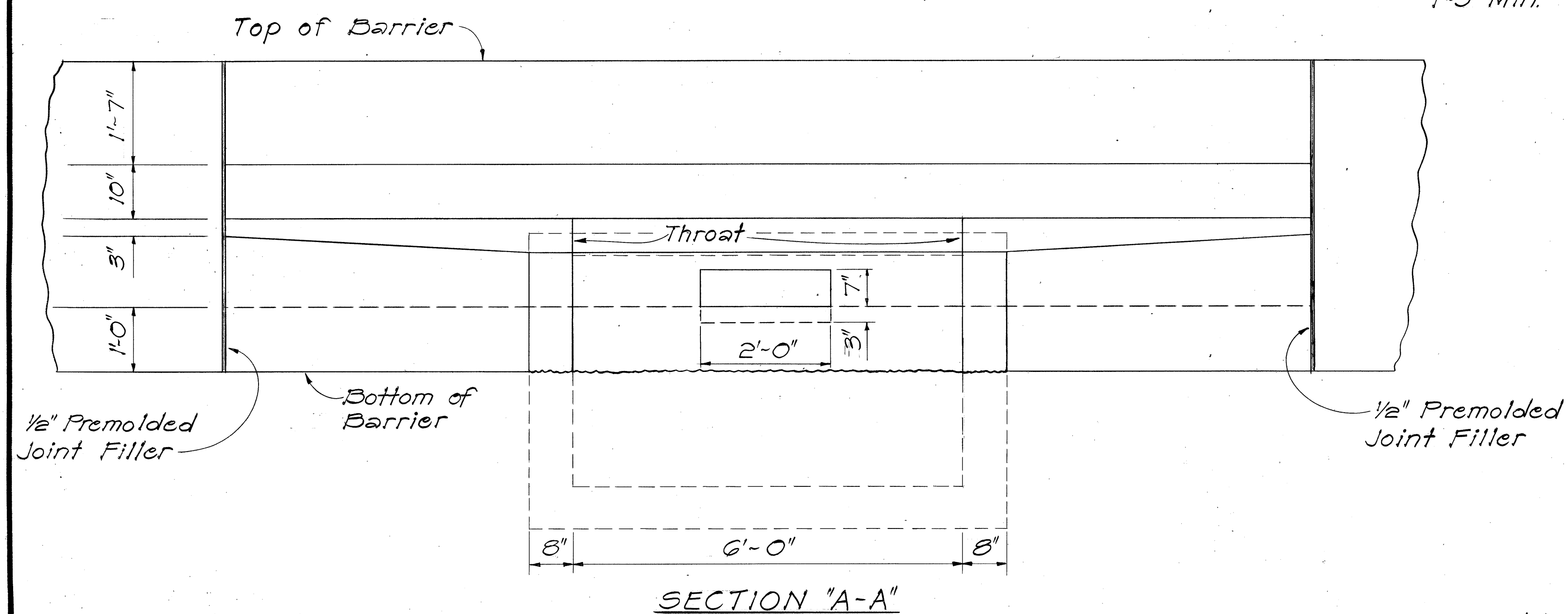
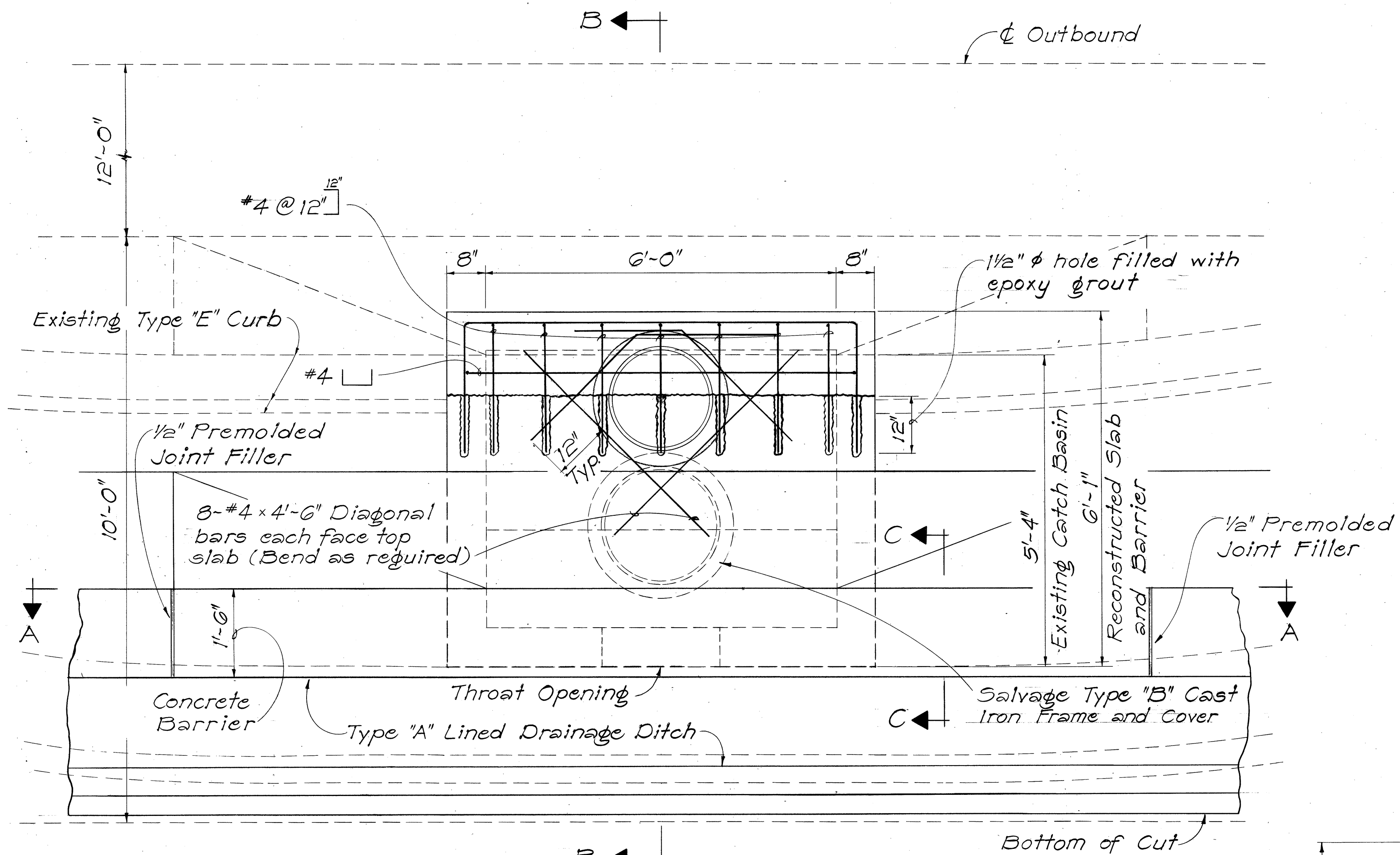
**PLAN DETAIL 1**  
Scale: 1/2" = 1'-0"

**TYPE "B" CATCH BASIN AT & STA. 96+00 LT. O.B.**

|               |                   |      |
|---------------|-------------------|------|
| ORIGINAL PLAN | SURVEY PLOTTED BY | DATE |
| DRAWN BY      |                   |      |
| TRACED BY     |                   |      |
| DESIGNED BY   |                   |      |
| QUANTITIES BY |                   |      |
| CHECKED BY    |                   |      |

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
LAND TRANSPORTATION FACILITIES DIVISION  
**DRAINAGE DETAIL**  
Type "B" Catch Basin at  
& Sta. 96+00 Lt. O.B.  
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kamehameha Hwy.  
F.A. Project No. ROS-061-1(21)  
Scale: As Shown Date: Sept. 1977  
SHEET NO. 13 OF 25 SHEETS

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | R05-061-1(2)       | 1978        | 49        | 94           |

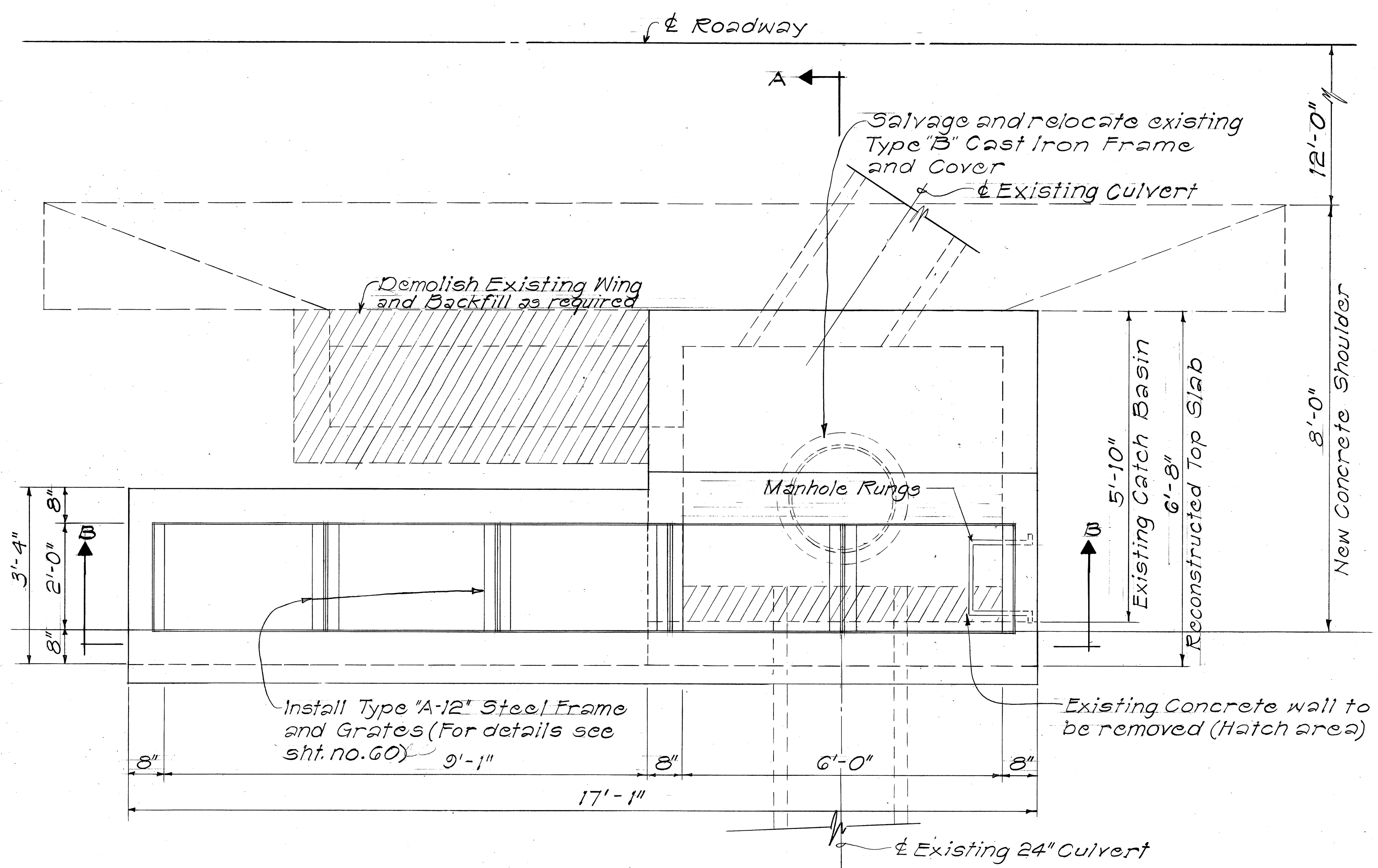


NOTE:  
Construct Concrete  
Gutter Apron as shown  
on DH-1 for Type "C" C.B.

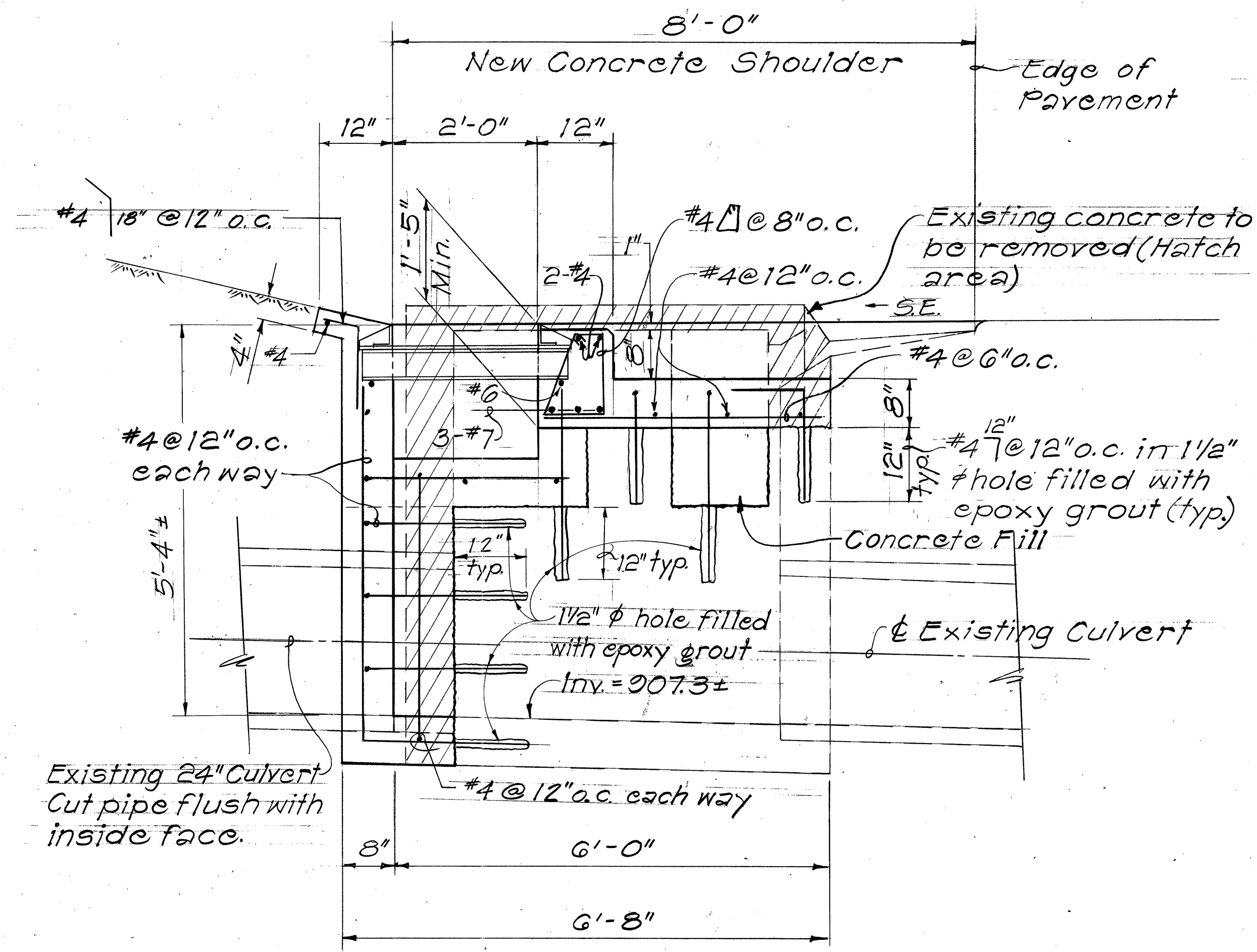
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
LAND TRANSPORTATION FACILITIES DIVISION  
DRAINAGE DETAIL  
Type "D" Catch Basin at  
Sta. 117+70 Rt. O.B.  
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kamehameha Hwy.  
F.A. Project No. ROS-061-1(21)  
Scale: 3/4" = 1'-0" Date: Sept. 1977  
SHEET NO. 14 OF 25 SHEETS

|                  |                         |            |
|------------------|-------------------------|------------|
| ORIGINAL<br>PLAN | SURVEY PLOTTED BY _____ | DATE _____ |
|                  | DRAWN BY _____          | " _____    |
|                  | TRACED BY _____         | " _____    |
| NOTE BOOK        | DESIGNED BY _____       | " _____    |
|                  | QUANTITIES BY _____     | " _____    |
| No. _____        | CHECKED BY _____        | " _____    |

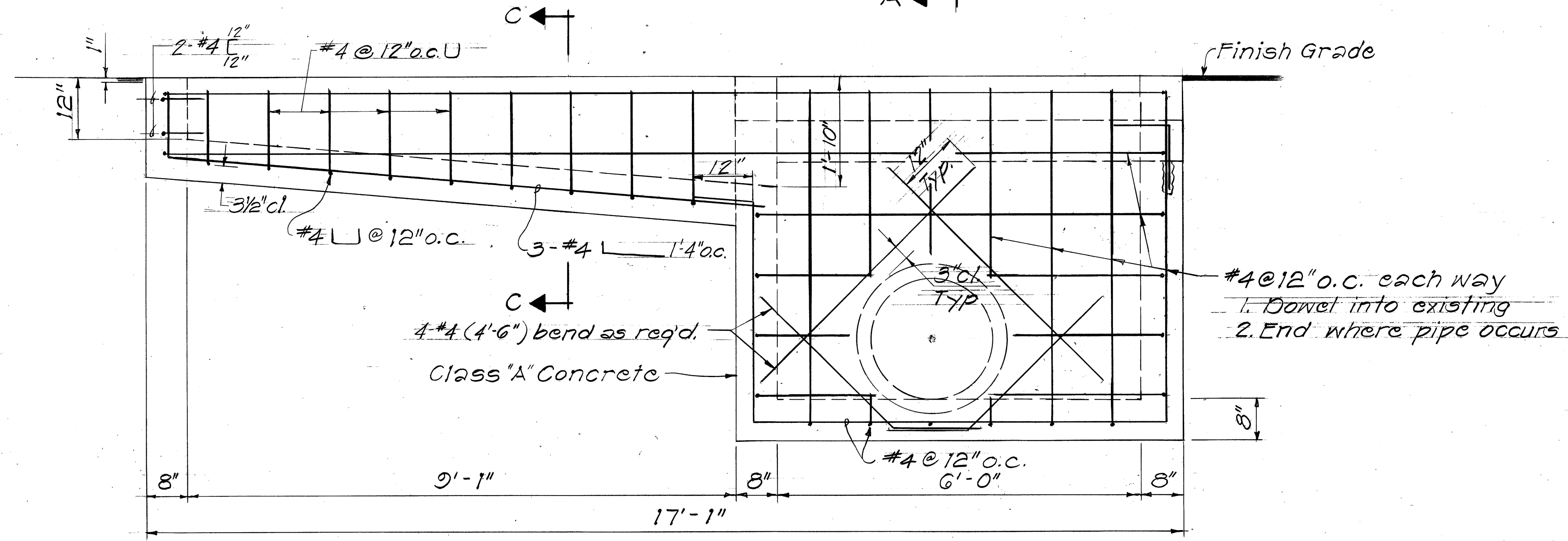
| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061-1(21)      | 1978        | 50        | 94           |



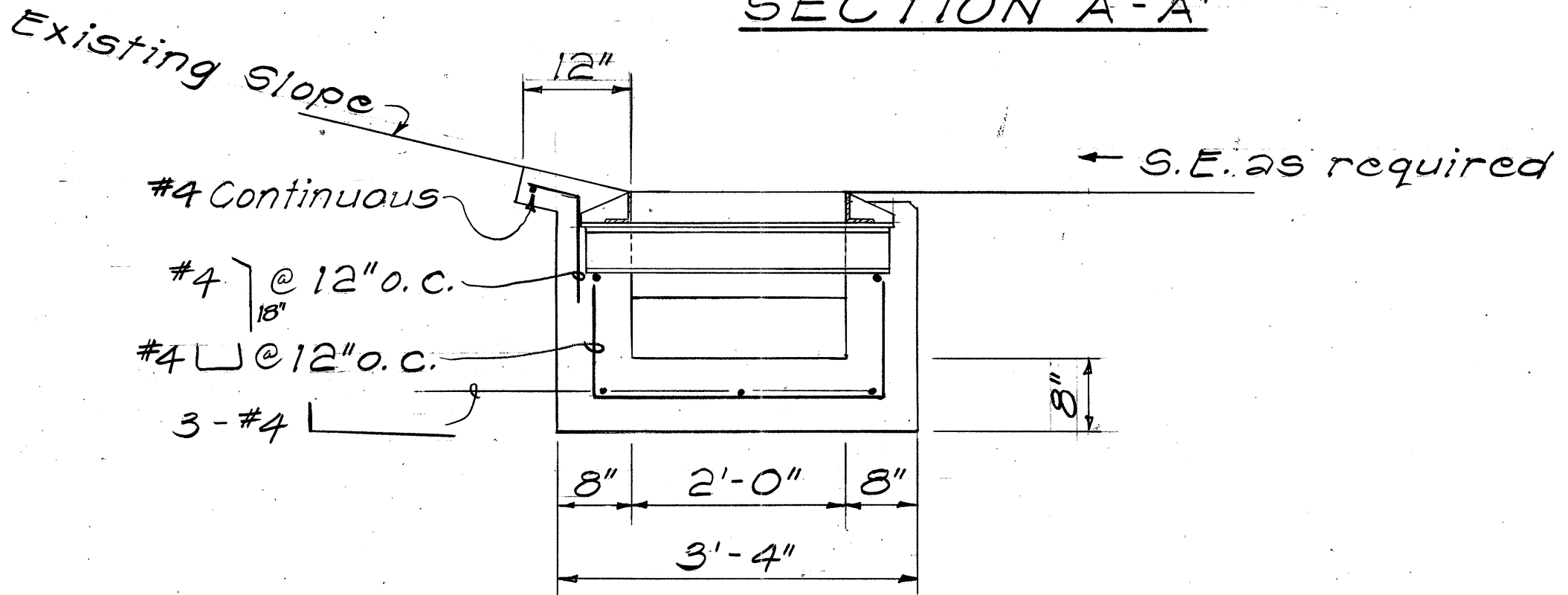
PLAN



SECTION "A-A"



SECTION "B-B"



SECTION "C-C"

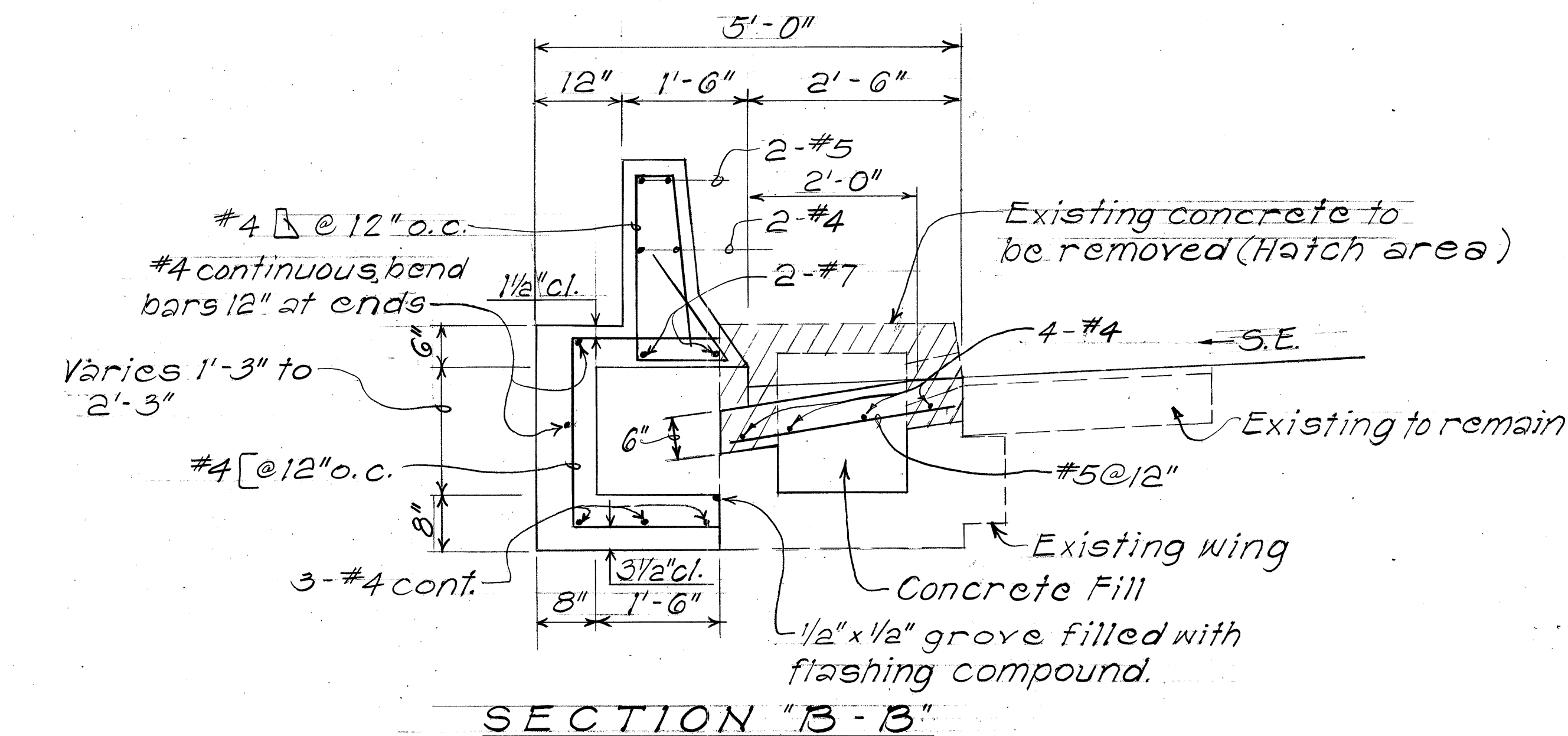
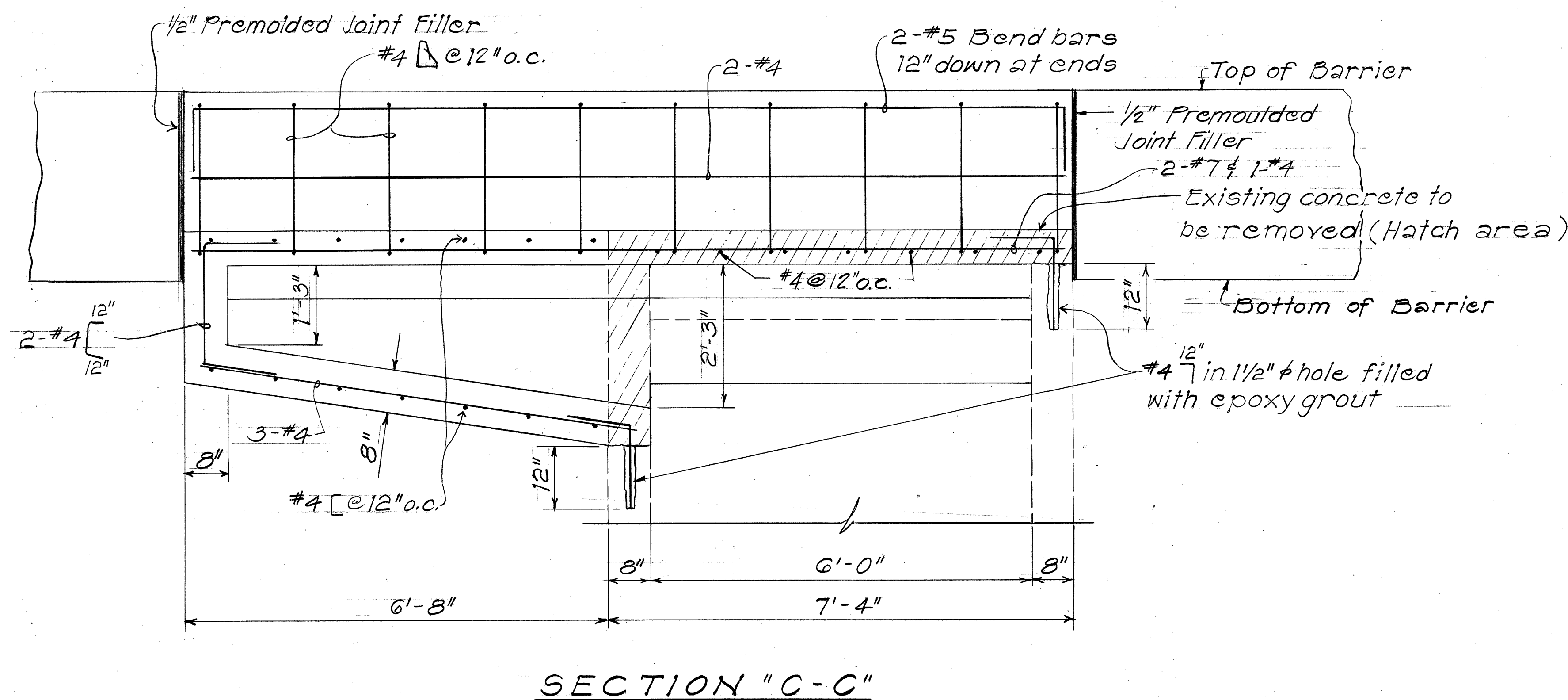
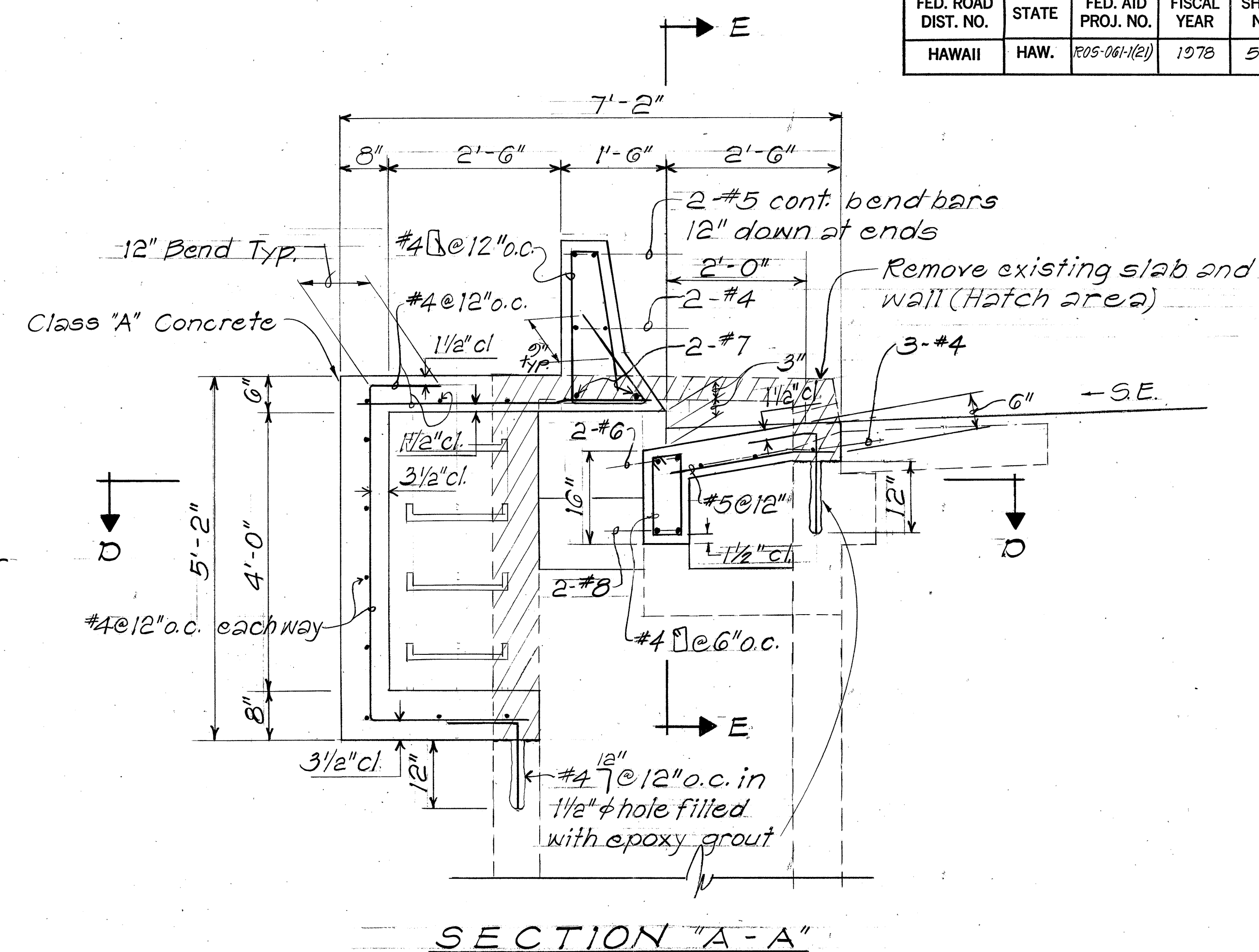
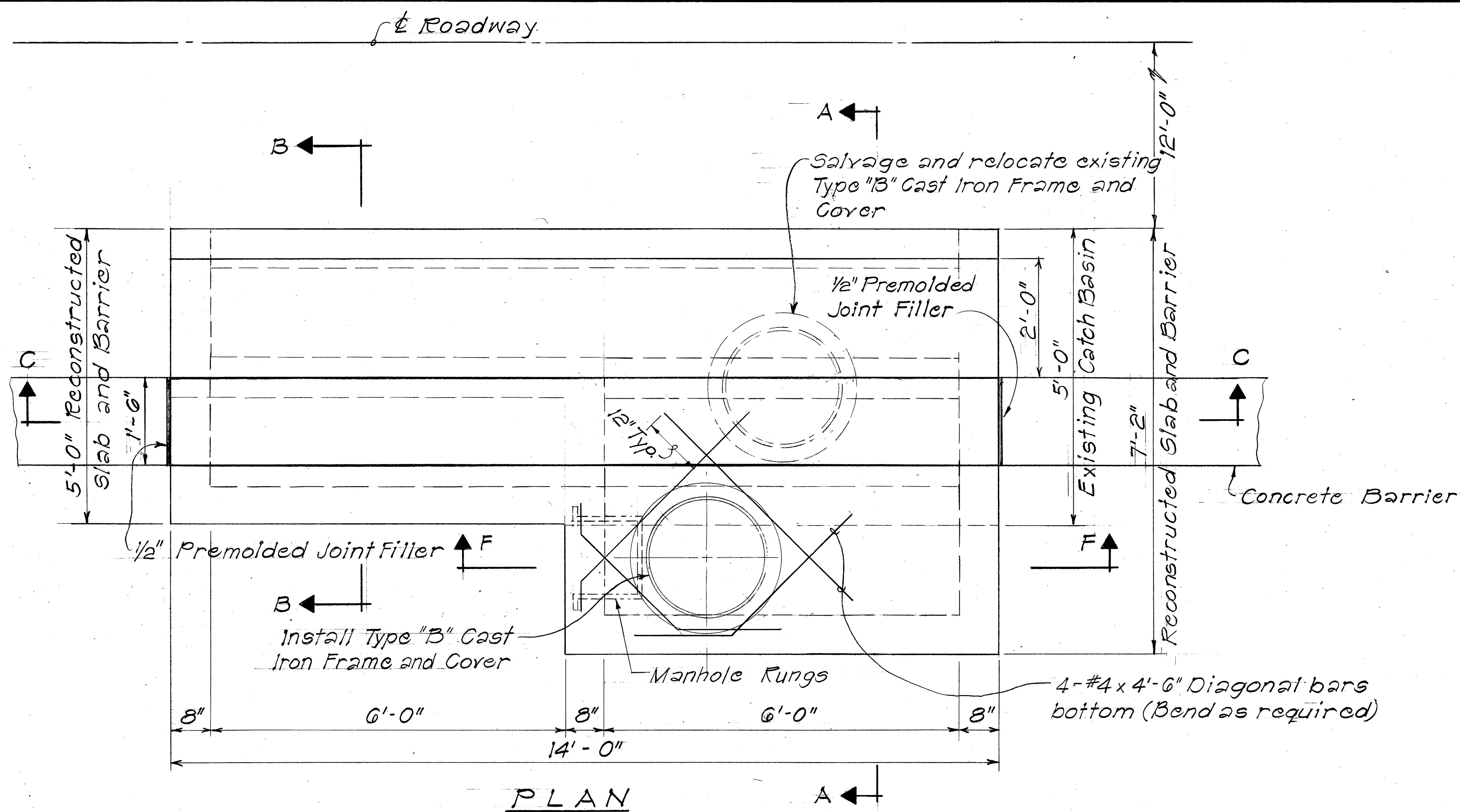
TYPE "C" CATCH BASIN AT STA. 118+15 RT. I.B.

1. Center Support Assembly shall be used and it shall not be paid for separately, but shall be considered incidental to Type 'A-12' Frame & Grates.
2. All grates shall be removable
3. Manhole rungs may be placed at any location as ordered by the Engineer.

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
LAND TRANSPORTATION FACILITIES DIVISION  
**DRAINAGE DETAIL**  
Type "C" Catch Basin at  
Sta. 118+15 Rt. I.B.  
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kamehameha Hwy.  
F.A. Project No. ROS-061-1(21)  
Scale: 3/4" = 1'-0" Date: Sept. 1977  
SHEET No. 15 OF 25 SHEETS

|                   |      |
|-------------------|------|
| ORIGINAL PLAN     | DATE |
| SURVEY PLOTTED BY |      |
| DRAWN BY          |      |
| DESIGNED BY       |      |
| NOTED BY          |      |
| CHECKED BY        |      |
| NO.               |      |

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061-1(2)       | 1978        | 51        | 94           |

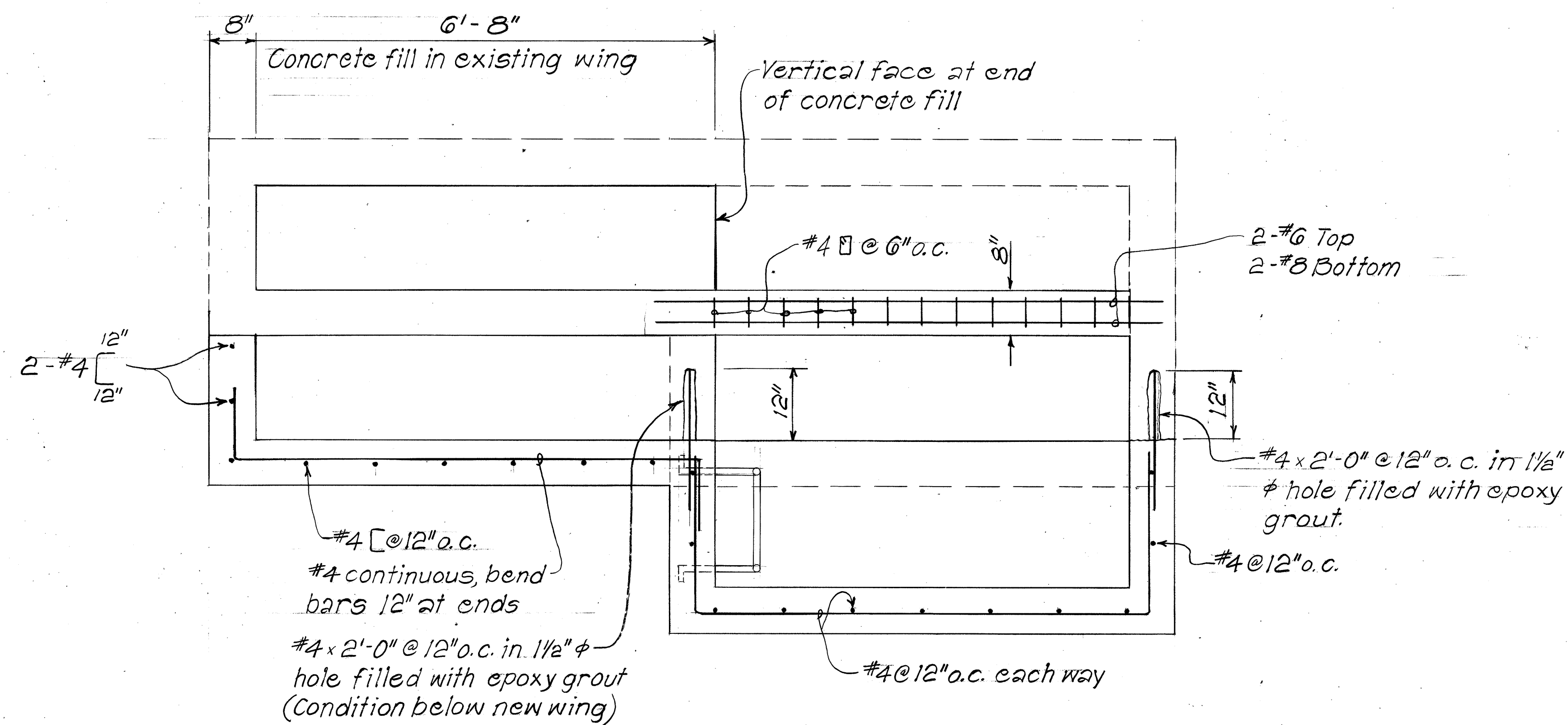


NOTE: Construct Concrete Gutter Apron as shown on DH-1 for Type "C" C.B.

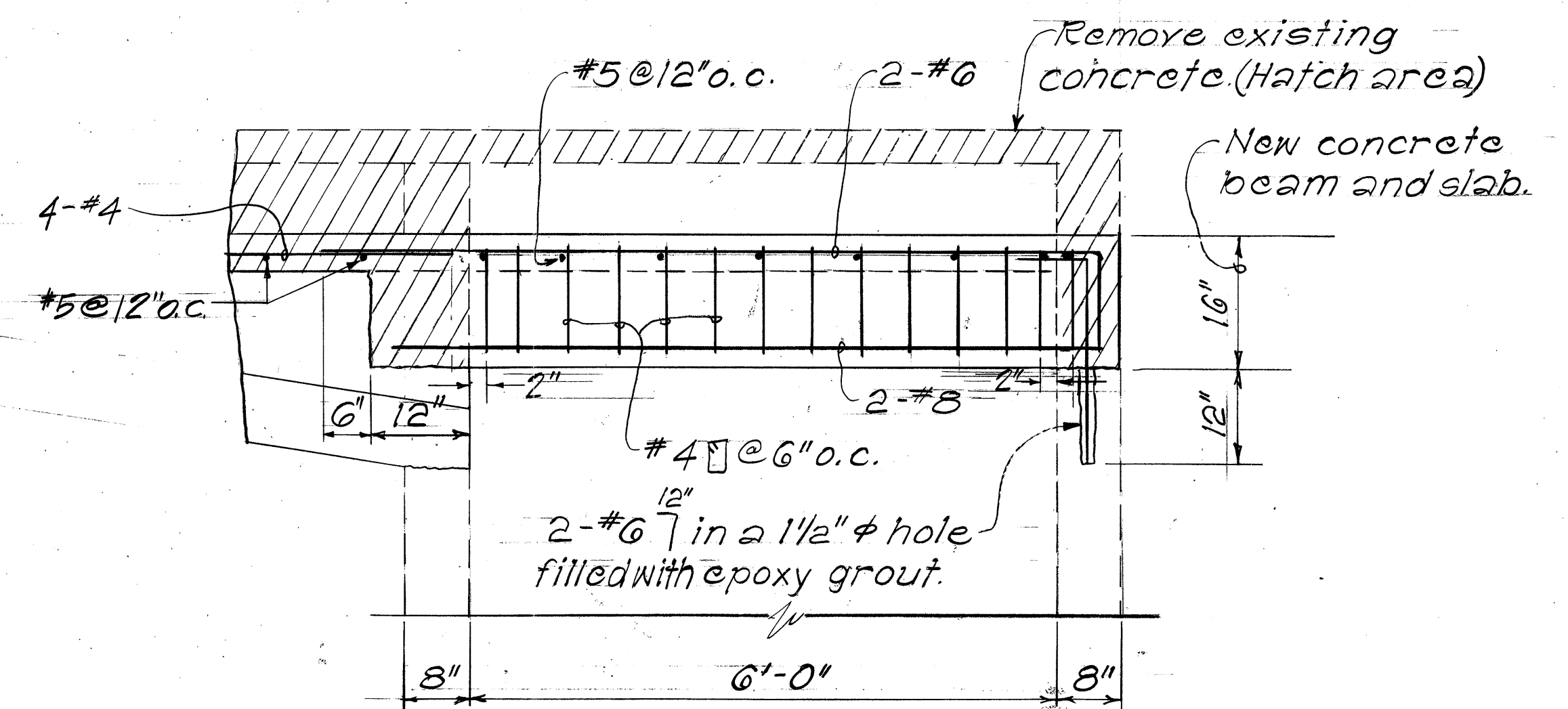
TYPE "C" CATCH BASIN AT & STA. 129+20 RT. I.B.

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
LAND TRANSPORTATION FACILITIES DIVISION  
**DRAINAGE DETAIL**  
Type "C" Catch Basin at  
& Sta. 129+20 Rt. I.B.  
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnel to Kamehameha Hwy.  
F.A. Project No. ROS-061-1(2)  
Scale: 3/4" = 1'-0" Date: Sept. 1977  
SHEET NO. 16 OF 25 SHEETS

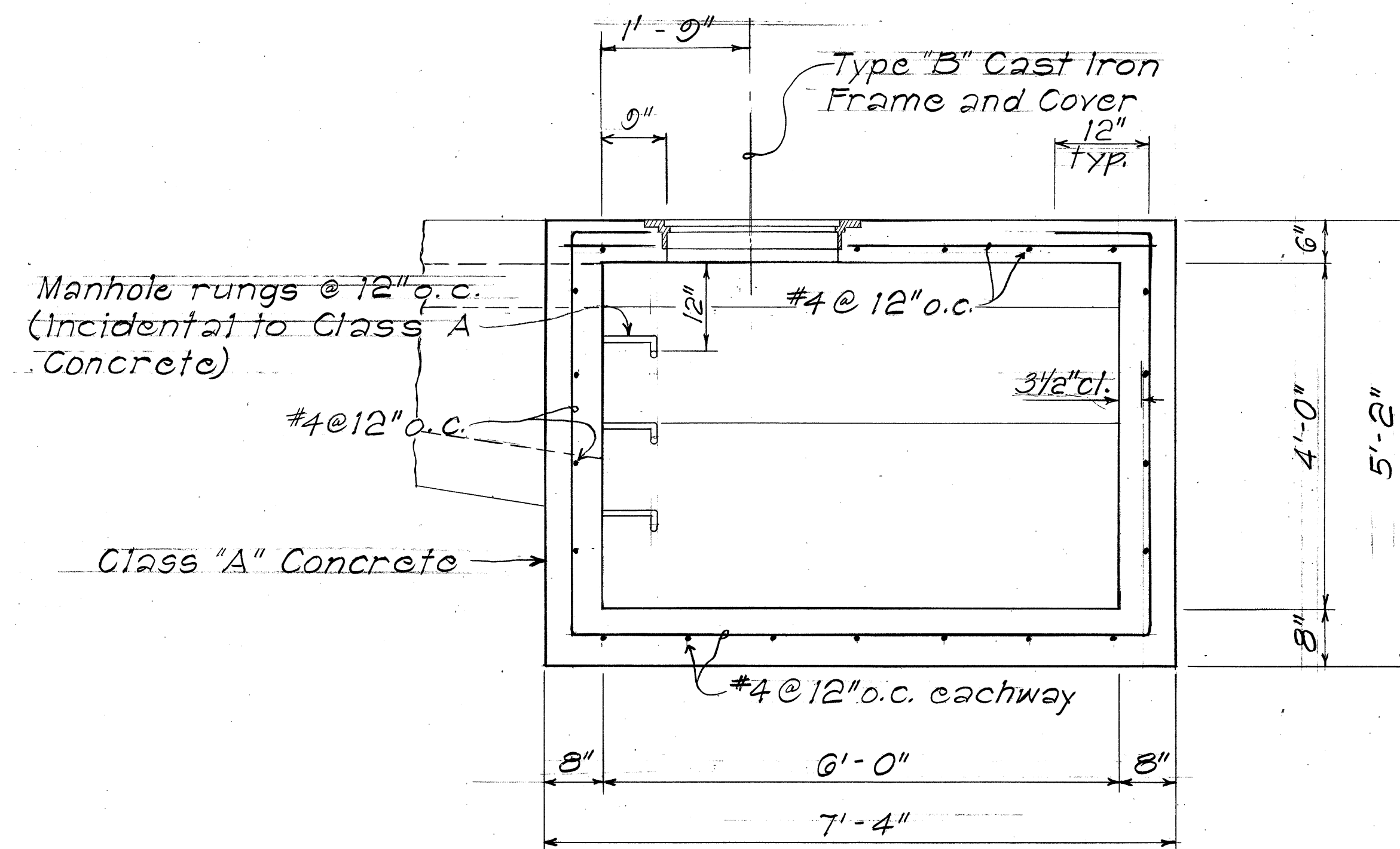
| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061-1(2)       | 1978        | 52        | 94           |



PLAN SECTION "D-D"



SECTION "E-E"

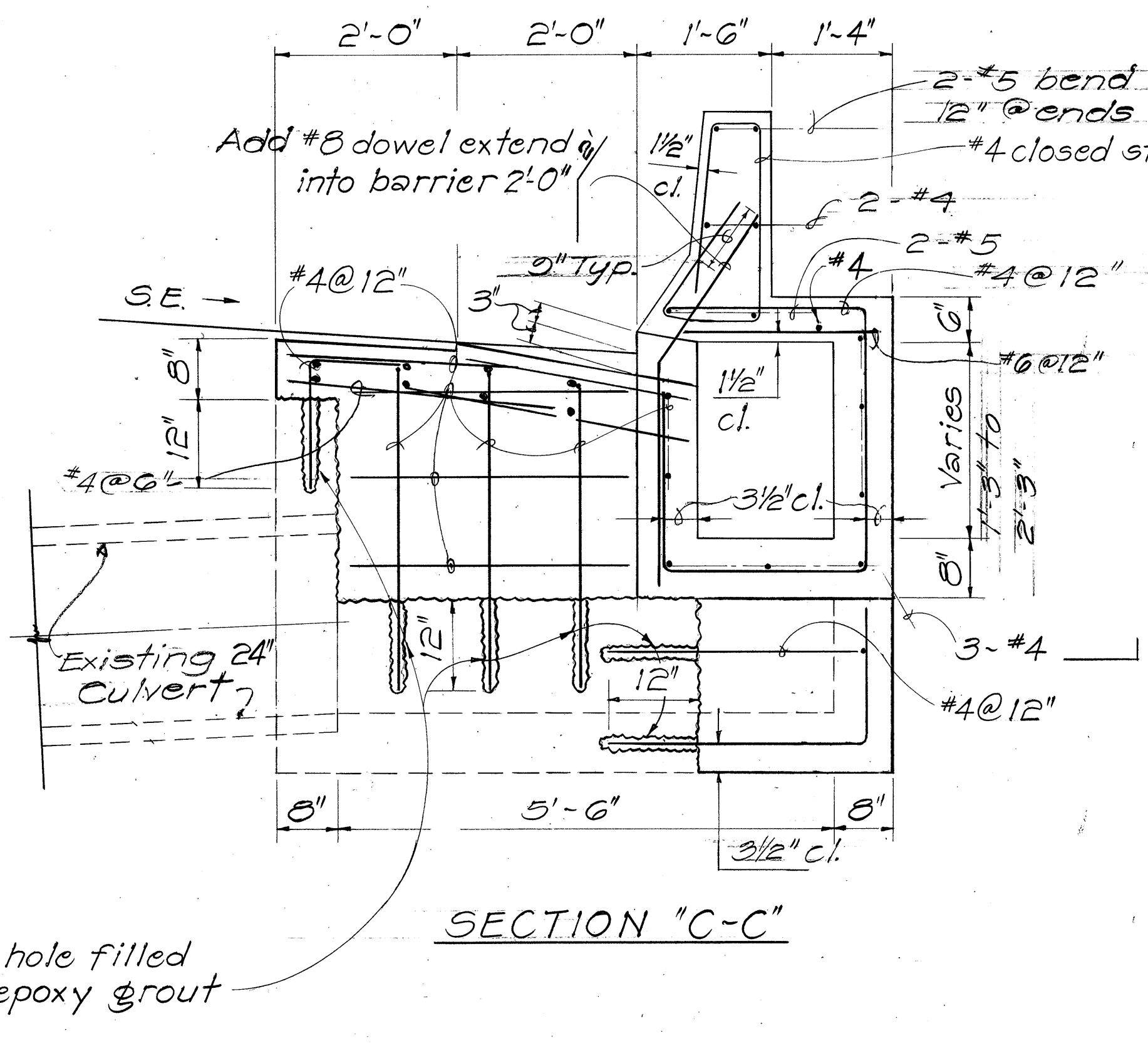
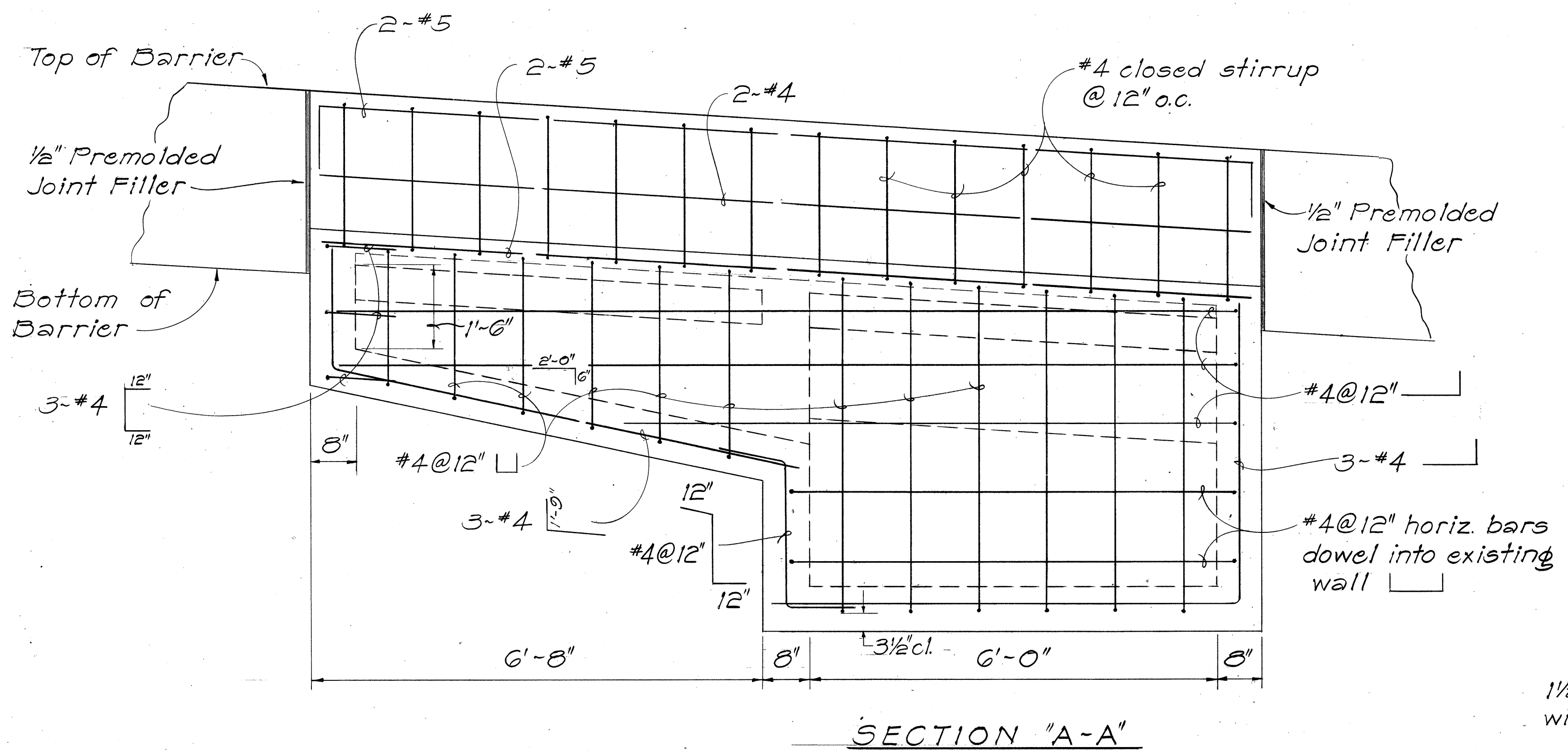
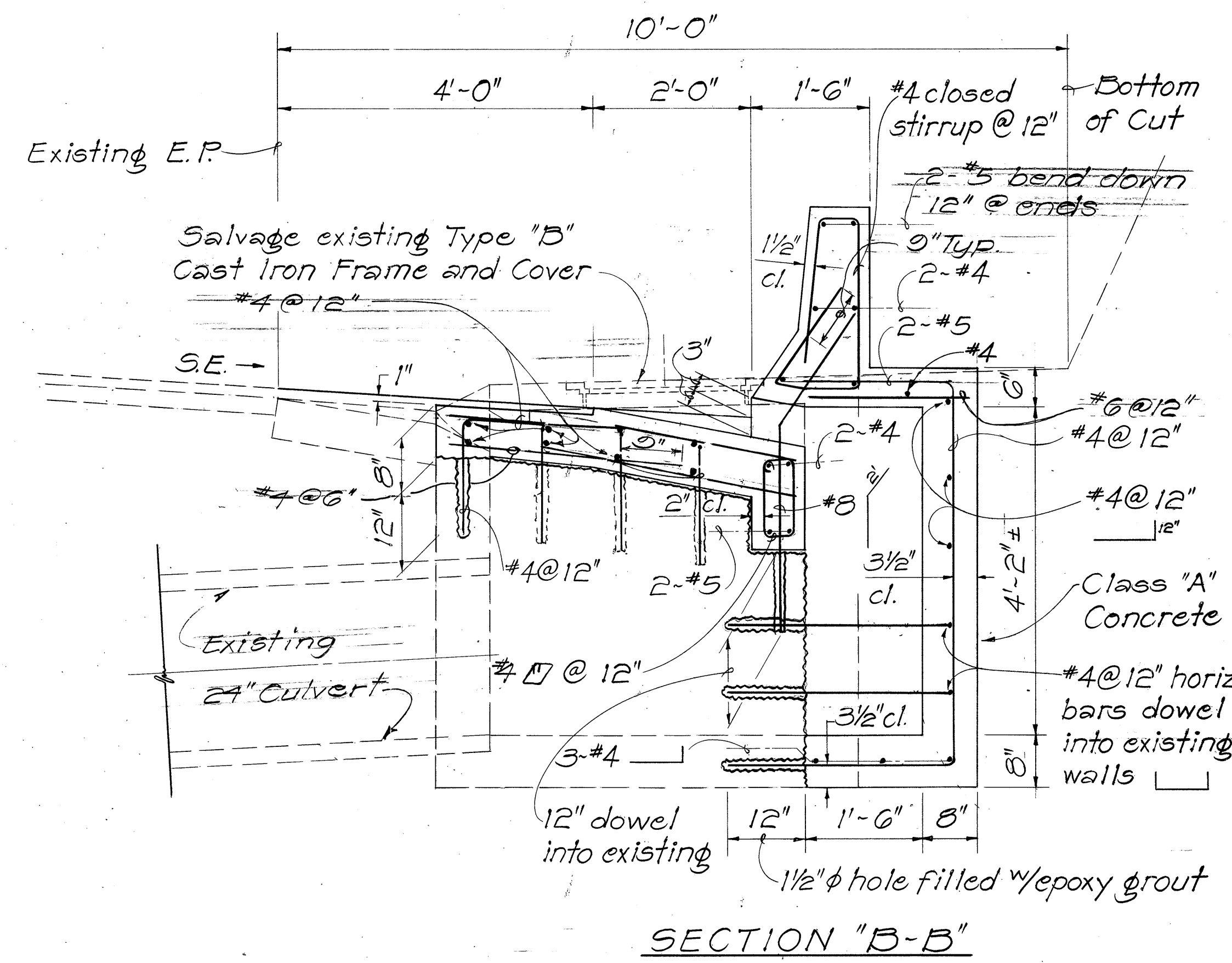
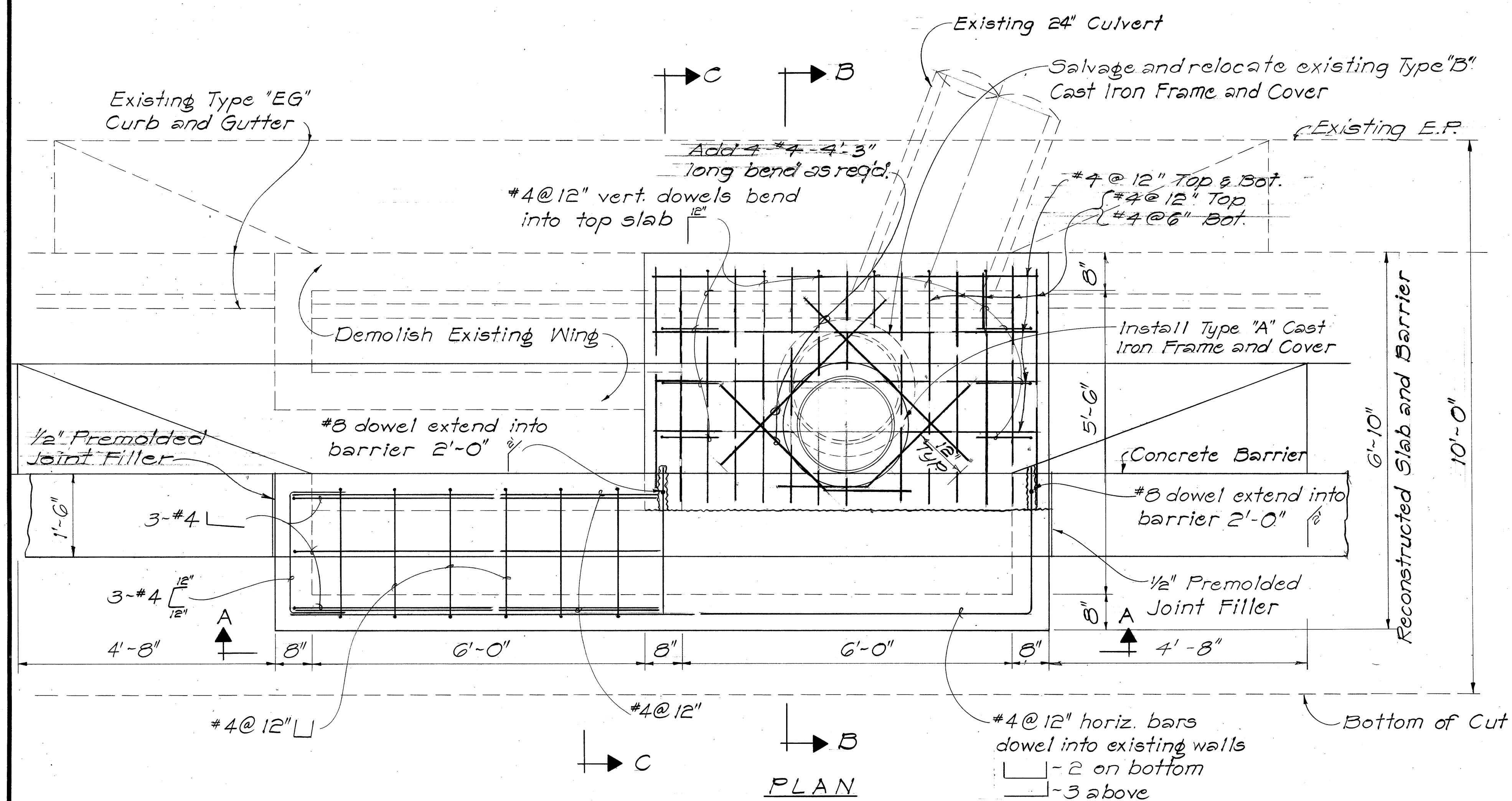


SECTION "F-F"

TYPE "C" CATCH BASIN AT STA. 129+20 RT. I.B.

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
LAND TRANSPORTATION FACILITIES DIVISION  
DRAINAGE DETAIL  
Type "C" Catch Basin at  
Sta. 129+20 Rt. I.B.  
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnel to Kamehameha Hwy.  
F.A. Project No. ROS-061-1(2)  
Scale: 3/4" = 1'-0" Date: Sept. 1977  
SHEET No. 17 OF 25 SHEETS

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061-1(21)      | 1978        | 53        | 94           |



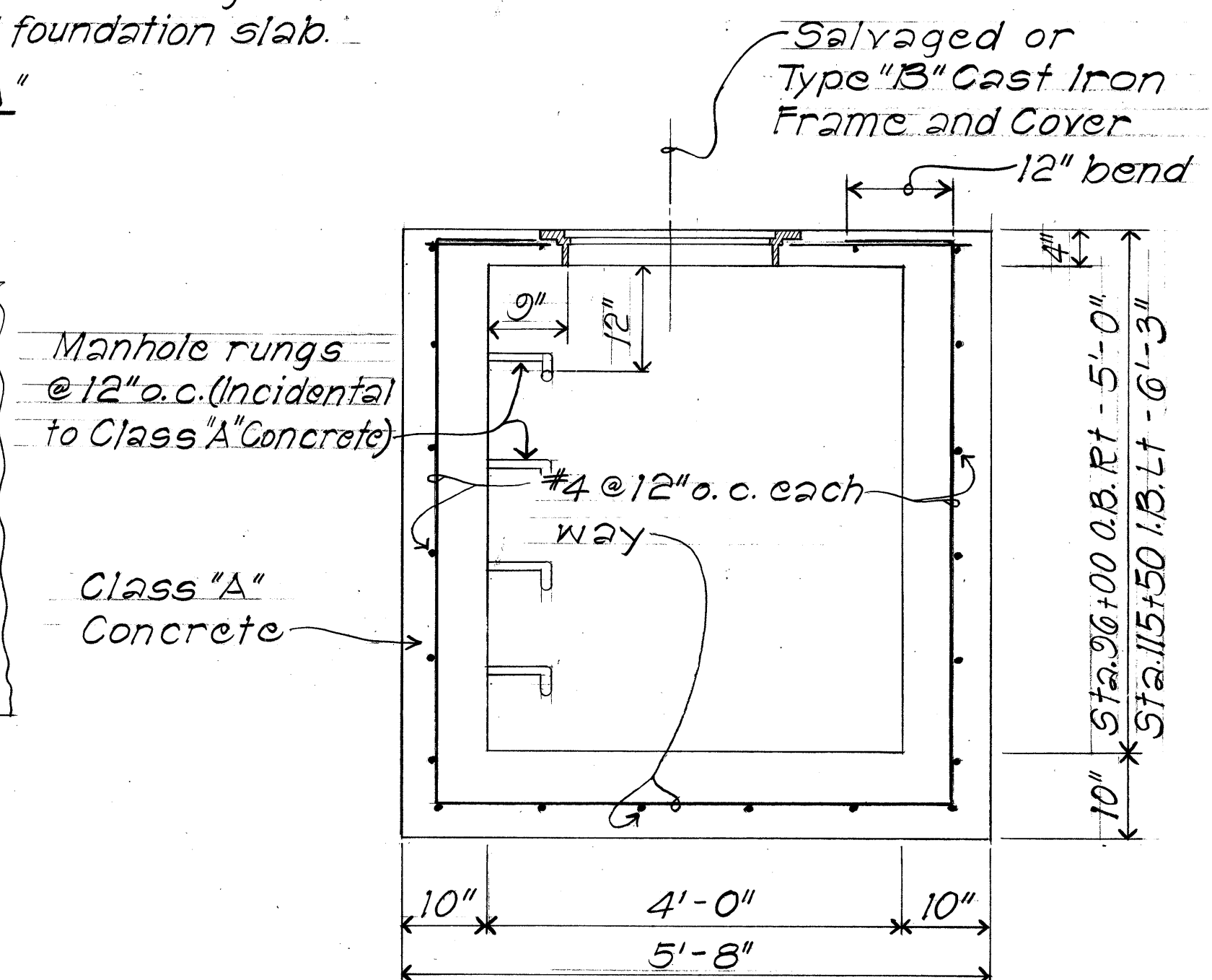
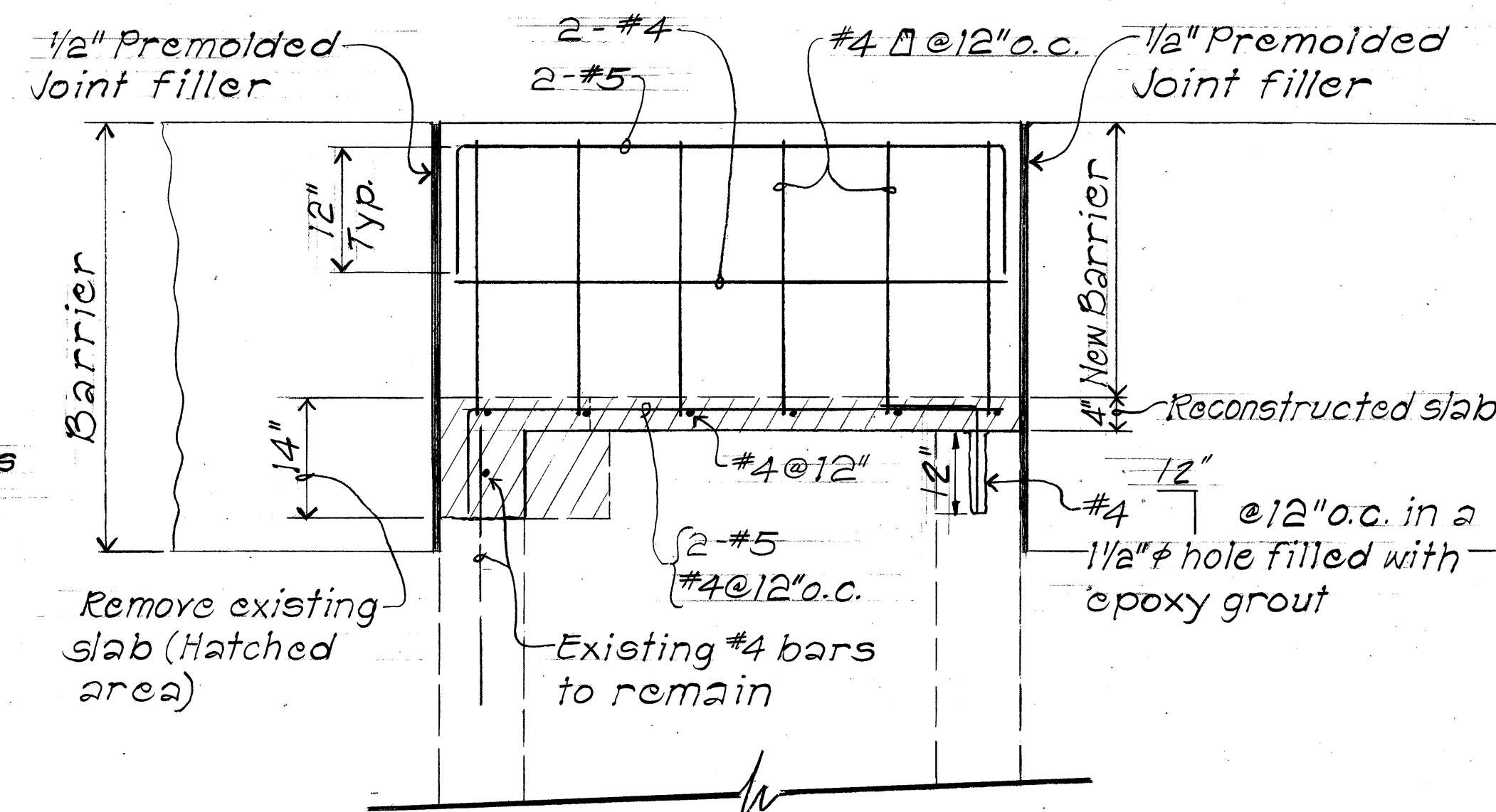
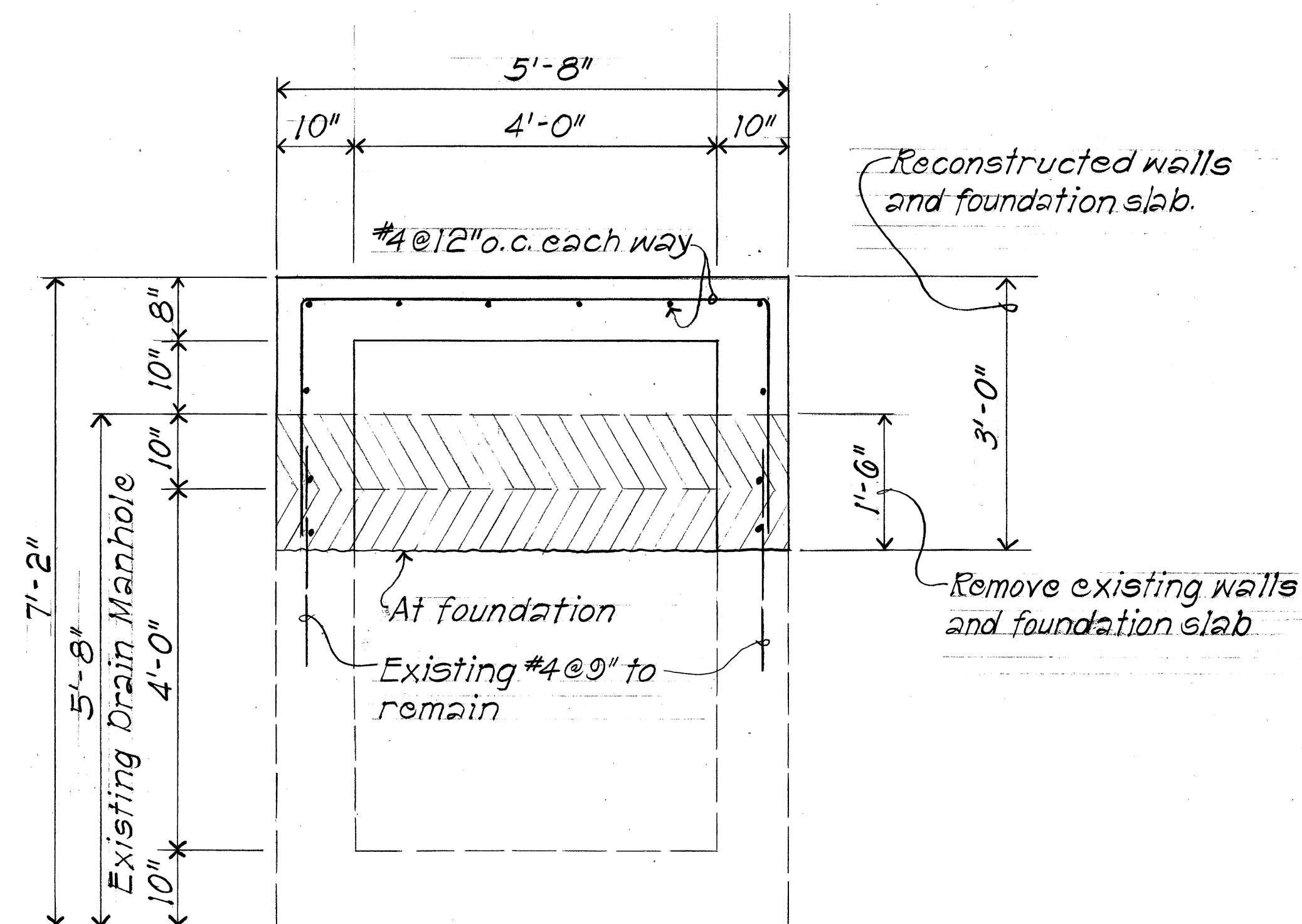
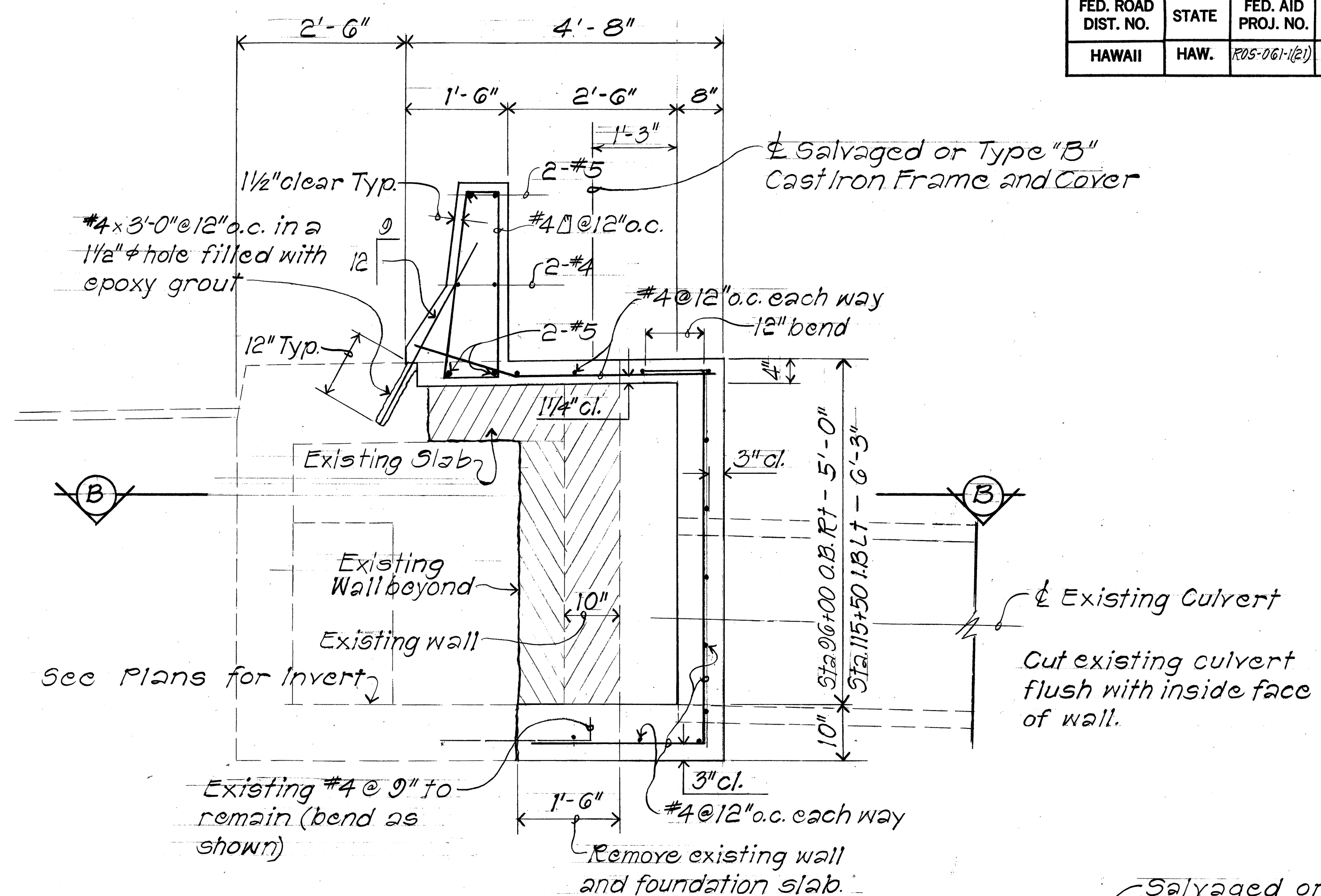
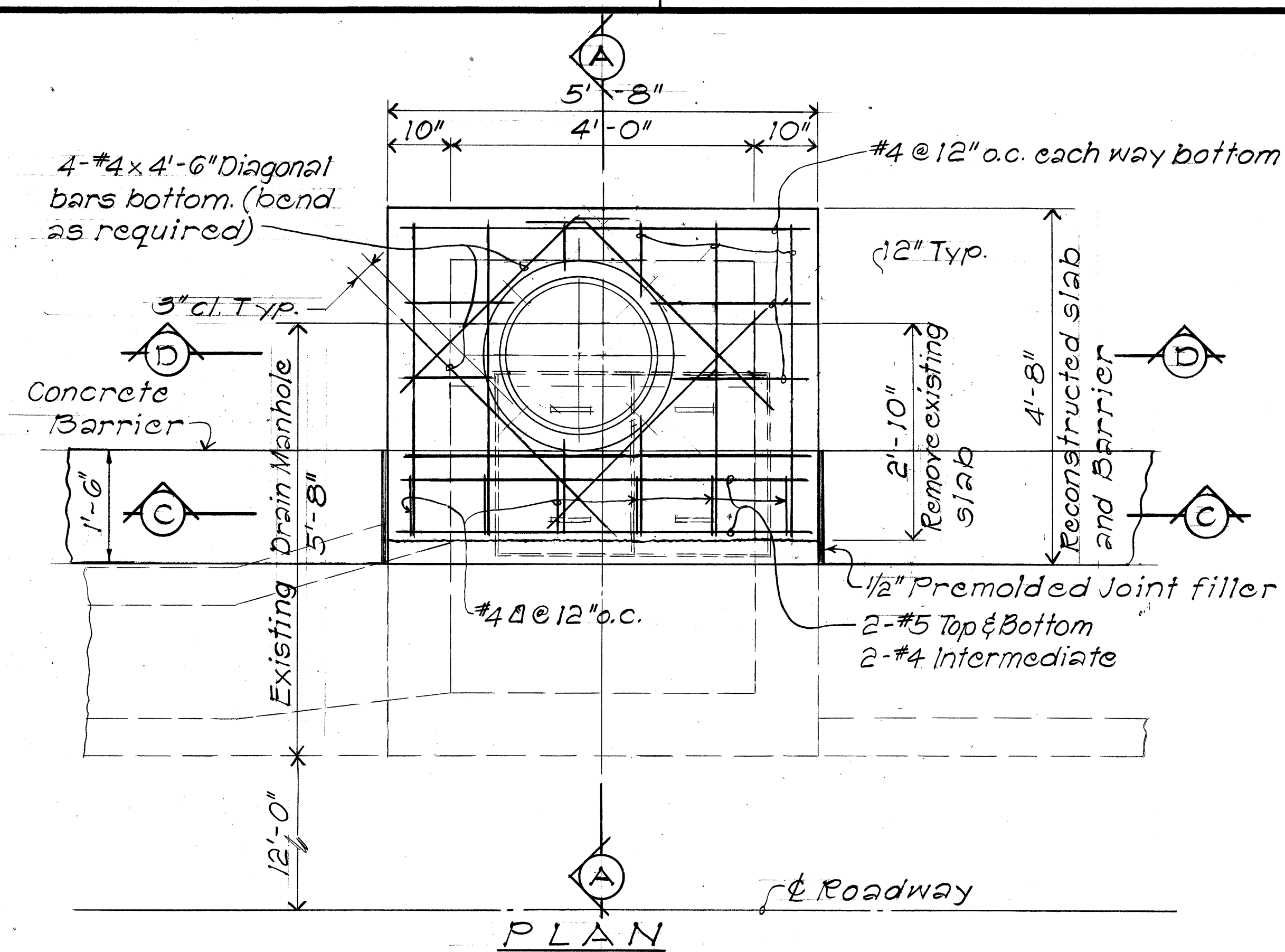
NOTE: Construct Concrete Gutter Apron as shown on DH-1 for Type "C" C.B.

TYPE "C" CATCH BASIN AT & STA. 140+25 RT. O.B.

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
LAND TRANSPORTATION FACILITIES DIVISION  
**DRAINAGE DETAIL**  
Type "C" Catch Basin at  
& Sta. 140+25 Rt. O.B.  
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kamehameha Hwy  
F.A. Project No. ROS-061-1(21)  
Scale: 3/4" = 1'-0" Date: Sept. 1977  
SHEET No. 18 OF 25 SHEETS

DATE: \_\_\_\_\_  
SURVEY PLOTTED BY: \_\_\_\_\_  
DRAWN BY: \_\_\_\_\_  
CHECKED BY: \_\_\_\_\_  
DESIGNED BY: \_\_\_\_\_  
NOTED BY: \_\_\_\_\_  
ORIGINAL PLAN: \_\_\_\_\_  
NO. \_\_\_\_\_

| FED. ROAD<br>DIST. NO. | STATE | FED. AID<br>PROJ. NO. | FISCAL<br>YEAR | SHEET<br>NO. | TOTAL<br>SHEETS |
|------------------------|-------|-----------------------|----------------|--------------|-----------------|
| HAWAII                 | HAW.  | R05-061-1(21)         | 1978           | 54           | 94              |



PLAN SECTION "B-B"

SECTION "C-C"

SECTION "D-D"

STORM DRAIN MANHOLE AT £ STA. 96+00 RT. O.B. AND £ STA. 115+50 LT. I.B.

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

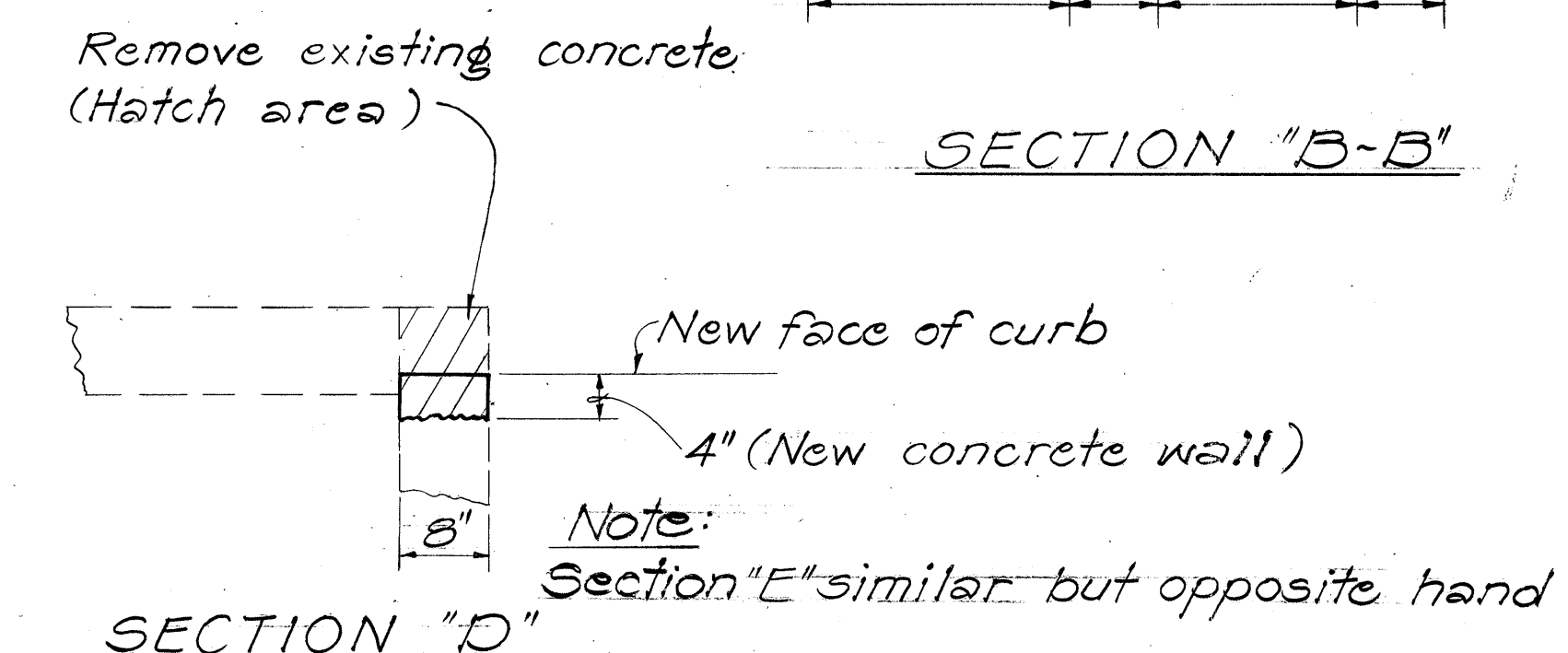
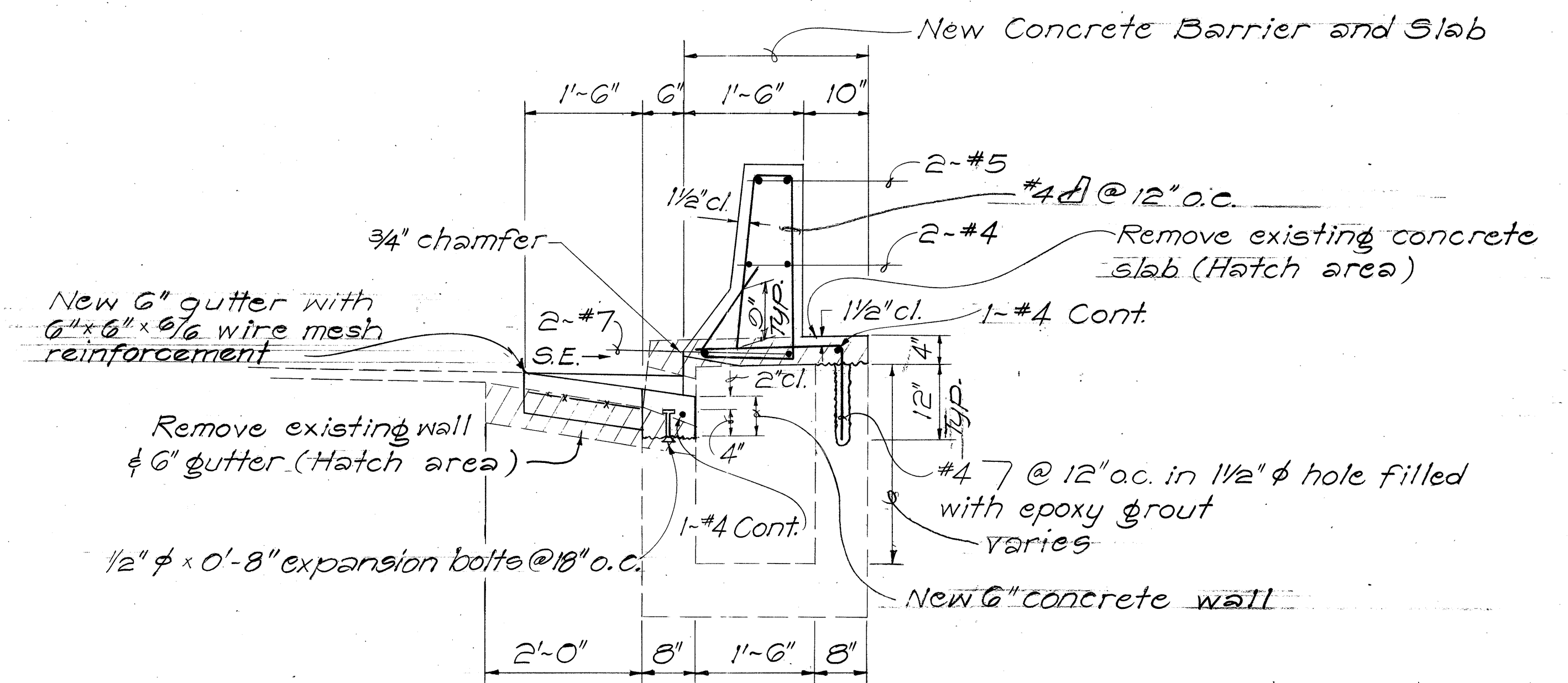
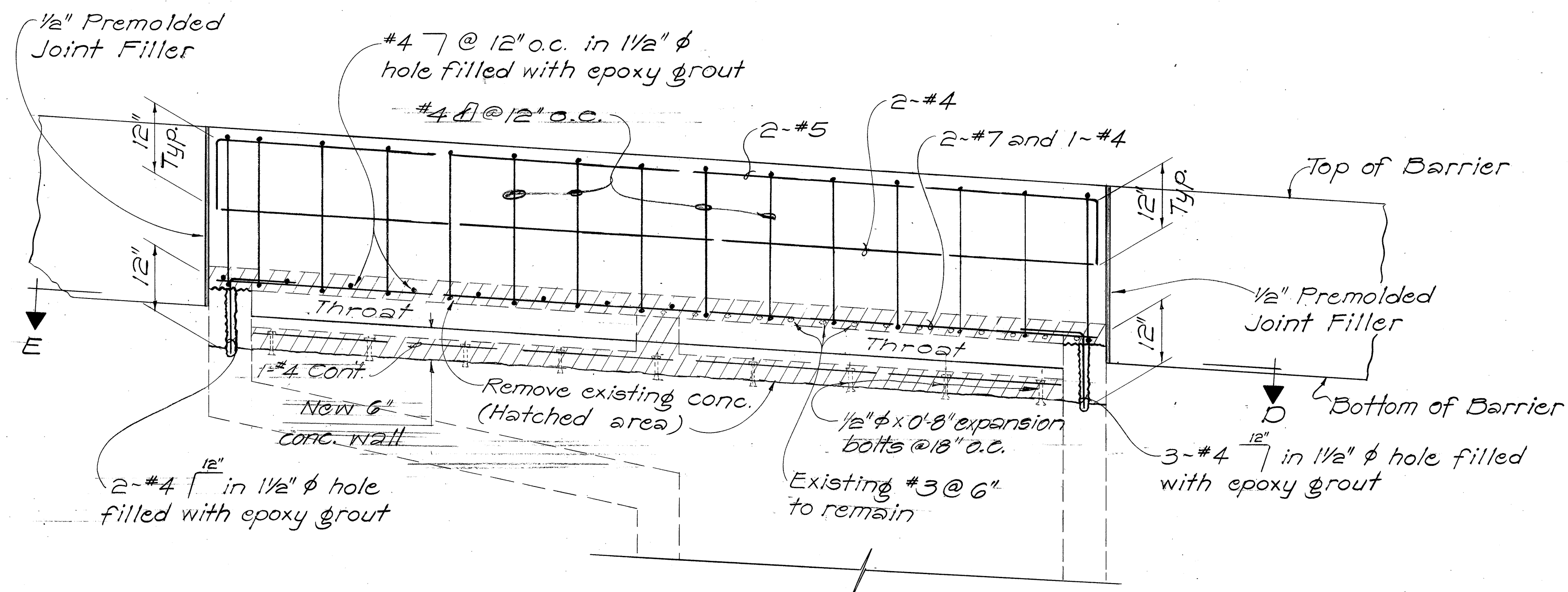
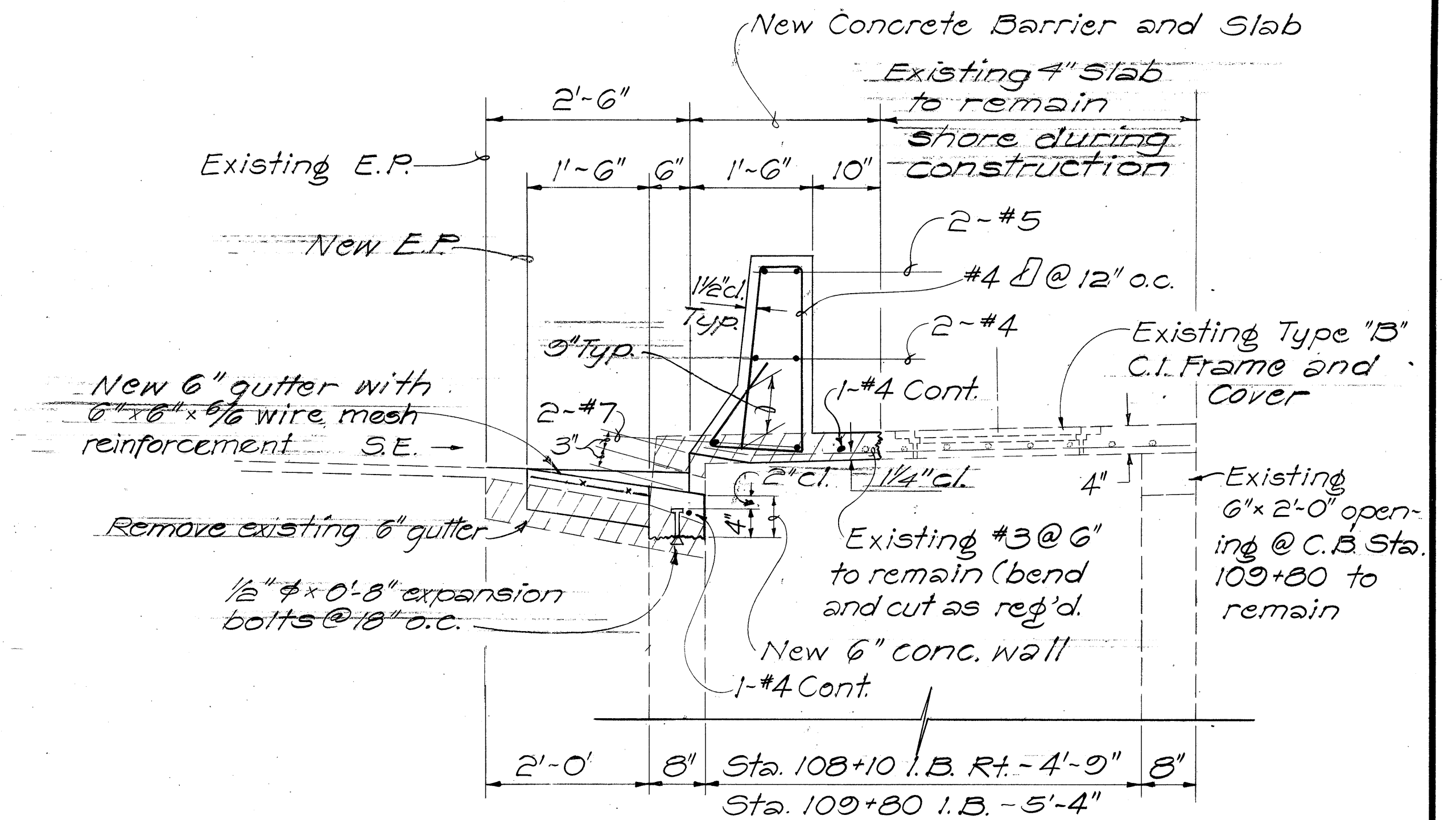
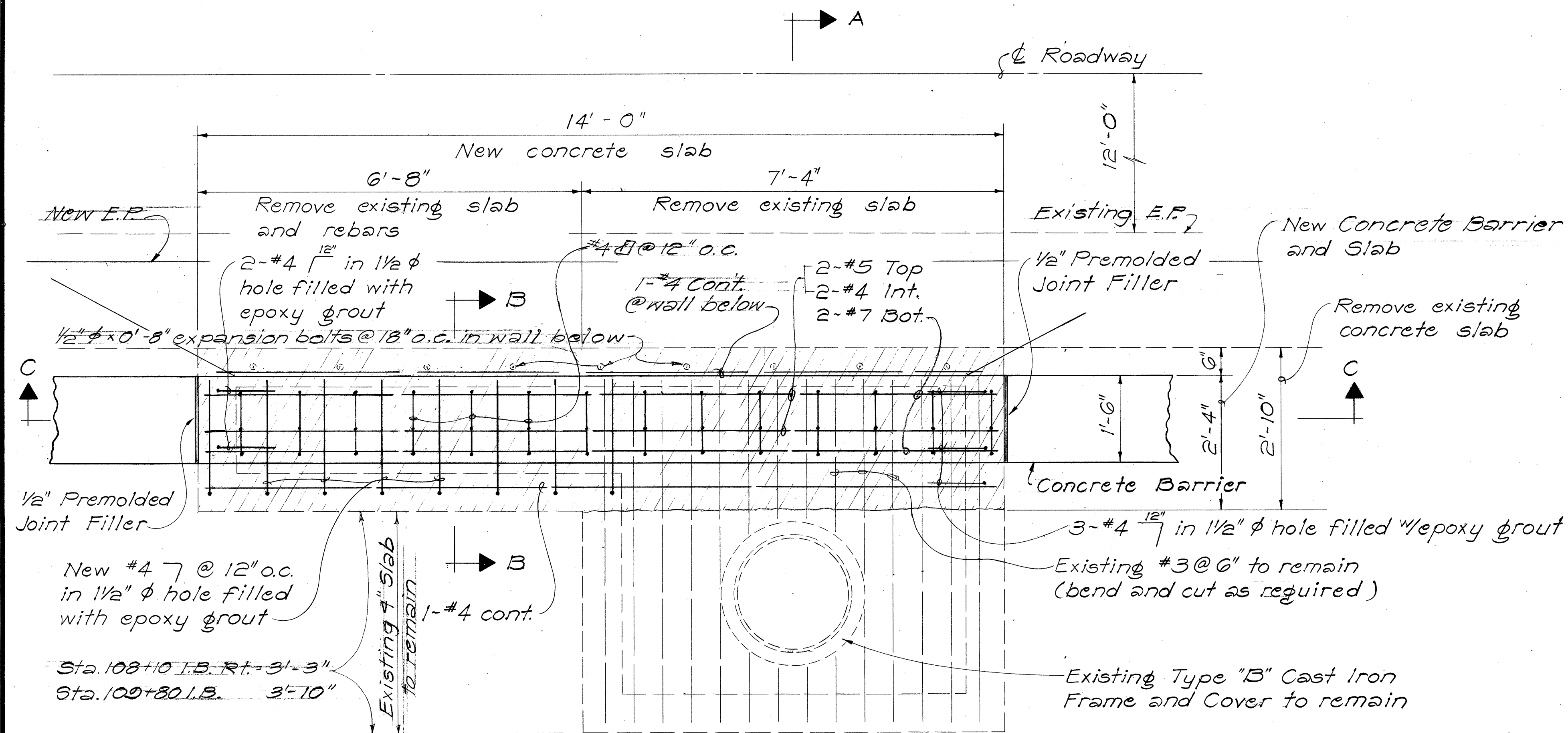
DRAINAGE DETAIL

Storm Drain Manhole at  
Sta. 26+00 R.O.B. & Sta. 115+50 L.T. I.B.  
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnel to Kamehameha Hwy.  
F.A. Project No. ROS-061-1(21)

Scale: 3/4" = 1' - 0"      Date: Sept. 1977

SHEET NO. 12 OF 25 SHEETS

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | R05-061-1(21)      | 1978        | 55        | 94           |

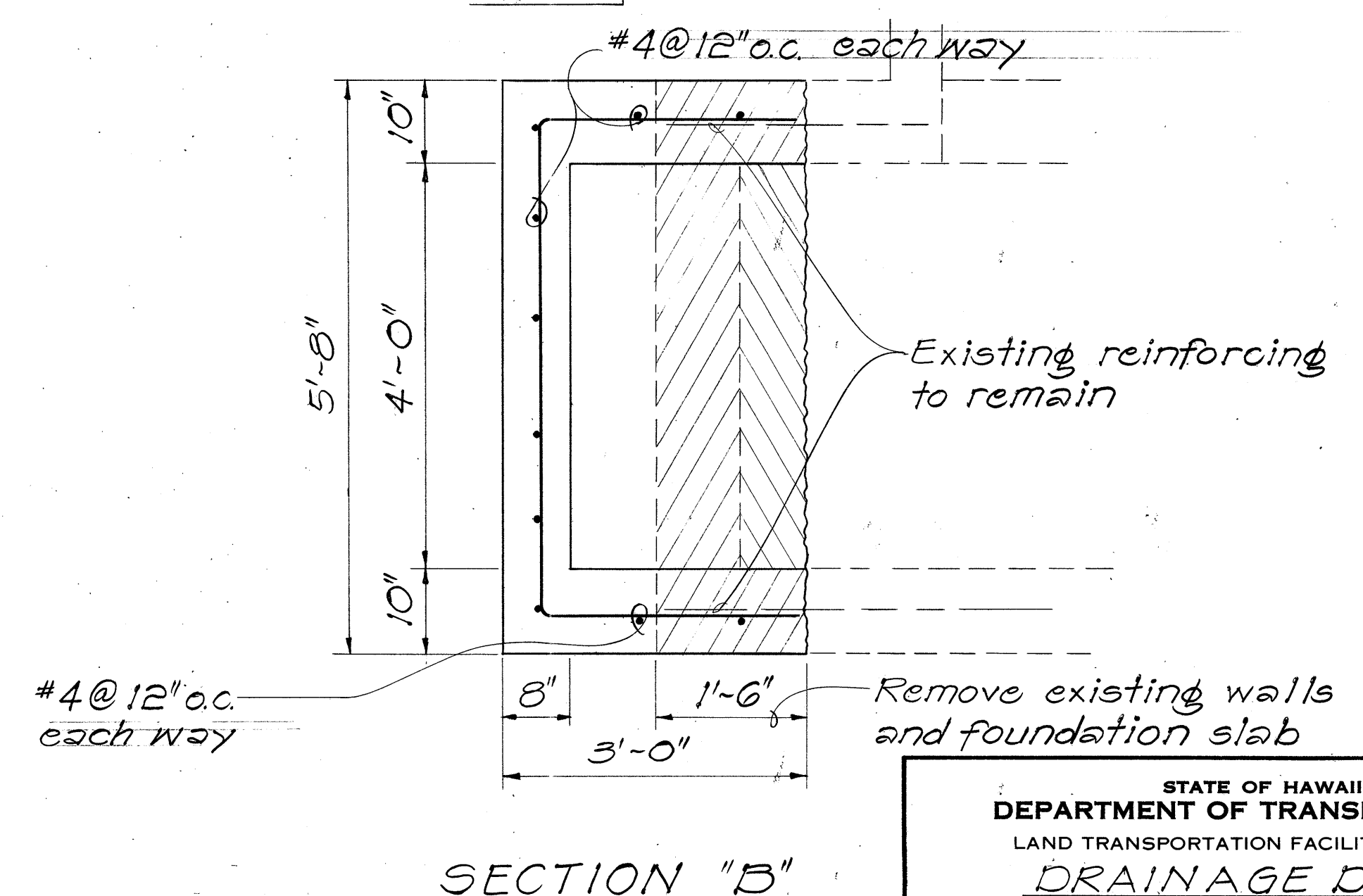
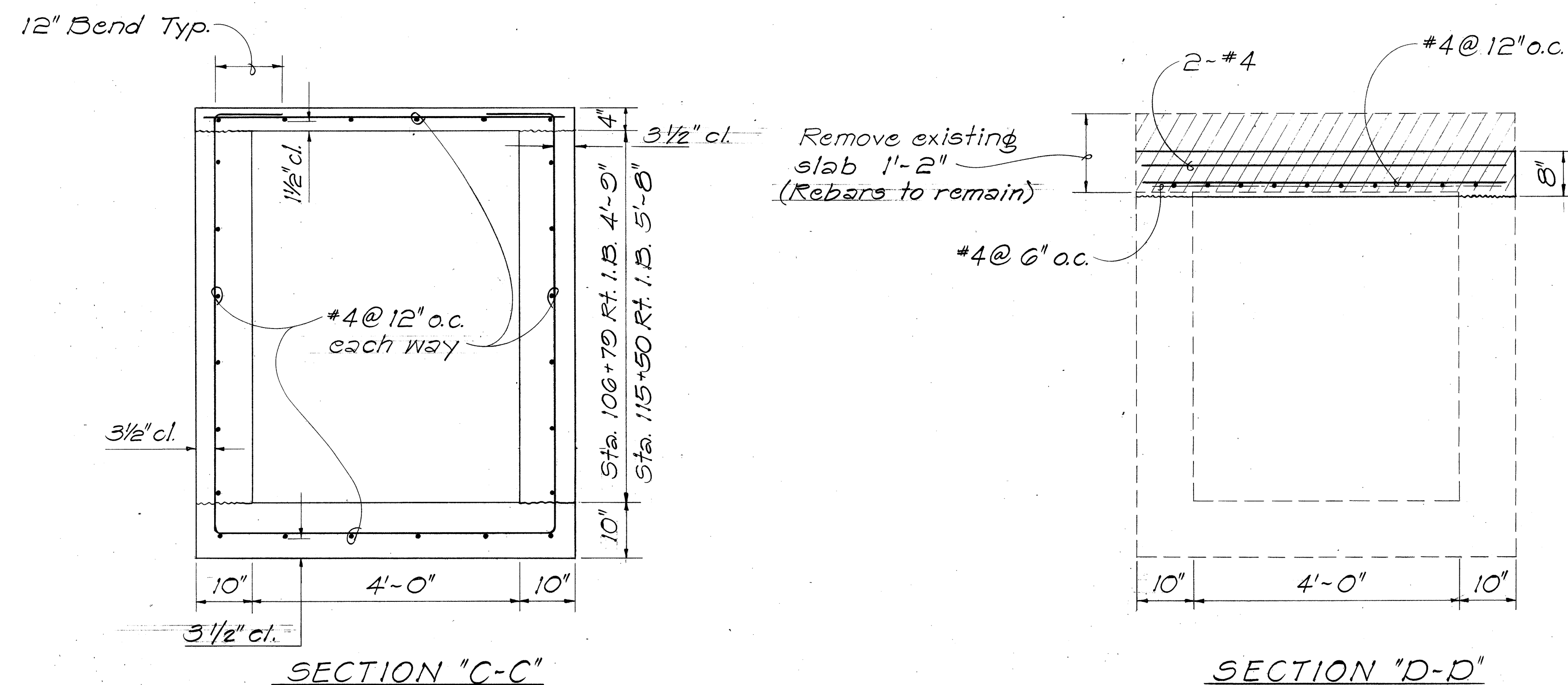
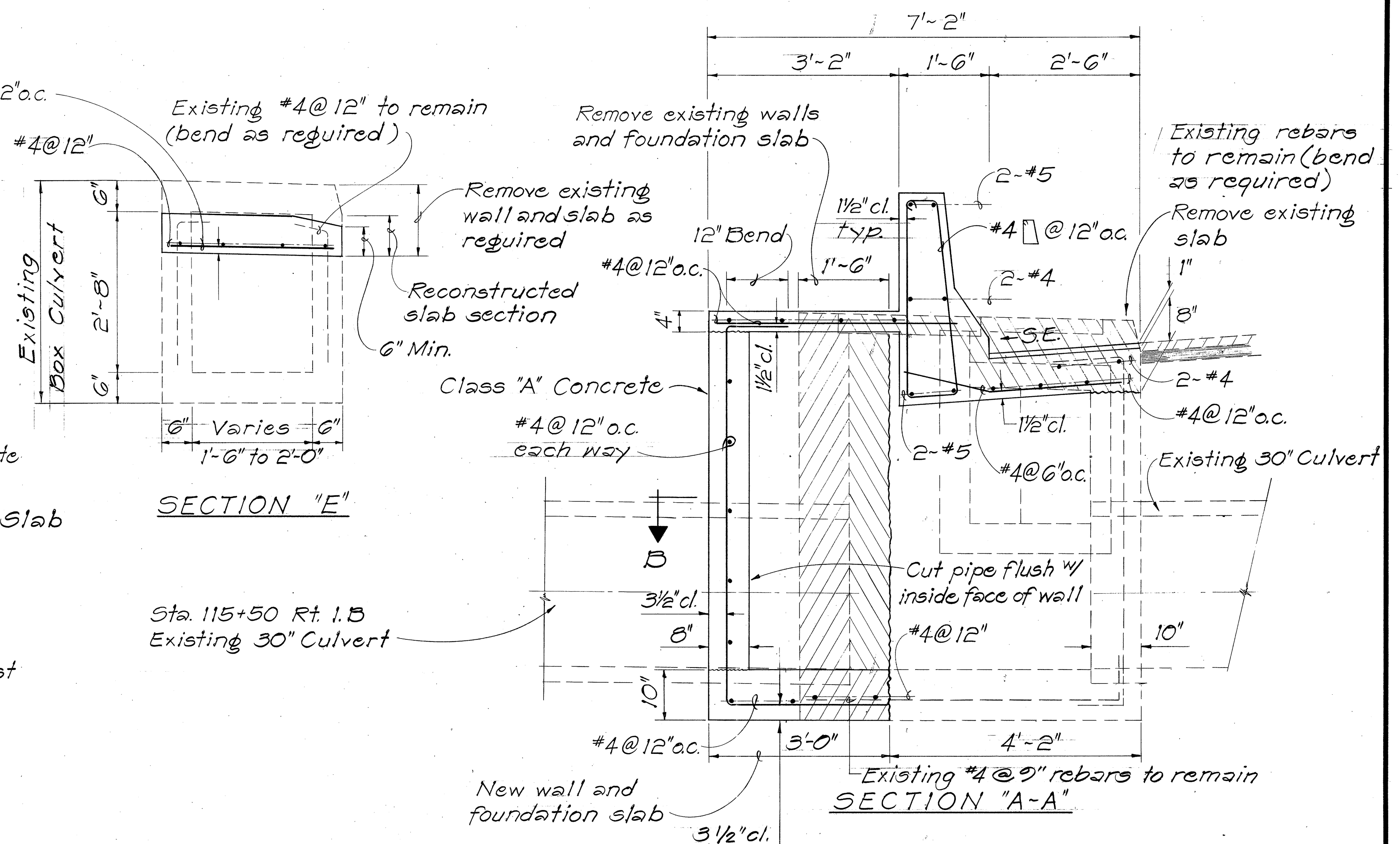
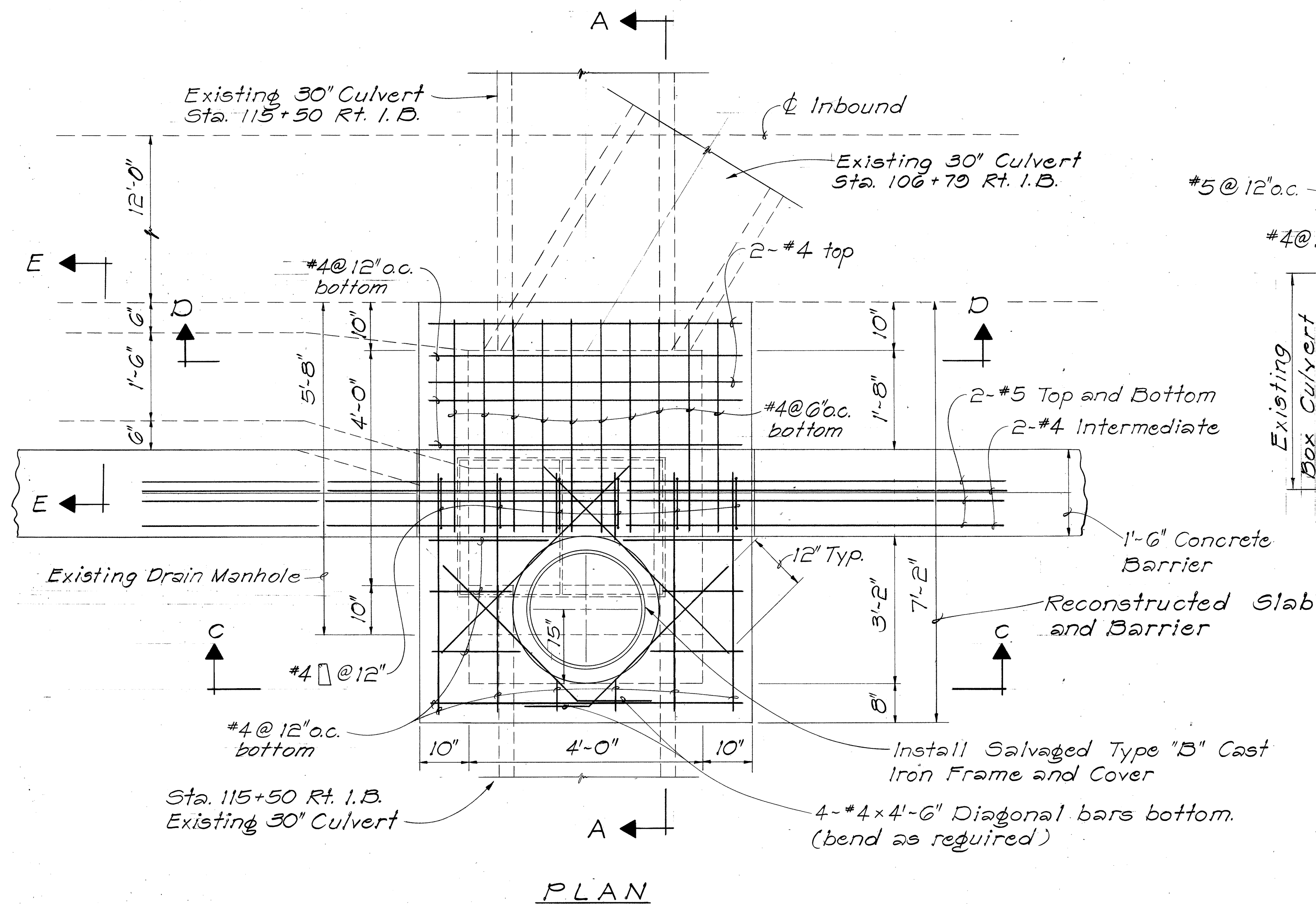


NOTE: Construct Concrete Gutter Apron as shown on DH-1 for Type "C" C.B.

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
LAND TRANSPORTATION FACILITIES DIVISION  
**DRAINAGE DETAIL**  
Type "C" Catch Basin at  
Sta. 108+10 Rt. I.B. & Sta. 109+80 Rt. I.B.  
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kamehameha Hwy.  
F.A. Project No. R05-061-1(21)  
Scale: 3/4" = 1'-0" Date: Sept. 1977  
SHEET No. 20 OF 25 SHEETS

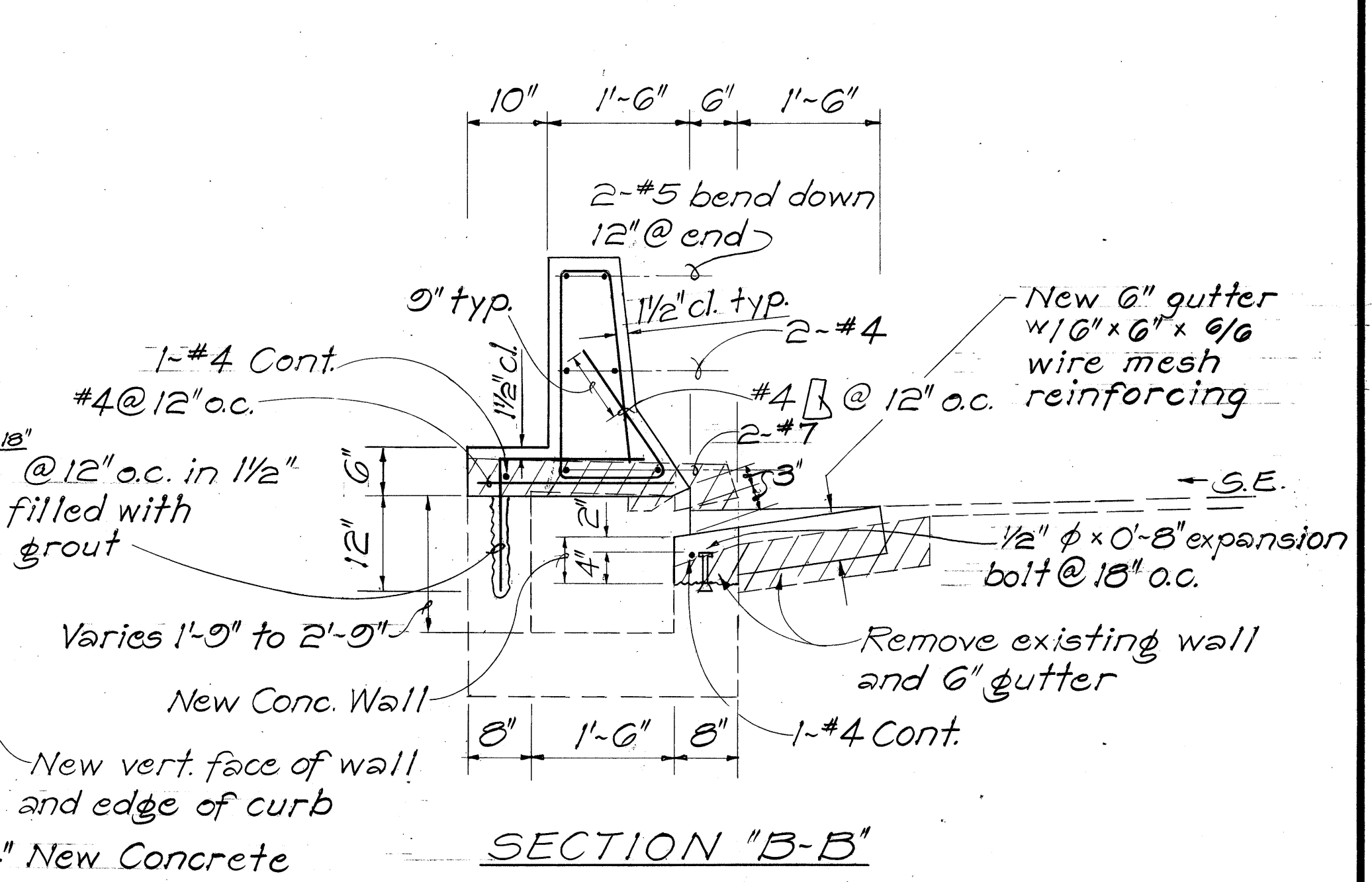
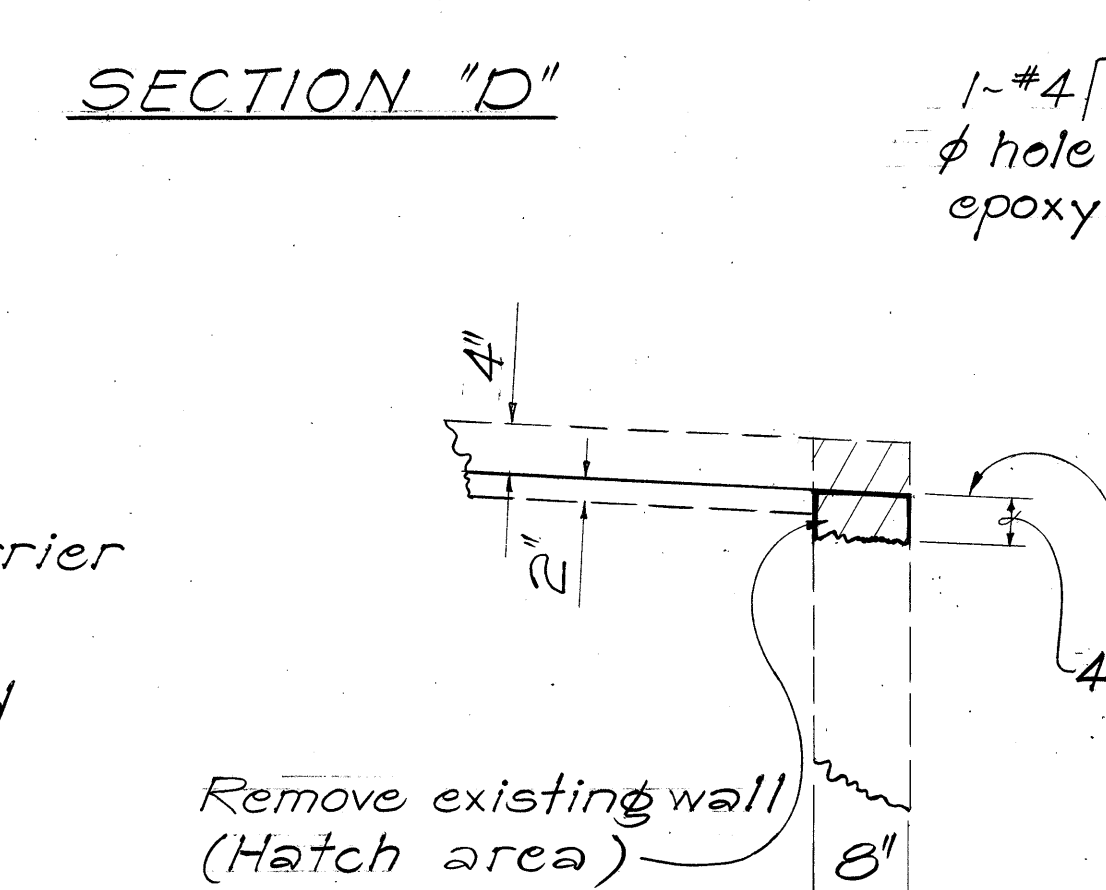
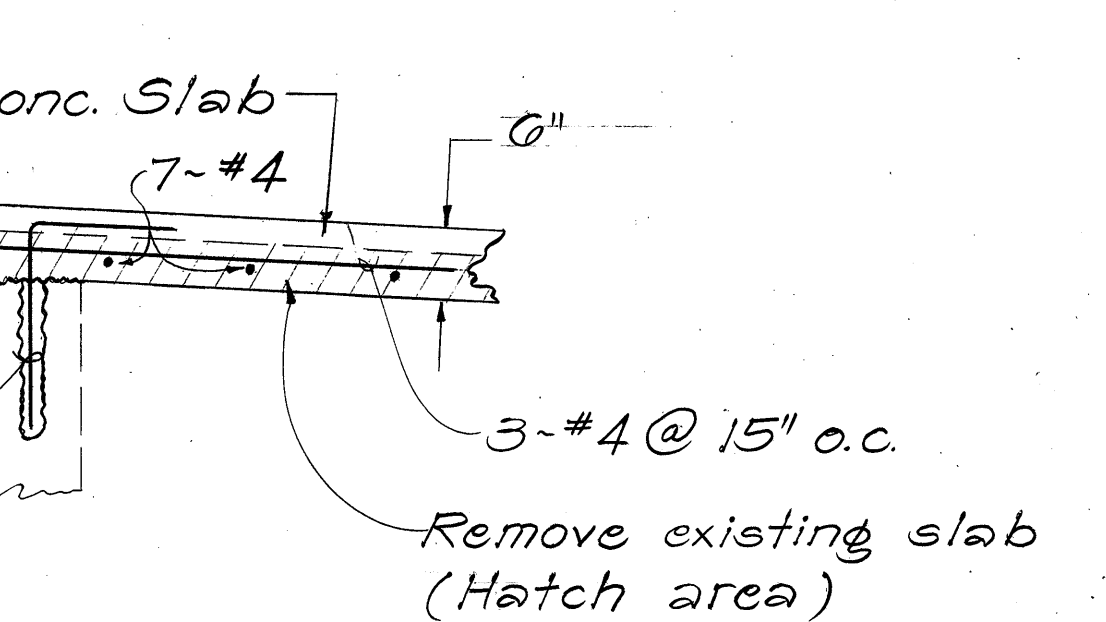
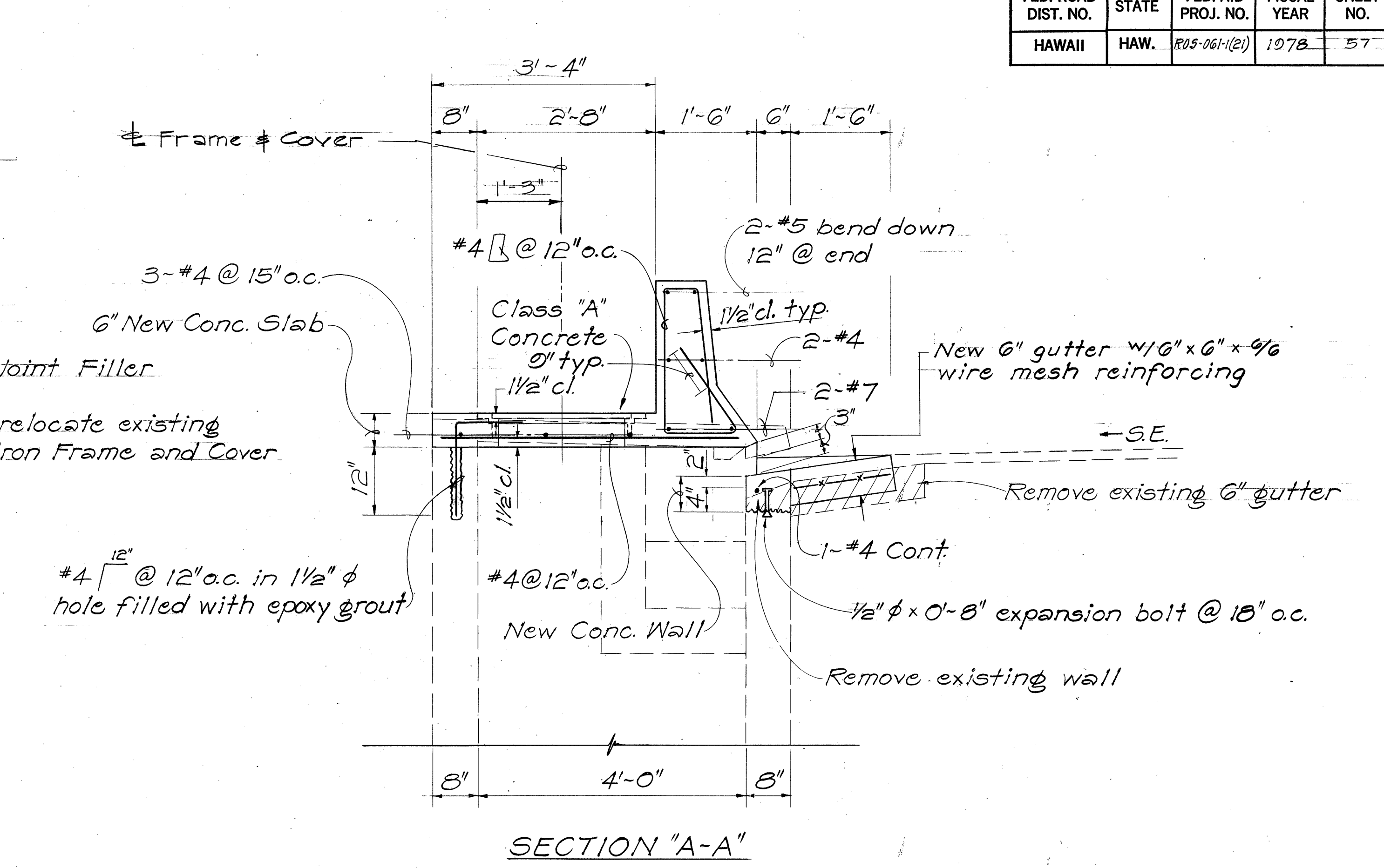
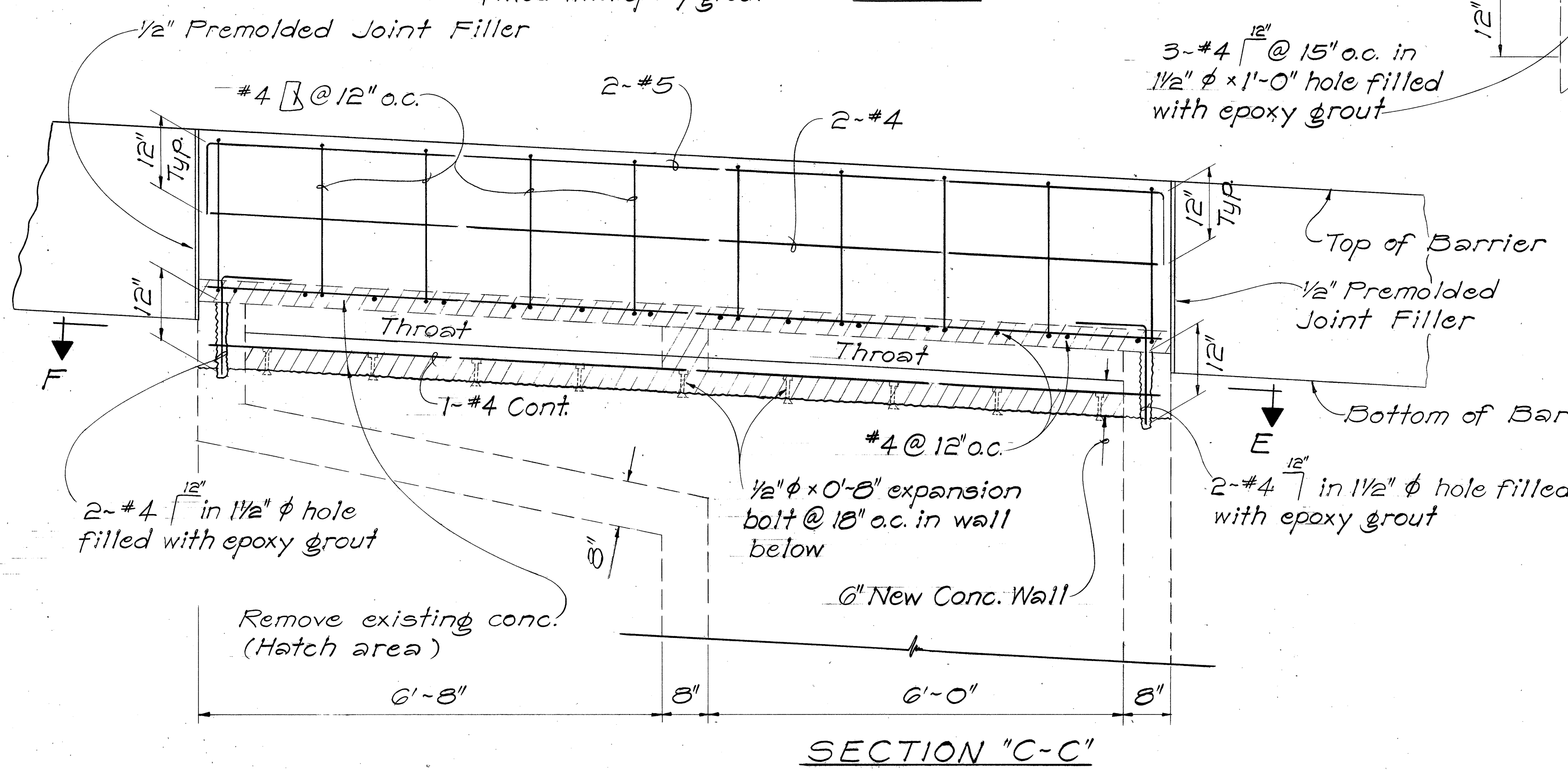
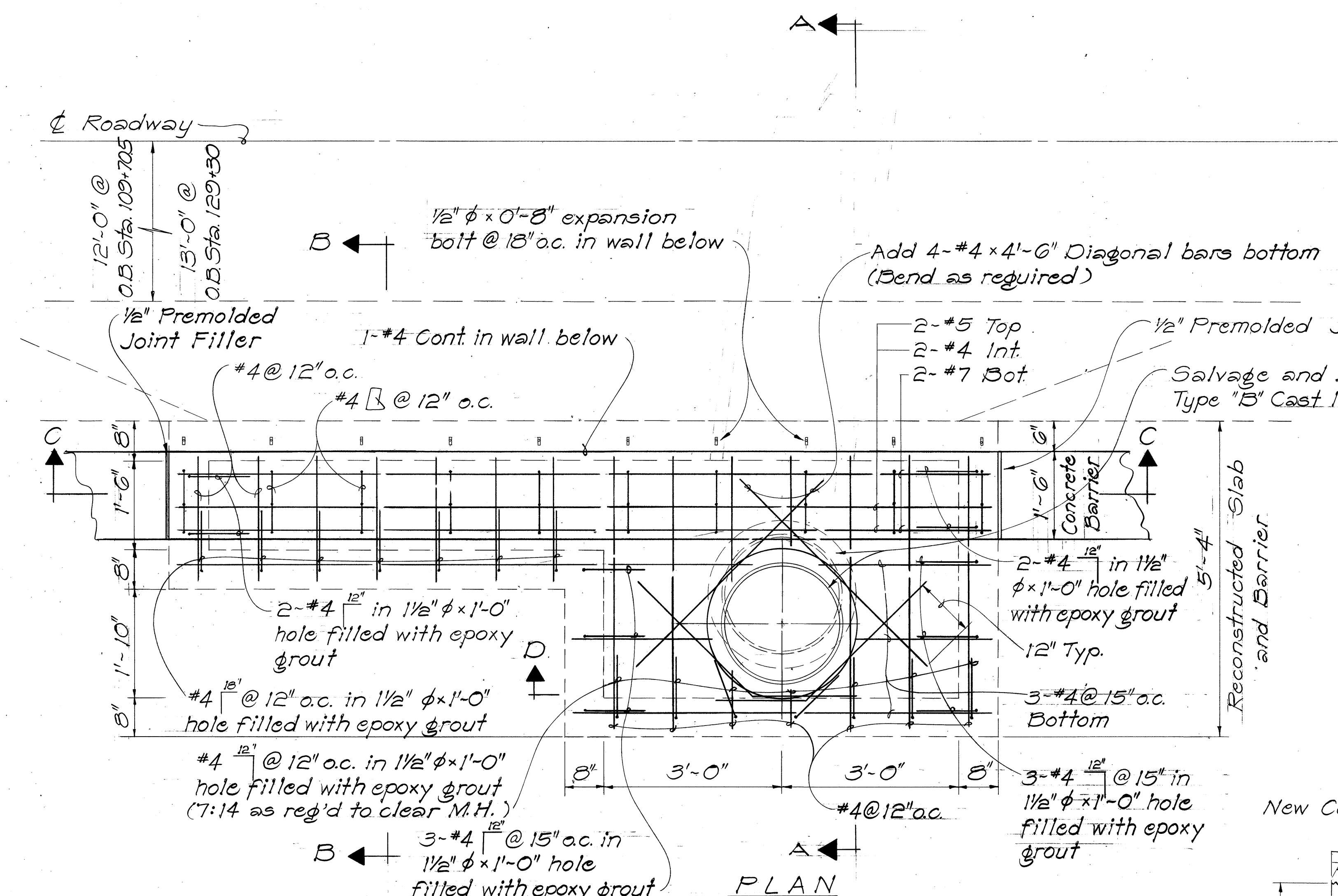
TYPE "C" CATCH BASIN AT STA. 108+10 RT. I.B. AND STA. 109+80 RT. I.B.

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | R05-061-1(21)      | 1978        | 56        | 94           |



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
LAND TRANSPORTATION FACILITIES DIVISION  
DRAINAGE DETAIL  
Storm Drain Manhole at  
Sta. 106+79 Rt. 1.B & Sta. 115+50 Rt. 1.B.  
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnel to Kamehameha Hwy.  
F.A. Project No. R05-061-1(21)  
Scale: 3/4" = 1'-0" Date: Sept. 1977  
SHEET NO. 21 OF 25 SHEETS

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | ROS-061-1(2)       | 1978        | 57        | 94           |

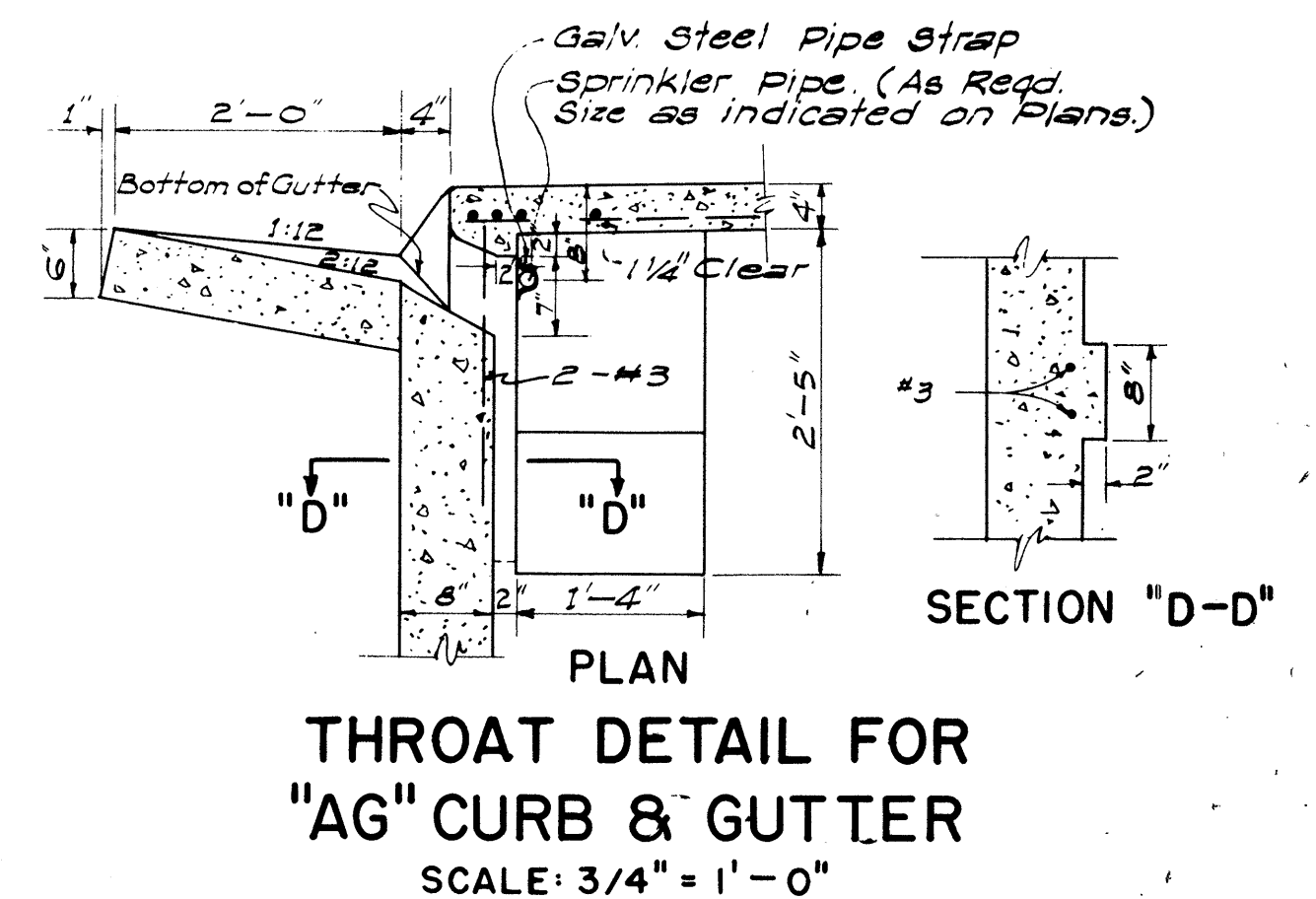
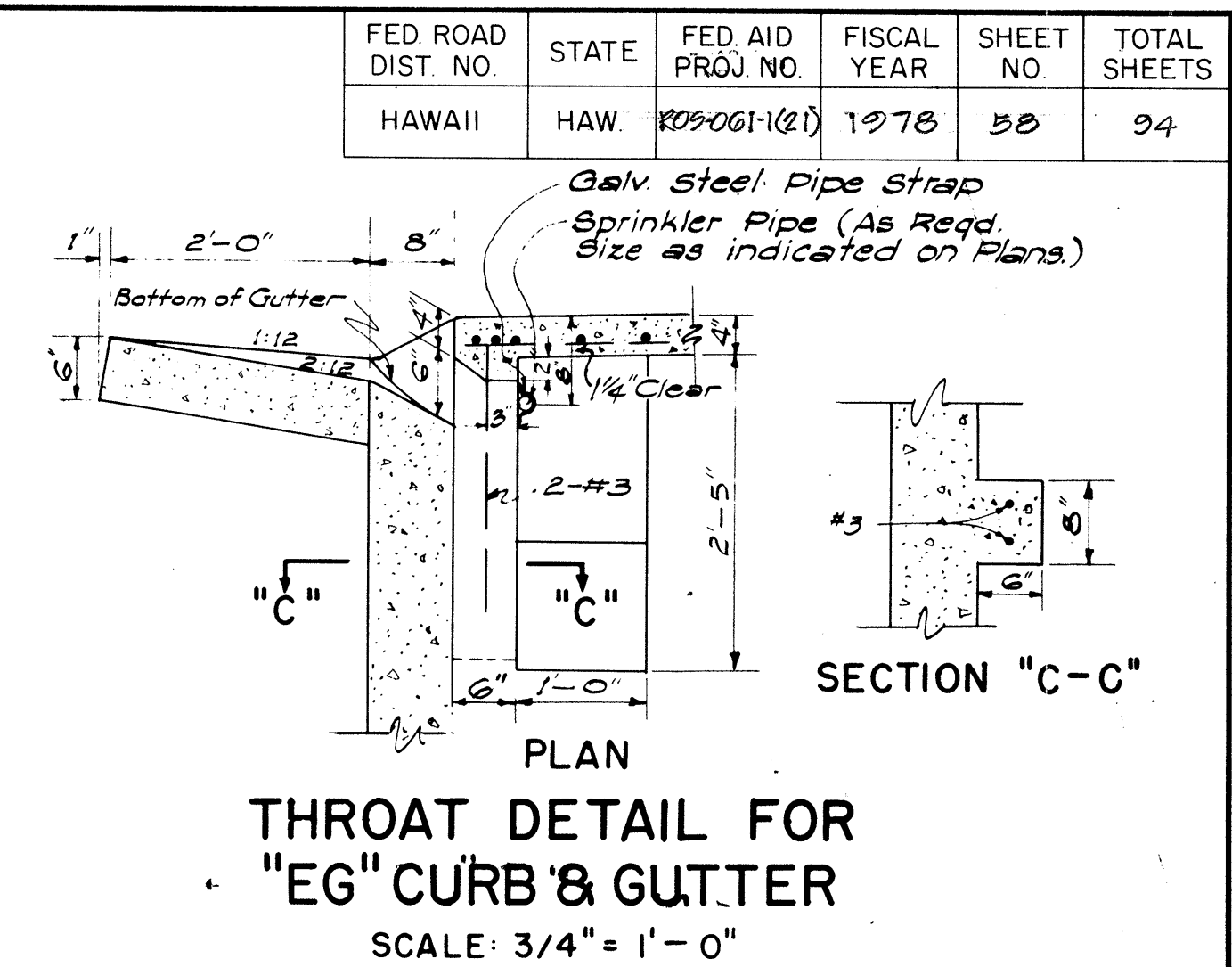
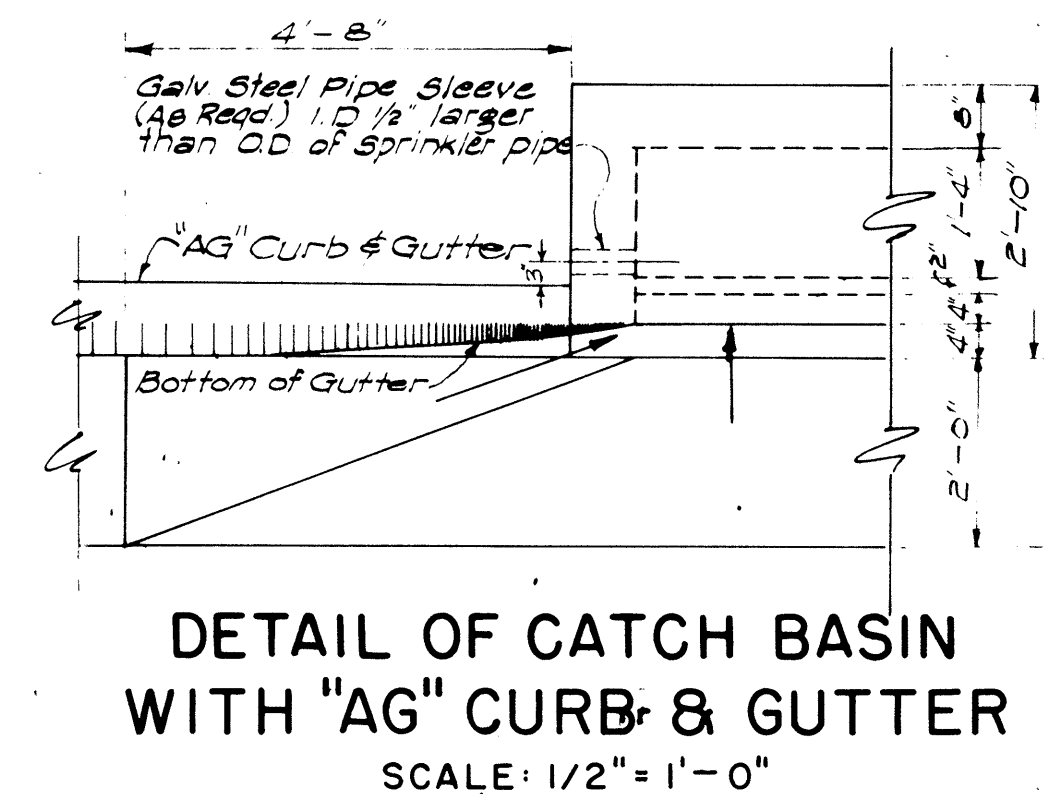
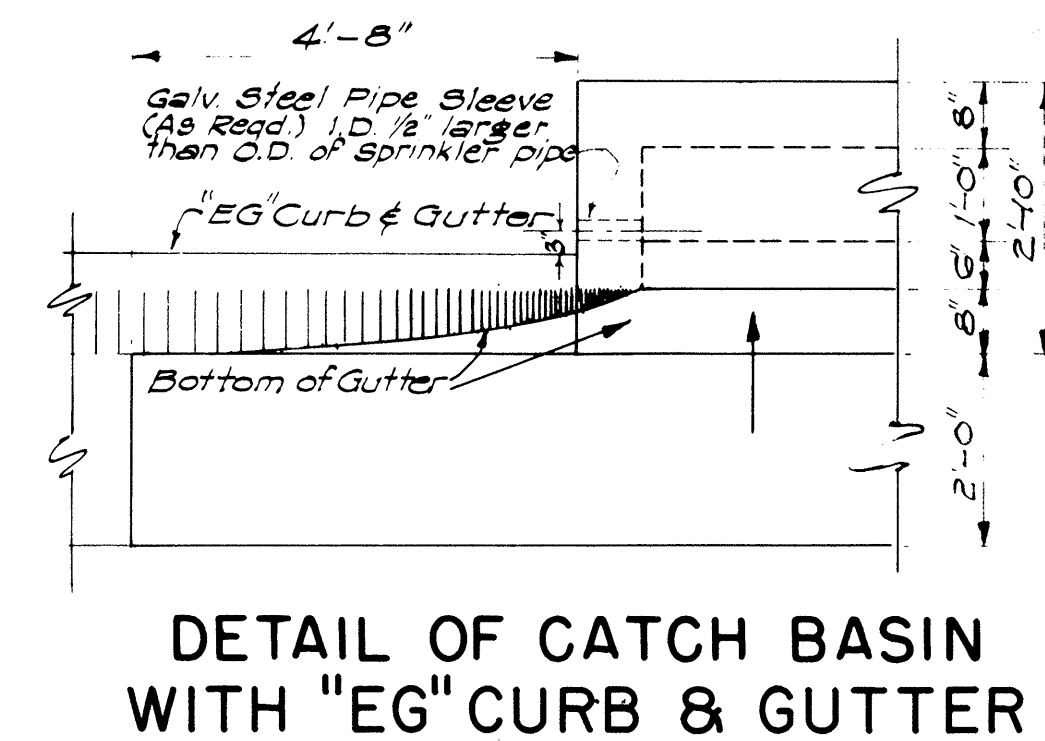
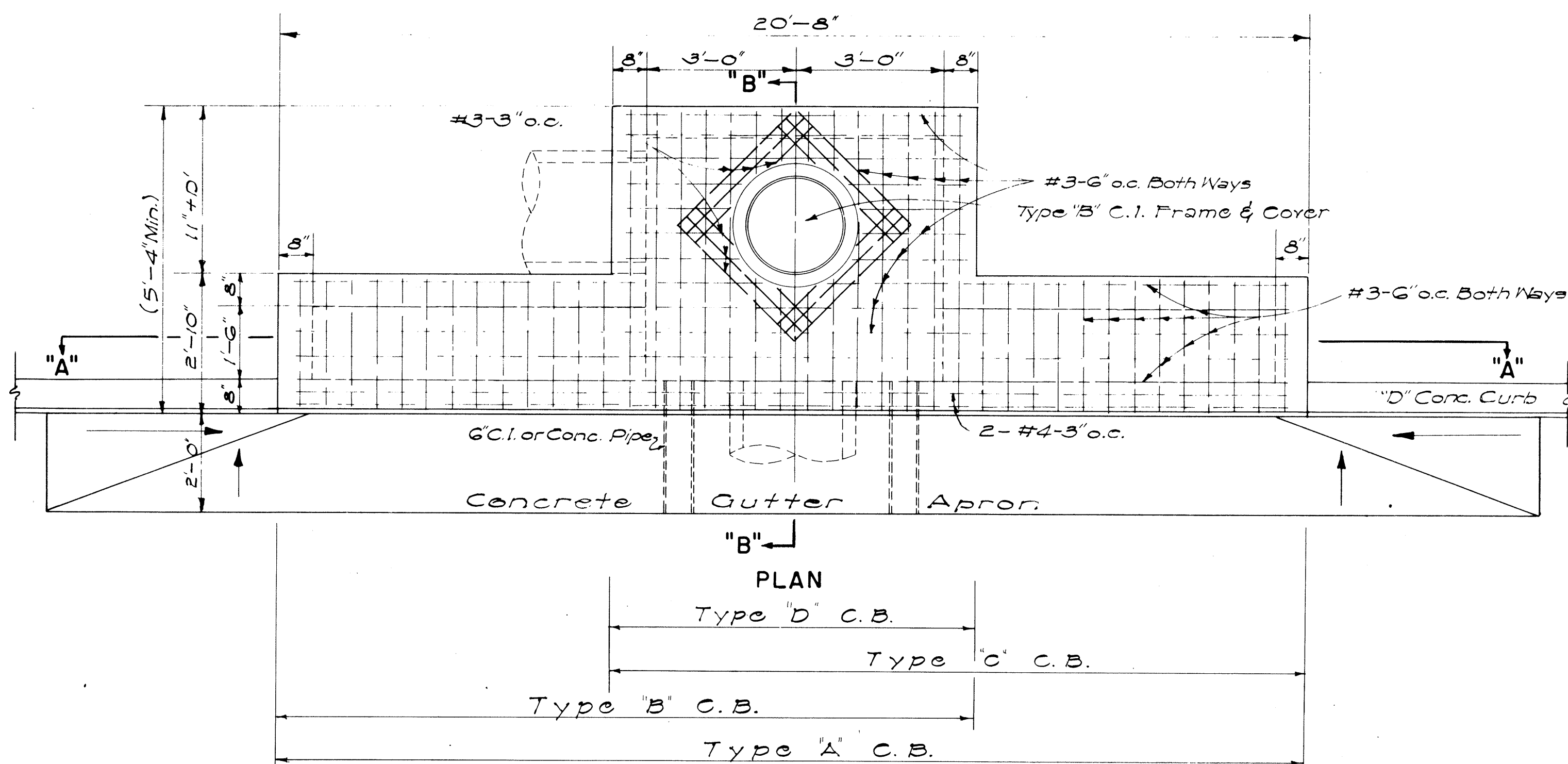
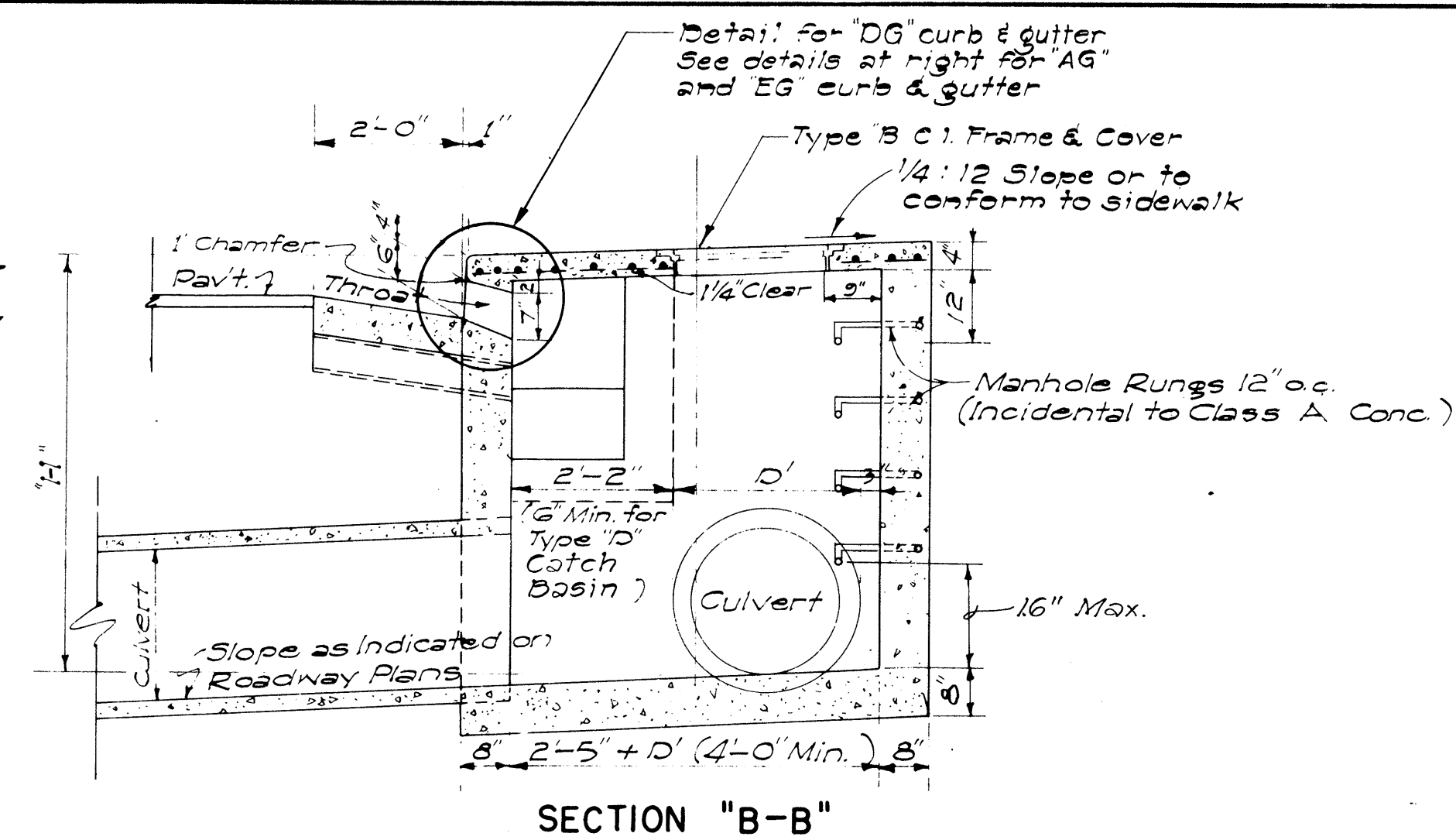
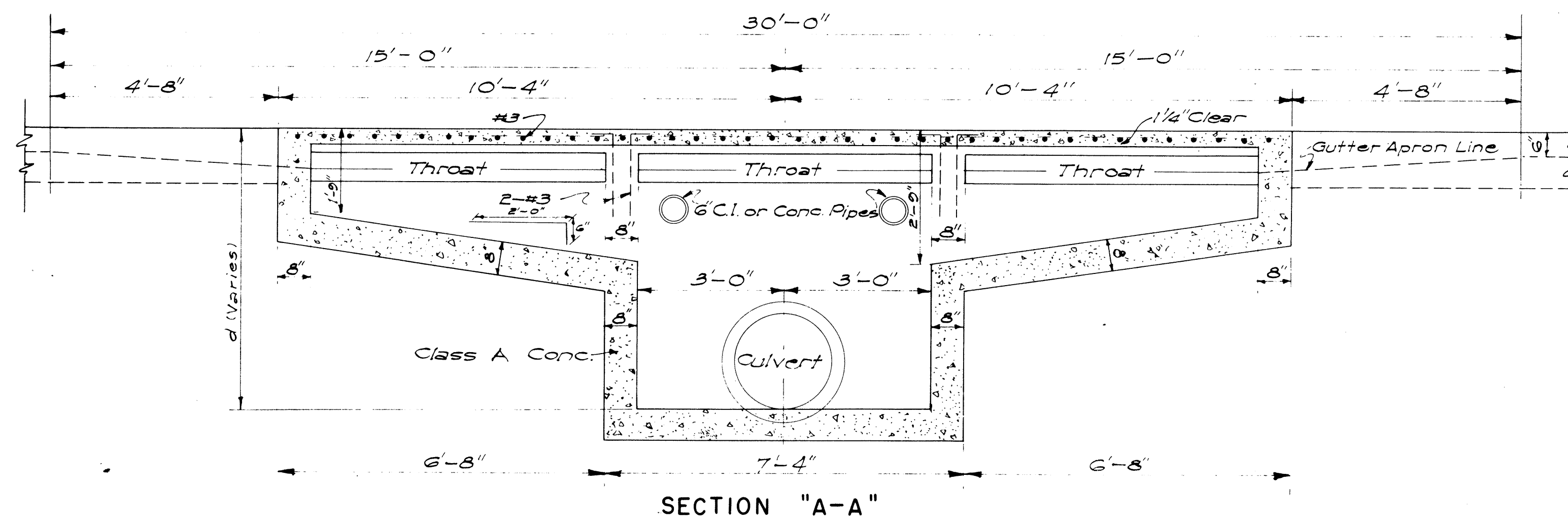


- NOTES:**
1. Section "F" similar but opposite hand.
  2. Construct concrete gutter apron as shown on DH-1 Type "C" C.B.

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
LAND TRANSPORTATION FACILITIES DIVISION  
**DRAINAGE DETAIL**  
Type "C" Catch Basin at  
Sta. 109+70.5 Rt. O.B. & Sta. 129+30 Rt. O.B.  
PALI HIGHWAY SAFETY IMPROVEMENTS  
West of Tunnels to Kamehameha Hwy.  
F.A. Project No. ROS-061-1(21)  
Scale: 3/4" = 1'-0" Date: Sept. 1977  
SHEET NO. 22 OF 25 SHEETS

TYPE "C" CATCH BASIN AT STA. 109+70.5 RT. O.B. AND STA. 129+30 RT. O.B.

|                  |                                |  |                      |
|------------------|--------------------------------|--|----------------------|
| ORIGINAL<br>PLAN | SURVEY PLOTTED BY <u>S. M.</u> |  | DATE <u>11/11/54</u> |
| NOTE BOOK        | DESIGNED BY <u>S. M.</u>       |  | "                    |
|                  | DRAWN BY <u>S. M.</u>          |  | "                    |
|                  | TRACED BY <u>S. M.</u>         |  | "                    |
|                  | QUANTITIES BY <u>S. M.</u>     |  | "                    |
|                  | CHECKED BY <u>S. M.</u>        |  | "                    |
| No. <u>100</u>   | SHEET OF 10 SHEETS             |  | "                    |



## DETAILS OF TYPES "A", "B", "C" AND "D" CATCH BASINS

SCALE: 1/2" = 1' - 0"

## GENERAL NOTES

1. Quantities based on  $d' = 5.75'$  and  $D' = 30'$ .
2. Quantities do not include concrete for Gutter Apron.
3. The Contractor shall install two 6" Cast Iron or Concrete Pipes as incidental to Class A Concrete for Construction Drainage. The Engineer shall determine the exact location in the field.
4. Culvert shall leave C.B. from any position and any direction indicated by plans or ordered by the Engineer. Culvert may both enter and leave C.B. so that C.B. will also act as Manhole.
5. The Contractor shall install Galvanized Steel Pipe Sleeves and Straps as incidental to Sprinkler System.
6. The type of curb and/or gutter (Type 1, 2, 3, etc.) shall conform to the type specified on the roadway plans.
7. Manhole Rungs (12" o.c.) are required when "H" is greater than 4 feet 6 inches. Only one rung (16 inches from the bottom) is required if "H" is 4 feet 6 inches or less. Type "B" Cast Iron Frame and Cover and Manhole Rungs may be placed at any location as ordered by the Engineer.

## ESTIMATED QUANTITIES

| Type                                                                                    | Class A Conc. | Struct. Exc. | Reinf. Steel | Gutter Length |
|-----------------------------------------------------------------------------------------|---------------|--------------|--------------|---------------|
| "A"  | 7.5 c.y.      | 24.7 c.y.    | 145 lb.      | 30' - 0"      |
| "B"  | 6.0 c.y.      | 21.5 c.y.    | 108 lb.      | 23' - 4"      |
| "C"  | 6.0 c.y.      | 21.5 c.y.    | 108 lb.      | 23' - 4"      |
| "D"  | 4.9 c.y.      | 16.5 c.y.    | 77 lb.       | 16' - 8"      |

APPROVAL RECOMMENDED:

*T. J. Jahan*  
HYDRAULIC DESIGN ENGINEER

12-17-69  
DATE

APPROVED:

Hussein Z. Zahedi  
ASSISTANT CHIEF, ENGINEERING

12-17-69  
DATE

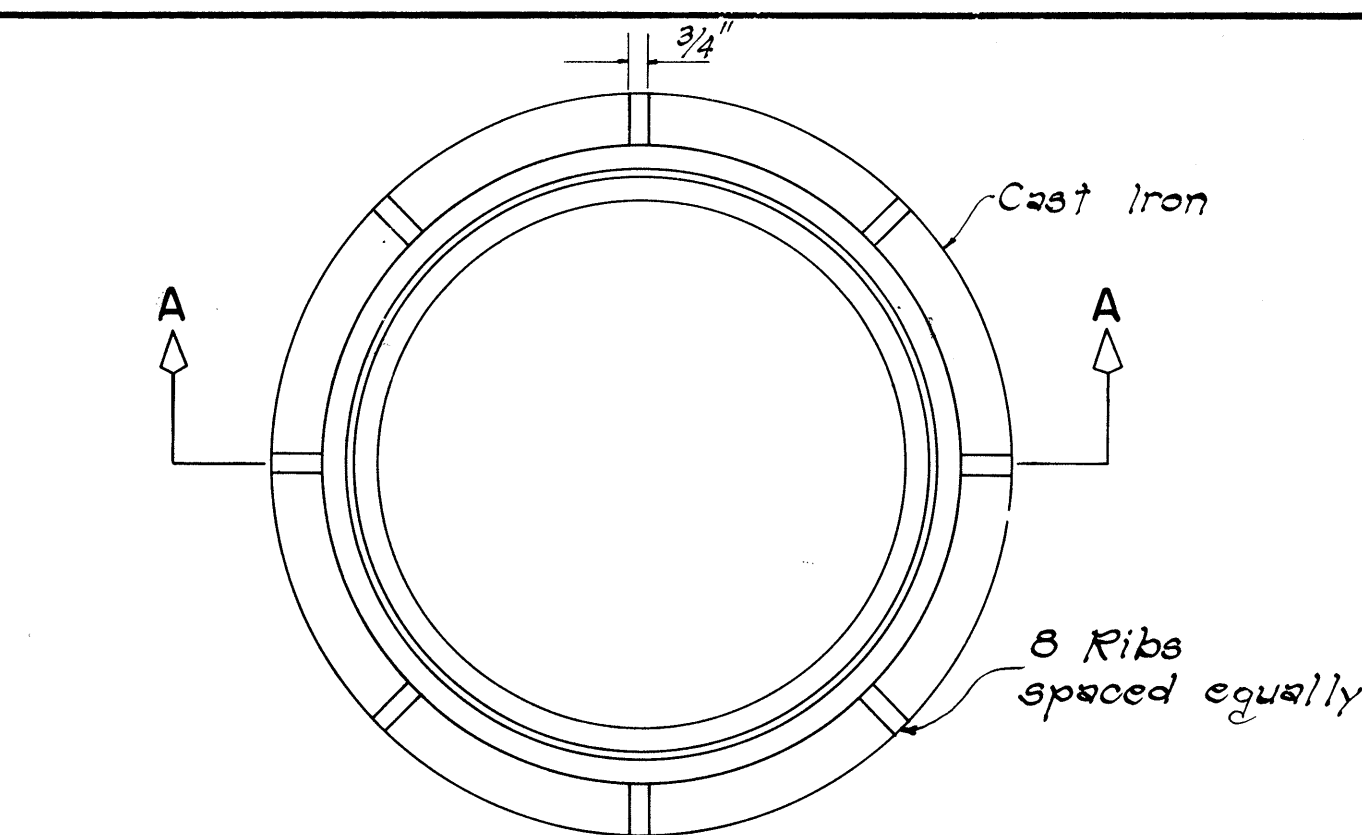
| NO. | REVISION                                     | APPROVED BY | DATE    |
|-----|----------------------------------------------|-------------|---------|
| 1   | Spacing on Manhole Rungs to conform to OSHA. | H.T.        | 1-21-78 |

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
STANDARD DETAILS  
**CATCH BASINS**

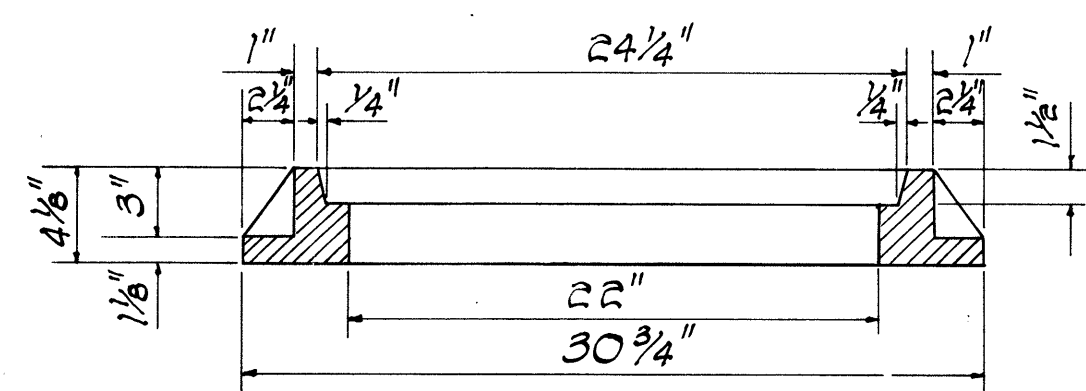
Scale: As Noted Date: July, 1969

SHEET NO OF SHEETS

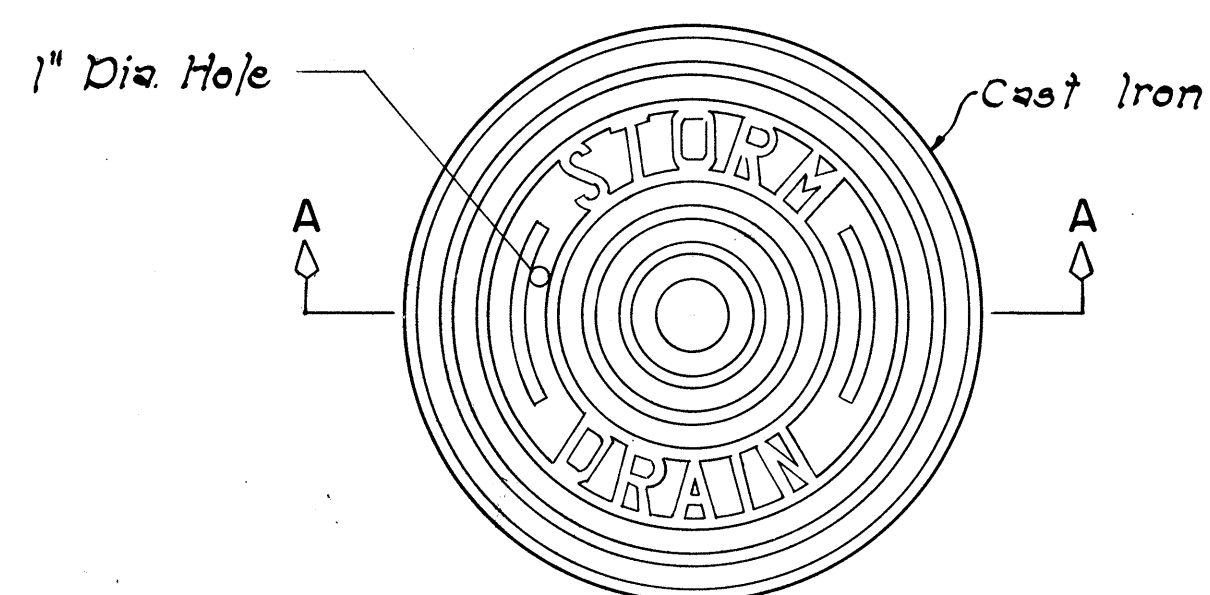
| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | 809-061-1(21)      | 1978        | 59        | 94           |



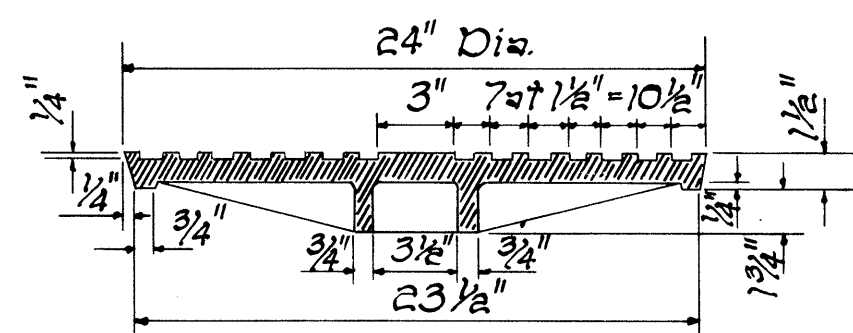
PLAN



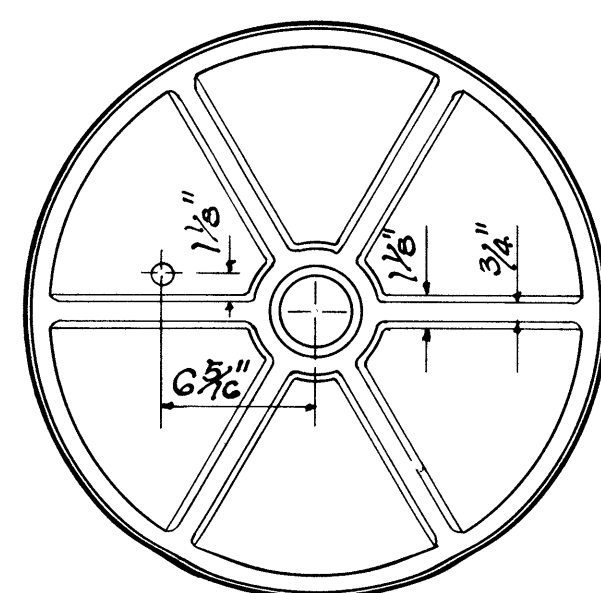
SECTION A-A



PLAN



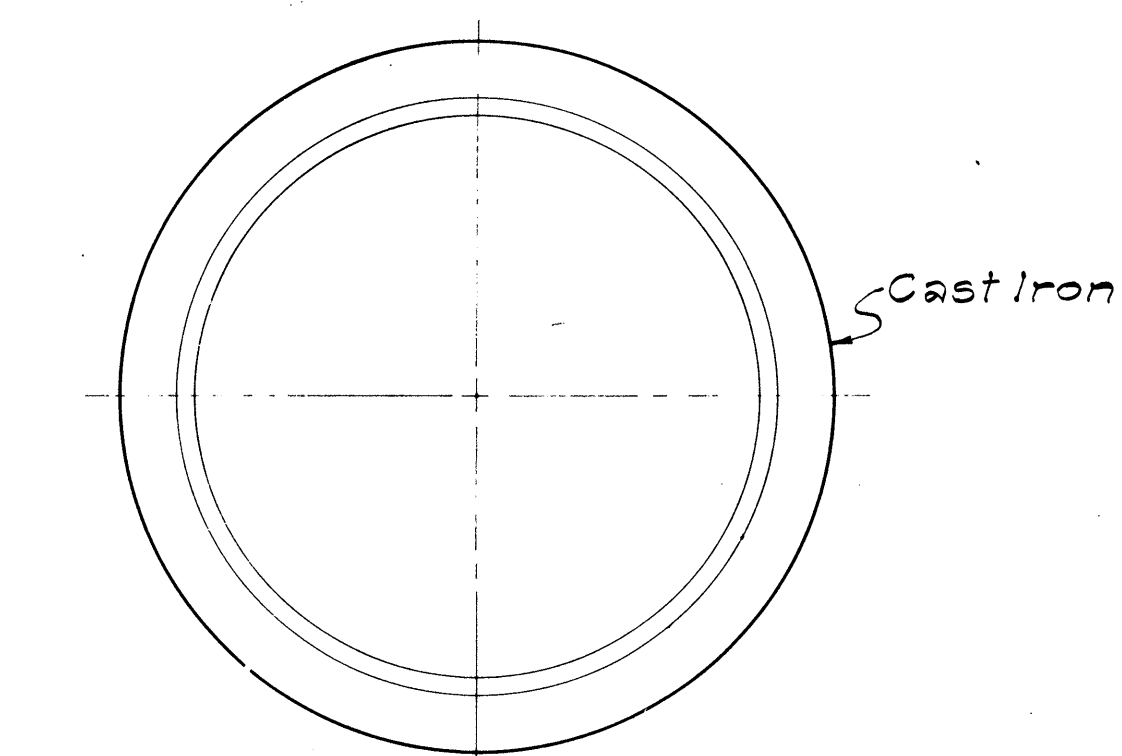
SECTION A-A



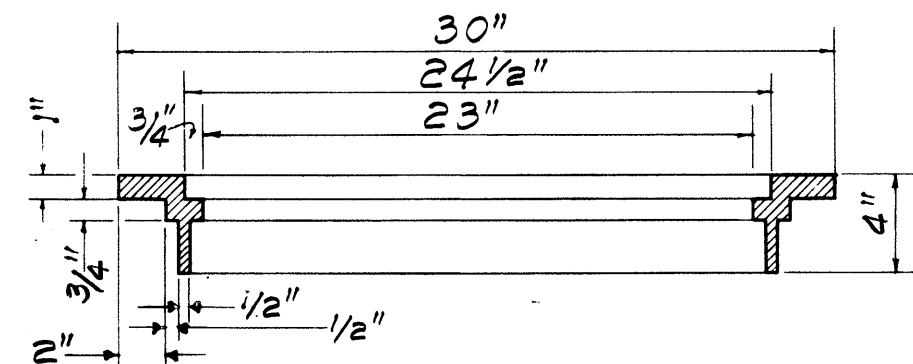
BOTTOM VIEW OF COVER

DETAILS OF TYPE "P"  
CAST IRON FRAME AND COVER

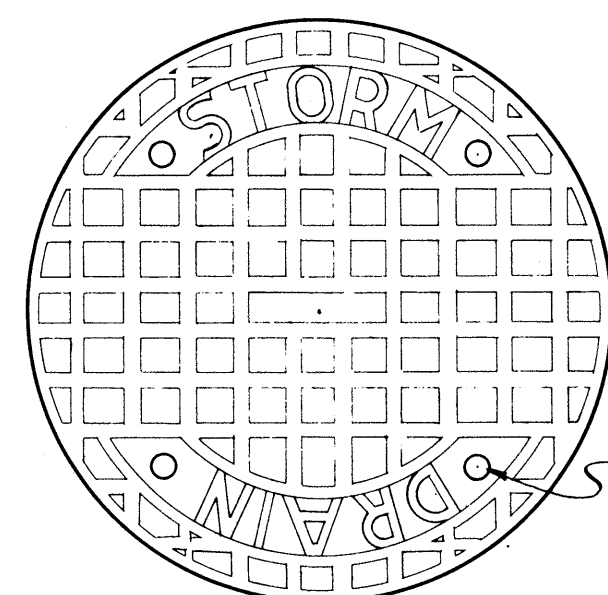
SCALE: 1-1/2" = 1'-0"



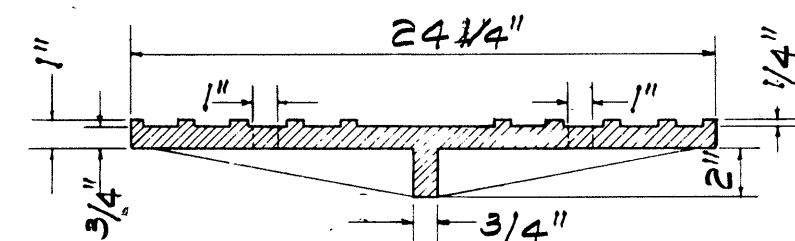
PLAN OF RIM



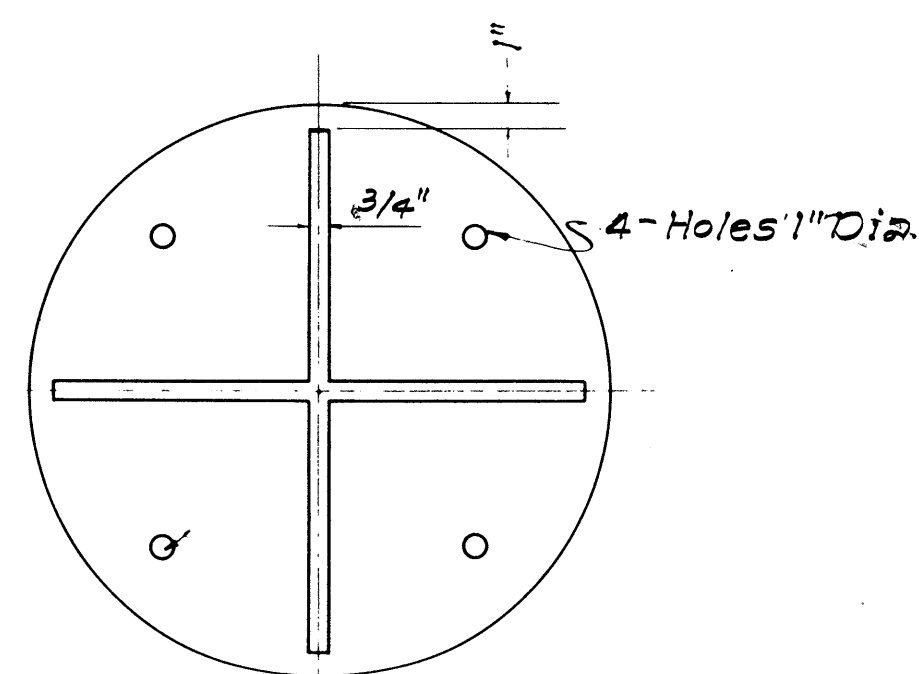
SECTION OF RIM



TOP VIEW OF COVER



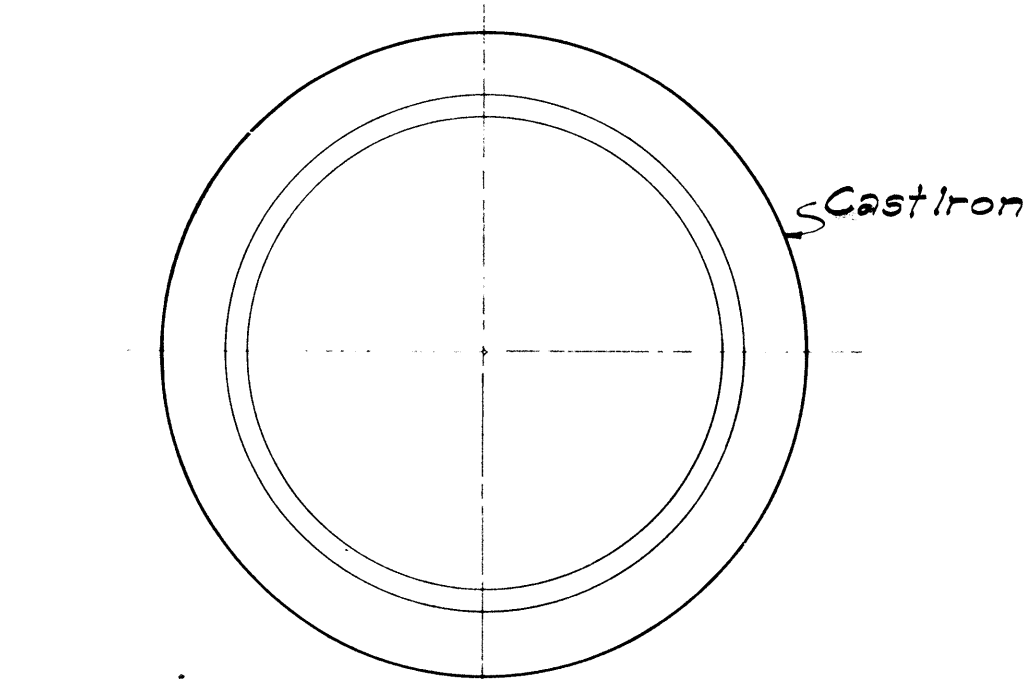
SECTION



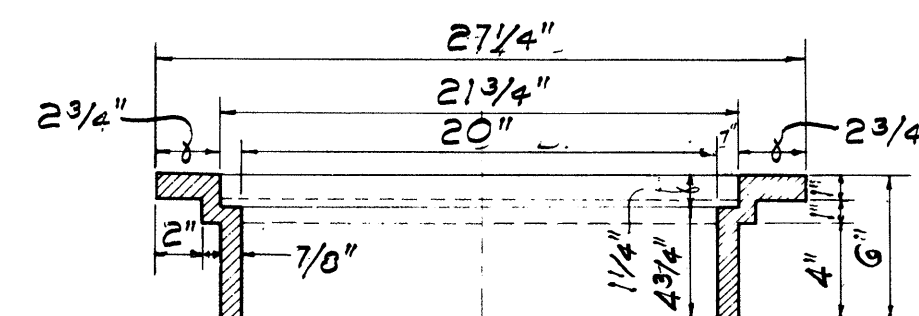
BOTTOM VIEW OF COVER

DETAILS OF TYPE "B"  
CAST IRON FRAME AND COVER

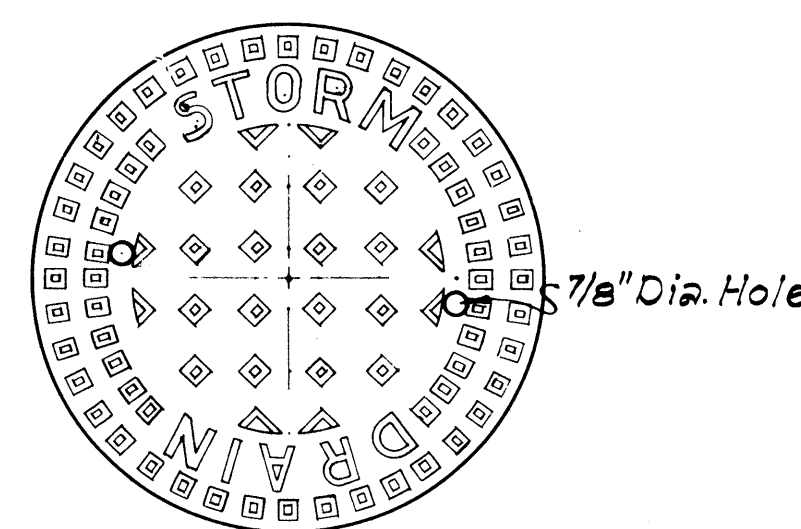
SCALE: 1-1/2" = 1'-0"



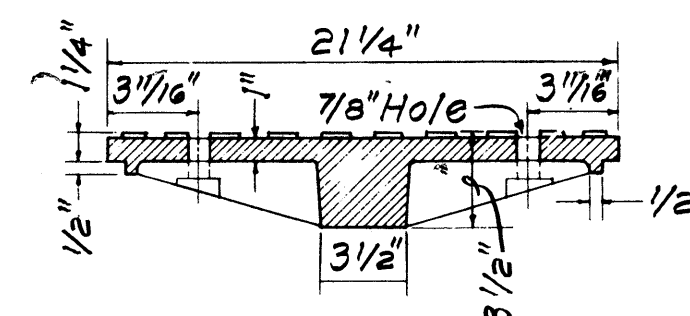
PLAN OF RIM



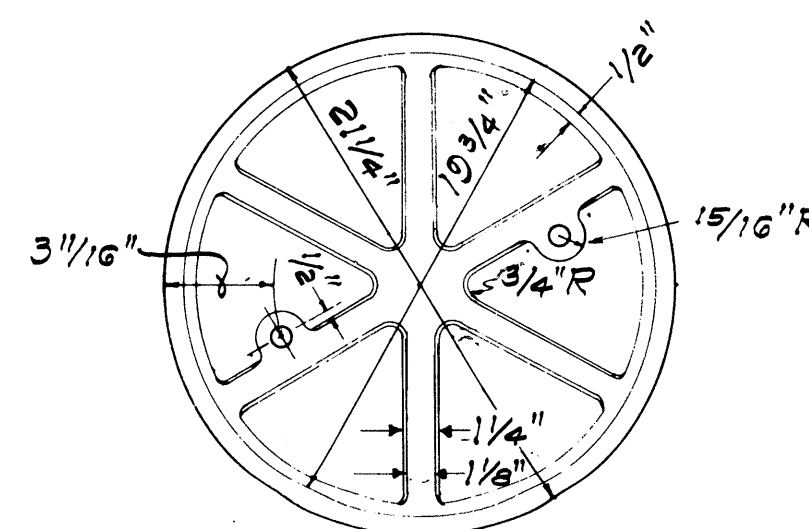
SECTION OF RIM



TOP VIEW OF COVER



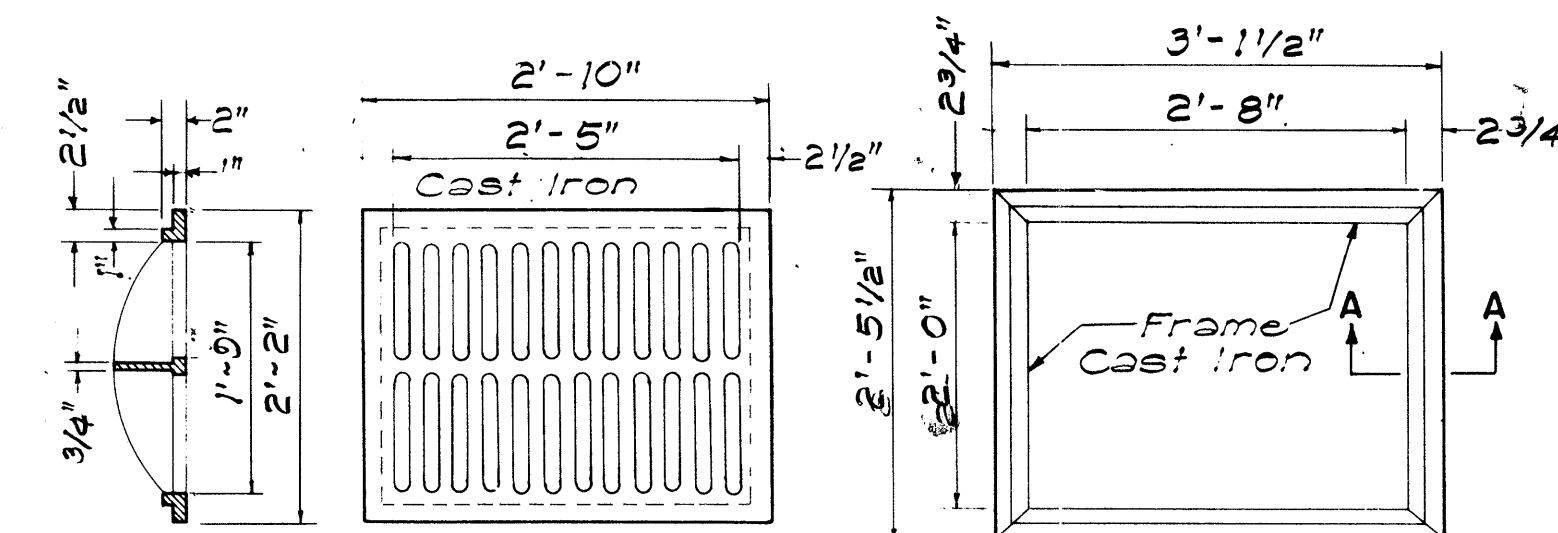
SECTION



BOTTOM VIEW OF COVER

DETAILS OF TYPE "A"  
CAST IRON FRAME AND COVER

SCALE: 1-1/2" = 1'-0"



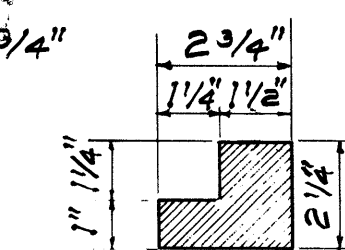
SECTION

TOP VIEW

TOP VIEW

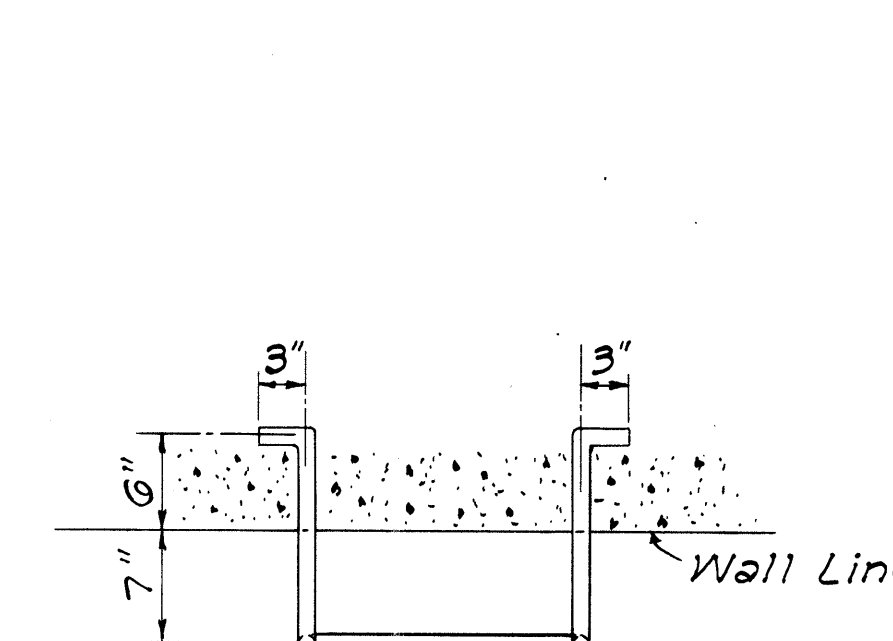
TYPE C C.I. FRAME AND GRATE

SCALE: 3/4" = 1'-0"



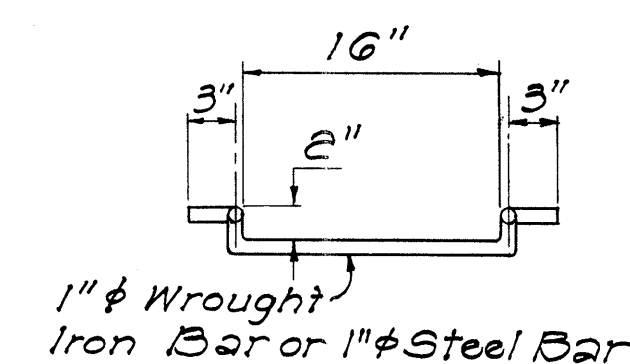
SECTION "A-A"

SCALE 3" = 1'-0"

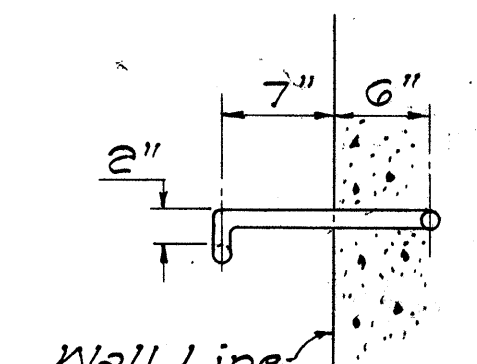


P L A N

PICTORIAL VIEW  
NOT TO SCALE



FRONT VIEW



SIDE VIEW

DETAILS OF MANHOLE RUNG

SCALE: 1" = 1'-0"

|                              |          |
|------------------------------|----------|
| APPROVAL RECOMMENDED:        | 12-17-67 |
| HYDRAULIC DESIGN ENGINEER    | DATE     |
| APPROVED:                    | 12-17-67 |
| ASSISTANT CHIEF, ENGINEERING | DATE     |

| NO. | REVISION                                     | APPROVED BY | DATE    |
|-----|----------------------------------------------|-------------|---------|
| 1.  | Detail of Type "P" Cast Iron Frame and Cover | H.T.        | 1-6-71  |
| 2.  | Details of Manhole Rungs to conform to OSHA. | H.T.        | 1-21-75 |
| 3.  | Option for Manhole Rungs                     | H.T.        | 1-18-76 |

|                                                                      |
|----------------------------------------------------------------------|
| STATE OF HAWAII<br>DEPARTMENT OF TRANSPORTATION<br>HIGHWAYS DIVISION |
| STANDARD DETAILS<br>CATCH BASIN AND<br>MANHOLE CASTINGS              |
| Scale: As Noted                                                      |
| Date: July, 1969                                                     |
| SHEET NO. OF SHEETS                                                  |

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | 505-001(2)         | 1973        | 60        | 94           |

### GENERAL NOTES

- Contractor has the option of using cast malleable iron, cast steel, welded, bolted, cast malleable iron end block or cast steel end block grate.
- Grates and Frames shall be hot dip galvanized after fabrication, see specifications.
- All welds  $\frac{3}{8}$ " unless otherwise noted.
- Center support assembly shall be used when two or more grates are specified. Incidental to Types A-9 or A-12 Frame and Grates.
- Refer to "Grate Bar Spacing Table" for Types A-9 and A-12 Grate dimensions.
- The various materials shall conform to specifications of ASTM as listed in the following tabulation and the Standard Specifications for Highway Construction.

| Material               | ASTM Designation |
|------------------------|------------------|
| Structural Steel       | A235             |
| Cast Steel             | A248             |
| Malleable Iron Casting | A275             |

| GRATE BAR SPACING TABLE |          |                       |                   |
|-------------------------|----------|-----------------------|-------------------|
| TYPE                    | NO. BARS | CLEAR BAR SPACING - W |                   |
| A-9                     | 9        | 2"                    | $1\frac{9}{16}$ " |
| A-12                    | 12       | $\frac{3}{8}$ "       | $1\frac{1}{4}$ "  |

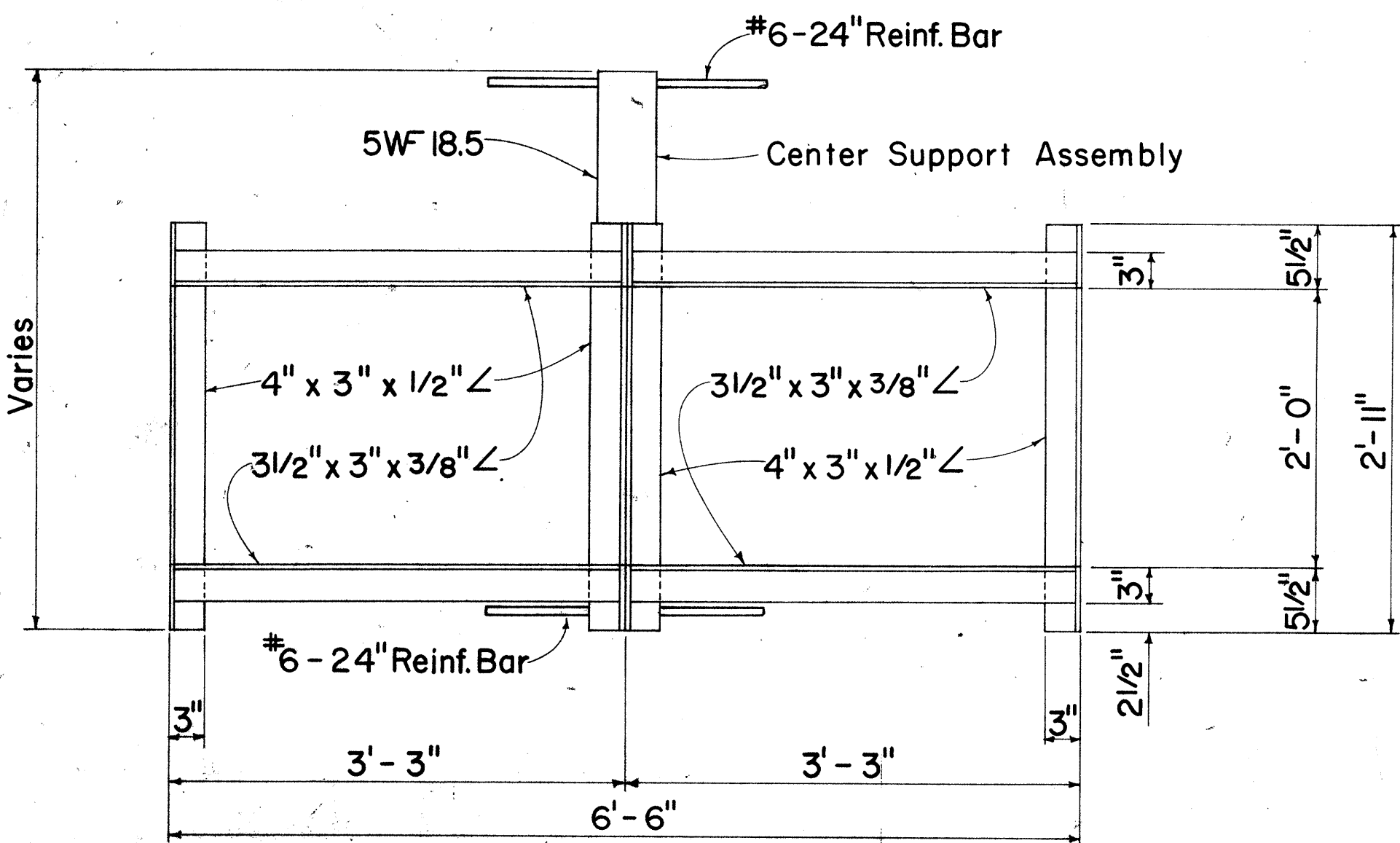
### NOTE:

- Type A-9 - Use in locations off the roadbed on all types of highways.
- Type A-12 - Use within the roadbed on all types of highways.

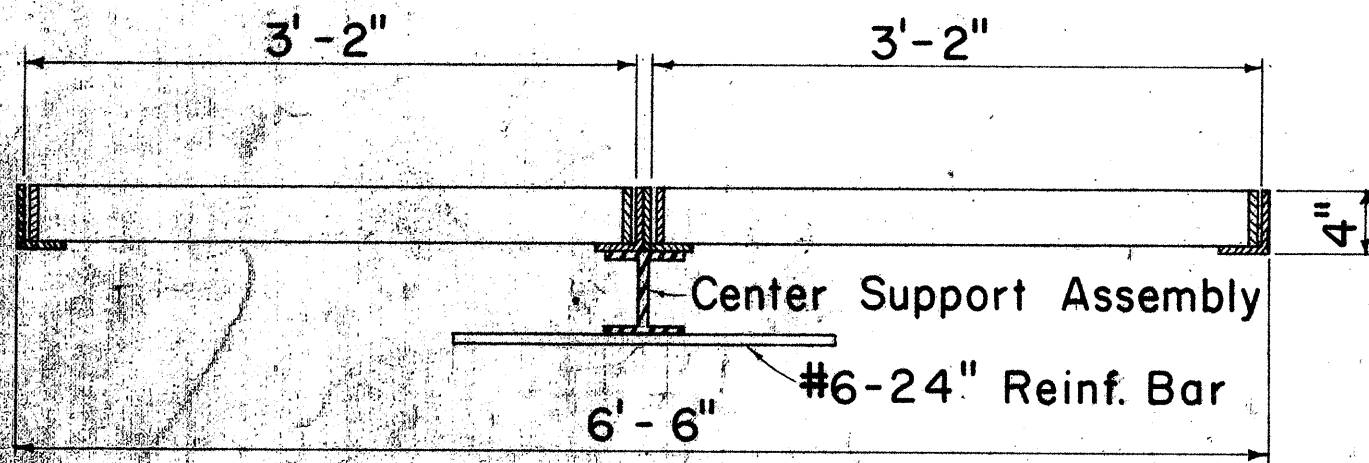
|                              |                |
|------------------------------|----------------|
| APPROVAL RECOMMENDED:        |                |
| HYDRAULIC DESIGN ENGINEER    | DATE: 12-17-89 |
| APPROVED:                    |                |
| ASSISTANT CHIEF, ENGINEERING | DATE: 12-17-89 |

|                                                                      |                 |
|----------------------------------------------------------------------|-----------------|
| STATE OF HAWAII<br>DEPARTMENT OF TRANSPORTATION<br>HIGHWAYS DIVISION |                 |
| STANDARD DETAILS                                                     |                 |
| TYPE A-9 AND A-12<br>FRAMES AND GRATES                               |                 |
| Scales: As Noted                                                     | Date: Aug. 1969 |

SHEET NO. OF SHEETS 01

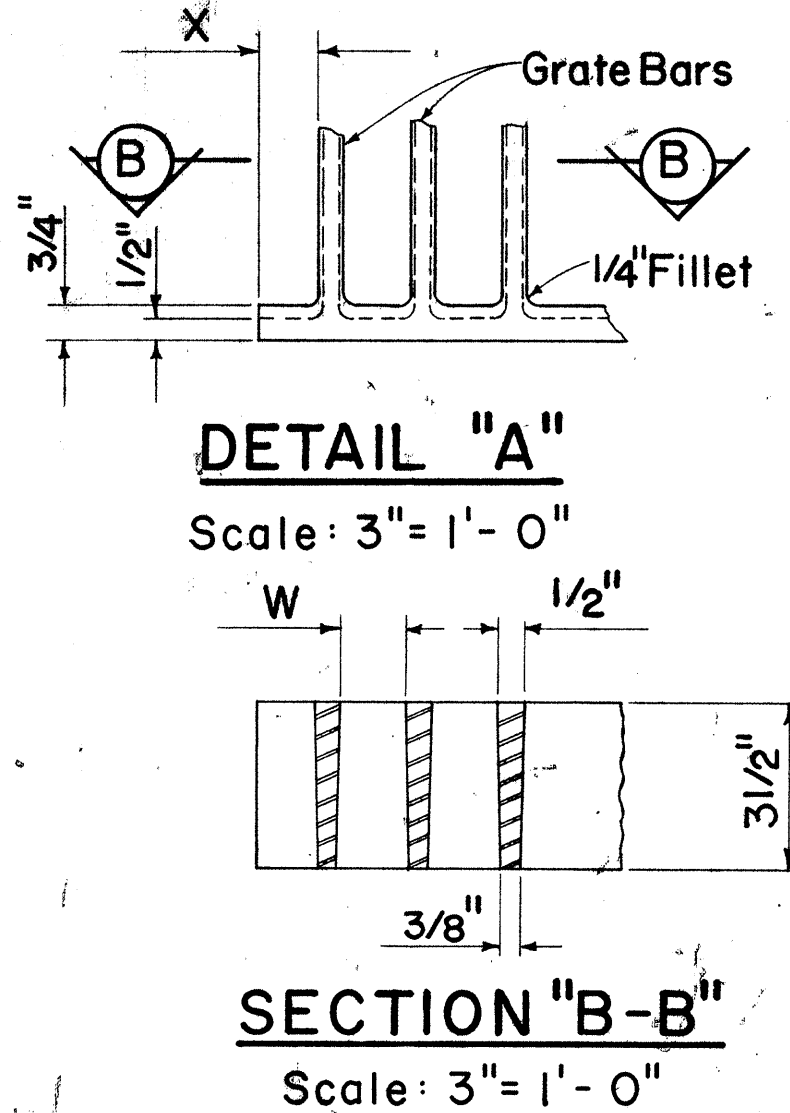


**PLAN**  
(Two or More Grates)



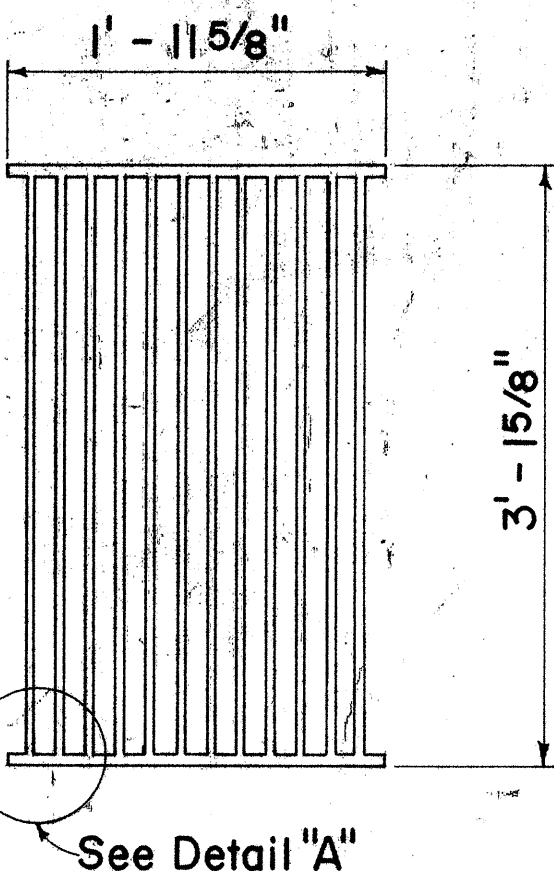
**LONGITUDINAL SECTION**  
(Thru Frame & Grate)

**FRAME DETAILS**  
Scale: 1" = 1' - 0"



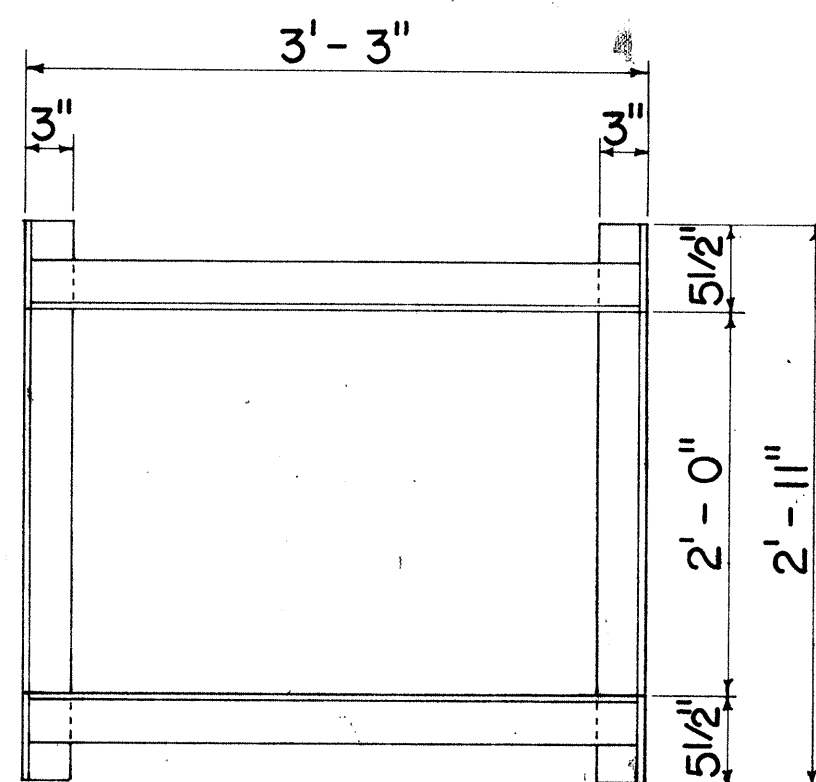
**DETAIL "A"**  
Scale: 3" = 1' - 0"

**SECTION "B-B"**  
Scale: 3" = 1' - 0"

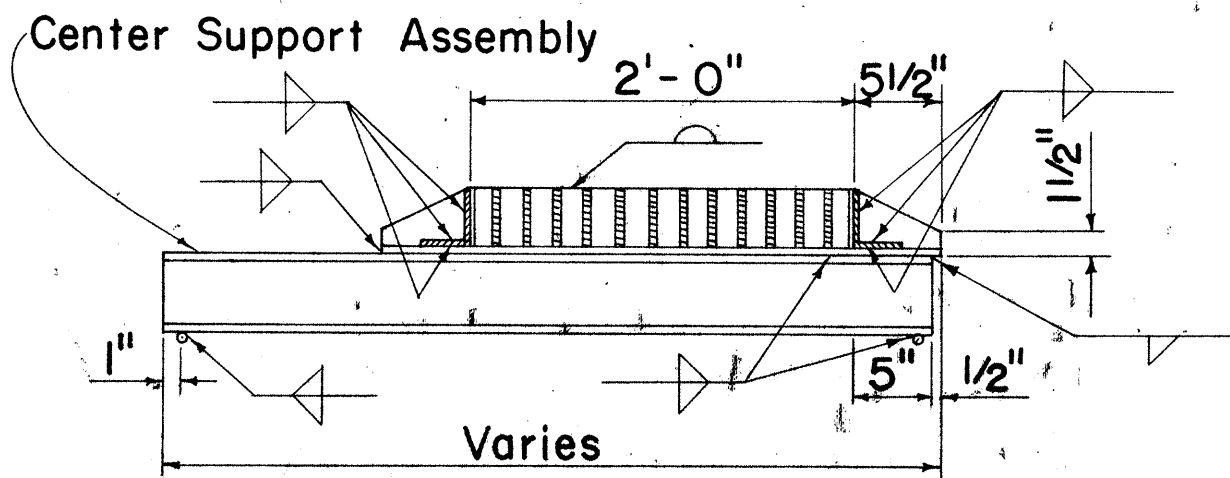


**PLAN**  
Scale: 1" = 1' - 0"

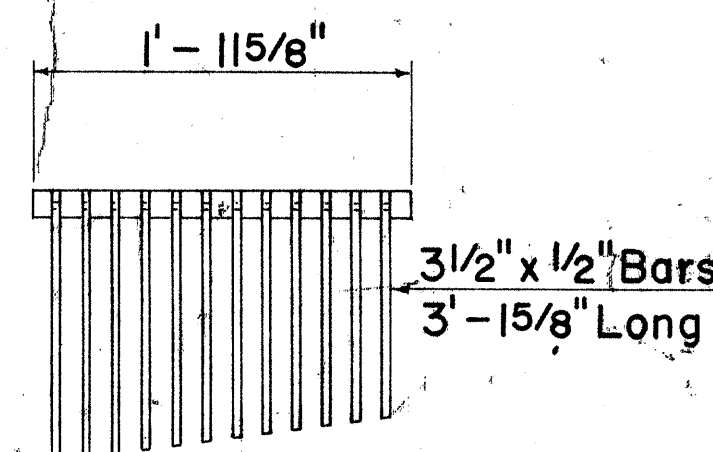
### ALTERNATIVE CAST MALLEABLE IRON OR CAST STEEL GRATE



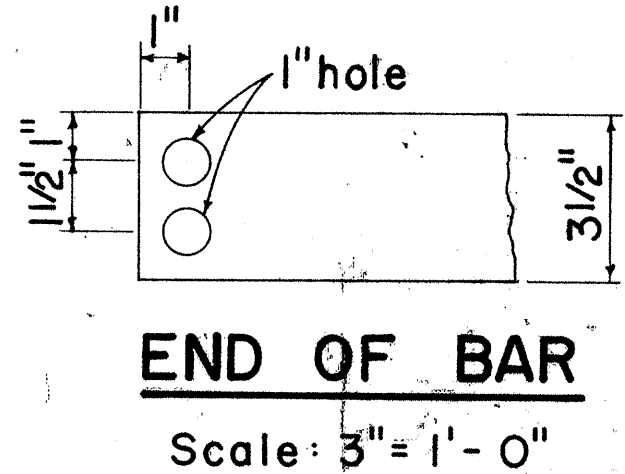
**PLAN**  
(Single Grate)



**CROSS SECTION**  
(Thru Frame & Grate)

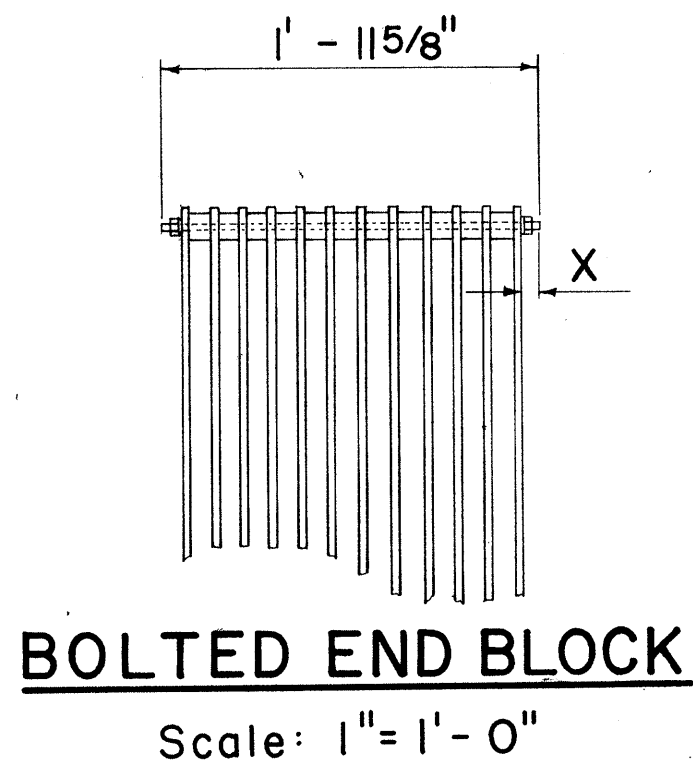


**CAST END BLOCK**  
Scale: 1" = 1' - 0"

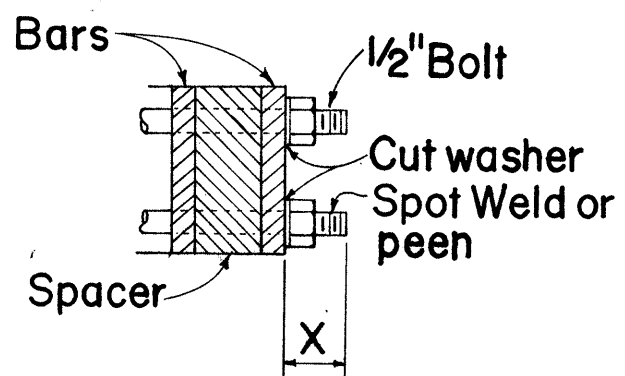


**END OF BAR**  
Scale: 3" = 1' - 0"

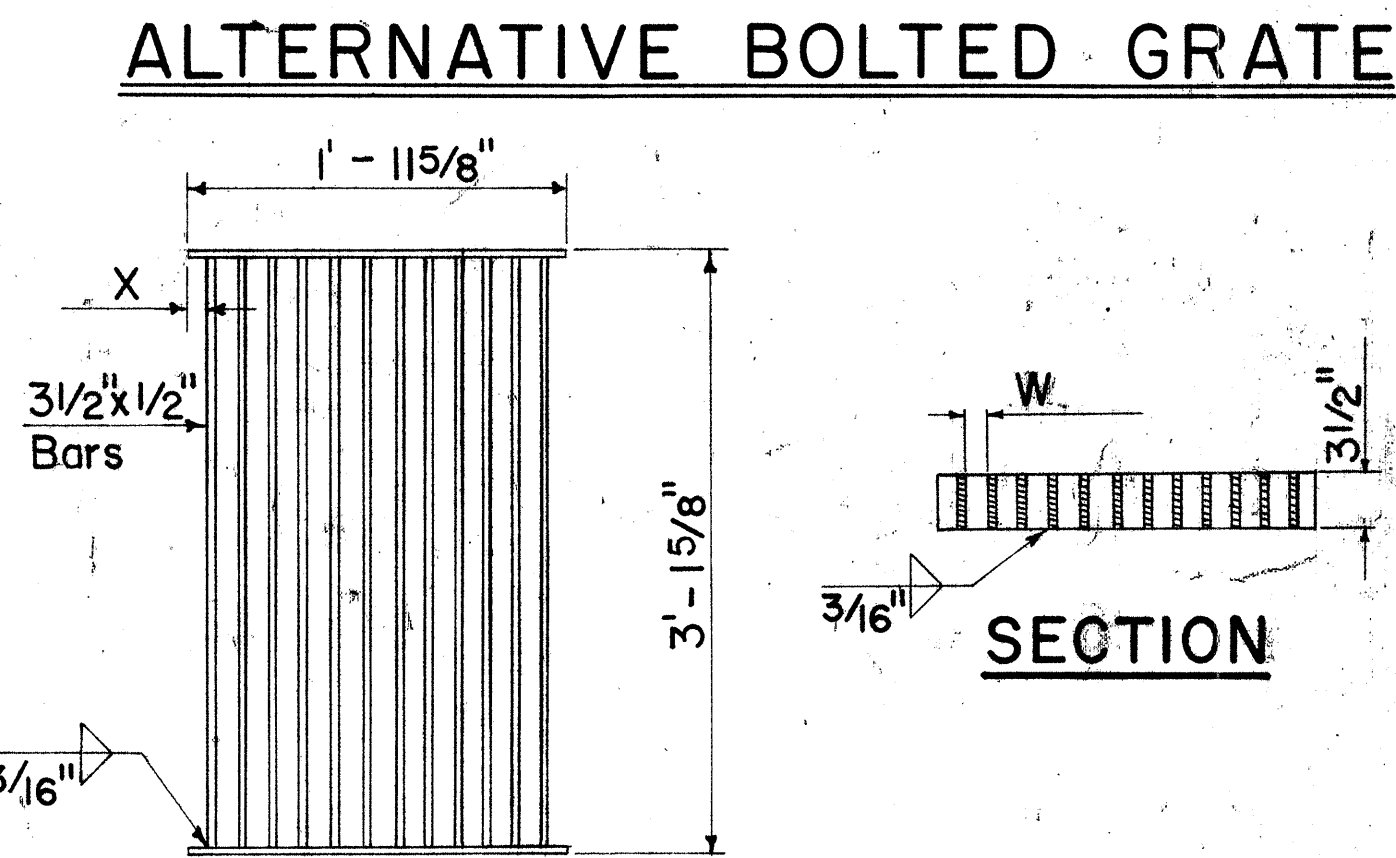
### ALTERNATIVE CAST MALLEABLE IRON OR CAST STEEL END BLOCK GRATE



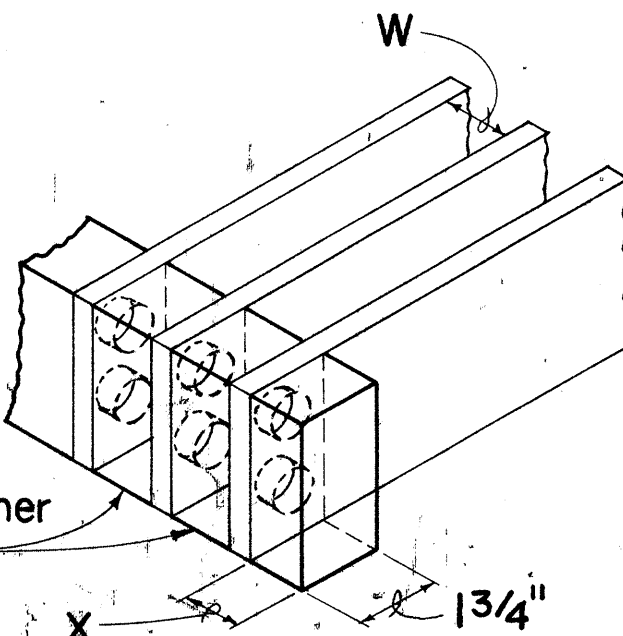
**BOLTED END BLOCK**  
Scale: 1" = 1' - 0"



**BOLTING DETAIL**  
Scale: 3" = 1' - 0"



**PLAN**  
**ALTERNATIVE WELDED GRATE**  
Scale: 1" = 1' - 0"



Both ends held together by solid casting

| NO. | REVISION | APPROVED BY | DATE |
|-----|----------|-------------|------|
|     |          |             |      |