

GENERAL TRAFFIC SIGNAL NOTES

- All Traffic Signal work shall conform to the requirements of the Manual on Uniform Traffic Control Devices for Streets and Highways, U.S. Department of Transportation, Federal Highways Administration, Latest Edition, and Amendments.
- The locations of the traffic signal standards, traffic signal standards with mast arm, pedestrian push buttons, traffic controller, transformer, pullboxes, conduits, & loop detectors shall be staked out in the field by the Contractor and locations accepted by the Engineer prior to construction and installation. Locations shown on plans shall be adjusted as necessary to prevent conflict with existing or new facilities.
- All conduits shall be PVC Schedule 80.
- Loop detectors shall be installed according to Loop Detector Details shown on the Plans.
- Lead-in wires in pullbox near loops shall be tagged with Loop Number(s).
- Existing pavement shall be restored according to Restoration of Existing Pavement due to Trench Excavation detail shown on the Plans.
- Department of Transportation Services, City & County of Honolulu will assist the Engineer in construction inspection for the Traffic Signal System. The following work is to be performed by the Department of Transportation Services, City & County of Honolulu.
 - Test controller & auxiliary equipment in cabinet
 - Make all electrical equipment connections in the field for signal system after the system has been installed in place by the Contractor.
 - Final adjustment of traffic signal control equipment
- Steel plates for covering trenches shall have skid resistant surface.
- All structures, pavements, utilities, landscaping, and other topographical features shown on the Plans are existing and shall remain unless noted or indicated otherwise. All grassed areas damaged by construction activities shall be topsoiled and grassed.
- A solid #8 bare copper wire shall be pulled in all conduits with the traffic control cable for equipment ground. Cost shall be considered incidental to the installation of the signal control cable.
- All splicing shall be done in the pullboxes.
- All traffic signal controller equipment shall be completely wired in the cabinet and shall control the traffic signal as called for in the Plans.
- The loop amplifier units furnished for this project shall be capable of operating the loop detector configurations shown on the Plans.
- The Contractor shall notify the Traffic Control Branch, Department of Transportation Services, three (3) working days prior to commencing work on the traffic signal system (phone: 523-4589).
- A 3'x5' level area shall be provided along side pedestrian push button assemblies at a distance not to exceed 10'-0". This work will not be measured or paid for separately, but shall be considered incidental to the various contract items.

- The Contractor shall verify with the respective utility companies and government agencies, the locations of all electric, telephone, traffic signal, street light, cable television, fire alarm, gas, water, sewer, drain and other lines crossing the excavation path or in excavation areas.
- All work and materials for the traffic signal system shall conform to Section 623 - Traffic Signal System, of the current Standard Specifications for Road, Bridge, and Public Works Construction - 1994 of the Hawaii State Department of Transportation, except as otherwise provided on the Plans or in the Special Provisions.
- Provide ground rod in all pullboxes, pullboxes adjacent to signal standards, pedestals, controller cabinets, and other locations ordered by the Engineer. Ground rod connectors shall be copper welded and shall meet ground to earth resistance as specified by the National Electric Code or local inspecting agency. Furnishing and installing ground rods will not be measured or paid for separately, but shall be considered incidental to the various contract items.
- Lane closures shall be allowed only during the working hours from 8:30 am to 3:30 pm, Monday through Friday.
- Underground pipes, cables, or ductlines known to exist are indicated on the Plans. The Contractor shall verify the locations and depths of the facilities and exercise proper care in excavating in the area. Wherever connections of new utilities to existing utilities are shown on the Plans, the Contractor shall expose the existing lines at the proposed connections to verify their locations and depths prior to excavation for the new lines.
- During working hours, the Contractor shall provide two lanes for through traffic. On streets too narrow to make this practicable, the Contractor may work in one half of the roadway keeping one lane open to traffic and alternating the flow of traffic. During non-working hours, all trenches shall be covered with a safe, non-skid, traffic-bearing bridging material and all lanes shall be open to traffic.
- As required by the Hawaii Department of Transportation and/or Department of Transportation Services - City & County of Honolulu, the Contractor shall provide off-duty police officers to control the flow of traffic.
- Where pedestrian walkways exist, they shall be maintained in passable condition or other facilities for pedestrians shall be provided. Passage between walkways at intersections shall likewise be provided.
- Driveways shall be kept open unless the owners of the property using these rights-of-way are otherwise provided for satisfactorily.
- No material and/or equipment shall be stockpiled or otherwise stored within street rights-of-way except at locations designated in writing and accepted by the Engineer.
- The work shall conform to the applicable provisions of the 1994 Americans with Disabilities Act Accessibility Guidelines (ADAAG), 4.1 through 4.35 and Section 10.

Approved:

[Signature]
Chief, Traffic Review Branch, DPP Date

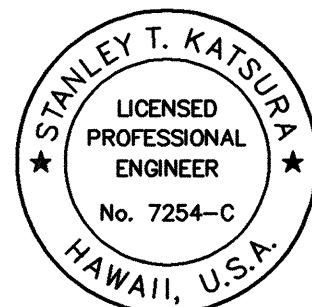
TRAFFIC NOTES FOR WORK ON CITY & COUNTY STREETS

- A permit shall be obtained from the Department of Transportation Services before work on any portion of a public street or highway may begin. Construction Traffic Control Plans approved by the Department of Transportation Services and/or the Department of Planning and Permitting must be provided when applying for the permit.
- The Contractor shall provide, install, and maintain all necessary signs and other protective facilities, which shall conform with the "Hawaii Administration Rules Governing the Use of Traffic Control Devices at Work Sites on or Adjacent to Public Streets and Highways" adopted by the Director of Transportation, and the current U.S. Federal Highways Administration's "Manual on Uniform Traffic Control Devices for Streets and Highways, Part VI - Traffic Controls for Street and Highway Construction and Maintenance."
- Work on any city street area may be performed only between the hours of 8:30 a.m. to 3:30 p.m., Monday through Friday, unless otherwise permitted by the Department of Transportation Services.
- During working hours, the Contractor shall provide for through traffic. During non-working hours, all trenches shall be covered with a safe non-skid bridging material and all lanes shall be open to traffic.
- As required by the Department of Transportation Services, the Contractor shall provide off-duty police officers to control the flow of traffic.
- Where pedestrian walkways exist, they shall be maintained in passable condition or other facilities for pedestrians shall be provided. Passage between walkways at intersections shall likewise be provided.
- Driveways shall be kept open unless the owners of the property using these rights-of-way are otherwise provided for satisfactorily.
- Contractor shall reference to the approval of the Department of Transportation Services and the Department of Planning and Permitting, all existing traffic signs, posts and pavement markings prior to the commencement of construction. The Contractor shall replace or repair all traffic signs, posts and pavement markings disturbed by his activities.
- The Contractor shall notify the Department of Planning and Permitting at 527-5087 one (1) week prior to any work to be done on signs, posts and pavement markings.
- No material and/or equipment shall be stockpiled or otherwise stored within street rights-of-way except at locations designated in writing and approved by the Department of Transportation Services.
- The Engineer shall ensure that the Contractor installs the construction traffic control devices in accordance with the MUTCD and the Hawaii Administration Rules as specified in Traffic Note #2.

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	83B-01-98	2000	29	46

TRAFFIC SIGNAL LEGEND

	Conduits and Cables, Conduit Run X
	Temporary Signal System - Traffic Signal Head (Existing)
	Traffic Signal Head
	Programmed Visibility Traffic Signal Head
	Pedestrian Signal Head with Pedestrian Push Button Assembly
	Emergency Vehicle Preempt Receiver (Opticom Receiver)
	Signal Standard with Mast Arm Type II, L=Length of Mastarm, Pole X, Footing Type C
	Signal Standard Type I, Pole X, H=10', Footing Type A
	Loop Detectors
	Pullbox Type A (Old Type "B")
	Pullbox Type B (Old Type "C")
	Pullbox Type C (Old Type "D")
	Traffic Controller Model 170E and 332A Cabinet with Type D Concrete Base for Controller Cabinet
	Existing Pullbox



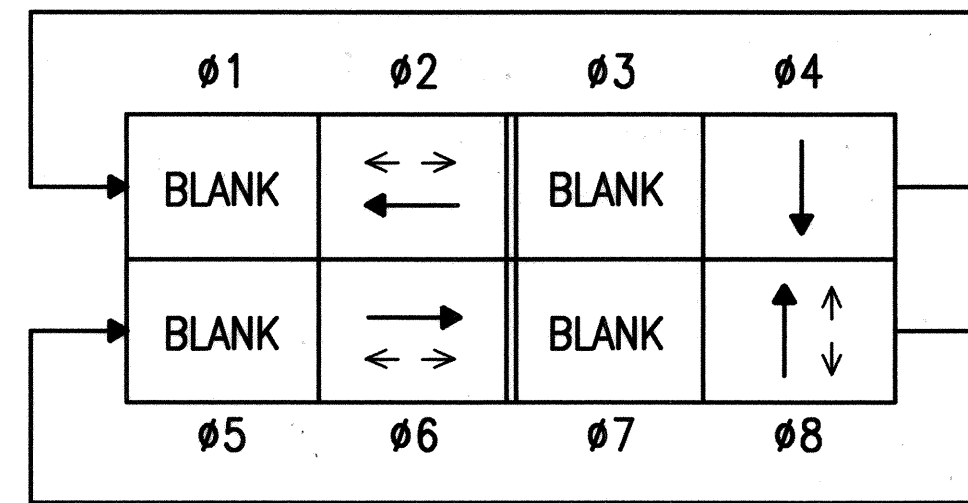
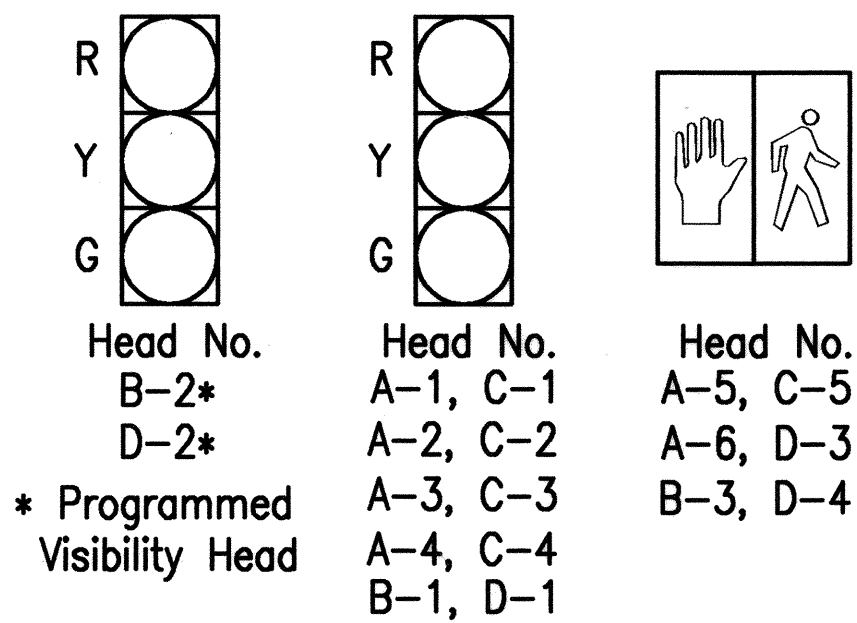
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

[Signature]

STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION	
TRAFFIC SIGNAL SYSTEM NOTES & LEGEND	
KAMEHAMEHA HIGHWAY INTERSECTION IMPROVEMENTS AT PUPUKEA ROAD PROJECT NO. 83B-01-98	
SCALE: NONE	DATE: FEBRUARY 2000
SHEET NO. TS1 OF 7 SHEETS	

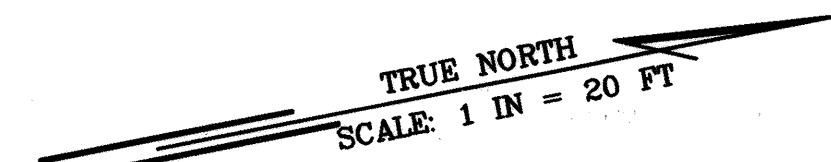
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	83B-01-98	2000	30	46

SIGNAL INDICATIONS



PHASE DIAGRAM
Model 170E Controller
Model 332A Cabinet

→ Protected Vehicle Movement
← → Pedestrian Movement

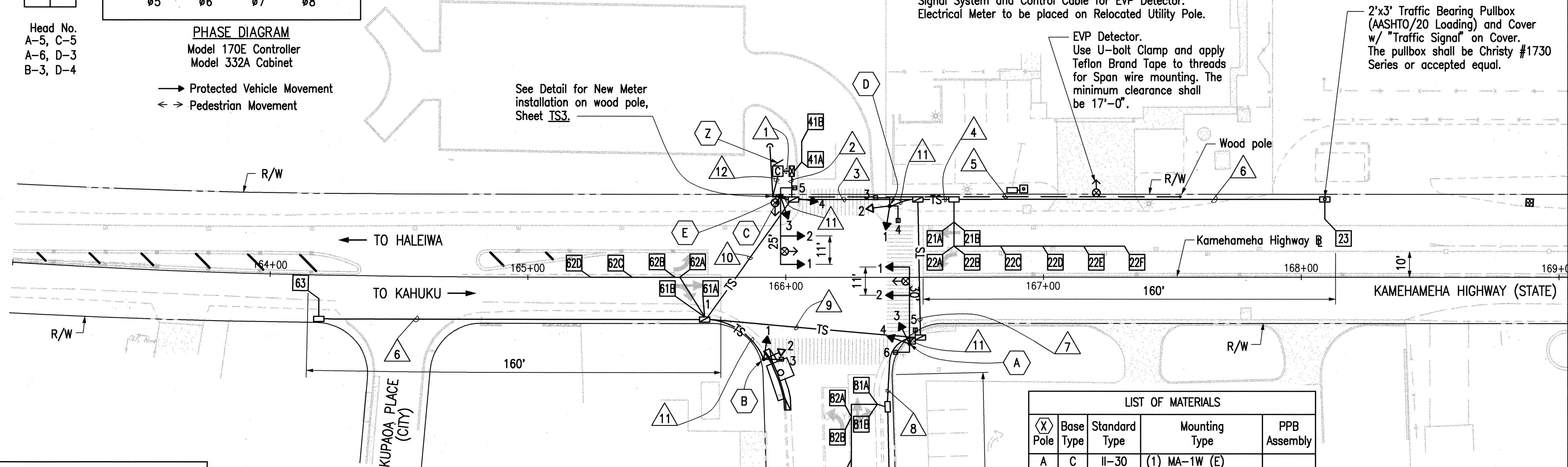


NOTES:

- Cable Run No. 5 is a control cable lashed to the Messenger Cable. Provide Messenger rings at 18" o.c. Span wire (1/4" Messenger Cable) shall conform to ASTM A 475, extra high strength (6,650 lbs. ultimate), Class 'C' coating. This work shall be considered incidental to the various contract items.
- Conduit Run No. 12 is a 2-2" Riser on the Relocated Utility Pole for Power Supply to Intersection Signal System and Control Cable for EVP Detector. Electrical Meter to be placed on Relocated Utility Pole.

EVP Detector.
Use U-bolt Clamp and apply Teflon Brand Tape to threads for Span wire mounting. The minimum clearance shall be 17'-0".

2'x3' Traffic Bearing Pullbox (AASHTO/20 Loading) and Cover w/ "Traffic Signal" on Cover. The pullbox shall be Christy #1730 Series or accepted equal.



CONDUIT & CABLE SCHEDULE

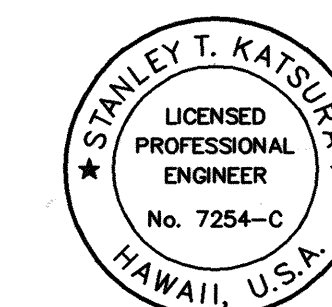
# No.	Conduit Size	26C#14 Signal Control	2C#14 PPB/Loops	3C#20 Opticom	3C#6 Power/Service	Other
1	2"	1				
	2"	1				
	2"		4			
	2"		4			
	2"		4			
	2"		3			
	2"			3		
2	2"	1				Spare
	2"	1				
	2"		4			
	2"		4			
	2"		4			
	2"		2			
	2"			3		
3	2"	1				Spare
	2"		4			
	2"		4			
	2"		1			
	2"			1		
	2"					Spare

CONDUIT & CABLE SCHEDULE

# No.	Conduit Size	26C#14 Signal Control	2C#14 PPB/Loops	3C#20 Opticom	3C#6 Power/Service	Other
4	2"		4			
5	2"			1		
6	2"		1			
7	2"	1				
	2"		3			
	2"			1		
	2"					Spare
8	2"		3			
9	2"	1				
	2"		1			
10	2"	1				Spare
	2"		4			
	2"					Spare
11	2"	Install Cables to Pole and Signal Devices as Needed				
	2"					
12	2"				1	
	2"			1		

LIST OF MATERIALS

X Pole	Base Type	Standard Type	Mounting Type	PPB Assembly
A	C	II-30	(1) MA-1W (E) (*) Opticom Mounting (2) MA-1W (I) (3)(4) B-2W (5)(6) B-2W	2
B	A	I-10	(1)(2) TP-2W (3) C-1W	1
C	C	II-25	(1) MA-1W (E) (*) Opticom Mounting (2) MA-1W (I) (3)(4) B-2W (*) Opticom Mounting	1
D	A	I-10	(1)(2) TP-2W (3)(4) B-2W	2
E	*	Existing Relocated Utility Pole with Guy Wire		
Z	D	Model 170E Controller & Model 332A Cabinet		



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Stanley Katsura

STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION TRAFFIC SIGNAL SYSTEM PLAN

KAMEHAMEHA HIGHWAY
INTERSECTION IMPROVEMENTS AT PUPUKEYA ROAD
PROJECT NO. 83B-01-98

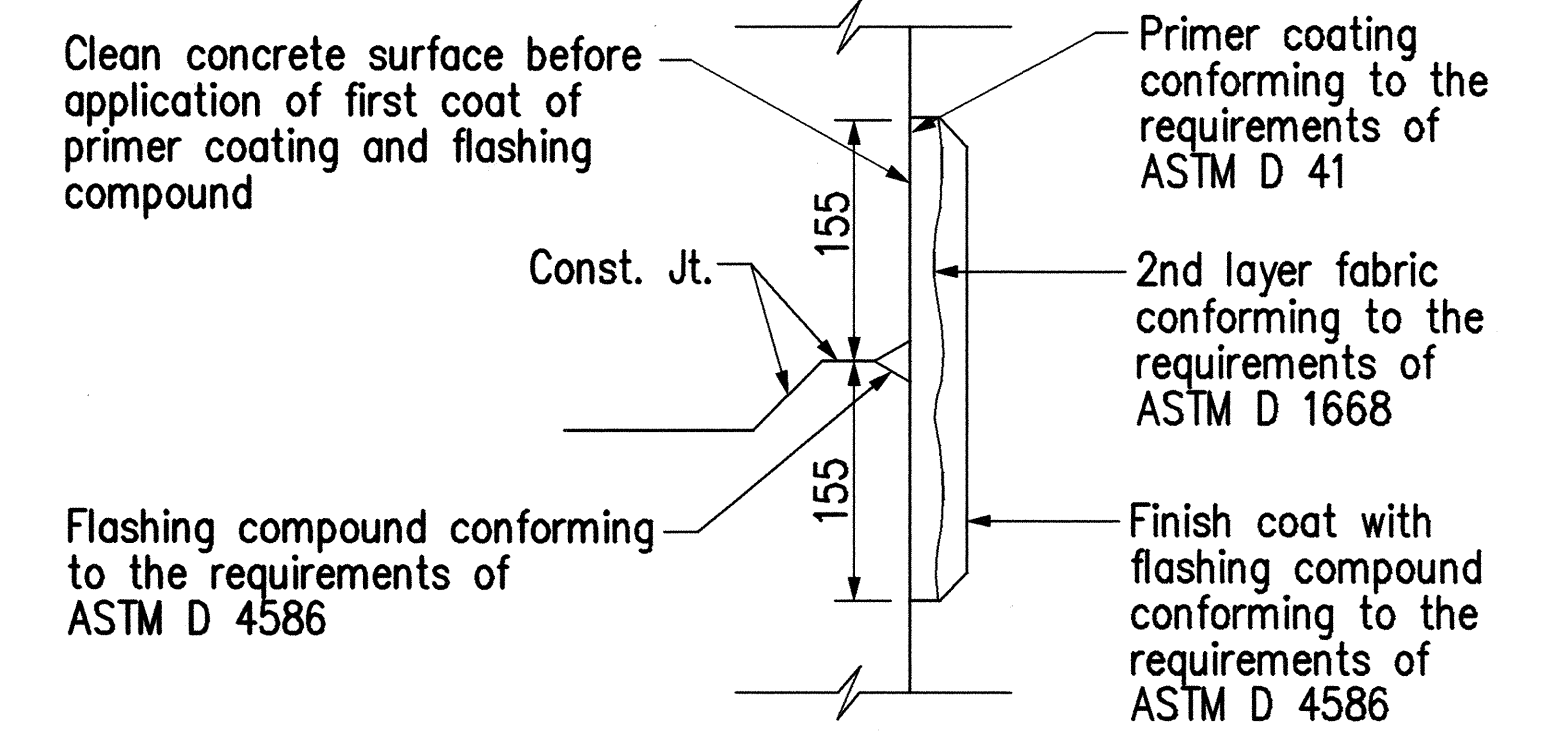
SCALE: 1" = 20' DATE: FEBRUARY 2000

SHEET NO. TS2 OF 7 SHEETS

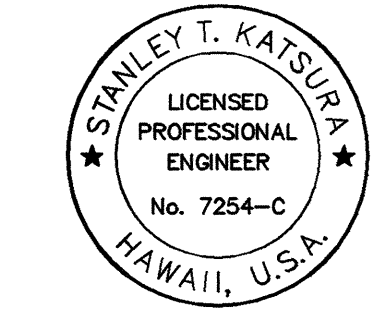
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	83B-01-98	2000	32	46

GENERAL NOTES:

1. Provide a minimum of one 16# x 2.5m Copperweld Ground Rod in each pullbox. When ordered by the 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 (25MPa, 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



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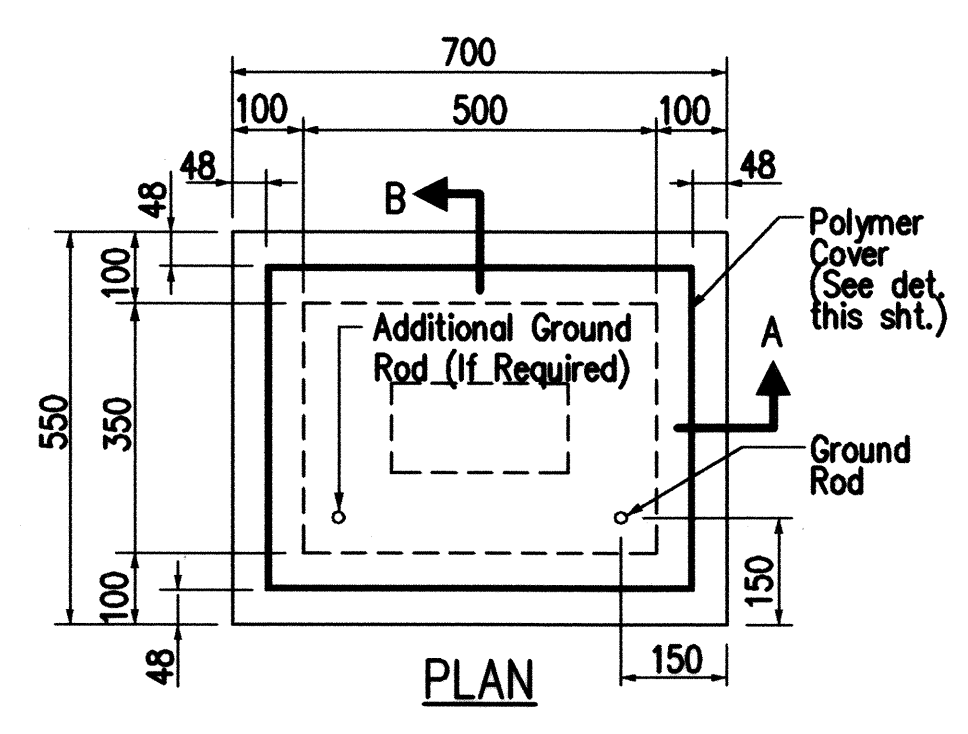
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

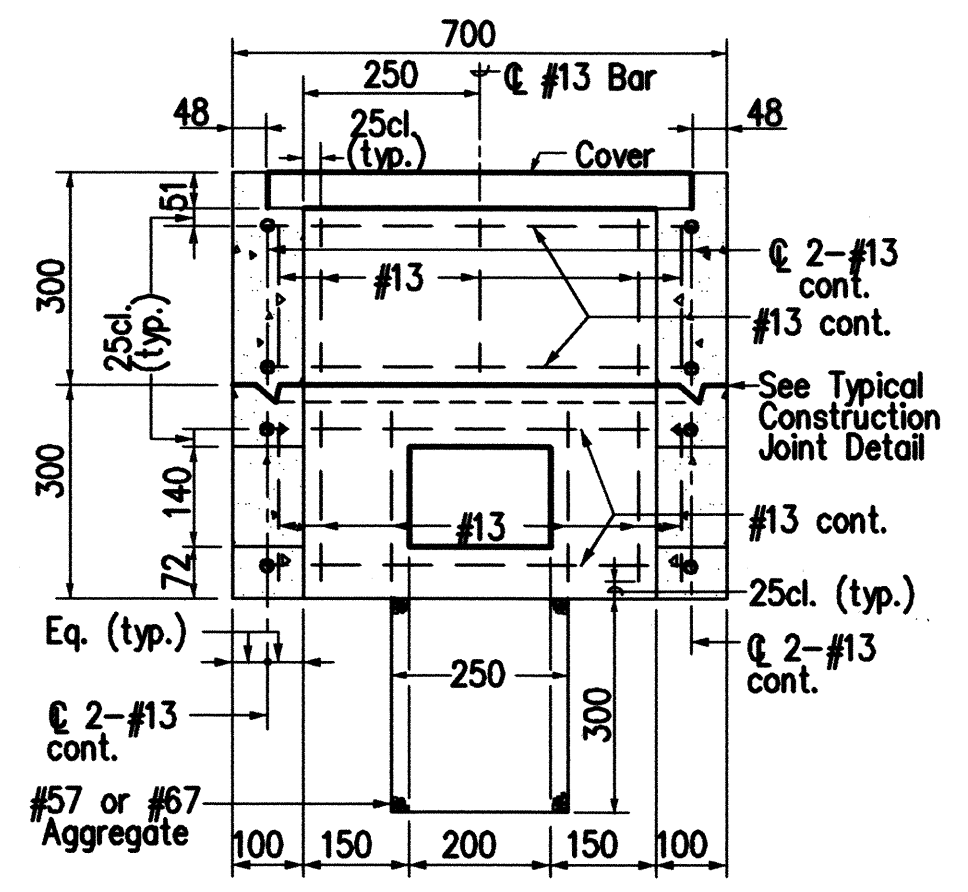
**TRAFFIC SIGNAL SYSTEM
PULLBOX & COVER DETAILS**

KAMEHAMEHA HIGHWAY
INTERSECTION IMPROVEMENTS AT PUPUKEA ROAD
PROJECT NO. 83B-01-98

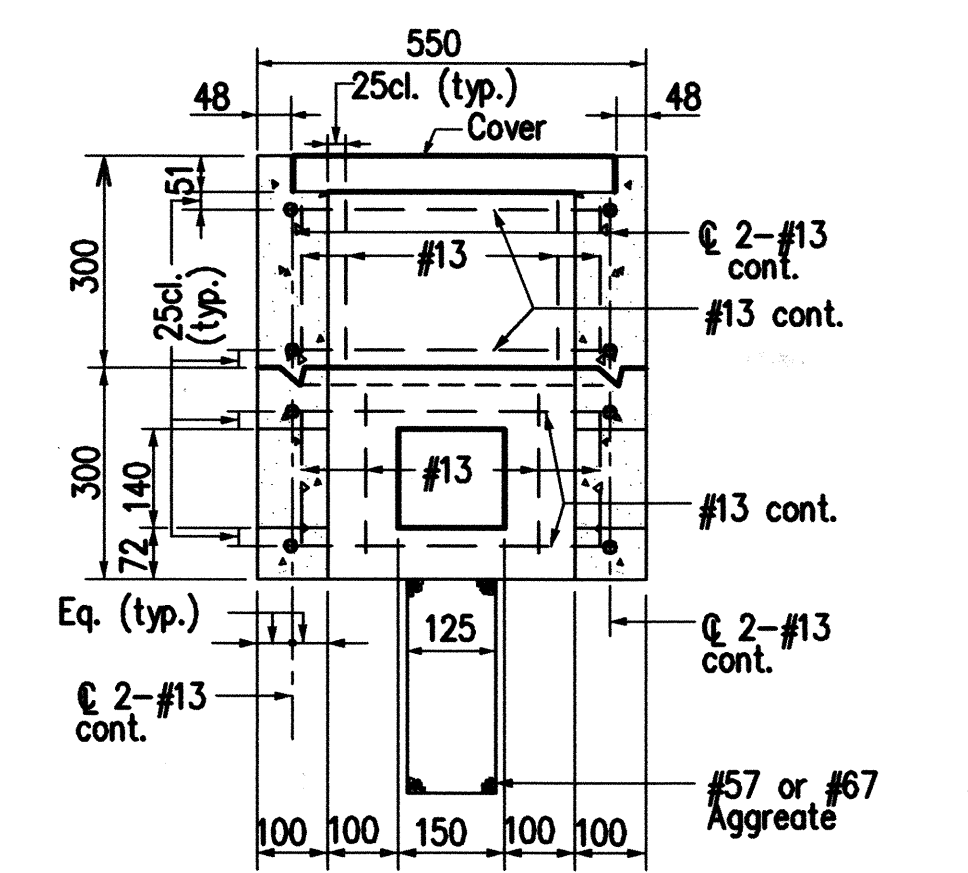
SCALE: AS SHOWN DATE: FEBRUARY 2000
SHEET NO. TS4 OF 7 SHEETS



PLAN

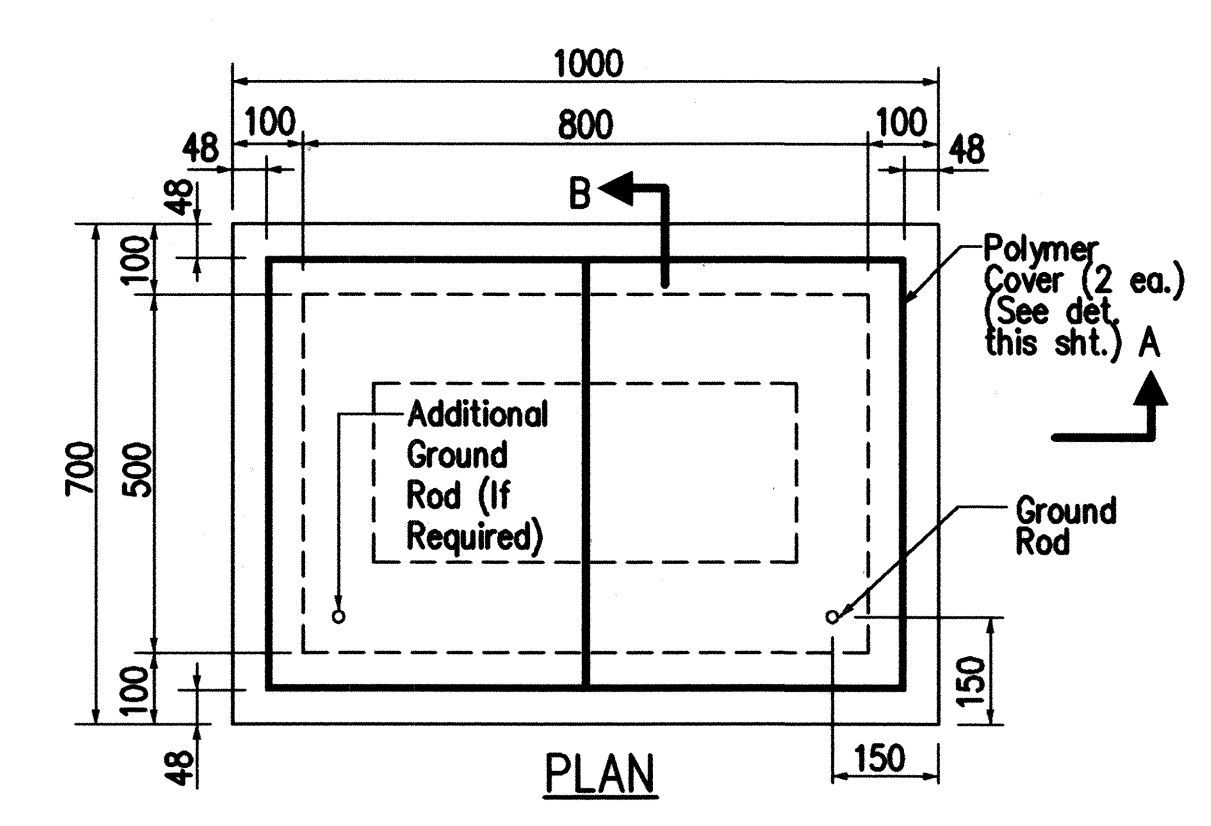


SECTION A-A

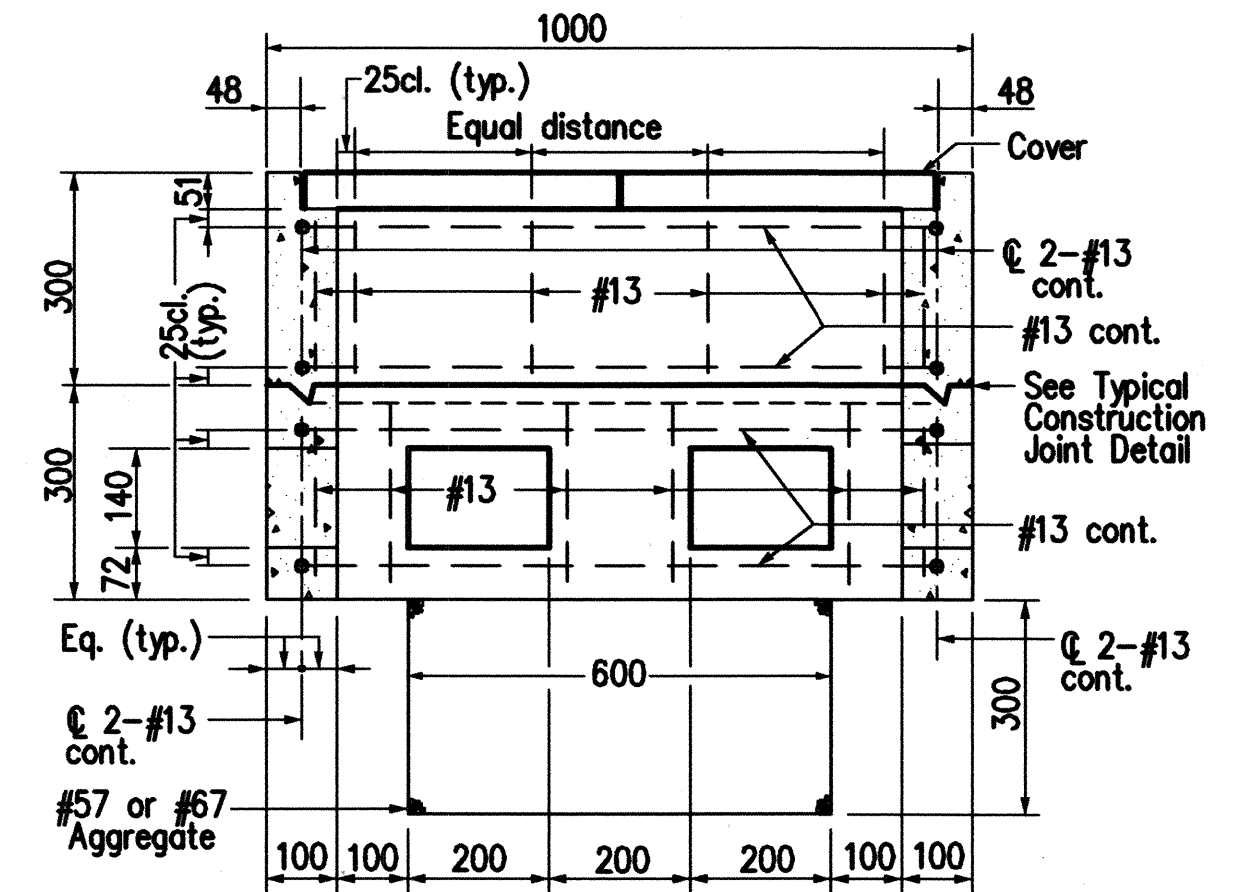


SECTION B-B

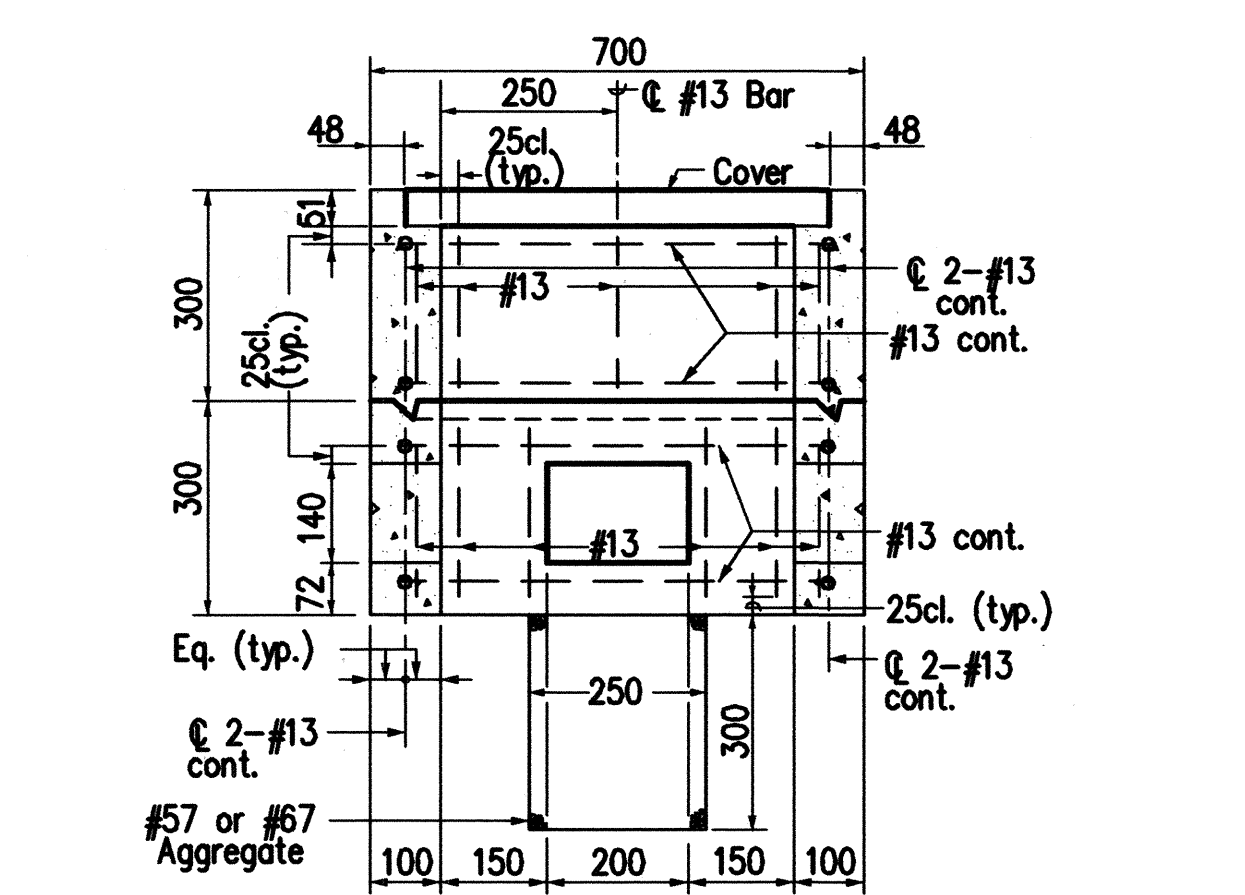
TYPE "A" PULLBOX
(Old Type "B")
Scale: 1 : 100



PLAN

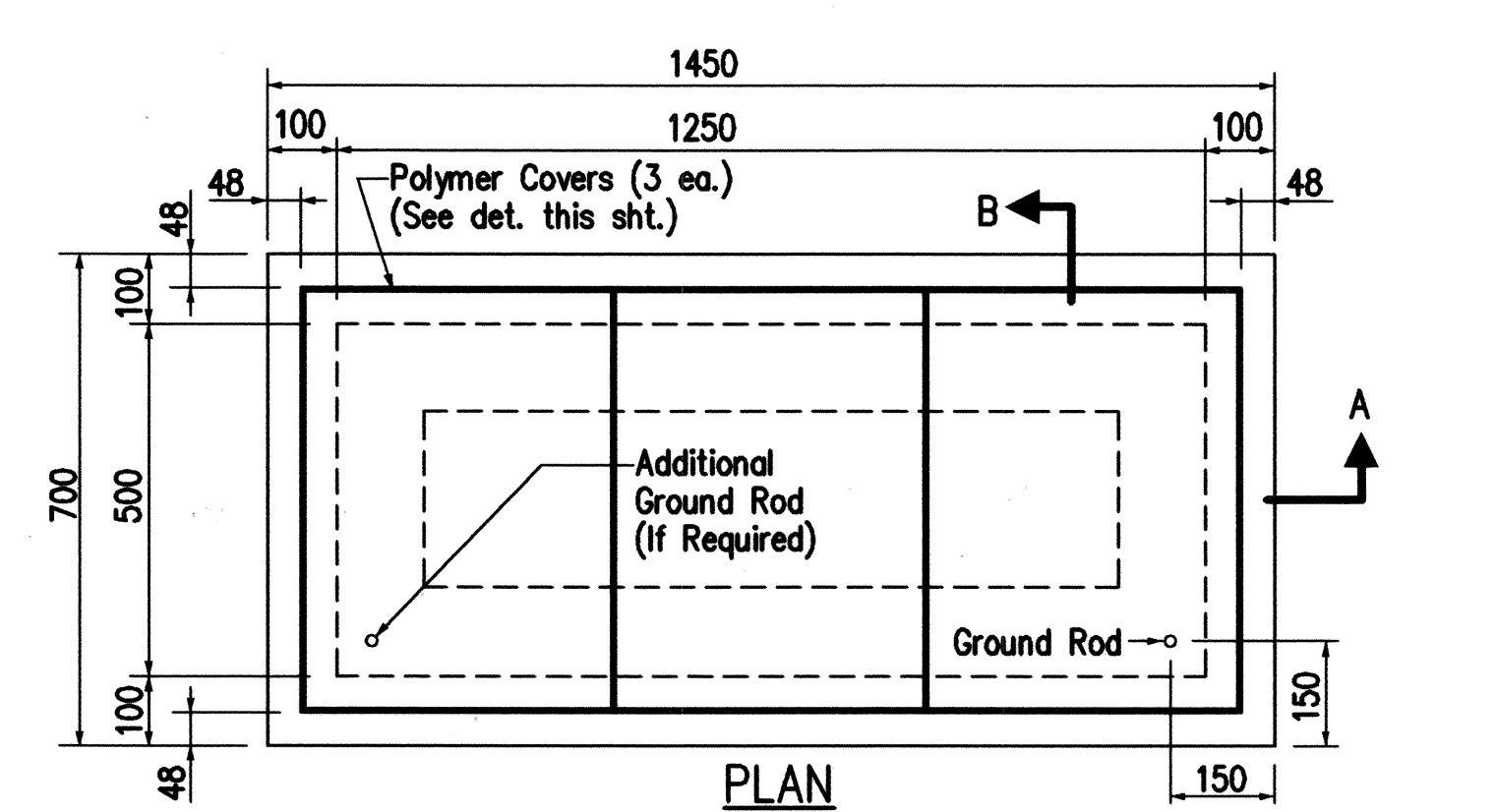


SECTION A-A

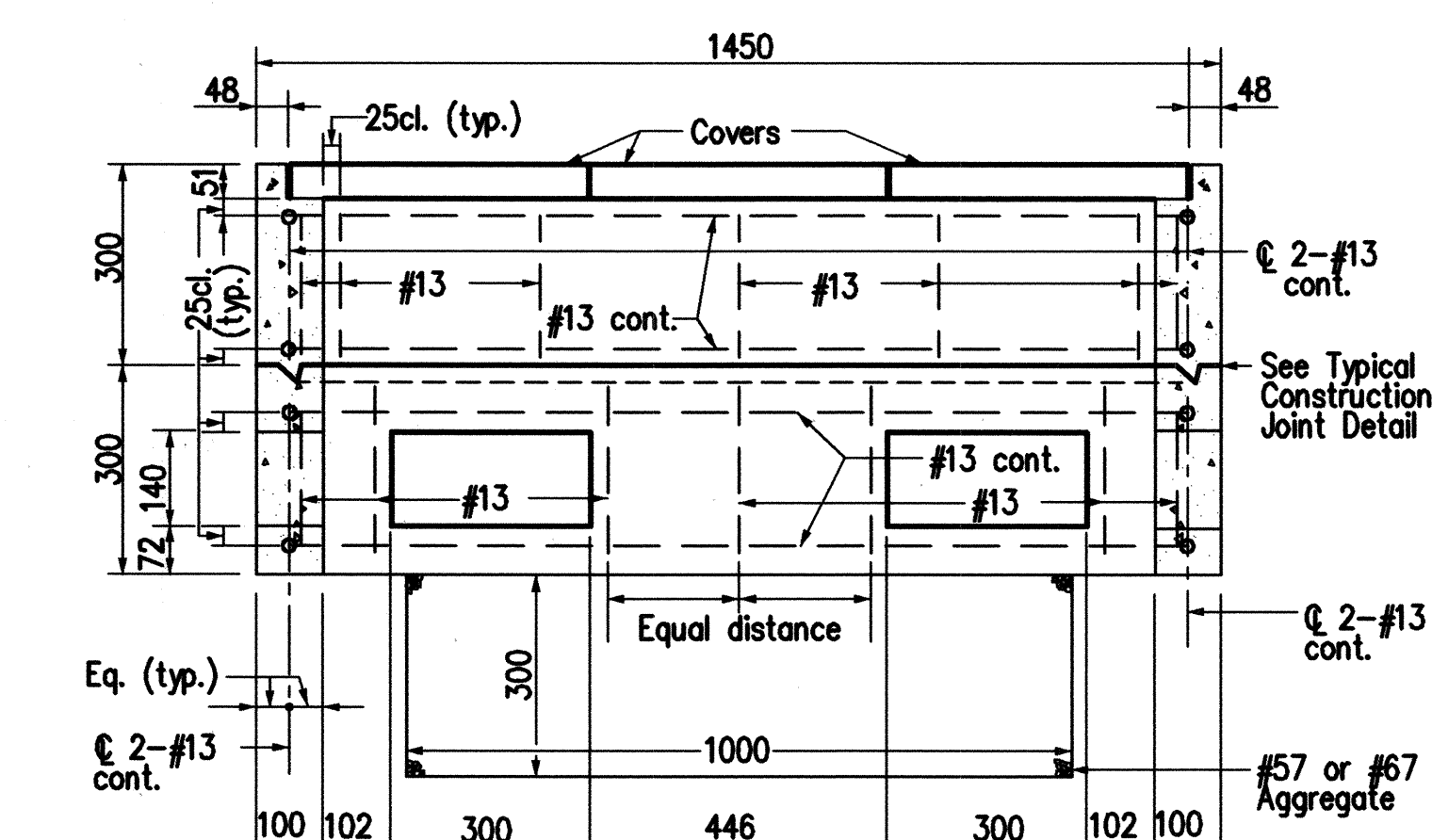


SECTION B-B

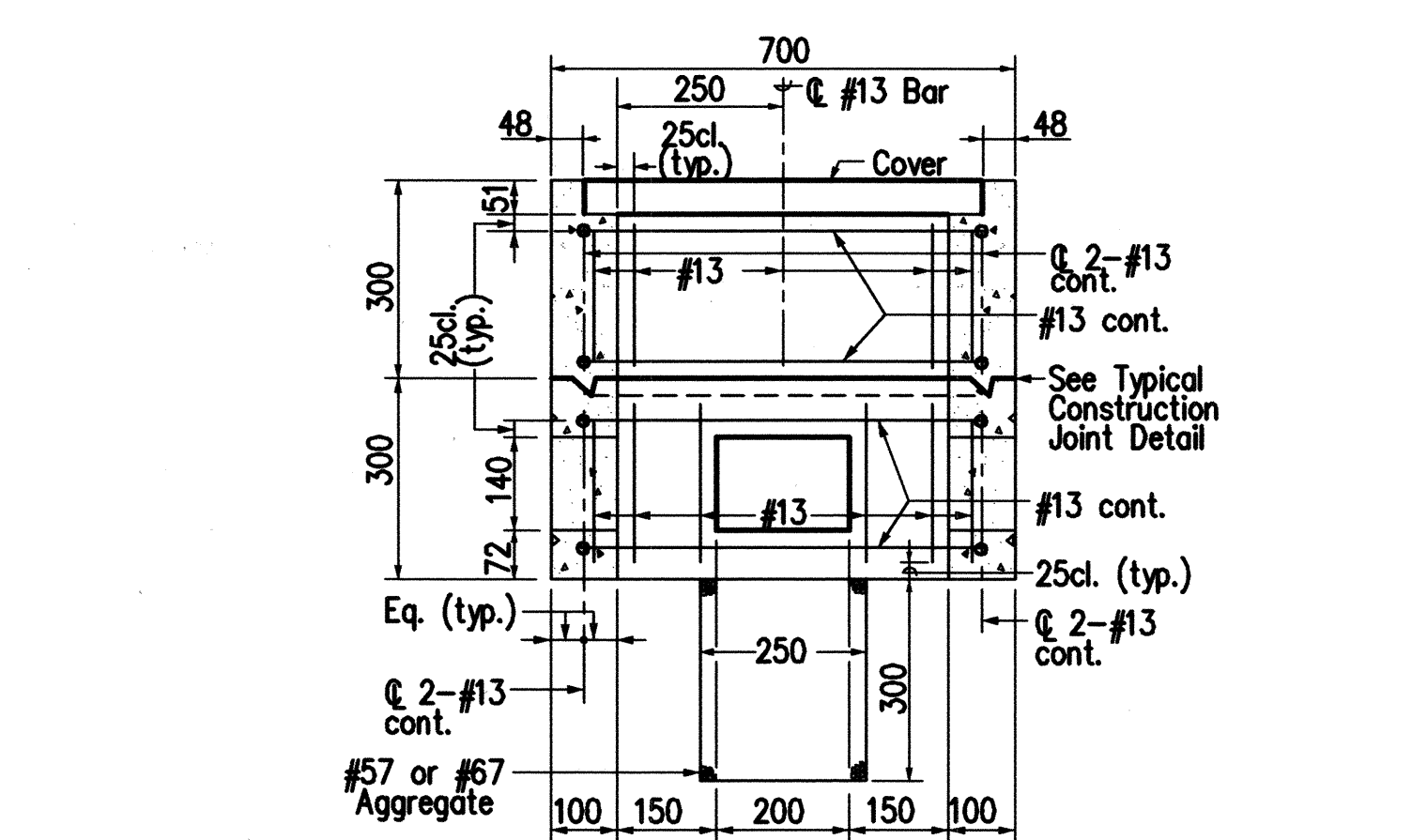
TYPE "B" PULLBOX (Old Type "C")
Scale: 1 : 100



PLAN

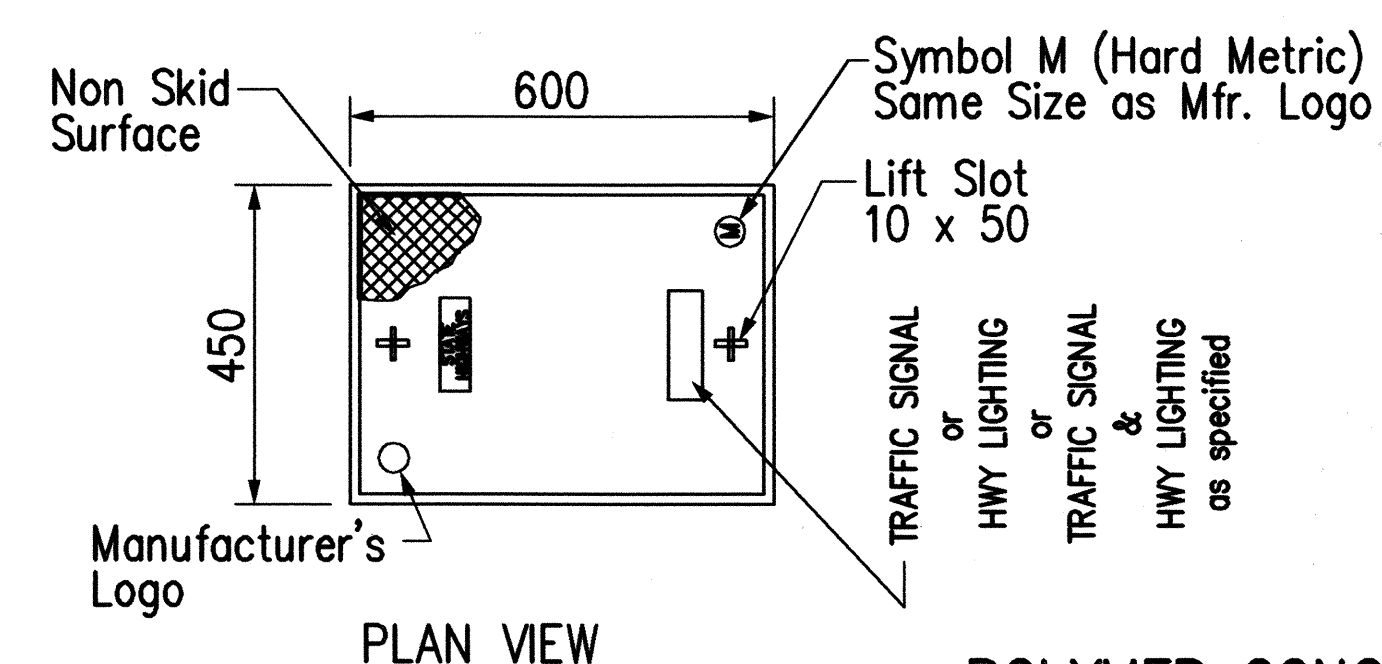


SECTION A-A

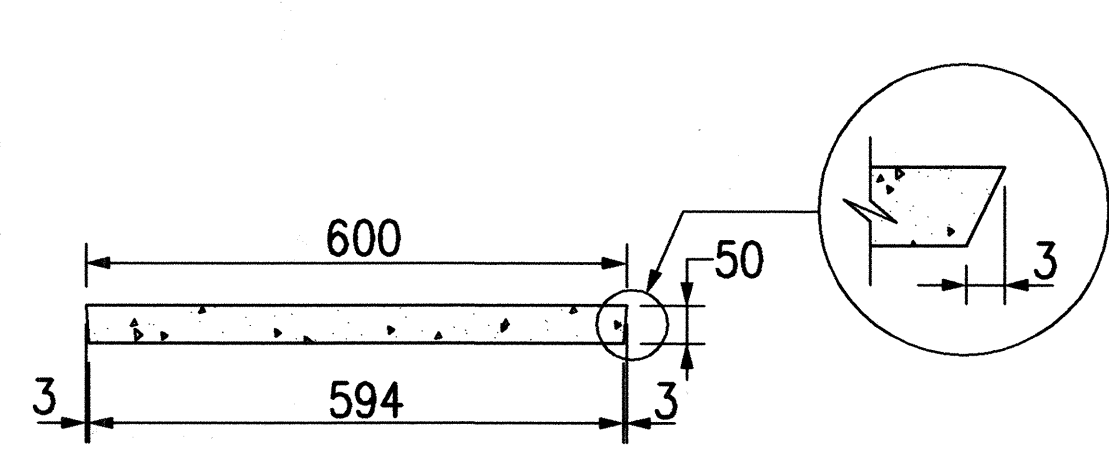


SECTION B-B

TYPE "C" PULLBOX (Old Type "D")
Scale: 1 : 100

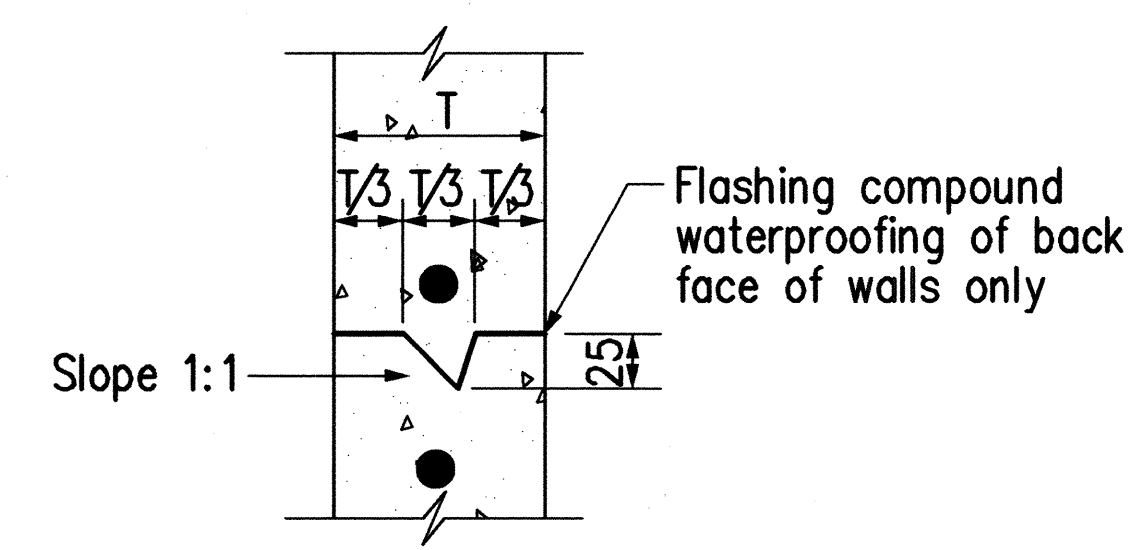


PLAN VIEW



ELEVATION

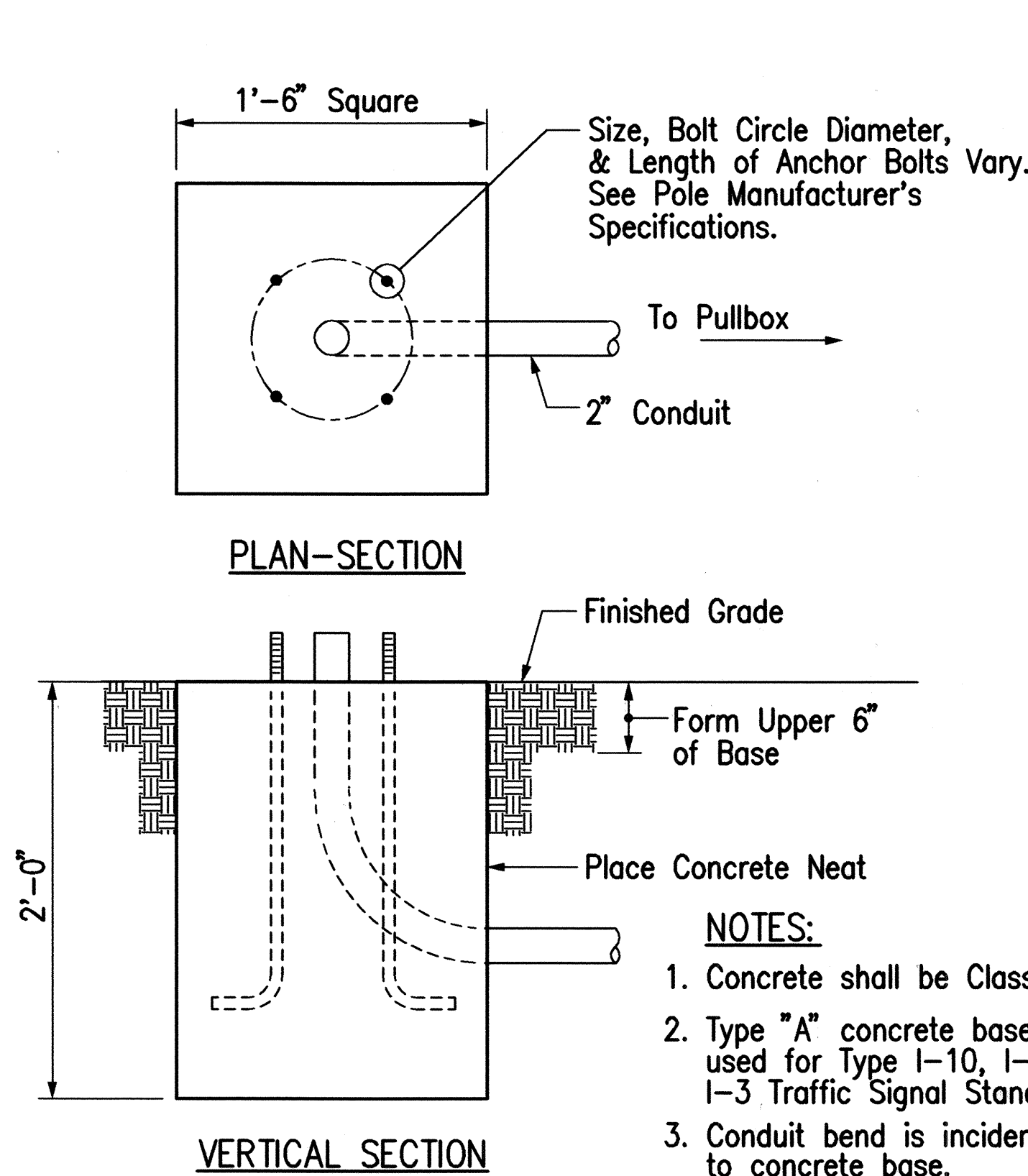
POLYMER CONCRETE COVER
Not to Scale



TYPICAL CONSTRUCTION JOINT DETAIL
Not to Scale

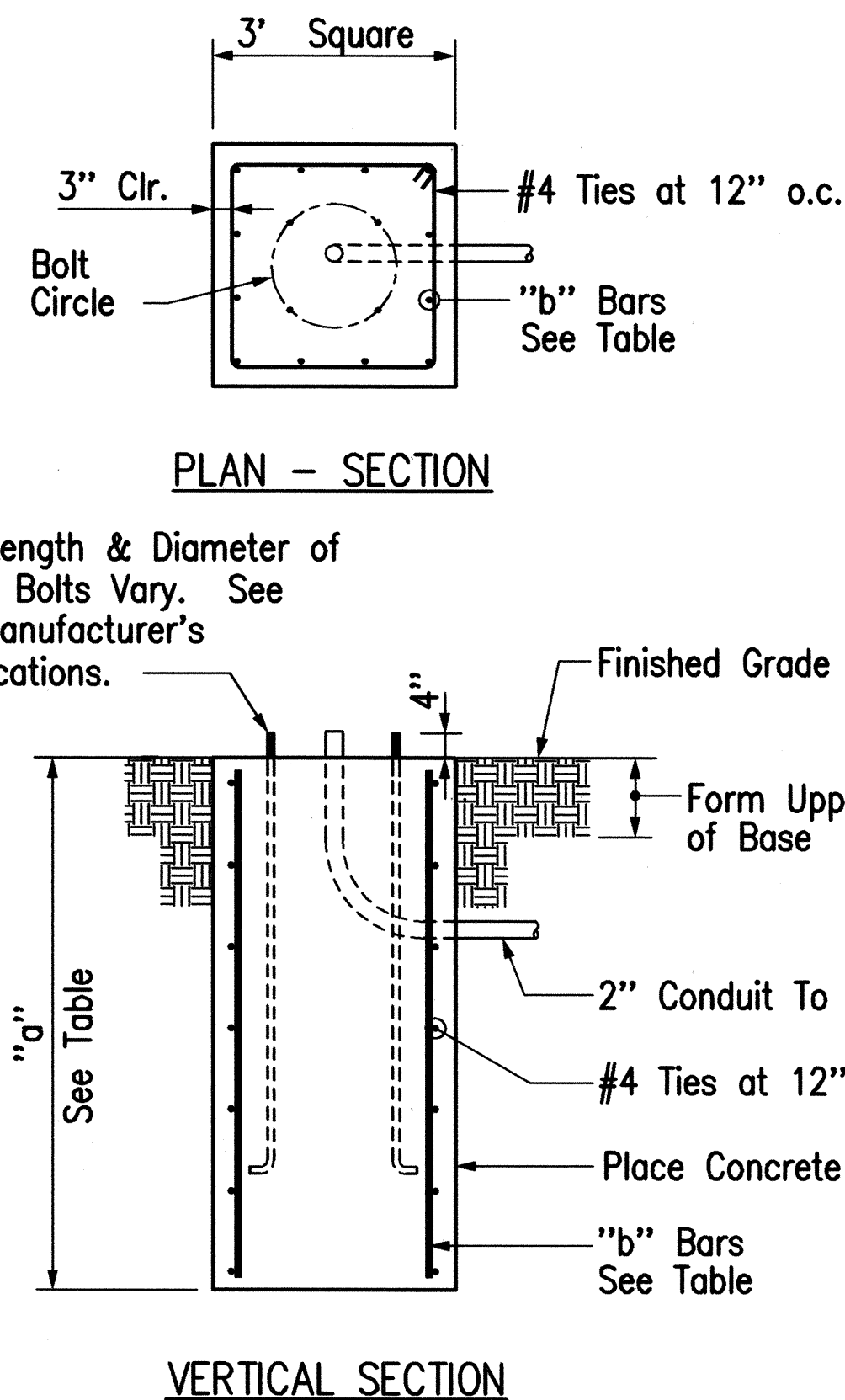
SURVEY PLOTTED BY: _____
DATE: _____
ORIGINAL PLAN
DRAWN BY: _____
TRACED BY: _____
NOTE BOOK
DESIGNED BY: _____
CHECKED BY: _____
No. _____

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	83B-01-98	2000	33	46



TYPE "A" CONCRETE BASE

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



TYPE "C" CONCRETE BASE

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

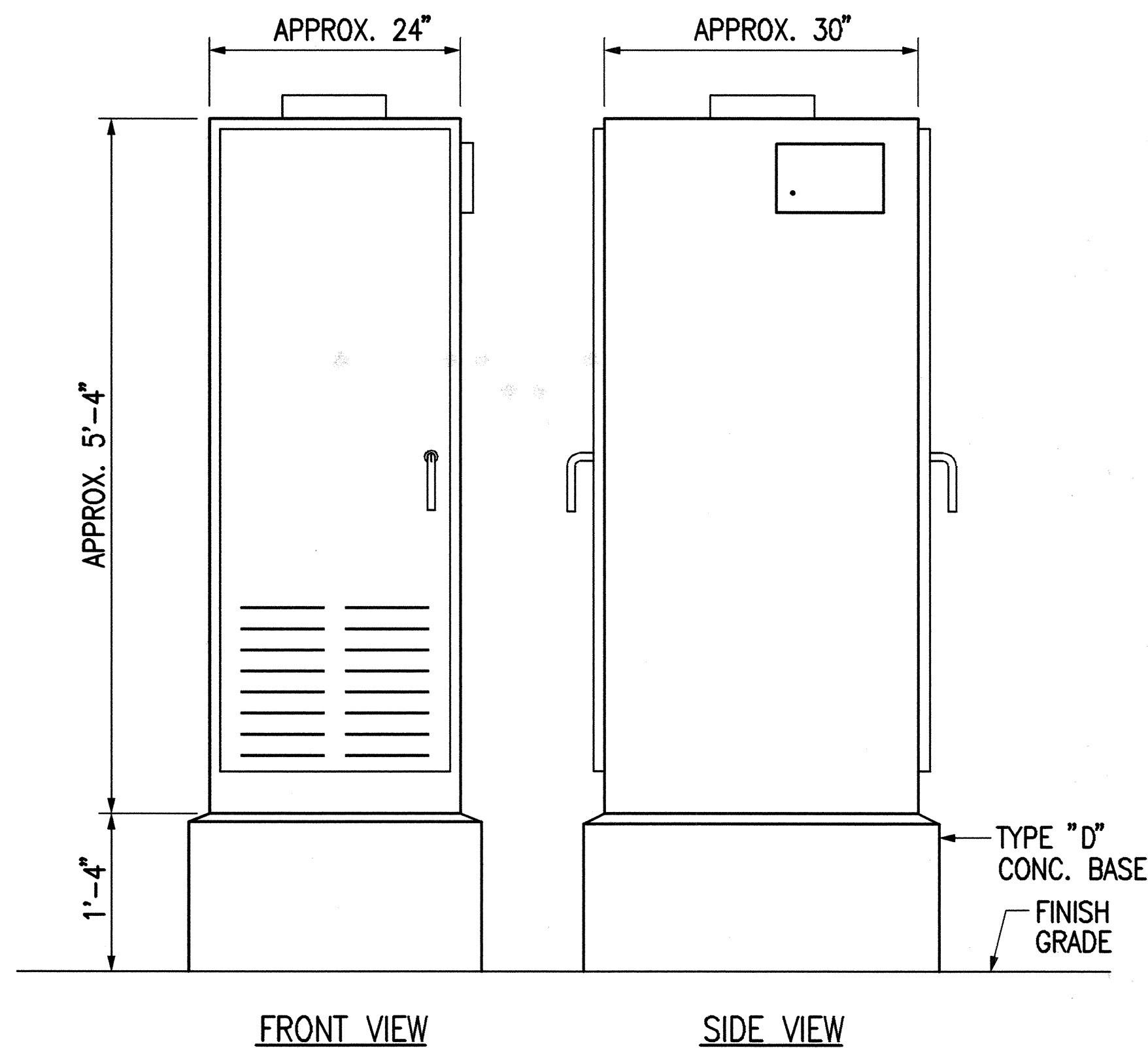
TYPE "C" CONCRETE BASE		
TYPE OF STANDARD	"a" Bars	"b" Bars
II - 18	5'-0"	12-#6
II - 20	5'-6"	12-#6
II - 25	6'-0"	12-#6
II - 30	6'-6"	12-#8
II - 35	6'-6"	12-#8
II - 40	7'-0"	12-#8
III - 18	5'-0"	12-#6
III - 20	5'-6"	12-#6
III - 25	6'-0"	12-#6
III - 30	6'-6"	12-#8
III - 35	6'-6"	12-#8
III - 40	7'-0"	12-#8

Typical Standard Designation: II - 25

Type ↑

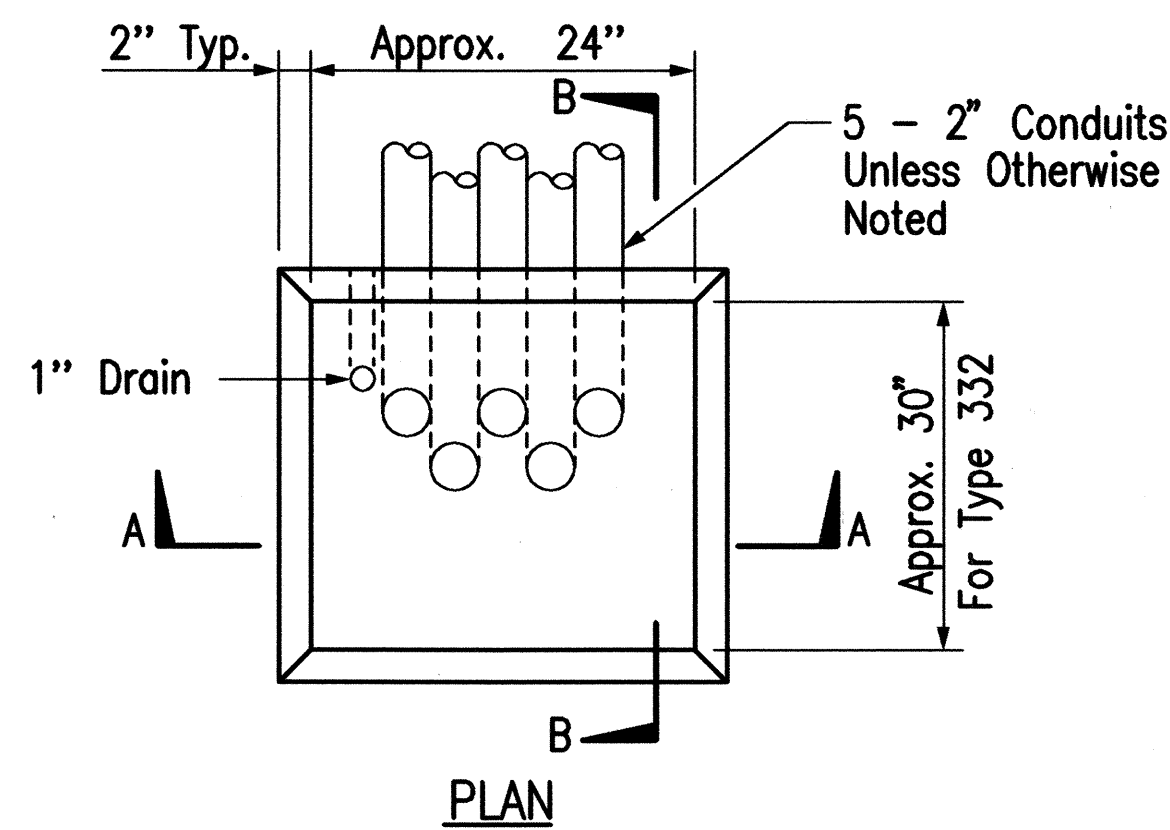
Mast Arm Length →

- NOTES:**
- Concrete shall be Class "B".
 - Type "C" concrete base shall be used for Types II and III Traffic Signal Standards.
 - Design Lateral Pressure: 1,500 PSF.
 - Conduit bend is incidental to concrete base.



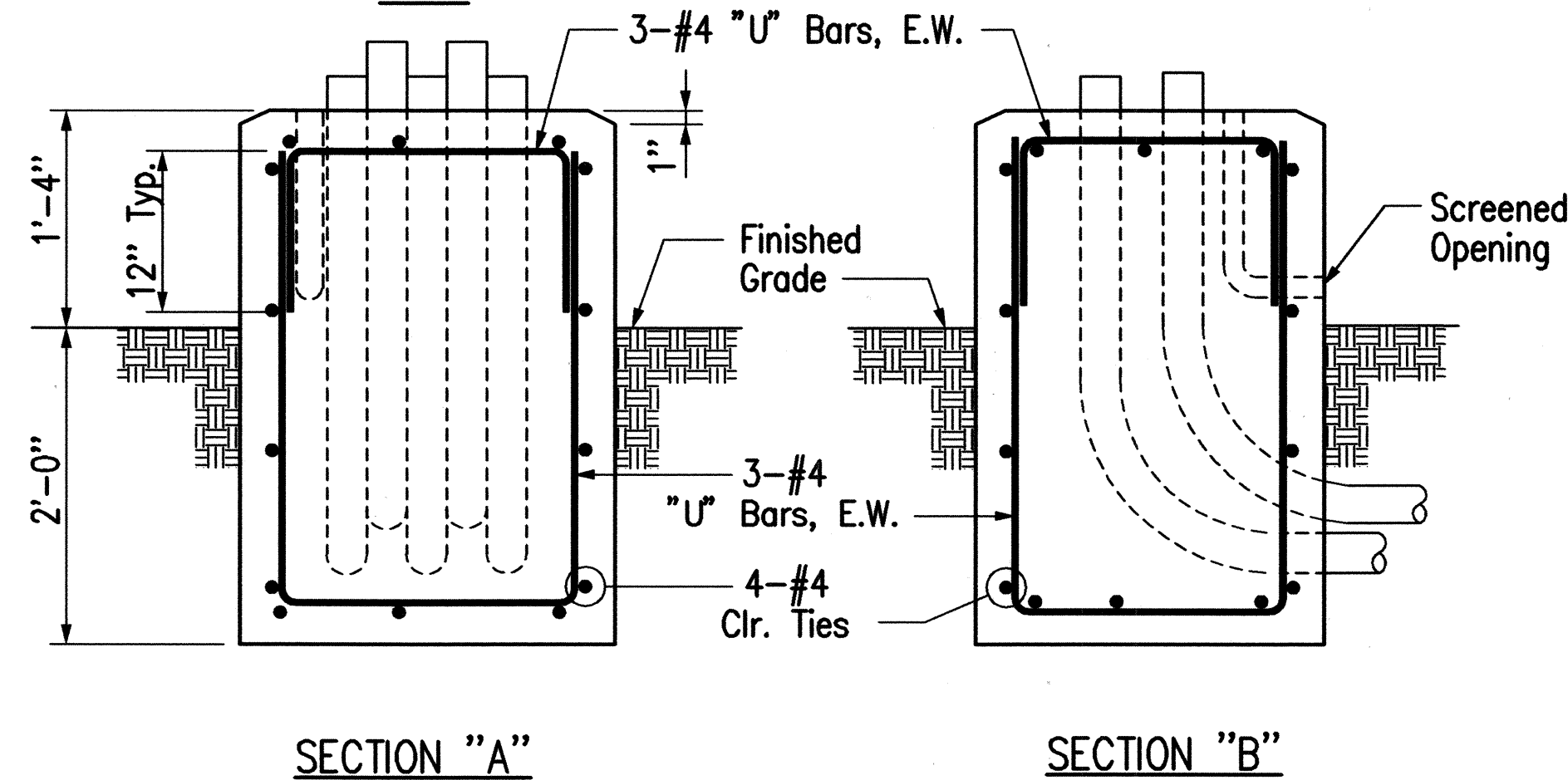
TYPE 332A CABINET

Not to Scale



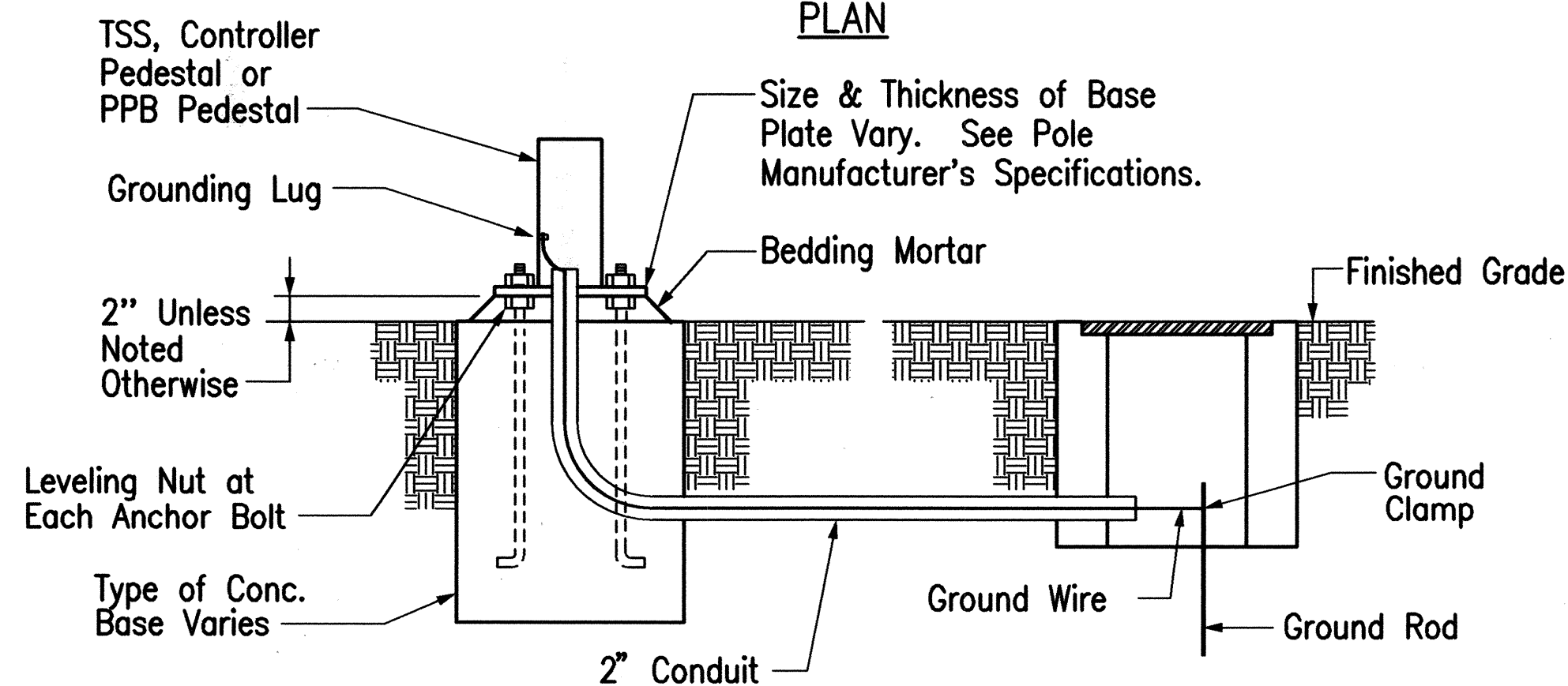
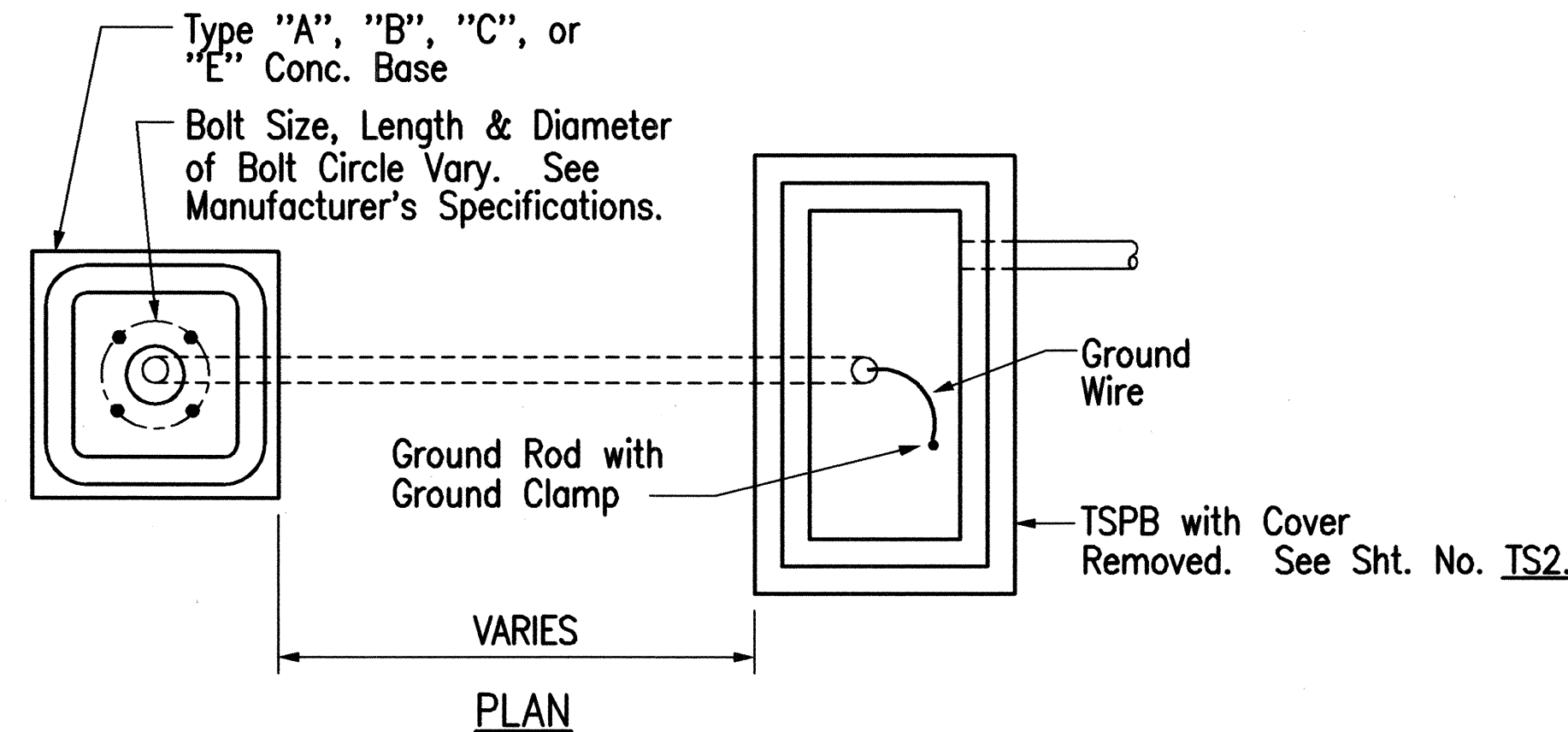
NOTES:

- Concrete shall be Class "B".
- Dimensions shall be altered to suit controller cabinet actually furnished.
- Conduit bends and drain are incidental to concrete base.
- Refer to cabinet manufacturer's specifications for details of anchor bolts and base setting.
- All exposed surfaces of concrete base shall be given a Class 2, Rubbed Finish.



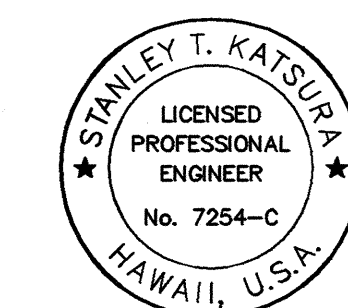
TYPE "D" CONC. BASE FOR CONTROLLER CABINETS

Scale: 1" = 1'-0"



TYPICAL STANDARD AND PEDESTAL INSTALLATION

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



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Stanley T. Katsura

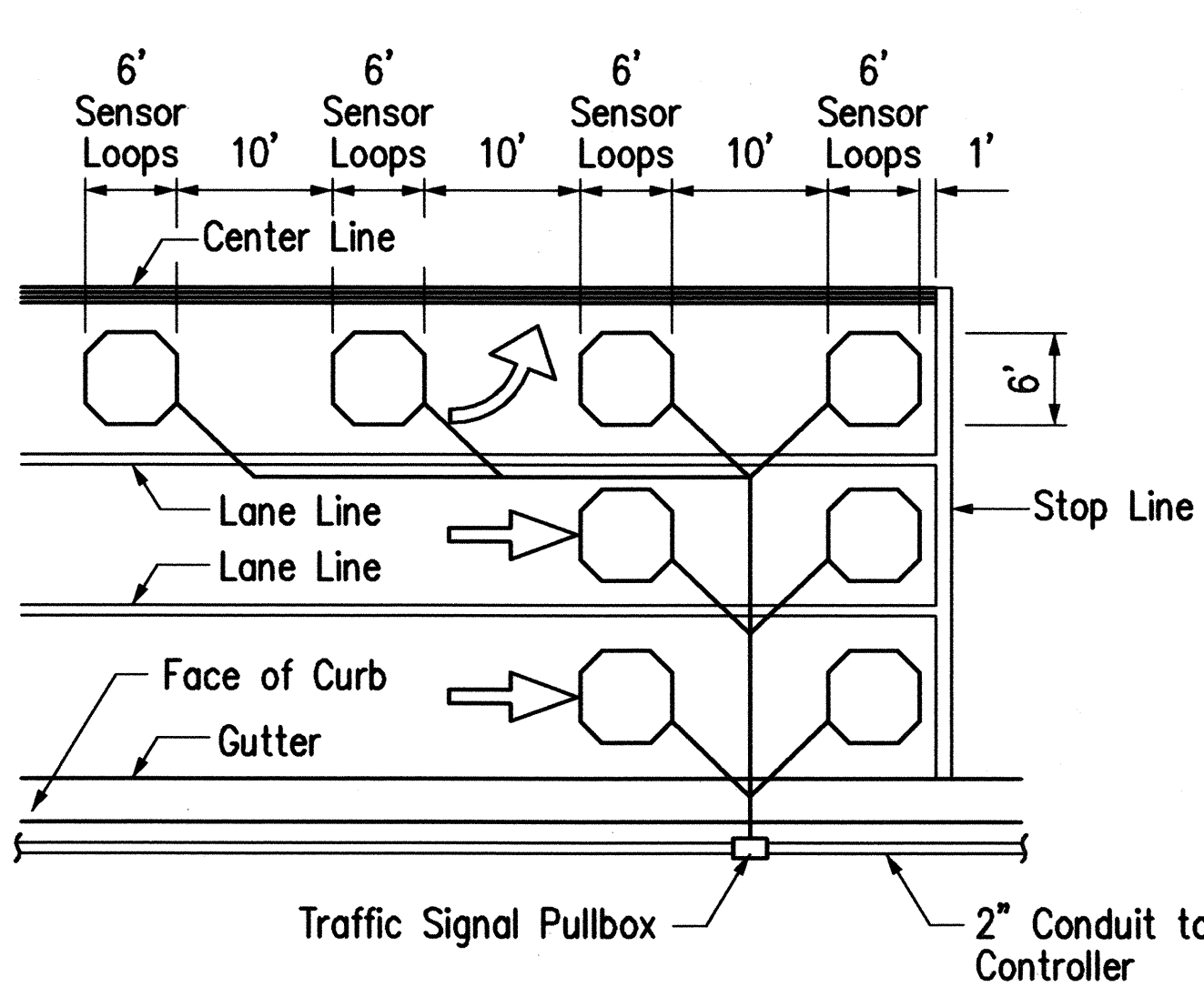
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**TRAFFIC SIGNAL SYSTEM
MISCELLANEOUS DETAILS**

KAMEHAMEHA HIGHWAY
INTERSECTION IMPROVEMENTS AT PUPUKEA ROAD
PROJECT NO. 83B-01-98

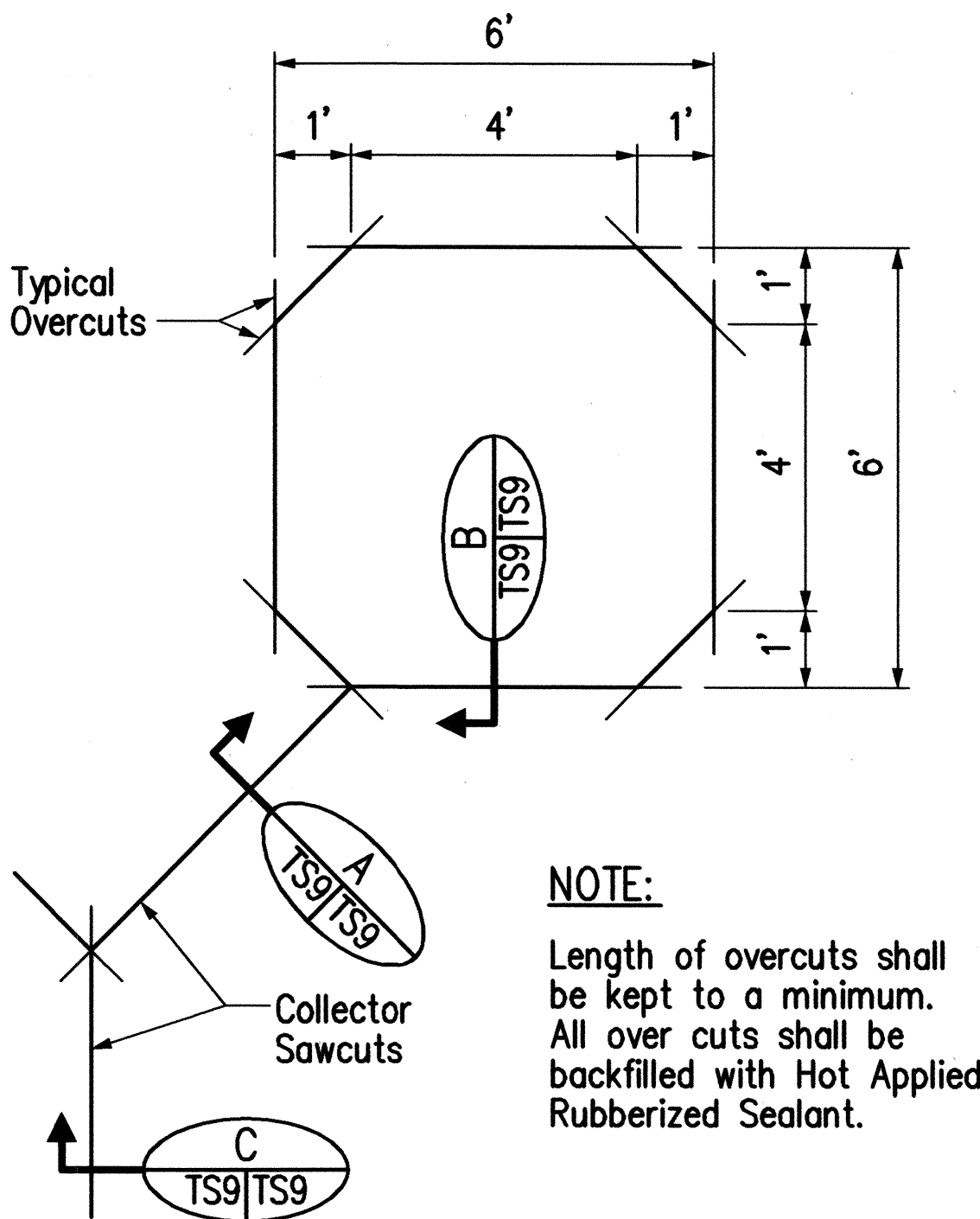
SCALE: AS SHOWN DATE: FEBRUARY 2000
SHEET NO. TS5 OF 7 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	83B-01-98	2000	34	46



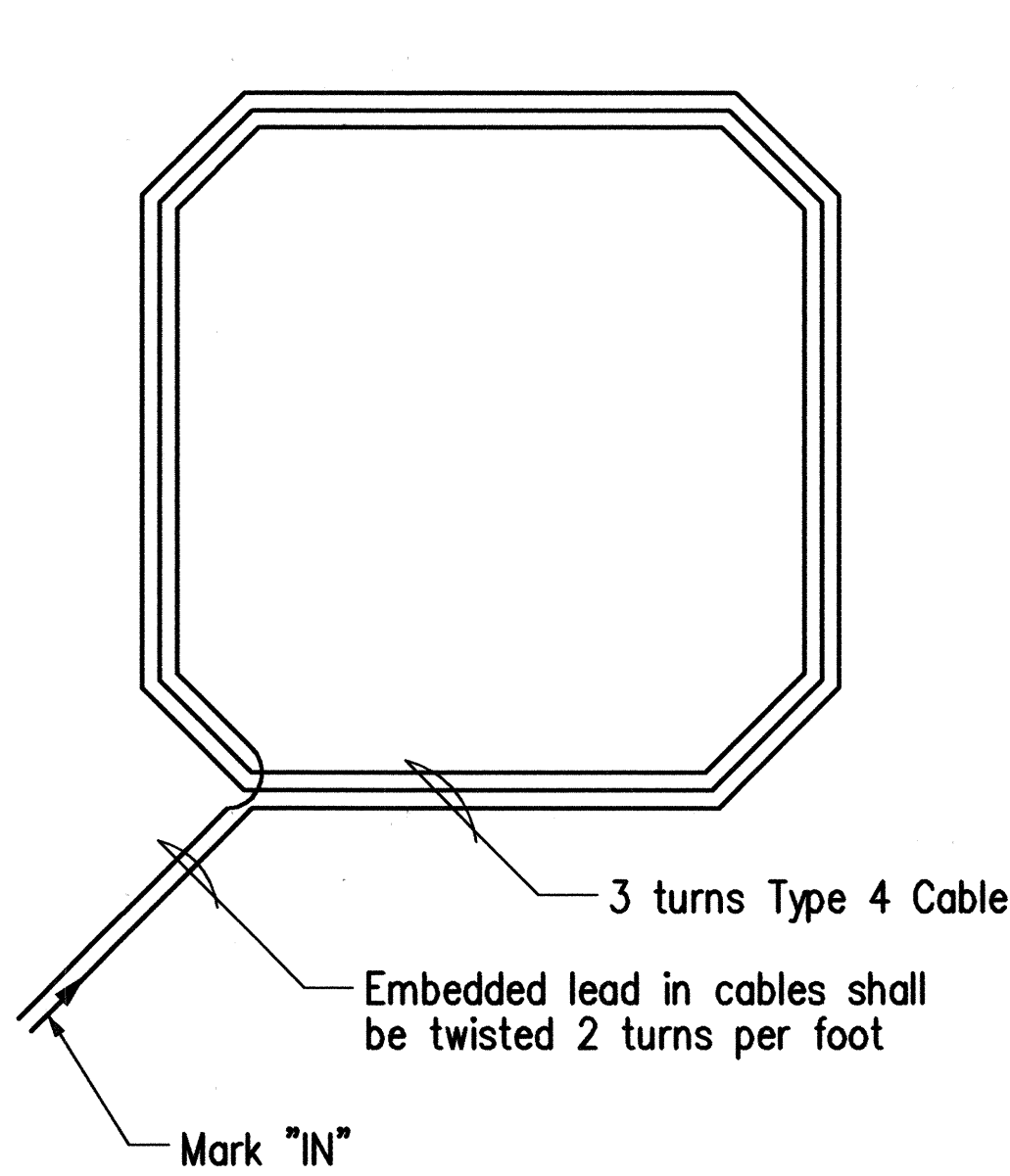
- NOTES:**
- Center sensor loops in lanes.
 - Collector Cables shall be twisted 2 turns per foot.
 - Number of loops and locations vary. See Sht. No. **TS2**.
 - Number and locations of Collector Sawcuts may be varied in the field.

TYPICAL SENSOR LOOP LAYOUT

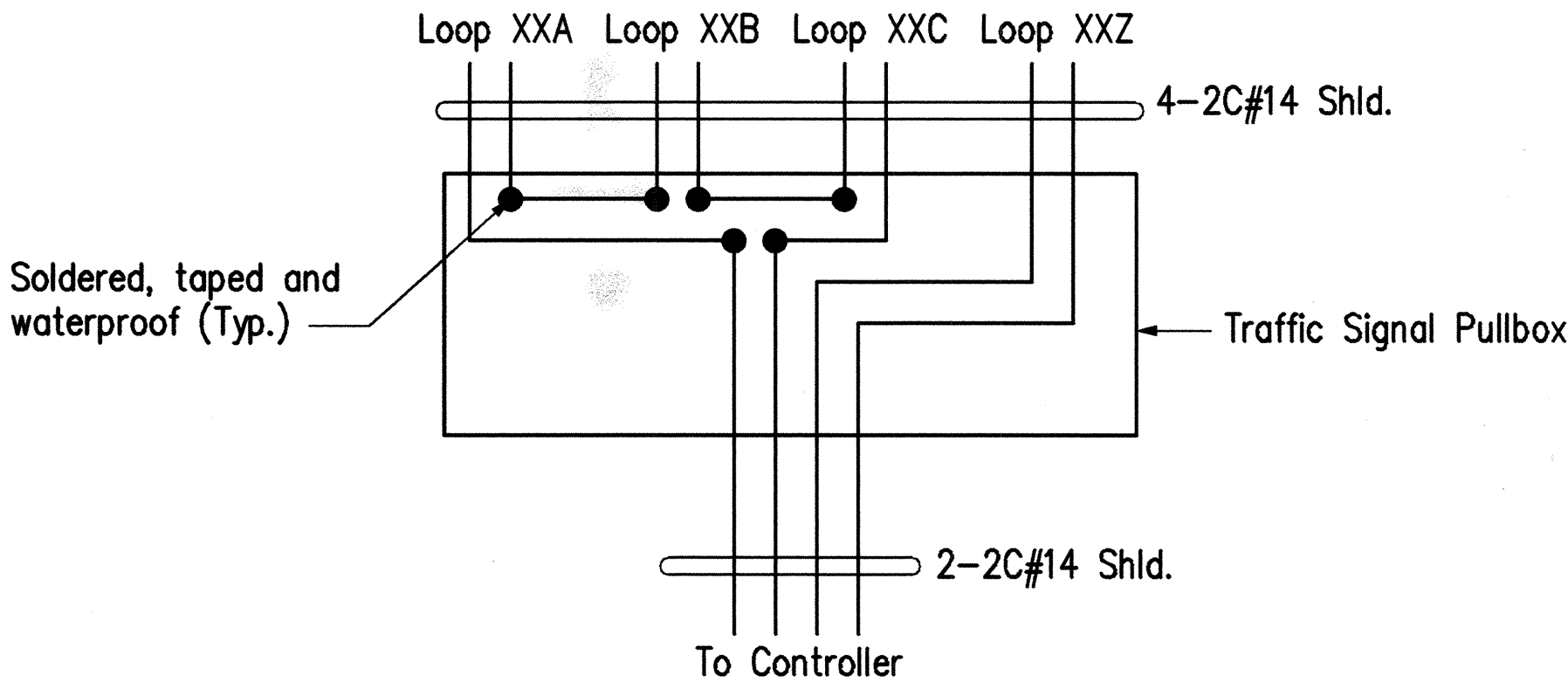


NOTE:
Length of overcuts shall be kept to a minimum. All over cuts shall be backfilled with Hot Applied Rubberized Sealant.

TYPICAL SENSOR LOOP SAWCUT DETAIL



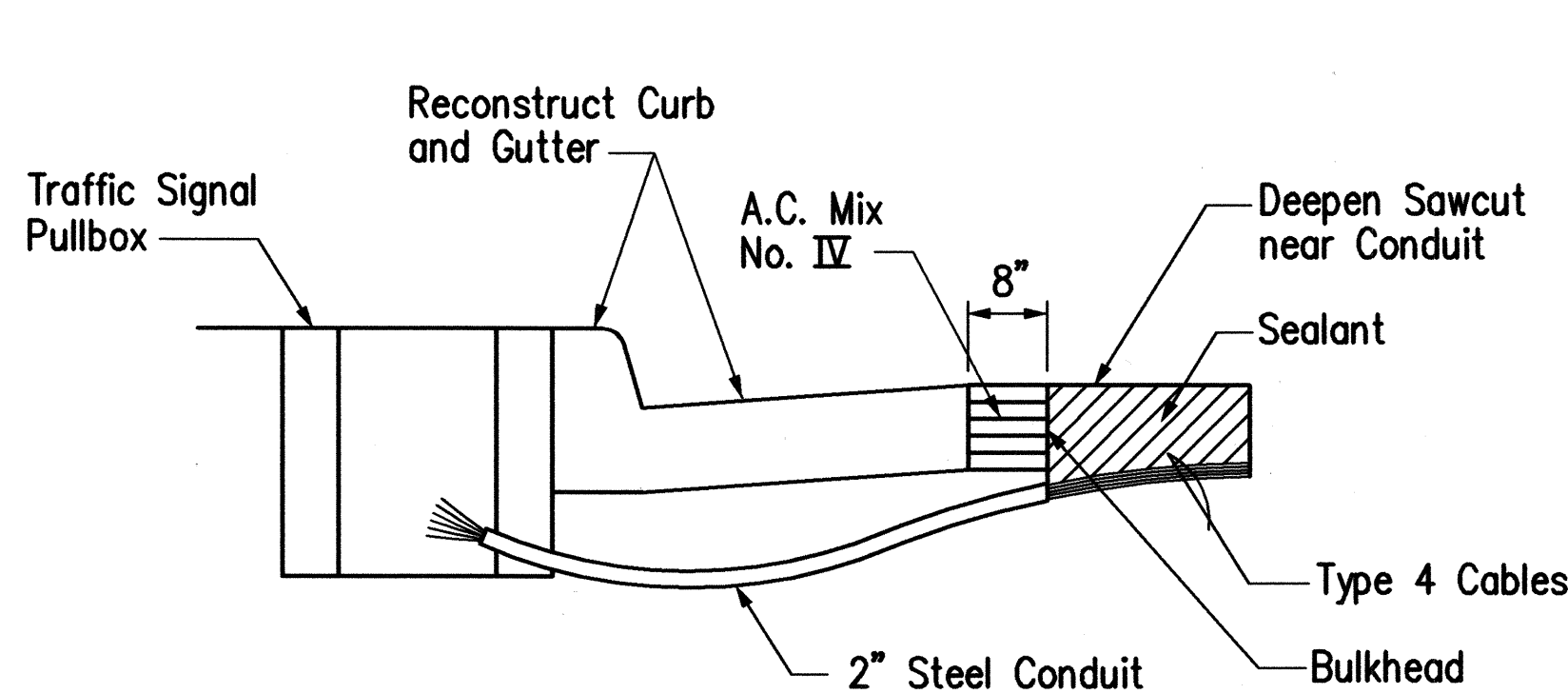
TYPICAL SENSOR LOOP WIRING DIAGRAM



LOOP DETECTOR CONNECTION DETAIL

TYPES OF CABLES

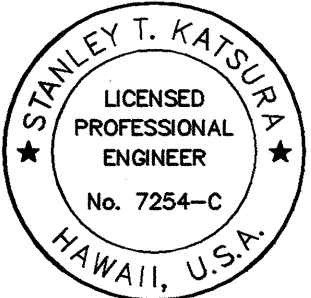
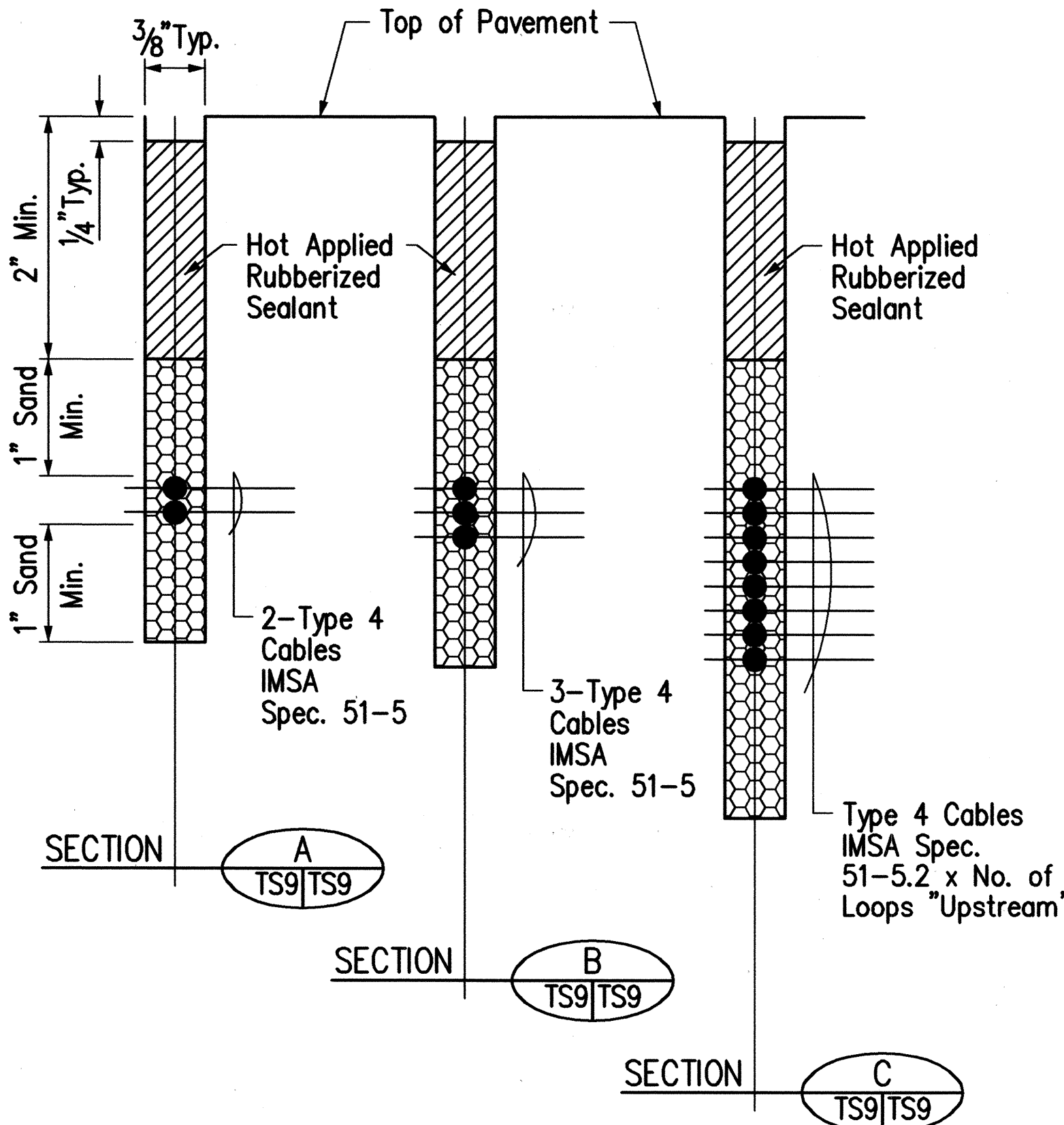
- Type 1 Signal Loop Cable: Stranded No. 14, 26 conductors
- Type 2 Detector lead in cable and pedestrian push button circuit cable: Stranded, No. 14, two conductors
- Type 3 Interconnect Cable: Solid No. 19, 12 pairs
- Type 4 Loop Sensor Cable: Solid No. 12, single conductor to IMSA spec. 51-5
- Type 5 Cable from signal loop to signal head: Stranded, No. 14, four conductors
- Type 6 Service Cable: Solid, No. 6, three conductors
- Type 7 Optical Detector Cable: Berktek Type B, Stranded, No. 20, three conductors
- Type 8 Drop Cable: Solid, No. 14, four conductors



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 PAVEMENT



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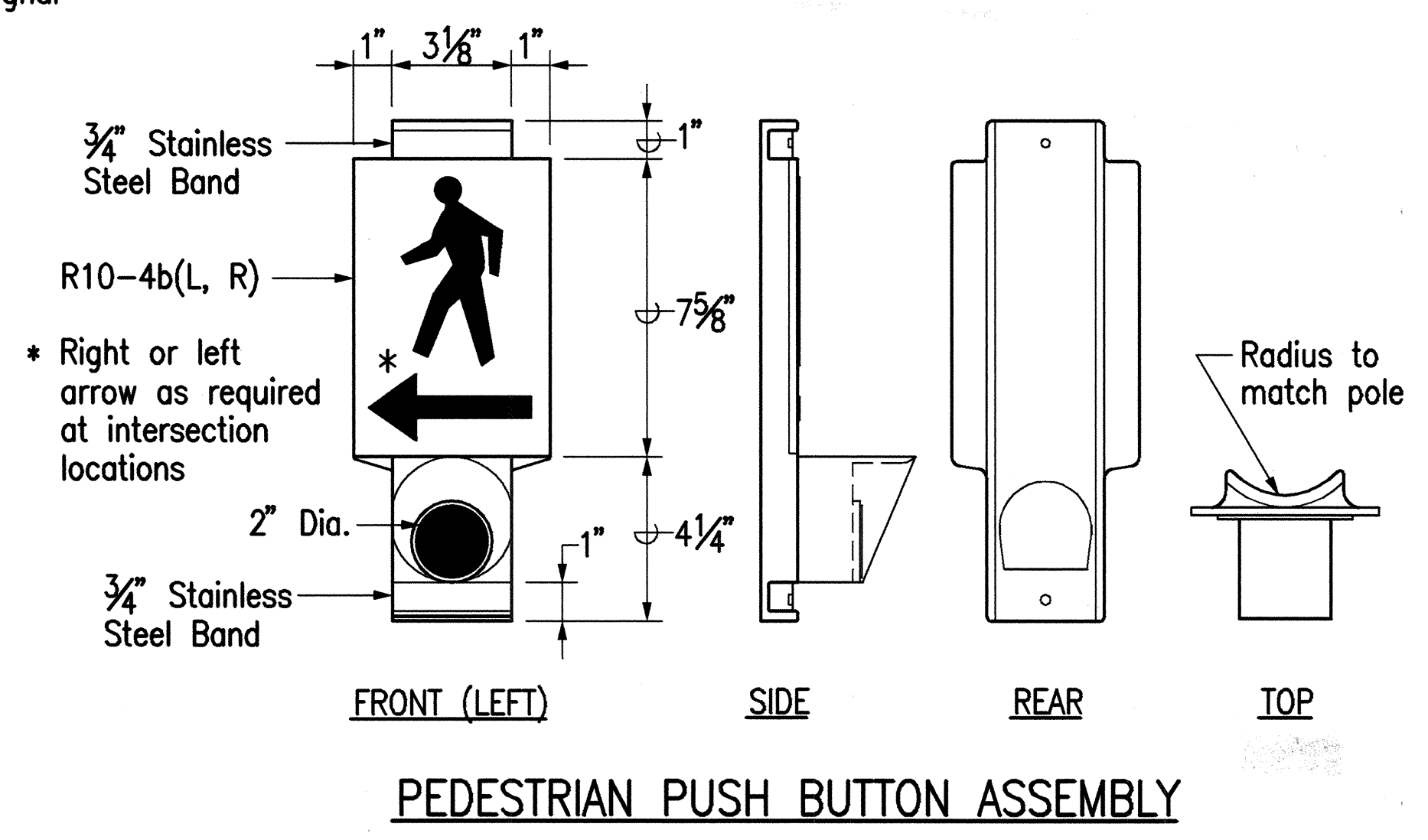
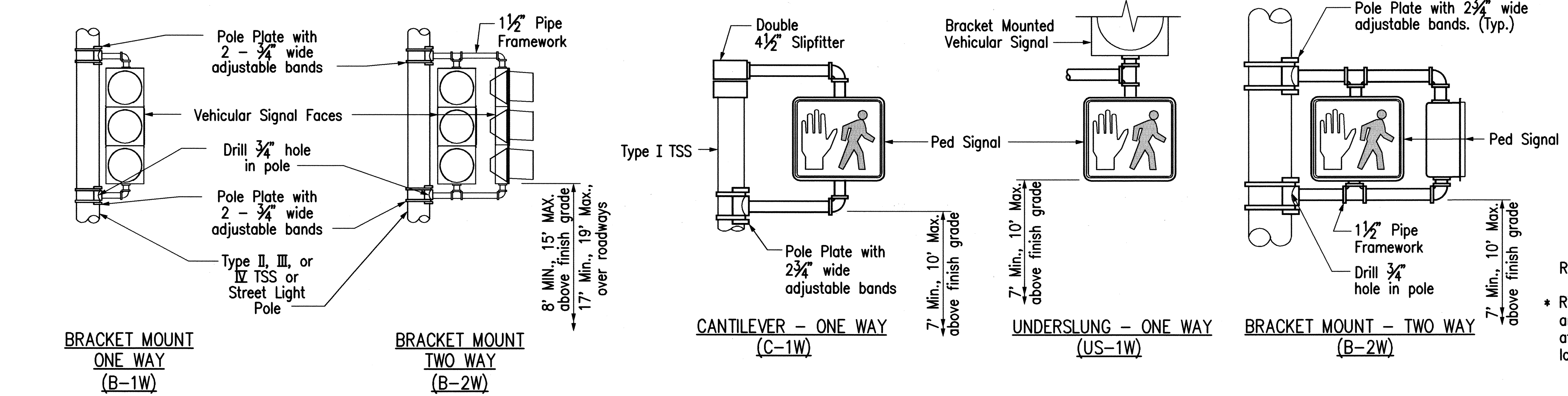
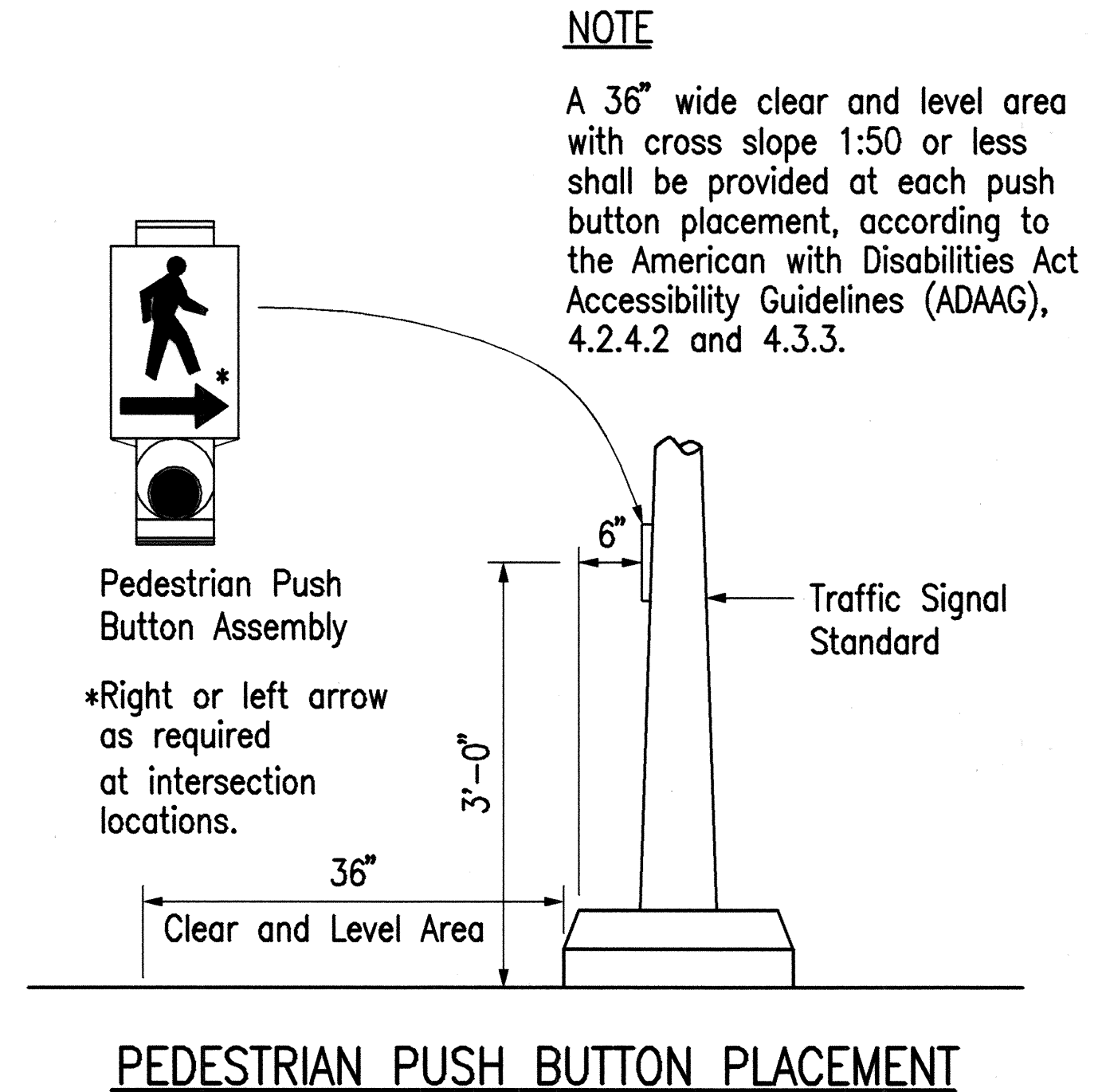
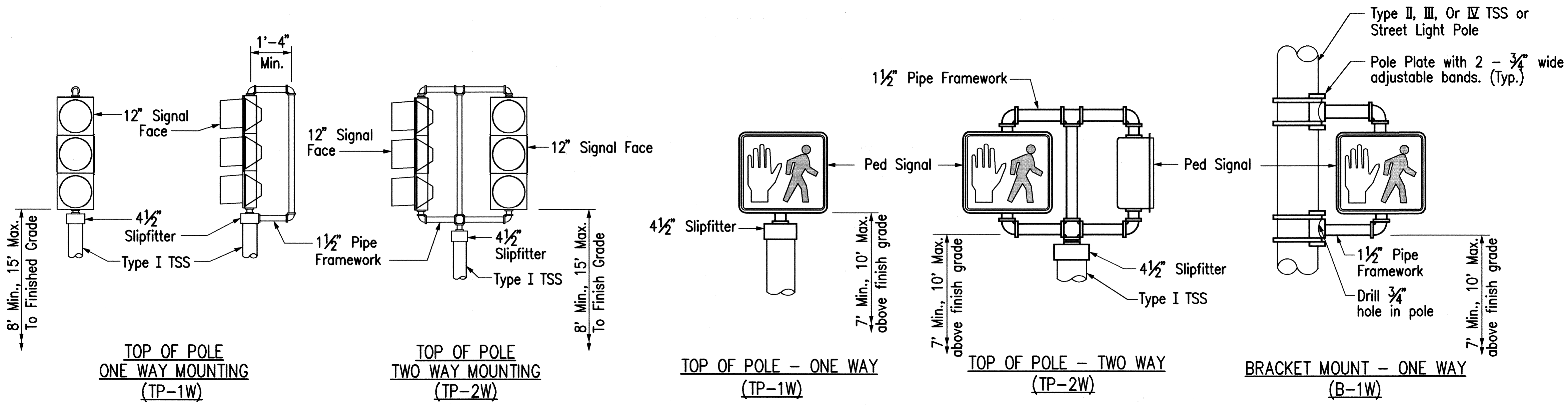
Stanley T. Katsura

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
**TRAFFIC SIGNAL SYSTEM
LOOP DETECTOR DETAILS**

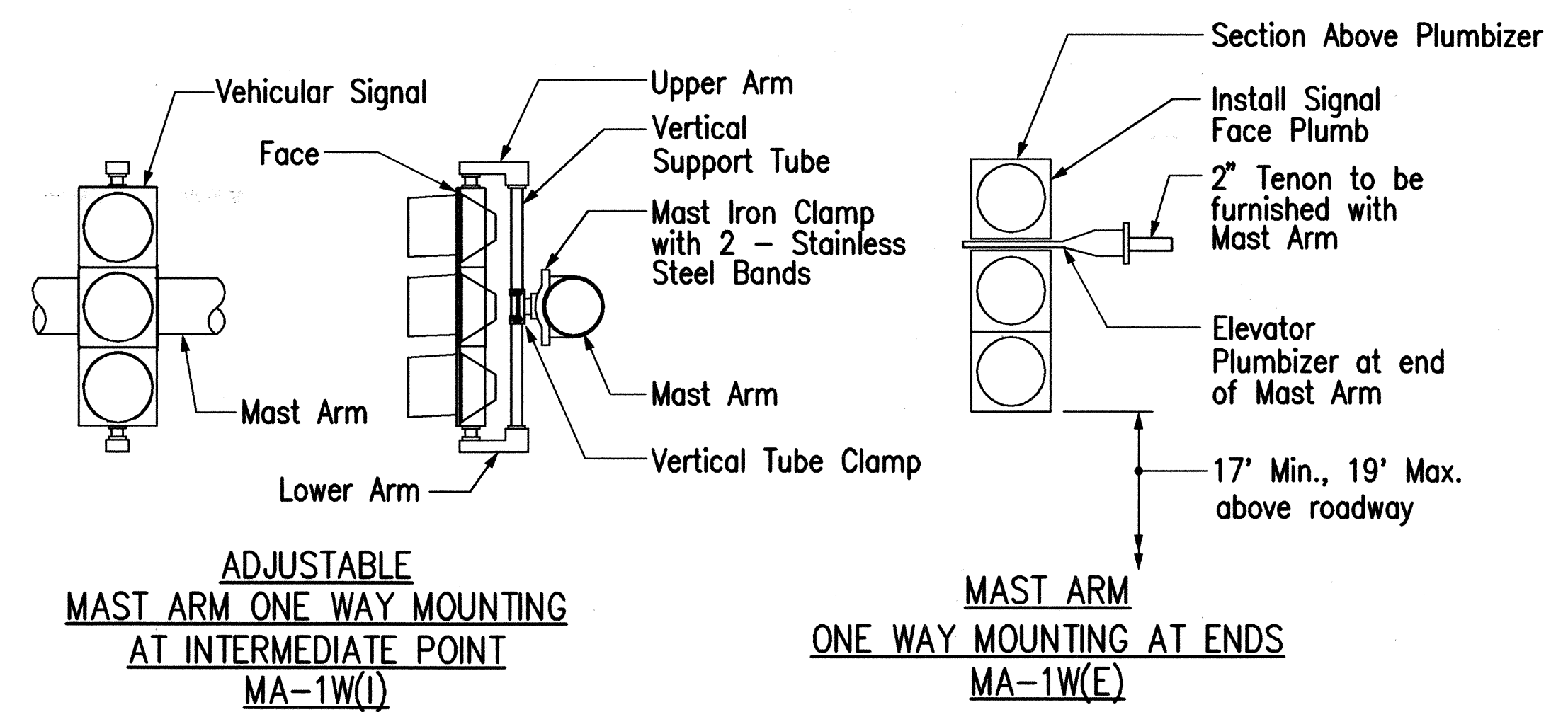
KAMEHAMEHA HIGHWAY
INTERSECTION IMPROVEMENTS AT PUPUKEA ROAD
PROJECT NO. 83B-01-98
SCALE: NONE DATE: FEBRUARY 2000
SHEET NO. TS6 OF 7 SHEETS

SURVEY PLOTTED BY	DATE
DRAWN BY	
TRACED BY	
DESIGNED BY	
CHECKED BY	
No.	

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	83B-01-98	2000	35	46



- NOTES:**
1. Stainless Steel Bands shall be 1/2" wide X .050" thick, minimum. Tensile Strength shall be 100,000 PSI minimum.
 2. Upper Arm, Lower Arm and Vertical Support Tube shall be of 356 Cast Aluminum.
 3. All wiring shall be concealed.
 4. Vertical Tube Clamp shall be of Malleable Iron, Grade 32510.
 5. All aluminum parts shall have an Alodine 1200 finish.



PEDESTRIAN SIGNAL MOUNTINGS

VEHICULAR SIGNAL MOUNTINGS

STANLEY T. KATSURA
LICENSED PROFESSIONAL ENGINEER
No. 7254-C
HAWAII, U.S.A.

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Stanley T. Katsura

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**TRAFFIC SIGNAL SYSTEM
MOUNTING BRACKET DETAILS**

KAMEHAMEHA HIGHWAY
INTERSECTION IMPROVEMENTS AT PUPUKEA ROAD
PROJECT NO. 83B-01-98

SCALE: NONE DATE: FEBRUARY 2000

SHEET NO. TS7 OF 7 SHEETS

DATE: _____
SURVEY PLOTTED BY: _____
ORIGINAL PLAN: _____
DRAWN BY: _____
NOTE BOOK: _____
DESIGNED BY: _____
CHECKED BY: _____
No. _____