

TRAFFIC SIGNAL NOTES

1. The Locations of the Traffic Signal Standards, Traffic Signal Standards W/Mast Arms, Pedestrian Push Buttons, Traffic Controller, Pullboxes, Conduits and Loop Detectors Shall Be Staked Out in the Field By the Contractor and Approval of the Locations Shall Be Obtained From the Engineer Prior to Construction and Installation.
2. All Splicing Shall Be Done in the Pullboxes.
3. Furnishing and Installing the Conduit Stubouts (Pullboxes to Edge of Pavement) Will Not Be Paid For Separately But Shall Be Considered Incidental to the Various Control Items.
4. A Solid #8 Bare Copper Wire Shall Be Pulled With the Traffic Signal Control Cable For Equipment Ground. Cost Shall Be Incidental to the Installation of the Control Cable.
5. All Traffic Signal Controller Equipment Shall Be Completely Wired in the Cabinet and Shall Control the Traffic Signals as Called For in the Plans.
6. The Contractor Shall Install One Meter Socket and 50 Amp. Breaker as Shown On the Plans in Accordance With MECO Requirements. The Meter Shall Be Mounted On the Existing Power Pole Between 5 Feet and 6 Feet Above Ground. For Details, See Electrical Drawings Meter Socket Shall Be 4-Prong, Complete With a Manual Circuit Closing Device.
7. The Loop Amplifier Units Furnished For This Project Shall Be Capable of Operating the Loop Detector Configurations Shown On the Plans. Cost For the Loop Amplifier Shall Be Incidental to the Installation of the Loop Detector.
8. Should Any Defect Be Encountered During the Warranty Period, the Manufacturer Will Be Notified and He Shall Promptly Correct Such Defect. Service Call (By Factory Qualified Representative) During the Warranty Period For Repairs or Other Maintenance Shall Be Answered Within 24 Hours and Shall Be Done At No Expense to the State. All Repairs Shall Be Done As Soon As Possible.
9. All Traffic Signal Work Shall Conform to the Requirements Of the "Manual On Uniform Traffic Control Devices For Streets and Highways", Federal Highway Administration (1988) and Amendments.
10. Locations Of Traffic Markings and Markers (Lane Lines, Stop Lines, Crosswalk, Etc.) Shown On the Plans Shall Be Verified With the Engineer Prior to the Installation Of the Traffic Signal System.
11. Installation of the Opticum Receiver Shall Conform to the Standard Details and Standard Specifications of the State Department of Transportation.
12. All Work Relating to Hawaiian Telephone Shall Be Done in Accordance With HTCO's Underground Specifications, Dated May 1992.
13. Provide All New Non-programmable Signal Heads With LED Signal Assemblies. Retrofit Existing Non-programmable Signal Heads to Remain or to Be Reused With LED Signal Assemblies.
14. Traffic Signals, Traffic Standards and Mast Arms Shall Conform with Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 1994 with 1998 and Interim Revisions for 105 mph winds.

TRAFFIC SIGNAL LEGENDS

C

New Traffic Signal Controller

1

New Traffic Signal Conduits & Cables

8

Existing Traffic Signal Conduits & Cables

New 12" RYG Traffic Signal Head

New 12" RY↑ Traffic Signal Head

New 12" RY← Traffic Signal Head

40'

12'

New Type II Traffic Signal Standard (Mast Arm Length, and Signal Head Spacing as Specified), Unless Indicated Otherwise.

New Type I Traffic Signal Standard (height-10') Signal Heads as Specified

New Pedestrian Signal Head

New Type A Pullbox

New Type B Pullbox

New Type C Pullbox

New Type B Pullbox (street Lighting)

New Loop Detectors

Opticom Receiver

TRAFFIC SIGNAL SYSTEM
CONDUIT TRENCH SECTION

Not to Scale

NOTES:

1. The Metal Detectable Red Plastic Warning Tape shall be a minimum 5 mils thick and 4" wide with a continuous metallic backing and corrosion resistant 1± mil thick foil core. The message on the tape shall read, "CAUTION - STATE TRAFFIC SIGNAL AND/OR HWY LIGHTING BURIED BELOW," utilizing 1 1/2" inches series "C" black lettering. The message will be repeated with a 4 1/2" spacing between top line of message and start of next repeat. Tape shall be considered incidental to ductline cost.

2. The Contractor may begin backfilling the conduit trench when the concrete reaches 2000 psi compressive strength after 3 days.

3. Maximum four (4) Conduits per row for multiple conduit duct section.

4. After installing all the traffic signal cables, the Contractor shall duct seal all conduits in the pullboxes, traffic signal standards and traffic signal controller cabinet concrete base. The duct seal material shall be approved by the Traffic Signal Inspector/Engineer and shall not be paid for separately but considered incidental to the direct buried and /or concrete encased conduits.

FED. ROAD DIST. NO.	STATE	FEDERAL - AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-A311(3)	2002	102	159

DANIEL S. MIYASATO

LICENSED PROFESSIONAL ENGINEER

No. 3443-C

HAWAII U.S.A.

SATO & ASSOCIATES, INC.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

TRAFFIC SIGNAL PLAN

PUUNENE AVENUE WIDENING

Kuihelani Highway to Hansen Road

And

MOKULELE HIGHWAY WIDENING

Hansen Road to Vicinity of

Cane Haul Road Crossing

Federal - Aid Project No. NH-A311(3)

Scale: None

Date: October 2001

SHEET No. 1 OF 8 SHEETS

102

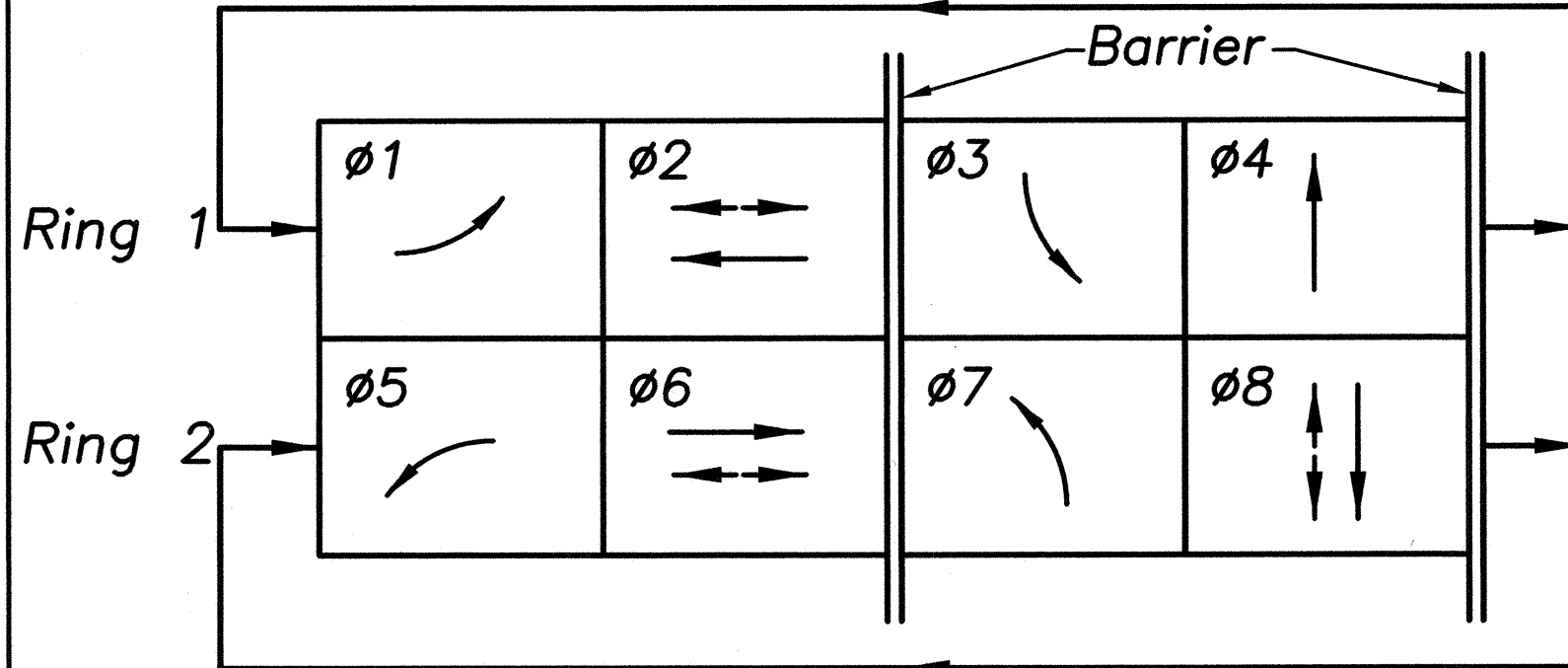
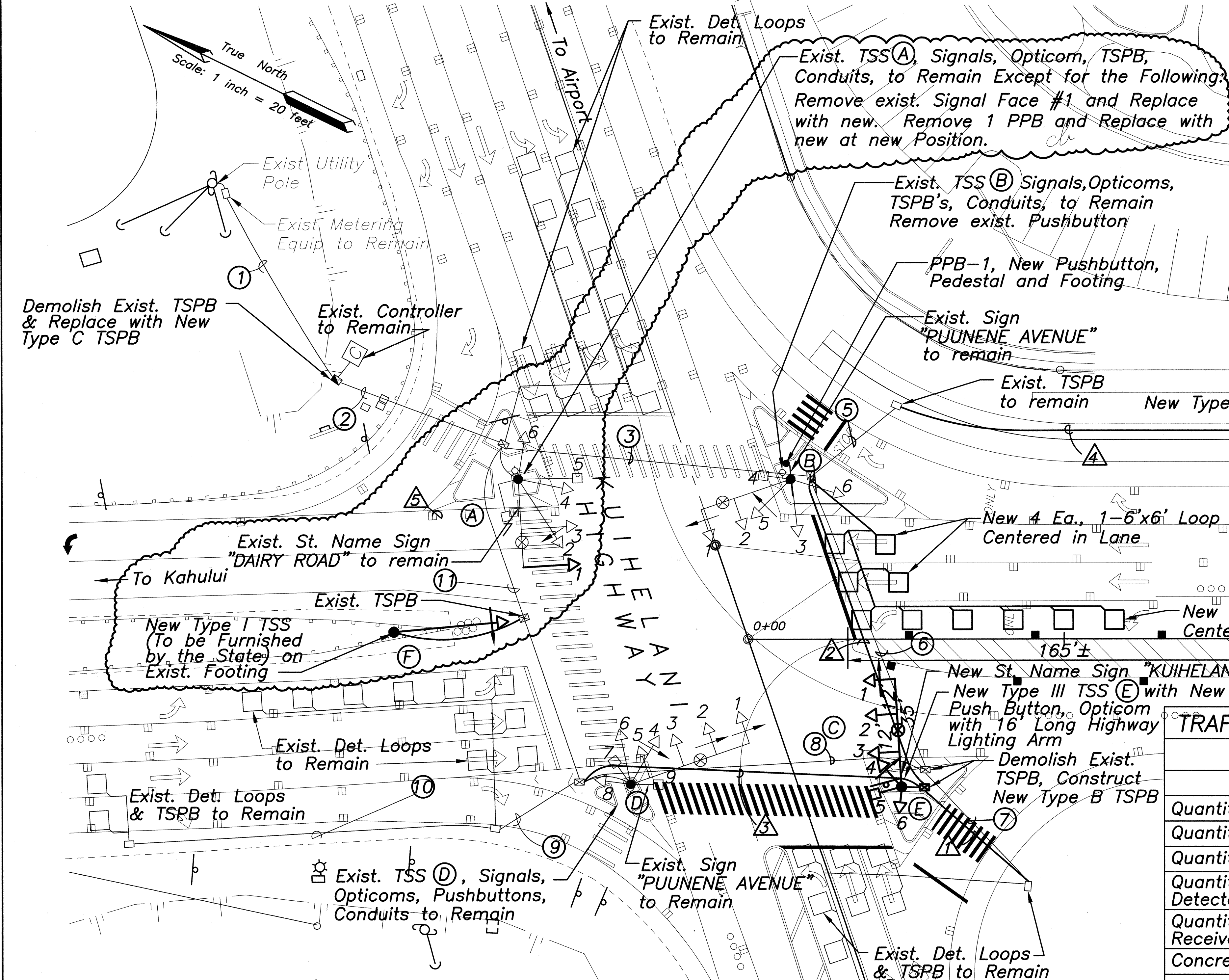
TRAFFIC SIGNAL HEAD SCHEDULE

Traffic Signal Head Type and Description				
Pole Letter Signal Head Number	A-4ex. D-6ex. A-6ex. D-8ex. B-3ex. E-3 B-6ex. E-6	A-1 D-5ex. A-3ex. E-2 B-2ex. D-3ex.	*F-1 *A-2ex. *D-2ex. *B-1ex. D-4ex. B-5ex. *E-1 E-4	A-5ex. E-5 A-7ex. B-4ex. D-7ex. D-9ex.
ex = Existing * = Programed Visibility Signals				

TRAFFIC SIGNAL SYSTEM CONDUIT AND CABLE SCHEDULE

	Delta Item No. (O or Δ)															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Quantity of 2" Conduit, See Note No. 1	6	7	4		1					1	1	5	1	4	4	1
Quantity of 3/C #4 Power Cable	1															
Quantity of 26/C #14 Control Cable	4	4	2								2		2	2		
Quantity of 2/C #14 Shielded Loop Detector and Pedestrian PB Cable	16	16	7							3	1	5	2	3		1
Quantity of 3/C #20 Shielded Opticom Receiver Cable	4	4	1								2				1	
Concrete Jacket																
Note: 1. All Conduits Shall Be Schedule 80 PVC, Unless Otherwise Noted.																
Existing Conduits & Cables to Remain Unless Noted	New Conduits & Cables															

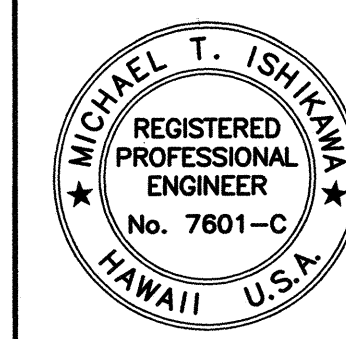
Note:
Exist TSS A, B & D to Remain.
Exist TSS C to be Salvaged.
Verify Exist. Cables in (3), (6), (8) & (11)
Before Laying Δ and Δ.
For Luminaire & Highway Lighting Power for TSS (E) See Electrical Plan



PHASE DIAGRAM

PUUNENE AVENUE/DAIRY ROAD
NORTH
SCALE: 1"=20'

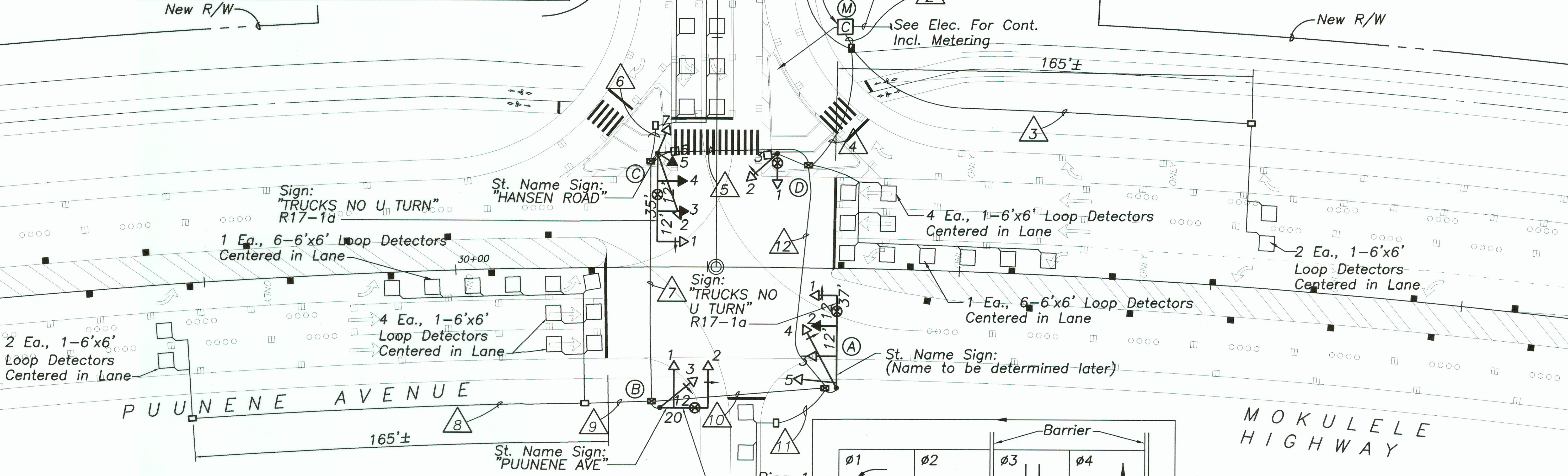
10/27/02	CHANGES TO TSS A AND ADDITION OF TSS F
DATE	REVISION



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
TRAFFIC SIGNAL PLAN
PUUNENE AVENUE WIDENING
Kuihelani Highway to Hansen Road
And
MOKULELE HIGHWAY WIDENING
Hansen Road to Vicinity of
Cane Haul Road Crossing
Federal - Aid Project No. NH-A311(3)
Scale: 1"=20' Date: October 2001
SHEET No. 2 OF 8 SHEETS

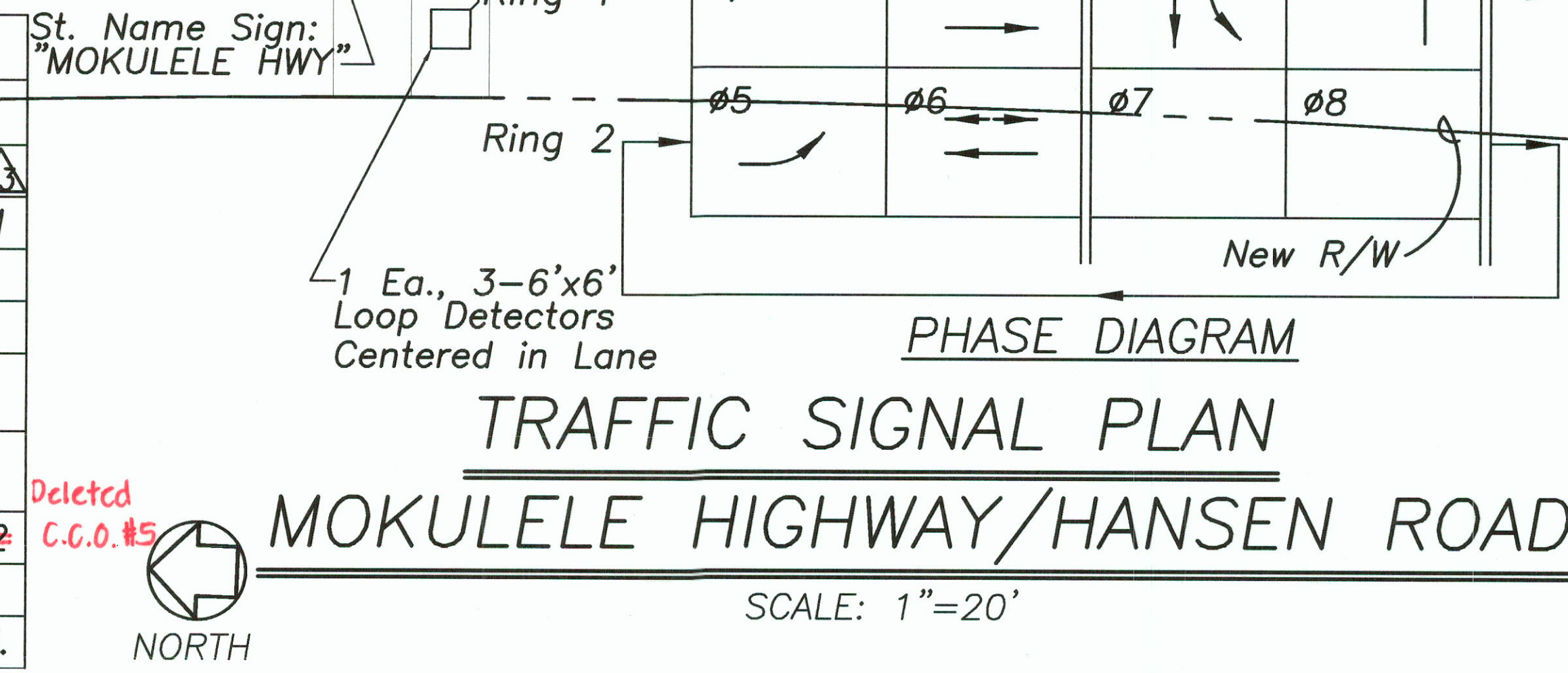
TRAFFIC SIGNAL HEAD SCHEDULE				
Traffic Signal Head Type and Description				
	12" RYG Traffic Signal Head	12" RY↑ Traffic Signal Head	12" RY← Traffic Signal Head	Pedestrian Signal Head
Pole Letter	A-3	A-2	A-1*	C-6
Signal Head Number	A-5	C-3	A-4	D-3
	B-1	C-4	B-2	
	C-2	C-5	B-3	
	C-7		C-1*	
	D-1		D-2	

* = Programmed Visibility Signals



TRAFFIC SIGNAL SYSTEM CONDUIT AND CABLE SCHEDULE													
New R/W	Delta Item No. (Δ)												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Quantity of 2" Conduit, See Note No. 1	10	1	8	4	1	2	1	1	3	1	4	1	
Quantity of 3/C #4 Power Cable													
Quantity of 26/C #14 Control Cable	4		4	2		2			2		2		
Quantity of 2/C #14 Shielded Loop Detector and Pedestrian PB Cable	11	1	10	3	2			1	3	3	1	4	
Quantity of 3/C #20 Shielded Opticom Receiver Cable	4		4	1							2		
Quantity Of 24/C #19 Interconnect cable	2												2
Concrete Jacket	•	•	•	•	•	•	•	•	•	•	•	•	•

Note: 1. All Conduits Shall Be Schedule 80 PVC, Unless Otherwise Noted.



1/8/02
Added Interconnect Provisions

DATE
REVISIONS

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
TRAFFIC SIGNAL PLAN
PUUNENE AVENUE WIDENING
Kuihelani Highway to Hansen Road
And
MOKULELE HIGHWAY WIDENING
Hansen Road to Vicinity of
Cane Haul Road Crossing
Federal - Aid Project No. NH-A311(3)
Scale: 1"=20' Date: October 2001
SHEET No. 3 OF 8 SHEETS

R:\moku-VE\trf-sig\HANSEN.dwg
JN: M9901.00
PLOT: 1=20
8/16/01

SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	
NO.	

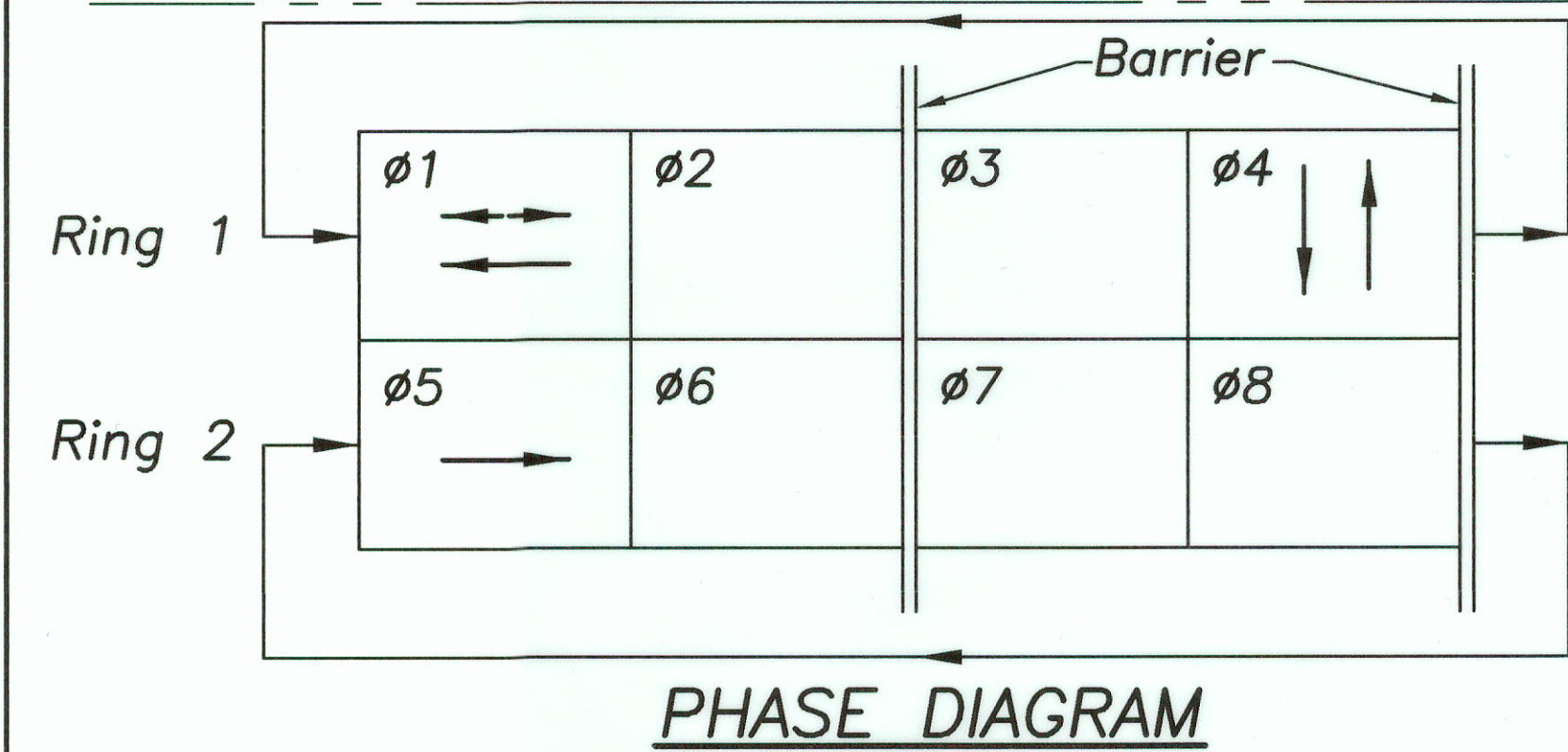
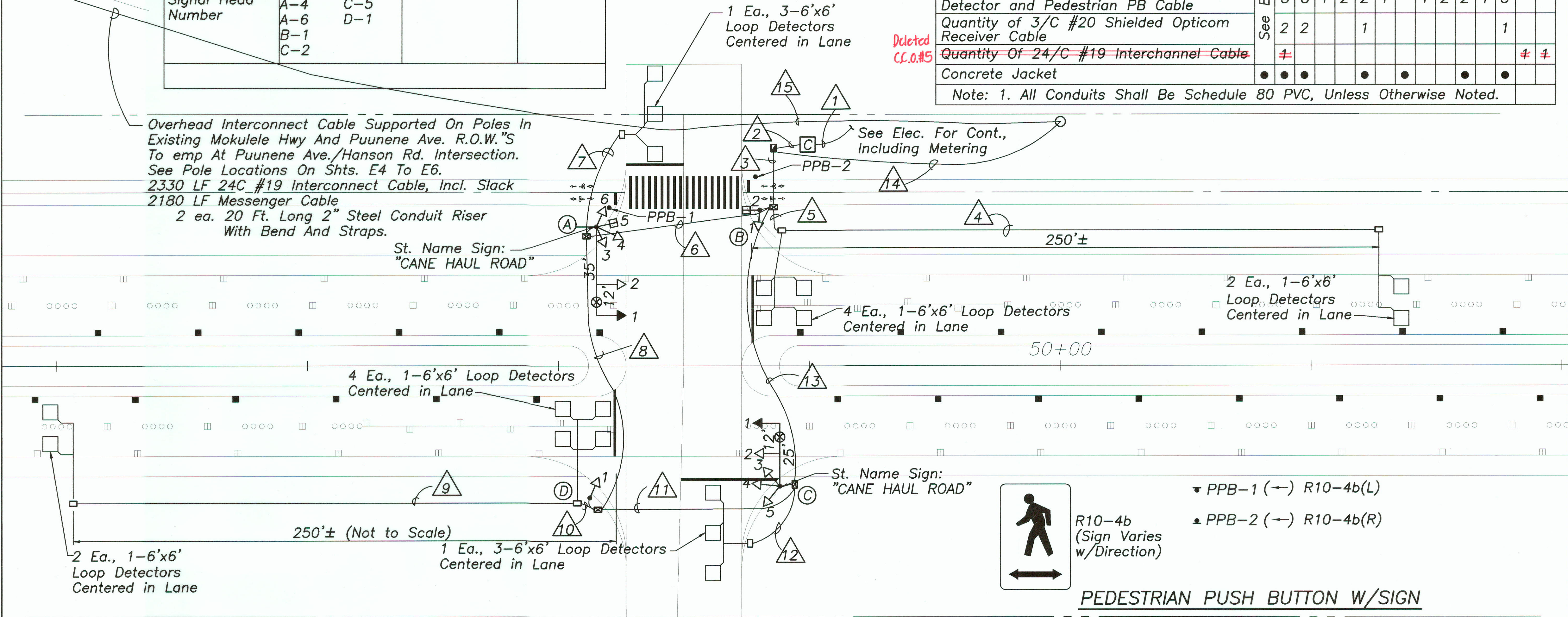
"AS-BUILT"

ADD.104

FED. ROAD DIST. NO.	STATE	FEDERAL - AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-A311(3)	2002	105	159

TRAFFIC SIGNAL HEAD SCHEDULE			
Traffic Signal Head Type and Description			
	12" RYG Traffic Signal Head	12" RY1 Traffic Signal Head	Pedestrian Signal Head
Pole Letter Signal Head Number	A-2 C-3	A-1 C-1	A-5 B-2
	A-3 C-4		
	A-4 C-5		
	A-6 D-1		
	B-1		
	C-2		

TRAFFIC SIGNAL SYSTEM CONDUIT AND CABLE SCHEDULE															
Delta Item No. (Δ)															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Quantity of 2" Conduit, See Note No. 1	7	6	1	1	4	1	2	1	1	3	1	3	1		
Quantity of 3/C #4 Power Cable															
Quantity of 26/C #14 Control Cable	2	2			1	1				1	1				
Quantity of 2/C #14 Shielded Loop Detector and Pedestrian PB Cable	8	8	1	2	2	1		1	2	2	1	3			
Quantity of 3/C #20 Shielded Opticom Receiver Cable	2	2			1							1			
Quantity Of 24/C #19 Interchannel Cable	1													1	1
Concrete Jacket	•	•	•			•	•			•	•				
Note: 1. All Conduits Shall Be Schedule 80 PVC, Unless Otherwise Noted.															



TRAFFIC SIGNAL PLAN MOKULELE HIGHWAY/CANE HAUL CROSSING

SCALE: 1"=20'

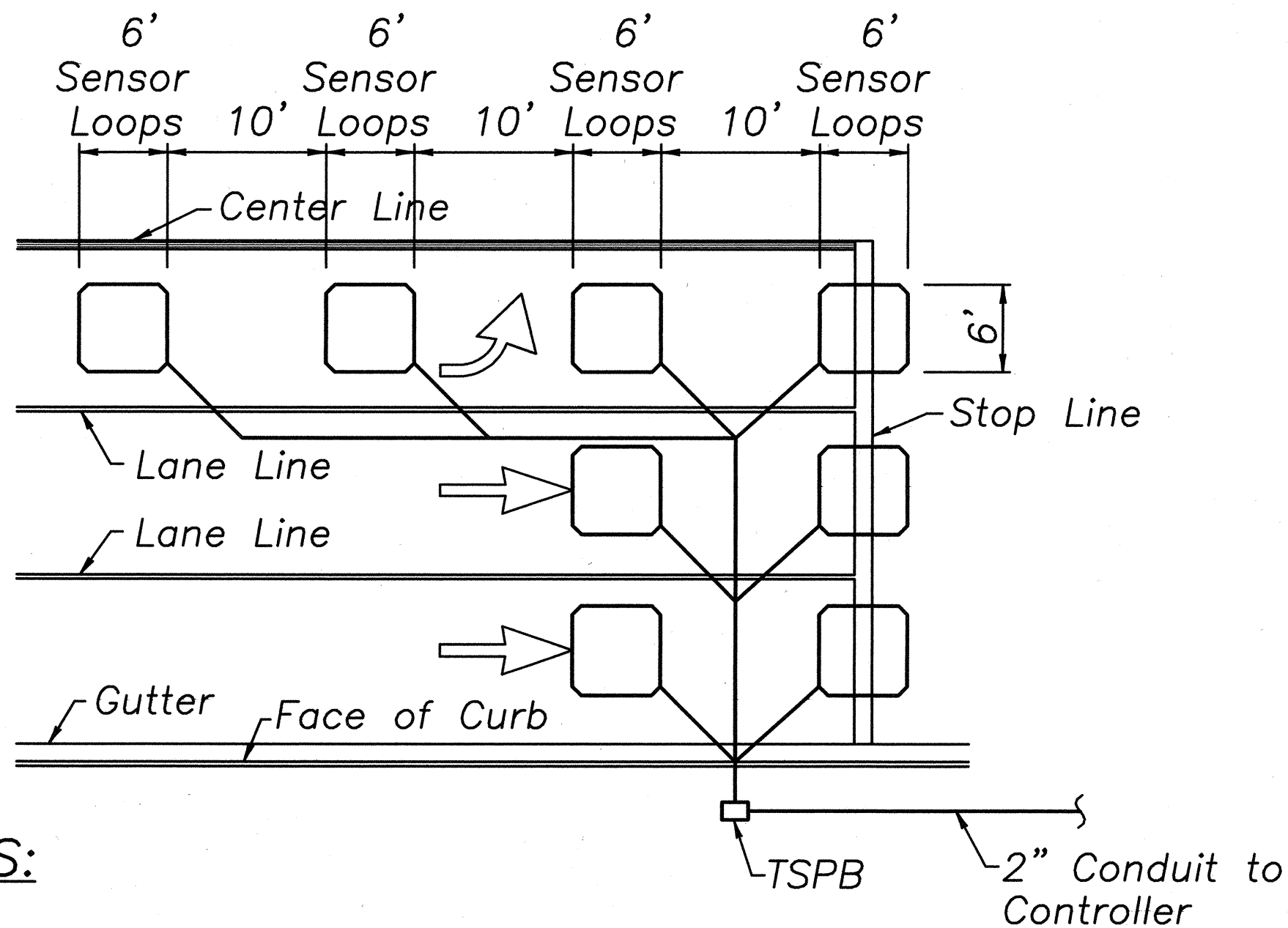
1/8/02	Added Interconnection Provisions
DATE	REVISIONS
	STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION TRAFFIC SIGNAL PLAN PUUNENE AVENUE WIDENING Kuihelani Highway to Hansen Road And MOKULELE HIGHWAY WIDENING Hansen Road to Vicinity of Cane Haul Road Crossing Federal - Aid Project No. NH-A311(3) Scale: 1"=20' Date: October 2001
	SHEET No. 4 OF 8 SHEETS

"AS-BUILT"

ADD.105

SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
CHECKED BY	
NOTE BOOK	
QUANTITIES BY	
No.	

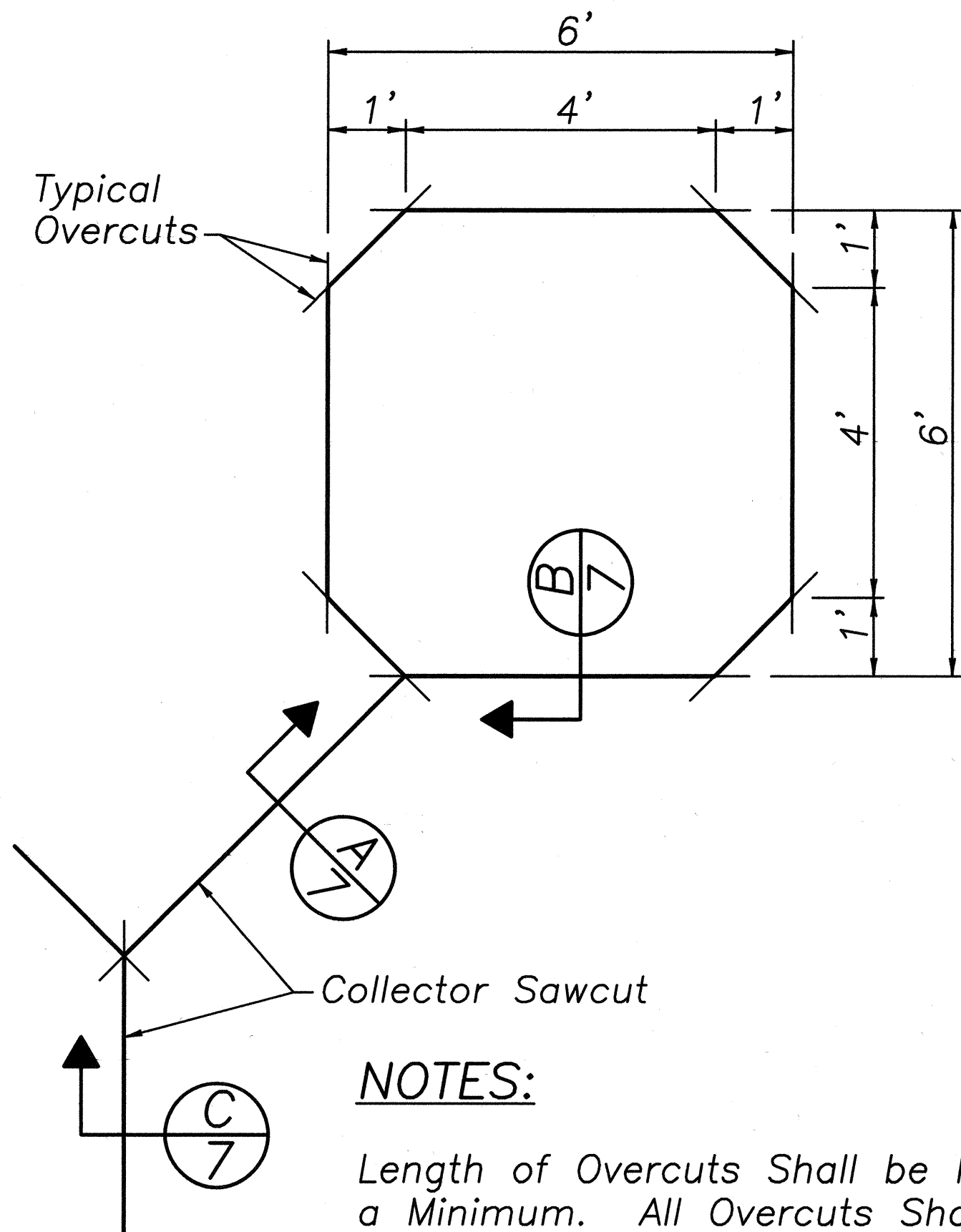
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HAWAII	HAW.	NH-A311(3)	2002	106	159



NOTES:

- Center Sensor Loops in Lanes.
- Collector Cables Shall Be Twisted 2 Turns Per Foot.
- Number and Loops and Locations Vary. See Project Plans.
- Number and Locations of Collector Sawcuts May Be Varied in the Field to Suit.

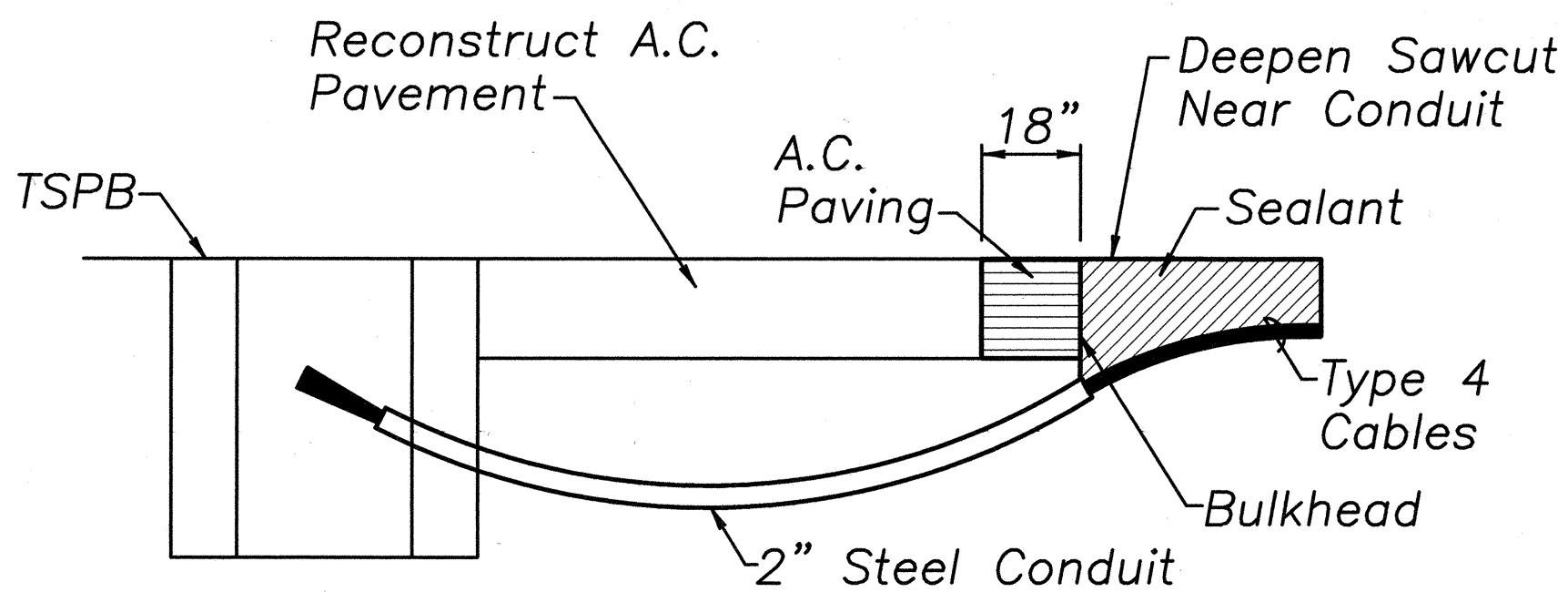
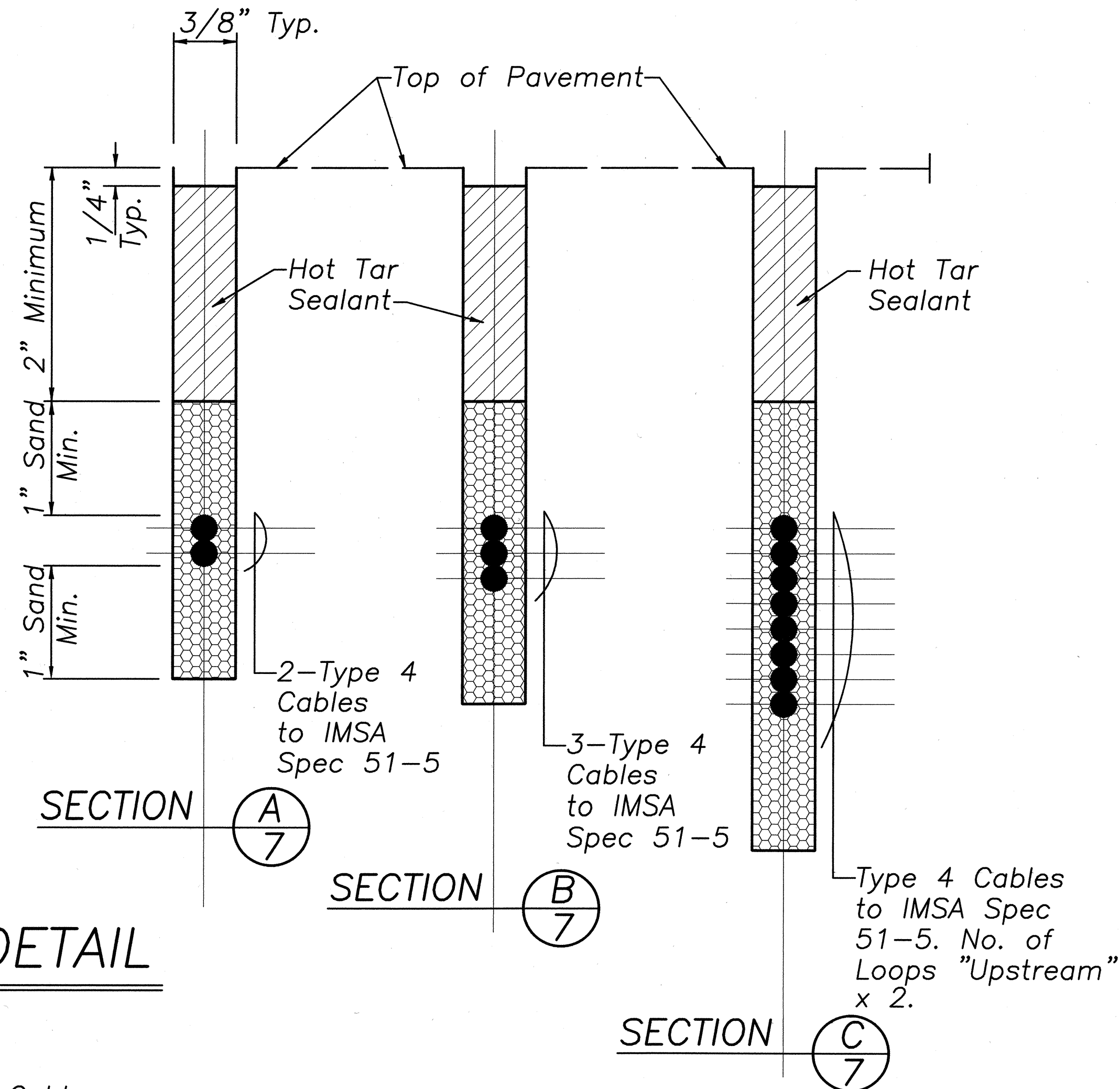
TYPICAL SENSOR LOOP LAYOUT



NOTES:

Length of Overcuts Shall be Kept to a Minimum. All Overcuts Shall be Back Filled With Hot Tar.

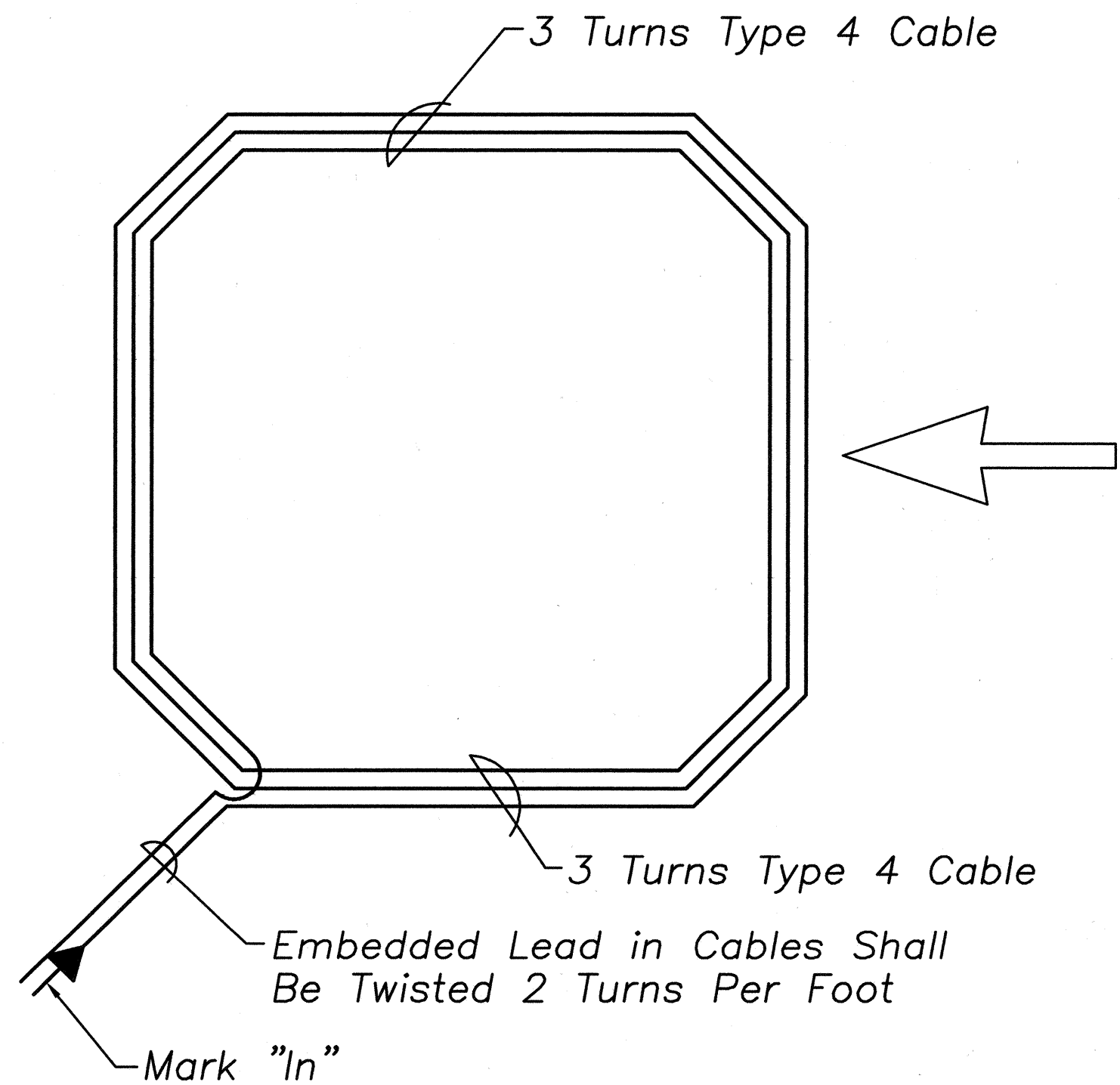
TYPICAL SENSOR LOOP SAWCUT DETAIL



NOTES ON CONSTRUCTION AT END OF SAWCUT

- Seal Roadway End of Conduit After Installation of Conductors.
- Install Bulkhead Across Conduit Trench.
- Place Hot Tar in Sawcut.
- Backfill Over Conduit With New A.C.
- Reconstruct Curb and Gutter as Required.

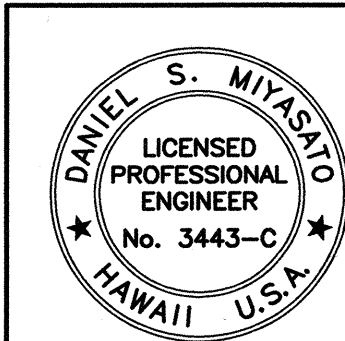
DETAIL OF SENSOR LOOP INSTALLATION AT EDGE OF ROADWAY



TYPICAL SENSOR LOOP WIRING DIAGRAM

TYPES OF CABLE

- | | |
|--------|---|
| Type 1 | Signal Loop Cable: Stranded No. 14, 26 Conductors |
| Type 2 | Detector Lead-In Cable and Pedestrian Push Button Circuit Cable: Stranded, No. 14, 2 Conductors |
| Type 3 | Interconnect Cable: Solid No. 20, 12 Pairs |
| Type 4 | Loop Sensor Cable: Solid No. 12, Single Conductor to IMSA Spec 51-5 |
| Type 5 | Cable From Signal Loop to Signal Head: Stranded, No. 14, Single Conductor |
| Type 6 | Service Cable: Solid, No. 6, 3 Conductors |



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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
TRAFFIC SIGNAL PLAN

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Kuihelani Highway to Hansen Road
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Hansen Road to Vicinity of
Cane Haul Road Crossing
Federal - Aid Project No. NH-A311(3)

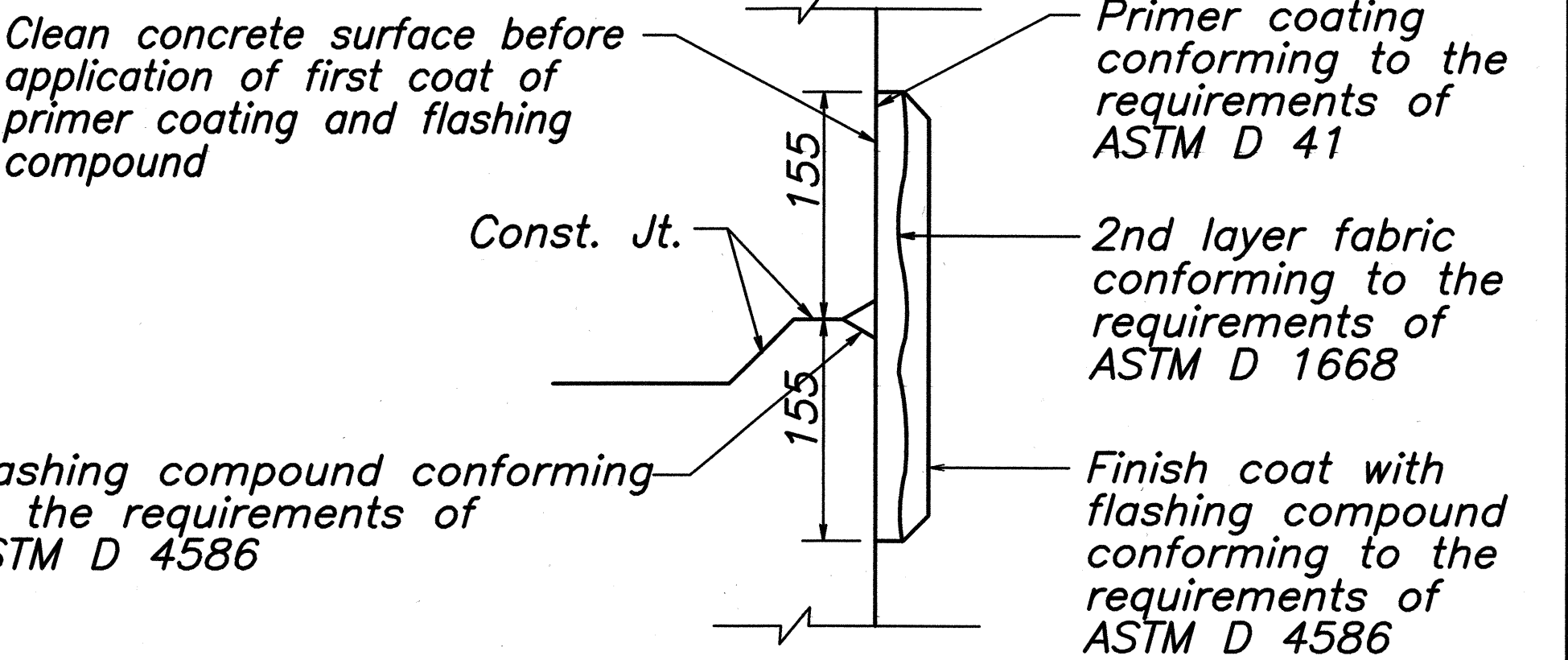
Scale: As Noted Date: October 2001

SHEET No. 5 OF 8 SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL - AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-A311(3)	2002	107	159

GENERAL NOTES

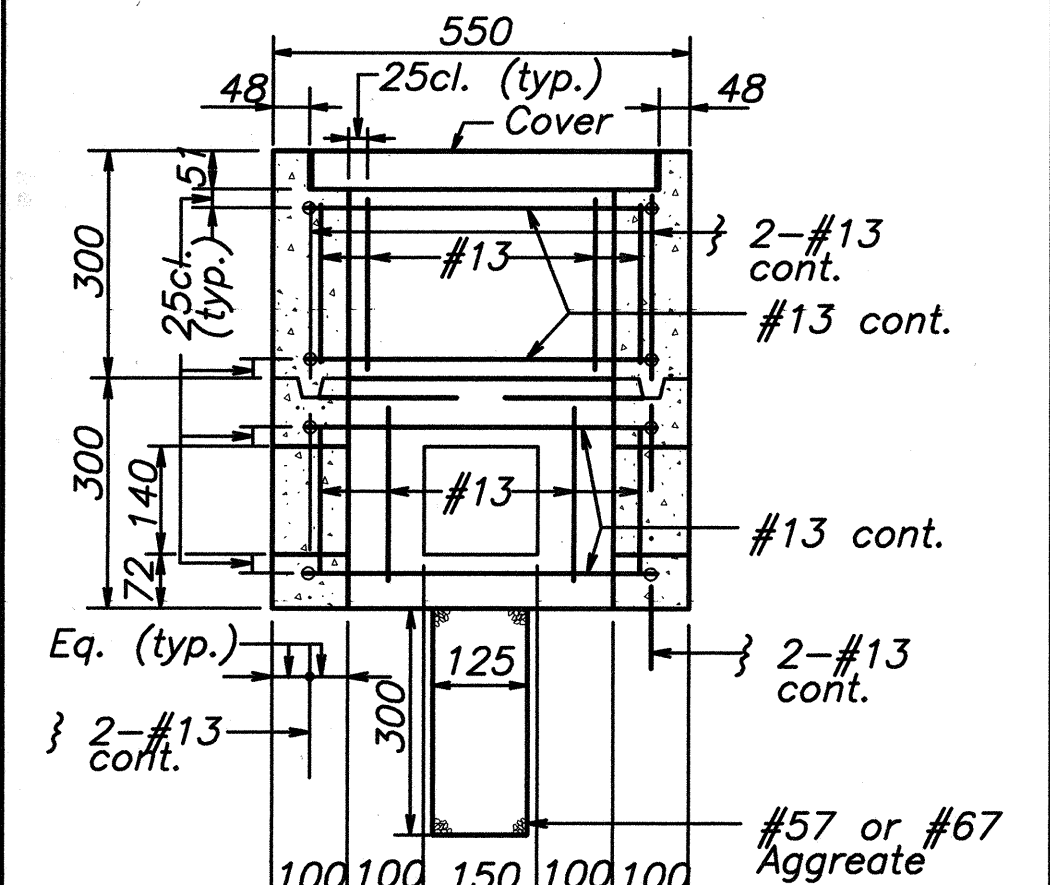
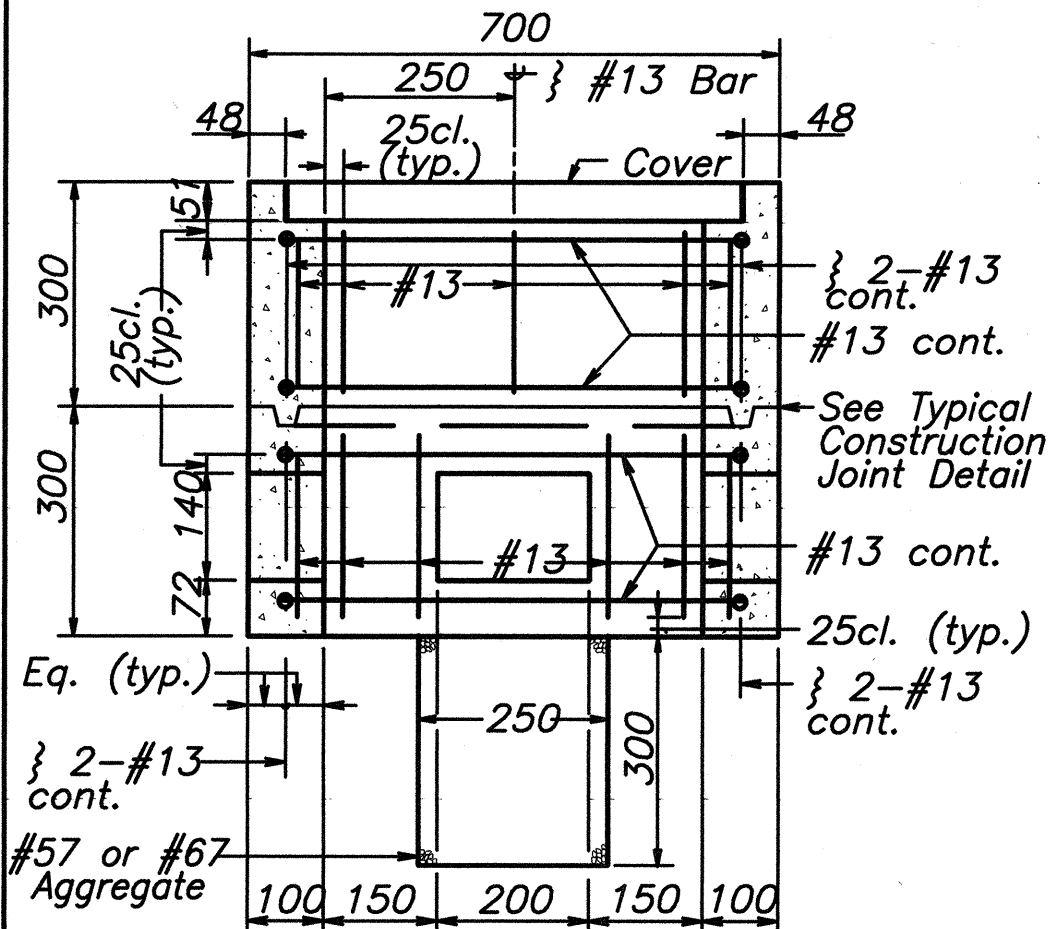
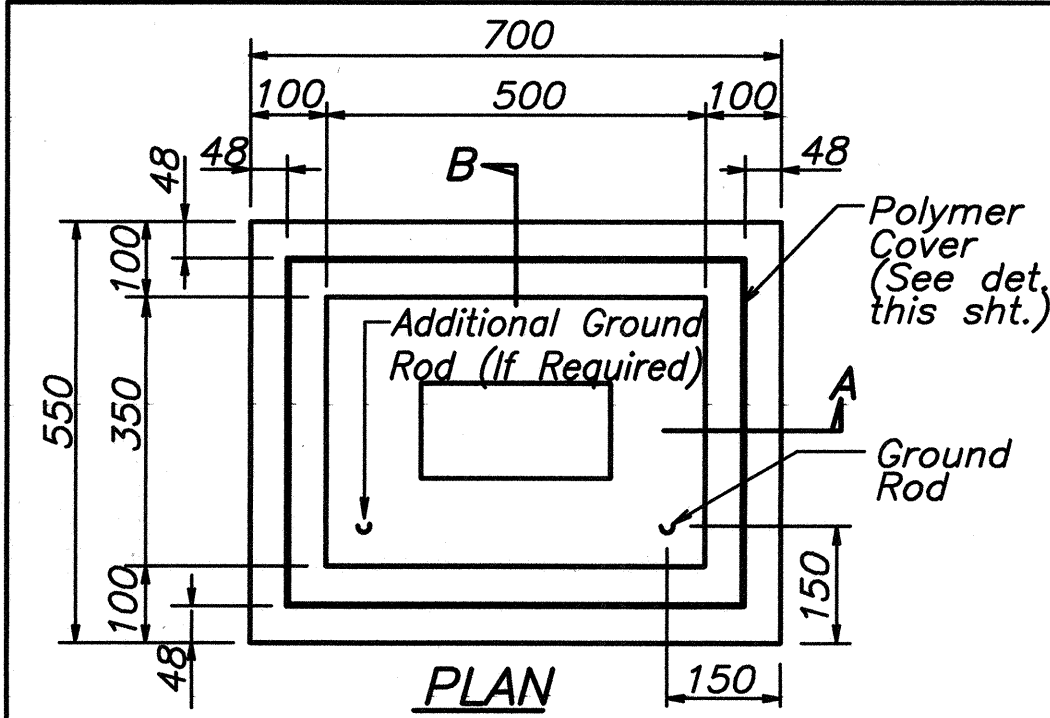
1. Provide a minimum of one 16mm x 2.5m Copperweld Ground Rod in each pullbox. When directed by the Traffic Signal Inspector/Engineer, install additional Ground Rods. Cost of Ground Rods shall be incidental to the pullboxes.
2. All pre-cast concrete pullboxes shall be manufactured in two pieces.
3. The pullbox with cover shall be capable of supporting an MS 18 Loading.
4. The maximum weight of the pullbox cover shall not exceed 27 kilograms.
5. The openings for the conduits on all pullboxes shall be pre-cast concrete knockouts.
6. After installing the conduits in the openings of the pullboxes, the Contractor shall fill the excess opening in the pre-cast knockouts with concrete mortar.
7. Prior to installing the pullboxes, the Contractor shall level the bottom of the trench and achieve a minimum of 95% relative compaction of the bottom of the trench.
8. All concrete shall be Class A (21 MPa (3,000 psi), min.)
9. Rebars shall be Grade 300 and all lapped splices shall be 360mm minimum.
10. The #57 or #67 size aggregate shall conform to latest version of AASHTO M43 (ASTM D 448).
11. Type "C" Pullbox shall be installed in a location protected from vehicular traffic (i.e. raised sidewalk, behind A.C. curbs, traffic signal standard or pipe guards).



TYPICAL FLASHING COMPOUND WATERPROOFING DETAILS

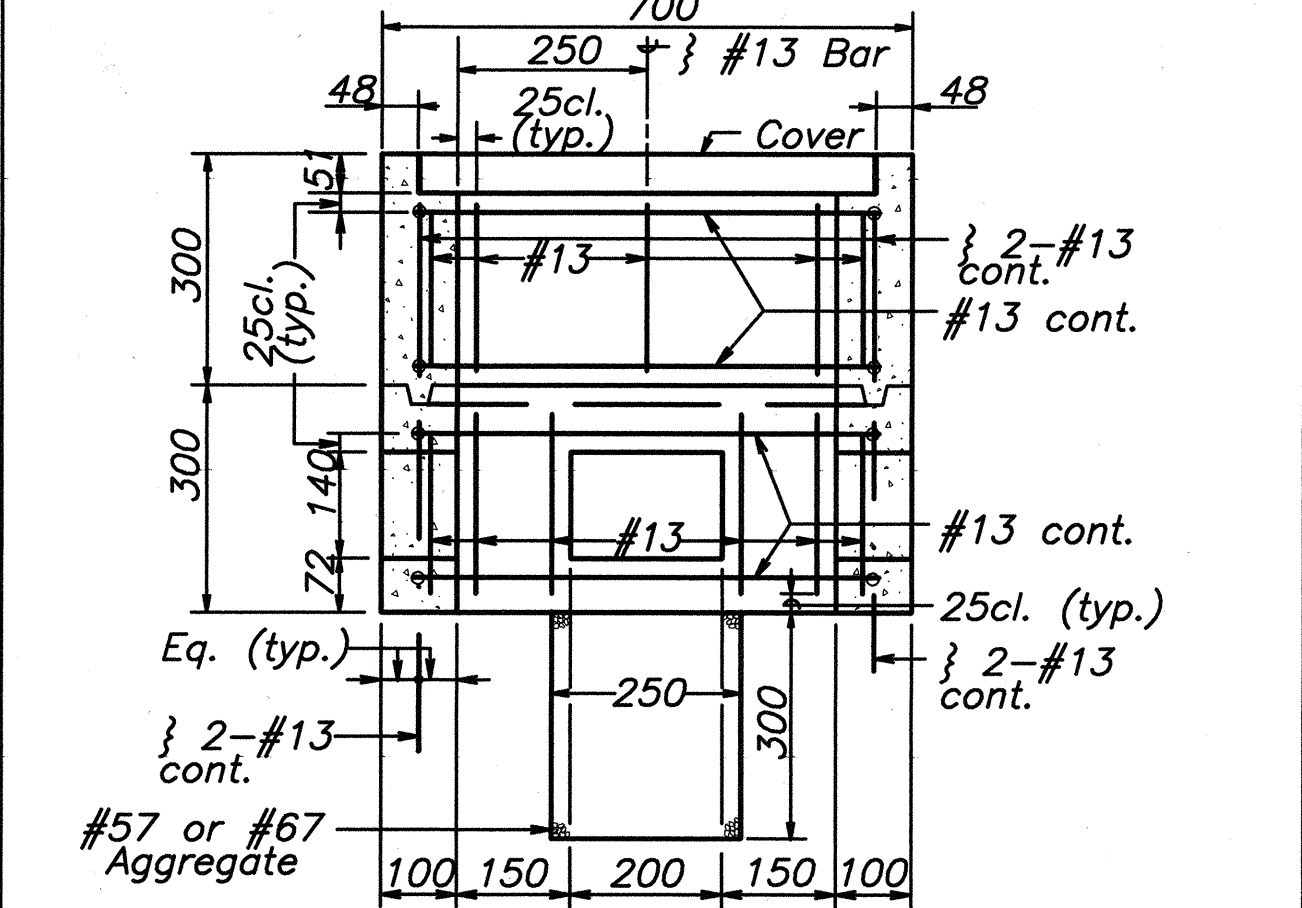
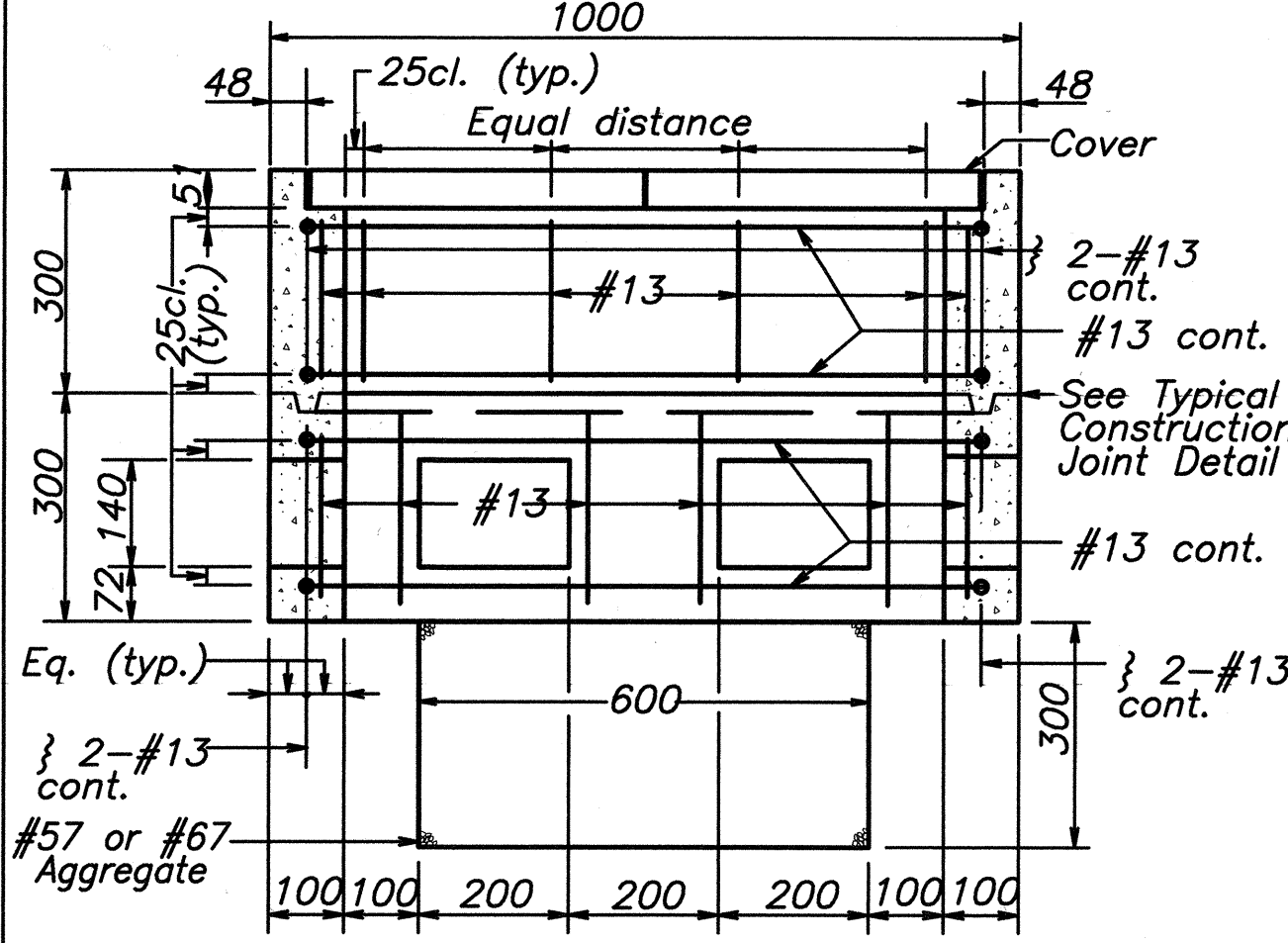
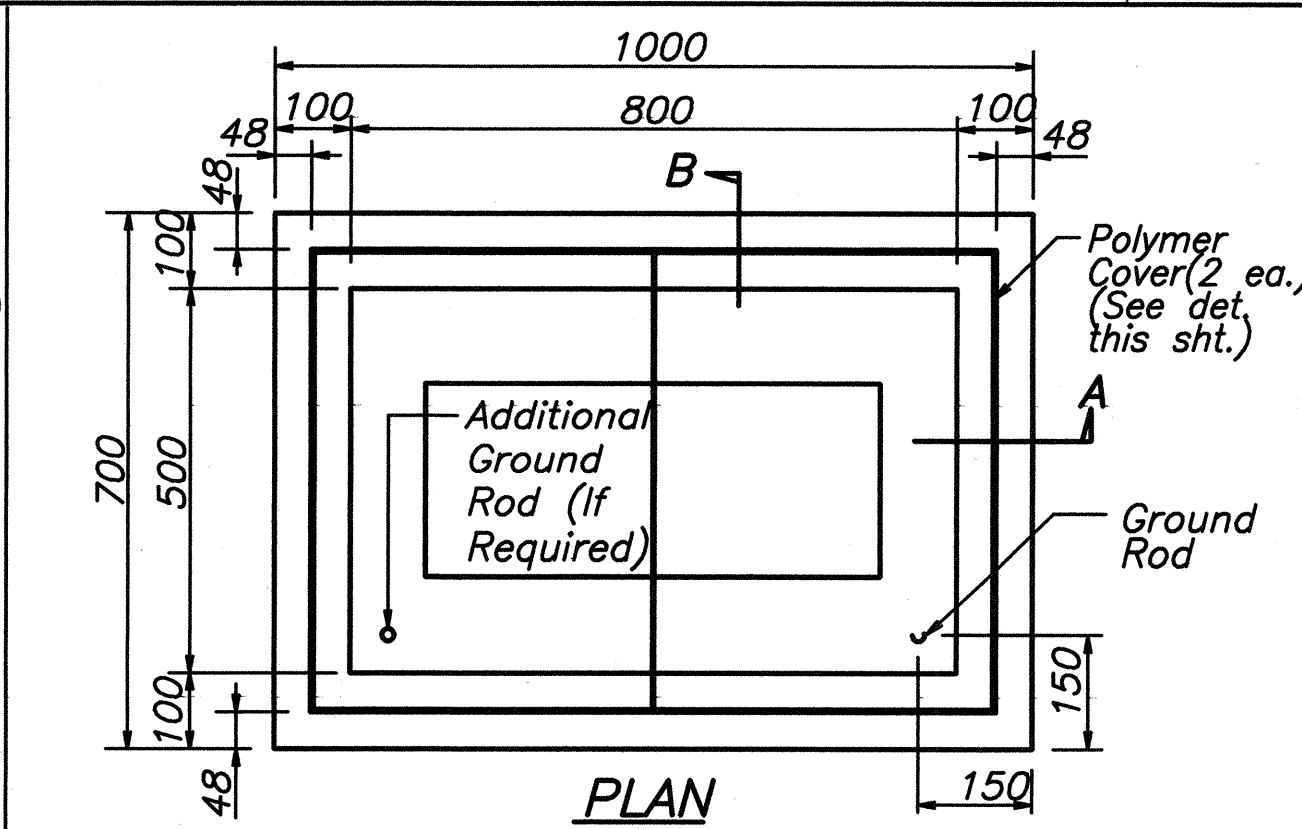
Not to Scale

NOTE: All dimensions and rebar sizes are in metric.



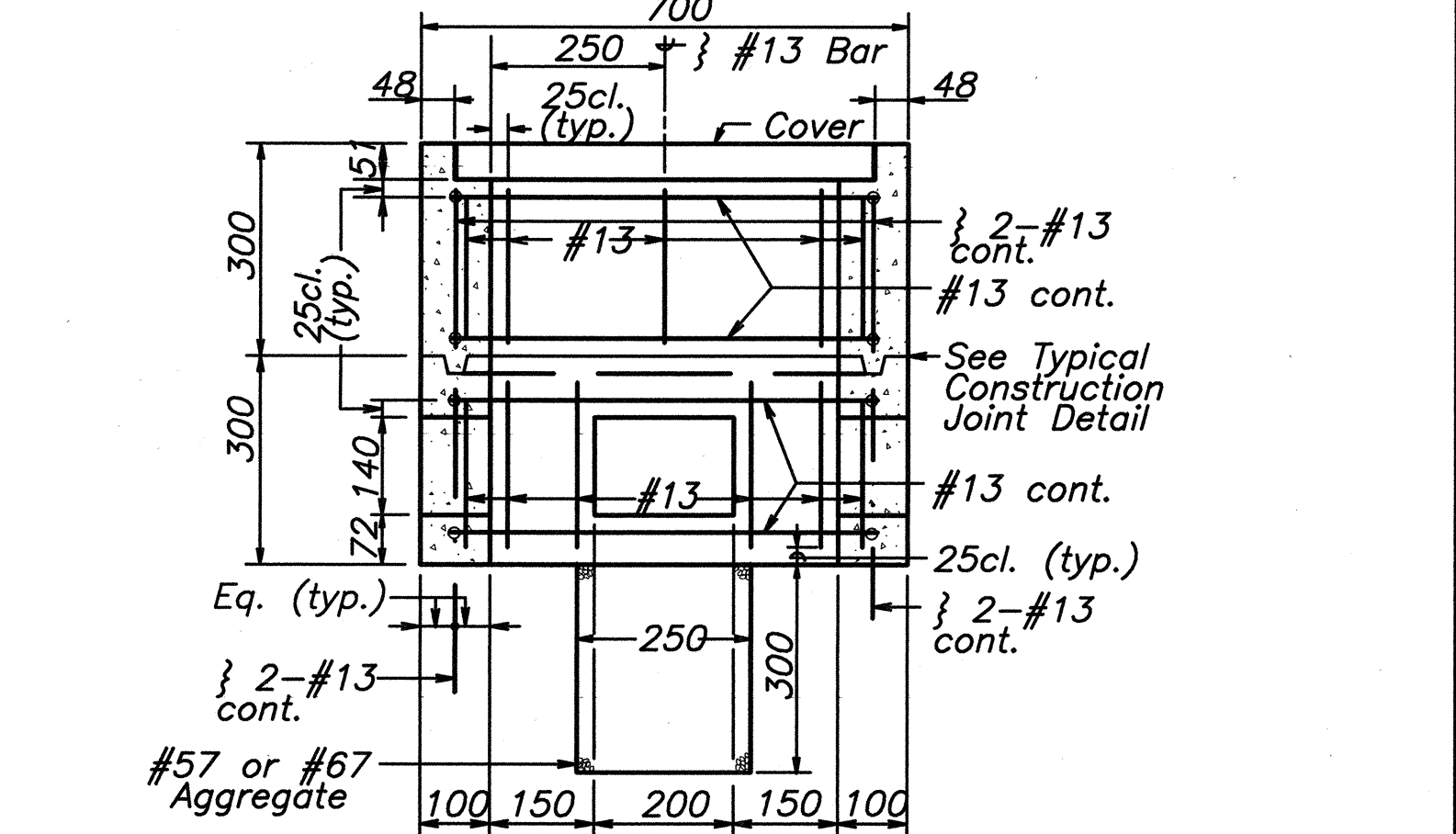
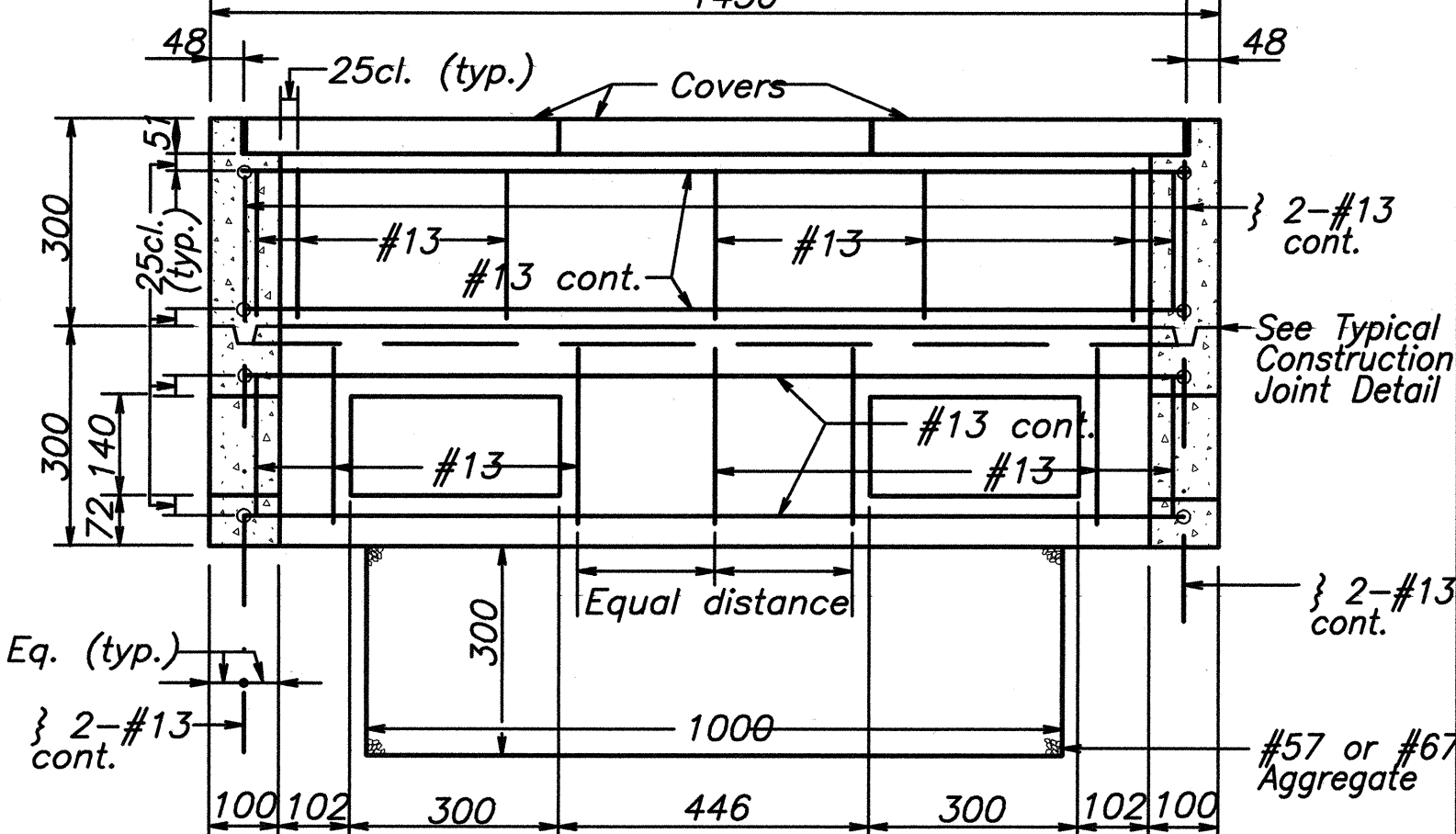
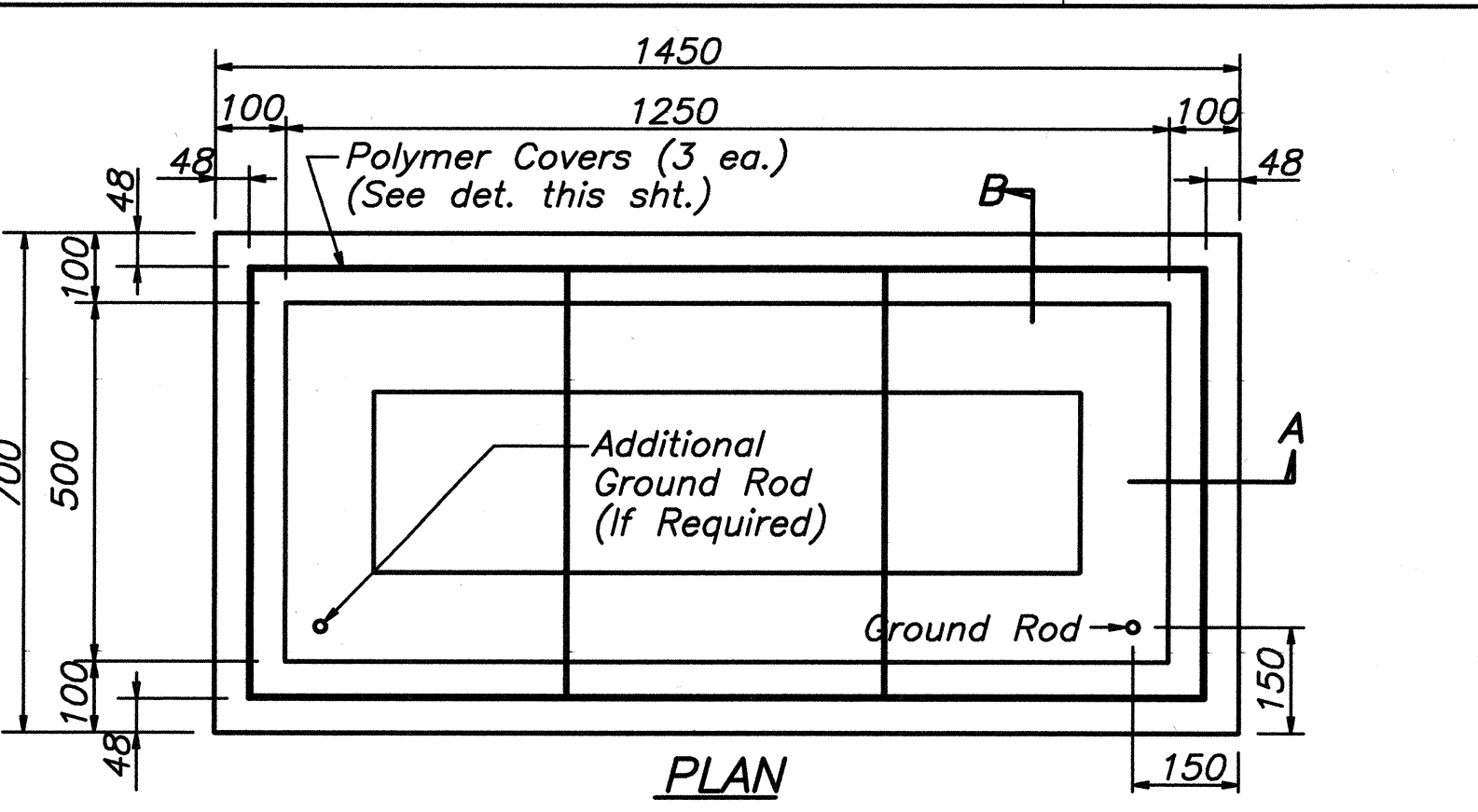
TYPE "A" PULLBOX (Old Type "B")

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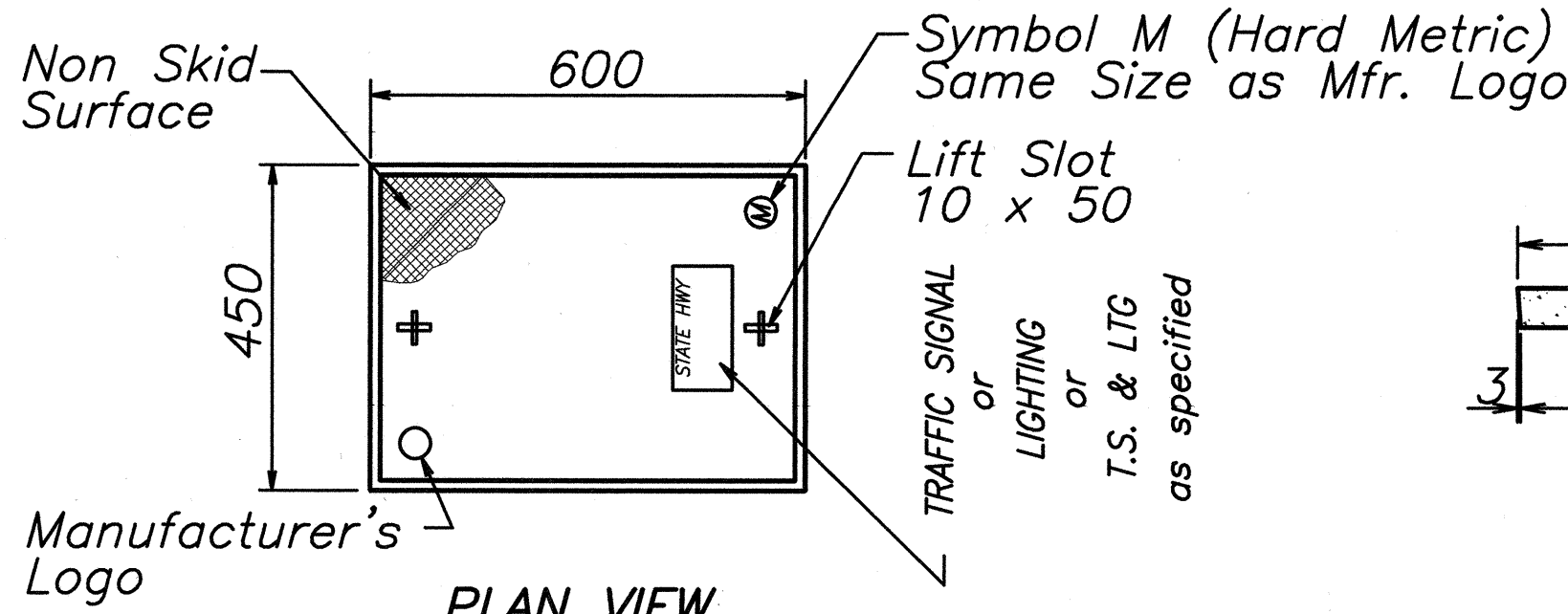
TYPE "B" PULLBOX (Old Type "C")

Scale: 1:10



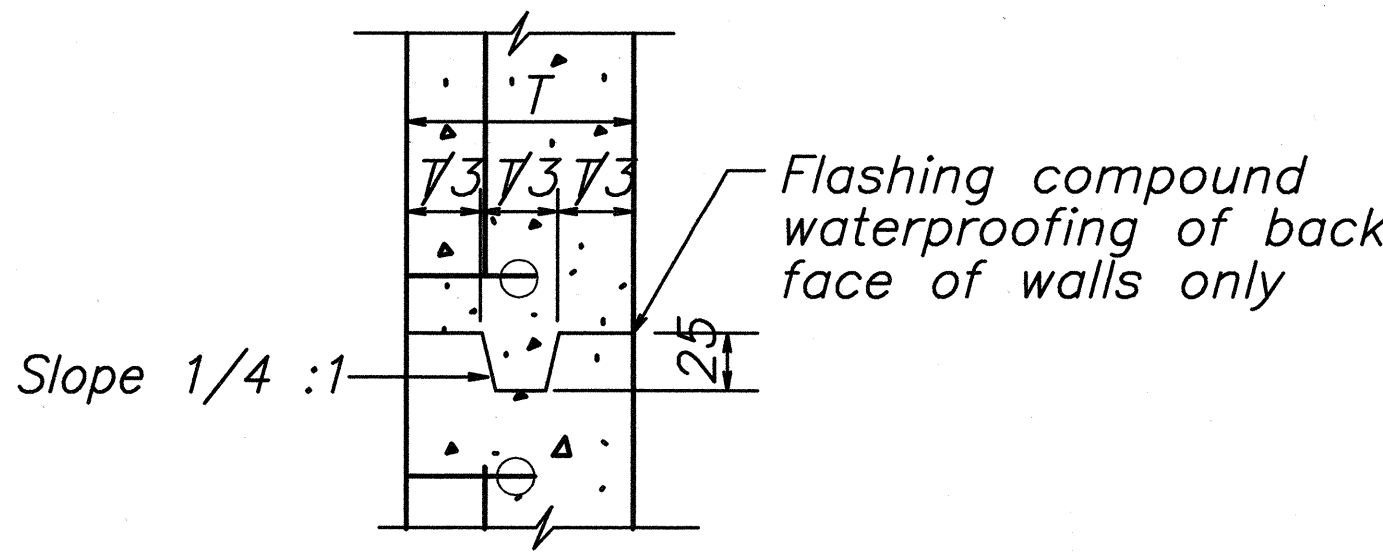
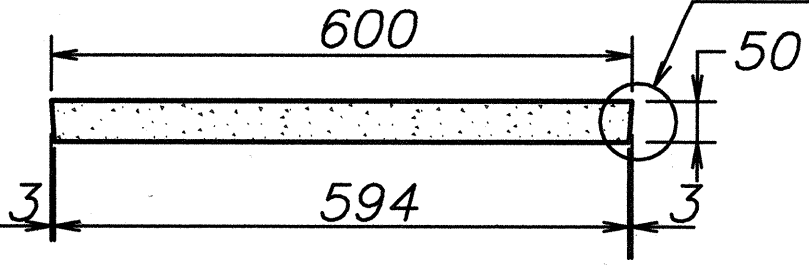
TYPE "C" PULLBOX (Old Type "D")

Scale: 1:10



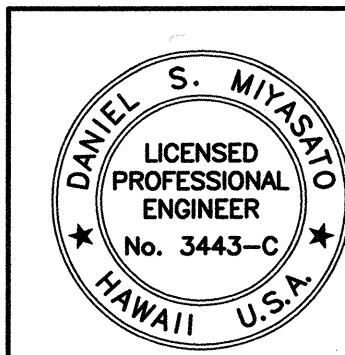
POLYMER CONCRETE COVER

Not to Scale



TYPICAL CONSTRUCTION JOINT DETAIL

Not to Scale

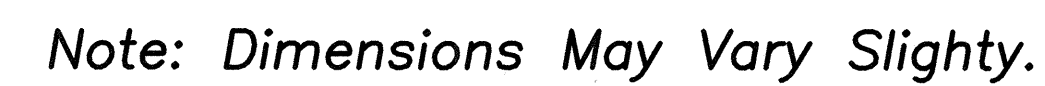


PULLBOX & COVER DETAILS

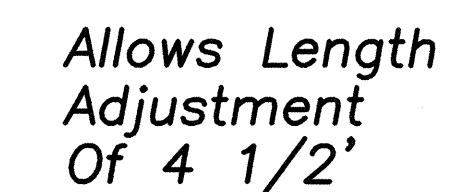
STATE OF HAWAII
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Scale: As Noted Date: October 2001

SHEET No. 6 OF 8 SHEETS

- ① Pivotal Upper Bracket
- ② 1 5/8"x 1/4" Slot For Double Strapping to Electrolier Mast Arm.
(M2G-34S(HD) 0.030"x 3/4" Heavy Duty Stainless Steel Strap
With M22G-34B(HD) Buckle Recommended.
- ③ 1/2"- 13 x 1 1/2" Stainless Steel Hex Head Bolt With Stainless
Steel Hex Lock Nut and 1/16" Stainless Steel Washer (Both Sides).
Allow Upper Bracket to Pivot and Align With Electrolier Mast Arm.
- ④ 6" Overall Drop With Fixed Length Sign Bracket.
- ⑤ Stainless Steel Dampener Spring (removable).
- ⑥ Stainless Steel Hex Lock Nut With 1/16" Stainless Steel Washer.
- ⑦ 1" O.D. Axle Housing.
- ⑧ 1/2"- 13 x 4" Stainless Steel Hex Head Bolt With 1/16"
Stainless Steel Washer.
- ⑨ Oilite Bushing.
- ⑩ Sign Mounting Sets, Consisting of Two Each 5/16"- 18 x 1"
Stainless Steel Hex Head Bolt With Stainless Steel Hex Lock Nut.
Two Holes On 1 1/2" Centers Provide Positive Lock Sign Mounting
to Bracket.
- ⑪ 8 1/4" Overall Length Upper Adjustable Sign Bracket Section.
- ⑫ 9" Overall Length Lower Adjustable Sign Bracket Section,
Including Axle Housing (8" Overall Length to Top of Housing).
- ⑬ 1/2"- 13 x 1 1/2" Stainless Steel Hex Bolt With Stainless Steel
Hex Lock Nut and 1/16" Stainless Steel Washers (Both sides).
Loosen Lock Nut, Adjust Bracket Teeth to Level sign.
- ⑭ 1 1/4" x 1 1/4" x 1/8" Aluminum Angle.



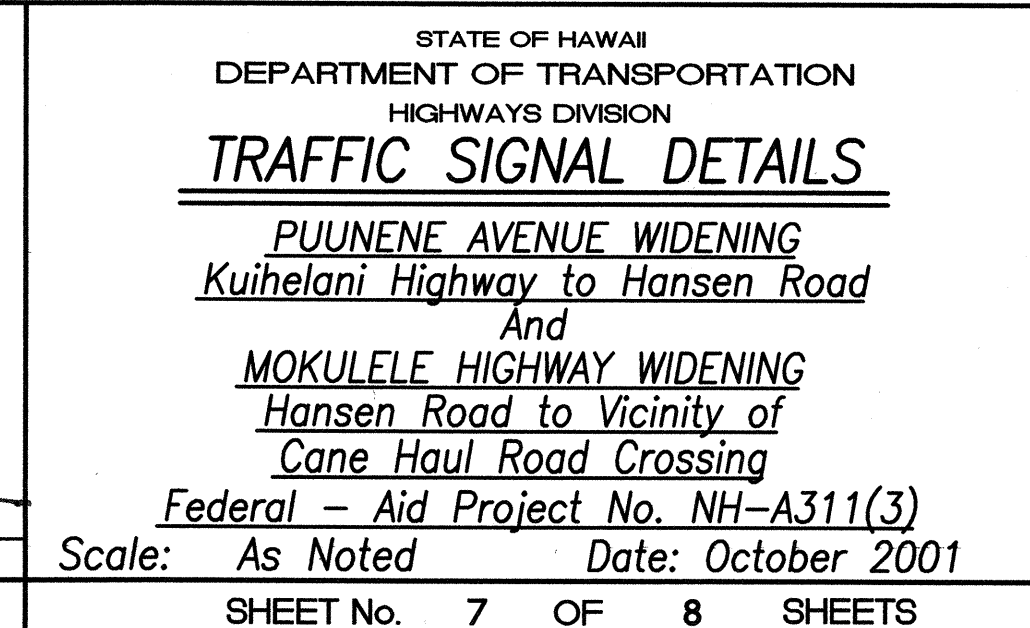
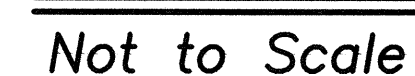
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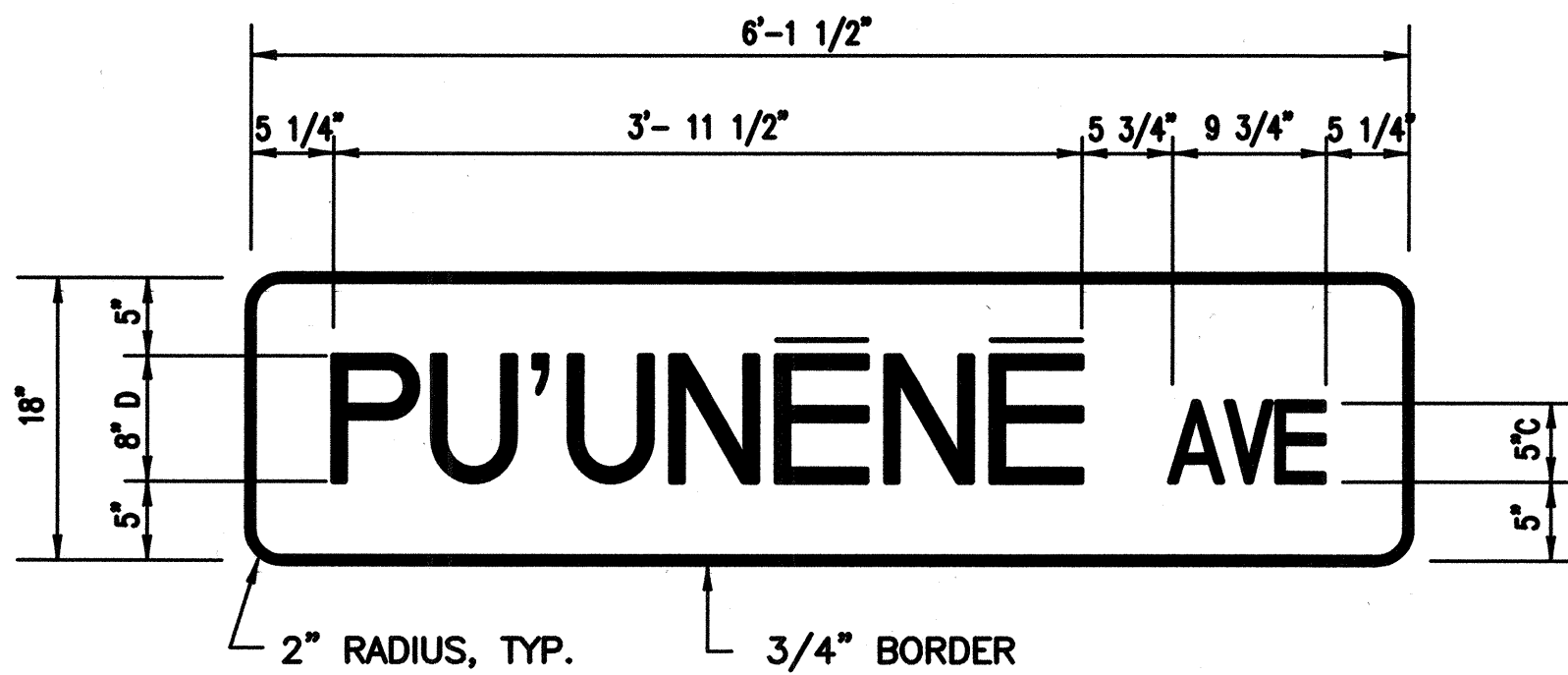
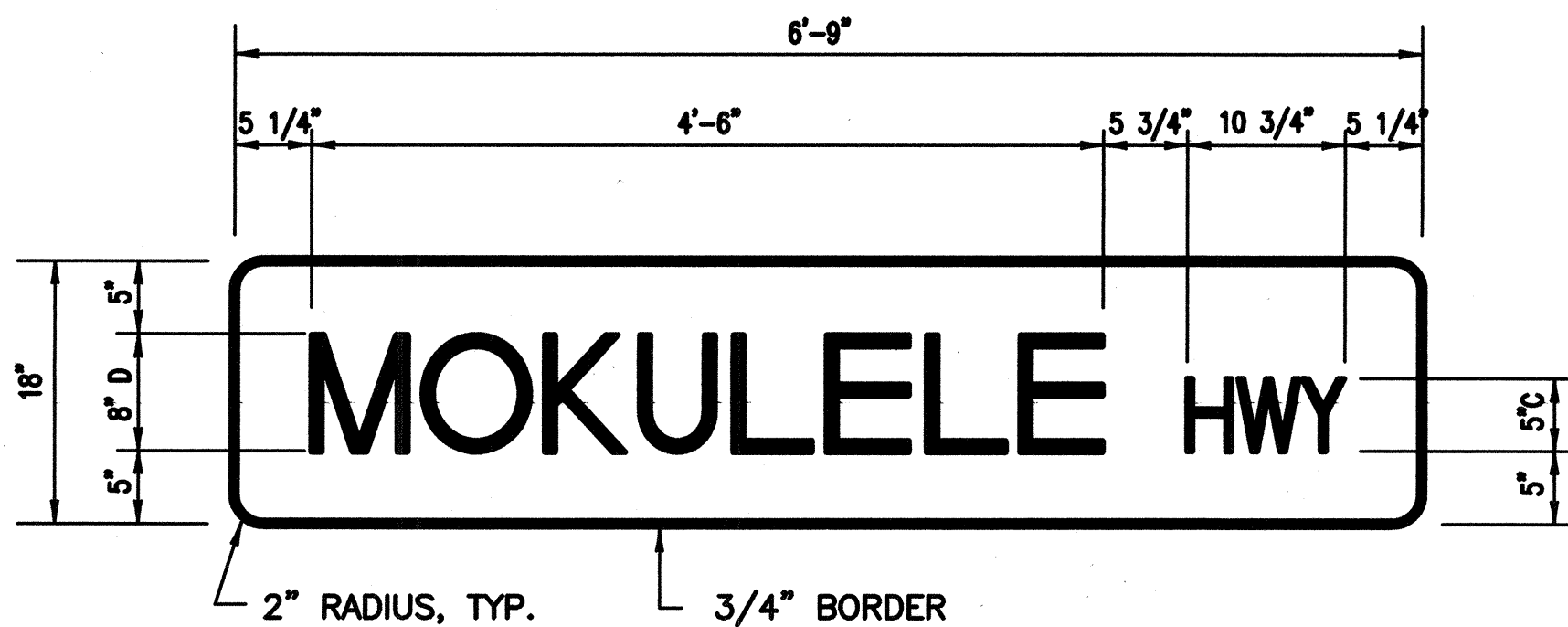
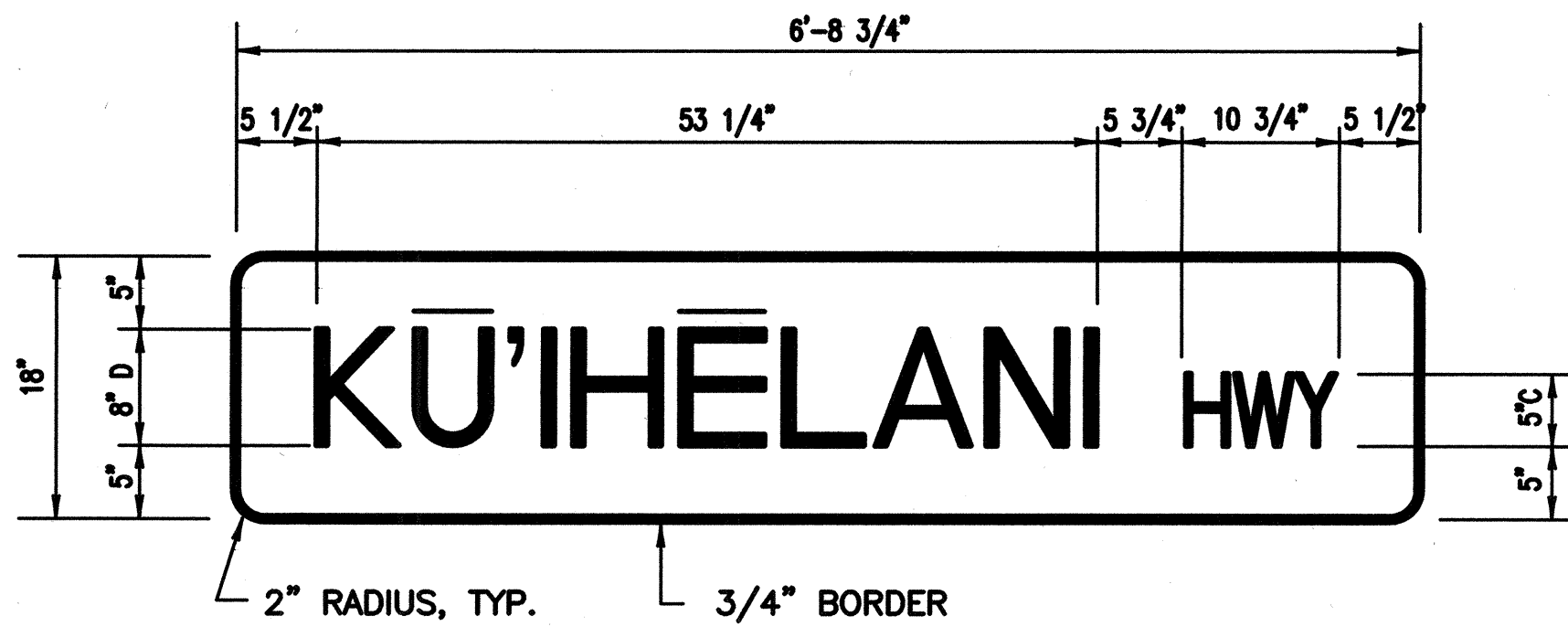
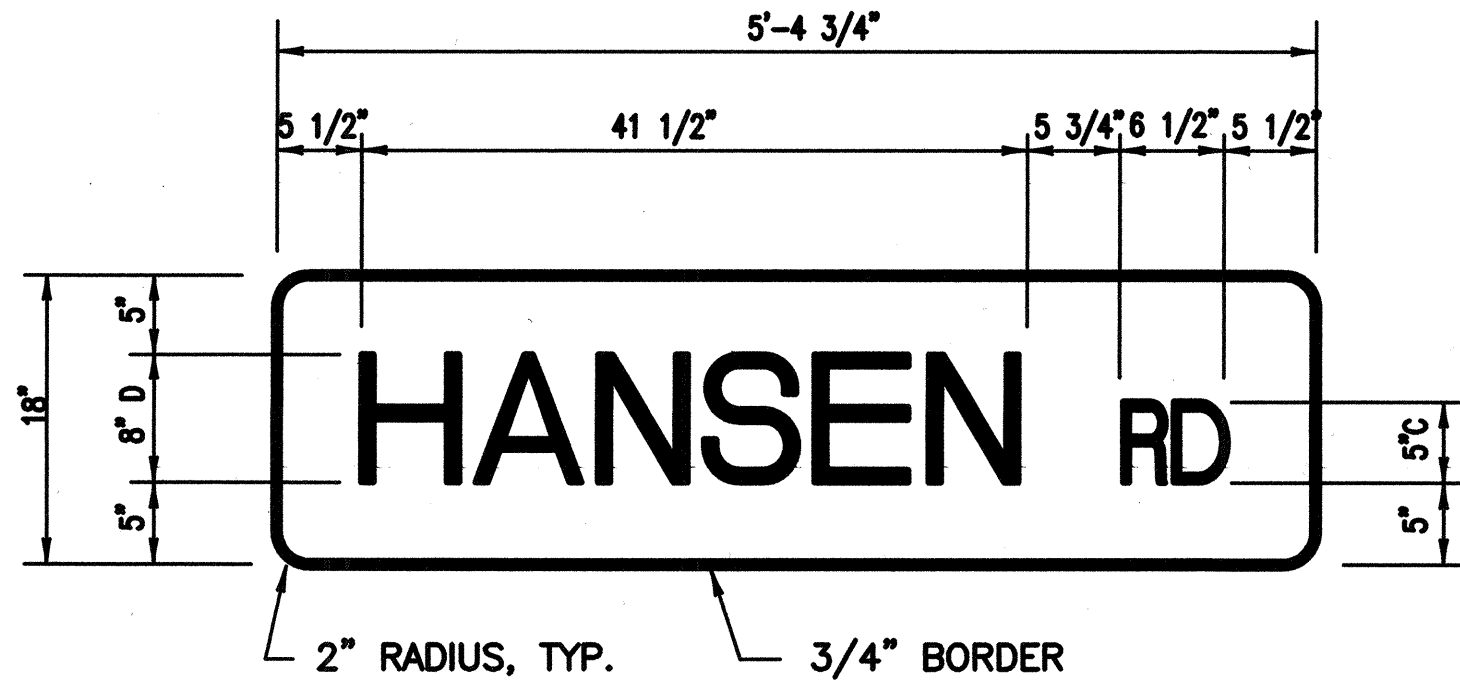
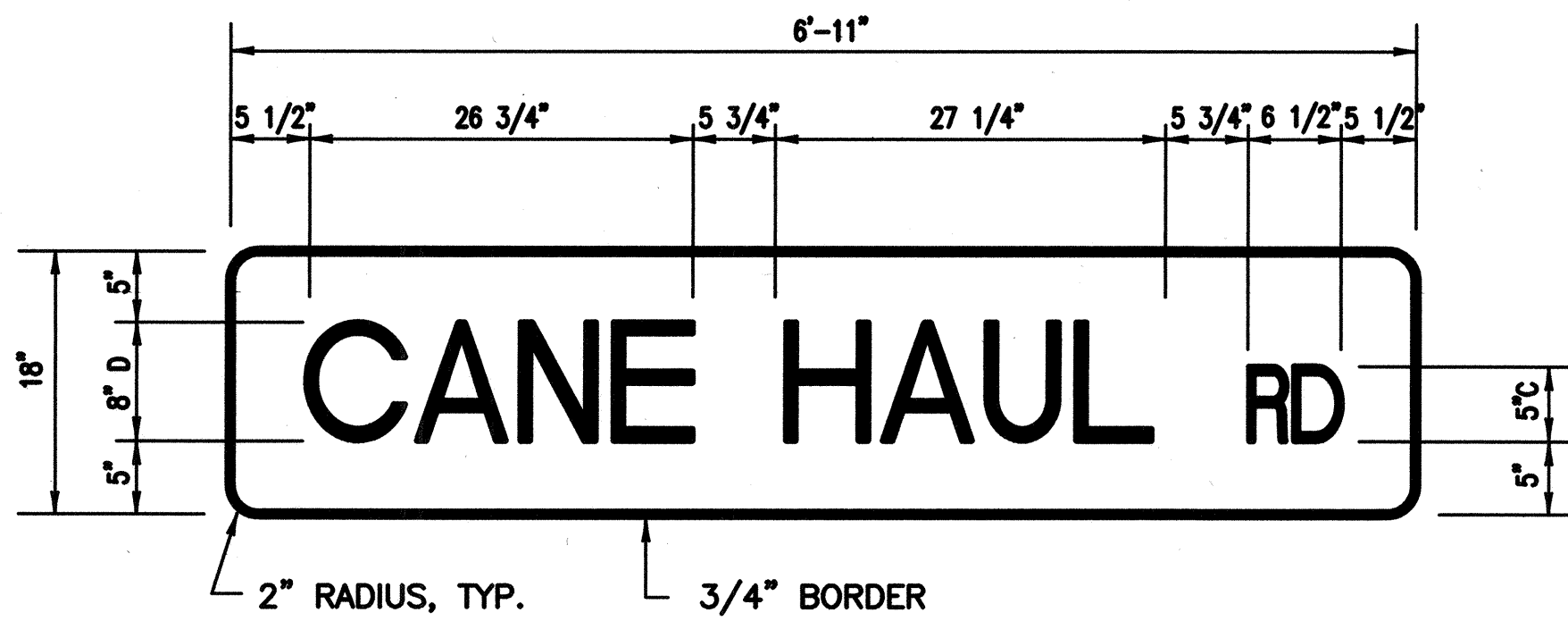
Not to Scale



Not to Scale

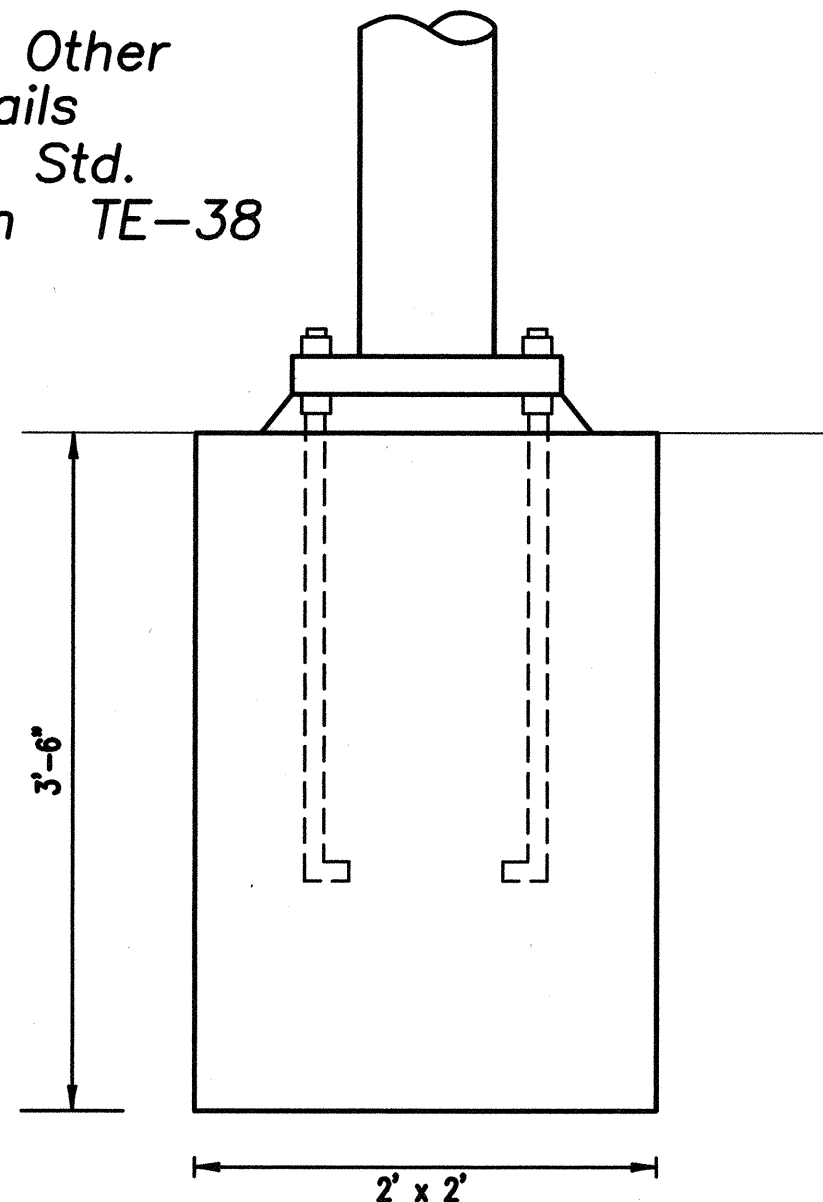


FED. ROAD DIST. NO.	STATE	FEDERAL - AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-A311(3)	2002	109	159



STREET NAME SIGN DETAILS
Not to Scale

For Other
Details
See Std.
Plan TE-38



FOOTING FOR
TYPE I SIGNAL STANDARD

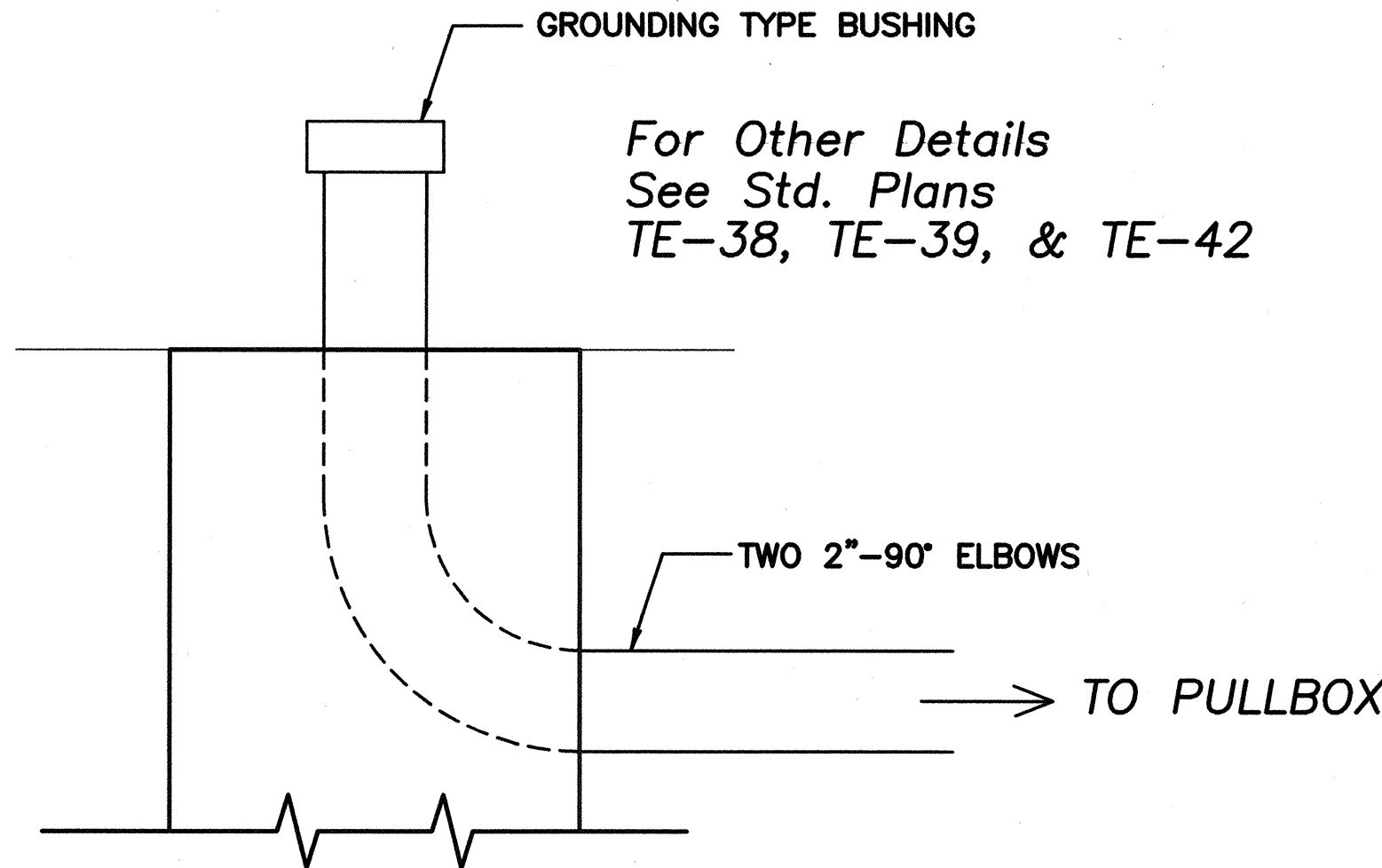
Not to Scale

TSS TYPE	MAST ARM LENGTH	"c"	"d" BARS
II	20'	6'-2"	12-#6
II	25'	6'-4"	12-#6
II	30'	6'-9"	12-#6
II	35'	7'-0"	12-#8
II	40'	8'-0"	12-#8
III	35'	8'-4"	12-#8

TYPE II FOOTINGS

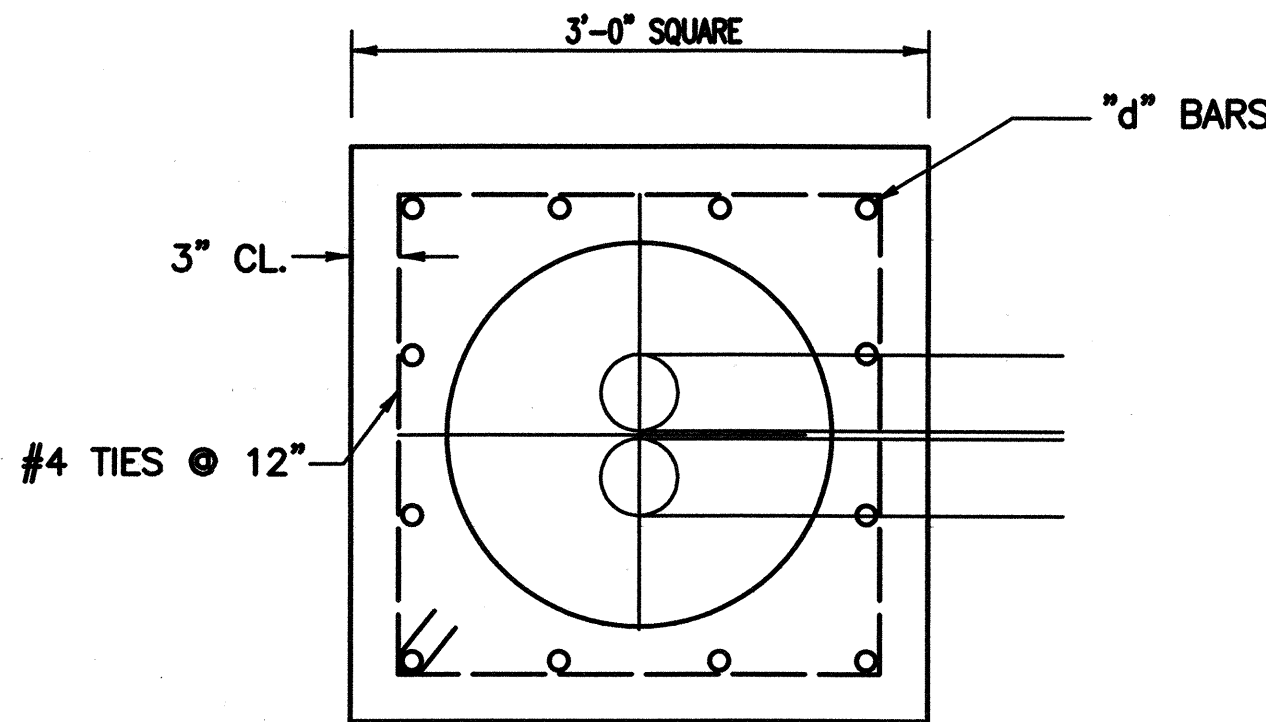
GROUNDING TYPE BUSHING

For Other Details
See Std. Plans
TE-38, TE-39, & TE-42

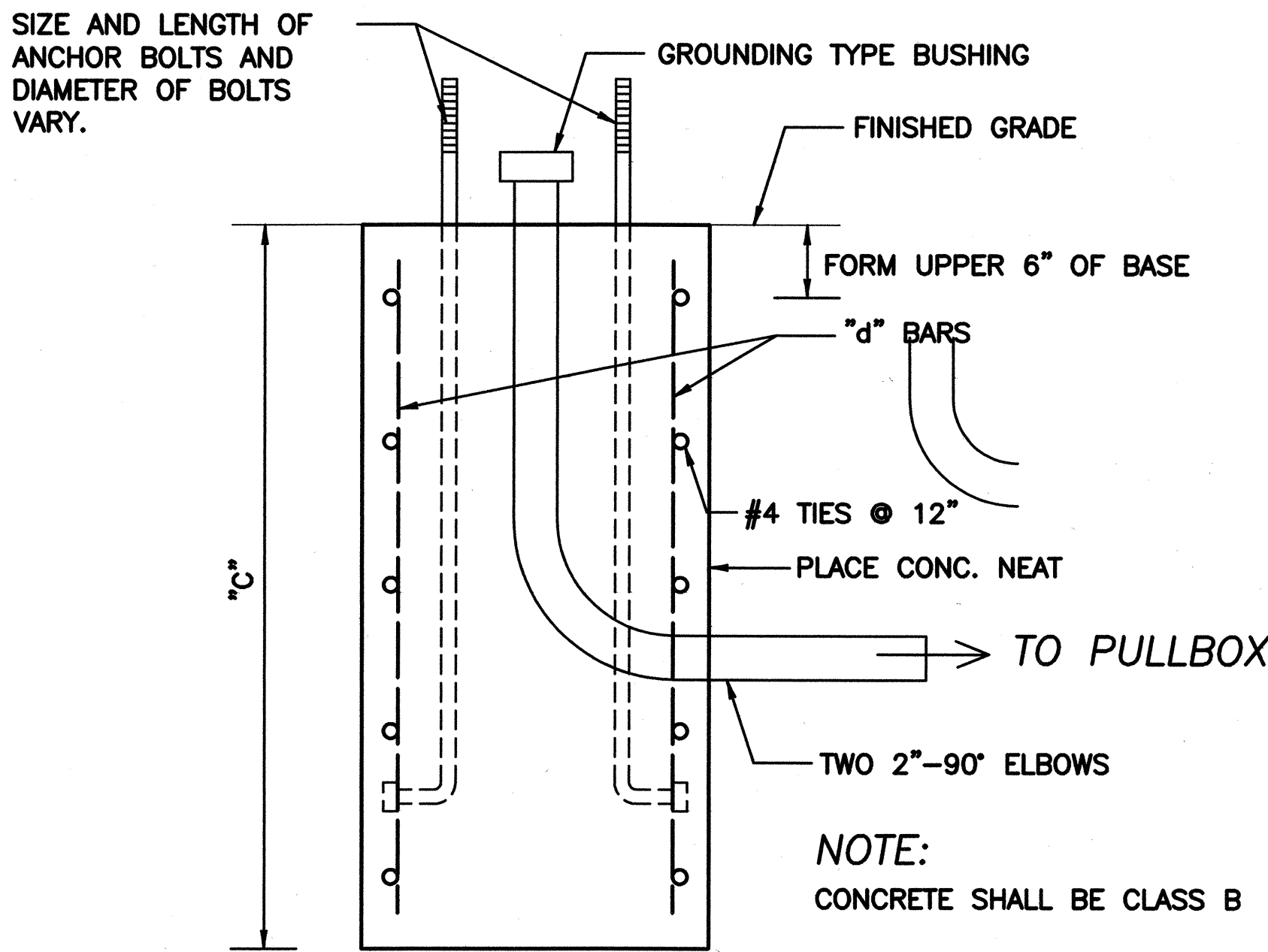


CONDUITS IN TRAFFIC SIGNAL
STANDARD FOOTINGS

Not to Scale

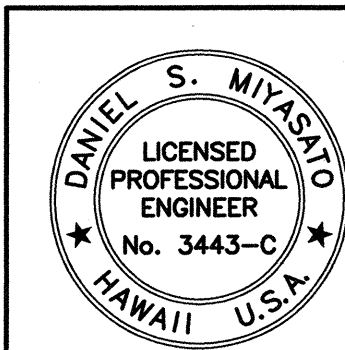


PLAN- SECTION



FOOTING FOR
MAST ARM STANDARD

Not to Scale



SATO & ASSOCIATES, INC.
THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
TRAFFIC SIGNAL DETAILS
PUUNENE AVENUE WIDENING
Kuihelani Highway to Hansen Road
And
MOKULELE HIGHWAY WIDENING
Hansen Road to Vicinity of
Cane Haul Road Crossing
Federal - Aid Project No. NH-A311(3)
Scale: As Noted Date: October 2001
SHEET No. 8 OF 8 SHEETS