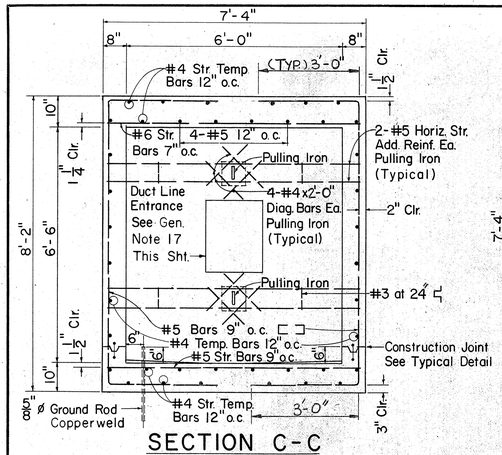
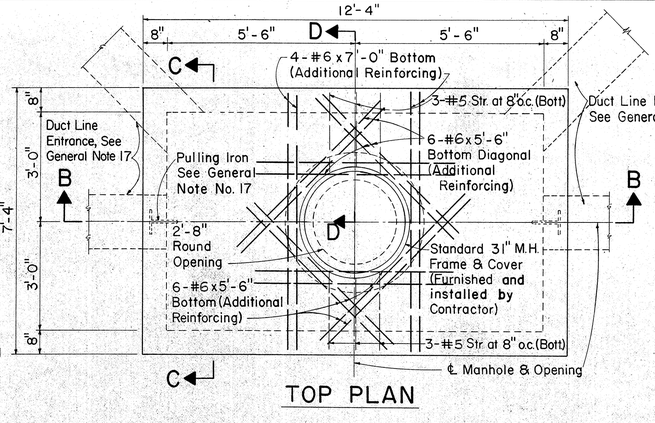
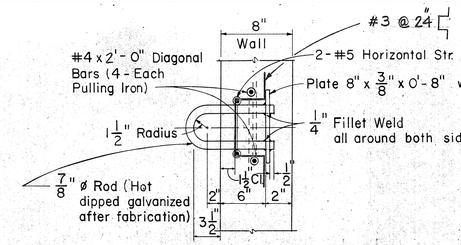
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAWAII	FHI-(13)-17	1976	55	124



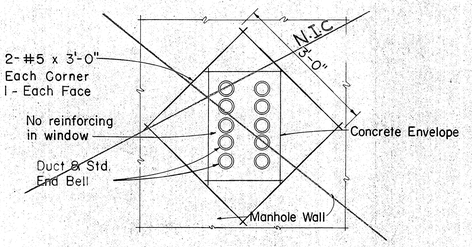
SECTION C-C



TOP PLAN



PULLING IRON DETAIL

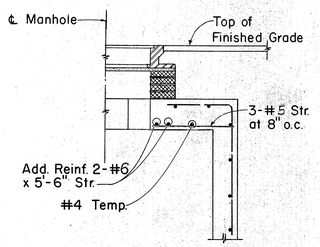


ELEVATION

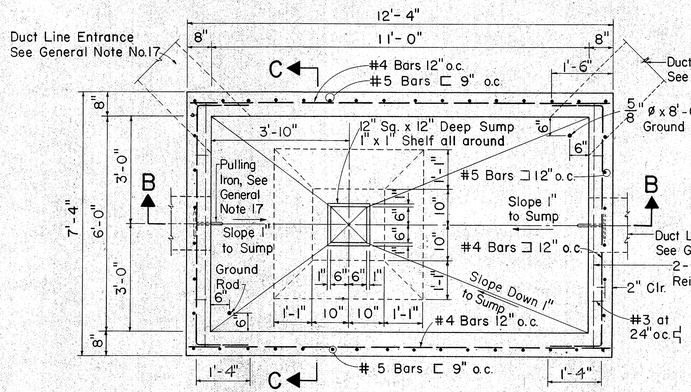
REINFORCING AT DUCT WINDOW

GENERAL NOTES

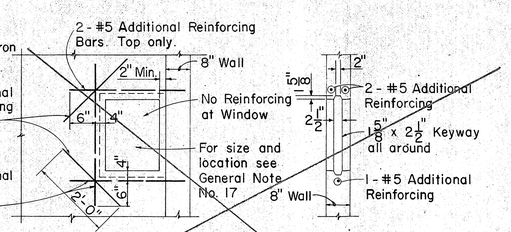
1. EXCAVATION : Excavate for manhole to accurate alignment, grades and dimensions as shown on drawings. All excavation must be approved by Engineering Dept. H.E. Co. before any concrete is poured. All excess cut shall be backfilled with concrete or approved aggregate.
2. BACKFILL : Remove all debris before backfilling. Backfill in accordance with latest specifications of Division of Highways, State of Hawaii.
3. All work to be done in dry.
4. Concrete shall be Class A conforming to the requirements of Section 601 of the State Standard Specificaiom.
5. MIXING : Ready - Mixed A.S.T.M. C - 94 - 47.
6. REINFORCING : Round deformed bars (clean and new). Grade 40 Billet Steel per ASTM A615.
7. SPLICE : Lap 30 bar diameters unless otherwise shown.
8. CURING : Keep concrete moist at least 7 days after pouring (By approved method)
9. FINISH : All surfaces smooth and free from defects. Top of manhole - wood floated. Manhole floor - steel troweled. Inside walls and ceiling - cement washed.
10. Install all inserts, including pulling irons, ground rods, etc, before pouring concrete.
11. POURING : Notify the H.E.Co. Contracting and Inspection Division, 24 hours before pouring any concrete. All concrete pouring shall be done in the presence of an H.E.Co. Engineer or Inspector.
12. FORMS : Make of good sound lumber, of sufficient strength, water tight and conforming to shape and dimensions indicated on drawings.
13. The Contractor to furnish and install for each manhole
    a. 5/8" ø x 8'-0" copper-clad steel ground rods.
    b. Standard manhole frame and cover. (H.E. Standard)
14. Slope manhole floor down 1" toward sump, unless otherwise shown.
15. All work shall be subject to inspection by the Hawaiian Electric Co. Inc.; and/or Division of Highways, State of Hawaii; and/or Division of Engineering, City & County of Honolulu.
16. All materials shall be new and shall be manufactured in the United States of America
17. For number, size, and exact location of ducts entrances and pulling irons, refer to project drawings.
18. Waterstop shall conform to the requirements of Section 705.07 of the State Standard Specifications for Road & Bridge Construction.
19. The Contractor is to furnish all materials to complete the construction.
20. Refer to drawing 16688-A for miscellaneous Details and additional Wall Reinforcement Details around Openings.
21. For special manhole collar equal or greater than 3'-0" see sheet 70

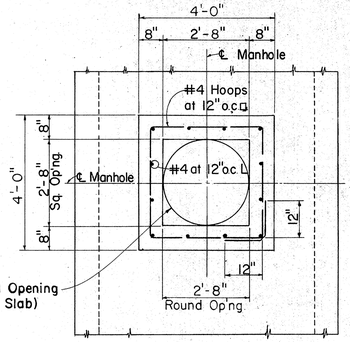


SECTION D-D

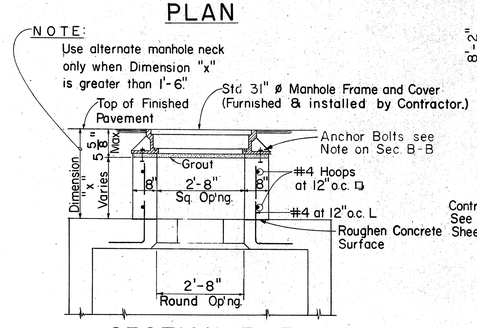


SECTIONAL PLAN A-A



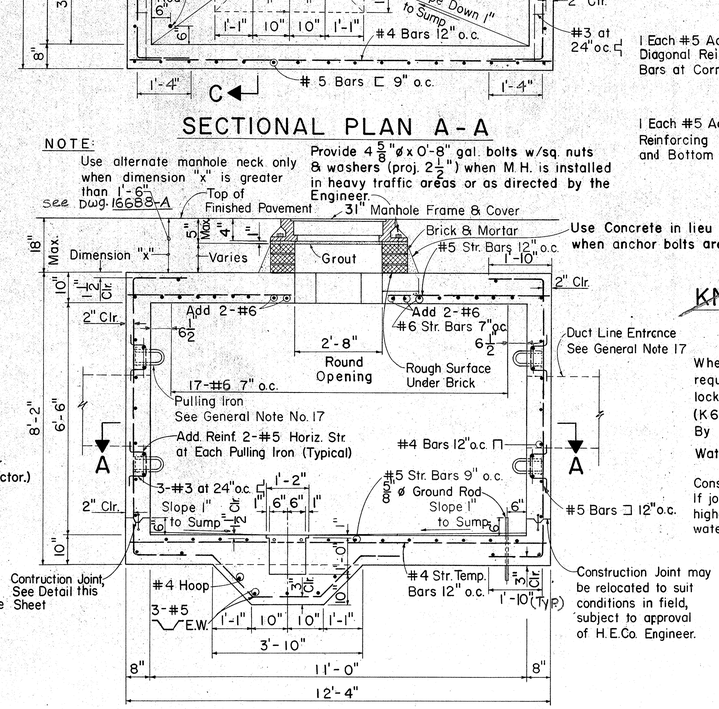


PLAN



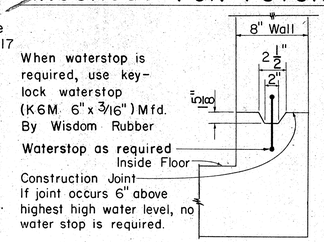
SECTION E-E

ALTERNATE MANHOLE NECK



SECTION B-B

KNOCKOUT FOR FUTURE DUCT LINE



TYPICAL DETAIL OF CONSTRUCTION JOINT AND KEYWAY

REFERENCE DRAWINGS AND SPECIF.

011327 & 011328 - Standard H.E.Co. 31" Manhole Frame and Cover.
30-1030-A & 30-1035-A Underground Ductline Construction Standards - Details.
CS 7001-0 - Construction of Underground Facilities - Specification

QUANTITY OF MATERIALS, (M.H. ONLY)

* Concrete	= 11.52 Cu. Yds.
Reinf. Steel	= 1444.61 lbs.
Misc. Steel (Pulling Irons, ea.	= 10.90 lbs.

ADDITIONAL QUANTITY OF MATERIALS FOR ALTERNATE NECK (Dim. "X" = 2'-0")

Concrete	= 0.50 Cu. Yds.
Reinf. Steel	= 40.0 lbs.

* NOTE: Conc. for M.H. necks when used in lieu of bricks (for dim "X" < 1'-6") for anchor bolt installation is not included in above totals.

APPROVED:
J. Karamitsos 7/27/76
HAWAIIAN ELECTRIC Co., Inc. CHIEF ENGR. DATE

FOR USE IN AREAS SUBJECT TO VEHICULAR TRAFFIC

HECo., Inc. Drawing Number
18775-A

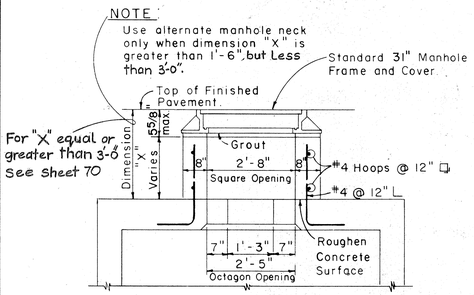
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS
MANHOLE TYPE No. 1
(6'-0" x 11'-0")
UNDERGROUND STANDARDS

Scales: Not to Scale Date: July 15, 1976

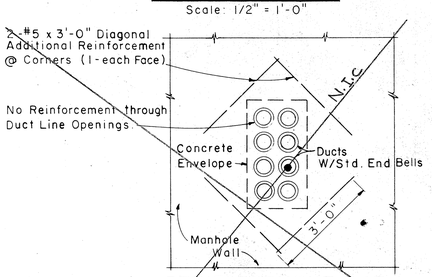
SHEET NO. 1 OF 17 SHEETS

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	"
NOTE BOOK	TRACED BY	"
	DESIGNED BY	"
No.	QUANTITIES BY	"
	CHECKED BY	"



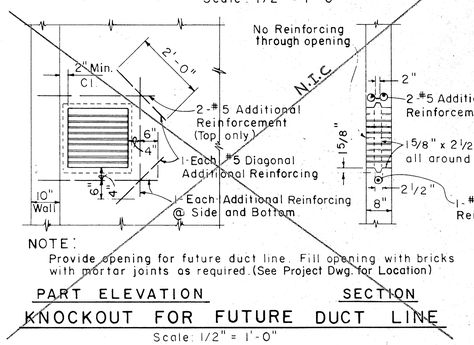
SECTION "E-E"

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



REINFORCEMENT AT DUCT LINE ENTRANCES

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

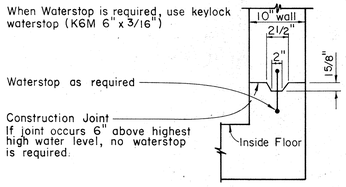


NOTE:
Provide opening for future duct line. Fill opening with bricks with mortar joints as required. (See Project Dwg. for Location)

PART ELEVATION SECTION

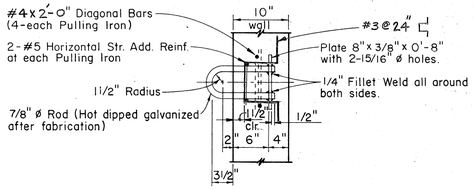
KNOCKOUT FOR FUTURE DUCT LINE

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



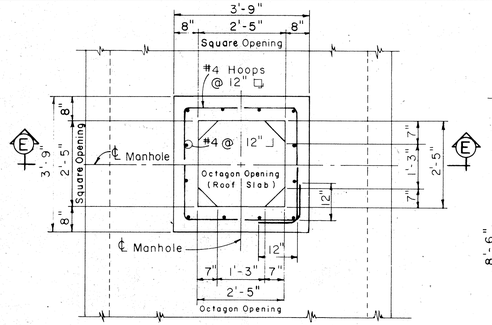
TYPICAL DETAIL OF CONSTRUCTION JOINT AND KEYWAY

Scale: NTS



PULLING IRON DETAIL

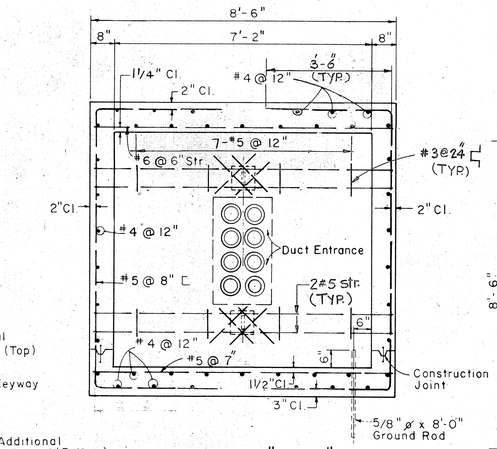
Scale: NTS



PLAN

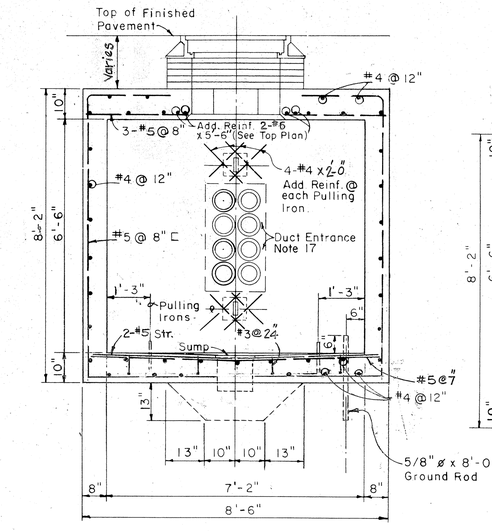
ALTERNATE MANHOLE NECK

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



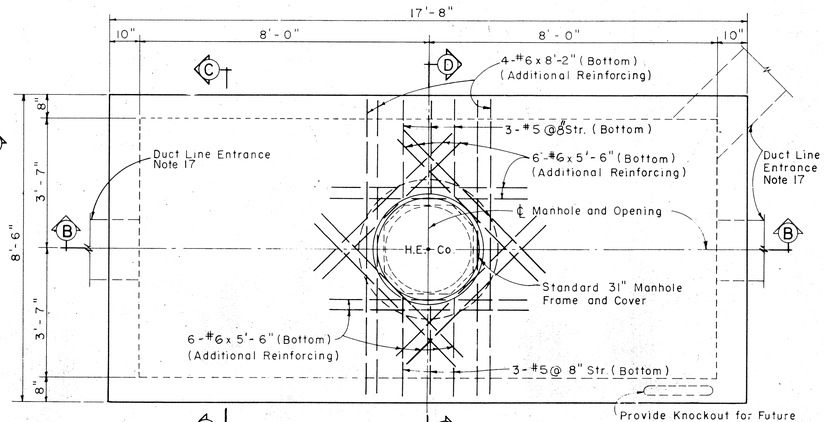
SECTION "C-C"

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



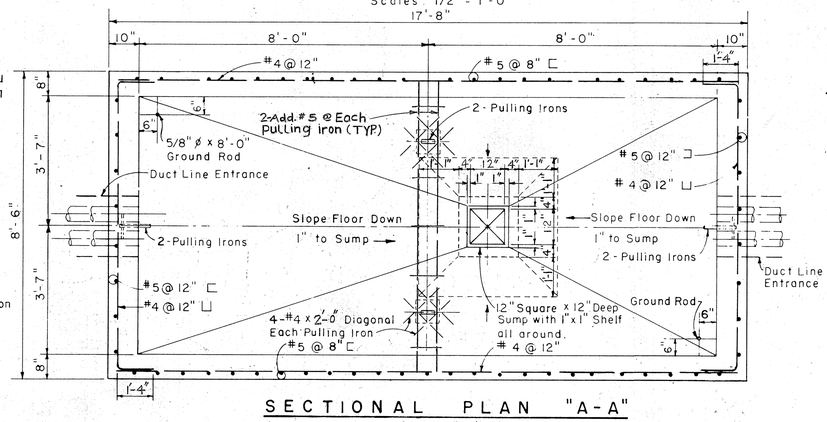
SECTION "D-D"

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



TOP PLAN

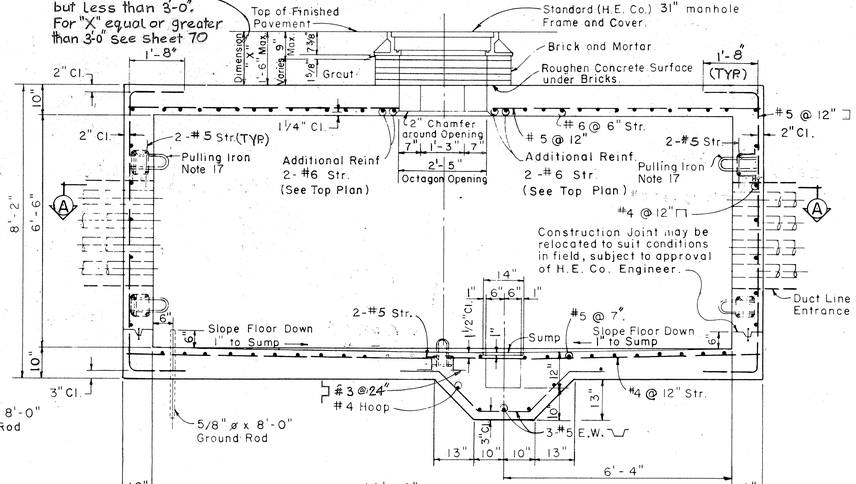
Scales: 1/2" = 1'-0"



SECTIONAL PLAN "A-A"

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

NOTE:
Use alternate manhole neck only when dimension "X" is greater than 1'-6" but less than 3'-0". For "X" equal or greater than 3'-0" see Sheet 70



SECTION "B-B"

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

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-HI-1(136):17	1976	56	124

GENERAL NOTES

1. Excavation: Excavate for manhole to accurate alignment, grades and dimensions as shown on drawings. All excavation must be approved by the Engineering Dept., H.E. Co., before any concrete is poured. All excess cuts shall be backfilled with concrete or approved aggregate.
2. Backfill: Remove all debris before backfilling. Backfill in accordance with latest specifications of Division of Highways, State of Hawaii.
3. All work to be done in dry.
4. Concrete shall be Class A conforming to the requirements of Section 601 of the State Standard Specification.
5. Mixing: Ready-Mixed A.S.T.M. C-94-47.
6. Reinforcing: Round deformed bars. (Clean and new). Grade 40 Billet Steel per ASTM A615
7. Splice: Lap 30 bar diameters unless otherwise shown.
8. Curing: Keep concrete moist at least 7 days after pouring. (By approved method).
9. Finish: All surfaces smooth and free from defects.
   Top of manhole - wood floated.
   Manhole floor - steel trowelled.
   Inside wall and ceiling - cement washed.
10. Install all inserts, including pulling irons, ground rods, and etc., before pouring concrete.
11. Pouring: Notify the H.E. Co., Contracting and Inspection Division, 24 hours before pouring any concrete. All concrete pouring shall be done in the presence of an H.E. Co., Engineer or Inspector.
12. Forms: Made of good sound lumber of sufficient strength, water tight and conforming to shape and dimensions indicated on drawings.
13. The Contractor shall furnish and install for each manhole:
    A. 2 - 5/8" ø x 8'-0" copperweld ground rods.
    B. Standard (H.E. Co.) 31" manhole frame and cover. (H.E.Co. Standard)
14. Slope manhole floor down 1" toward sump.
15. All work shall be subject to inspection by the H.E. Co. and/or Division of Highways, State of Hawaii, or Div. of Engineering, C & C of Honolulu.
16. All materials shall be new and manufactured in the United States of America.
17. For number, size, and exact location of duct entrances and pulling irons, refer to project drawings.
18. Water Stop shall conform to the requirements of Section 705.07 of the State Standard Specifications for Road and Bridge Construction.
19. Refer to drawing 16688-A for miscellaneous details and additional Wall Reinf. Detail around Openings

REFERENCE DRAWINGS

011327 & 011328 Standard H.E. Co., 31" Manhole Frame and Cover.
30-1030-A&30-1035-A U.G. Duct Line Construction Standards.
CS7001-0 Construction of Underground Facilities - Specifications

REINFORCED CONCRETE QUANTITIES

QUANTITY OF MATERIALS FOR DEPTH "D"

Total Concrete	=	18 Cu. Yds.
Total Reinforcing Steel	=	2,579 Lbs.

QUANTITY OF MATERIALS FOR ALTERNATE NECK "D" = 1'-0"

Concrete	=	0.29 Cu. Yds.
Reinforcing Steel	=	39 Lbs.

MATERIALS FOR 6" DEPTH OF 8" AND 10" THICK WALL

Concrete	=	0.66 Cu. Yds.
Reinforcing Steel	=	52.5 Lbs.

APPROVED:

F. Kaimoto 7/27/76

HAWAIIAN ELECTRIC Co. Inc. DATE

FOR USE IN AREAS SUBJECT TO PRESENT AND FUTURE VEHICULAR TRAFFIC.

~~HECo., Inc. Drawing Number~~

15588-A

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

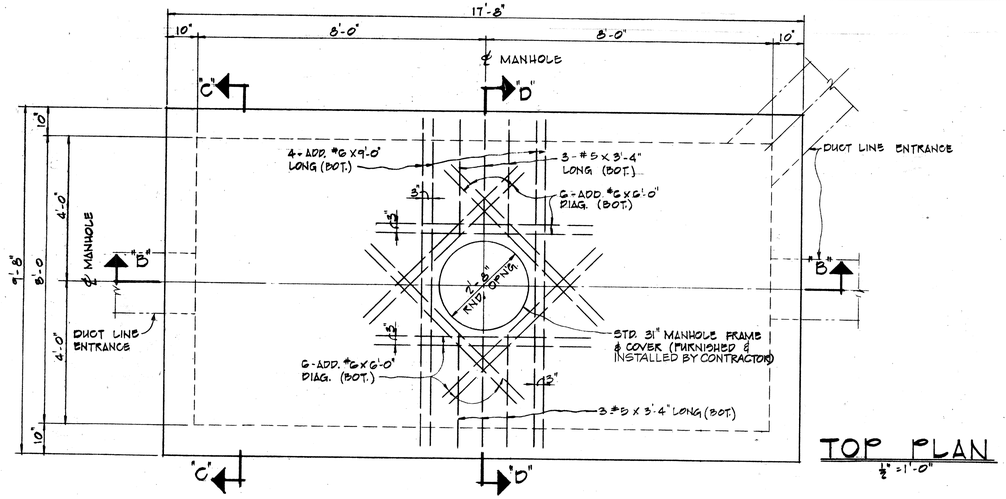
MANHOLE TYPE No. 4
(7'-2" x 16'-0")
INTERSTATE ROUTE H-1
PROJECT NO. I-HI-1(136):17

SCALE: AS SHOWN DATE: July 15, 1976

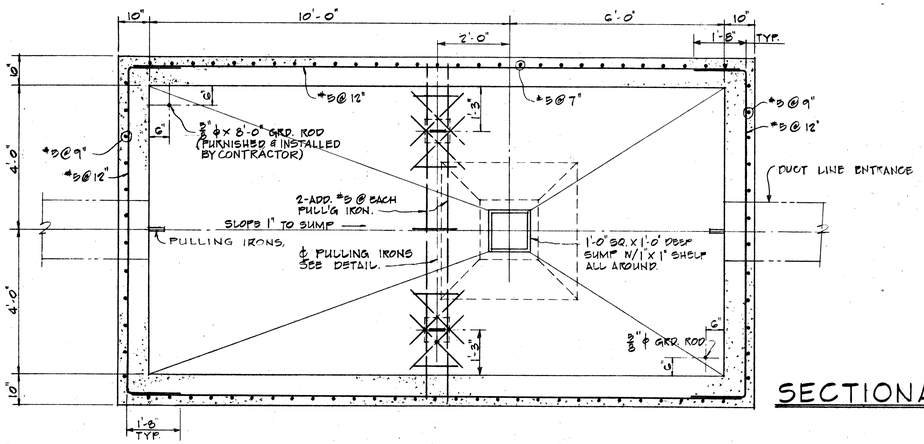
SHEET No. 2 OF 17 SHEETS

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

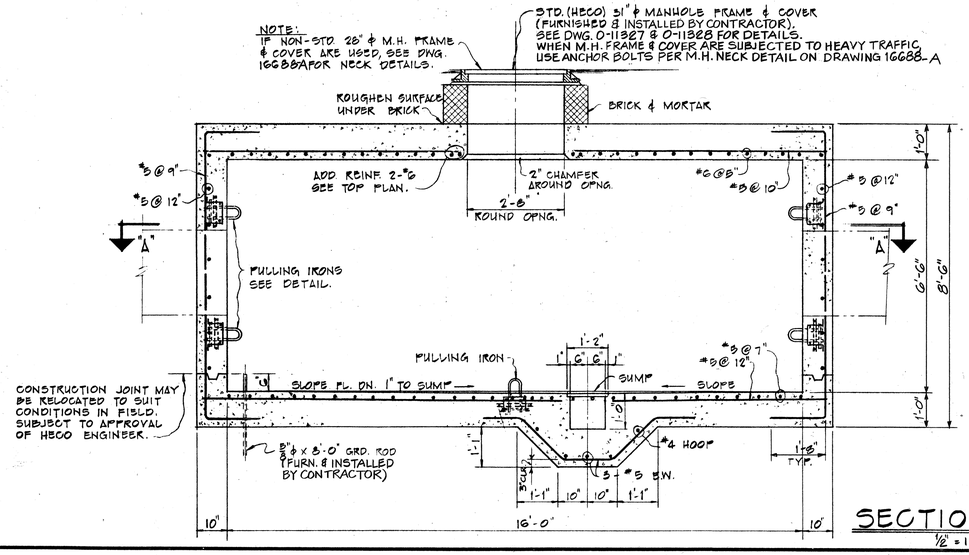
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-HI-1(136).17	1976	57	124



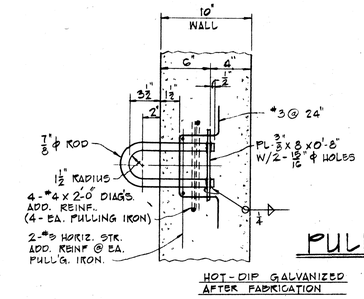
TOP PLAN
½" = 1'-0"



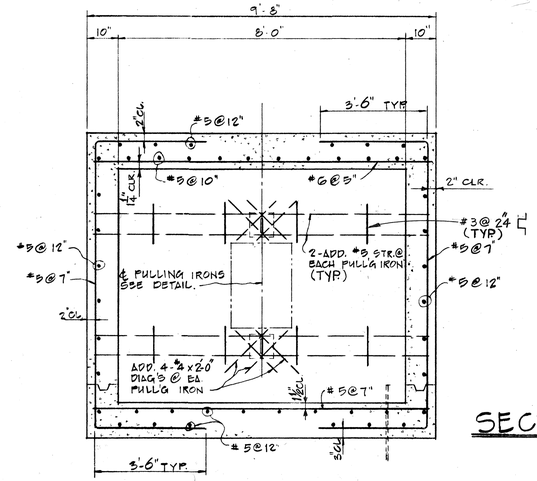
SECTIONAL PLAN "A-A"
½" = 1'-0"



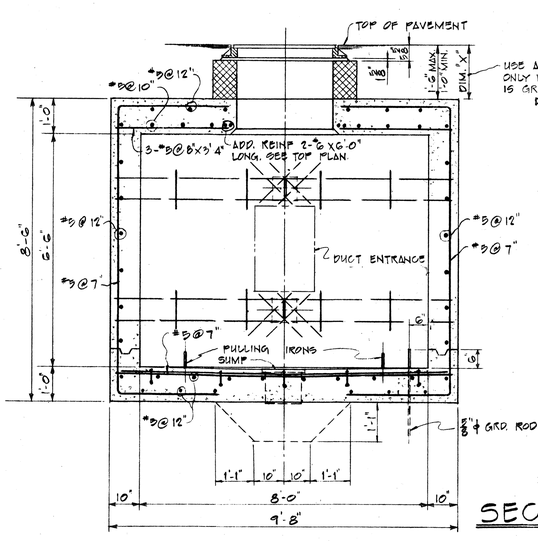
SECTION "B-B"
½" = 1'-0"



PULLING IRON DETAIL
1½" = 1'-0"



SECTION "C-C"
½" = 1'-0"



SECTION "D-D"
½" = 1'-0"

NOTES:

1. FOR GENERAL NOTES, SEE SHEET NO. 55
2. CAST IRON FRAME AND COVER HAVE TO BE PAINTED WITH ASPHALTUM PAINT FOR CORROSION PREVENTION.

REFERENCE DRAWINGS (HECO)

CS-7001-	CONSTRUCTION OF UNDERGROUND FACILITIES (6 SHEETS) SPECIFICATION SHEET
CS-7003-	CONSTRUCTION OF ELECTRICAL FACILITIES (4 SHEETS) SPECIFICATION SHEET
O-11327	STANDARD HECO 31" MANHOLE COVER
O-11328	STANDARD HECO 31" MANHOLE FRAME
16688-A	MISCELLANEOUS DETAILS, MANHOLES & HANDHOLES.

QUANTITY OF MATERIALS, (M.H. ONLY)

CONCRETE	22.80 C.Y.
REINFORCING	2977 LBS.
MISC STEEL (PULL'G IRONS, EA.)	10.9 LBS.

ADDITIONAL QUANTITY OF MATERIALS FOR ALTERNATE M.H. NECK (DIMENSION "X" = 2'-0")

CONCRETE	0.50 C.Y.
REINFORCING	42.31 LBS

APPROVED:

J. Karimoto 7/27/76
HAWAIIAN ELECTRIC CO., LTD. CIVIL ENGR. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

MANHOLE TYPE #6
(8'-0" X 16'-0" X 6.5')

INTERSTATE ROUTE H-1
PROJECT NO. I-H1-1 (136).17

SCALE: AS SHOWN DATE: July 15, 1976

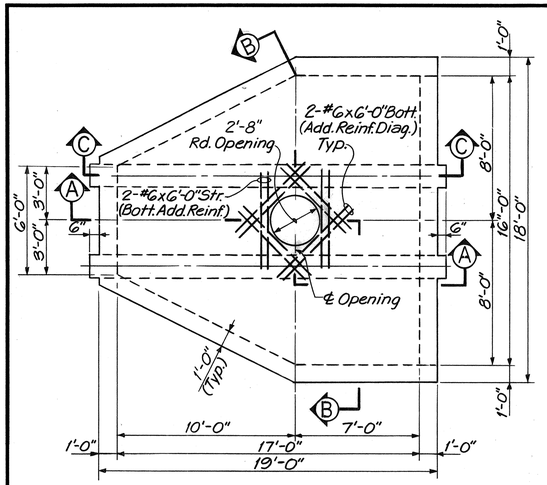
JOHN P. JOHNSON REGISTERED PROFESSIONAL ENGINEER No. 3647 HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.
John P. Johnson

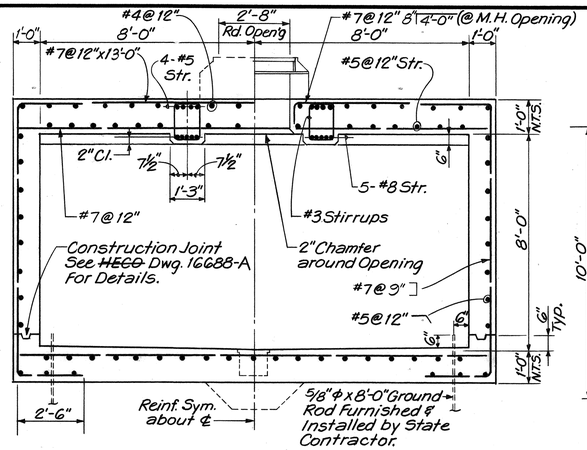
SHEET No. 3 OF 17 SHEETS

ORIGINAL PLAN	NOTE BOOK	NO	DATE
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DRAWN BY			
TRACED BY			
DESIGNED BY			
QUANTITIES BY			
CHECKED BY			

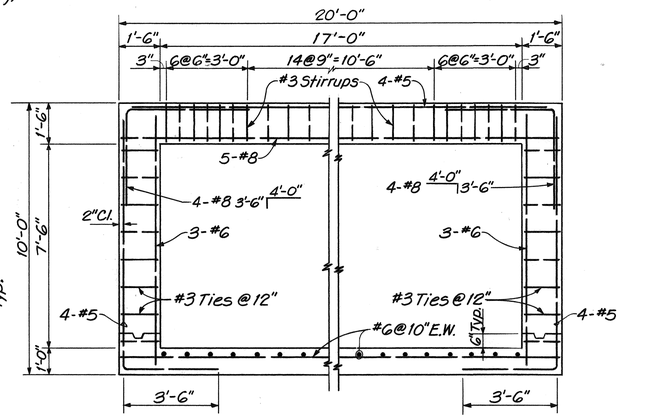
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-HI-1(136):17	1976	58	124



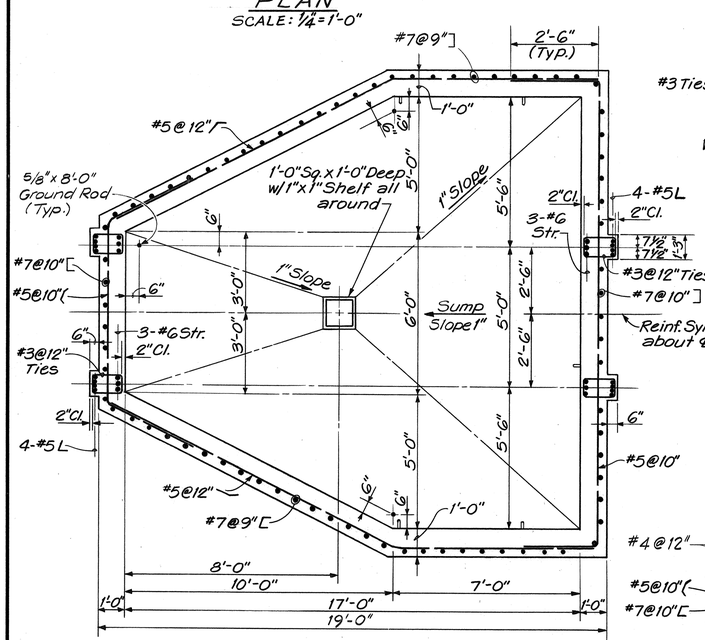
PLAN
SCALE: 1/4"=1'-0"



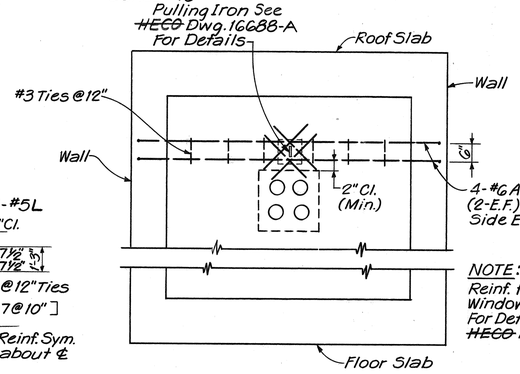
SECTION B-B
SCALE: 3/8"=1'-0"



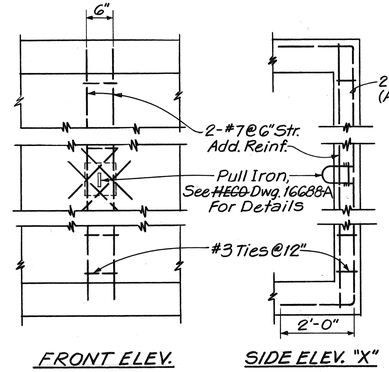
SECTION C-C
SCALE: 3/8"=1'-0"



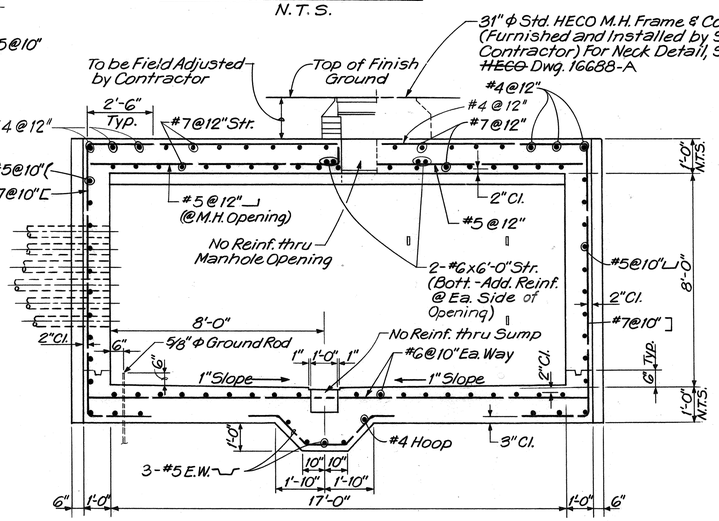
SECTION PLAN
SCALE: 3/8"=1'-0"



TYP. PULLING IRON REINF. @ DUCT WINDOW
N.T.S.



TYP. PULLING IRON REINF.
N.T.S.



SECTION A-A
SCALE: 3/8"=1'-0"

QUANTITY OF MATERIALS

Concrete	34 Cu. Yd.
Reinforcing	5900 Lbs.
Miscellaneous Steel (Pull'g Irons Only	10.9 Lbs.

NOTES:

1. For "General Notes" see Sheet No. (53)
2. Cast iron Frame and Cover have to be painted with Asphaltum paint to prevent corrosion.
3. Specifications for Construction of Underground Facilities, HECO Dwg. No. CS 7001, shall govern.

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

JOHN P. JOHNSON REGISTERED PROFESSIONAL ENGINEER No. 3647 HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.
John P. Johnson

APPROVED:
J. Karamoto 7/27/76
Hawaiian Electric Co. Inc. C&G M. 9. Date

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

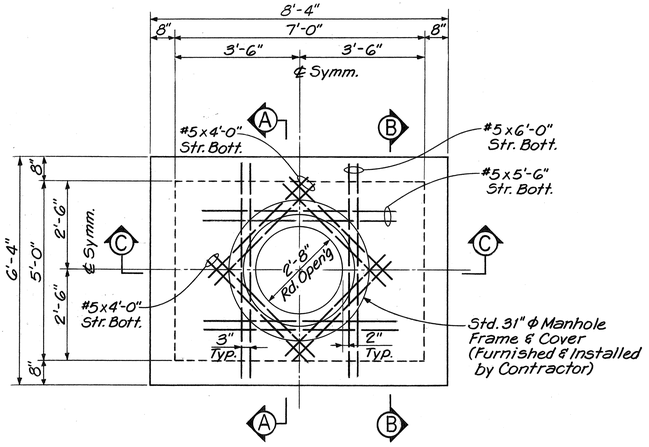
TYPE A MANHOLE

INTERSTATE ROUTE H-1
PROJECT NO. I-H1-1 (136):17

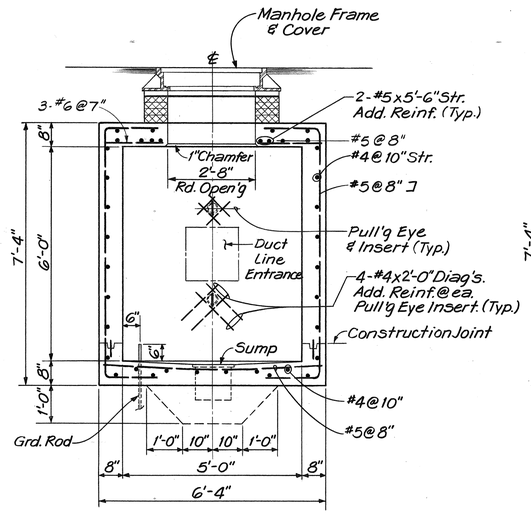
SCALE: AS SHOWN DATE: July 15, 1976

SHEET No. 4 OF 17 SHEETS

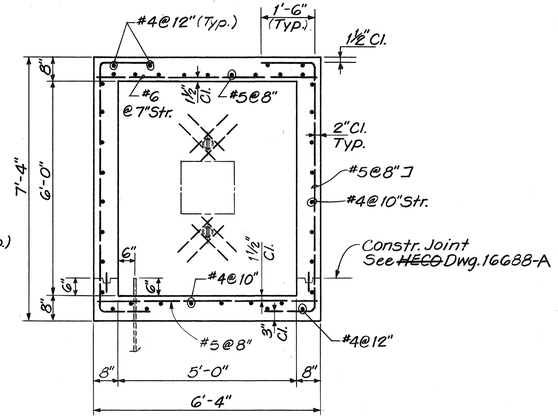
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	IHH(136):17	1976	59	124



TOP PLAN
Scale: ½"=1'-0"



SECTION A-A
Scale: ½"=1'-0"

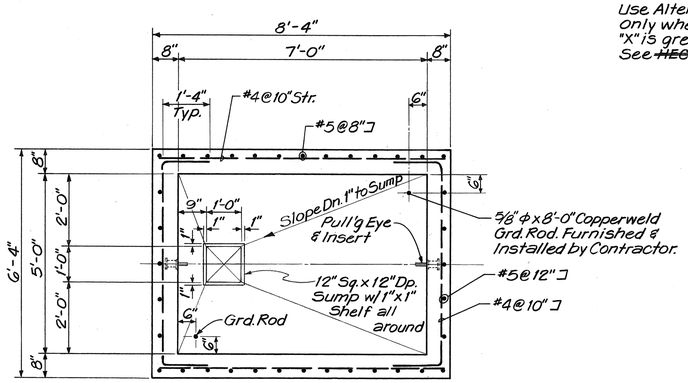


SECTION B-B
Scale: ½"=1'-0"

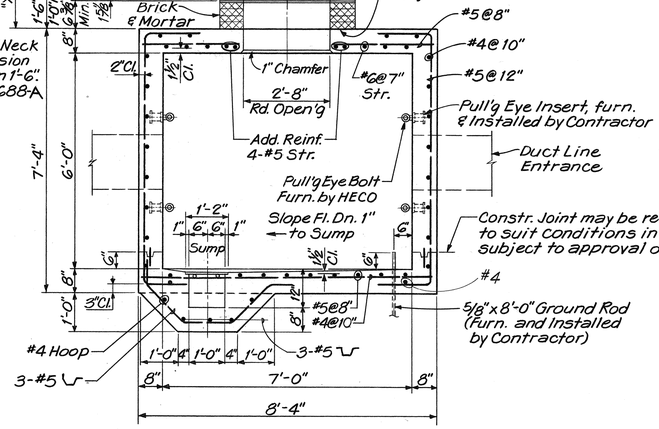
Std. HECO 31" ϕ MH Frame & Cover Furn. & Installed by Contractor. When MH Cover & Frame are subjected to heavy traffic, use Anc. Bolts per MH Neck Detail on ~~HECO~~ Dwg. 16688-A

NOTE: If non-Std. 28" ϕ MH Frame and Cover are used, See Dwg. 16688-A for Neck Detail

NOTE: Use Alternate MH Neck only when Dimension "X" is greater than 1'-6". See ~~HECO~~ Dwg. 16688-A



SECTIONAL PLAN
Scale: ½"=1'-0"



SECTION C-C
Scale: ½"=1'-0"

NOTE: For General Notes See Sheet No. 55

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

APPROVED:

J. Kurimoto — 7/27/76
Hawaiian Electric Co., Ltd. C&S M.E. — Date

JOHN P. JOHNSON REGISTERED PROFESSIONAL ENGINEER No. 3647 HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.
John P. Johnson

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

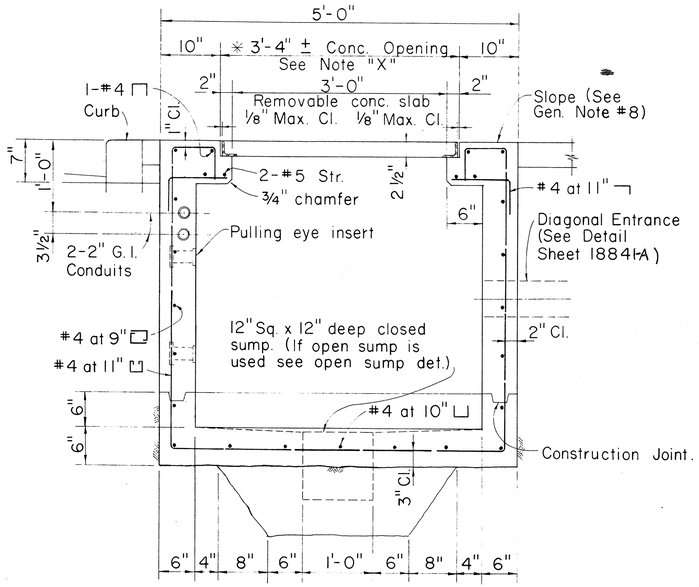
MANHOLE TYPE 57M

INTERSTATE ROUTE H-1
PROJECT NO. I-H1-1 (136):17

SCALE: 1/2"=1'-0" DATE: July 15, 1976

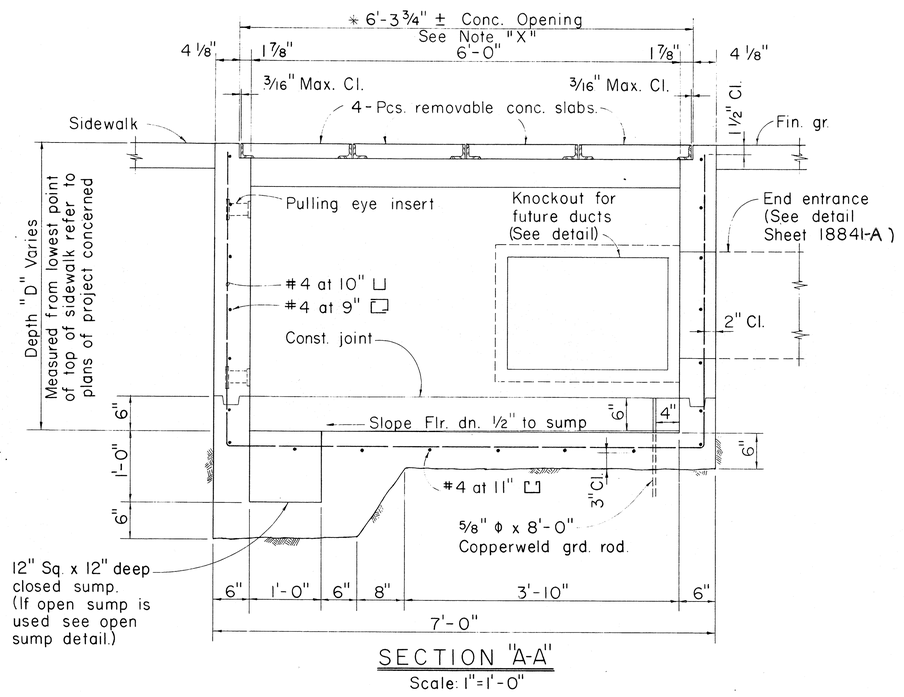
SHEET No. 5 OF 17 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAWAII	I-HI-1(136):17	1976	60	124



SECTION "B-B"

Scale: 1"=1'-0"



SECTION "A-A"

Scale: 1"=1'-0"

GENERAL NOTES

1. The general conditions of specifications sheet 16190 shall govern throughout the entire work.
2. Concrete to develop compressive cylinder strength of 3000 PSI in 28 days.
3. CONCRETE FINISH: Top of H.H.- wood floated (sidewalk finish) according to Div. of Hwy., State of Hawaii or Div. of Engr., City and County of Honolulu specs. whichever the case may be unless otherwise directed. Floor - smooth metal trowelled. Exposed wall surfaces and edges - smooth and free from defects.
   CONCRETE POURING: Notify the Haw'n. Elec. Co., Ltd., Eng. Dept., 24 hours before pouring any conc. All conc. shall be poured in the presence of Haw'n. Elec. Co. Eng's. or its representative.
4. REINFORCING:
   Round deformed bars, new billet stock intermediate grade ASTM A-15. All hooked bars shall have ACI std. hook unless otherwise shown.
5. FORMS:
   Form handhole to size and shape as shown. Exterior face of handhole wall shall be formed except;
   A.) Excavation in solid material such as coral or rock - neat cut; no forms required. Excavation in solid material other than coral or rock-lining such as salvaged corrugated iron, canec, etc. shall be used.
6. PULLING EYE INSERTS:
   For location and number required see duct entrance plan of project concerned.
7. DRAINAGE:
   Slope floor down 1/2" to sump.
8. Slope top of handhole to match finish grade.
9. FINISH STEEL WORK:
   Angle iron frames, lifting devices for removable concrete slabs shall be hot dip galvanized after fabrication.
10. EXCAVATION:
    Excavate for handhole to accurate alignment grades and dimensions as shown on drawing. All excavation must be approved by the Engineering Department, The Hawaiian Electric Co., Ltd., before any concrete is poured. All excess cut shall be backfilled with concrete or rock.
11. BACKFILL:
    Remove all debris before backfilling. Backfill in accordance with latest specifications of and subject to approval of Div. of Hwys., State of Hawaii or Div. of Engr., C. & C. of Hon. whichever the case may be unless otherwise directed.
12. For duct line construction standards, see drawing 30-1030-A and specification sheet U-18585A.
13. DUCTS:
    For size, location and number required, see duct entrance plan of project concerned.
14. ALL MATERIALS SHALL BE NEW AND SHALL BE MANUFACTURED IN THE UNITED STATES OF AMERICA.

* NOTE "X" IMPORTANT

Maximum clearances between removable concrete cover slabs and concrete opening at the supports must be kept. Concrete contractor shall measure cover slab steel frame after fabrication to obtain proper clearances. Any variation in clearances shall be corrected to the satisfaction of the Engineer at contractor's expense.

REINFORCED CONCRETE QUANTITIES

QUANTITIES OF MATERIALS FOR DEPTH "D"= 5'-0",

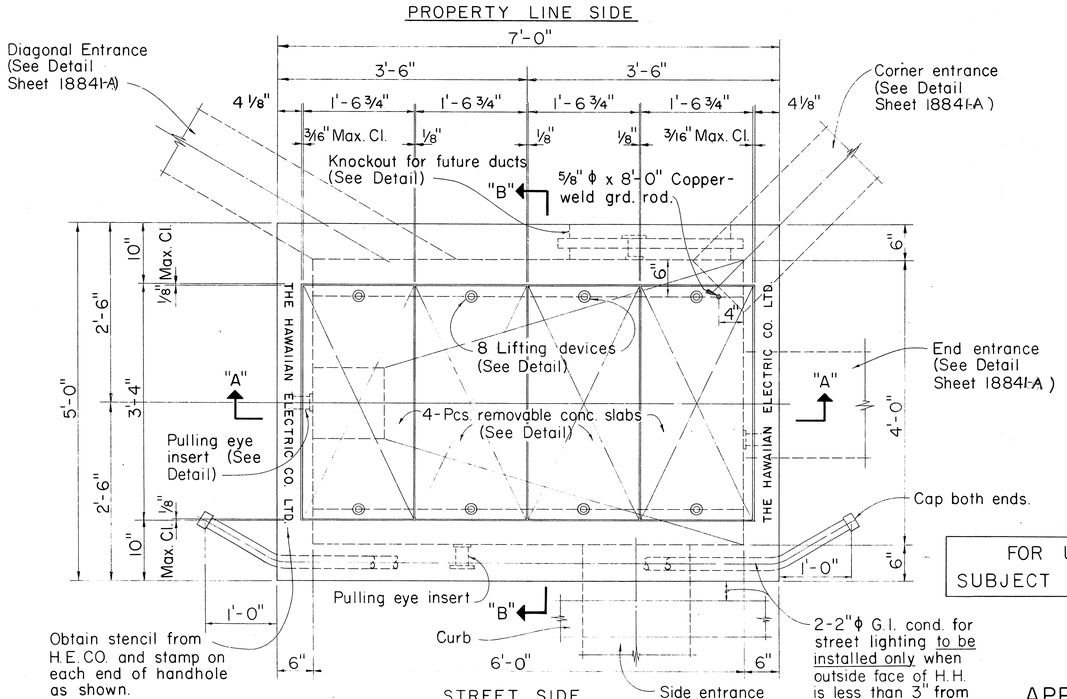
Total concrete	=	35 Cu. Yds.
Total reinf. steel	=	450 Lbs.
Total misc. steel	=	160 Lbs.

WEIGHT PER REMOVABLE CONCRETE SLAB,

Concrete	=	150 Lbs.
Reinf. steel	=	7 Lbs.
Misc. steel	=	40 Lbs.
TOTAL		197 Lbs.

MATERIALS FOR 6" DEPTH OF 6" THICK WALL,

Concrete	=	0.2 Cu. Yds.
Reinf. steel	=	18 Lbs.



TOP PLAN

Scale: 1"= 1'- 0"

FOR USE IN AREAS NOT SUBJECT TO VEHICULAR TRAFFIC

APPROVED:

J. Kaumeyer 7/27/76

HAWAIIAN ELECTRIC CO., INC. CHG DATE

HECo., Inc. Drawing Number

18842-A SHEET No. 1 OF 2 SHEETS

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS

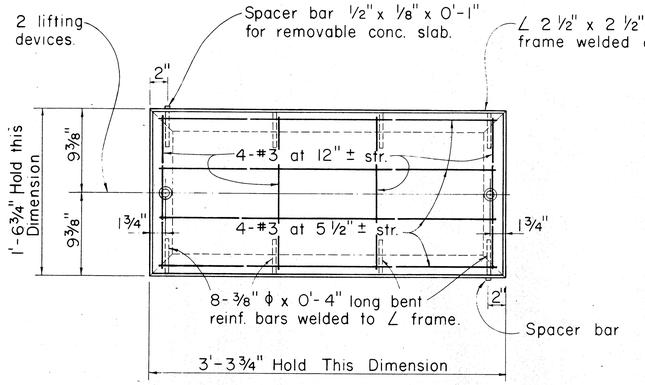
HANDHOLE TYPE
46 (4'-0" x 6'-0")

Scale: As Shown Date: July 15, 1976

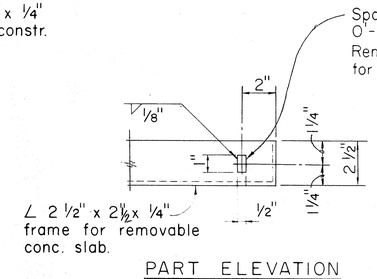
SHEET No. 6 OF 17 SHEETS

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

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAWAII	I-HH-1(36)-17	1976	61	124



TOP PLAN

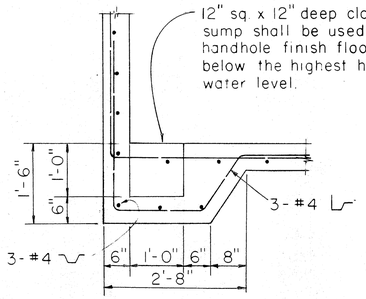


PART ELEVATION

SPACER BAR FOR REMOVABLE CONC. SLAB

Scale: 3" = 1'-0"

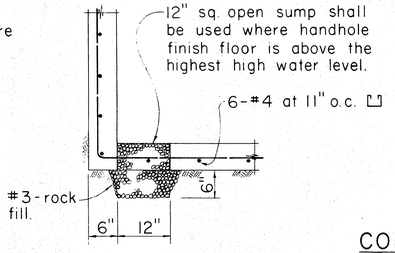
NOTE:
Exact location of sump to be determined in the field.



SECT ELEVATION

CLOSED SUMP

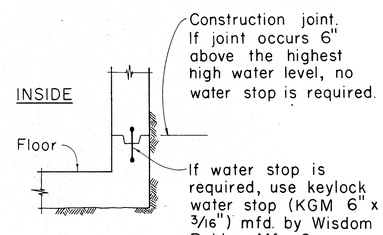
Scale: 3/4" = 1'-0"



SECT. ELEVATION

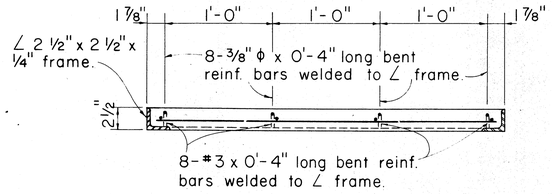
OPEN SUMP

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



CONSTRUCTION JOINT TYPICAL

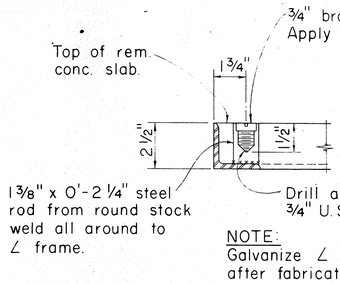
Scale: 1" = 1'-0"



SECTION

REMOVABLE CONC. SLAB

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

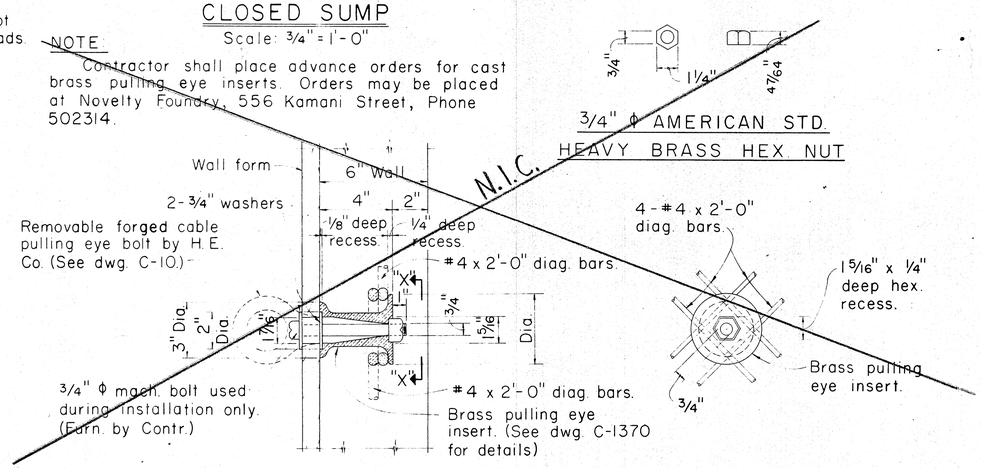


NOTE:
Galvanize ∠ frame after fabrication.

REMOVABLE CONC. COVER SLAB LIFTING DEVICE

Scale: 3" = 1'-0"

NOTE:
Contractor shall place advance orders for cast brass pulling eye inserts. Orders may be placed at Novelty Foundry, 556 Kamani Street, Phone 502314.



SECT. ELEVATION

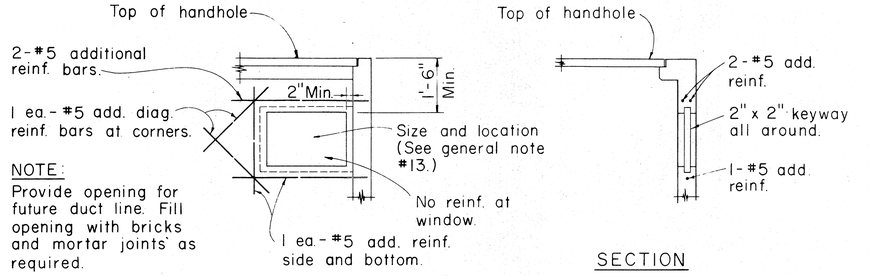
SECT. "X-X"

BRASS PULLING EYE INSERT

Scale: 3" = 1'-0"

3/4" ϕ AMERICAN STD. HEAVY BRASS HEX. NUT

N.I.C.

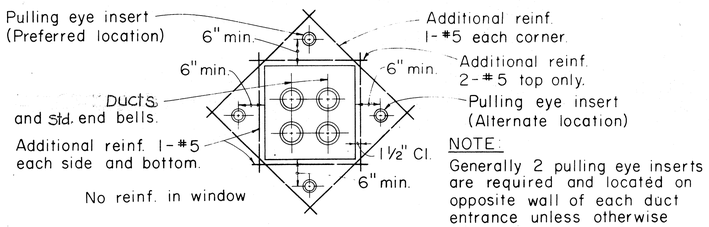


ELEVATION

SECTION

KNOCKOUT FOR FUTURE DUCT LINE

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



NOTE:
Generally 2 pulling eye inserts are required and located on opposite wall of each duct entrance unless otherwise shown or noted. H.E.CO. Engineers shall determine number required.

ELEVATION

TYP. DET. AT DUCT WINDOW

Note:
Refer to drawing 16688-A for pulling eye insert notes and details.

APPROVED:

J. Kamimoto 7/27/76
HAWAIIAN ELECTRIC CO., INC. ELEC. ENG. DATE

HECo, Inc. Drawing Number
18842-A SHEET No. 2 OF 2 SHEETS

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS

HANDHOLE TYPE 46 (4'-0" x 6'-0")

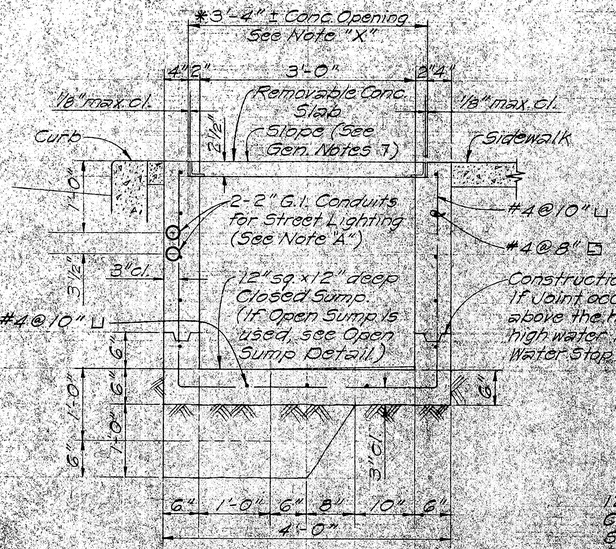
SCALE: As Shown DATE: July 15, 1976

SHEET No. 7 OF 17 SHEETS

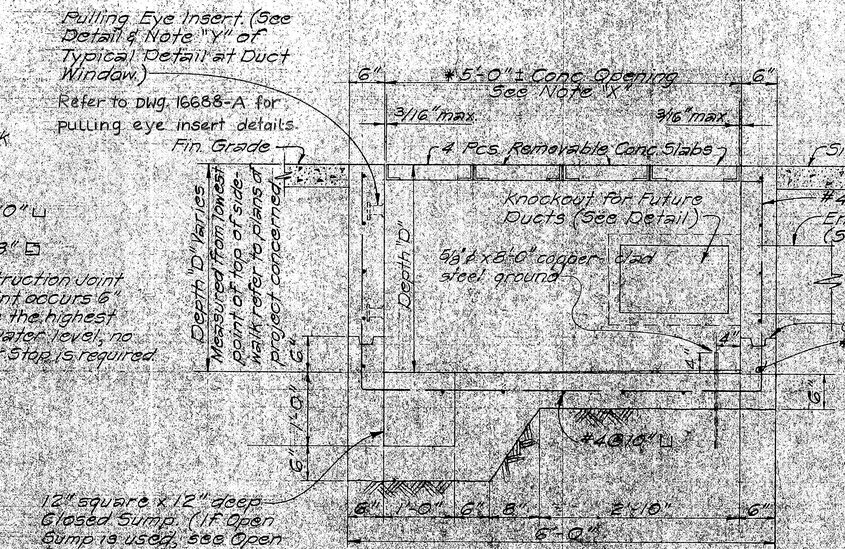
61

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

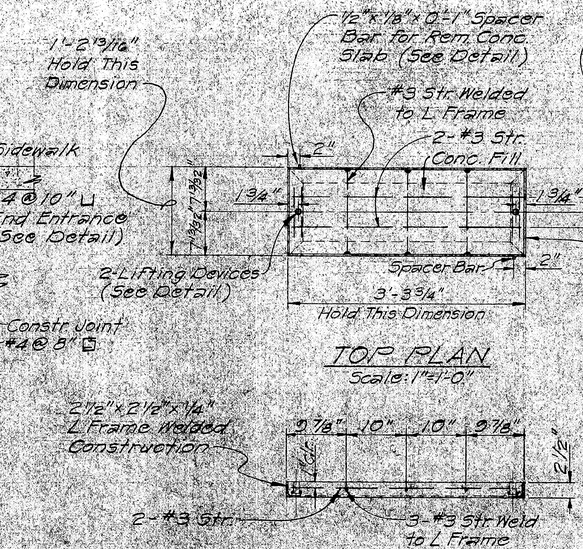
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-HF-1(13)-17	1976	62	124



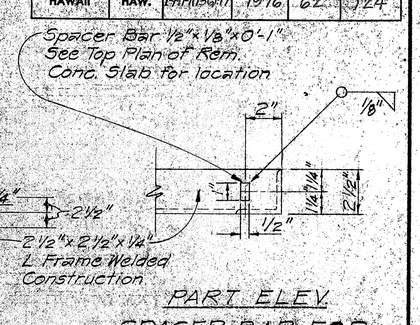
SECTION "B-B"
Scale: 1"=1'-0"



SECTION "A-A"
Scale: 1"=1'-0"



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



PART ELEV.

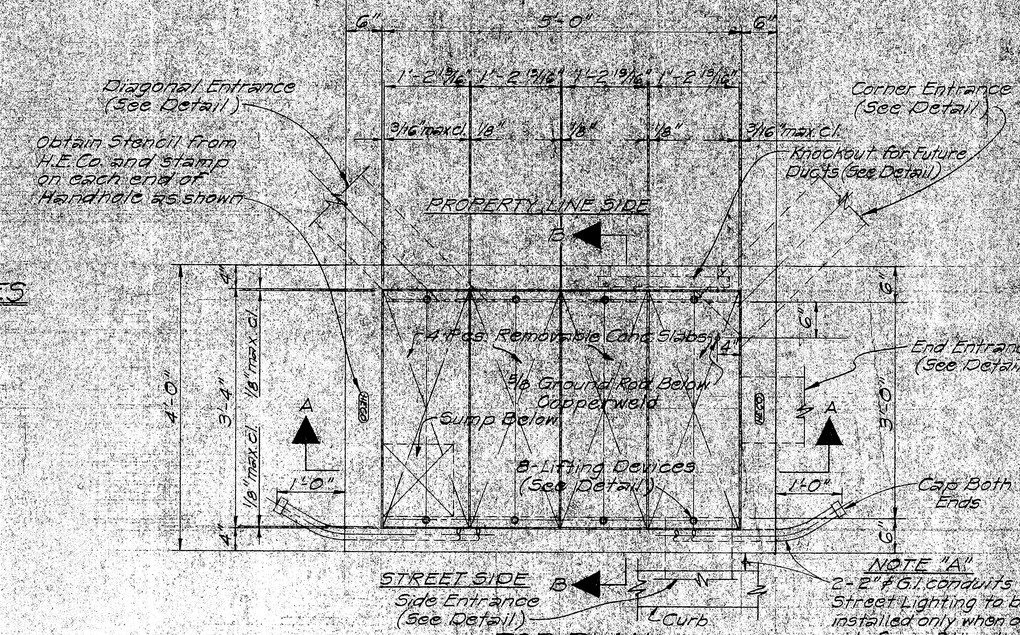
SPACER BAR FOR REMOV. CONC. SLAB
Scale: 3"=1'-0"

SECTION
Scale: 1"=1'-0"

REMOVABLE CONC. SLAB DETAIL
Scale: As Shown

*NOTE "X" IMPORTANT

Maximum clearances between removable concrete cover slabs and concrete opening at the supports must be kept. Concrete Contractor shall measure cover slab steel frame after fabrication to obtain proper clearances. Any variation in clearances shall be corrected to the satisfaction of the Engineer at Contractor's expense.



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

NOTE "A"
2-2" ϕ G.I. conduits for Street Lighting to be installed only when outside face of Handhole is less than 3" from curbing.

¾" ϕ x 0'-1⅞" cadmium plated thin slab insert threaded 10 threads per inch.
Clean surface and apply corrosive adhesive between Filler plate and insert after galvanizing of frame.
2-¼" ϕ x 0'-8" bars welded to insert
1½"x⅜"x1½" Filler Plate Tack Welded to L Frame
2½"x2½"x¼" L Frame
¾" ϕ x 0'-1" threaded (10 thds per inch) nylon plug furn. by H.E.Co. to Contractor. Fabricator shall adequately seal opening of insert to prevent water from entering during storage. Apply corrosion resistant grease to insert threads before installing plugs.
1¾"
⅜"
1⅞"
2½"
⅜"
#3 Reinf. Bar (See Top Plan) @ Rem. Conc. Slab

PART SECTION

LIFTING DEVICE DETAIL
Scale: 1/2 Full Size

REINFORCED CONCRETE QUANTITIES

QUANTITY OF MATERIALS FOR DEPTH "D"=4'-0"

Total concrete	= 2.05 cu. yds.
Total reinf. steel	= 300 lbs.
Total misc. steel	= 157 lbs.

WEIGHT PER REMOVABLE CONCRETE SLAB,

Concrete	=	1119 lbs.
Reinf. steel	=	7 lbs.
Misc. steel	=	39 lbs.
Total		165 lbs.

MATERIALS FOR 6" DEPTH OF 6" THICK WALL,

Concrete	= 0.17 cu. yds.
Reinf. steel	19 lbs.

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

FOR USE IN AREAS NOT SUBJECT TO VEHICULAR TRAFFIC.

APPROVED

HAWAIIAN ELECTRIC Co., Inc. DATE

HECo., Inc. Drawing Number

18841-A

SHEET No. 1 OF 2 SHEETS

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS

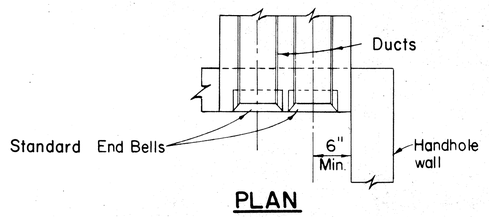
HANDHOLE TYPE 35 (3'-0" x 5'-0")
UNDERGROUND STANDARDS

SCALE: AS NOTED DATE: Jun. 15, 1976.

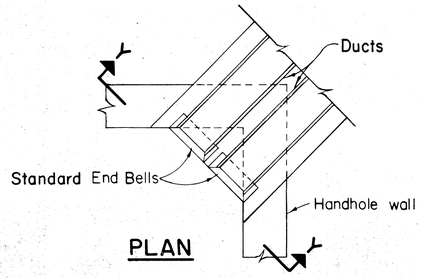
SHEET No. 8 OF 17 SHEETS

K+E INSTALLED IN LA 2020

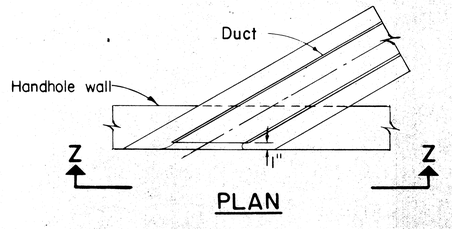
FED. AID DIST. NO.	STATE	FED. AID PROJECT	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAWAII	I-HI-1(136):17	1976	63	124



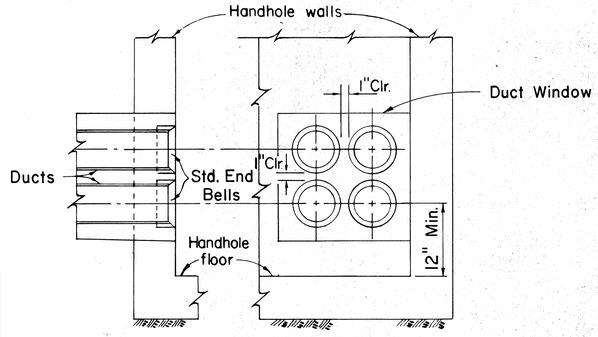
PLAN



PLAN



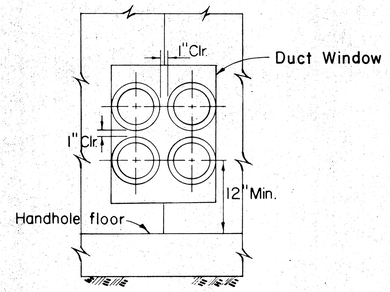
PLAN



SIDE ELEV. FRONT ELEV.

END & SIDE ENTRANCES

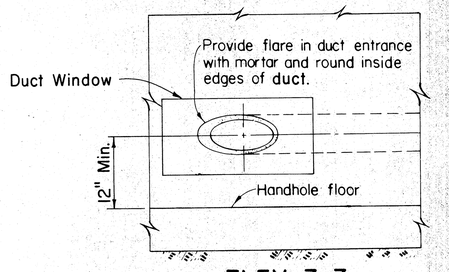
(FOUR WAY DUCT)



ELEV. Y-Y

CORNER ENTRANCE

(FOUR WAY DUCT)



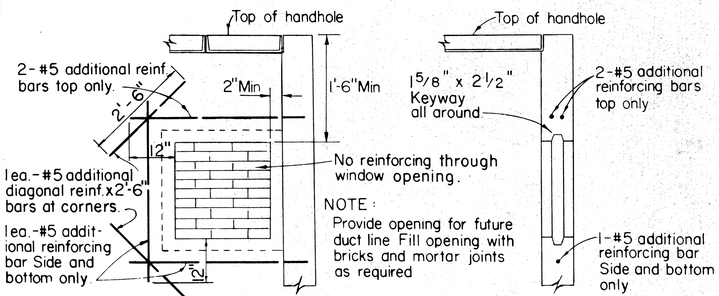
ELEV. Z-Z

DIAGONAL ENTRANCE

(ONE WAY DUCT)

TYPICAL DUCT LINE ENTRANCE DETAIL

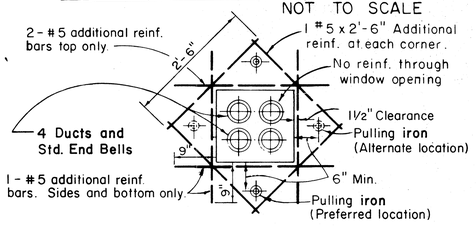
NOT TO SCALE



ELEVATION SECTION

KNOCKOUT FOR FUTURE DUCT LINE

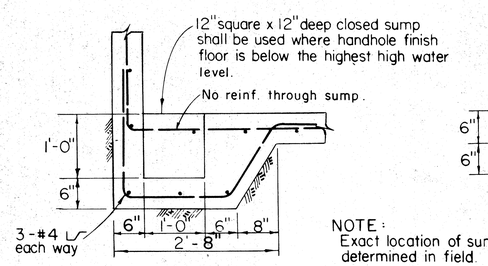
NOT TO SCALE



ELEVATION

TYPICAL DETAIL AT DUCT WINDOW

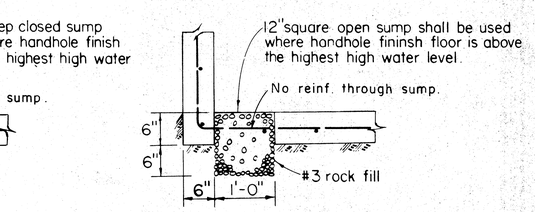
NOT TO SCALE



SECTION ELEV.

CLOSED SUMP

NOT TO SCALE

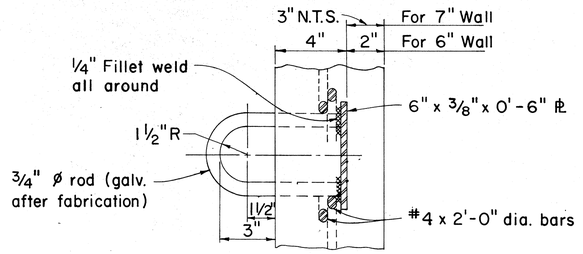


NOTE:
Exact location of sump to be determined in field.

SECTION ELEV.

OPEN SUMP

NOT TO SCALE



SECTION ELEV.

PULLING IRON

NOT TO SCALE

NOTE "Y":
Generally 2 pulling irons are required and located on opposite wall of each duct entrance unless otherwise shown or noted. H. E. Co. engineer shall determine number required.

GENERAL NOTES

1. Concrete to develop compressive cylinder strength of 3000 PSI in 28 days.
2. CONCRETE FINISH:
   Top of Handhole - Woodfloated (sidewalk finish) according to Highways Division, State of Hawaii or Division of Engineering, City & County of Honolulu specification whichever Agency has authority over the work.
   Floor - Smooth metal trowelled.
   Exposed Wall Surfaces, and Edges - Smooth and free from defects.
   CONCRETE POURING:
   Notify the Hawaiian Electric Co. Contracting & Inspection Div., 24 hours before pouring any concrete. All concrete pouring shall be done in the presence of an H.E.CO. Engineer or Inspector.
3. REINFORCING: round deformed bars, new billet stock grade 40, ASTM A615. All hooked bars shall have ACI Std. hook unless otherwise shown.
4. FORMS: form handhole to size and shape as shown. Exterior face of handhole wall shall be formed except:
   A) Excavation in solid material such as coral or rock, neat cut no forms required.
   B) Excavation in solid material other than coral or rock, lining such as salvaged corrugated iron, canec etc. may be used.
5. PULLING IRONS:
   For location and number required, see duct entrance plan of project concerned.
6. DRAINAGE: Slope floor down 1/2" to sump.
7. Slope top of handhole. See plan of project concerned.
8. FINISH STEEL WORK:
   Angle Iron frames for remov. conc. slabs and pulling irons shall be HOT DIP. GALVANIZED AFTER FABRICATION.
9. EXCAVATION:
   Excavate for handhole to accurate alignment grades and dimensions as shown on drawing. All excavation must be approved by the Engineering Department, the Hawaiian Electric Co., Inc., before any concrete is poured. All excess cut shall be backfilled with concrete or approved aggregate.
10. BACKFILL:
    Remove all debris before backfilling. Backfill in accordance with latest specifications of and subject to approval of Highways Division, State of Hawaii or Division of Engineering, City & County of Honolulu whichever Agency has authority over the work.
11. For duct line construction standards see ~~H.E.CO.~~ Dwgs.30-1030-A,30-1035-A and specs sheet CS 7001-0.
12. DUCTS: For number, size, and exact location of duct entrances, refer to project drawings.
13. ALL MATERIALS SHALL BE NEW AND SHALL BE MANUFACTURED IN THE UNITED STATES OF AMERICA

FOR USE IN AREAS NOT SUBJECT TO VEHICULAR TRAFFIC.

APPROVED:

J. Kawamoto 7/27/76

HAWAIIAN ELECTRIC Co., Inc. CHIEF ENGR. DATE

HECo., Inc. Drawing Number

18841-A SHEET No. 2 OF 2 SHEETS

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS

HANDHOLE TYPE 35 (3'-0" x 5'-0")

UNDERGROUND STANDARDS

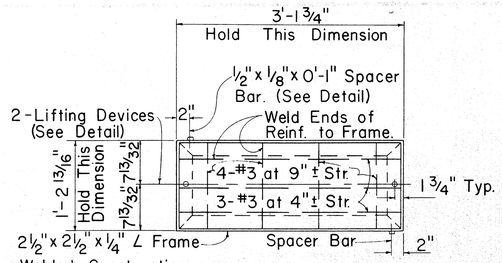
Scales As Noted Date: July 15, 1976

SHEET NO. 9 OF 17 SHEETS

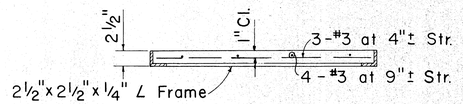
63

KEUFFEL & ESSER CO. NO. 1103 AMERAGRAPH TRACING CLOTH 10 60 20 KE

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-HI-7 (136)17	1976	C0635-1	124



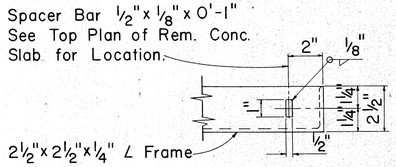
PLAN



SECTION

REMOVABLE CONCRETE SLAB

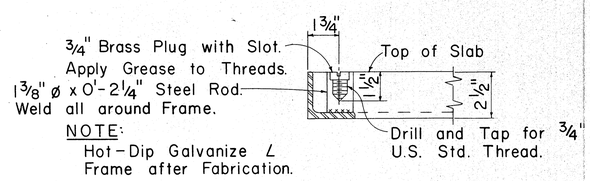
1" = 1'-0"



PART ELEVATION

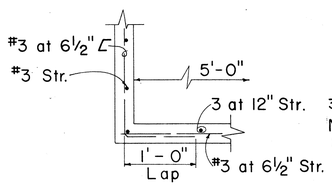
SPACER BAR DETAIL

3" = 1'-0"



LIFTING DEVICE DETAIL

3" = 1'-0"

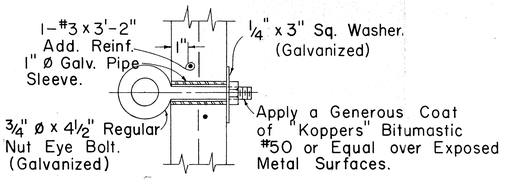


PLAN

CORNER REINF.

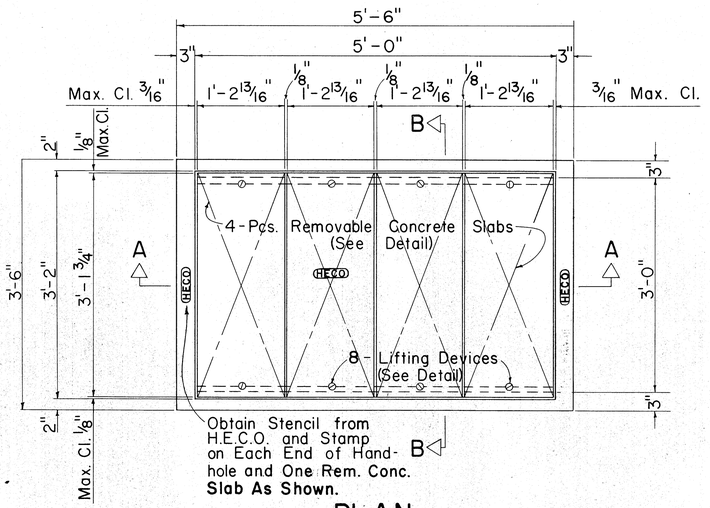
TYPICAL

1" = 1'-0"



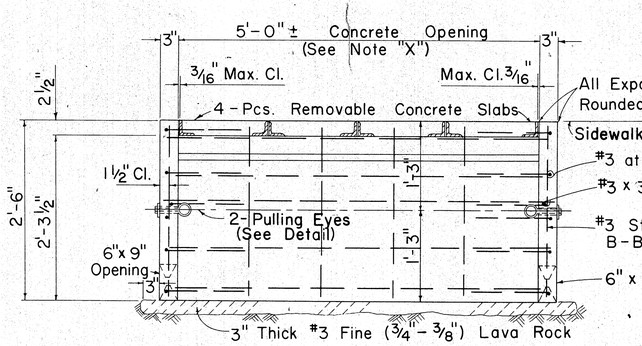
PULLING EYE DETAIL

3" = 1'-0"



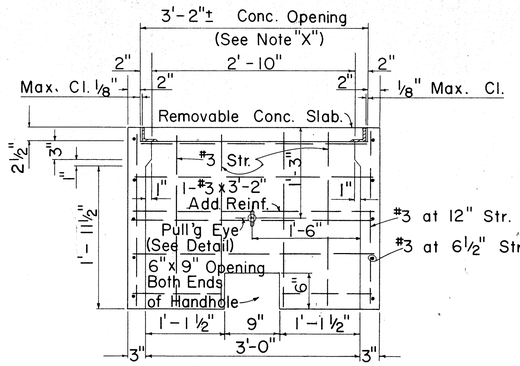
PLAN

1" = 1'-0"



SECTION A-A

1" = 1'-0"



SECTION B-B

1" = 1'-0"

GENERAL NOTES

HANDHOLE FABRICATION

1. CONCRETE STRENGTH:
   Concrete to develop compressive cylinder strength of 3,000 psi. in 28 days.
2. CONCRETE FINISH:
   Top of handhole wood floated (sidewalk finish) according to Division of Highways, State of Hawaii or Division of Engineering, City & County of Honolulu specification whichever governs unless otherwise directed. Round all exposed edges to 3/8" radius.
3. REINFORCING:
   Round deformed bars, new billet stock, intermediate grade ASTM A15.
4. FINISH STEEL WORK:
   Angle iron frames, lifting devices for removable concrete slabs and pulling eye attachments shall be Hot-Dip Galvanized After Fabrication.
5. All materials shall be new and manufactured in the United States of America.

HANDHOLD INSTALLATION

6. EXCAVATION:
   Excavate for handhole to accurate alignment, grades and dimensions as shown on drawings. All excavation must be approved by the Engineering Dept., Hawaiian Electric Co. Inc. before installing precast handhole.
7. INSTALLATION:
   Place handhole on 3" thick #3 fine lava rock. Top of handhole to be level and 1" above finished grade except in sidewalk areas where top is to match top of sidewalk.
8. BACKFILL:
   Remove all debris before backfilling. Backfill in accordance with latest specifications of and subject to approval of Division of Highways, State of Hawaii or Division of Engineering, City & County of Honolulu whichever governs unless otherwise directed.

WEIGHT PER REMOVABLE COVER

Reinf. & Angle Frames	=	38.0 Lb.
Concrete	=	115.0 Lb.
Total	=	153.0 Lb.

WEIGHT OF MATERIAL PER UNIT (EXCLUDING COVERS)

Concrete	= 1,675 Lb.	(.42 cu. yd.)
Reinf. Steel	= 59 Lb.	(157 L.F. of #3)
Total	= 1,734 Lb.	

NOTE "X" — IMPORTANT

Maximum clearances between removable concrete cover slabs and concrete opening at the supports must be kept. Concrete Contractor shall measure cover slab steel frame after fabrication to obtain proper clearances. Any variation in clearances shall be corrected to the satisfaction of the Engineer at Contractors expense.

Note: This tracing added during "As-Built" posting.

FOR USE IN AREAS NOT SUBJECT TO VEHICULAR TRAFFIC.

APPROVED:

HAWAIIAN ELECTRIC Co., Inc. DATE

DD-630.010

HECo., Inc. Drawing Number

15501

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS

PRECAST HANDHOLE (3'-0" x 5'-0") UNDERGROUND STANDARDS

Scales: As Noted Date:

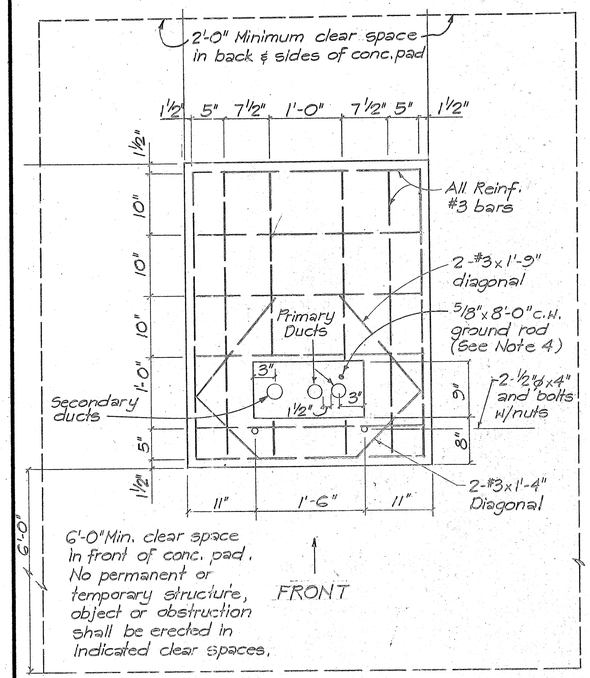
SHEET No. OF SHEETS

C.O. 635-1

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	"
	TRACED BY	"
NOTE BOOK	DESIGNED BY	"
No.	QUANTITIES BY	"
	CHECKED BY	"

HE-3

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-HI-1(136)17	1976	64	124



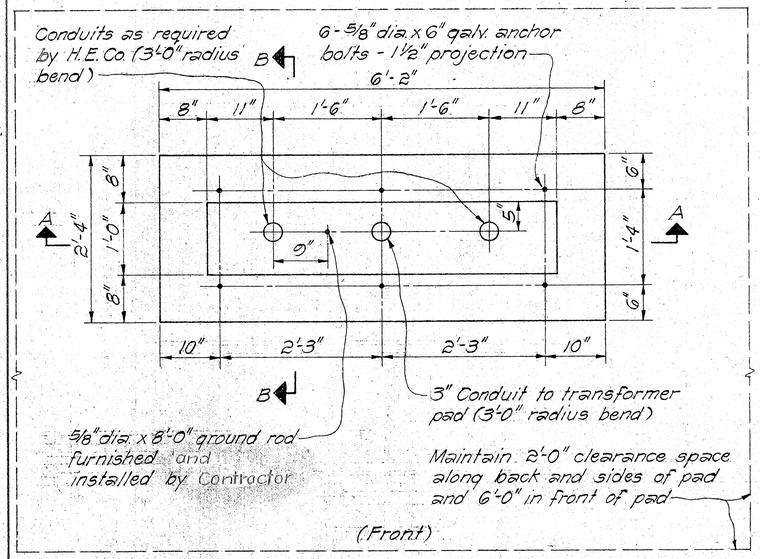
PLAN VIEW

NOTES:

1. The Contractor is to furnish materials and construct the facilities for the padmounted Transformer including the concrete pad, primary and secondary ducts and anchor bolts. Concrete curb and rock fill around the pad, when required, shall also be furnished and installed by the Contractor.
2. The Contractor is to furnish and install all the secondary cables & ducts, the secondary cables are to be a minimum of 5'-0" long from the end of the duct.
3. Bends due to changes of grade or horizontal alignment are to have a minimum radius of 20'-0". Ducts are to be ABS ducts or Schedule 40 PVC pipe in concrete jacket. The duct is to run in a straight line from pad to handhole. PVC and ABS ducts shall conform to the applicable provisions of subsection 630.02 (G) of the Specifications.
4. One copperweld ground rod 5/8"ϕ x 8'-0" long is to be provided by HECo. and installed by the Contractor. The Contractor is to pick up the rod at HECo. Ward Avenue Supply Room. Tie the rod to a water pipe with #1/0 copper wire. Tie may be eliminated where the water pipe is more than 25' away.
5. The Contractor shall provide safeguards as outlined in Paragraph 450-25 of the National Electrical Code Latest revision subject to the approval of the City & County Building Inspectors for construction of pad near combustible material or combustible buildings.
6. The front side of the concrete pad shall be located to face the vehicular access
7. All duct lines shall contain a Polyolefin Pull Line (Jet Line Cat.#232 or equivalent).
8. After the conduits are installed, the Contractor shall pass a smooth bullet-shaped wooden test Mandrel through the entire length of each conduit to test for freedom of burrs and constructions.
9. Select backfill: As specified in HECo's Service Installation Manual.
10. HECo's metering facilities shall be installed in a readily accesible, preferably unlocked, area.

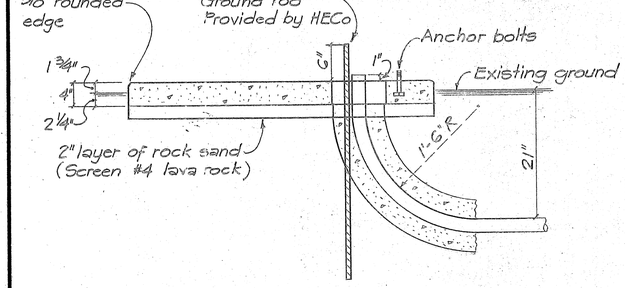
CONCRETE PAD NOTES

1. Compressive Strength: 3,000 P.S.I. in 28 days.
2. Reinforcing: Clean and new round deformed bars.
3. Top of concrete pad to be smooth, true and level. Other exposed surfaces to be smooth and free from defects.



PLAN

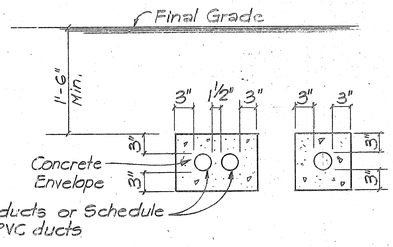
Scale: 1"=1'-0"



ELEVATION VIEW

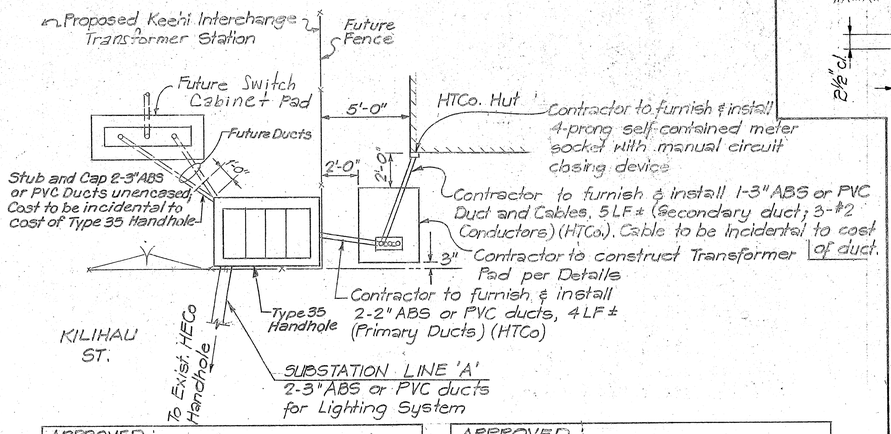
TRANSFORMER PAD (BUILT FOR HTCO)

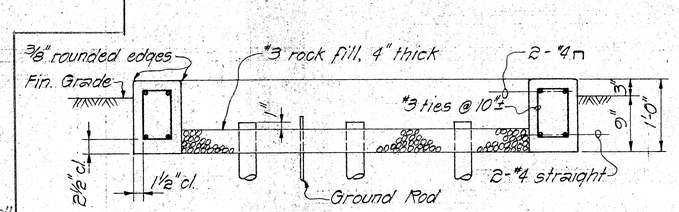
Scale: 1"=1'-0"



DUCT ENCASEMENT DETAILS

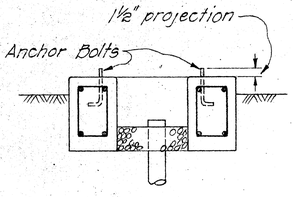
N.T.S.





SECTION A-A

Scale: 1"=1'-0"



SECTION B-B

Scale: 1"=1'-0"

SWITCH CABINET PAD

(For use with 75-500 KVA Padmount Transformers)

APPROVED:
John R. Elliott
Hawaiian Electric Co. Inc.
Customer Engineering
7/27/76 Date

APPROVED:
B. Goodwin
Hawaiian Telephone Co.
8/9/76 Date

APPROVED:
J. Kashiwa
Hawaiian Electric Co. Inc.
7/27/76 Date

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

SWITCH CABINET PAD & TRANSFORMER PAD
INTERSTATE ROUTE H-1
PROJECT NO. I-HI-1(136)17

SCALE: AS SHOWN DATE: July 15, 1976

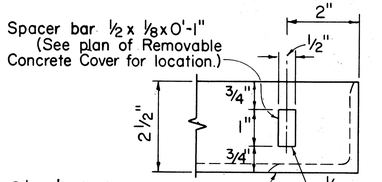
SHEET No. 10 OF 17 SHEETS

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

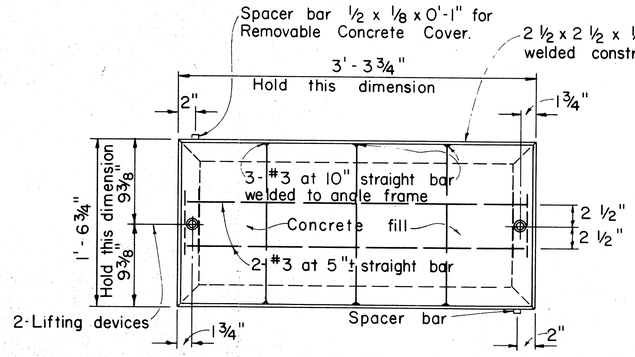
K+E CRYSTALENE® LA 2920 TRACING PAPER

64

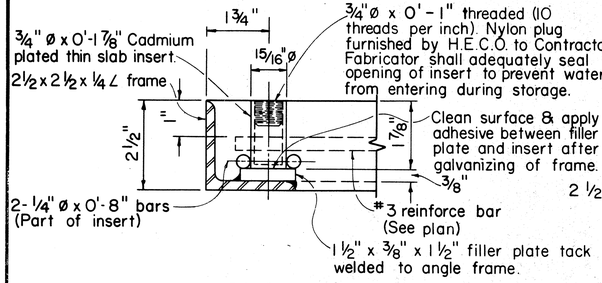
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-HI-1(136)17	1976	65	124



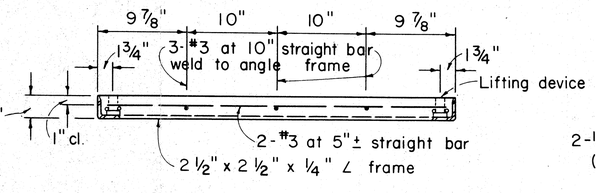
PART ELEVATION
SPACER BAR
Scale: ½ full size



PLAN
Scale: 1½" = 1'-0"



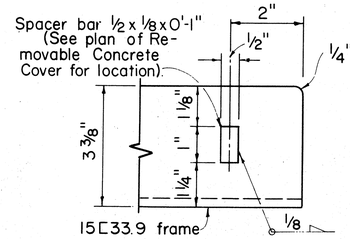
PART SECTION
LIFTING DEVICE
Scale: ½ full size



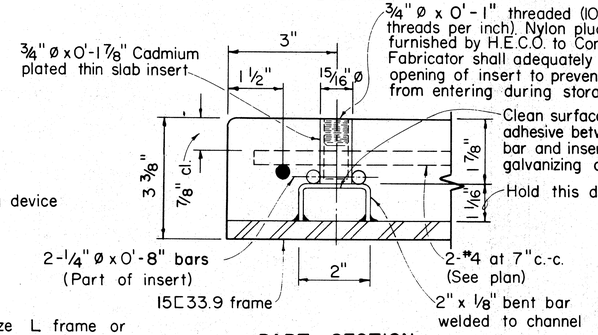
SECTION
Scale: 1½" = 1'-0"

NOTE: Galvanize L frame or C frame, steel rods, and spacer bars after fabrication.

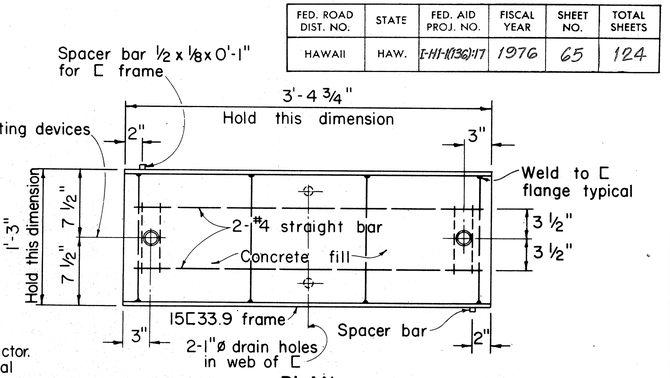
TYPE "SW" REMOVABLE CONCRETE COVER



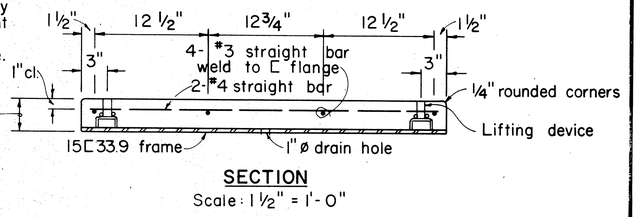
PART ELEVATION
SPACER BAR
Scale: ½ full size



PART SECTION
LIFTING DEVICE
Scale: ½ full size

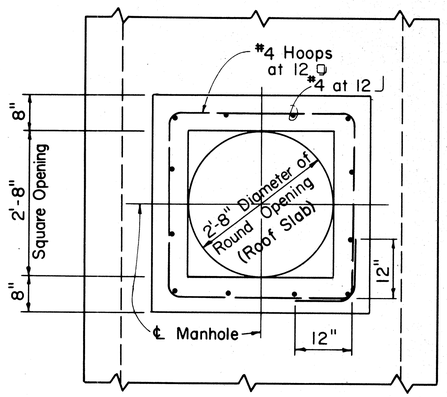


PLAN
Scale: 1½" = 1'-0"

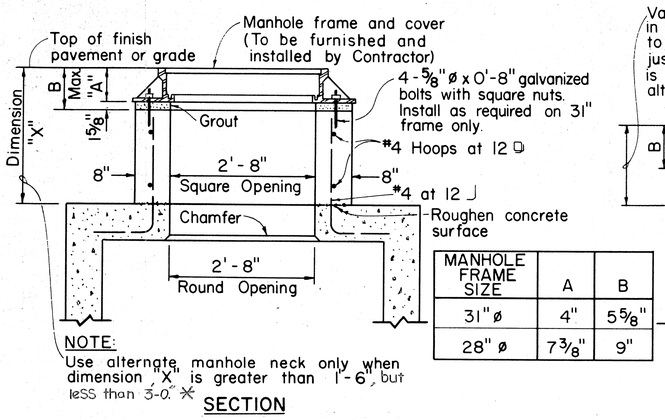


SECTION
Scale: 1½" = 1'-0"

TYPE "TR" REMOVABLE CONCRETE COVER



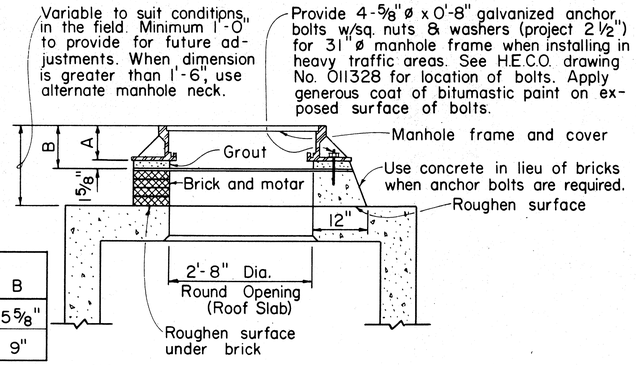
PLAN



MANHOLE FRAME SIZE	A	B
31" ø	4"	5⅝"
28" ø	7⅜"	9"

NOTE:
Use alternate manhole neck only when dimension "X" is greater than 1'-6", but less than 3'-0". *

SECTION



NOTE:
See table alternate manhole neck detail for dimension A and B.

ALTERNATE MANHOLE NECK
Scale: ¾" = 1'-0"

* For "X" equal or greater than 3'-0" see sheet 10

31" ø & 28" ø MANHOLE FRAME NECK DETAIL
Scale: ¾" = 1'-0"

GENERAL NOTES

1. On handhole covers, maximum clearances must be kept between removable concrete cover slabs and concrete openings at the supports. Contractor shall measure cover slabs steel frame after fabrication to obtain proper clearances. All covers after being installed shall be seated firmly and evenly and be free from rocking. Any variation in clearances and unevenness shall be corrected to the satisfaction of the Engineer at the Contractor's expense.
2. Concrete Pouring: Notify the Hawaiian Electric Co., Inc. Contracting & Inspection Division, 24 hours before pouring concrete. All concrete pouring shall be done in the presence of a Hawaiian Electric Co., Inc. Engineer or Inspector.
3. All materials shall be new and manufactured in the United States of America.

APPROVED:
J. Karamoto 7/27/76
Hawaiian Electric Co., Inc. Eng. Dept. Date

HECo., Inc. Drawing Number
16688-A
SHEET NO. 1 OF 2 SHEETS

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

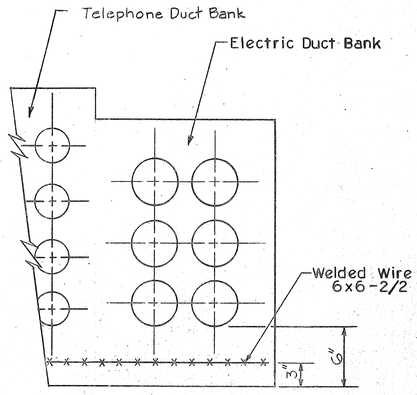
MISCELLANEOUS DETAILS HANDHOLES & MANHOLES UNDERGROUND STANDARDS

Scale as noted Date: July 15, 1976

SHEET No. 11 OF 17 SHEETS

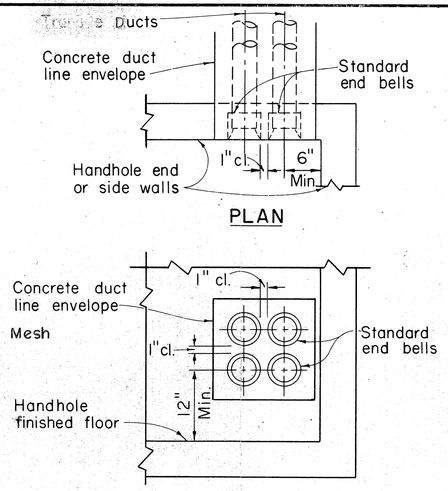
ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE | NOTE BOOK | No.

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-HH-1(36)17	1976	66	124



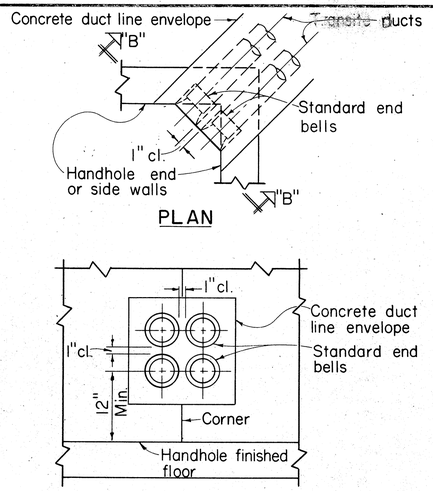
CONCRETE JACKET WITH WIRE MESH

NOT TO SCALE



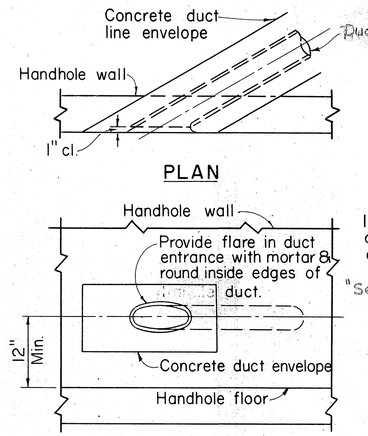
END OR SIDE ENTRANCE

Scale: 1" = 1'-0"



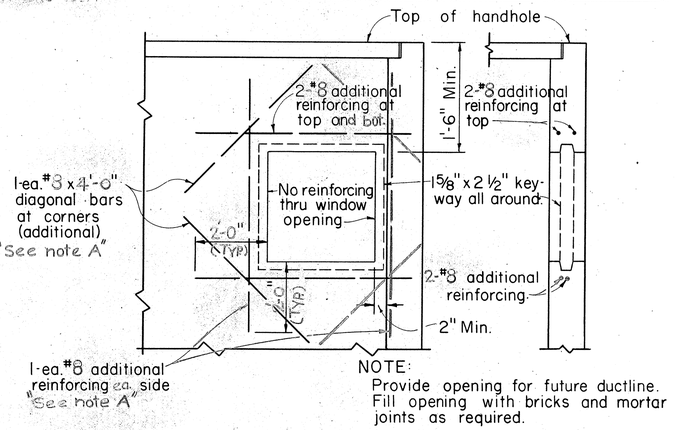
CORNER ENTRANCE

Scale: 1" = 1'-0"



DIAGONAL ENTRANCE

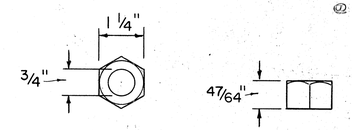
Scale: 1" = 1'-0"



KNOCKOUT FOR FUTURE DUCT LINE

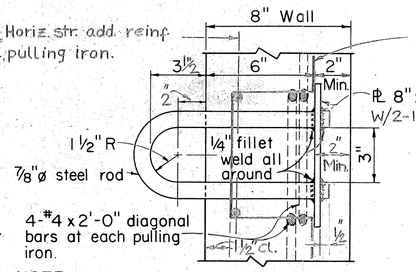
Scale: N.T.S.

NOTE "A":
The Reinforcement around opening to be bent where there is insufficient clearance.



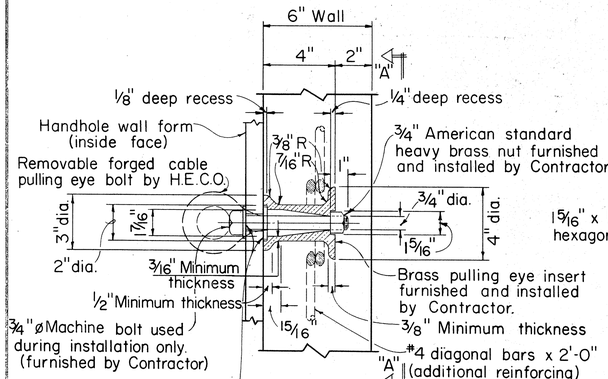
3/4" ø AMERICAN STANDARD HEAVY BRASS HEXAGON NUT

Scale: 1/2 full size



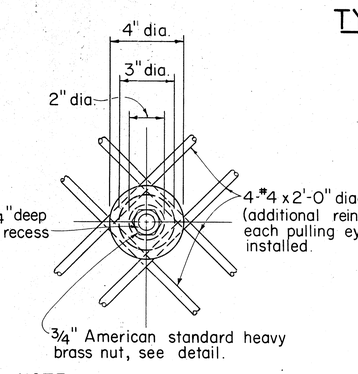
PULLING IRON

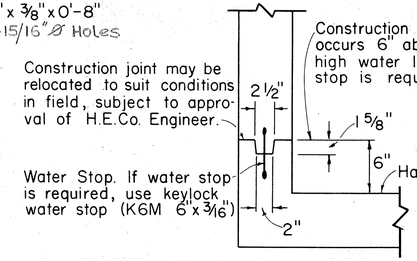
Scale: 3" = 1'-0"



BRASS PULLING EYE INSERT

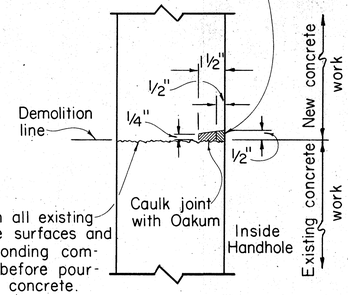
Scale: 3" = 1'-0"





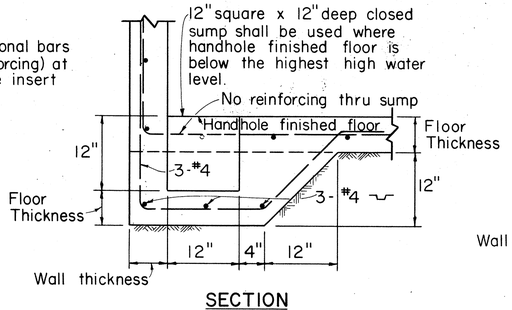
TYPICAL CONSTRUCTION JOINT

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



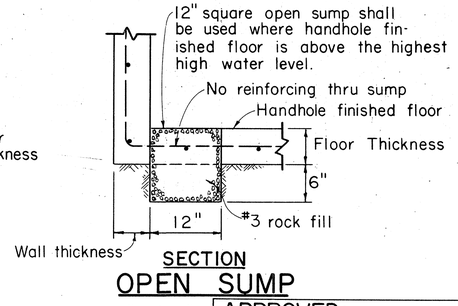
TYPICAL COLD JOINT

Scale: 3" = 1'-0"



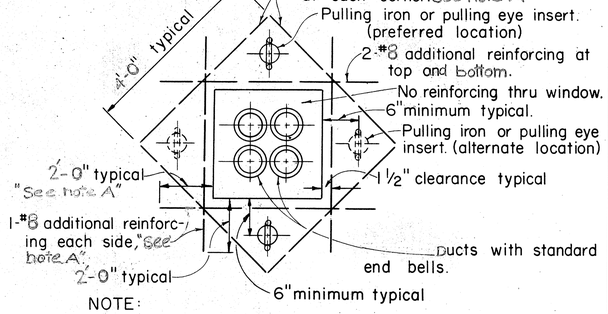
CLOSED SUMP

Scale: 1" = 1'-0"



OPEN SUMP

Scale: 1" = 1'-0"



TYPICAL DUCT WINDOW

Scale: N.T.S.

APPROVED:
J. Kimoto 7/27/76
Hawaiian Electric Co., Inc. Engineer Date

HECo., Inc. Drawing Number
16688-A
SHEET NO. 2 OF 2 SHEETS

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

MISCELLANEOUS DETAILS HANDHOLES & MANHOLES UNDERGROUND STANDARDS

Scale as noted Date: July 15, 1976

SHEET No. 12 OF 17 SHEETS

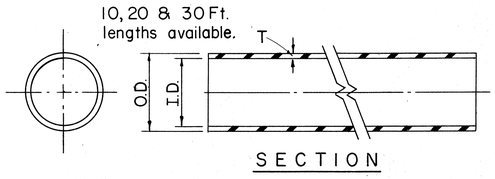
ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE | NOTE BOOK | No.

66

HE-8

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-HI-1(136)17	1976	67	124

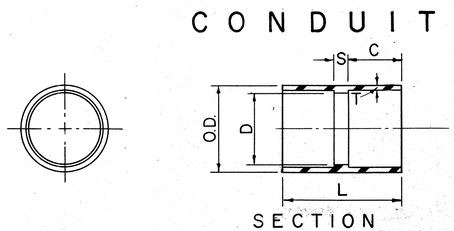
CONDUIT



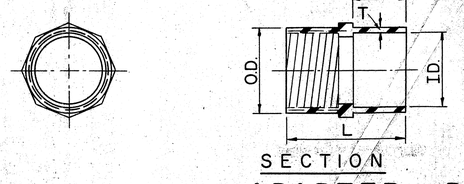
CONDUIT SIZE	EB (ENCASED BURIAL) HECO CODE	O.D.	I.D.	T (MIN.)	WEIGHT #/10² FT.	DB (DIRECT BURIAL) HECO CODE	O.D.	I.D.	T (MIN.)	WEIGHT #/10² FT.
2		2.375	*2.25	.060	21	29010	2.375	2.15	.110	38
3		3.500	3.35	.075	39	29012	3.500	3.25	.125	64
4		4.500	4.31	.095	63	29014	4.500	4.18	.160	104
5		5.563	5.36	.100	82	29016	5.563	5.20	.180	146
6		6.625	6.375	.125	121		6.625	6.25	.190	182

NOTE: Type EB & DB Conduits have same O.D. for a given size. All fittings which go over Conduits are DB type & fit both types of Conduits.

COUPLING (ASTM D-2750)

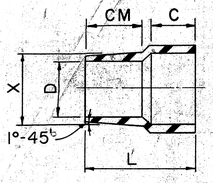


SIZE	HECO CODE	O.D.	D	L	C	S	T
2		2.620	2.255	2 7/16	1.16	.110	.110
3		3.780	3.350	3 3/8	1.63	.120	.125
4		4.855	4.310	3 11/16	1.78	.120	.160
5		5.965	5.363	4 3/32	1.97	.160	.180
6		7.050	6.375	4 15/32	2.16	.160	.190



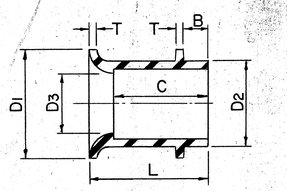
SIZE	HECO CODE	O.D.	I.D.	L	T	C
2				2 15/16	1 1/16	1.16
3				3 7/16	1 5/8	1.63
4				3 11/16	1 23/32	1.78
5				4 1/16	1 27/32	1.97
6				15 5/8	1 11/16	3.44

ADAPTER - PLASTIC TO STEEL



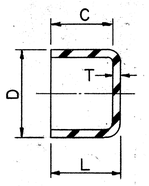
SIZE	HECO CODE	L	X	C.M.	D	C
2		3 1/16	2.580	1 3/4	2.18	1.16
3		3 19/32	3.620	1 3/4	3.09	1.63
4		4 1/32	4.620	2	4.03	1.78
5						

ADAPTER - PLASTIC TO ASBESTOS CEMENT



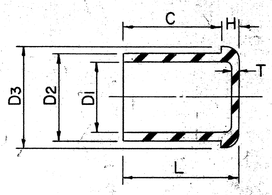
SIZE	HECO CODE	D1	D2	D3	B	C	L	T
2		3.01	2.520	2.255	.50	1.16	1.54	.060
3		4.10	3.680	3.350	.75	1.63	2.00	.075
4		5.31	4.725	4.310	.75	1.78	2.28	.095
5		6.36	5.805	5.363	1.00	1.97	2.47	.100
6		7.38	6.920	6.375	1.00	2.16	2.66	.125

END BELL (ASTM D-2750)



SIZE	HECO CODE	D	C	L	T
2		2.52	.59	.65	.060
3		3.68	.81	.89	.075
4		4.725	.91	1.01	.095
5		5.805	1.00	1.10	.100
6		6.920	1.13	1.25	.125

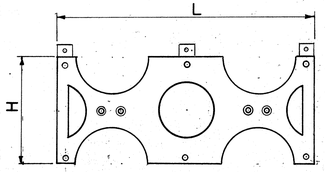
CAP (RIGID) - FOR SEMI-PERMANENT USE (ASTM D-2750)



SIZE	HECO CODE	D1	D2	D3	C	H	L	T
2		2.260	2.375	2.500	.593	.125	.718	.060
3		3.360	3.500	3.656	.812	.156	.968	.075
4		4.320	4.500	4.687	.906	.187	1.092	.095
5		5.375	5.638	5.760	1.000	.218	1.218	.100
6		6.390	6.625	6.875	1.093	.250	1.343	.125

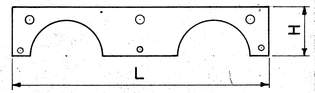
CAP (TEMPORARY) (ASTM D-2750)

NOTE: Cap will go over conduit or "plug" the coupling.



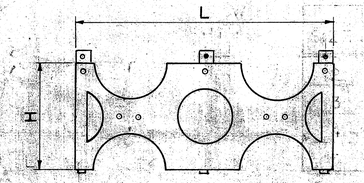
SIZE	HECO CODE	L	H	W
2		9.50	3.94	
3		11.25	5.06	
4		13.75	6.06	
5		15.97	7.06	
6		18.0	8.19	

INTERMEDIATE SPACER



SIZE	HECO CODE	L	H
2		9.50	1.75
3		11.25	2.25
4		13.75	3.13
5		15.87	3.63
6		18.0	4.25

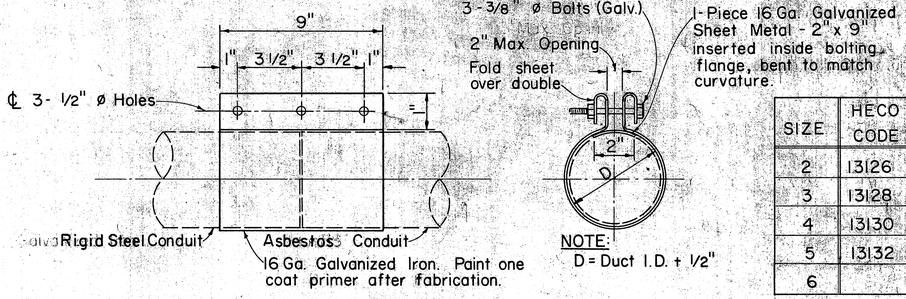
CAP SPACER



SIZE	HECO CODE	L	H
2		9.50	4.25
3		11.25	4.75
4		13.75	5.25
5		15.87	5.87
6		18.0	6.375

BASE SPACER

DUCT SPACER COMPONENTS (FORMEX SPACER OR EQUIVALENT)



SIZE	HECO CODE
2	13126
3	13128
4	13130
5	13132
6	

3 - BOLT CLAMP

GENERAL NOTES:

1. All dimensions in inches.
2. Spacers shown are different than that used for Asbestos Cement Type.
3. These accessories are to be used with ABS (Acrylonitrile-Butadiene - Styrene), or PVC (Poly-Vinyl Chloride) Plastic Conduit, per HECO purchase specification M7001-0.

APPROVED:
L. Karimoto 7/27/76
Hawaiian Electric Co., Inc. Date

HECo, Inc. Drawing Number
30-1035-A

SHEET NO. 2 OF 2 SHEETS

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS
PLASTIC DUCTS
INSTALLATION DETAILS
UNDERGROUND STRUCTURES

Scales: Not to Scale Date: July 15, 1976

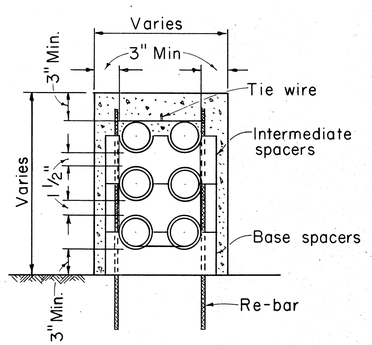
SHEET No. 13 OF 17 SHEETS

67

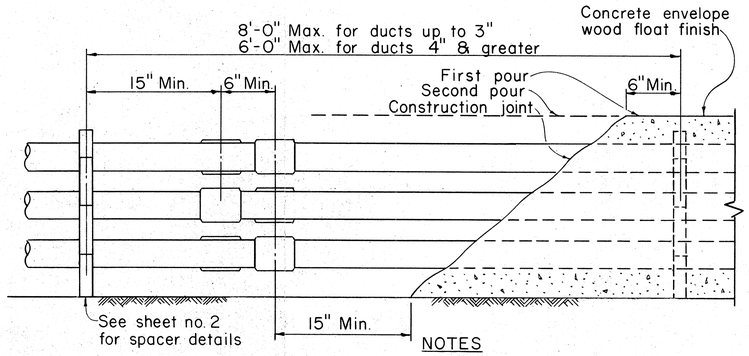
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
No.	TRACED BY	
	DESIGNED BY	
	QUANTITIES BY	
	CHECKED BY	

HE-41

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-HI-1(13)47	1976	68	124



SECTION



ELEVATION

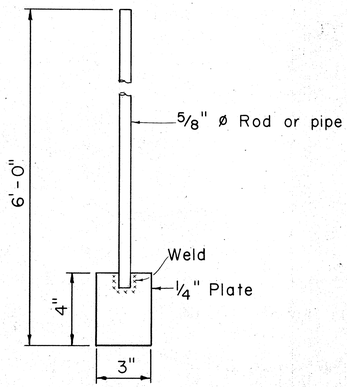
TYPICAL DUCT LINE

(6-WAY DUCT SHOWN)

Scale: 1½" = 1'-0"

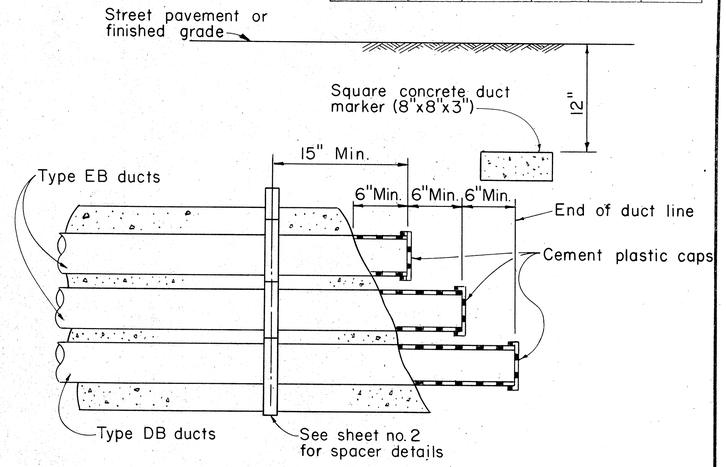
NOTES

1. Stagger couplings (or belled ends).
2. Anchor conduit with #14 steel tie wire & #4 reinforcing bars.
3. Cement all joints.
4. Avoid standing on conduit.



HAND SPADE

Scale: 3" = 1'-0"



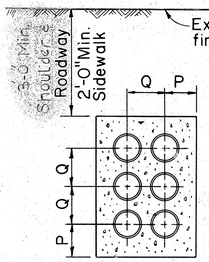
TYPICAL STUB OUT DETAIL

(6-WAY DUCT SHOWN)

Scale: 1½" = 1'-0"

NOTE:

1. Maintain 1½" minimum spacing between conduit; 3" minimum concrete envelope around top, bottom & sides.
2. Dimensions are minimum dimensions.
3. The bottom row in an encased duct bank of three or more layers shall be Type DB ducts. The remaining ducts shall be Type EB.
4. Refer to Go-10 or specific project DWGS for depth requirements.



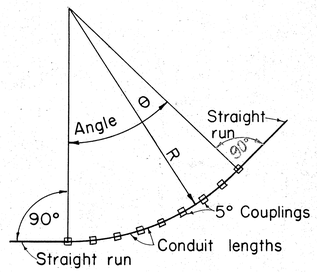
DUCT SIZE	DIMENSIONS (INCHES) P	Q
2	4 ¼	4 ⅛
3	4¾	5 ⅛
4	5 ¼	6 ¼
5	5⅞	7⅝
6	6 5/16	8⅝

EB TYPICAL DUCT SECTION

(6-WAY DUCT SHOWN)

Scale: 1" = 1'-0"

TABLE "A"	
APPROX. RADIUS OF BEND, R	LENGTH OF EA. CONDUIT-FT USING 5° BEND AT COUPL.
11'-6"	1
17'-3"	1.5
23'-0"	2
28'-9"	2.5
34'-6"	3
40'-3"	3.5
46'-0"	4
51'-9"	4.5
57'-6"	5
69'-0"	6
80'-6"	7
92'-0"	8



EXAMPLE:

Radius of bend (R) = 60'
Angle of bend (θ) = 45°

From Table A, the nearest value to 60' radius is 57'-6". Length of conduit = 5'.

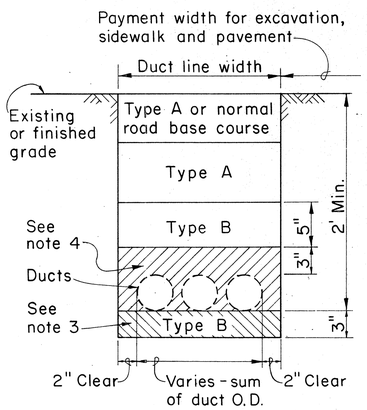
From Table B, for 45° angle.
Number of couplings required = 9
Number of conduit lengths required = 8

TABLE "B"		
ANGLE OF BEND θ	NO. OF COUPLINGS	LENGTH OF CONDUIT
15°	3	2
30°	6	5
45°	9	8
60°	12	11
75°	15	14
90°	18	17

METHOD OF FORMING CURVES:

There are 4 methods of forming curves with plastic conduit.

1. "Cold" bending: Limit trench formed radius sweeps to 25' minimum radius.
2. "Heat" bending: Do not heat bend conduit.
3. 5° angle couplings may be used as shown.
4. Factory made elbows and sweeps may be used only when specified by Engineer.



NOTES:

1. Type A: Beach sand, earth or earth and gravel. If earth and gravel, the max. rock size shall be 1" and the mixture shall contain not more than 50%, by volume, of rock particles.
2. Type B: Beach sand, earth or earth and gravel. If earth and gravel, the mixture must pass a ½" mesh screen and contain not more than 20%, by volume, of rock particles.
3. When trench bottom is coarser than Type B material, provide 3" duct cushion.
4. Soil poison details: Use an aqueous solution of 2% chlordane, 1% dieldrin or 1% adlrin, when specified by engineer. Apply soil poison (1 gal. per 3 square feet) to trench floor and to layer of backfill from trench floor to 3" above conduit.

D.B. EXCAVATION & BACKFILL DETAILS (TYPICAL)

Scale 1½" = 1'-0"

GENERAL NOTES

HECO PURCHASE SPECIFICATION NO.

A. APPROVED CONDUIT MATERIALS
   1. Encased Burial (EB) Conduit
      a) Asbetos Cement, Type I ---------- M7005
      b) ABS (Acrylonitrile-Butadiene-Styrene) Plastic Conduit, Type EB ---------- M7001
      c) PVC (Polyvinyl Chloride) Plastic Conduit, Type EB ---- M7001
      d) PVC Plastic Conduit, Schedule 40 ---------- 116
      See note 3 EB Typical Duct Section
   2. Direct Burial (DB) Conduit
      a) ABS Plastic Conduit, Type DB ---------- M7001
      b) PVC Plastic Conduit ---------- M7001
      c) PVC Plastic Conduit, Schedule 40 ---------- 116
B. This drawing provides details for installing Plastic Ducts (ABS & PVC) only. ~~Refer to drawing 30-1030 & 30-1033 for installing Asbestos Cement Ducts Encased Burial.~~

APPLICATION OF 5° COUPLING FOR LONG RADIUS BENDS

REFERENCE SPECIFICATION

CS 7202	General Conditions
CS 7001	Construction of U.G. Facilities
CS 7003	Construction of Electrical Facilities

APPROVED:
J. Karimoto 7/27/76
Hawaiian Electric Co., Inc. Date

~~HECo, Inc. Drawing Number~~
30-1035-A SHEET No. 1 OF 2 SHEETS

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS

PLASTIC DUCTS
INSTALLATION DETAILS
UNDERGROUND STRUCTURES

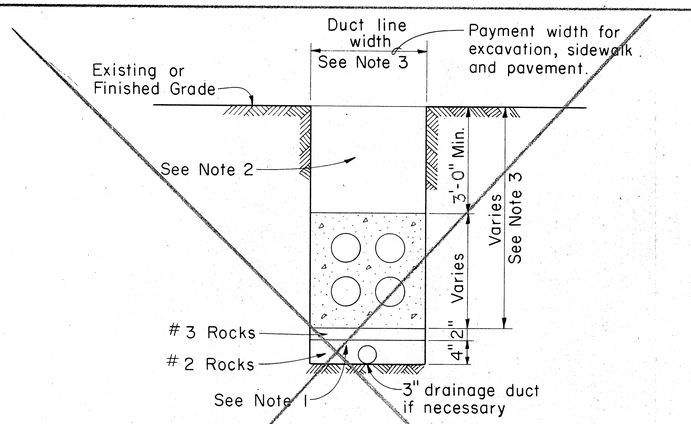
Scale as noted Date: July 15, 1976

SHEET No. 14 OF 17 SHEETS

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	"
	TRACED BY	"
NOTE BOOK	DESIGNED BY	"
	QUANTITIES BY	"
No.	CHECKED BY	

HE-40

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-HI-1(136)17	1976	69	124



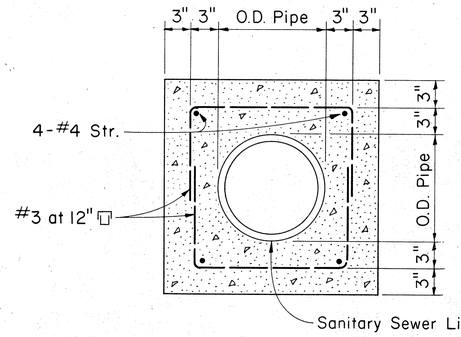
NOTES:

1. If drainage is necessary, install 6" rockfill as shown. In extremely watery areas, install 3" drainage duct.
2. Refer to H.E.Co. Specification CS7001-0 (or equivalent) for backfill material requirements.
3. Size of concrete envelope and depth of excavation to be determined by specific project.

EB EXCAVATION AND BACKFILL DETAILS

(TYPICAL)

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



CROSS-SECTION OF SEWER LINE

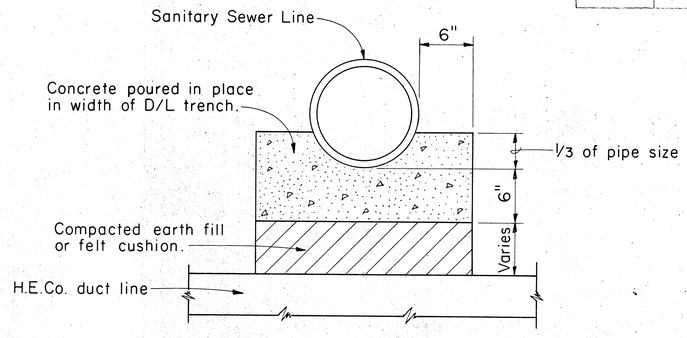
NOTE:

Where duct line crosses sewer line, cover sewer line with concrete jacket as located on the Plans. Concrete jacket shall be considered incidental to the cost of duct line.

DUCT LINE WIDTH	LENGTH OF SEWER LINE TO BE COVERED
24" or less	5'
Greater than 24"	(Width of duct line) + (5')

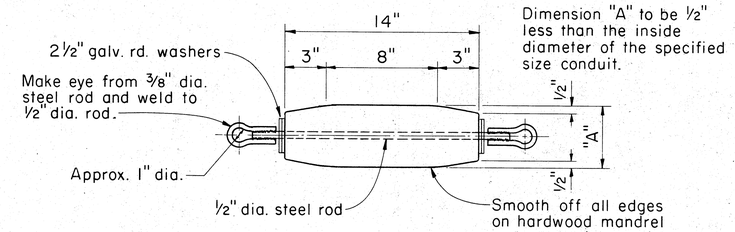
SANITARY SEWER LINE CROSSING DETAIL

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



CONCRETE CRADLE FOR SANITARY SEWER LINE CROSSING

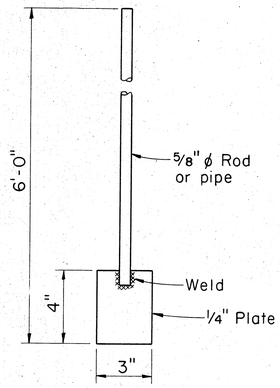
Scale: 1 1/2" = 1'-0"



Dimension "A" to be 1/2" less than the inside diameter of the specified size conduit.

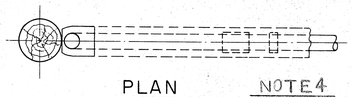
MANDREL DETAIL

Not To Scale

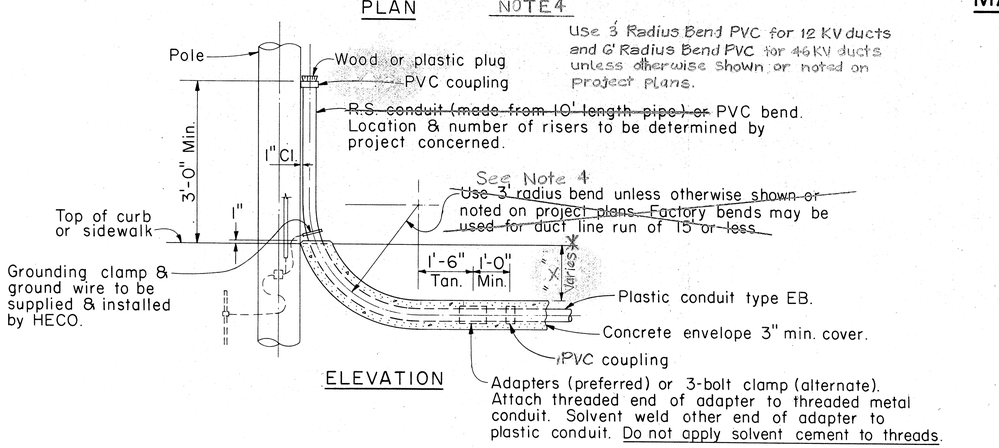


HAND SPADE

Scale: 3" = 1'-0"



PLAN NOTE 4



Use 3' Radius Bend PVC for 12 KV ducts and 6' Radius Bend PVC for 46 KV ducts unless otherwise shown or noted on Project Plans.

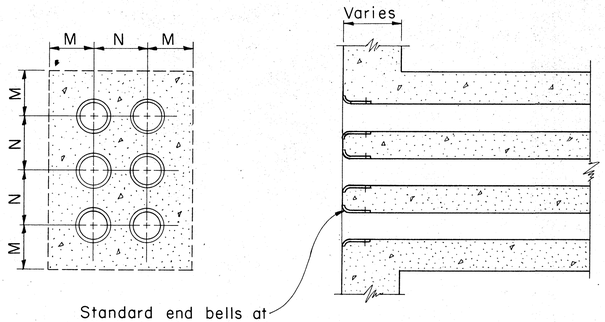
ELEVATION

TYPICAL RISER DETAIL

(POLE RISER SHOWN)

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

* For Sidewalk Area X=2'-0" Min.
For Roadway & Shoulder Area X= 3'-0" Min.



TYPICAL CONDUIT ENTRANCE INTO HANDHOLE, MANHOLE OR VAULT WALLS

(6 WAY DUCT LINE SHOWN)

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

DUCT SIZE	DIMENSIONS (INCHES)	
	M	N
2	4	5
3	5	6
4	5 1/2	7
5	6	8
6	6 5/16	9

APPROVED:

F. Kawamoto 7/27/76

Hawaiian Electric Co., Inc. acting Date

HECo., Inc. Drawing Number

30-1030-A

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

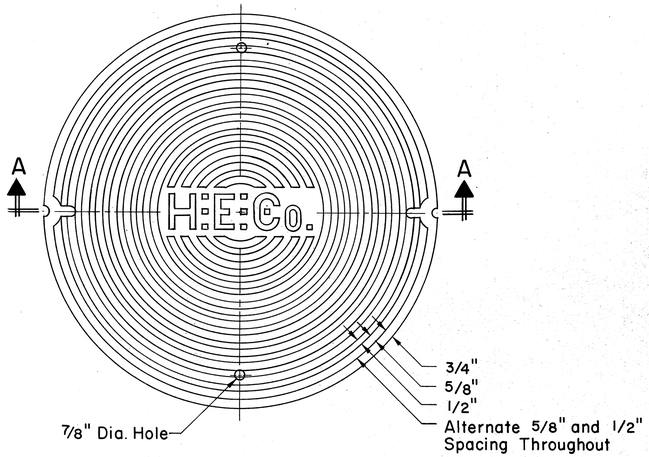
TYPICAL DUCT CONSTRUCTION INSTALLATION DETAILS UNDERGROUND DETAILS

Scale as noted Date: July 15, 1976

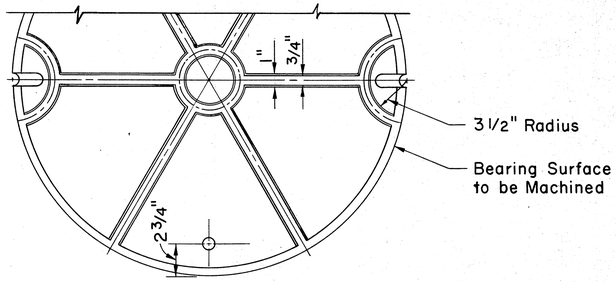
SHEET No. 15 OF 17 SHEETS

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	"
NOTE BOOK	TRACED BY	"
	DESIGN BY	"
No.	QUANTITIES BY	"
	CHECKED BY	"

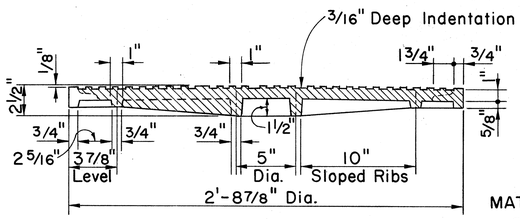
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	I-HI-1(136):17	1976	70	124



TOP VIEW



BOTTOM VIEW



SECTION A-A

MATERIAL:
Cast Iron per ASTM A48, Class 30.

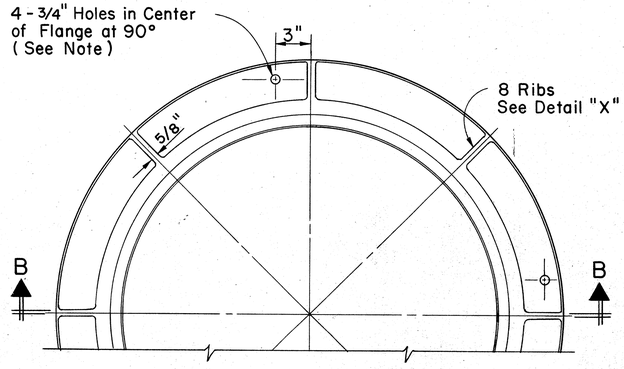
WEIGHT:
Approx. 262 lbs.

REFERENCE:
31" Manhole Frame - Dwg. 011328.

31" MANHOLE COVER

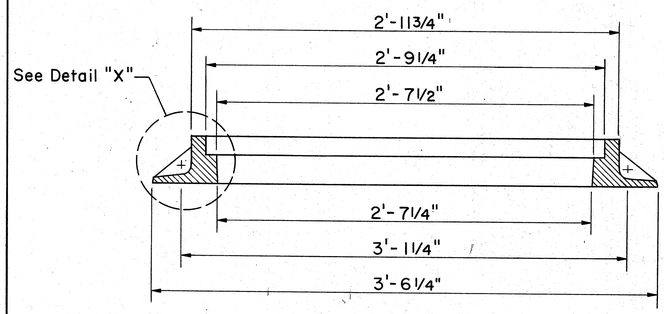
Scale: 2" = 1'-0"

011327



PARTIAL PLAN

Scale: 2" = 1'-0"



SECTION B-B

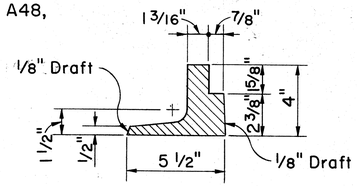
Scale: 2" = 1'-0"

INSTALLATION NOTE:
If frame is to be installed where heavy traffic will be on frame, insert 5/8" ϕ bolts thru holes in flange into concrete.

MATERIAL:
Cast Iron per ASTM A48, Class 30.

WEIGHT:
Approx. 300 lbs.

REFERENCE:
31" Manhole Cover - Dwg. 011327.



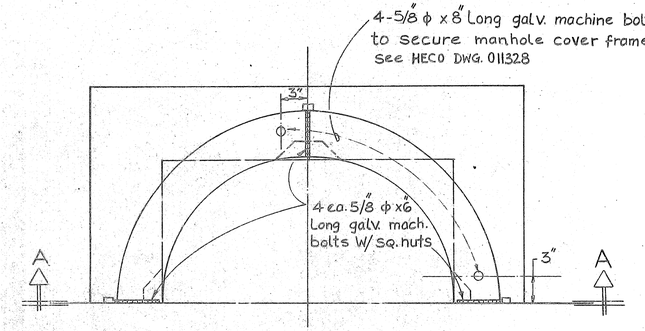
DETAIL "X"

Scale: 3" = 1'-0"

31" MANHOLE FRAME

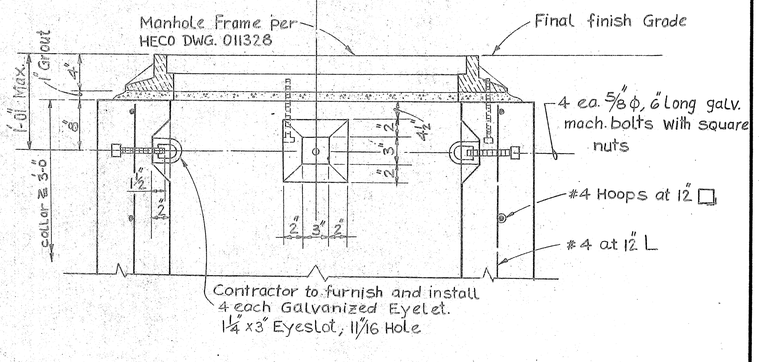
Scale: As Shown

011328



HALF PLAN

N.T.S



SECTION A-A

N.T.S

SPECIAL MANHOLE COLLAR DETAIL

(For Manhole Collar equal or greater than 3-0)

APPROVED:

J. Kawuchi 7/27/76
Hawaiian Electric Co., Inc. Eng'g. Date

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

MANHOLE FRAME & COVER DETAILS

INTERSTATE ROUTE H-1
PROJECT NO. I-HI-1(136):17

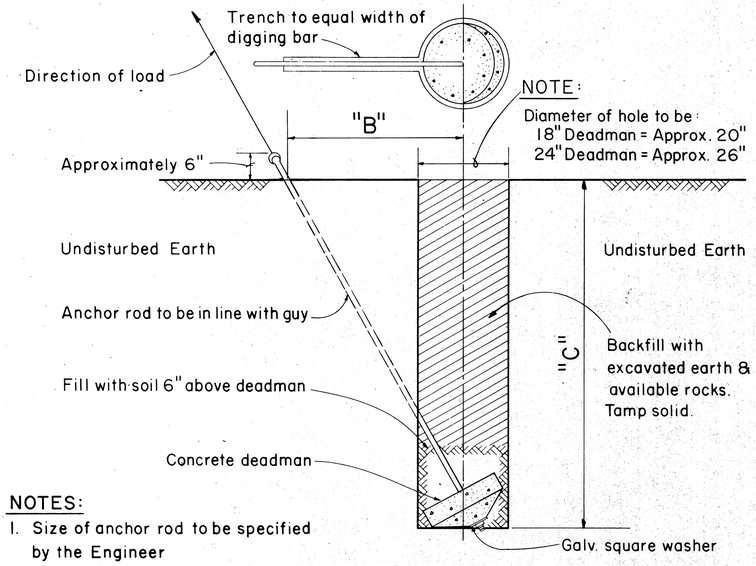
SCALE: AS SHOWN DATE: July 15, 1976

SHEET No. 16 OF 17 SHEETS

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

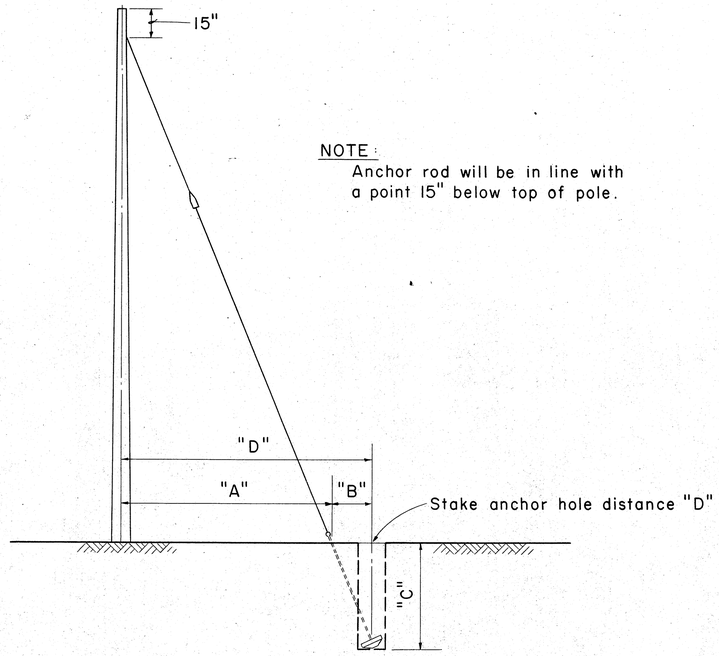
K+E IMPERIAL™ LA 3207 TRACING CLOTH

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAWAII	I-HI-1(136):17	1976	71	124



NOTES:
1. Size of anchor rod to be specified by the Engineer
2. Use Anchoring Data.

GUY ANCHOR DEADMAN
Scale: 3/4" = 1' – 0"



Not to Scale

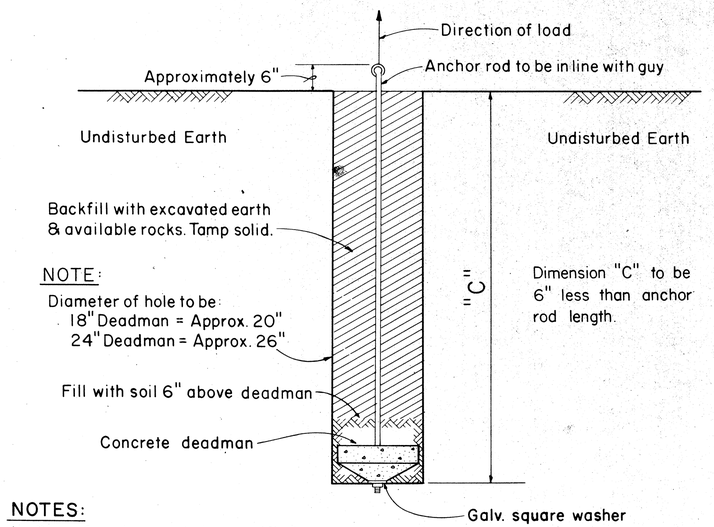
FOR 25', & 30' POLES WITH 8'-0" ANCHOR RODS				
"A"	"B"	"C"		"D" = ("A" + "B")
LEAD-ANCHOR ROD TO ℄ OF POLE	ANCHOR ROD TO ℄ OF HOLE	VERTICAL DEPTH 18" D.M.	VERTICAL DEPTH 24" D.M.	TOTAL DISTANCE POLE TO HOLE
5'-0"	1'-8"	7'-1"	7'-4"	6'-8"
10'-0"	3'-0"	6'-7"	7'-0"	13'-0"
15'-0"	4'-0"	6'-1"	6'-6"	19'-0"
20'-0"	4'-8"	5'-6"	5'-10"	24'-8"
25'-0"	5'-2"	4'-11"	5'-4"	30'-2"
FOR 35' THRU 70' POLES WITH 8'-0" ANCHOR RODS				
5'-0"	1'-0"	7'-3"	7'-4"	6'-0"
10'-0"	1'-11"	7'-1"	7'-3"	11'-11"
15'-0"	2'-8"	6'-9"	7'-1"	17'-8"
20'-0"	3'-3"	6'-6"	6'-10"	23'-3"
25'-0	3'-10"	6'-2"	6'-7"	28'-10"
FOR 40' THRU 70' POLES WITH 1 1/4" x 10'-0" ANCHOR RODS				
5'-0"	1'-7"		9'-4"	6'-7"
10'-0"	3'-0"		9'-0"	13'-0"
15'-0"	4'-2"		8'-6"	19'-2"
20'-0"	5'-3"		7'-11"	25'-3"
25'-0"	6'-2"		7'-3"	31'-2"

D. M. = Deadman

TABLE 2 ANCHOR ROD - ANCHOR SLUG - SQUARE WASHER COMBINATION							
H.E. CODE NO.	ANCHOR ROD	WORKING TENSION 1/2 ULT (LBS.)	H.E. CODE NO.	CONC. ANC. (IN.)	H.E. CODE NO.	WASHER SIZE	QTY.
617	5/8" x 8'-0" Steel	8,000	518	18	2320	4" x 4" x 3/16"	2
615	5/8" x 8'-0" Cu Cov Stl	9,250	518	18	**	3" x 3" x 1/8"	2
618	3/4" x 8'-0" Steel	11,500	518	18	2330	6" x 6" x 3/8"	1
619	1" x 8'-0" Steel	18,000	524	24	2331	6" x 6" x 1/2"	1
616	1" x 8'-0" Cu Cov Stl	22,500	524	24	**	4" x 4" x 3/16"	2
613	1 1/4" x 10'-0" Steel	29,000	524	24	2330	6" x 6" x 3/8"	2

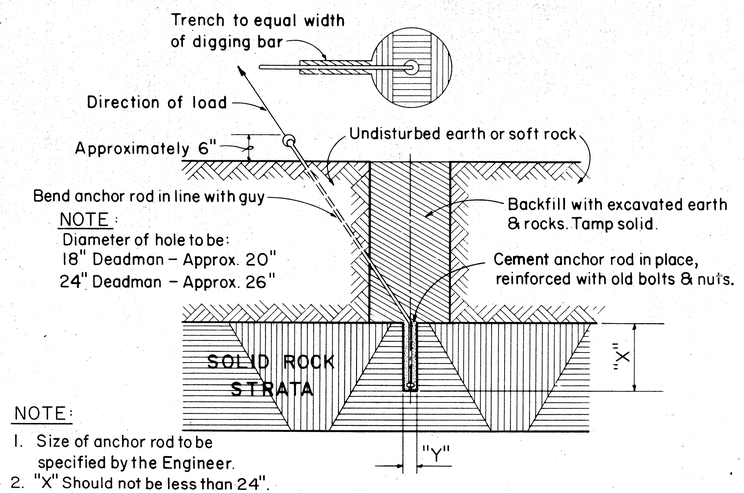
** Use bronze square washers included in anchor rod assembly on copper covered steel (Cu Cov Stl) anchor rods.

ANCHORING DATA



NOTES:
1. Size of anchor rod to be specified by the Engineer.
2. Use Anchoring Data.

SIDE – WALK ANCHOR
Scale: 3/4"= 1' – 0"



NOTE:
1. Size of anchor rod to be specified by the Engineer.
2. "X" Should not be less than 24". If "X" is less than 24" complete hole & install anchor.
3. "Y" 5/8" Anchor rod drill 2" hole
   3/4" Anchor rod drill 2" hole
   1" Anchor rod drill 2 1/2" hole
   1 1/4" Anchor rod drill 3" hole
4. Use Anchoring Data.

ROCK ANCHOR
Not to Scale

APPROVED:

HAWAIIAN ELECTRIC Co., Inc. DATE

HAWAIIAN TELEPHONE Co. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS
H.E. Co. AND H.T. Co.
ANCHOR DETAILS AND ANCHORING DATA

Scales: As Noted Date: July 15, 1976

SHEET No. 17 OF 17 SHEETS