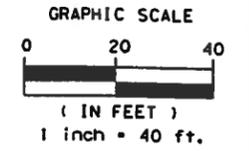
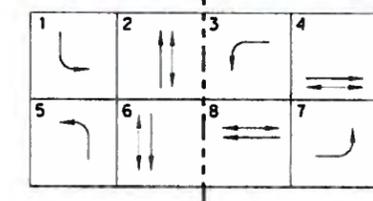


| EQUIPMENT SCHEDULE | | LOCATION | |
|--------------------|--|---------------|--------------|
| ID | CONSTRUCTION NOTES | | |
| A | INSTALL "TS-1" TYPE 332 CABINET & 2070 CONTROLLER ASSEMBLY ON CITY TYPE CONCRETE FOUNDATION. | 80+55.73 | 73.96 RT |
| B | INSTALL 24' HIGH, LMA-80 STEEL POLE WITH 60' MA, 21.9' DEEP 48-A FOUNDATION, (2) LED COUNTDOWN PEDESTRIAN HEADS, (2) PEDESTRIAN PUSH BUTTONS WITH R10-3e(L) (L&R) SIGNS, (1) 9' ILSNS MAST ARM, (2) VIVDS CAMERA ASSEMBLIES, AND (1) OPTICOM DETECTOR. | 13726644.37 N | 2150213.39 E |
| C | INSTALL 24' HIGH, SMA-80 STEEL POLE WITH 40' MA, 13.2' DEEP 36-A FOUNDATION, (1) LED COUNTDOWN PEDESTRIAN HEAD, (1) PEDESTRIAN PUSH BUTTON WITH R10-3e(L) SIGN, (1) 9' ILSNS MAST ARM, (2) VIVDS CAMERA ASSEMBLIES, AND (1) OPTICOM DETECTOR. | 80+38.51 | 56.29 RT |
| D | INSTALL 24' HIGH, LMA-80 STEEL POLE WITH 65' MA, 21.9' DEEP 48-A FOUNDATION, (2) LED COUNTDOWN PEDESTRIAN HEADS, (2) PEDESTRIAN PUSH BUTTONS WITH R10-3e(L) (L&R) SIGNS, (1) ON 9' ILSNSMAST ARM, (2) VIVDS CAMERA ASSEMBLIES, AND (1) OPTICOM DETECTOR. | 13726539.46 N | 2150174.99 E |
| E | INSTALL 19' HIGH, SMA-80 STEEL POLE WITH 40' MA, 13.2' DEEP 36-A FOUNDATION, (2) LED COUNTDOWN PEDESTRIAN HEADS, (2) PEDESTRIAN PUSH BUTTONS WITH R10-3e(L) (L&R) SIGNS, (1) 9' ILSNS MAST ARM, (2) VIVDS CAMERA ASSEMBLIES, AND (1) OPTICOM DETECTOR. | 79+47.72 | 63.55 RT |
| F | INSTALL 7' HIGH PEDESTAL POLE, 5.7' DEEP 24-A FOUNDATION, ONE LED COUNTDOWN PEDESTRIAN HEAD, ONE PEDESTRIAN PUSH BUTTON WITH R10-3e(R) SIGN ASSEMBLY. | 13726511.78 N | 2150042.02 E |
| G | INSTALL 7' HIGH PEDESTAL POLE, 5.7' DEEP 24-A FOUNDATION, ONE LED COUNTDOWN PEDESTRIAN HEAD, ONE PEDESTRIAN PUSH BUTTON WITH R10-3e(R) SIGN ASSEMBLY. | 78+82.65 | 55.61 LT |
| H | INSTALL 7' HIGH PEDESTAL POLE, 5.7' DEEP 24-A FOUNDATION, ONE LED COUNTDOWN PEDESTRIAN HEAD, ONE PEDESTRIAN PUSH BUTTON WITH R10-3e(R) SIGN ASSEMBLY. | 13726623.91 N | 2150055.97 E |
| I | INSTALL 7' HIGH PEDESTAL POLE, 5.7' DEEP 24-A FOUNDATION, ONE LED COUNTDOWN PEDESTRIAN HEAD, ONE PEDESTRIAN PUSH BUTTON WITH R10-3e(R) SIGN ASSEMBLY. | 79+77.56 | 68.50 LT |
| J | INSTALL 7' HIGH PEDESTAL POLE, 5.7' DEEP 24-A FOUNDATION, ONE LED COUNTDOWN PEDESTRIAN HEAD, ONE PEDESTRIAN PUSH BUTTON WITH R10-3e(R) SIGN ASSEMBLY. | 80+33.07 | 64.59 RT |
| K | INSTALL 7' HIGH PEDESTAL POLE, 5.7' DEEP 24-A FOUNDATION, ONE LED COUNTDOWN PEDESTRIAN HEAD, ONE PEDESTRIAN PUSH BUTTON WITH R10-3e(R) SIGN ASSEMBLY. | 13726623.91 N | 2150198.75 E |
| L | INSTALL 7' HIGH PEDESTAL POLE, 5.7' DEEP 24-A FOUNDATION, ONE LED COUNTDOWN PEDESTRIAN HEAD, ONE PEDESTRIAN PUSH BUTTON WITH R10-3e(R) SIGN ASSEMBLY. | 79+39.45 | 58.27 RT |
| M | INSTALL 7' HIGH PEDESTAL POLE, 5.7' DEEP 24-A FOUNDATION, ONE LED COUNTDOWN PEDESTRIAN HEAD, ONE PEDESTRIAN PUSH BUTTON WITH R10-3e(R) SIGN ASSEMBLY. | 13726532.78 N | 2150167.55 E |
| N | INSTALL 7' HIGH PEDESTAL POLE, 5.7' DEEP 24-A FOUNDATION, ONE LED COUNTDOWN PEDESTRIAN HEAD, ONE PEDESTRIAN PUSH BUTTON WITH R10-3e(R) SIGN ASSEMBLY. | 78+87.48 | 64.44 LT |
| O | INSTALL 7' HIGH PEDESTAL POLE, 5.7' DEEP 24-A FOUNDATION, ONE LED COUNTDOWN PEDESTRIAN HEAD, ONE PEDESTRIAN PUSH BUTTON WITH R10-3e(R) SIGN ASSEMBLY. | 13726518.94 N | 2150035.04 E |
| P | INSTALL 7' HIGH PEDESTAL POLE, 5.7' DEEP 24-A FOUNDATION, ONE LED COUNTDOWN PEDESTRIAN HEAD, ONE PEDESTRIAN PUSH BUTTON WITH R10-3e(R) SIGN ASSEMBLY. | 79+87.30 | 62.51 LT |
| Q | INSTALL 7' HIGH PEDESTAL POLE, 5.7' DEEP 24-A FOUNDATION, ONE LED COUNTDOWN PEDESTRIAN HEAD, ONE PEDESTRIAN PUSH BUTTON WITH R10-3e(R) SIGN ASSEMBLY. | 13726611.51 N | 2150064.24 E |

PHASE DIAGRAM

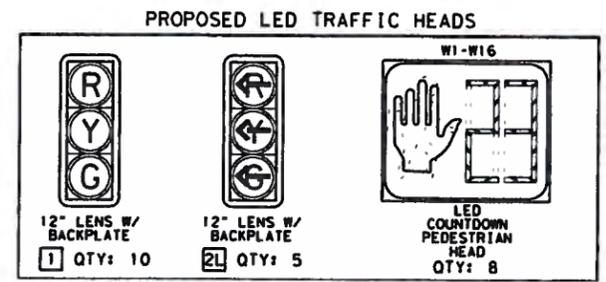
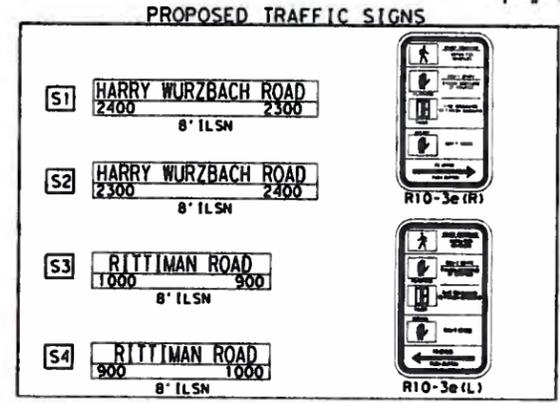
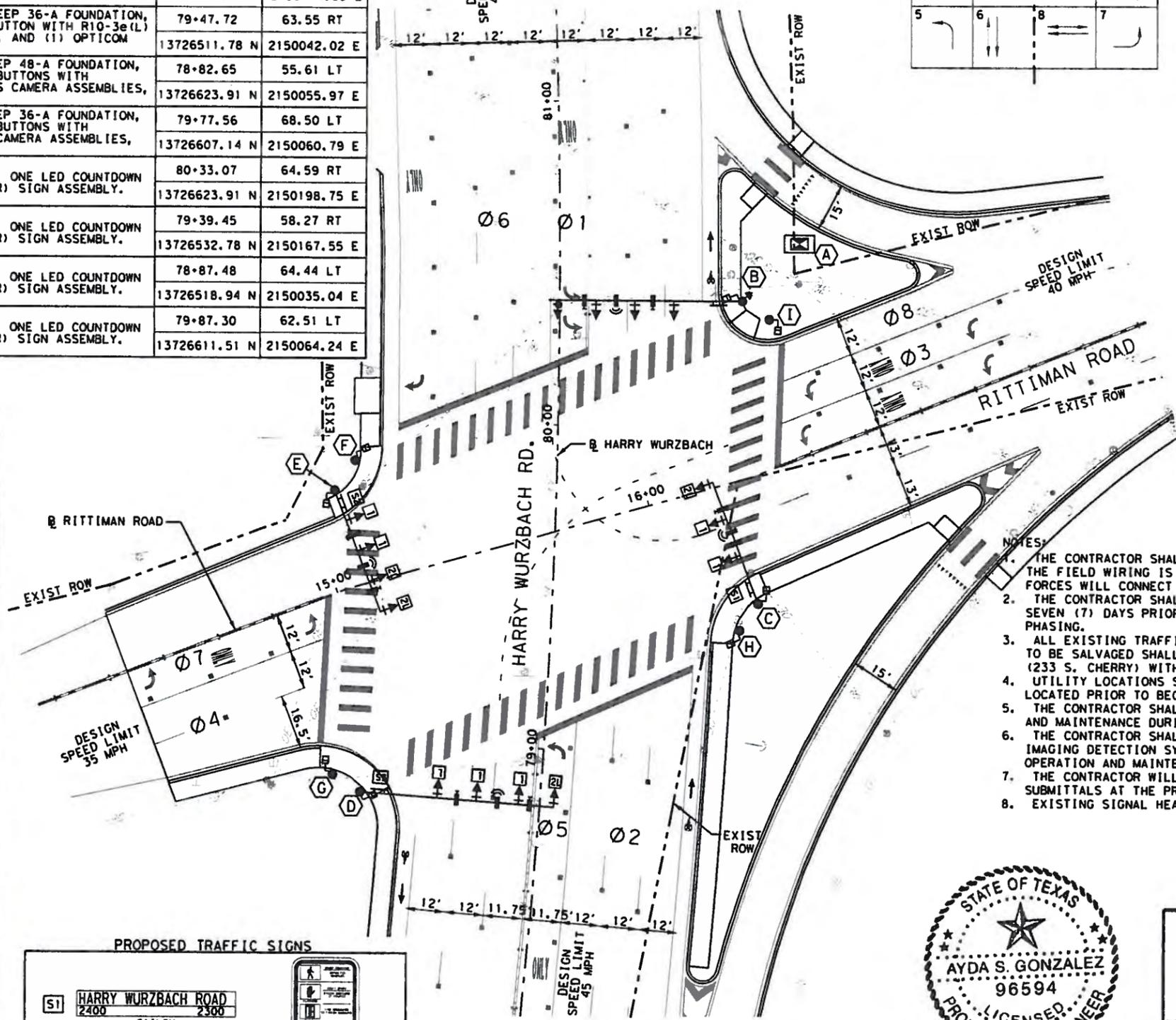


| LEGEND | |
|----------------------------|--|
| TYPE D GROUND BOX | |
| SIGNAL POLE WITH MA | |
| OPTICOM DETECTOR | |
| VIVDS CAMERA AND MOUNT | |
| CONTROLLER & CABINET | |
| ELECTRICAL SERVICE CABINET | |
| SIGNAL CONDUIT | |
| SIGNAL HEAD | |
| PEDESTRIAN HEAD | |
| POLE IDENTIFIER | |
| CONDUIT IDENTIFIER | |
| SIGNAL HEAD IDENTIFIER | |
| VIDEO CAMERA IDENTIFIER | |
| SIGN | |
| IL STREET NAME SIGN | |

ITEMS PROVIDED BY THE CONTRACTOR
ESTIMATED QUANTITIES - SHEET TOTAL

| EST | UNIT | DESCRIPTION |
|------|------|---|
| 111 | LF | CONDT (PVC) (SCHD 40) (2 IN) |
| 650 | LF | CONDT (PVC) (SCHD 40) (3 IN) |
| 1 | EA | TYPE 2070 CONTROLLER AND 332 CABINET |
| 16 | LF | ELEC CONDR (NO. 6) INSULATED |
| 753 | LF | ELEC CONDR (NO. 8) BARE |
| 8 | LF | ELEC CONDR (NO. 6) BARE |
| 4 | EA | GROUND BOX TY D (162922) W/ APRON |
| 1 | EA | ELEC SERV TY D (120/240) 060 (NS) SS(E) SP(U) |
| 1 | EA | BATTERY BACKUP SYSTEM FOR TRAFFIC SIGNAL |
| 10 | SF | ALUMINUM SIGNS (TYPE A) |
| 1 | EA | TYPE 332 CONTROLLER FOUNDATION*** |
| 27 | LF | FND FOR TRAF SIG (TY A) (36 IN DRIL SHFT) |
| 44 | LF | FND FOR TRAF SIG (TY A) (48 IN DRIL SHFT) |
| 1 | EA | INSTAL OF HWY TRAF SIG (SYSTEM) |
| 5 | EA | VEH SIG SEC (12 IN) LED (GRN ARW) |
| 10 | EA | VEH SIG SEC (12 IN) LED (GRN) |
| 5 | EA | VEH SIG SEC (12 IN) LED (YEL ARW) |
| 10 | EA | VEH SIG SEC (12 IN) LED (YEL) |
| 5 | EA | VEH SIG SEC (12 IN) LED (RED ARW) |
| 10 | EA | VEH SIG SEC (12 IN) LED (RED) |
| 8 | EA | PED SIG SEC (12IN) LED (2 INDICAT IN 1 SEC) |
| 15 | EA | BACK PLATE (12 IN) (3 SEC) |
| 646 | LF | TRAF SIG CBL (TY A) (12 AWG) (7 CONDR) * |
| 1003 | LF | TRAF SIG CBL (TY A) (14 AWG) (9 CONDR) ** |
| 8 | EA | PED DETECT (2 INCH PUSH BTN) |
| 4 | EA | PED POLE ASSEMBLY |
| 2 | EA | TRAF SIG POLE ASM (STL) 1 ARM (40 FT) |
| 1 | EA | TRAF SIG POLE ASM (STL) 1 ARM (60 FT) |
| 1 | EA | TRAF SIG POLE ASM (STL) 1 ARM (65 FT) |
| 4 | EA | ILSN (LED) (8 D) |
| 2 | EA | VIVDS PROCESSOR SYSTEM |
| 9 | EA | VIVDS CAMERA ASSEMBLY |
| 1196 | LF | VIVDS COMMUNICATION CABLE (COAXIAL) * |
| 1 | EA | VIVDS SET-UP SYSTEM |
| 642 | LF | ILSN 3-CONDUCTOR (12 AWG) * |
| 646 | LF | EMERGENCY PREEMPTION DETECTOR CABLE* |
| 8 | EA | LED COUNTDOWN PEDESTRIAN MODULE |
| 1 | EA | EMERGENCY PREEMPTION PHASE SELECTOR |
| 4 | EA | EMERGENCY PREEMPTION DETECTOR |

* QUANTITY INDICATES AN ADDITIONAL 24' FOR VERTICAL DISTANCE ON POLE.
** QUANTITY INDICATES AN ADDITIONAL 7' FOR VERTICAL DISTANCE ON POLE.
*** THIS ITEM WILL BE SUBSIDIARY TO ITEM 680 - INSTALL HWY TRAF SIG (SYSTEM)*.



- NOTES:
- THE CONTRACTOR SHALL DEMONSTRATE TO THE ENGINEER'S SATISFACTION THAT THE FIELD WIRING IS PROPERLY INSTALLED IN THE CONTROLLER. ONLY THEN COSA FORCES WILL CONNECT THE FIELD WIRING TO THE CONTROLLER.
 - THE CONTRACTOR SHALL CONTACT CITY TRAFFIC OPERATIONS AT 207-7765, SEVEN (7) DAYS PRIOR TO BEGINNING WORK OF A CHANGE IN THE CONSTRUCTION PHASING.
 - ALL EXISTING TRAFFIC SIGNAL EQUIPMENT REMOVED BY THE CONTRACTOR AND TO BE SALVAGED SHALL BE DELIVERED TO THE CITY TRAFFIC OPERATIONS OFFICE (233 S. CHERRY) WITH 48 HRS ADVANCE NOTICE.
 - UTILITY LOCATIONS SHOWN ARE APPROXIMATE. ALL UTILITIES SHALL BE LOCATED PRIOR TO BEGINNING WORK.
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SIGNAL HEAD ADJUSTMENTS AND MAINTENANCE DURING CONSTRUCTION.
 - THE CONTRACTOR SHALL INSTALL, MAINTAIN AND OPERATE THE VISUAL IMAGING DETECTION SYSTEM DURING CONSTRUCTION. THE CITY SHALL TAKEOVER OPERATION AND MAINTENANCE. ONCE THE PROJECT IS ACCEPTED.
 - THE CONTRACTOR WILL PROVIDE THE ENGINEER WITH SIGNAL EQUIPMENT SUBMITTALS AT THE PRE-CONSTRUCTION MEETING.
 - EXISTING SIGNAL HEADS AND SIGNS TO REMAIN ON SPAN WIRES.



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 TBPE Firm # 10015

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CITY OF SAN ANTONIO
 CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

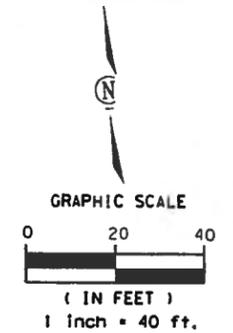
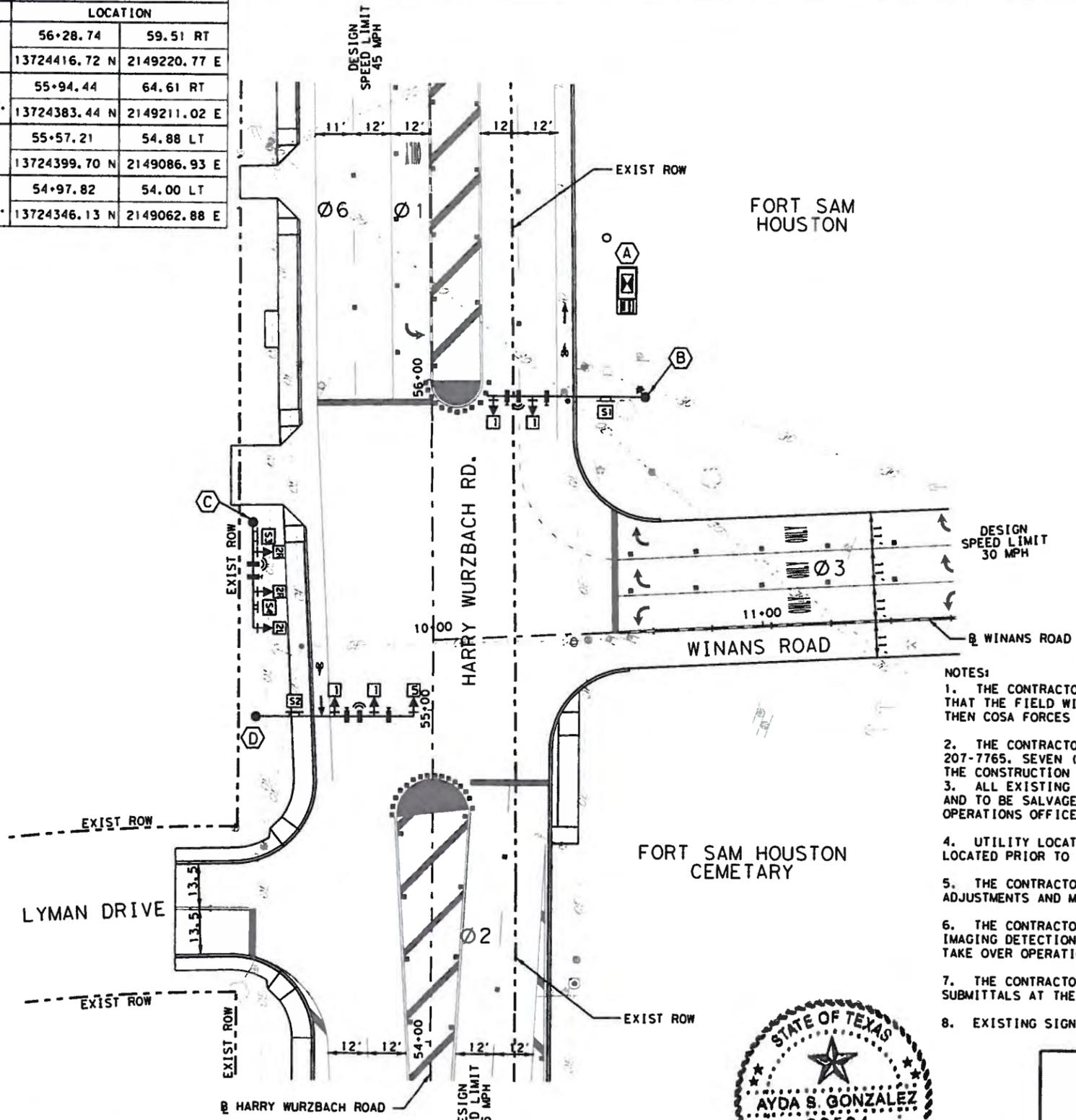
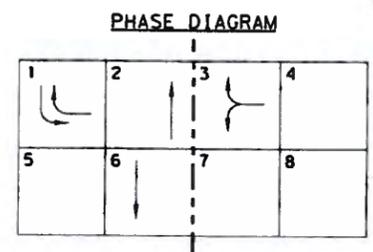
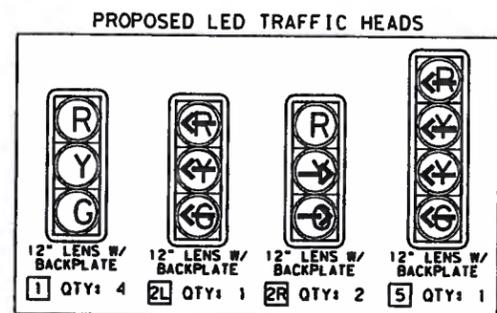
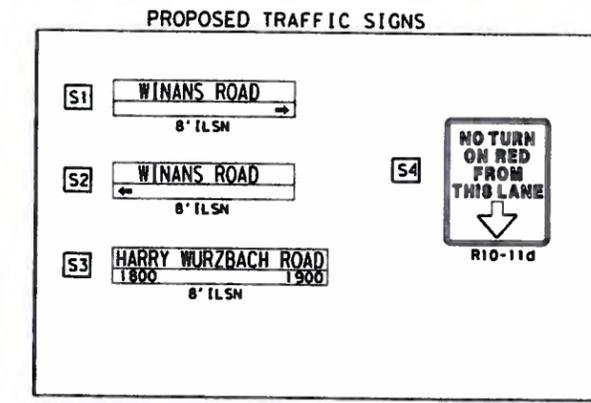
FORT SAM HOUSTON TRANSPORTATION PROJECTS
TRAFFIC SIGNAL LAYOUT PLAN
 HARRY WURZBACH @ RITTIMAN ROAD

100% SUBMITTAL PROJECT NO.: 40-00015 DATE: 7/14/2011
 DRWN. BY: M.L. DSGN. BY: E.D. CHD. BY: E.D. SHEET NO.: 235

| EQUIPMENT SCHEDULE | | LOCATION | |
|--------------------|--|----------|----------|
| A | INSTALL "TS-2" TYPE 332 CABINET & 2070 CONTROLLER ASSEMBLY ON CITY TYPE CONCRETE FOUNDATION. | 56+28.74 | 59.51 RT |
| B | INSTALL 24' HIGH, SMA-80 STEEL POLE WITH 48' MA, 13.2' DEEP 36-A FOUNDATION, (1) 7' ILSNS MAST ARM, (2) VIVDS CAMERA ASSEMBLIES, AND (1) OPTICOM DETECTOR. | 55+94.44 | 64.61 RT |
| C | INSTALL 24' HIGH, SMA-80 STEEL POLE WITH 32' MA, 11.3' DEEP 30-A FOUNDATION, (1) 9' ILSNS MAST ARM, (1) VIVDS CAMERA ASSEMBLY, AND (1) OPTICOM DETECTOR. | 55+57.21 | 54.88 LT |
| D | INSTALL 24' HIGH, SMA-80 STEEL POLE WITH 48' MA, 13.2' DEEP 36-A FOUNDATION, (1) 7' ILSNS MAST ARM, (2) VIVDS CAMERA ASSEMBLIES, AND (1) OPTICOM DETECTOR. | 54+97.82 | 54.00 LT |

| ITEMS PROVIDED BY THE CONTRACTOR | | |
|------------------------------------|------|---|
| ESTIMATED QUANTITIES - SHEET TOTAL | | |
| EST | UNIT | DESCRIPTION |
| 95 | LF | CONDT (PVC) (SCHD 40) (2 IN) |
| 299 | LF | CONDT (PVC) (SCHD 40) (3 IN) |
| 1 | EA | TYPE 2070 CONTROLLER AND 332 CABINET |
| 24 | LF | ELEC CONDR (NO. 6) INSULATED |
| 449 | LF | ELEC CONDR (NO. 8) BARE |
| 12 | LF | ELEC CONDR (NO. 6) BARE |
| 3 | EA | GROUND BOX TY D (162922) W/ APRON |
| 1 | EA | ELEC SERV TY D (120/240) 060 (NS) SS(E) SP(U) |
| 1 | EA | BATTERY BACKUP SYSTEM FOR TRAFFIC SIGNAL |
| 10 | SF | ALUMINUM SIGNS (TYPE A) |
| 1 | EA | TYPE 332 CONTROLLER FOUNDATION *** |
| 12 | LF | FND FOR TRAF SIG (TY A) (30 IN DRIL SHFT) |
| 27 | LF | FND FOR TRAF SIG (TY A) (36 IN DRIL SHFT) |
| 1 | EA | INSTAL OF HWY TRAF SIG (SYSTEM) |
| 4 | EA | VEH SIG SEC (12 IN) LED (GRN ARW) |
| 4 | EA | VEH SIG SEC (12 IN) LED (GRN) |
| 5 | EA | VEH SIG SEC (12 IN) LED (YEL ARW) |
| 4 | EA | VEH SIG SEC (12 IN) LED (YEL) |
| 2 | EA | VEH SIG SEC (12 IN) LED (RED ARW) |
| 6 | EA | VEH SIG SEC (12 IN) LED (RED) |
| 7 | EA | BACK PLATE (12 IN) (3 SEC) |
| 1 | EA | BACK PLATE (12 IN) (4 SEC) |
| 438 | LF | TRAF SIG CBL (TY A) (12 AWG) (7 CONDR) * |
| 1 | EA | TRAF SIG POLE ASM (STL) 1 ARM (32 FT) |
| 2 | EA | TRAF SIG POLE ASM (STL) 1 ARM (48 FT) |
| 3 | EA | ILSN (LED) (8 D) |
| 2 | EA | VIVDS PROCESSOR SYSTEM |
| 6 | EA | VIVDS CAMERA ASSEMBLY |
| 664 | LF | VIVDS COMMUNICATION CABLE (COAXIAL) * |
| 1 | EA | VIVDS SET-UP SYSTEM |
| 495 | LF | ILSN 3-CONDUCTOR (12 AWG) * |
| 438 | LF | EMERGENCY REEMPTION DETECTOR CABLE * |
| 1 | EA | EMERGENCY PREEMPTION PHASE SELECTOR |
| 3 | EA | EMERGENCY PREEMPTION DETECTOR |

* QUANTITY INDICATES AN ADDITIONAL 24" FOR VERTICAL DISTANCE ON POLE.
 *** THIS ITEM WILL BE SUBSIDIARY TO ITEM 680 "INSTALL HWY TRF SIG SYSTEM."



LEGEND

| | |
|----------------------------|-----|
| TYPE D GROUND BOX | □ |
| SIGNAL POLE WITH MA | ● |
| OPTICOM DETECTOR | ⊖ |
| VIVDS CAMERA AND MOUNT | ⊕ |
| CONTROLLER & CABINET | ⊞ |
| ELECTRICAL SERVICE CABINET | ⊙ |
| SIGNAL CONDUIT | --- |
| SIGNAL HEAD | ⊕ |
| PEDESTRIAN HEAD | ⊕ |
| POLE IDENTIFIER | ⊕ |
| CONDUIT IDENTIFIER | ⊕ |
| SIGNAL HEAD IDENTIFIER | ⊕ |
| VIDEO CAMERA IDENTIFIER | ⊕ |
| SIGN | ⊕ |
| IL STREET NAME SIGN | ⊕ |

- NOTES:
1. THE CONTRACTOR SHALL DEMONSTRATE TO THE ENGINEER'S SATISFACTION THAT THE FIELD WIRING IS PROPERLY INSTALLED IN THE CONTROLLER. ONLY THEN COSA FORCES WILL CONNECT THE FIELD WIRING TO THE CONTROLLER.
 2. THE CONTRACTOR SHALL CONTACT CITY TRAFFIC OPERATIONS AT 207-7765, SEVEN (7) DAYS PRIOR TO BEGINNING WORK OF A CHANGE IN THE CONSTRUCTION PHASING.
 3. ALL EXISTING TRAFFIC SIGNAL EQUIPMENT REMOVED BY THE CONTRACTOR AND TO BE SALVAGED SHALL BE DELIVERED TO THE CITY TRAFFIC OPERATIONS OFFICE (233 S. CHERRY) WITH 48 HRS ADVANCE NOTICE.
 4. UTILITY LOCATIONS SHOWN ARE APPROXIMATE. ALL UTILITIES SHALL BE LOCATED PRIOR TO BEGINNING WORK.
 5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SIGNAL HEAD ADJUSTMENTS AND MAINTENANCE DURING CONSTRUCTION.
 6. THE CONTRACTOR SHALL INSTALL, MAINTAIN AND OPERATE THE VISUAL IMAGING DETECTION SYSTEM DURING CONSTRUCTION. THE CITY SHALL TAKE OVER OPERATION AND MAINTENANCE. ONCE THE PROJECT IS ACCEPTED.
 7. THE CONTRACTOR WILL PROVIDE THE ENGINEER WITH SIGNAL EQUIPMENT SUBMITTALS AT THE PRE-CONSTRUCTION MEETING.
 8. EXISTING SIGNAL HEADS AND SIGNS TO REMAIN ON SPAN WIRES.



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CITY OF SAN ANTONIO
 CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

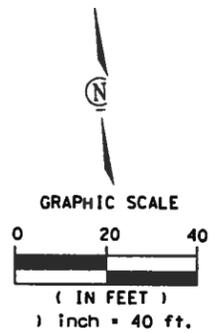
FORT SAM HOUSTON TRANSPORTATION PROJECTS
TRAFFIC SIGNAL LAYOUT PLAN
 HARRY WURZBACH @ WINANS ROAD

100% SUBMITTAL PROJECT NO.: 40-00015 DATE: 7/14/2011
 DRWN. BY: M.L. DSGN. BY: E.D. CHKD. BY: E.D. SHEET NO.: 36

| EQUIPMENT SCHEDULE | | |
|--------------------|--|---|
| ID | CONSTRUCTION NOTES | LOCATION |
| A | INSTALL "TS-3" TYPE 332 CABINET & 2070 CONTROLLER ASSEMBLY ON CITY TYPE CONCRETE FOUNDATION. | 24*23.17 50.30 LT 13721569.04 N 2147743.31 E |
| B | INSTALL 24' HIGH, SMA-80 STEEL POLE WITH 36' MA, 13.2' DEEP 36-A FOUNDATION, (1) 7' ILSNS MAST ARM, (2) VIVDS CAMERA ASSEMBLIES, AND (1) OPTICOM DETECTOR. | 23*14.14 42.68 LT 13721467.35 N 2147703.28 E |
| C | INSTALL 24' HIGH, SMA-80 STEEL POLE WITH 48' MA, 13.2' DEEP 36-A FOUNDATION, (1) 7' ILSNS MAST ARM, (2) VIVDS CAMERA ASSEMBLIES, AND (1) OPTICOM DETECTOR. | 24*26.28 59.18 RT 13721524.75 N 2147843.47 E |
| D | INSTALL 24' HIGH, SMA-80 STEEL POLE WITH 36' MA, 13.2' DEEP 36-A FOUNDATION, (1) 9' ILSNS MAST ARM, (1) VIVDS CAMERA ASSEMBLY, AND (1) OPTICOM DETECTOR. | 23*32.81 57.22 LT 13721441.21 N 2147801.49 E |

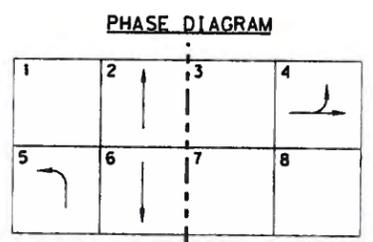
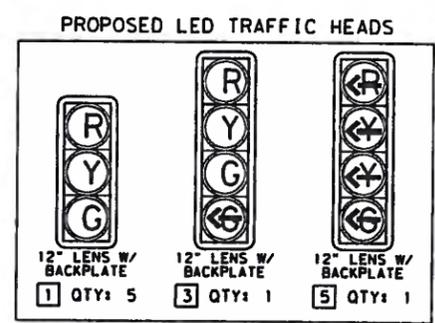
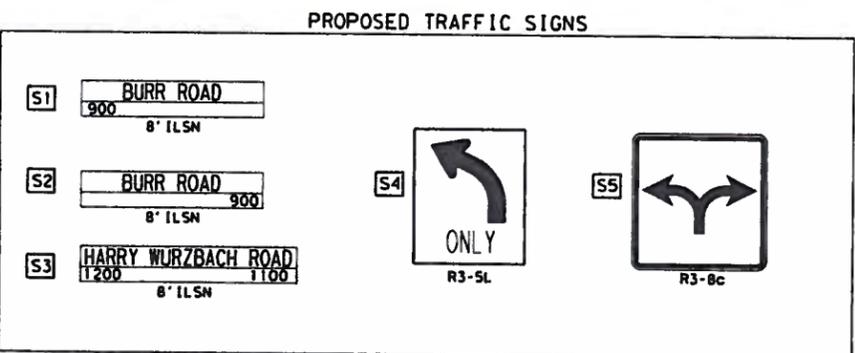
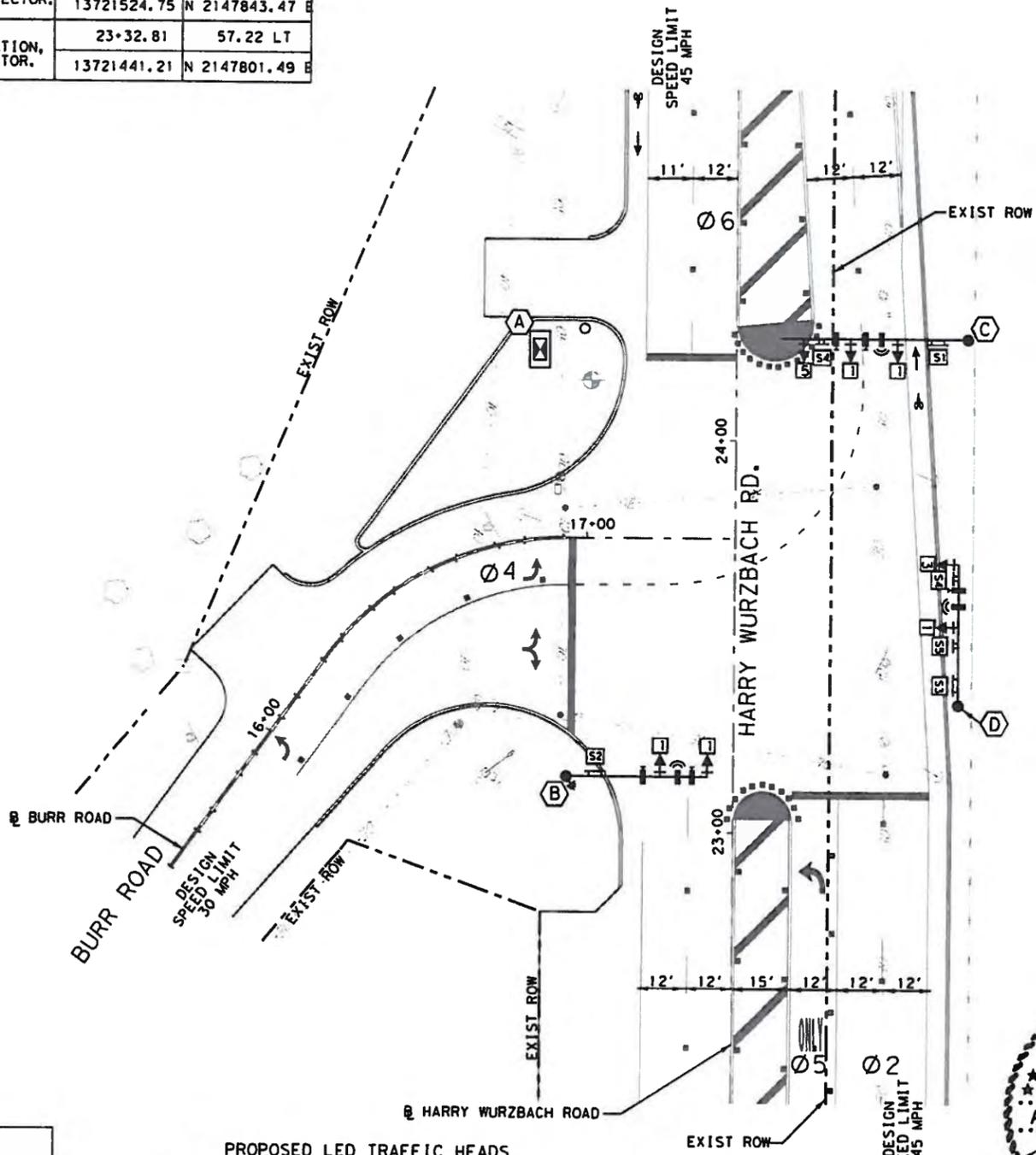
| ITEMS PROVIDED BY THE CONTRACTOR | | |
|------------------------------------|------|---|
| ESTIMATED QUANTITIES - SHEET TOTAL | | |
| EST | UNIT | DESCRIPTION |
| 47 | LF | CONDT (PVC) (SCHD 40) (2 IN) |
| 538 | LF | CONDT (PVC) (SCHD 40) (3 IN) |
| 1 | EA | TYPE 2070 CONTROLLER ASSEMBLY AND 332 CABINET |
| 10 | LF | ELEC CONDR (NO. 6) INSULATED |
| 297 | LF | ELEC CONDR (NO. 8) BARE |
| 11 | LF | ELEC CONDR (NO.6) BARE |
| 4 | EA | GROUND BOX TY D (162922) W/ APRON |
| 1 | EA | ELEC SERV TY D (120/240) 060 (NS) SS(E) SP(U) |
| 1 | EA | BATTERY BACKUP SYSTEM FOR TRAFFIC SIGNAL |
| 10 | SF | ALUMINUM SIGNS (TYPE A) |
| 1 | EA | TYPE 332 CONTROLLER FOUNDATION *** |
| 40 | LF | FND FOR TRAF SIG (TY A) (36 IN DRIL SHFT) |
| 1 | EA | INSTAL OF HWY TRAF SIG (SYSTEM) |
| 2 | EA | VEH SIG SEC (12 IN) LED (GRN ARW) |
| 5 | EA | VEH SIG SEC (12 IN) LED (GRN) |
| 2 | EA | VEH SIG SEC (12 IN) LED (YEL ARW) |
| 5 | EA | VEH SIG SEC (12 IN) LED (YEL) |
| 7 | EA | VEH SIG SEC (12 IN) LED (RED) |
| 7 | EA | BACK PLATE (12 IN) (3 SEC) |
| 2 | EA | BACK PLATE (12 IN) (4 SEC) |
| 506 | LF | TRAF SIG CBL (TY A) (12 AWG) (7 CONDR) * |
| 2 | EA | TRAF SIG POLE ASM (STL) 1 ARM (36 FT) |
| 1 | EA | TRAF SIG POLE ASM (STL) 1 ARM (48 FT) |
| 3 | EA | ILSN (LED) (8 D) |
| 2 | EA | VIVDS PROCESSOR SYSTEM |
| 6 | EA | VIVDS CAMERA ASSEMBLY |
| 753 | LF | VIVDS COMMUNICATION CABLE (COAXIAL) * |
| 1 | EA | VIVDS SET-UP SYSTEM |
| 518 | LF | ILSN 3-CONDUCTOR (12 AWG) * |
| 434 | LF | EMERGENCY PREEMPTION DETECTOR CABLE * |
| 1 | EA | EMERGENCY PREEMPTION PHASE SELECTOR |
| 3 | EA | EMERGENCY PREEMPTION DETECTOR |

* QUANTITY INDICATES AN ADDITIONAL 24' FOR VERTICAL DISTANCE ON POLE.
 *** THIS ITEM WILL BE SUBSIDIARY TO ITEM 680 "INSTALL HWY TRF SYSTEM."



| LEGEND | |
|----------------------------|-----|
| TYPE D GROUNDBOX | □ |
| SIGNAL POLE WITH MA | ● |
| OPTICOM DETECTOR | ◀ |
| VIVDS CAMERA AND MOUNT | ⊞ |
| CONTROLLER & CABINET | ⊞ |
| ELECTRICAL SERVICE CABINET | ⊞ |
| SIGNAL CONDUIT | --- |
| SIGNAL HEAD | ↑ |
| PEDESTRIAN HEAD | ↓ |
| POLE IDENTIFIER | ⓐ |
| CONDUIT IDENTIFIER | ⓑ |
| SIGNAL HEAD IDENTIFIER | ⓓ |
| VIDEO CAMERA IDENTIFIER | ⓔ |
| SIGN | ⊞ |
| IL STREET NAME SIGN | ⊞ |

- NOTES:
1. THE CONTRACTOR SHALL DEMONSTRATE TO THE ENGINEER'S SATISFACTION THAT THE FIELD WIRING IS PROPERLY INSTALLED IN THE CONTROLLER. ONLY THEN COSA FORCES WILL CONNECT THE FIELD WIRING TO THE CONTROLLER.
 2. THE CONTRACTOR SHALL CONTACT CITY TRAFFIC OPERATIONS AT 207-7765. SEVEN (7) DAYS PRIOR TO BEGINNING WORK OF A CHANGE IN THE CONSTRUCTION PHASING.
 3. ALL EXISTING TRAFFIC SIGNAL EQUIPMENT REMOVED BY THE CONTRACTOR AND TO BE SALVAGED SHALL BE DELIVERED TO THE CITY TRAFFIC OPERATIONS OFFICE (233 S. CHERRY) WITH 48 HRS ADVANCE NOTICE.
 4. UTILITY LOCATIONS SHOWN ARE APPROXIMATE. ALL UTILITIES SHALL BE LOCATED PRIOR TO BEGINNING WORK.
 5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SIGNAL HEAD ADJUSTMENTS AND MAINTENANCE DURING CONSTRUCTION.
 6. THE CONTRACTOR SHALL INSTALL, MAINTAIN AND OPERATE THE VISUAL IMAGING DETECTION SYSTEM DURING CONSTRUCTION. THE CITY SHALL TAKEOVER OPERATION AND MAINTENANCE. ONCE THE PROJECT IS ACCEPTED.
 7. THE CONTRACTOR WILL PROVIDE THE ENGINEER WITH SIGNAL EQUIPMENT SUBMITTALS AT THE PRE-CONSTRUCTION MEETING.
 8. EXISTING SIGNAL HEADS AND SIGNS TO REMAIN ON SPAN WIRES.



7-14-11

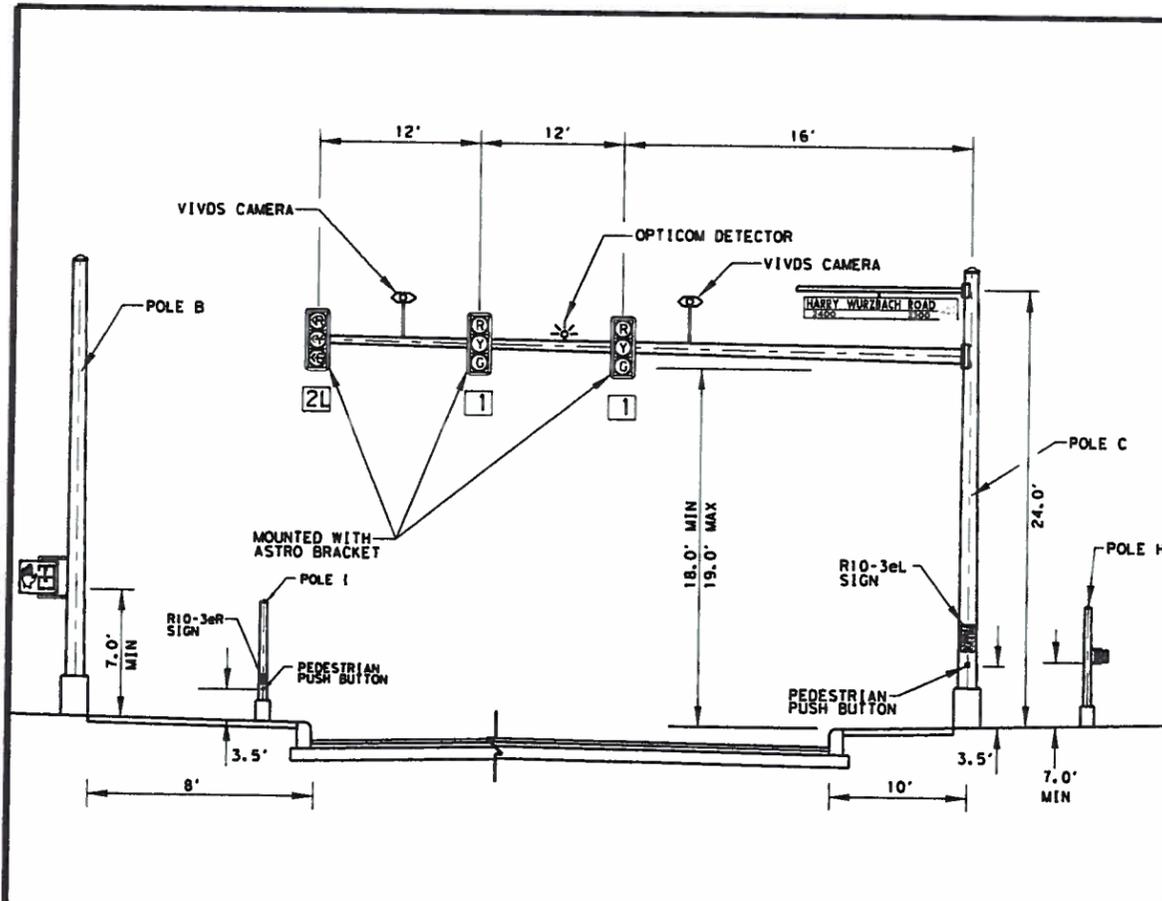
GONZALEZ + DE LA GARZA & ASSOCIATES, L.L.C.
 115 E. Travis St. Suite 640 San Antonio, TX 78205 P: 210.208.9400
 TBPE Firm # 10015 F: 210.208.9401

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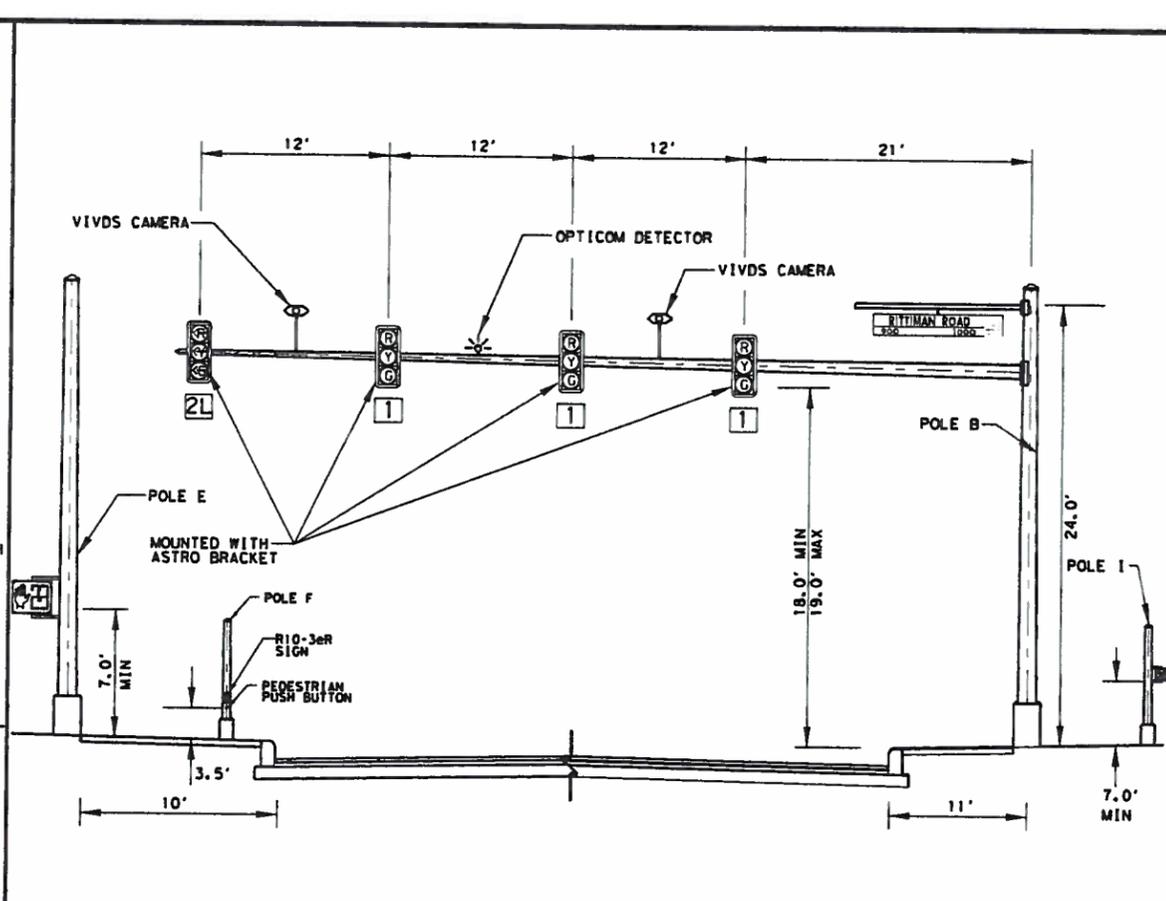
CITY OF SAN ANTONIO
 CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

FORT SAM HOUSTON TRANSPORTATION PROJECTS
TRAFFIC SIGNAL LAYOUT PLAN
 HARRY WURZBACH @ BURR ROAD

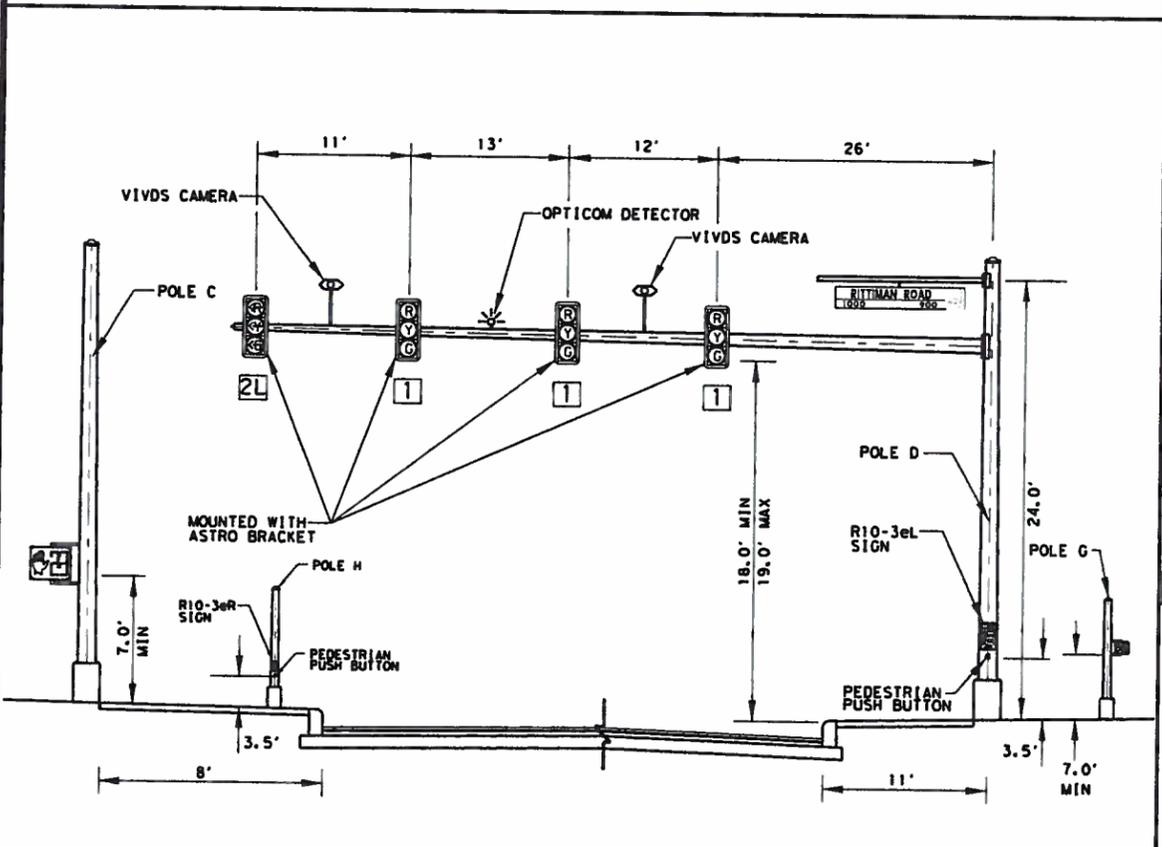
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 DRWN. BY: M.L. DSGN. BY: A.G. CHD. BY: A.G. SHEET NO.: 237



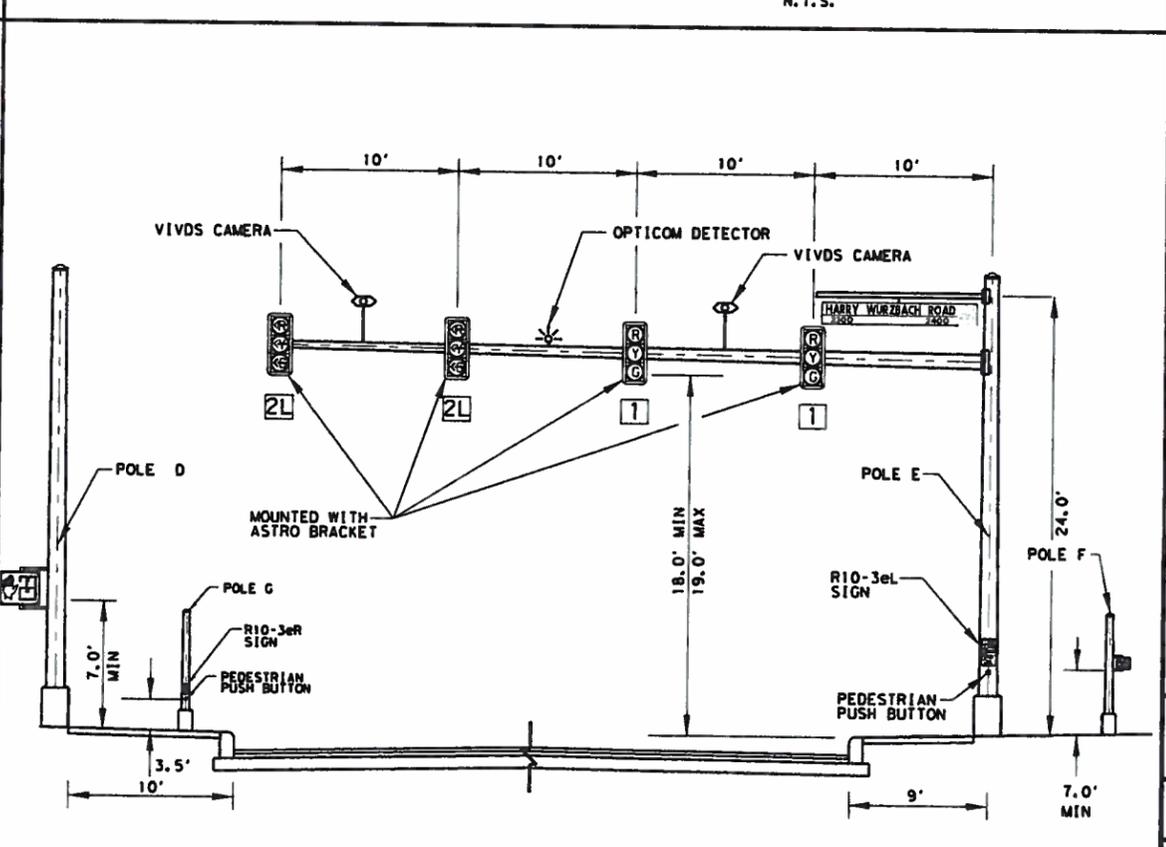
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N. T. S.



LOOKING NORTH ON HARRY WURZBACH RD,
N. T. S.



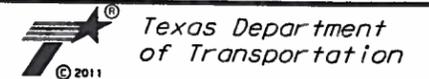
LOOKING SOUTH ON HARRY WURZBACH RD,
N. T. S.



LOOKING SOUTHWEST ON RITTIMAN RD,
N. T. S.



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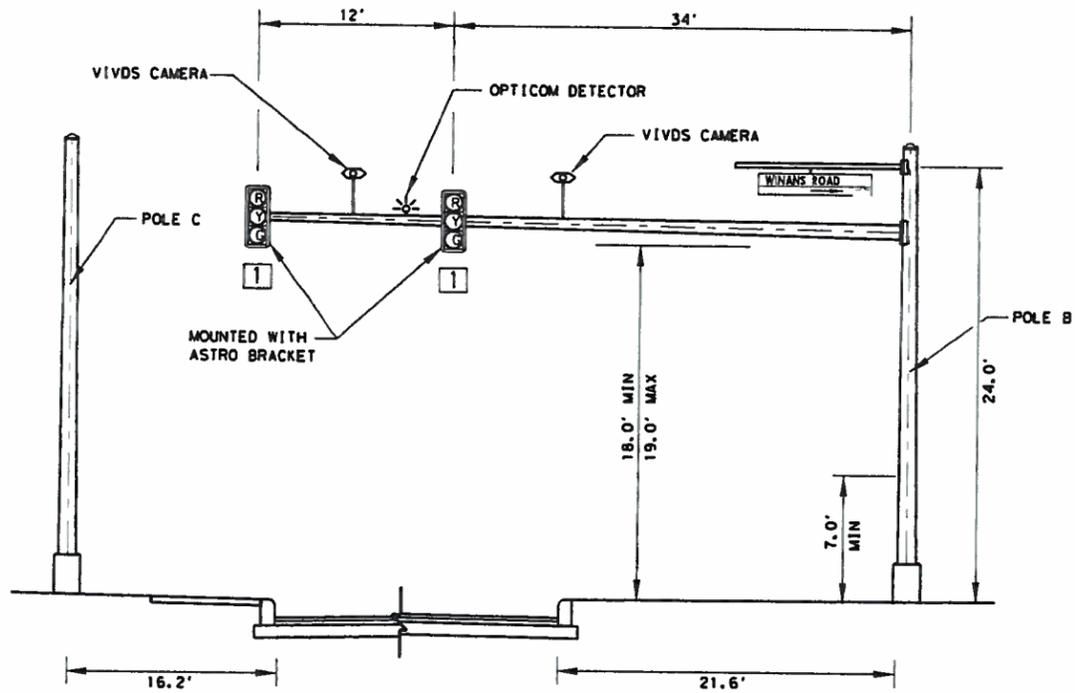
CITY OF SAN ANTONIO
 CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

FORT SAM HOUSTON TRANSPORTATION PROJECTS

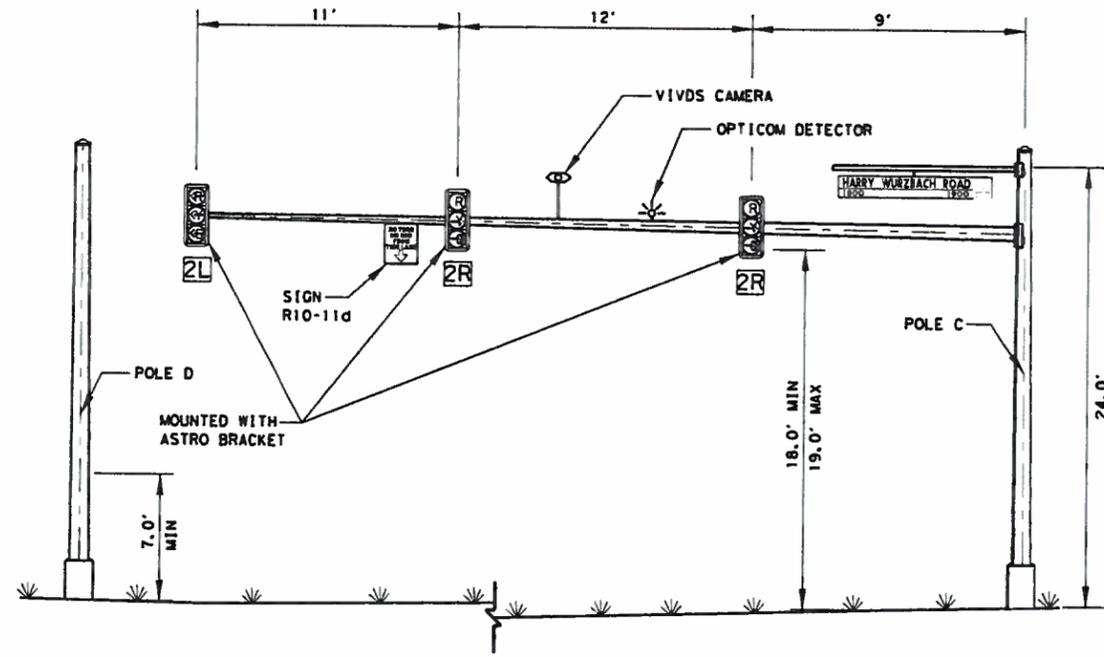
SIGNAL ELEVATIONS

RITTIMAN RD. & HARRY WURZBACH INTERSECTION

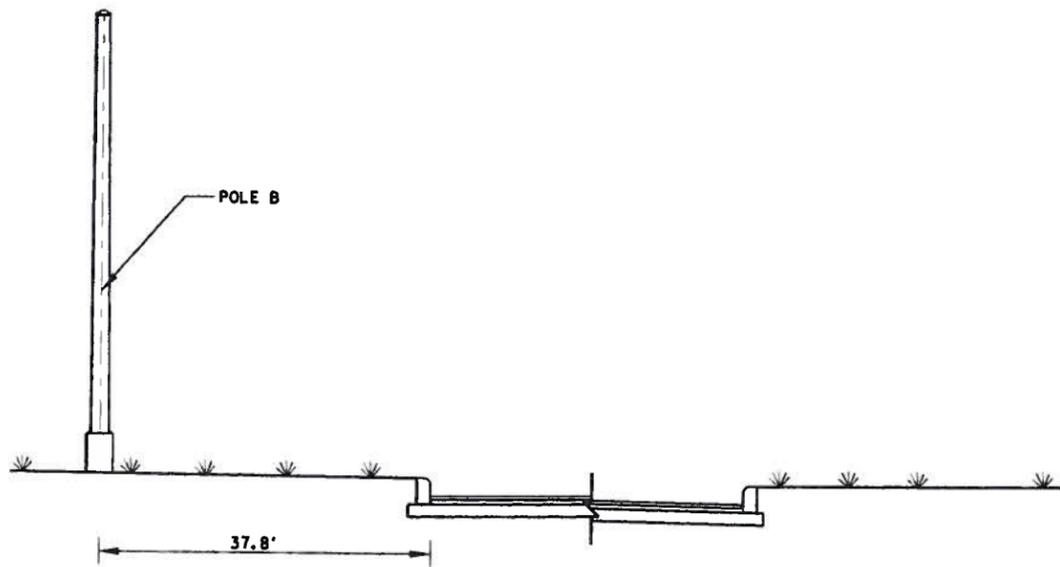
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|----------------|-----------------------|-----------------|
| 100% SUBMITTAL | PROJECT NO.: 40-00015 | DATE: 7/14/2011 |
| DRWN. BY: ML | DSGN. BY: ED | CHKD. BY: ED |
| | | SHEET NO.: 238 |



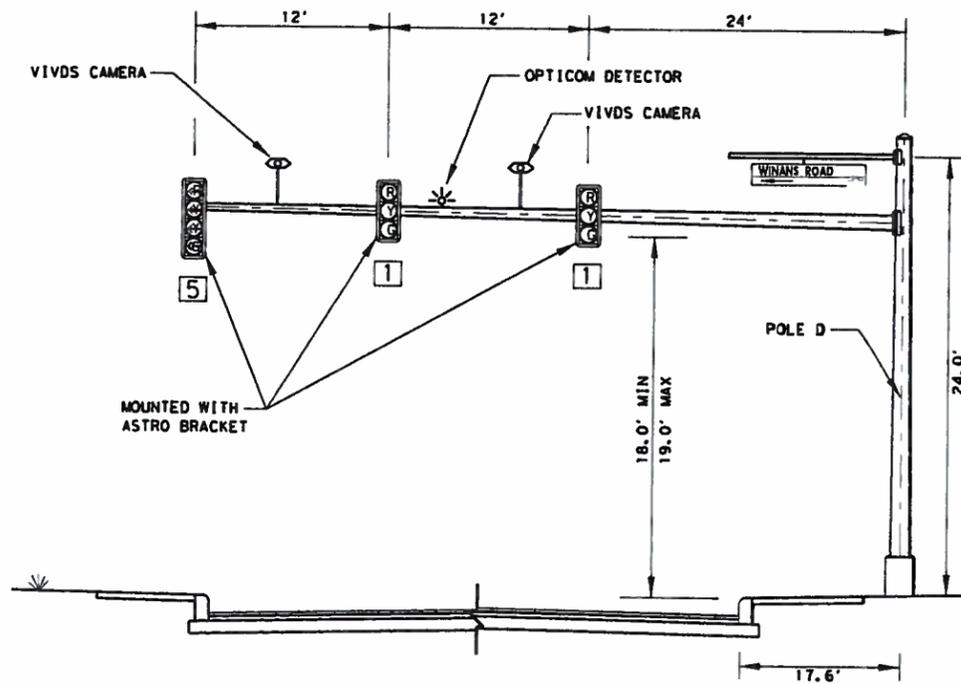
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N. T. S.



LOOKING WEST ON WINANS RD,
N. T. S.



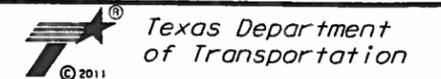
LOOKING EAST ON WINANS RD,
N. T. S.



LOOKING SOUTH ON HARRY WURZBACH RD,
N. T. S.



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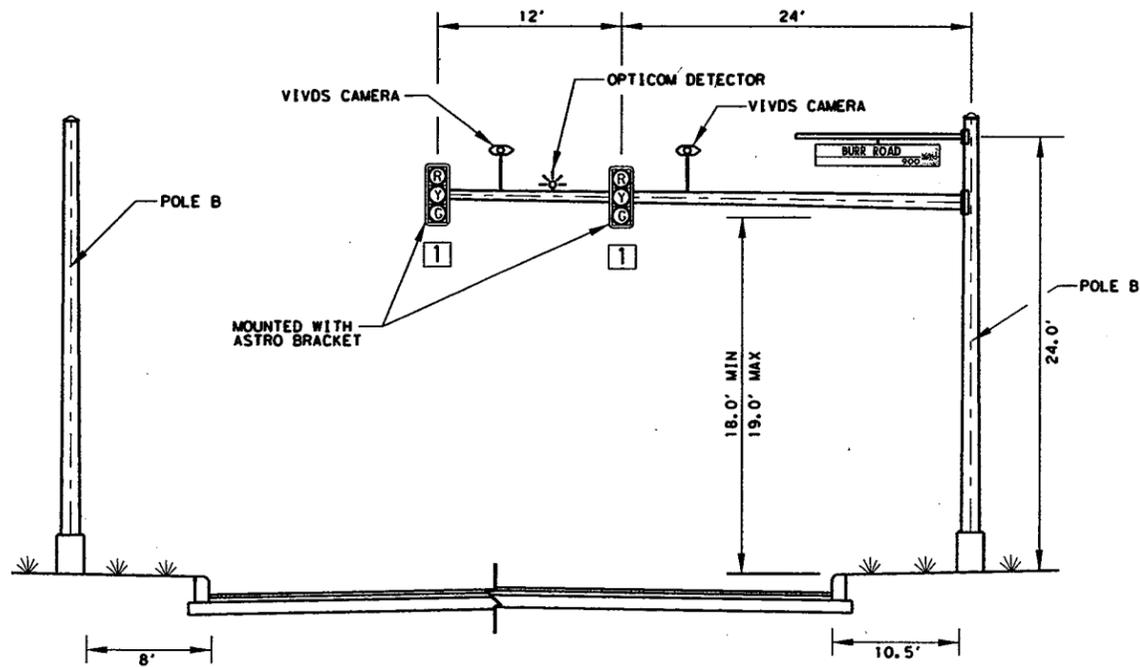
CITY OF SAN ANTONIO
 CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

FORT SAM HOUSTON TRANSPORTATION PROJECTS

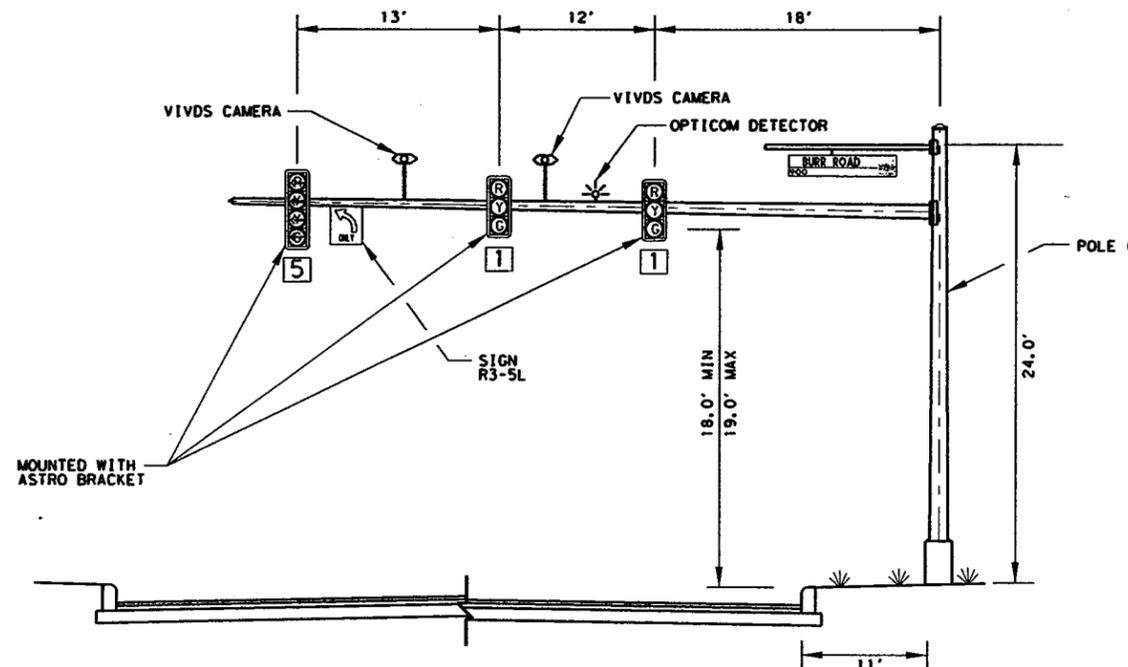
SIGNAL ELEVATIONS

WINANS RD. & HARRY WURZBACH INTERSECTION

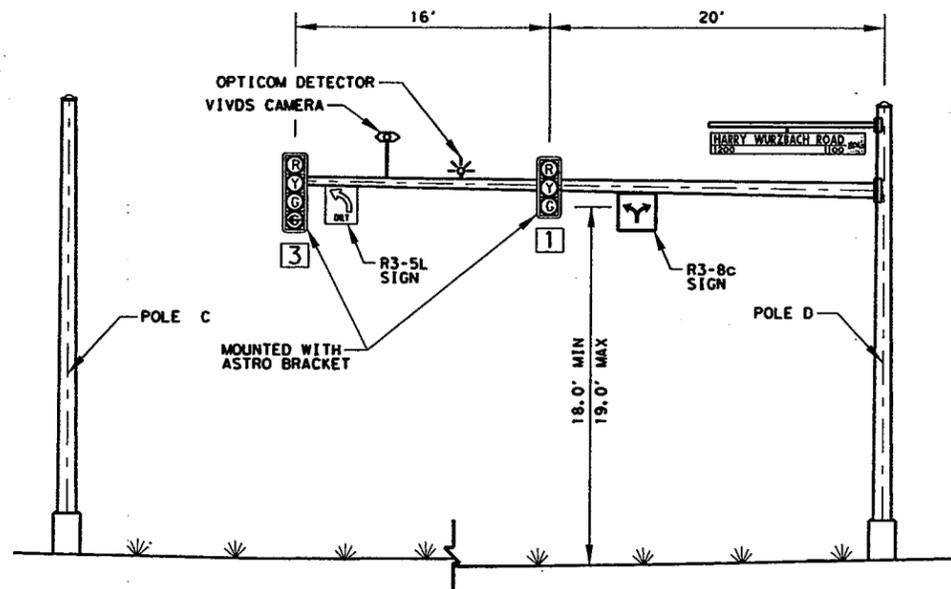
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| DRWN. BY: ML | DSGN. BY: ED | CHKD. BY: ED |
| | | SHEET NO.: 239 |



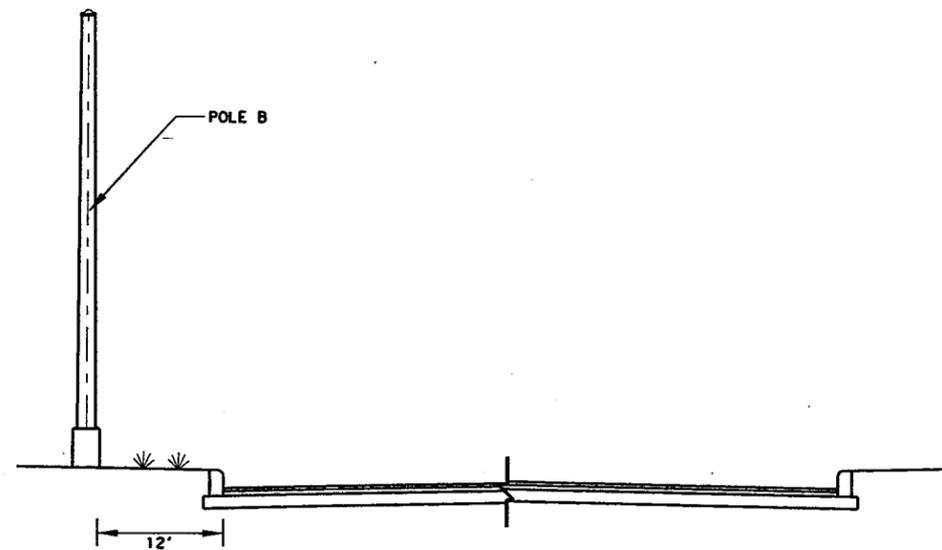
LOOKING SOUTH ON HARRY WURZBACH RD,
N. T. S.



LOOKING NORTH ON HARRY WURZBACH RD,
N. T. S.



LOOKING EAST ON BURR RD,
N. T. S.



LOOKING WEST ON BURR RD,
N. T. S.



Ayda S. Gonzalez
3/7/11



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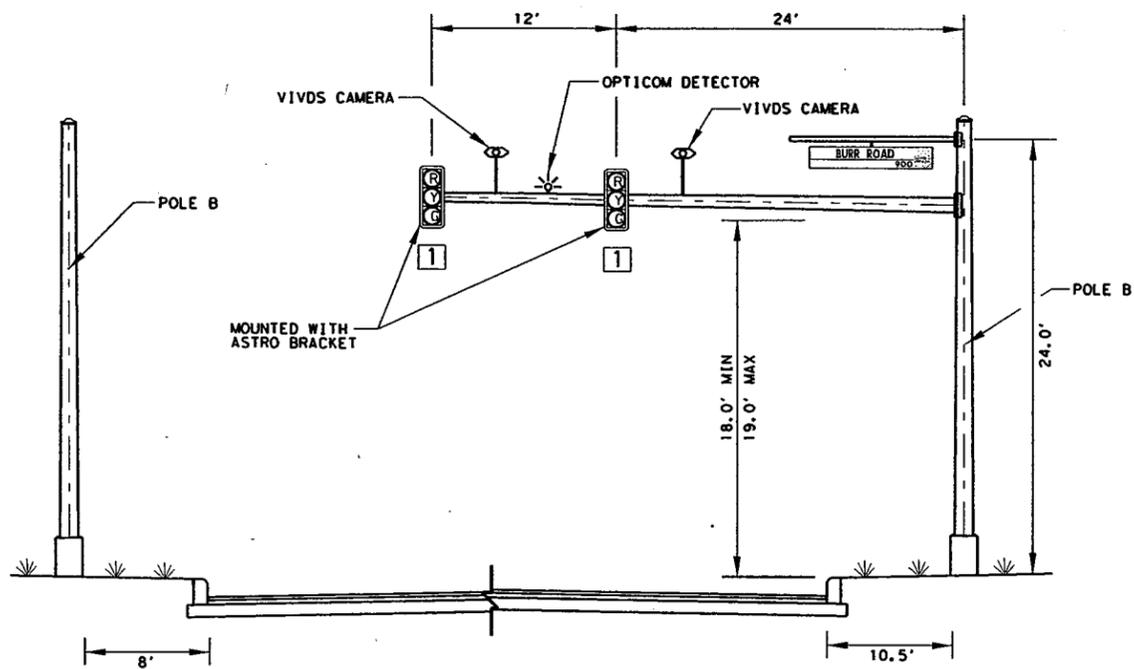
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

FORT SAM HOUSTON TRANSPORTATION PROJECTS

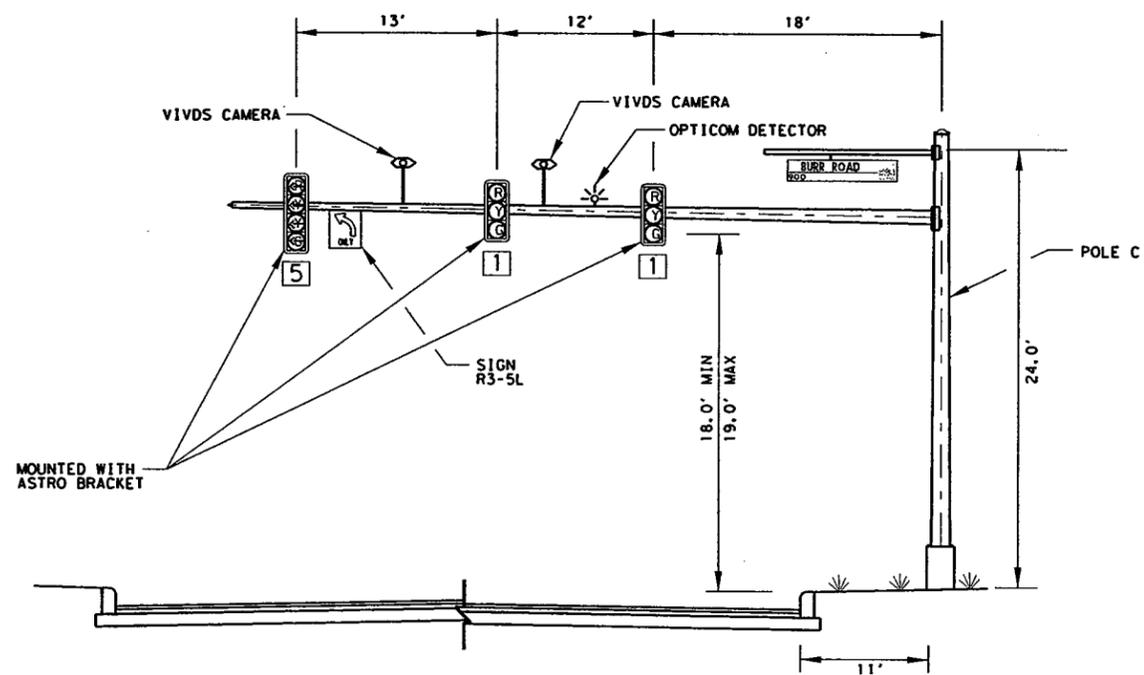
SIGNAL ELEVATIONS

BURR RD. & HARRY WURZBACH INTERSECTION

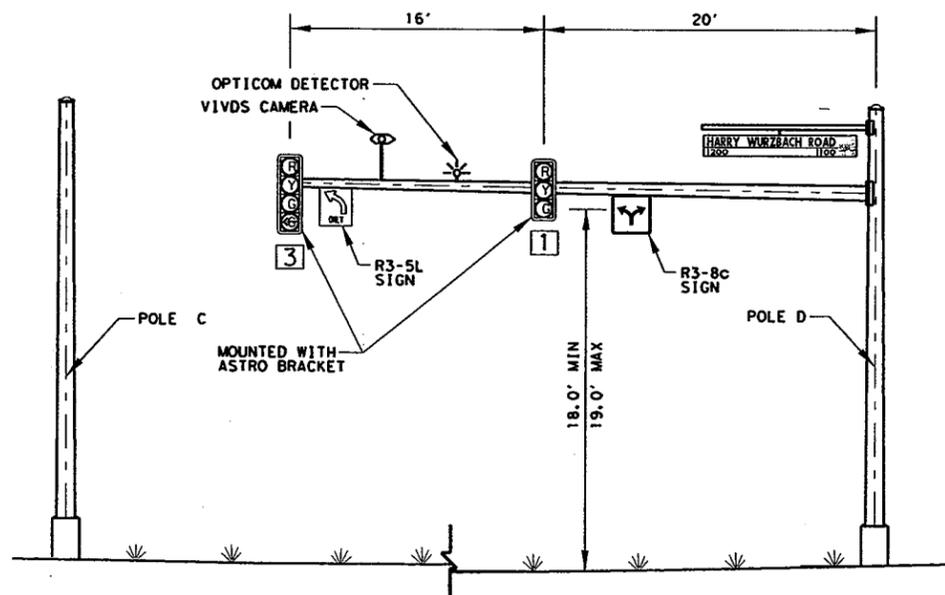
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| DRWN. BY: MG | DSGN. BY: ED | CHKD. BY: ED |
| | | SHEET NO.: 23/25 |



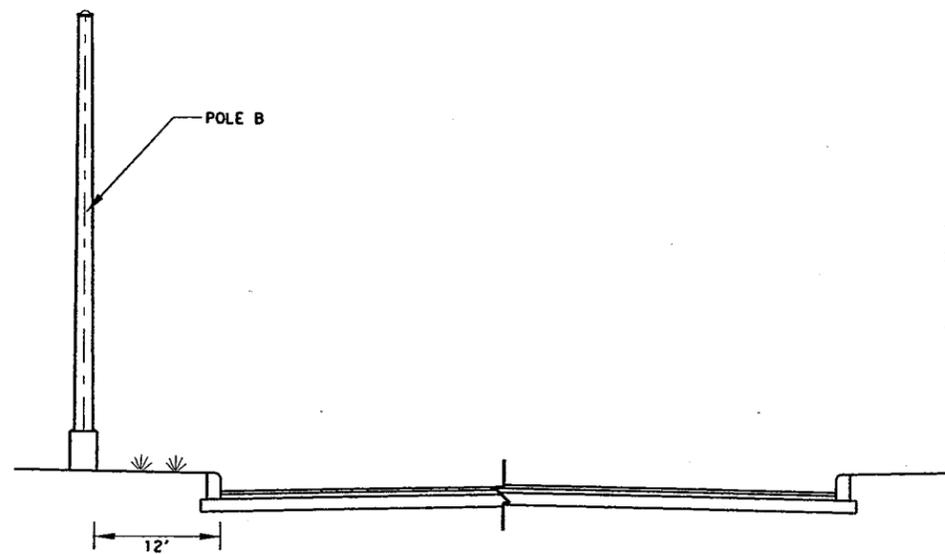
LOOKING SOUTH ON HARRY WURZBACH RD.
N.T.S.



LOOKING NORTH ON HARRY WURZBACH RD.
N.T.S.



LOOKING EAST ON BURR RD.
N.T.S.



LOOKING WEST ON BURR RD.
N.T.S.



Ayda S. Gonzalez
3/7/11



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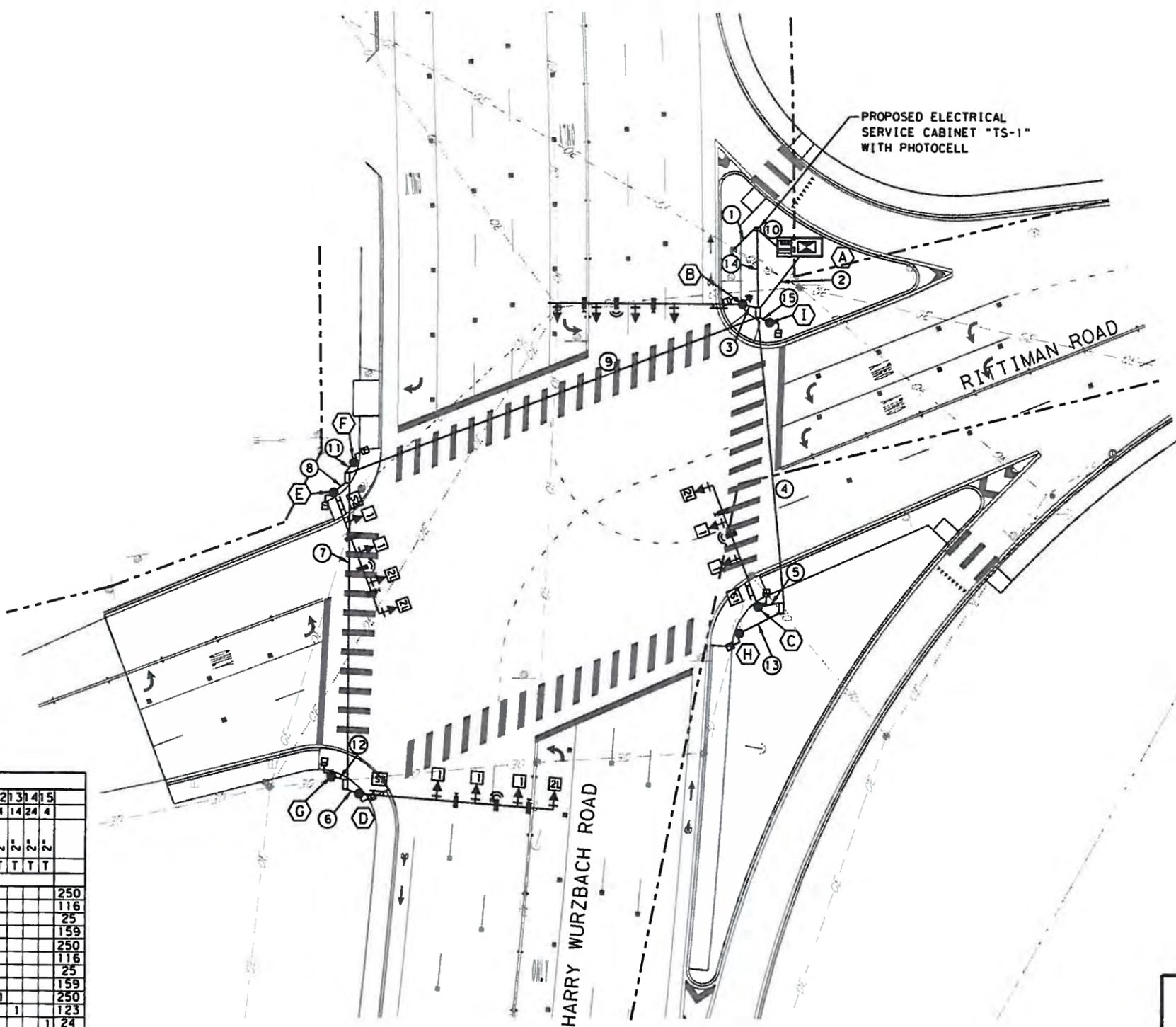
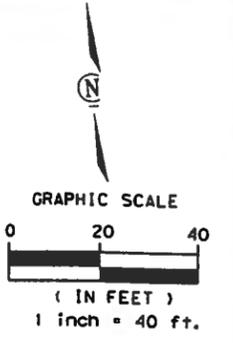
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

FORT SAM HOUSTON TRANSPORTATION PROJECTS

SIGNAL ELEVATIONS

BURR RD. & HARRY WURZBACH INTERSECTION

| | | |
|----------------|-----------------------|----------------|
| 100% SUBMITTAL | PROJECT NO.: 40-00015 | DATE: 3/8/2011 |
| DRWN. BY: MG | DSGN. BY: ED | CHKD. BY: ED |
| | | SHEET NO.: 201 |



LEGEND

| | |
|----------------------------|--|
| BATTERY BACKUP SYSTEM | |
| TYPE D GROUND BOX | |
| SIGNAL POLE WITH MA | |
| OPTICOM DETECTOR | |
| VIVDS CAMERA AND MOUNT | |
| CONTROLLER & CABINET | |
| ELECTRICAL SERVICE CABINET | |
| SIGNAL CONDUIT | |
| SIGNAL HEAD | |
| PEDESTRIAN HEAD | |
| POLE IDENTIFIER | |
| CONDUIT RUN | |
| SIGNAL HEAD IDENTIFIER | |
| VIDEO CAMERA IDENTIFIER | |
| SIGN | |
| IL STREET NAME SIGN | |

CONDUIT AND CONDUCTOR SCHEDULE

| CONDUIT/SPAN RUN NUMBER | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |
|---|----------------------|---|----|---|---|----|---|----|---|----|----|----|----|----|----|-----|
| CONDUIT/SPAN LENGTH (FEET) | 20 | 5 | 89 | 7 | 4 | 92 | 5 | 34 | 8 | 36 | 4 | 14 | 24 | 4 | | |
| CONDUIT SIZE IN INCHES | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | |
| RUN TYPE | T | T | B | T | T | B | T | B | T | T | T | T | T | T | T | |
| AWG | CIRCUIT | | | | | | | | | | | | | | | |
| # 14 | SIGNALS | | | | | | | | | | | | | | | |
| 7 - COND | 1 | | | | | | | | | | | | | | | 250 |
| IMSA CABLE | 1 | | | | | | | | | | | | | | | 116 |
| | | | | | | | | | | | | | | | | 25 |
| | | | | | | | | | | | | | | | | 159 |
| # 14 | PED. SIGNAL & BUTTON | | | | | | | | | | | | | | | |
| 9 - COND | 1 | | | | | | | | | | | | | | | 250 |
| IMSA CABLE | 1 | | | | | | | | | | | | | | | 116 |
| | | | | | | | | | | | | | | | | 25 |
| | | | | | | | | | | | | | | | | 159 |
| | | | | | | | | | | | | | | | | 250 |
| | | | | | | | | | | | | | | | | 123 |
| | | | | | | | | | | | | | | | | 24 |
| | | | | | | | | | | | | | | | | 190 |
| # 6 THHN/THWN | 120 POWER HOT | | | | | | | | | | | | | | | |
| | 120 POWER COMMON | | | | | | | | | | | | | | | |
| BARE | BARE BOND #8 | | | | | | | | | | | | | | | |
| | BARE BOND #6 | | | | | | | | | | | | | | | |
| TWO-IN-ONE VIVDS COAX & 3-CONDUCTOR #18 POWER CABLE | 2 | | | | | | | | | | | | | | | 500 |
| | | | | | | | | | | | | | | | | 232 |
| | | | | | | | | | | | | | | | | 50 |
| | | | | | | | | | | | | | | | | 318 |
| 1LSN 3-CONDUCTOR #12 | | | | | | | | | | | | | | | | 254 |
| | | | | | | | | | | | | | | | | 120 |
| | | | | | | | | | | | | | | | | 29 |
| | | | | | | | | | | | | | | | | 143 |
| 3M OPTICOM M138 DETECTOR CABLE | 1 | | | | | | | | | | | | | | | 250 |
| | | | | | | | | | | | | | | | | 116 |
| | | | | | | | | | | | | | | | | 25 |
| | | | | | | | | | | | | | | | | 159 |

B=BORED
T=TRENCHED

| Elec. Service No. | Sheet No. | Electrical Service Description (see ED (4) & (5) - 03) | Service Conduit Size | Service Conductors No./Size | Safety Switch Amps | Main Ckt. Bkr. Pole/Amp | Two-Pole Contactor Amps | Panel/Loadcenter Amp Rating | Circuit No. | Branch Ckt. Bkr. Pole/Amps | Branch Circuit Amps | KVA Load |
|-------------------|-----------|--|----------------------|-----------------------------|--------------------|-------------------------|-------------------------|-----------------------------|------------------------|----------------------------|---------------------|----------|
| TS-1 | 241A | ELC SRV TY D 120/240 060 (NS)SS(E)SP(U) | 1 1/4" | 3#6 | N/A | 2P/60 | 30 | 100 | Traffic Luminaire ILSN | 1P/50 2P/15 1P/15 | 40 4 4 | 6.2 |



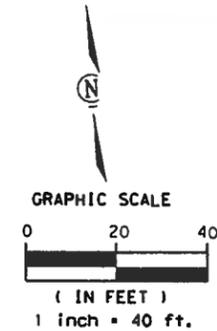
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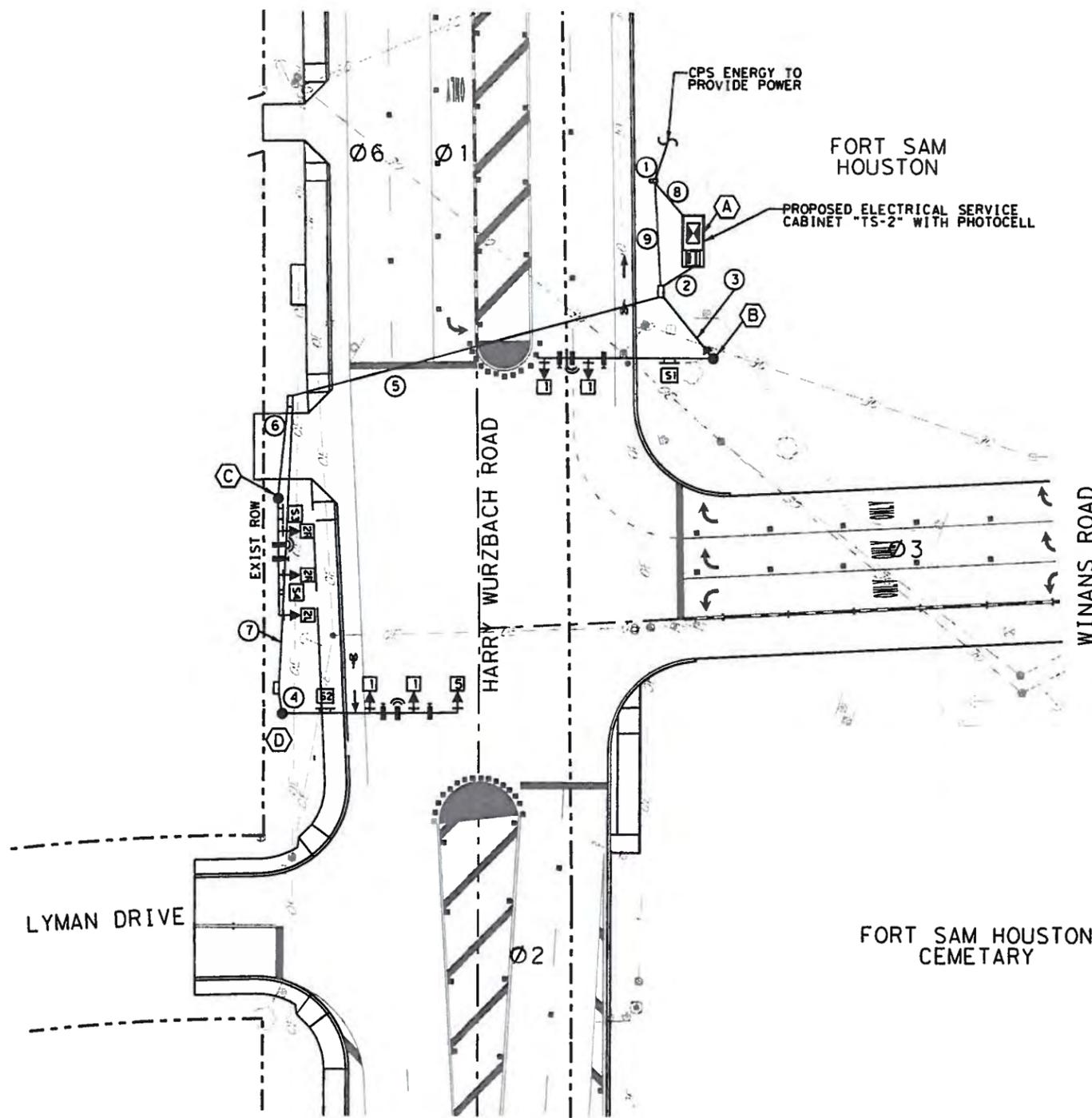
CITY OF SAN ANTONIO
 CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

FORT SAM HOUSTON TRANSPORTATION PROJECTS
WIRING LAYOUT
 HARRY WURZBACH @ RITTIMAN ROAD

100% SUBMITTAL PROJECT NO.: 40-00015 DATE: 7/14/2011
 DRWN. BY: JS DSGN. BY: ED CHKD. BY: ED SHEET NO.: 241-1



| LEGEND | |
|----------------------------|--|
| BATTERY BACKUP SYSTEM | |
| TYPE D GROUNDBOX | |
| SIGNAL POLE WITH MA | |
| OPTICOM DETECTOR | |
| VIVDS CAMERA AND MOUNT | |
| CONTROLLER & CABINET | |
| ELECTRICAL SERVICE CABINET | |
| SIGNAL CONDUIT | |
| SIGNAL HEAD | |
| PEDESTRIAN HEAD | |
| POLE IDENTIFIER | |
| CONDUIT RUN | |
| SIGNAL HEAD IDENTIFIER | |
| VIDEO CAMERA IDENTIFIER | |
| SIGN | |
| IL STREET NAME SIGN | |



| CONDUIT AND CONDUCTOR SCHEDULE | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | |
|---|------------------|-------------|-----|---|-----|----|----|----|----|---|--|-----|
| CONDUIT/SPAN RUN NUMBER | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | |
| CONDUIT/SPAN LENGTH (FEET) | | 10 | 22 | 6 | 104 | 26 | 74 | 12 | 29 | | | |
| CONDUIT SIZE IN INCHES | | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | | |
| RUN TYPE | | T | T | T | B | T | T | T | T | T | | |
| AWG | CIRCUIT | WIRE BY C/S | | | | | | | | | | |
| # 14 | SIGNALS | Ø 1 | Ø 6 | | | | | | | | | 194 |
| 7 - COND | | Ø 3 | | | | | | | | | | 140 |
| IMSA CABLE | | Ø 2 | | | | | | | | | | 32 |
| # 6 THHN/THWN | 120 POWER HOT | | | | | | | | | | | 12 |
| | 120 POWER COMMON | | | | | | | | | | | 12 |
| BARE | BARE BOND #8 | | | 1 | 1 | 2 | 1 | 2 | | | | 449 |
| | BARE BOND #6 | | | | | | | | | | | 12 |
| YWO-IN-ONE VIVDS COAX & 3-CONDUCTOR #18 POWER CABLE | Ø 1 Ø 6 | 2 | 2 | 2 | 2 | | | | | | | 388 |
| | Ø 3 | 1 | | | 1 | | | | | | | 140 |
| | Ø 2 | 2 | 2 | | | | | | | | | 64 |
| ILSN 3-CONDUCTOR #12 | S1-POLE D | | | | 1 | 1 | | 1 | 1 | | | 213 |
| | S2-POLE C | | | | | 1 | 1 | | | | | 159 |
| | S3-POLE B | | | | 1 | | | | | 1 | | 51 |
| 3M OPTICOM MI 38 DETECTOR CABLE | POLE D | 1 | 1 | 1 | | 1 | | | | | | 194 |
| | POLE C | 1 | | | 1 | 1 | | | | | | 140 |
| | POLE B | 1 | 1 | | | | | | | | | 32 |

B=BORED
T=TRENCHED

| Elec. Service No. | Sheet No. | Electrical Service Description (see ED (4) & (5) - 03) | Service Conduit Size | Service Conductors No./Size | Safety Switch Amps | Main Ckt. Bkr. Pole/Amp | Two-Pole Contactor Amps | Panelbd/ Loadcenter Amp Rating | Circuit No. | Branch Ckt. Bkr. Pole/Amps | Branch Circuit Amps | KVA Load |
|-------------------|-----------|--|----------------------|-----------------------------|--------------------|-------------------------|-------------------------|--------------------------------|------------------------|----------------------------|---------------------|----------|
| TS-2 | 241B | ELC SRV TY D 120/240 060 (NS)SS(E)SP(U) | 1 1/4" | 3#6 | N/A | 2P/60 | 30 | 100 | Traffic Luminaire ILSN | 1P/50 2P/15 1P/15 | 40 4 4 | 6.2 |



Handwritten signature and date:
2/14/11

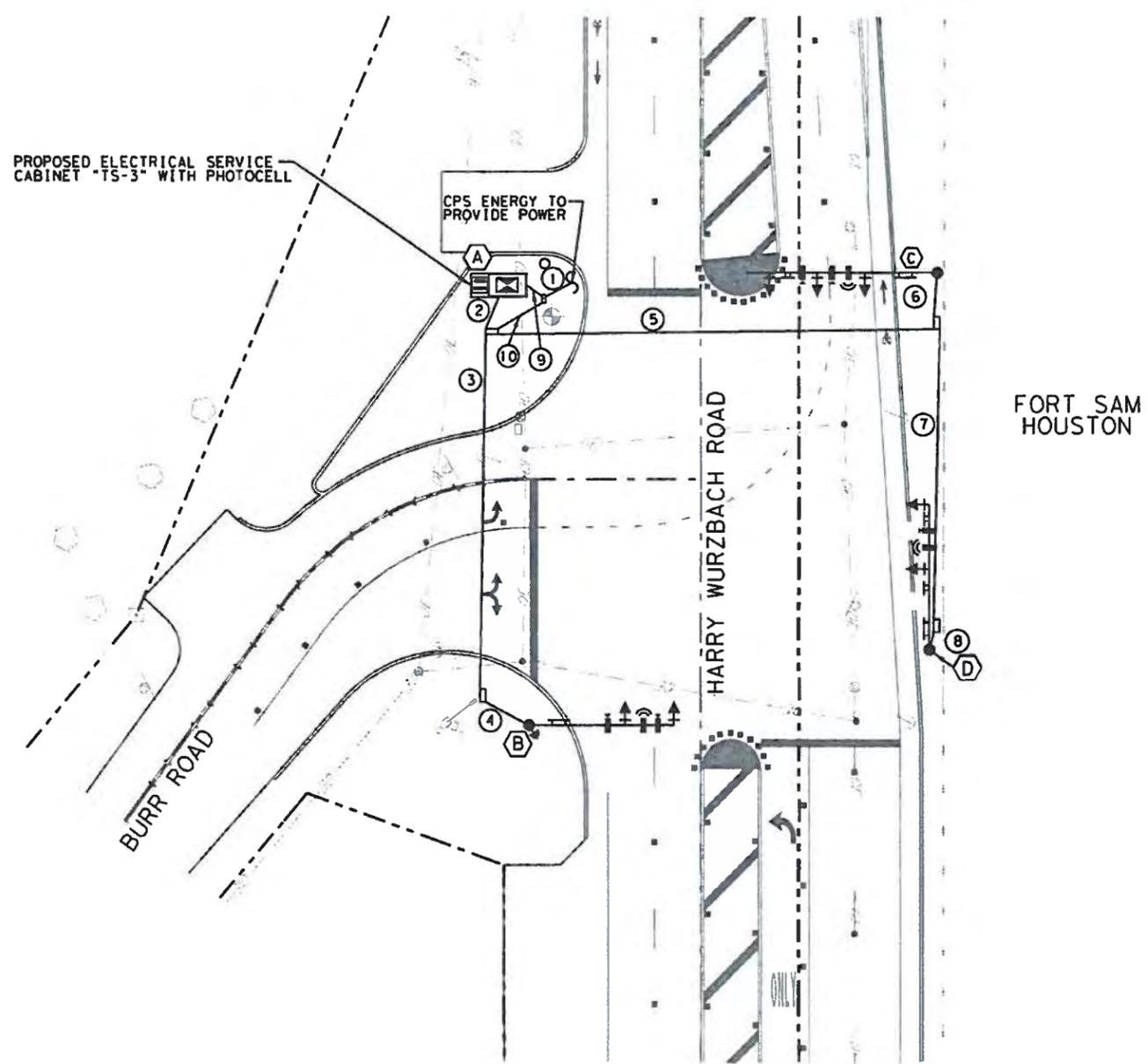
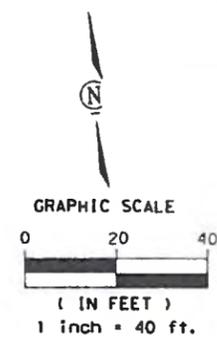
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 TBPE Firm # 10015

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FORT SAM HOUSTON TRANSPORTATION PROJECTS
WIRING LAYOUT
 HARRY WURZBACH @ WINANS ROAD

100% SUBMITTAL PROJECT NO.: 40-00015 DATE: 7/14/2011
 DRWN. BY: WL DSGN. BY: ED CHKD. BY: ED SHEET NO.: 241B



LEGEND

| | |
|----------------------------|--|
| BATTERY BACKUP SYSTEM | |
| TYPE D GROUNDBOX | |
| SIGNAL POLE WITH MA | |
| OPTICOM DETECTOR | |
| VIVDS CAMERA AND MOUNT | |
| CONTROLLER & CABINET | |
| ELECTRICAL SERVICE CABINET | |
| SIGNAL CONDUIT | |
| SIGNAL HEAD | |
| PEDESTRIAN HEAD | |
| POLE IDENTIFIER | |
| CONDUIT RUN | |
| SIGNAL HEAD IDENTIFIER | |
| VIDEO CAMERA IDENTIFIER | |
| SIGN | |
| IL STREET NAME SIGN | |

AYDA S. GONZALEZ
 96594
 LICENSED PROFESSIONAL ENGINEER
Ayda Gonzalez
 7-22-11

| CONDUIT AND CONDUCTOR SCHEDULE | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--------------------------------|------------------|-------------|----|----|-----|----|----|---|---|----|-----|
| CONDUIT/SPAN RUN NUMBER | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| CONDUIT/SPAN LENGTH (FEET) | | 9 | 88 | 13 | 109 | 11 | 72 | 5 | 5 | 13 | |
| CONDUIT SIZE IN INCHES | | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| RUN TYPE | | T | B | T | B | T | B | T | T | T | T |
| AWG | CIRCUIT | WIRE BY CPS | | | | | | | | | |
| # 14 | SIGNALS | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 129 |
| 7 - COND | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 110 |
| IMSA CABLE | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 195 |
| # 6 THHN/ | 120 POWER HOT | | | | | | | | | | 5 |
| THWN | 120 POWER COMMON | | | | | | | | | | 5 |
| BARE | BARE BOND #8 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 589 |
| BARE | BARE BOND #6 | | | | | | | | | | 5 |
| TWO-IN-ONE | VIVDS CAMERAS | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 258 |
| VIVDS COAX & | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 220 |
| 3-CONDUCTOR | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 195 |
| #18 POWER | | | | | | | | | | | |
| CABLE | | | | | | | | | | | |
| ILSN | S1-POLE C | | | | | | | | | | 133 |
| 3-CONDUCTOR | S2-POLE B | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 114 |
| #12 | S3-POLE D | | | | | | | | | | 199 |
| 3M OPTICOM | POLE C | 1 | | | | | | | | | 129 |
| M138 | POLE B | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 110 |
| DETECTOR | POLE D | 1 | | | | | | | | | 195 |
| CABLE | | | | | | | | | | | |

B=BORED
T=TRENCHED

| Elec. Service No. | Sheet No. | Electrical Service Description (see ED (4) & (5) - 03) | Service Conduit Size | Service Conductors No./Size | Safety Switch Amps | Main Ckt. Bkr. Pole/Amp | Two-Pole Contactor Amps | Panel/Loadcenter Amp Rating | Circuit No. | Branch Ckt. Bkr. Pole/Amps | Branch Circuit Amps | KVA Load |
|-------------------|-----------|--|----------------------|-----------------------------|--------------------|-------------------------|-------------------------|-----------------------------|------------------------|----------------------------|---------------------|----------|
| TS-3 | 241C | ELC SRV TY D 120/240 060 (NS)SS(E)SP(U) | 1 1/4" | 3/#6 | N/A | 2P/60 | 30 | 100 | Traffic Luminaire ILSN | 1P/50 2P/15 1P/15 | 40 4 4 | 6.2 |

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 CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

FORT SAM HOUSTON TRANSPORTATION PROJECTS
TRAFFIC SIGNAL LAYOUT PLAN
 HARRY WURZBACH @ BURR ROAD

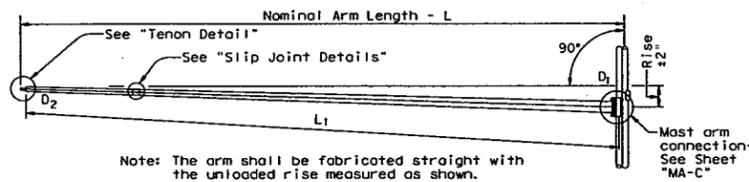
| | | |
|----------------|-----------------------|-----------------|
| 100% SUBMITTAL | PROJECT NO.: 40-00015 | DATE: 7/22/2011 |
| DRWN. BY: ML | DSGN. BY: AC | CHKD. BY: AC |
| | | SHEET NO.: 241C |

| Arm Length | ROUND POLES | | | | | POLYGONAL POLES | | | | | Foundation Type |
|------------|----------------|-----------------|-----------------|-----------------|-------|-----------------|-----------------|-----------------|-----------------|-------|-----------------|
| | D ₈ | D ₁₉ | D ₂₄ | D ₃₀ | ① thk | D ₈ | D ₁₉ | D ₂₄ | D ₃₀ | ① thk | |
| ft. | in. | in. | in. | in. | in. | in. | in. | in. | in. | in. | |
| 20 | 10.5 | 7.8 | 7.1 | 6.3 | .179 | 11.5 | 8.5 | 7.7 | 6.8 | .179 | 30-A |
| 24 | 11.0 | 8.3 | 7.6 | 6.8 | .179 | 12.0 | 9.0 | 8.2 | 7.3 | .179 | 30-A |
| 28 | 11.5 | 8.8 | 8.1 | 7.3 | .179 | 12.5 | 9.5 | 8.7 | 7.8 | .179 | 30-A |
| 32 | 12.5 | 9.8 | 9.1 | 8.3 | .179 | 12.0 | 9.0 | 8.2 | 7.3 | .239 | 36-A |
| 36 | 12.0 | 9.3 | 8.6 | 7.8 | .239 | 12.5 | 9.5 | 8.7 | 7.8 | .239 | 36-A |
| 40 | 12.0 | 9.3 | 8.6 | 7.8 | .239 | 13.5 | 10.5 | 9.7 | 8.8 | .239 | 36-A |
| 44 | 12.5 | 9.8 | 9.1 | 8.3 | .239 | 14.0 | 11.0 | 10.2 | 9.3 | .239 | 36-A |
| 48 | 13.0 | 10.3 | 9.6 | 8.8 | .239 | 15.0 | 12.0 | 11.2 | 10.3 | .239 | 36-A |

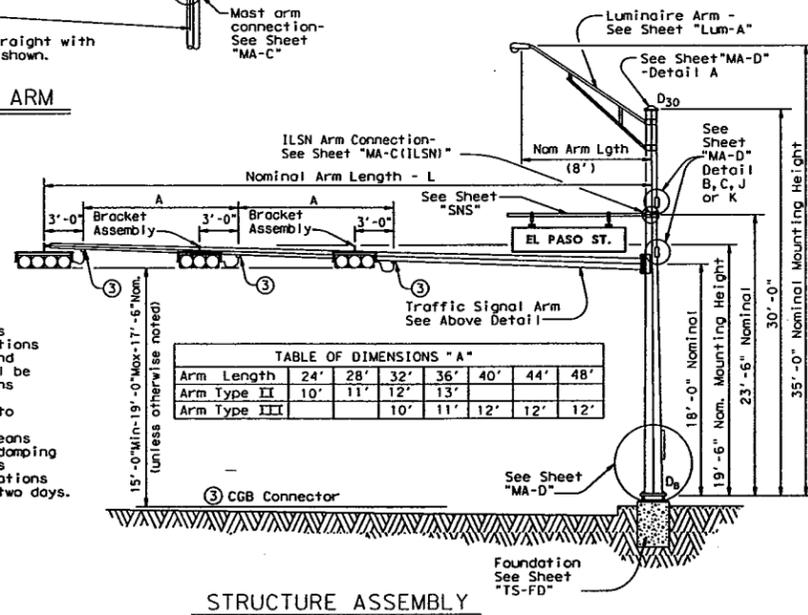
| Arm Length | ROUND ARMS | | | | POLYGONAL ARMS | | | | Rise |
|------------|----------------|----------------|----------------|-------|----------------|----------------|----------------|-------|--------|
| | L ₁ | D ₁ | D ₂ | ① thk | L ₁ | D ₁ | D ₂ | ① thk | |
| ft. | ft. | in. | in. | in. | ft. | in. | in. | in. | |
| 20 | 19.1 | 6.5 | 3.8 | .179 | 19.1 | 7.0 | 3.5 | .179 | 1'-8" |
| 24 | 23.1 | 7.5 | 4.3 | .179 | 23.1 | 7.5 | 3.5 | .179 | 1'-9" |
| 28 | 27.1 | 8.0 | 4.2 | .179 | 27.1 | 8.0 | 3.5 | .179 | 1'-10" |
| 32 | 31.0 | 9.0 | 4.7 | .179 | 31.0 | 9.0 | 3.5 | .179 | 2'-0" |
| 36 | 35.0 | 9.5 | 4.6 | .179 | 35.0 | 10.0 | 3.5 | .179 | 2'-1" |
| 40 | 39.0 | 9.5 | 4.1 | .239 | 39.0 | 9.5 | 3.5 | .239 | 2'-3" |
| 44 | 43.0 | 10.0 | 4.1 | .239 | 43.0 | 10.0 | 3.5 | .239 | 2'-6" |
| 48 | 47.0 | 10.5 | 4.1 | .239 | 47.0 | 11.0 | 3.5 | .239 | 2'-9" |

D₈ = Pole Base O.D.
D₁₉ = Pole Top O.D. with no Luminaire and no ILSN
D₂₄ = Pole Top O.D. with ILSN w/out Luminaire
D₃₀ = Pole Top O.D. with Luminaire
D₁ = Arm Base O.D.
D₂ = Arm End O.D.
L₁ = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.
② D₂ may be increased by up to 1" for polygonal arms.



TRAFFIC SIGNAL ARM
(Fixed Mount)



| Arm Length | 24' | 28' | 32' | 36' | 40' | 44' | 48' |
|--------------|-----|-----|-----|-----|-----|-----|-----|
| Arm Type II | 10' | 11' | 12' | 13' | | | |
| Arm Type III | | 10' | 11' | 12' | 12' | 12' | |

VIBRATION WARNING

Most Arms of approximately 40' or longer are subject to possible harmonic vertical vibrations in light wind conditions due to unusual combinations of signal numbers, weights or positions, arm-wind orientation, and arm-pole stiffness. Arms shall be visually inspected in 5 to 20 mph wind conditions after signal head installation and, if vertical movements with a total excursion (max positive to max negative) of more than approximately 8" are observed at arm tip, damping devices or other means shall be fitted to the arms. The necessary damping device(s) or other remedial measures shall be as recommended by the fabricator. Excessive vibrations shall not be allowed to continue for more than two days.

SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

| Nominal Arm Length | 30' Poles With Luminaire | 24' Poles With ILSN | 19' Poles With No Luminaire and No ILSN | | | |
|--------------------|---|---|---|----------|-------------|----------|
| | Above hardware plus One (or two if ILSN attached) small hand hole, clamp-on simplex | Above hardware plus one small hand hole | See note above | | | |
| ft | Designation | Quantity | Designation | Quantity | Designation | Quantity |
| 20 | 20L-80 | | 20S-80 | | 20-80 | |
| 24 | 24L-80 | | 24S-80 | | 24-80 | |
| 28 | 28L-80 | | 28S-80 | | 28-80 | |
| 32 | 32L-80 | | 32S-80 | 1 | 32-80 | |
| 36 | 36L-80 | | 36S-80 | 2 | 36-80 | |
| 40 | 40L-80 | | 40S-80 | 2 | 40-80 | |
| 44 | 44L-80 | | 44S-80 | | 44-80 | |
| 48 | 48L-80 | | 48S-80 | 3 | 48-80 | |

Traffic Signal Arms (1 per Pole) Ship each arm with the listed equipment attached

| Nominal Arm Length | Type I Arm (1 Signal) | Type II Arm (2 Signals) | Type III Arm (3 Signals) | | | |
|--------------------|-----------------------|---|---|----------|-------------|----------|
| | 1 CGB connector | 1 Bracket Assembly and 2 CGB Connectors | 2 Bracket Assemblies and 3 CGB Connectors | | | |
| ft | Designation | Quantity | Designation | Quantity | Designation | Quantity |
| 20 | 20I-80 | | | | | |
| 24 | 24I-80 | | 24II-80 | | | |
| 28 | 28I-80 | | 28II-80 | | | |
| 32 | | | 32II-80 | 2 | 32III-80 | |
| 36 | | | 36II-80 | | 36III-80 | 2 |
| 40 | | | | | 40III-80 | 2 |
| 44 | | | | | 44III-80 | |
| 48 | | | | | 48III-80 | 3 |

Luminaire Arms (1 per 30' pole)

| Nominal Arm Length | Quantity |
|--------------------|----------|
| 8' Arm | |

④ Supply Option "A" unless otherwise noted

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

| Nominal Arm Length | Quantity |
|--------------------|----------|
| 7' Arm | |
| 9' Arm | |

Anchor Bolt Assemblies (1 per pole)

| Anchor Bolt Diameter | Anchor Bolt Length | Quantity |
|----------------------|--------------------|----------|
| 1 1/2" | 3'-4" | |
| 1 3/4" | 3'-10" | 11 |

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, 4 lock washers and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".
Templates may be removed for shipment.

SHEET 1 OF 2

Texas Department of Transportation
Traffic Operations Division
TRAFFIC SIGNAL SUPPORT STRUCTURES
SINGLE MAST ARM ASSEMBLY
(80 MPH WIND ZONE)
SMA-80(1)-99

11/99 Revision
Changed to Facilitate new terminal strip enclosure

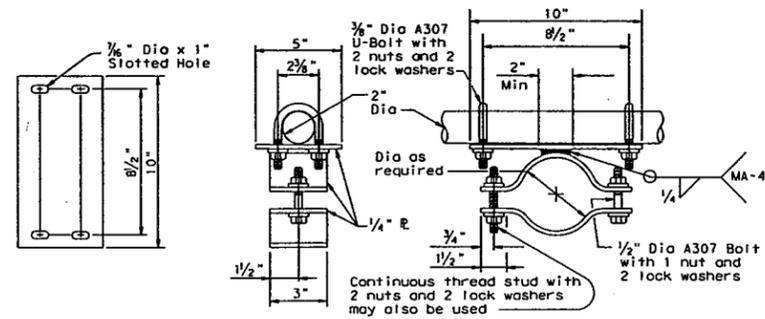
| | | | | |
|---------------------|--------|---------|---------------------|---------|
| FILED SMA-80.DGN | DWG MS | CHK JST | DWG MMF | CHK JST |
| © TxDOT August 1995 | DIST | FED REQ | FEDERAL AID PROJECT | SHEET |
| REVISIONS | 6 | | | |
| 5-96 | | COUNTY | CONTROL SECT | JOB |
| 11-99 | | | | HIGHWAY |

122A

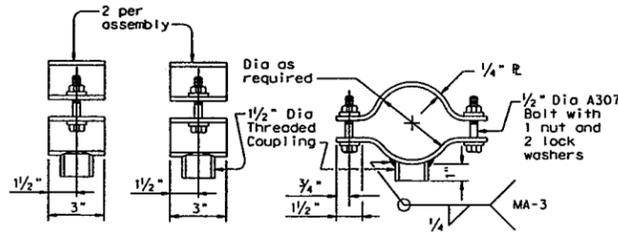
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CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT
FORT SAM HOUSTON TRANSPORTATION PROJECTS
SMA - 80 (1) - 99
WINANS RD. & HARRY WURZBACH INTERSECTION

| | | |
|----------------|-----------------------|----------------|
| 100% SUBMITTAL | PROJECT NO.: 40-00015 | DATE: 3/8/2011 |
| DRWN. BY: ML | DSGN. BY: ED | CHKD. BY: ED |
| | | SHEET NO.: 242 |



BRACKET ASSEMBLY DETAILS OPTION A

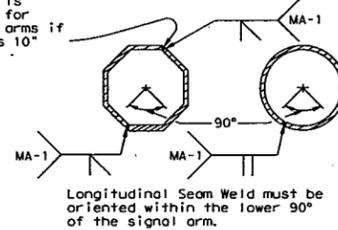


BRACKET ASSEMBLY DETAILS OPTION B

BRACKET ASSEMBLY OPTION C

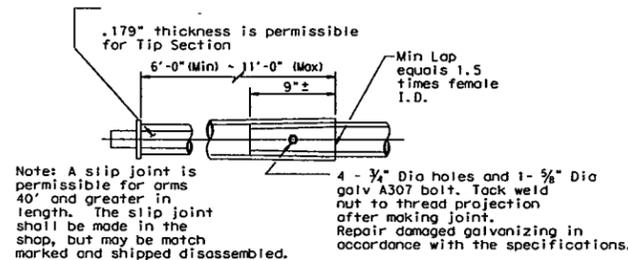
Stainless steel bands and cast bracket as in "Astro-Brac" with 1/2" Dia Threaded Coupling.

Second longitudinal Seam Weld is permitted for polygonal arms if D_1 exceeds 10"

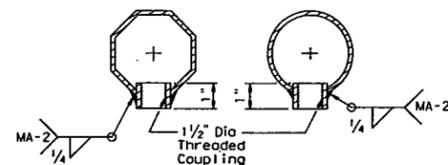


Longitudinal Seam Weld must be oriented within the lower 90° of the signal arm.

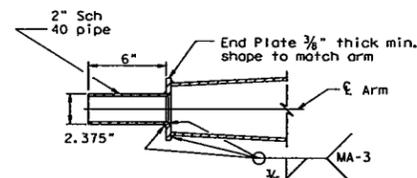
ARM WELD DETAIL



SLIP JOINT DETAIL



COUPLING DETAILS



TENON DETAIL

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor.

Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 75 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.5 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "IS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with the Specifications and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Miscellaneous welds which do not call for preapproved weld procedures are nevertheless subject to rejection for poor workmanship. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and the Specifications.

Unless otherwise noted, all parts shall be galvanized in accordance with the Specifications.

Special design require submission of shop drawings in accordance with the item "Steel Structures".

SHEET 2 OF 2

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL
SUPPORT STRUCTURES
SINGLE MAST ARM ASSEMBLY
(80 MPH WIND ZONE)

SMA-80(2)-96

| | | | | | | | | | |
|-------|------------|--------|------|---------|------|-----|---------|-----|---------|
| FILE# | SMA-80.DDN | DN | MS | CK | JSY | DN | MMF | CK | JSY |
| © | TxDOT | AUGUST | 1995 | DIST | FED | REC | FEDERAL | AID | PROJECT |
| 5-96 | REVISIONS | E | | | | | | | SHEET |
| | | COUNTY | | CONTROL | SECT | JOB | | | HIGHWAY |
| | | | | | | | | | 1228 |



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Texas Department
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CITY OF SAN ANTONIO

CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

FORT SAM HOUSTON TRANSPORTATION PROJECTS

SMA - 80 (2) - 96

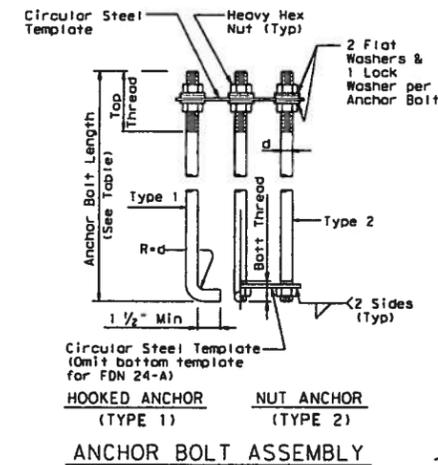
WINANS RD. & HARRY WURZBACH INTERSECTION

| | | |
|----------------|-----------------------|----------------|
| 100% SUBMITTAL | PROJECT NO.: 40-00015 | DATE: 3/8/2011 |
| DRWN. BY: ML | DSGN. BY: ED | CHKD. BY: ED |
| | | SHEET NO.: 249 |

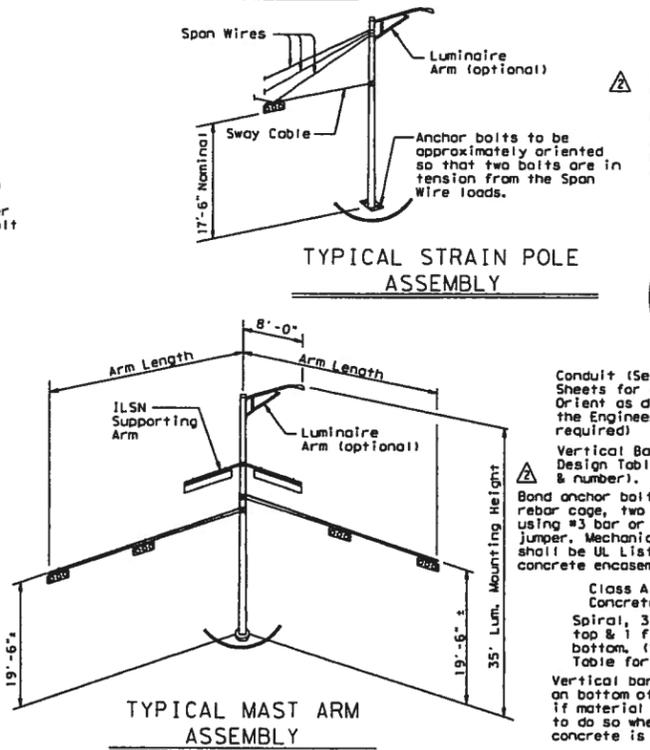
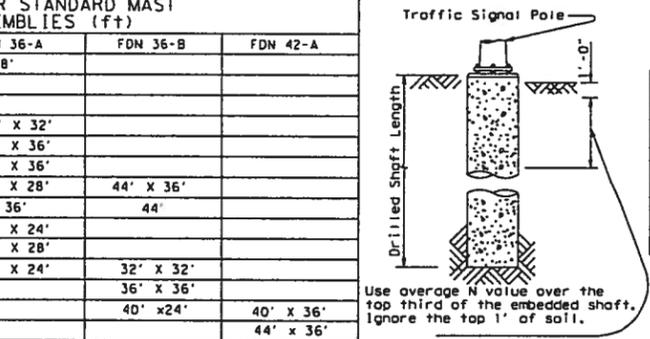
| FDN TYPE | DRILLED SHAFT DIA | REINFORCING STEEL | | DRILLED SHAFT LENGTH-FT (4, 5, 6) | | | ANCHOR BOLT DESIGN (1) | | | | FOUNDATION DESIGN LOAD (2) | | TYPICAL APPLICATION |
|----------|-------------------|-------------------|----------------|------------------------------------|------|------|------------------------|----------------------|--------------|-------------|----------------------------|------------|--|
| | | VERT BARS | SPIRAL & PITCH | TEXAS CONE PENETROMETER N Blows/ft | | | ANCHOR BOLT DIA | F _y (ksi) | BOLT CIR DIA | ANCHOR TYPE | MOMENT K-ft | SHEAR Kips | |
| | | | | 10 | 15 | 40 | | | | | | | |
| 24-A | 24" | 4- #5 | #2 at 12" | 5.7 | 5.3 | 4.5 | 3/4" | 36 | 12 3/4" | 1 | 10 | 1 | Pedestal pole, pedestal mounted controller. |
| 30-A | 30" | 8- #9 | #3 at 6" | 11.3 | 10.3 | 8.0 | 1 1/2" | 55 | 17" | 2 | 87 | 3 | Mast arm assembly. (see Selection Table) |
| 36-A | 36" | 10- #9 | #3 at 6" | 13.2 | 12.0 | 9.4 | 1 3/4" | 55 | 19" | 2 | 131 | 5 | Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire. |
| 36-B | 36" | 12- #9 | #3 at 6" | 15.2 | 13.6 | 10.4 | 2" | 55 | 21" | 2 | 190 | 7 | Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm |
| 42-A | 42" | 14- #9 | #3 at 6" | 17.4 | 15.6 | 11.9 | 2 1/4" | 55 | 23" | 2 | 271 | 9 | Mast arm assembly. (see Selection Table) |

| FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft) | | | | | |
|--|--|-----------|-----------|-----------|-----------|
| 80 MPH DESIGN WIND SPEED | MAX SINGLE ARM LENGTH | FDN 30-A | FDN 36-A | FDN 36-B | FDN 42-A |
| | | 24' x 24' | 48' | | |
| MAXIMUM DOUBLE ARM LENGTH COMBINATIONS | 28' x 28' | | | | |
| | 32' x 28' | | | | |
| | 36' x 36' | | | | |
| | 40' x 36' | | | | |
| 100 MPH DESIGN WIND SPEED | MAX SINGLE ARM LENGTH | 36' | 44' x 28' | 44' x 36' | 44' |
| | MAXIMUM DOUBLE ARM LENGTH COMBINATIONS | 24' x 24' | | | |
| | | 28' x 28' | | | |
| | | 32' x 24' | | 32' x 32' | 36' x 36' |
| | | | 40' x 24' | 44' x 36' | |

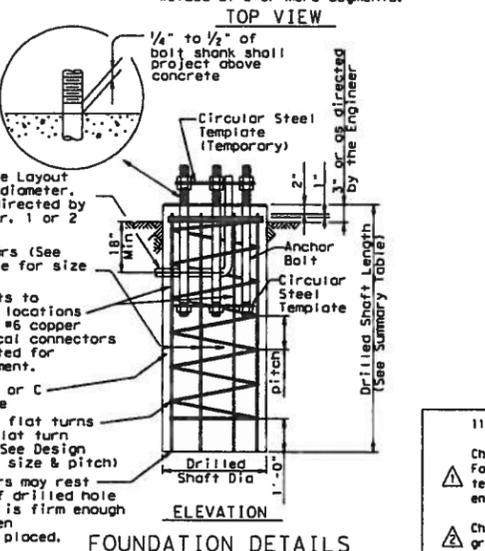
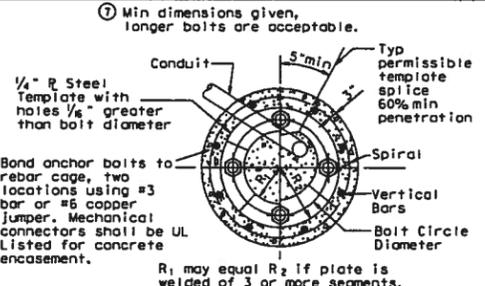
- EXAMPLE:
- For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
 - For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



INSTALLATION PROCEDURE:
Threads of anchor bolts shall be coated with pipe joint compound prior to installation of upper nuts when erecting pole. After pole is plumbed and in permanent alignment, the exposed threads of painted bolts shall be cleaned and an additional coating of zinc-rich paint applied to seal the bolt thread-nut joint.



| ANCHOR BOLT & TEMPLATE SIZES | | | | | | |
|------------------------------|-------------|------------|-------------|-------------|----------------|----------------|
| BOLT DIA IN. | BOLT LENGTH | TOP THREAD | BOTT THREAD | BOLT CIRCLE | R ₂ | R ₁ |
| 3/4" | 1'-6" | 3" | — | 12 3/4" | 7 1/4" | 5 3/4" |
| 1 1/2" | 3'-4" | 6" | 2" | 17" | 10" | 7" |
| 1 3/4" | 3'-10" | 7" | 2 1/4" | 19" | 11 1/4" | 7 3/4" |
| 2" | 4'-3" | 8" | 2 1/2" | 21" | 12 1/2" | 8 1/2" |
| 2 1/4" | 4'-9" | 9" | 3" | 23" | 13 3/4" | 9 1/4" |



- NOTES:**
- Anchor bolt design develops the foundation capacity given under Foundation Design Loads.
 - Foundation Design Loads are the allowable moments and shears at the base of the structure.
 - Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.
 - Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.
 - If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.
 - Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

| FOUNDATION SUMMARY TABLE (3) | | | | | | | |
|---------------------------------------|------------------|----------|--------|---------------------------------|------|------|--|
| LOCATION IDENTIFICATION | AVG. N BLOW /ft. | FDN TYPE | NO. EA | DRILLED SHAFT LENGTH (FEET) (6) | | | |
| | | | | 24-A | 30-A | 36-A | |
| HARRY WURZBACH @ RITTIMAN ROAD | | | | | | | |
| POLE C | 10 | 36-A | 1 | | | 13.2 | |
| POLE E | 10 | 36-A | 1 | | | 13.2 | |
| POLE I | 10 | 24-A | 1 | 5.7 | | | |
| POLE H | 10 | 24-A | 1 | 5.7 | | | |
| POLE G | 10 | 24-A | 1 | 5.7 | | | |
| POLE F | 10 | 24-A | 1 | 5.7 | | | |
| HARRY WURZBACH @ WINANS ROAD | | | | | | | |
| POLE B | 10 | 36-A | 1 | | | 13.2 | |
| POLE C | 10 | 30-A | 1 | 11.3 | | | |
| POLE D | 10 | 36-A | 1 | | | 13.2 | |
| HARRY WURZBACH @ BURR ROAD | | | | | | | |
| POLE B | 10 | 36-A | 1 | | | 13.2 | |
| POLE C | 10 | 36-A | 1 | | | 13.2 | |
| POLE D | 10 | 36-A | 1 | | | 13.2 | |
| TOTAL DRILLED SHAFT LENGTHS | | | | 22.8 | 11.3 | 92.4 | |

GENERAL NOTES:
Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and Interim revisions thereto. Reinforcing steel shall conform to Item 440. Concrete shall be Class A or C. Threads for anchor bolts and nuts shall be rolled or cut threads of unified national coarse thread series except for A193B7 bolts which shall have 8 pitch thread series. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be topped after galvanizing. Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Anchor bolts larger than 1" in diameter shall conform to A36M55 in accordance with the Item, "Anchor Bolts" or ASTM A193B7 or A687. Galvanize or coat with zinc-rich paint a minimum of the upper 14 inches of all anchor bolts unless otherwise noted. Exposed nuts shall be galvanized or coated with zinc-rich paint. Washers shall be galvanized. Templates and embedded nuts need not be galvanized.

STANDARD PLANS
Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-99

11/99 Revision
Changed to facilitate new terminal strip enclosure
Changed from ground rod to UFER ground

| | | | |
|---------|------|----|--------|
| REVISED | DATE | BY | REASON |
| 5-96 | | E | |
| 11-99 | | E | |

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FORT SAM HOUSTON TRANSPORTATION PROJECTS
TS - FD - 99

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DISCLAIMER:

DATE: FILE:

I. GENERAL REQUIREMENTS FOR ALL ELECTRICAL WORK

The location of all conductors, conduits, junction boxes, ground boxes, and electrical services is diagrammatic only and may be shifted by the Engineer to accommodate local conditions.

Materials shall be new and unused. Materials and installation shall comply with the applicable provisions of the National Electrical Code (NEC), National Electrical Manufacturers Association (NEMA) standards, and shall be Underwriters Laboratories (UL) listed unless otherwise shown on the plans or specifications or approved by the Engineer in writing. Faulty fabrication or poor workmanship in any material, equipment, or installation shall be justification for rejection. When reference is made to UL, it can be considered to mean a Nationally Recognized Independent Testing Lab (NRTL). Comparable standards of Canadian Standard Association, Electrical Testing Laboratories or Factory Mutual can be equal to the referenced UL standard. Where reference is made to NEMA listed devices, IEC listed devices shall not be considered to be an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing.

With the exception of high strength bolts, miscellaneous nuts, bolts and hardware may be stainless steel when plans specify galvanized, provided that bolts are 1/2 inch or less in diameter. The Contractor shall provide the following electrical test instruments as required by the Engineer to confirm compliance with the contract and the NEC. Those test instruments are voltmeter, amp probe, megger (1000 volt DC) and torque wrenches. All meters shall have been properly calibrated within one year. Calibration certification shall be provided to the Engineer upon request. Calibration certification tag shall also be applied to the meter. The Contractor shall operate meters during inspection as requested by the Engineer. Grounding shall be as shown on the plans and in accordance with the NEC. Metallic conduit, light poles, luminaires on bridge structures, and all metal enclosures shall be bonded to the system-grounding conductor. The ground rod in each ground box or junction box at the bridge ends, and in each ground box installed for underpass lighting will also be bonded to the system grounding conductor. The grounding conductor shall be bare or, if insulated, shall be green. Ground rods, connectors, and bonding jumpers will not be paid for separately, but will be subsidiary to the various bid items.

SUBMITTALS:

The contractor shall submit for approval six (6) copies of catalog cut sheets for each of the following three (3) categories.
 Category 1. Electrical services including raceway.
 Category 2. Breakaway disconnects, heat shrink tubing, heat shrink filler tape, GelCaps and ground boxes which will include loading capacity certification.
 Category 3. Highest assembly kits, when applicable. See Item 614 "Highest Illumination Assemblies". Submittals shall be legible and shall be marked to indicate which product on a cut sheet is to be supplied. Where manufacturers provide warranties and guarantees as a customary trade practice, the Contractor shall furnish to the State such warranties and guarantees. Any deviation from plans or specifications, including deviations due to plan error should be prominently displayed on the submittal. Any changes not prominently noted in submittal and incorporated into the work without proper authorization will constitute grounds for rejection of that portion of the work.

II. CONDUIT

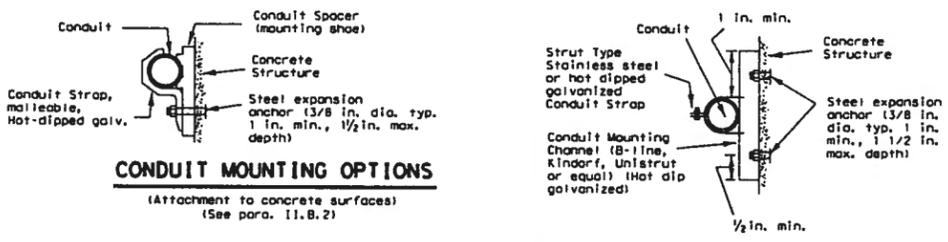
A. MATERIALS

- Conduit and fittings shall be equal to or smaller, in any dimension, than 12 x 12 x 6 (HxHxD), surface mounted and containing conductors #8 or larger, shall be hot dipped galvanized cast iron with minimum wall thickness of 3/16 inch, shall have external mounting lugs, and shall be UL listed Crouse-Hinds Type WAB, OZ/Geaney Type Y5 or approved equal. Unless otherwise shown elsewhere on the plans, RMC system junction boxes larger than the aforementioned boxes but equal to or smaller, in any dimension, than 18 x 18 x 6 (HxHxD) shall be 14-ga. stainless steel; RMC system junction boxes larger than 18 x 18 x 6 (HxHxD) shall be 12-ga. stainless steel. All metal junction boxes shall be equipped with a threaded hole or lug for grounding. Stainless steel boxes 12 x 12 x 6 and larger need not be UL listed but shall meet the other requirements of the NEC and shall have ribs, stiffeners, or thicker metal and shall have external mounting feet. Junction boxes with an internal volume of more than 100 cu. in. may be supported by connection of two or more rigid metal conduits, where specifically shown on the plans or where approved by the Engineer.
- Junction boxes containing only #10 or #12 AWG conductors shall be Crouse Hinds Type GRFX, Apollon Type J80X, two-gang FD, or similar approved cast iron box. Boxes shall be sized according to NEC Table 370-15(a).
- IMC and EMT conduit shall not be used unless specifically required by the plan layout sheets. Junction boxes in EMT conduit systems shall be made from galvanized sheeting and shall be UL listed and approved for outdoor use, unless otherwise noted on the plans. Sheet metal junction boxes shall be sized in accordance with the NEC. Junction boxes for IMC conduit systems shall meet the requirements of boxes used with RMC systems.
- Junction boxes in PVC conduit systems shall be PVC, intended for outdoor use, unless otherwise noted on the plans.
- Elbows in PVC conduit systems one inch and larger shall be rigid metal, with the exception of traffic signal systems which may have PVC elbows instead of rigid. If any part of the rigid metal elbow is buried less than 18 inches underground the elbow and rigid metal extension shall be grounded. Grounding shall be accomplished by means of a grounding bushing installed on the extension. Unless specifically shown on the plans, rigid metal elbows containing, or entering ground boxes containing only communications conductors, loop detectors, or other low voltage power limited circuits need not be grounded unless a ground wire is present in the conduit or ground box. The rigid metal elbows located in concrete foundations may be extended with PVC conduit and need not be grounded provided that the end of the elbow nearest the end of the conduit run exiting the foundation is at least 2 inches below the concrete. RMC elbows will not be eliminated. RMC elbows will not be paid for directly, but will be subsidiary to various bid items.
- High-Density Polyethylene (HDPE) conduit shall meet the requirements of Item 622, Duct Cable, except that the HDPE conduit, when bid under Item 616, Conduit, shall not contain factory installed conductors. Fittings for HDPE conduit shall be UL listed as an electrical conduit connector or shall be thermally fused using an electrically heated wound wire resistance welding method. HDPE conduit may be substituted for bored schedule 40 or schedule 80 PVC conduit. When such substitution is made, bored HDPE shall be schedule 40 of the size PVC being replaced. The HDPE conduit shall transition to PVC (or RMC elbow when required) at the bore pit. Size and schedule shall be as shown on the plans. Substituted conduit may not be extended to ground boxes or foundations; RMC elbows shall be installed at ground boxes and foundations. RMC elbows will not be eliminated.
- All conduit support hardware including straps, nuts, bolts, screws, retaining anchors and washers shall be hot dipped galvanized or stainless steel. Strut type conduit straps shall be stainless steel or hot dipped galvanized. Strut type straps need not be made of malleable type material. Strapped-rodium plated straps will not be allowed. Straps having only one mounting hole shall not be allowed for use on conduits 2 inches and larger with the exception of electrical service poles where stainless steel standoff straps will be allowed. Two piece conduit straps designed to be used with a mounting shoe shall be installed only with the correctly sized shoe.

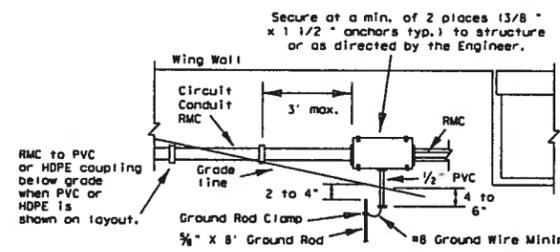
| AWG | 3 CONDUCTORS | 5 CONDUCTORS | 7 CONDUCTORS |
|-----|----------------|----------------|----------------|
| #1 | 10" x 10" x 4" | 12" x 12" x 4" | 16" x 16" x 4" |
| #2 | 8" x 8" x 4" | 10" x 10" x 4" | 12" x 12" x 4" |
| #4 | 8" x 8" x 4" | 10" x 10" x 4" | 10" x 10" x 4" |
| #6 | 8" x 8" x 4" | 8" x 8" x 4" | 10" x 10" x 4" |
| #8 | 8" x 8" x 4" | 8" x 8" x 4" | 8" x 8" x 4" |

B. CONSTRUCTION METHODS

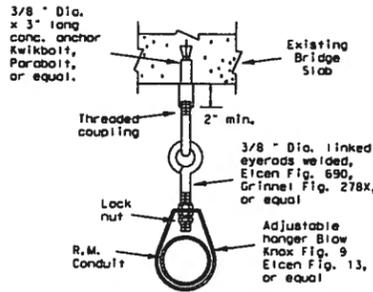
- Conduit in structures shall have expansion fittings at structure expansion joints. All straight runs of RMC conduit exposed on structures such as bridges shall have expansion joints installed at maximum intervals of 150 feet. Expansion joints shall be installed so they allow for movement of the conduit. Installation of the joint in such a manner that will not allow for movement shall be required at no expense to the state. The method of determining the final setting length of the expansion joint shall be provided to the Engineer upon request.
- Conduit supports shall be spaced at maximum intervals of 5 feet. Conduit spacers shall be used with metal conduit placed on surfaces of concrete structures (See conduit mounting options).
- Conduit supports shall not be attached directly to prestressed concrete beams except as shown specifically in the plans and approved by the Engineer.
- Unless otherwise shown on the plans, conduit placed beneath existing roadways, driveways, or sidewalks, or after the base or surfacing operation has begun, shall be accomplished by jacking or boring. The Contractor shall back fill and compact the bore pits to the bottom of the conduit prior to installing connecting conduit or duct cable to prevent bending of the connection.
- Conduit trenches in the subgrade of new roadways shall be backfilled with excavated material, unless otherwise noted on the plans. Conduit trenches in the sub-base of new roadways shall be backfilled with cement-stabilized base.
- Open ends of all conduit and raceways shall be fitted with temporary caps or plugs to prevent entry of dirt, debris and rodents during construction. The temporary cap may be constructed of duct tape, but in all cases shall be tightly fixed to the conduit and shall be durable. The contractor shall clean out the conduit and prove it clear in accordance with Standard Specifications Item 618.3 prior to installing any conductors.
- Conduit entry into the top of enclosures such as safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes shall be made weatherproof using conduit sealing hubs, or threaded bosses.
- A bonding jumper shall be installed from each grounding bushing to the nearest grounding rod, grounding lug, and/or equipment grounding conductor. All jumpers shall be the same size as equipment grounding conductor. Conduit used as casing under roadways for duct cable need not be grounded if duct extends full length through the casing. At electrical services, grounding electrode conductor shall be solid copper #6 AWG.
- Metal junction boxes shall be bonded to the grounding conductor in accordance with the NEC.
- Conduits entering ground boxes shall be placed so that the conduit ends shall be not less than 3 inches nor more than 6 inches from bottom of box (See ground box detail on sheet ED13).
- Conduit ends shall be sealed with heat shrink boots with waterproof sealant, urethane foam, or by other methods approved by the Engineer. Sealing shall be done after completion of any required pull tests. Duct tape shall not be used as a permanent conduit sealant. Silicone caulking shall not be used as a sealant.
- All strut mounting material and hardware shall be hot-dip galvanized or shall be stainless steel. The cut ends of strut and non-galvanized rigid metal conduit threads shall be coated with a zinc rich paint (90% or more zinc content). Zinc rich paint may only be used to touch up galvanized material as allowed under Item 445.6 galvanizing. The painting of non-galvanized material with a zinc rich paint shall not be considered as an approved alternative for galvanized materials.
- All PVC conduit terminations shall be fitted with bushings or bell ends. All metal conduit terminations shall be fitted with a grounding type bushing.



CONDUIT MOUNTING OPTIONS
(Attachment to concrete surfaces)
(See para. 11.B.2)



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL



CONDUIT HANGER DETAIL
(Attachment to horizontal surfaces)
Hangers need not be UL listed for electrical use
let plumber pipe hangers are acceptable

- NOTES**
- Ground rod clamp to be UL listed for direct burial.
 - For conduit placed in structure, use flush-mounted box.
 - Bond junction box and metal conduits to equipment grounding conductor and grounding electrode conductor using listed connector.
 - Seal all conduits entering the junction box from underground.
 - Install bell end or bushing on 1/2" PVC conduit both ends.
 - Ground rod to be driven within 8 inches of 1/2 inch PVC conduit end.

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**ELECTRICAL DETAILS-
CONDUIT**
 ED(1)-03

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|----------------------|------------|------------|------------|------------|
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| 4-98 | 12-00 | 3-03 | 5-03 | 7-1A |
| CONV. SECT. | JOB | DIST. | COUNTY | SHEET NO. |

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CITY OF SAN ANTONIO
 CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT
 FORT SAM HOUSTON TRANSPORTATION PROJECTS
 ED(1)-03

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| 100% SUBMITTAL | PROJECT NO.: 40-00015 | DATE: 7/14/2011 | SHEET NO.: 24/4 |
| DRWN. BY: JS | DSGN. BY: ED | CHKD. BY: ED | |

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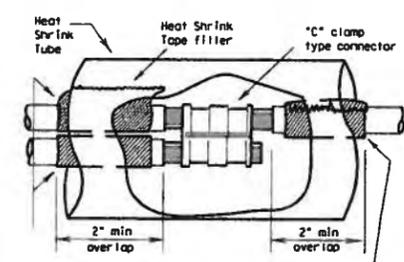
I. ELECTRICAL CONDUCTORS

A. MATERIALS

- Insulated conductors shall be NEC Type THHW. Insulated conductors shall be color coded in accordance with the NEC, articles 200, 250, and 310. I.e. insulation of grounded conductors (neutrals) shall be white. Grounding conductors (ground wires) shall be bare or insulation shall be green. Insulation of ungrounded conductors (hots) shall be any color except green, white, or gray. Identification of conductors #6 American Wire Gauge (AWG) and smaller shall be by continuous jacket color. Color coding of electrical conductors #4 AWG and larger shall be either by continuous color jacket or by colored tape. Colored tape marker shall consist of a half-lap of tape covering a 6-inch length of conductor.
- Where two or more circuits are present in one conduit or enclosure, the conductors of each circuit shall be identified by a permanent non-metallic tag at each accessible location. The tag shall be fastened to the conductors by two plastic straps. Each tag shall indicate circuit number, letter, or other identification shown in the plans.
- Grounding electrode conductor #6 AWG for bonding to ground rod of electrical service, shall be solid. Connection of conductor to ground rod shall be made using UL Listed connectors designed for such purposes.
- Heat Shrink Tape filler shall be used to seal the ends of heat shrink tubing around two or more conductors that are insulated with heat shrink tubing. Tape material shall have a minimum dielectric strength of 225 volts per mil and shall be cross-linked butyl rubber. Tape shall be supplied in rolls and shall have a backing (release paper) to prevent the tape from sticking to itself.
- Heat shrink tubing shall be heavy wall, UL listed for 600 volts or greater and shall have factory applied internal sealant.
- GeICaps shall be UL listed for 600-volt applications. GeICap shall have see-through elastomer molded cover. Cover shall be filled with high dielectric insulating gel silicone sealant to provide waterseal. Cover shall be held in place by snap-lock, molded clamp made of UV stable polypropylene.
- Splicing materials, insulating materials, breakaway disconnects, GeICaps and fuse holders will not be paid for directly but shall be subsidiary to various bid items.

B. CONSTRUCTION METHODS

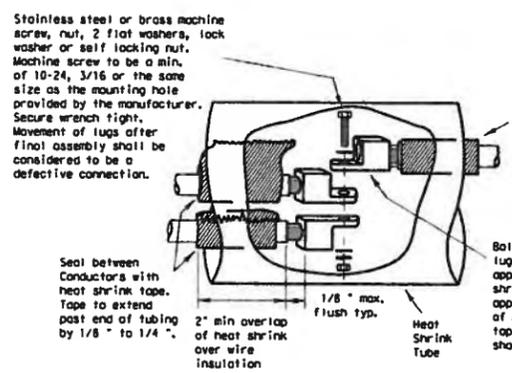
- After conductors have been installed in conduit, a pull test shall be made on conductors. When any length of conductor cannot be freely pulled, the Contractor shall make any needed alterations or repairs at no expense to the State.
- The Contractor shall perform insulation resistance tests in accordance with Item 620, "Electrical Conductors." The Contractor shall coordinate with the Engineer to witness the tests.
- A sufficient length of conductor for making up connections shall be left in ground boxes (2 feet minimum, 3 feet maximum, to point of splice, 3 feet minimum, 4 feet maximum, when conductor is pulled through with no splices), enclosures, weatherheads and pole bases (1 foot minimum, 1.5 feet maximum).
- Splices shall be made only in junction boxes, ground boxes, pole bases, or electrical enclosures and shall be made with listed compression or screw type pressure connectors, terminal blocks, bolted lugs, or split bolt connectors. Splices shall be insulated with heavy wall heat shrink tubing or GeICaps and shall be made so as to provide a watertight splice. Heat shrink sleeve shall overlap conductor insulation a minimum of 2 inches on both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, the Contractor shall increase the diameter of the conductors using heat shrink filler tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Tape shall be visible after completion of all splices. Where filler tape is used but not visible, the Engineer shall approve each individual splice by conducting a physical inspection of each splice. When it appears the tubing has been burned, or overheated the tubing shall be considered to be defective and shall be replaced.
- GeICaps when used in place of heat shrink method of splicing, shall be sized and installed according to manufacturer's specifications. (Raychem GeICap and GeICap SL or equal.)
- Wire nuts may be used for #8 AWG or smaller conductors in above-ground junction boxes, but not in pole bases or ground boxes. Wire nuts shall be positioned upright to prevent the accumulation of water. Wire nuts used at these locations shall have factory applied waterproof sealant.
- Conductors in illumination poles shall be supported by a J-hook in the top of the pole.
- All conductors bid under Item 620 "Electrical Conductors" shall have breakaway electrical disconnects installed anytime conductors pass through a break-away support device.
- For terminating the conductors, insulation-jacketing material shall be removed in such a manner as to not nick any of the individual strands of the conductor. When individual conductor strands are removed, the conductor shall be considered to be damaged.
- When a conductor or cable has been damaged, or fails to pass an insulation resistance test, the conductor shall be replaced.
- Duct tape, black electrical tape, or wire nuts shall not be used in the repair of a damaged conductor.
- For terminations, no more than one wire may be installed under a single pressure connector, unless the device is listed for more than one wire.
- Conductors connected to break-away in line fuse holders must be installed in accordance with the specific manufacturer's installation instructions. Where threaded connections are made, they shall be properly torqued. Where crimp type connections are made, crimps shall be made using properly sized crimping pliers. Proper conductor terminations are critical to the safe operation of break-away devices.
- Waterproofing boots shall be properly trimmed to fit snugly around the conductor so as to provide a water proof connection. No more than one wire may enter a single opening in any one boot. Waterproofing boots must provide the correct number of openings. Where only one wire is to be connected to a boot, the boot may not be a two wire type.



Seal between conductors with heat shrink tape. Tape to extend past end of tubing by 1/8" to 1/4".

Increase insulation diameter with heat shrink tape if necessary. Tape to extend past end of tubing by 1/8" to 1/4".

SPLICE OPTION 1
C-CLAMP

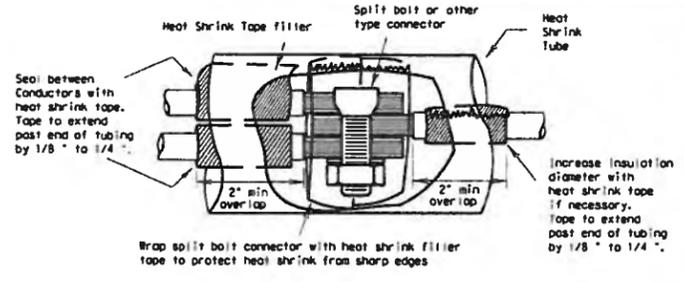


Seal between conductors with heat shrink tape. Tape to extend past end of tubing by 1/8" to 1/4".

Increase insulation diameter with heat shrink tape if necessary. Tape to extend past end of tubing by 1/8" to 1/4".

SPLICE OPTION 2
BOLTED WIRE LUGS

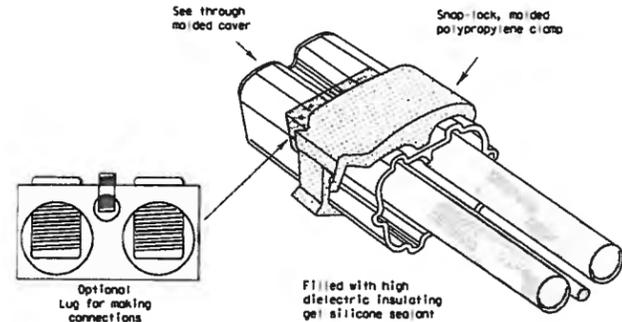
SPLICE OPTION 3
SPLIT BOLT



Wrap split bolt connector with heat shrink filler tape to protect heat shrink from sharp edges.

SPLICE OPTION 4
GELCAP

GeICap shall be sized and installed according to manufacturer's specifications.



- All conduits that contain circuit wiring of 50 volts or more shall contain an equipment grounding conductor (EGC). Conduit for traffic signals shall have an EGC, with a minimum size of #8 AWG stranded. Unless otherwise shown on the plans, the EGC for all other conduits shall be the same AWG size as the largest current carrying conductor contained in that conduit. The EGC shall be paid for Item 620-Electrical Conductors.

C. TEMPORARY WIRING

- Temporary conductors and electrical equipment to provide power for utilization equipment, shall be installed in accordance with the NEC article 305. All temporary wiring materials and methods shall comply with the standard sheets. All power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade, supplied from a utility power source, shall be provided with a ground fault circuit interrupter.
- Residual current protective devices (RCD) may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
- Where wire nuts are approved for temporary wiring, they shall be of the self-sealing type.
- All conductor splices must be contained within a listed enclosure, ground box or the splices will be more than ten feet above grade vertically and more than five feet horizontally from any metal structure. Where temporary conductors are installed in any area that is likely to be subjected to vehicle traffic, or mobile construction equipment, the vertical clearance to ground shall be at least 18 feet when measured at the lowest point. Where power conductors are to be supported by a span wire, the span wire shall be properly grounded.
- Existing conduit containing service conductors uncovered during the construction process shall be repaired in a timely manner in accordance with the NEC. Existing non-metallic conduit exposed during construction shall not be left exposed above grade, or with less than eighteen inches of cover, without protective methods approved by the Engineer.

Texas Department of Transportation
Traffic Operations Division

**ELECTRICAL DETAILS-
CONDUCTORS**

ED(2)-03

| REVISIONS | DATE | BY | CHKD. | APP'D. | DATE | BY | CHKD. | APP'D. |
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| 10-93 | | | | | | | | |
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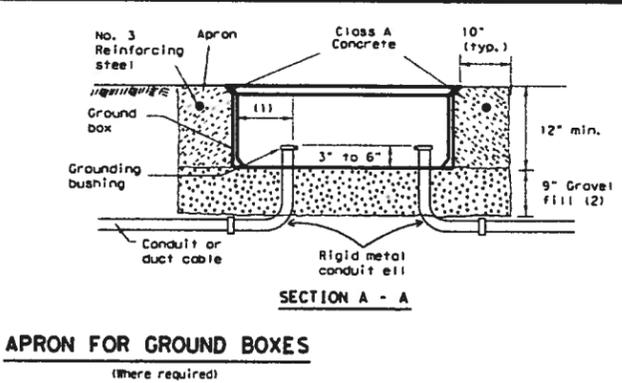
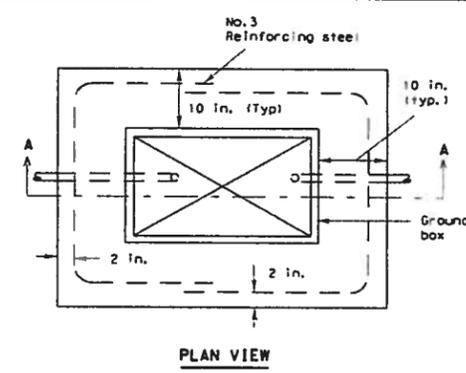
II. GROUND RODS

A. MATERIALS

- All ground rods installed at electrical services, including supplemental lightning protection ground rods specified by the plans in other locations such as pole bases, shall be copper clad and UL listed. Rods shall be a minimum diameter of 5/8 inch. The length shall be a minimum of 8 feet. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets.
- Ground rod clamps shall be listed to be in direct contact with the soil. Where concrete encasement is required, the clamp shall be listed for concrete encasement.

B. CONSTRUCTION METHODS

- Ground rods installed in locations such as pole bases, to provide supplemental lightning protection need not be totally in contact with the soil. Where called for in the plans, rods may be encased in soil or concrete or any combination of soil and concrete. When concrete encased, the connection of the conductor to the rod shall be readily accessible for inspection or repairs. When driven into the soil the upper end shall be between 2 to 4 inches below finished grade. Ground rods shall not be placed in the same drilled hole as a flagger pole.
- Ground rods shall be installed such that the end lap-jointed with the rod's part number is installed as being the upper end.
- Non-conductive coatings such as concrete spatter shall be removed from the rod at the clamp location.
- Routing of lightning protection ground rod wires shall be run as short and straight as possible. Where bends are required they shall have a minimum radius of four inches.
- Unless specifically called for by the plans, conduits used for ground rod wires shall be non-metallic. Where metal conduits are specified, a grounding bushing and properly sized bonding jumper shall be provided and properly installed on each end.
- Where rocky soil or a solid rock bottom is encountered when driving a ground rod and the horizontal trench placement method is the only viable solution, written authorization from the Engineer must be obtained.



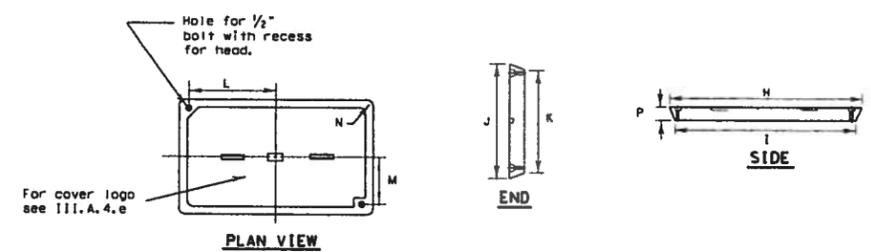
APRON FOR GROUND BOXES
(Where required)

III. GROUND BOX

A. MATERIALS

- Ground boxes 16x30x24 inches (HxLxD) or smaller shall be polymer concrete of the type required by the descriptive code shown elsewhere. Larger ground boxes shall be as shown elsewhere in the plans.
- All ground boxes and covers shall be permanently marked either by impress or by permanent ink, with manufacturer's model number and manufacturer's name or logo.
- Covers shall be bolted down, and bolt holes in the box shall be arranged to drain dirt.
- Ground box types A, B, C, D & E shall meet the following requirements:
 - Ground boxes and covers be manufactured from polymer concrete reinforced with continuous strands of woven or stitched borosilicate fiberglass cloth. The polymer concrete shall be made from catalyzed polyester resin, sand and aggregate, and shall have a minimum compressive strength of 11,000 psi. Polymer concrete containing chopped fiberglass or fiber-glass reinforced plastic is not acceptable.
 - Minimum inside dimensions shall be as follows (width x length x depth):
 - Type A shall be 11.5 inches x 21 inches x 10 inches, (122311)
 - Type B shall be 11.5 inches x 21 inches x 20 inches, (122322)
 - Type C shall be 15.25 inches x 28.25 inches x 10 inches, (162911)
 - Type D shall be 15.25 inches x 28.25 inches x 20 inches, (162922)
 - Type E shall be 11.5 inches x 21 inches x 16 inches, (122317)
 - Bottom edge of box or extension shall be faced with a minimum 1/4 inch flange.
 - Ground boxes shall withstand 600 lbs. per sq. ft. applied over the entire sidewall with less than 1/4 inch deflection per foot length of box. Ground boxes and covers shall withstand a test loading of 20,000 lbs. over a 10 inch by 10 inch area centered on the cover with less than 1/2 inch deflection. Ground boxes and covers shall meet Western Underground Standards 3.6. Manufacturer shall supply certification by an independent laboratory or sealed by a Texas-Licensed Professional Engineer.
 - Covers shall be 2 inch (nominal) thick polymer concrete. All hardware shall be stainless steel. Cover shall be secured with two 1/2 inch stainless steel bolts. Bolts shall be self-retaining and shall withstand a minimum of 70 ft-lbs. torque and shall have a minimum 150 lbs. straight pull out strength. Nuts shall be floating and shall provide a minimum of 1/2 inch movement from the center of the nut. Covers shall be skid resistant, minimum 0.5 coefficient of friction. Covers shall be interchangeable between manufacturers and shall conform to the dimensions shown herein. Unless otherwise approved by the Engineer, cover shall be legibly imprinted with the following words in minimum 1 inch letters:
 - Ground boxes containing wiring for traffic signals shall be labeled, Danger High Voltage Traffic Signal.
 - Ground boxes containing wiring for illumination systems shall be labeled, Danger High Voltage Illumination.
 - Ground boxes containing wiring for traffic management systems shall be labeled, Danger High Voltage Traffic Management.
 - Ground boxes containing wiring for sign illumination systems shall be labeled, Danger High Voltage Sign Illumination.
 - Ground boxes containing wiring for traffic signals that also contain illumination, powered by the signal electrical service, shall be labeled, Danger High Voltage Traffic Signal.

- Final position of end of conduit shall not exceed one-half the distance to the side of box opposite the conduit entry.
- Place gravel "under" the box, not "in" the box. Gravel should not encroach on the interior volume of the box.
- Install bushing on the upper end of all ells.
- Where a ground rod is present in the ground box, connect it to any and all equipment grounding conductors using a listed connector.
- Maintain sufficient space between all conduits so as to allow for proper installation of bushings.
- All conduits shall be installed in a neat and workmanlike manner.
- All conduits installed in the ground box shall be sealed after completion of conductor installation and any required pull tests. Silicone shall not be used as sealant.



GROUND BOX COVER

| BOX SIZE | DIMENSIONS (INCHES) | | | | | | | |
|----------|---------------------|--------|--------|--------|--------|-------|-------|---|
| | H | I | J | K | L | M | N | P |
| A, B & E | 23 1/4 | 23 | 13 3/4 | 13 1/2 | 9 1/8 | 5 1/8 | 1 3/8 | 2 |
| C & D | 30 1/2 | 30 1/4 | 17 1/2 | 17 1/4 | 13 1/4 | 6 3/4 | 1 3/8 | 2 |

B. CONSTRUCTION METHODS

- Ground boxes shall be set on a 9 inch (minimum) bed of aggregate from 3/4" up to 2" in size. Aggregate shall be in place prior to setting box and conduits shall be capped. Any gravel or dirt in conduit shall be removed.
- When required by item descriptive code, construction of an apron encasing a ground box including concrete and reinforcing steel shall not be paid for directly but shall be subsidiary to the ground box. Reinforcing steel may be field bent. Concrete for aprons shall be considered miscellaneous concrete for testing purposes. Aprons shall be cast in place.
- Conduit notes may be cut in the walls of type B & D boxes at least 18 inches beneath the cover.
- If, within the limits of this project, the Contractor must utilize an existing ground box equipped with a metal cover, the Contractor shall bond the cover to the grounding conductor with a 3 foot long flexible stranded jumper the same size as the grounding conductor. Connection of bonding jumper to metal ground cover shall not be paid for directly but shall be subsidiary to various bid items. The box(es) must be clearly shown on the plans with plan notes fully describing the work required.
- If there are other ground boxes with metal covers within the project limits but not involved in the contract, the Engineer may direct the Contractor to ground the covers, designating and identifying the specific boxes in writing. This work will be paid for separately.
- Termination to metal ground box covers shall be made using a tank ground type lug.

Texas Department of Transportation
 Traffic Operations Division

**ELECTRICAL DETAILS-
GROUND BOXES**

ED(3)-03

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|----------------|----------------------|-----------|----------|-----------|----------|
| 5/03 Revision | © 1x001 January 1992 | DWG 1x001 | CR 1x001 | DW 11001 | CR 1x001 |
| Revised notes. | 4-98 REVISIONS | CONF | SECT | JOB | HIGHWAY |
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ELECTRICAL SERVICES NOTES

All work, materials, services, and incidentals, whether or not specifically shown on the plans, which may be necessary for a complete and proper electrical service installation as specified in the plans to obtain electrical power shall be paid for, performed, furnished and installed by the Contractor. The Contractor shall contact the Utility for metering and shall comply with all Utility requirements.

Primary line extensions, connection charges, meter charges, and other charges by the Utility company to provide power to the location shown, when required, shall be paid for under "force account" work. The costs associated with these charges shall be approved by the Engineer prior to engaging the Utility company to do the work. The Contractor shall consult with the appropriate Utility to determine costs and requirements, and shall coordinate the Utility's work as approved by the Engineer. The Contractor shall be reimbursed only the amount billed by the Utility. No additional amount for supervision of the Utility's work will be paid.

Materials shall be new and unused, materials and installation shall comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards and shall be Underwriters Laboratories (UL) Listed. Electrical Service Data, conductors, disconnects, conductors, circuit breaker panel sizes, and branch circuit breakers, shall be as shown in the Electrical Service Data elsewhere in the plans. Faulty fabrication or poor workmanship in any material, equipment, or installation shall be justification for rejection.

The Contractor shall submit for approval no less than six (6) copies of catalog cut sheets on electrical service materials. Submittals shall be legible and shall be marked to indicate which product on a cut-sheet is to be supplied. Where manufacturers provide warranties and guarantees as a customary trade practice, Contractor shall furnish to the State such warranties or guarantees.

The Contractor shall provide locks keyed with Master #2195 for all lockable electrical enclosures. Keys and locks become property of the State. Unless otherwise approved by the Engineer, enclosures shall not be energized until locks are provided and all bolts are installed.

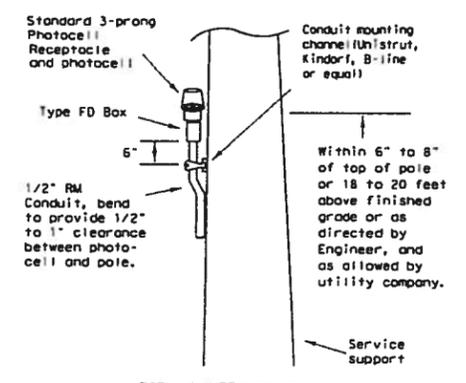
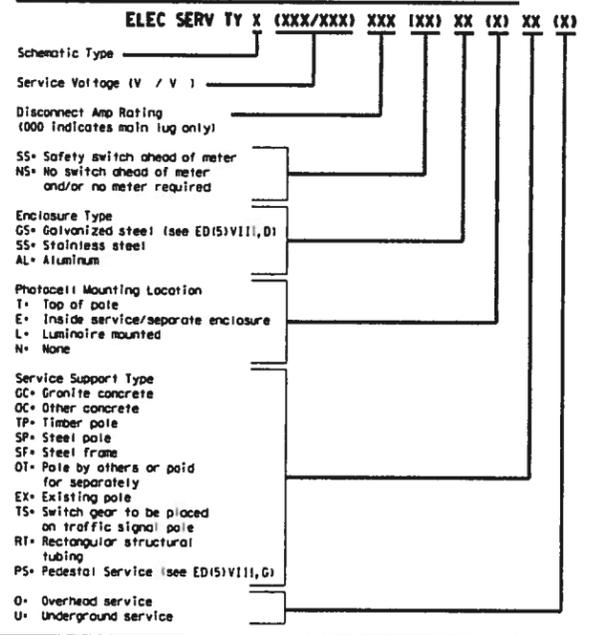
Circuit directories, where provided, shall be filled out. All breakers and components in shop built panels and enclosures shall be labeled with cap-colored plastic labels. Letters shall be a minimum 3/8" in height.

Enclosures with external disconnects that de-energize all equipment inside the enclosure, need not have dead front trim, except that incoming line terminations shall be protected from incidental contact.

When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used. All wiring and components shall be rated for 75 degrees C. Minimum size for service entrance conductors shall be #6 XHHW.

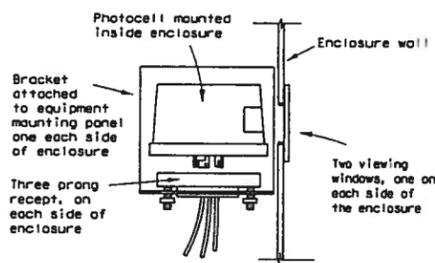
- Safety Switch. A safety switch, placed ahead of the meter, shall only be used when specified by the Utility and when shown on the Electrical Service Data. The switch shall be UL Listed, heavy duty type, 600 volt, unfused, with a UL type 3R enclosure and equipped with a solid neutral (s/n) assembly. The switch shall be lockable in the "on" position.
- Service Type. Electrical service types A, C, D, and T shall be as schematically detailed on ED(4) or ED(5). Other service types shall be as detailed elsewhere on the plans.
- Branch Circuit Breakers. Circuit breakers shall be thermal magnetic and have a minimum interrupting capacity of 10,000 amps and a voltage rating compatible with their use. Circuit breakers shall be sized as shown in the electrical service data. Circuit breakers in panelboards and load centers shall be full size and designed exclusively for the panelboard or load center in use. Tandem and half-width breakers shall not be used. All circuit breakers shall be permanently and clearly marked identifying the circuit or device supplied. Circuit breakers shall be UL Listed to UL489.
- Circuit Breaker Panelboards. Panelboards shall be UL Listed. Panelboards shall have copper buses, a minimum of 6 one-pole spaces or as required in the electrical service data, and when required will be rated for service equipment. Enclosure shall meet or exceed UL type 3R classification. Panelboards shall have a threaded hub conduit entry for conduit entering the top of the enclosure. Circuit breakers shall be bolt-in type only.
- Circuit Breaker Load Center. Load centers shall be UL Listed. Load centers for type T services may have copper or aluminum buses, all other load centers will be copper bus only. Load center will have a minimum of 4 one-pole spaces, and shall be rated for service equipment. Enclosure shall meet UL type 3R classification. Load centers shall have a threaded hub conduit entry for conduit entering the top of the enclosure. Circuit breakers shall be plug-in type only. Load centers for type T services shall accommodate a maximum of 6 one-pole breakers.
- Separate or Auxiliary Enclosure. Separate enclosures for HDA, photocell and lighting contactors for types D & T Services shall be a UL Listed assembly with outer door. Interior shall have dead front trim. HDA switch operator shall extend through the dead front trim. Photocell shall be mounted inside the enclosure as described in paragraph XIII when required by descriptive code. Separate enclosures shall meet the construction requirements of paragraph VIII. E, except that separate enclosure shall not have external operating handle, need not have a data pocket and door may latch on only one point. All equipment may be located in one enclosure instead of two, when approved by the Engineer.
- Where a type D or T service is provided, laminated "as built" drawings are required as shown on ED(5) VIII E; shall be delivered before completion of the work, to the Engineer in lieu of placement within these smaller enclosures. Conduit may not enter the back wall of a service enclosure penetrating the equipment mounting panel. Provide grounding bushings on all metal conduits, terminate bonding jumper to grounding bus. Grounding bushing is not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss such as a meter base.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE



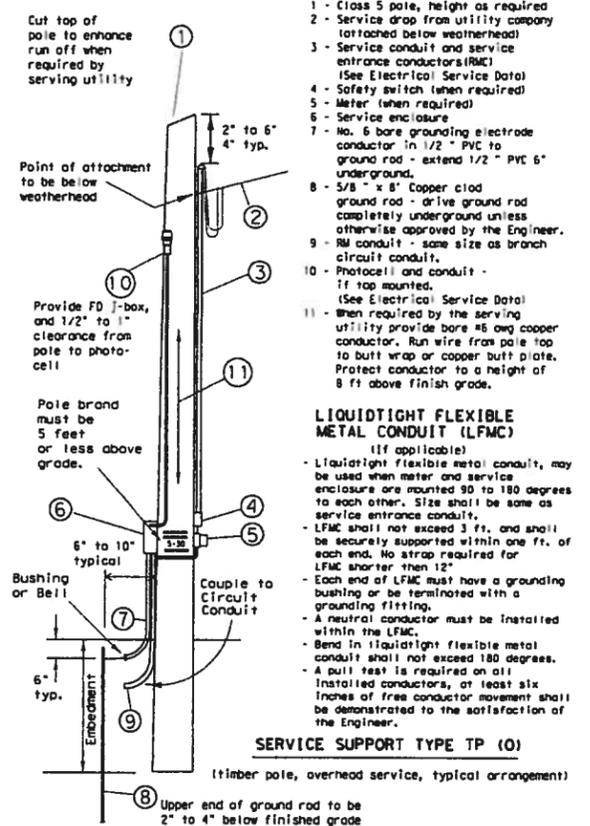
TOP MOUNTED PHOTOCELL

Conduit support spacing 3 feet from enclosure; 5 feet max.



ENCLOSURE MOUNTED PHOTOCELL

For photocell specifications see ED(5), XIII.



LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

(If applicable)

- Liquidtight flexible metal conduit, may be used when meter and service enclosure are mounted 90 to 180 degrees to each other. Size shall be same as service entrance conduit.
- LFMC shall not exceed 3 ft. and shall be securely supported within one ft. of each end. No strap required for LFMC shorter than 12".
- Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting.
- A neutral conductor must be installed within the LFMC.
- Bend in liquidtight flexible metal conduit shall not exceed 180 degrees.
- A pull test is required on all installed conductors, at least six inches of free conductor movement shall be demonstrated to the satisfaction of the Engineer.

SERVICE SUPPORT TYPE TP (O)

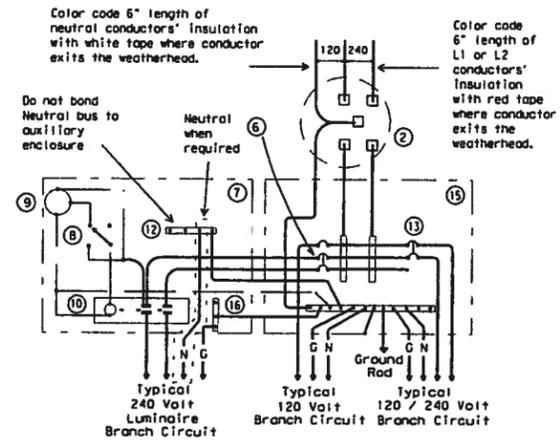
(timber pole, overhead service, typical arrangement)

TIMBER POLE NOTES

- Conduit and electrical conductors attached to the electrical service pole and underground within 12 inches of service pole shall not be paid for directly but shall be subsidiary to the service pole.
- Pole top mounted photocell, install on north side of pole or in service enclosure as required. See Electrical Service Data.
- Attach meter and service equipment with stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Gain pole as required to provide flat surfaces for each strut. Paint ends of galvanized channel with zinc rich paint. Gain depth 5/8" max. Gain height 1 7/8" max. Strut to be 1" max. deep, and 1 5/8" wide max. Secure each strut section to timber pole with two galvanized or SS lag bolts, 1/4" diameter min. by 1 1/2" length min. Place flat cut galvanized or SS washer on each lag bolt. Gain pole in a neat and workmanlike manner.
- Embedment depth shall be as required in Item 627 Treated Timber Poles.
- Poles trimmed for excess length shall be trimmed from the top end only.

SCHEMATIC LEGEND

- 1 - omitted
 - 2 - Meter (when required)
 - 3 - Service Assembly Enclosure
 - 4 - Main Disconnect Breaker (Not Used)
 - 5 - Omit
 - 6 - Circuit Breaker, 15 Amp typical for control circuit wiring
 - 7 - Auxiliary Enclosure
 - 8 - Control Station ("N-O-A" Switch)
 - 9 - Photo Electric Control (enclosure-mounted shown)
 - 10 - Lighting Contacter
 - 11 - Power Distribution Terminal Blocks (Not Used)
 - 12 - Neutral Bus required when 120 v. lights are controlled by lighting contactor
 - 13 - Branch Circuit Breaker (See Electrical Service Data)
 - 14 - Circuit Breaker Panelboard (Not Used)
 - 15 - Load Center
 - 16 - Ground Bus
- Power Wiring
— Control Wiring
— N - Neutral Conductor (when required to serve 120 v. loads only)
— G - Equipment grounding conductor-always required



SCHEMATIC TYPE I

120/240 VOLTS - THREE WIRE
Install photocell and lighting contactor when shown on Electrical Service Data.

Texas Department of Transportation
Traffic Operations Division

**ELECTRICAL DETAILS-
SERVICE SCHEMATICS AND
SUPPORT-TYPE TP (OVERHEAD)**

ED(4)-03

| | | | | | |
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| © TxDOT April 1998 | DWG T300T | REV T300T | REV T300T | REV T300T | REV T300T |
| 12-00 | REV T300T | CONV | SECT | JOB | HIGHWAY |
| 3-03 | | | | | |
| | | | | COUNTY | SHEET NO. |

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**Texas Department
of Transportation**

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

FORT SAM HOUSTON TRANSPORTATION PROJECTS

ED(4)-03

| | | |
|----------------|-----------------------|------------------|
| 100% SUBMITTAL | PROJECT NO.: 40-00015 | DATE: 7/14/2011 |
| DRWN. BY: JS | DSGN. BY: ED | CHKD. BY: ED |
| | | SHEET NO.: 244 D |

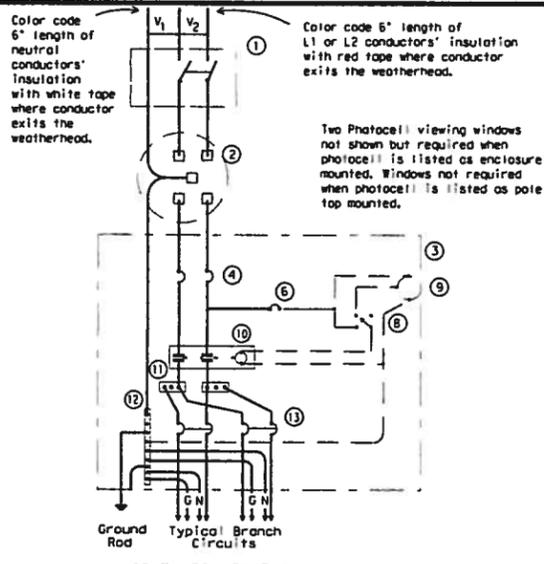
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SERVICE ENCLOSURE NOTES

- VIII. Service Assembly Enclosures. All service assemblies and enclosures shall be UL Listed for the intended purpose.
- A. Shop built or shop assembled service assemblies (all types except Type 1 and Type D without lighting contractor or enclosure mounted photo cell) and all auxiliary equipment enclosures mounted with service equipment and paid for as part of Item 528, "Electrical Services", shall be built or assembled by a UL Listed Industrial Control Panel shop and shall have a unique serial number UL Label with the words "LISTED ENCLOSED INDUSTRIAL CONTROL PANELS". The same or an additional label shall have the name, location, and phone number of the shop, the UL file number of the shop, the shop order or drawing number, date of manufacture or assembly, and the line voltage. The service assembly enclosure shall also be labeled "SUITABLE ONLY FOR USE AS SERVICE EQUIPMENT".
 - B. Conduit entries into the top of enclosures shall have threaded hubs. Conduit entries through the equipment mounting back plate will not be allowed.
 - C. All service enclosure front doors shall be permanently labeled "DANGER HIGH VOLTAGE". Label shall be a self sticking type, intended for outdoor installation. Lettering style, layout and colors of red, black and white shall be as required by OSHA. Label letters shall be 1 to 1 1/2 inches high or as high as the enclosure door width will permit for smaller services. Separate or auxiliary lighting enclosures need not be OSHA labeled when mounted in the same viewing plane as the service enclosure front door, where only one type of load is served by the service. The service door shall be marked using dual-colored plastic labels or self adhesive vinyl weather resistant labels, minimum of 1 inch high applied in a neat and workmanlike manner. On the label will be the service number shown on the plans as well as identifying the load served specifically (i.e., lighting, landscaping, signals, traffic management or other wording as directed by the Engineer). Safety switches need not be OSHA labeled unless specifically required by the serving utility.
 - D. Type GS enclosures will only be allowed for service Types D and T without an enclosure mounted photocell and/or lighting contractor and the Type C panelboard. This spec will allow an "off the shelf" product meeting these specifications to be used. Type GS enclosures shall be made from pre-galvanized steel sheeting, hot dipped galvanized steel, or powder coat painted steel unless shown differently on the plans. Steel enclosures shall be painted inside and outside; galvanized enclosures may be painted. Unless otherwise approved by the Engineer, painted enclosures shall be gray, beige, white or light green. Panelboard/Loadcenter enclosures shall meet UL type 3R requirements, shall have a dead front trim, and an outer padlockable door preventing unauthorized persons from operating contained equipment. Galvanized steel is no longer allowed for Types A, C, or custom-built D or T enclosures. If GS is shown in the descriptive code for any of these, an AL shall be provided.
 - E. Type AL enclosures for service Types A and C shall meet UL type 3R requirements and shall also meet additional requirements of this paragraph. The enclosure shall have both a main disconnect remote operator handle and a door latch handle. Disconnect handles are not acceptable. The main disconnect remote operator shall be flange-mounted, shall interlock the door when in the "on" position, and shall be padlockable in both the "on" or "off" positions. Door latch shall latch at two or more points, operate by a handle separate from disconnect switch and be capable of being locked. Door closure clamps will not be allowed. Lock must be keyed to Master #2135. All the enclosures shall have either a continuous stainless steel piano hinge with stainless steel pin or enclosures less than 30 inches may have two heavy duty hinges, those over 30 inches must have three. Heavy duty two and three point hinges shall have a 0.185 inch minimum diameter electro-zinc plated steel pin or a stainless steel pin. Two point hinged doors shall be rated for 50 lbs of loading. Three point hinged doors shall be rated for 70 lbs of loading. The door shall have an attached data pocket constructed of either thermoplastic or metal. Pocket shall be 12" x 12", unless that size will not fit in enclosure. The pocket shall then be as large as possible, as approved by the Engineer, and mechanically attached with stainless steel nuts and bolts, or stainless steel or aluminum rivets. Enclosure shall include an equipment mounting panel installed inside the enclosure on color studs or tapped bosses, and constructed of a minimum 12 gauge galvanized steel. Equipment mounting panels shall not be painted. Enclosure shall have factory installed external mounting feet. Enclosure door shall be capable of opening at least 130 degrees, with one or other approved means to hold the door open. Only the enclosure exterior will be primed and painted. Paint color shall be beige or gray and shall be powder coat paint as shown below. Condensation drainage shall be provided in the bottom of the enclosure before leaving the factory. The Contractor shall prepare and submit a schematic drawing unique to an individual service. The approved drawing shall be laminated and placed in the document pocket of the service at the time of shipment to the job site. All electrical wiring diagrams and layouts for all equipment and branch breaker circuits supplied by that service shall also be laminated and placed in the document pocket prior to shipping. Type A enclosures for Type D and T services with enclosure mounted photocell and/or lighting contractor shall have the loadcenter interior mounted in an enclosure with properly adapted dead front trim. Types D and T shall not have a loadcenter exterior "can" mounted inside another enclosure meeting these specifications. (Do not put one enclosure inside another enclosure). Types D and T with enclosure mounted photocell and/or lighting contractor shall meet the additional requirements of this paragraph except that remote-operating handle will not be provided.
 - F. Type SS enclosures for Type A and C shall meet all the requirements above for their respective type AL. Type SS enclosures for D and T shall meet all the requirements above for their respective type AL. Stainless Steel shall not be painted.
 - G. PS enclosure shall be as detailed and specified on ED(5). Galvanized steel will not be allowed for any pedestal service. If GS is shown in the descriptive code an AL will be provided.
 - IX. Powder Coat Paint. Powder coating shall be either a polyester thermosetting resin, a zinc rich primer with a T01C triethylene isocyanurate powder overcoating, or a zinc-rich epoxy powder, coated by either electrostatic spray or fluidized bed immersion, high temperature oven cured, high density, low gloss, 4 mil thick (minimum), coating. Adhesion shall meet the 5A or 5B classifications of ASTM D3359. Finish shall be uniform in appearance and free of scratches.
 - X. Main Disconnect. Main disconnect device shall be a circuit breaker, as specified in the Electrical Service Data, shall be two or three pole, and rated for the voltage and ampere specified. Circuit breaker shall be an UL Listed thermal-magnetic circuit breaker controlled by flange-mounted remote operator in the service assembly enclosure when required. Circuit breakers shall have a minimum interrupting rating of 10,000 Amperes. When the utility company provides a transformer larger than 50 KVA, Contractor shall verify that the available fault current is less than the circuit breaker ampere interrupting capacity (AIC) rating and shall provide documentation from the Utility to the Engineer. Documentation shall be submitted at the same time as other electrical submittals. Circuit breaker shall be UL Listed to UL489. No backfed breakers will be allowed for use as a main disconnect.
 - XI. Control Circuit. Control circuit protection shall be 15 amp circuit breaker.
 - XII. Control Station ("H-O-A" Switch). Control station shall be a maintained-contact, three position selector switch in an UL type enclosure. Switch shall be rated 600 volts and shall be fitted with "Hand-Off-Auto" legend.
 - XIII. Photo Electric Control. Photo electric control shall consist of a photocell, internal lightning arrester, and relay or bimetallic switch mounted inside a weatherproof enclosure with standard 3-prong twist lock photocell plug and receptacle. The enclosure shall be made of poly-acrylic with clear acrylic window. Enclosure chassis shall be made thermosetting plastic. The photocell shall have a polyethylene gasket, and shall have a hermetically sealed cadmium sulfide cell. The arrester shall have an enclosed type expulsion arrester rated 2.0 kV sparkover with 5,000 amps follow-through. Relay or switch shall be time delay type with normally closed contacts. Photo electric control shall be rated a minimum of 1800 VA, voltage as required. Enclosure mounted photocells shall be the same as above except that the photocell shall be mounted inside the enclosure. The enclosure shall have two acrylic paneled windows, or other material approved by the Engineer, one on each side of the enclosure. Each window shall be rectangular approximately one inch by two inches, round 2 inch diameter, or as otherwise approved by the Engineer. Bracket and photocell's receptacle will be mounted inside enclosure next to each window. Except for window size, 2" of clearance is required on all sides of photocell for ease of replacement. The photocell's receptacle is held in place by two mounting screws on bracket and located next to each window of the enclosure. The 3-prong twist lock photocell shall be mounted in a position to receive light from the window closest to the photocell. The photocell shall be mounted in a position to receive light from one window. Top of pole mounted photocells shall be mounted as shown on ED(4). The Contractor shall be responsible for proper operation of the photo-electric control. The Contractor shall move and/or adjust or shield the photocell from stray or ambient nighttime light or shall make any other adjustments required for proper operation. The photocell shall face North when practicable. Unless otherwise shown on the plans, the photocell shall turn on the illumination system at 1.0 +/- 0.5 footcandle and turn off the illumination system at two footcandles higher than turn on.
 - XIV. Lighting Contactor. Lighting contactor shall be a UL Listed NEMA rated lighting contactor, two-pole or multiple as required, electrically held type designed to control high pressure sodium lighting loads, with silver alloy double break contacts rated at 240 volts, 480 volts or 600 volts as required. Lighting contactor shall not be the DIN rail mounted type.
 - XV. Power Distribution Terminal Blocks. Power distribution terminal blocks shall be rated for 600 volts and shall be used for line side connections to branch circuit breakers where more than one circuit breaker is required. Lugs on blocks shall be properly sized for conductors being used. Only one conductor shall be placed under each lug.
 - XVI. Neutral/Ground Bus. Neutral/ground bus shall be a factory made bus permanently bonded to the enclosure with properly sized lugs for grounding and neutral conductors.

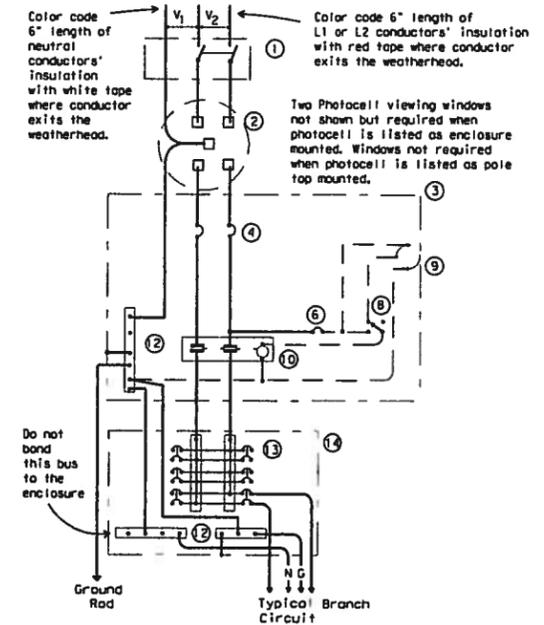
SCHEMATIC LEGEND

- | | |
|---|---|
| 1 - Safety Switch (when required) | 12 - Neutral/Ground Bus |
| 2 - Meter (when required) | 13 - Branch Circuit Breaker (See Electrical Service Data) |
| 3 - Service Assembly Enclosure | 14 - Circuit Breaker Panelboard (See Electrical Service Data) |
| 4 - Main Disconnect Breaker (See Electrical Service Data) | 15 - Load Center |
| 5 - Bolt | |
| 6 - Circuit Breaker, 15amp | |
| 7 - Auxiliary Enclosure | |
| 8 - Control Station ("H-O-A" Switch) | |
| 9 - Photo Electric Control (enclosure-mounted shown) | — Power Wiring |
| 10 - Lighting Contactor | — Control Wiring |
| 11 - Power Distribution Terminal Blocks | — N |
| | — G |
| | — Equipment grounding conductor-always required |



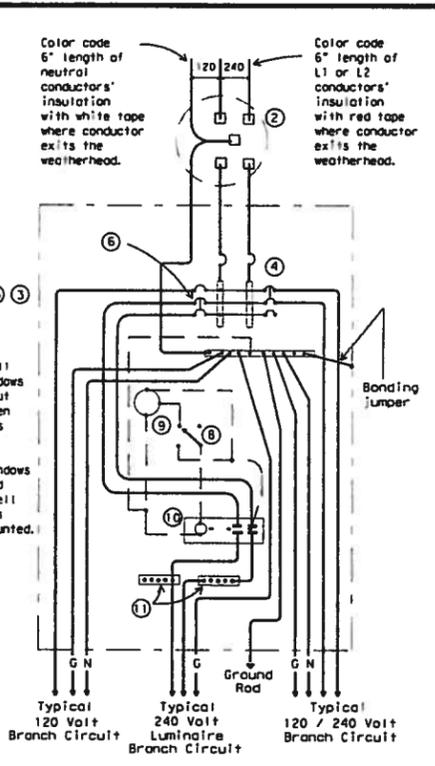
SCHEMATIC TYPE A
THREE WIRE

Maximum feeder circuit size (High Mast Poles):
100 amps for two pole 480V, 125 amps for one or two pole 120V or 240V. Maximum branch circuit size 50 amps.



SCHEMATIC TYPE C
THREE WIRE

Maximum feeder circuit size (High Mast Poles):
100 amps for two pole 480V, 125 amps for one or two pole 120V or 240V. Maximum branch circuit size 50 amps.



SCHEMATIC TYPE D
120/240 VOLTS - THREE WIRE

Install photocell and lighting contactor when shown on Electrical Service Data. See Type D Service Notes.

TYPE D SERVICE NOTES

Photocell and lighting contactor shall be located either in the same UL type 3R enclosure with load center or, if approved by Engineer, in separate enclosure. There shall be a window on each side of enclosure to allow operation of photocell. Both photocell contactor and breaker area shall have dead front trim. Enclosure, except for RT and PS supports, shall not exceed 36 inches in height or 18 inches in width unless approved by the Engineer. If D load center with lighting controls or T/D separate lighting control enclosure shall have power distribution blocks for a minimum of 4 #8 conductors per phase.


ELECTRICAL DETAILS-
SERVICE ENCLOSURE
& NOTES
ED(5) - 03

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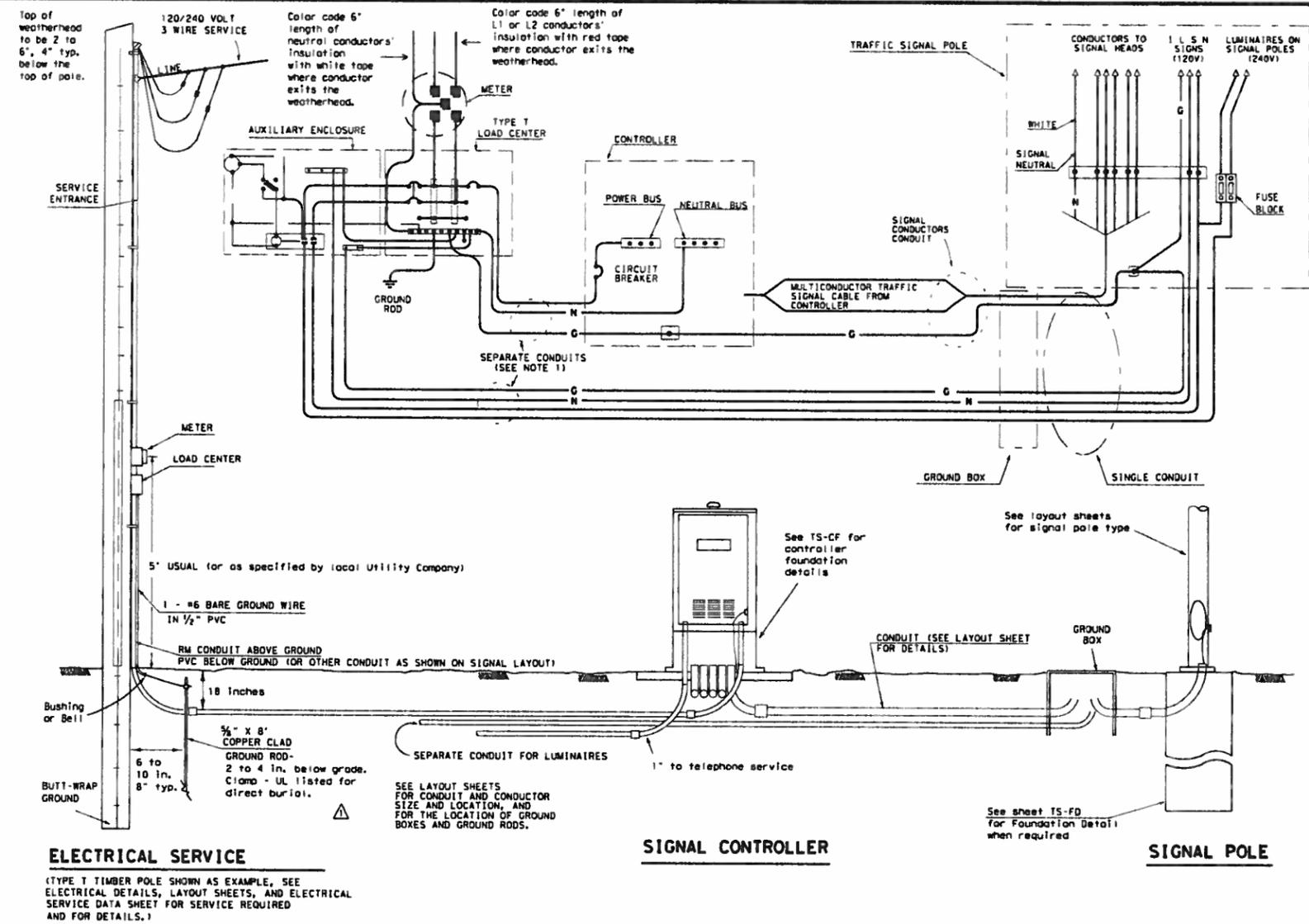

 Texas Department
 of Transportation
CITY OF SAN ANTONIO
 CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT
 FORT SAM HOUSTON TRANSPORTATION PROJECTS
 ED(5)-03

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| 100% SUBMITTAL | PROJECT NO.: 40-00015 | DATE: 7/14/2011 |
| DRWN. BY: JS | DSGN. BY: ED | CHKD. BY: ED |
| SHEET NO.: 244 | | E |

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NOTES:

- Luminaire conductors shall not be looped through controller cabinet.
- Electrical system to include an equipment grounding conductor noted here as "G". All exposed metal parts are to be bonded to grounding conductor.
- Photocell, when required, shall be mounted at top of pole or in enclosure as shown on ED(4) and ED(5) and as required by descriptive code.
- Roadway lighting fixtures, when required, shall be in accordance with the material and construction methods of the item, "Roadway Illumination Assemblies" except for the test period for proper operation of the luminaires. Installed roadway lighting luminaires and internally lighted street name signs shall be tested for proper operation as a part of the associated traffic signal system.
- Internally lighted street name signs (ILSN), when required, shall be in accordance with the item "Internally Lighted Street Name Signs". Because of the electrical isolation of ILSN hinges, a #12 green grounding conductor shall be run to the ILSN fixture.
- Install ground rod at alternate location when directed by the Engineer. Maintain a minimum of 8 ft in contact with the earth.
- Liquidtight flexible metal conduit (LFMC), may be used when meter and service enclosure are mounted 90 to 180 degrees to each other. LFMC shall be same size as service entrance conduit. LFMC shall not exceed 3 ft, and shall be securely supported within one foot of each end. No strap required for a LFMC shorter than 12". Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. A neutral conductor must be installed within the LFMC. Bend in liquidtight flexible metal conduit shall not exceed 180 degrees.
- Minimum embedment depth as per Item 627 Treated Timber Poles.
- Pole to be set plumb.
- Back fill thoroughly tamped in 6 in. lifts. Place 6 inches additional backfill above grade around pole base to allow for settling, as per Item 627.
- Excess pole length shall be trimmed from the top at a slope to aid water run off.
- Gain pole two places for each meter, service, separate or auxiliary enclosure. See ED(4) for details.
- All illumination and power conductors to be pull tested and megged. Do not meg traffic signal cable.
- Enclosures are to be locked, and ground box covers are to be bolted before power is applied to the circuit.
- Conduits entering top of enclosures to be fitted with conduit sealing hub or threaded boss, such as meter hub. Off-set nipple, when required, shall not be zinc-die-cast. All metal conduits not connected to conduit sealing hub, or threaded boss must have a grounding bushing. Terminate bonding jumper to ground bus. All conduits entering enclosures shall be sealed. Silicone shall not be allowed.



Unless shown elsewhere in the plans, electrical service data for Types D and T shall be as follows.

| ELECTRICAL SERVICE DATA | | | | | | | | | |
|--|----------------------------|-----------------------------|--------------------|------------------------------------|-----------------------------|--------------------------------------|---------------|----------------------------|----------|
| ELECTRICAL SERVICE DESCRIPTION (SEE ED(4)) | SERVICE CONDUIT SIZE (RMC) | SERVICE CONDUCTORS NO./SIZE | SAFETY SWITCH AMPS | MAIN DISCONNECT CKT. BRK. POLE/AMP | TWO-POLE CONTACTOR AMPS *** | PANELBD./LOADCENTER AMP RATING (MIN) | CIRCUIT NO. | BRANCH CKT. BRK. POLE/AMPS | KVA LOAD |
| TY D (120/240)070(NS)AL(E)*** | 1 1/4 | 3/#4 | N/A | 2P/70 | 30 | 100 | T.S. Lighting | 1P/50 2P/15 | <7.1 |
| TY T (120/240)000(NS)G(E)*** | 1 1/4 | 3/#4 | N/A | None | 30 | 70 | T.S. Lighting | 1P/50 2P/15 | <7.1 |

*** Eliminate photocell, contactor and separate enclosure if lighting, or internally lighted signs are not required by plans.
 ** See descriptive code in estimate for service support type.
 * See descriptive code in estimate for overhead or underground service.

Texas Department of Transportation
 Traffic Operations Division

ELECTRICAL DETAILS-TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(7)-03

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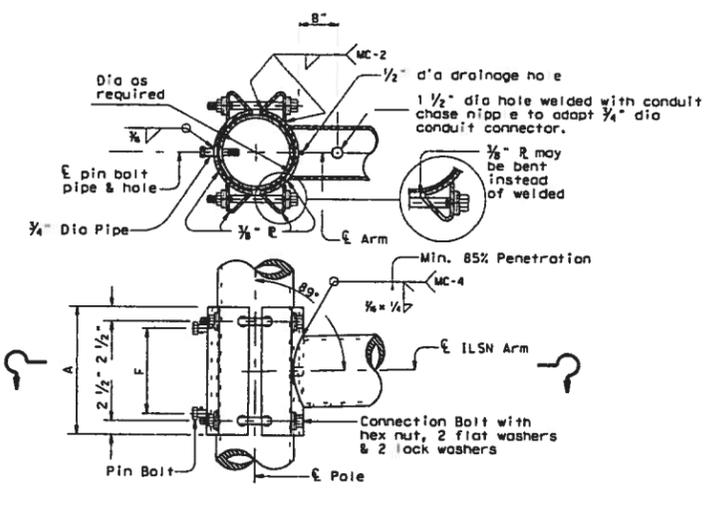
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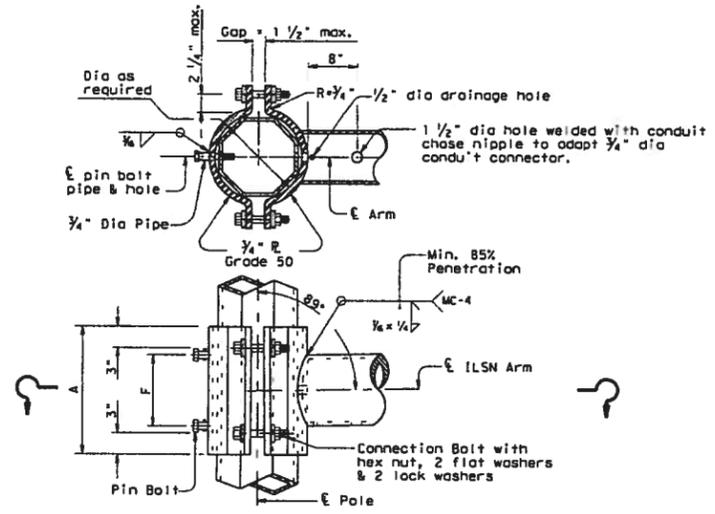
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 Level 98 for English 1.3 for Metric
 Level 99 for English 1.3 for Metric
 Level 100 for English 1.3 for Metric

TABLE OF DIMENSIONS
 for ILSN Support Arm Clamp-on
 Details 1, 2 and 3

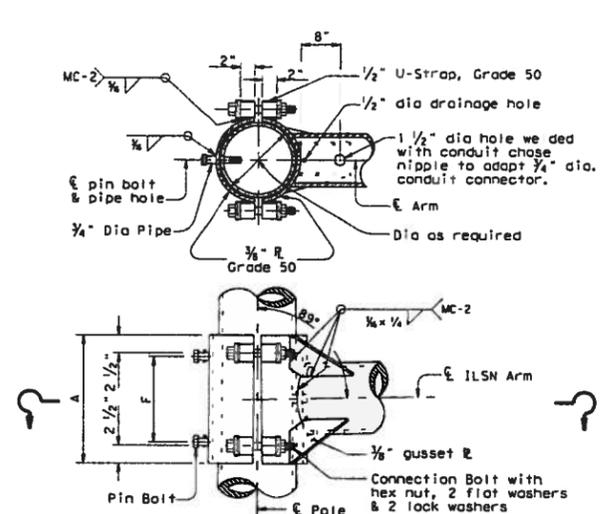
| ILSN ARM SIZE | CONN. BOLTS | | PIN BOLTS | |
|----------------------------------|-------------|-----|-----------|-----|
| | No. | Dia | No. | Dia |
| 3 in. dia Schedule 40 Pipe | 10 | 8 | 4 | 3/4 |



ILSN CLAMP-ON DETAIL 1



ILSN CLAMP-ON DETAIL 2



ILSN CLAMP-ON DETAIL 3

GENERAL NOTES:

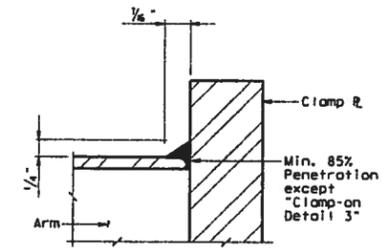
Clamp-on details shall be used for ILSN support arm assemblies. A 1 1/2 inch diameter hole shall be cut in the front clamp plate for wiring access. A matched hole shall be field drilled through the pole to provide wire access after arm is oriented. Deburr both holes.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the details.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and 3/4 inch diameter pipe shall have 3/8 inch diameter holes for a 1/4 inch diameter galvanized cotter pin. Back of clamp plate shall be furnished with a 3/4 inch diameter hole for each pin bolt. An 1/8 inch diameter hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.



CLAMP-ON ARM

ARM BASE WELD DETAILS

Texas Department of Transportation
 Traffic Operations Division

**STANDARD ASSEMBLY
 FOR TRAFFIC SIGNAL
 SUPPORT STRUCTURES**

MAST-ARM CONNECTIONS

MA-C (ILSN)-96

| | | | | | | | | | |
|-------|--------------|------|----|----|-----|------|----|----|-----|
| FILED | MA-CILSN.DGN | DATE | MS | BY | JST | DATE | MS | BY | JST |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

5-96

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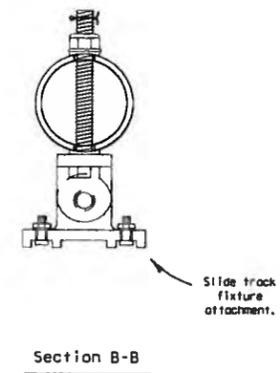
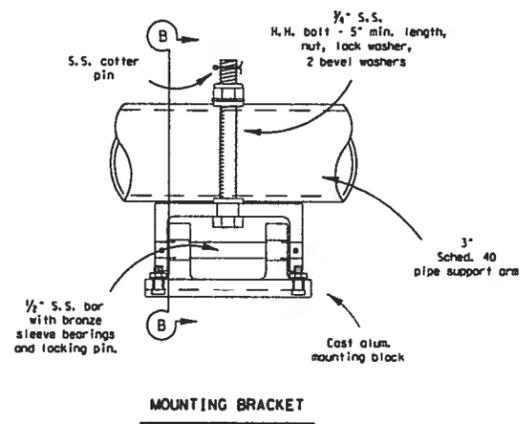
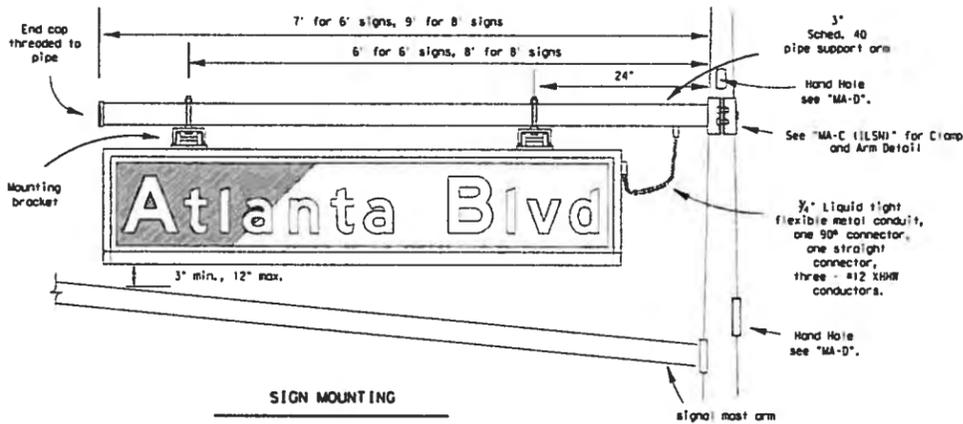
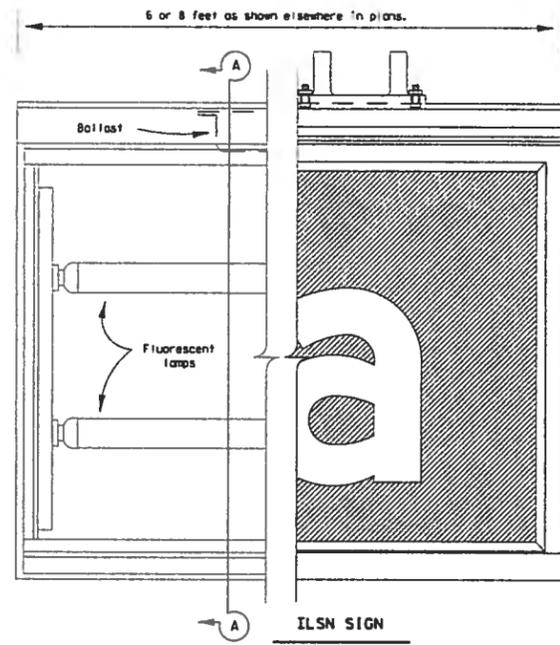
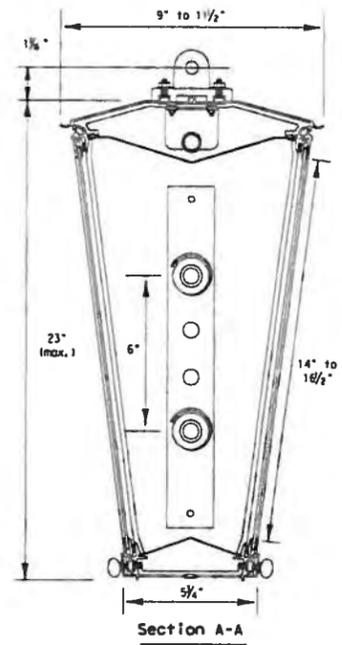
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FORT SAM HOUSTON TRANSPORTATION PROJECTS
 MA-C(ILSN)-96

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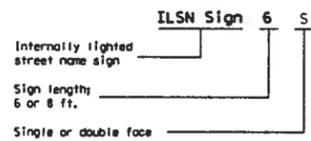
INTERNALLY LIGHTED STREET NAME SIGN DETAILS



ILSN SIGN NOTES:

1. Eight foot ILSN sign shall not exceed 11.5 sq. ft. effective projected area (EPA) and shall not exceed a weight of 85 lbs. Six foot ILSN sign shall not exceed 8.7 sq. ft. EPA and shall not exceed a weight of 70 lbs.
2. Sign message shall be as shown elsewhere in the plans.
3. See Special Specification, "Internally Lighted Street Name Signs" for additional details.

EXPLANATION OF DESCRIPTION



Texas Department of Transportation
 Traffic Operations Division

STREET NAME
 SIGN DETAILS
 (ILLUMINATED)

SNS-95

| | | | | |
|---------------------|-----------|-----------|----------|----------|
| © TxDOT August 1995 | DW: T201 | CR: T201 | DM: T201 | CR: T201 |
| REV: 0105 | CON: T201 | SHEET | JOB | HIGHWAY |
| DIST | COUNTY | SHEET NO. | | |

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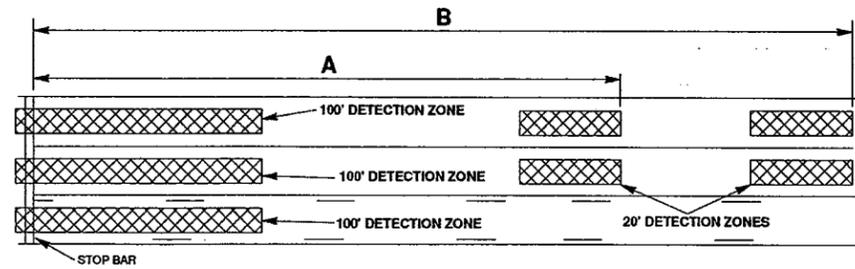
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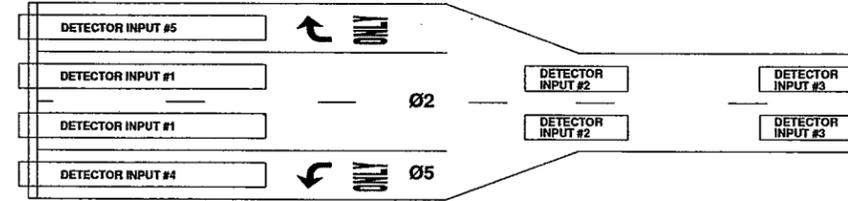
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 SNS-95



SETBACK DETECTION ZONE SPACING

| POSTED SPEED | A | B |
|--------------|------|------|
| 35 MPH | 165' | 270' |
| 40 MPH | 190' | 310' |
| 45 MPH | 210' | 350' |
| 50 MPH | 235' | 390' |
| 55 MPH | 255' | 430' |



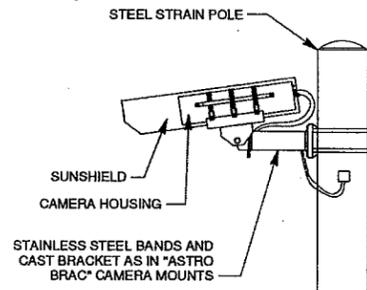
| DETECTOR INPUT # | PHASE |
|------------------|-------------------|
| 1 | Ø2 STOP BAR |
| 2 | Ø2 SETBACK - MID |
| 3 | Ø2 SETBACK - REAR |
| 4 | Ø5 STOP BAR |
| 5** | Ø5 RT LANE |

** SEE NOTE 5

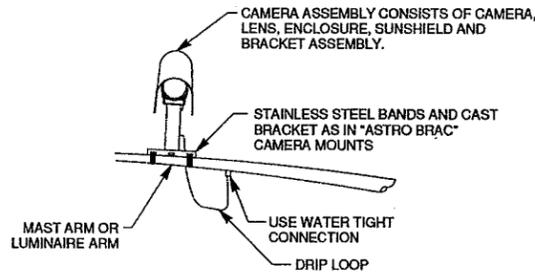
DETECTION PLACEMENT NOTES

1. ALL DETECTOR PLACEMENTS ARE BASED ON THE POSTED SPEED LIMIT
2. SPEEDS EQUAL OR GREATER THAN 35 MPH WILL REQUIRE THE USE OF TWO VIVDS CAMERAS. UTILIZATION OF CAMERA ONE FOR STOP BAR DETECTION AND CAMERA TWO FOR SET BACK DETECTION ZONES.
3. STOP BAR DETECTION ZONES SHALL BE PROVIDED FOR EACH LANE OF EACH APPROACH.
4. STOP BAR DETECTION AND SET BACK DETECTION SHOULD DRIVE A SEPARATE DETECTOR INPUT INTO THE CONTROLLER. IN ADDITION, DETECTORS IN EXCLUSIVE TURN LANES SHOULD DRIVE A SEPARATE DETECTOR INPUT INTO THE CONTROLLER. SEE TYPICAL LAYOUT.
5. WHEN AN EXCLUSIVE RIGHT TURN LANE IS PRESENT, AN EXTENSION MODULE MUST BE USED TO PROVIDE INPUT #5. IN LIEU OF AN EXTENSION MODULE, A SECOND PROCESSOR CARD CAN BE USED FOR THE STOP BAR CAMERA

VIDEO DETECTION PLACEMENT DETAILS

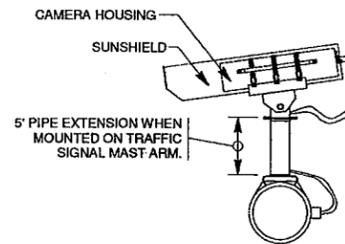


POLE MOUNT



FRONT VIEW

MAST ARM OR LUMINAIRE ARM



SIDE VIEW

TYPICAL VIVDS DETAILS

VIDEO DETECTION NOTES

1. VIDEO DETECTION PROCESSOR UNIT SHALL BE INSTALLED INSIDE CONTROLLER CABINET.
2. VIDEO DETECTION CAMERA & BRACKET SHALL BE INSTALLED AS DETAILED OR AS DIRECTED BY THE ENGINEER.
3. CAMERAS SHALL BE MOUNTED AS FAR OVER THE ROADWAY AS POSSIBLE.
4. STAINLESS STEEL BANDS AND CAST BRACKETS AS IN "ASTRO-BRAC" SHALL BE USED TO INSTALL THE CAMERAS.
5. WHEN AIMING CAMERA, HORIZON SHALL NOT BE VISIBLE IN THE FIELD OF VIEW.
6. CAMERA ENCLOSURE ASSEMBLY SHALL BE ROTATABLE AFTER INSTALLATION TO PROVIDE PROPER ALIGNMENT.
7. ALL CABLE ENTRY AND EXIT POINTS IN THE MAST ARM AND / OR POLES SHALL BE WATER TIGHT.

CITY OF SAN ANTONIO
TRAFFIC MANAGEMENT DIVISION
 DEPARTMENT OF PUBLIC WORKS

TRAFFIC SIGNAL STANDARDS
**VEHICLE DETECTOR
 INSTALLATION DETAILS**

TM-VIVDS-08

| | | | |
|---------|-------|---------------|--------------|
| DRW:MAB | APVD: | DATE: 5-27-08 | SHT. NO. |
| RVSD: | APVD: | DATE: | 1 OF 1 |
| RVSD: | APVD: | DATE: | NOT TO SCALE |

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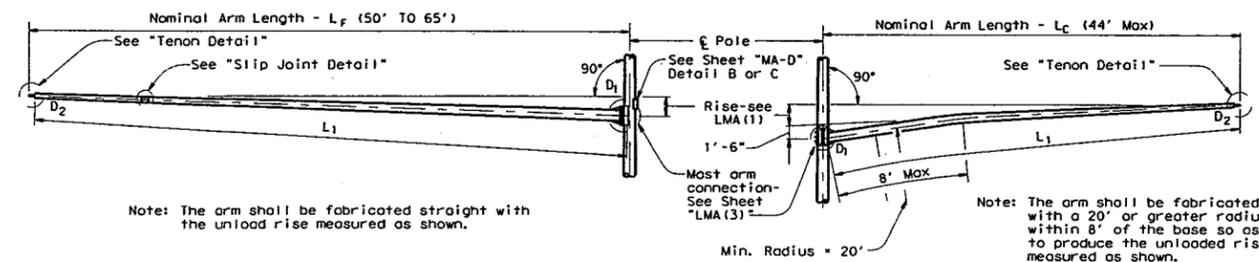
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 CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT
 FORT SAM HOUSTON TRANSPORTATION PROJECTS
TM - VIVDS - 08
 WINANS RD. & HARRY WURZBACH INTERSECTION

| | | |
|----------------|-----------------------|----------------|
| 100% SUBMITTAL | PROJECT NO.: 40-00015 | DATE: 3/8/2011 |
| DRWN. BY: ML | DSGN. BY: ED | CHKD. BY: ED |
| | | SHEET NO.: 245 |

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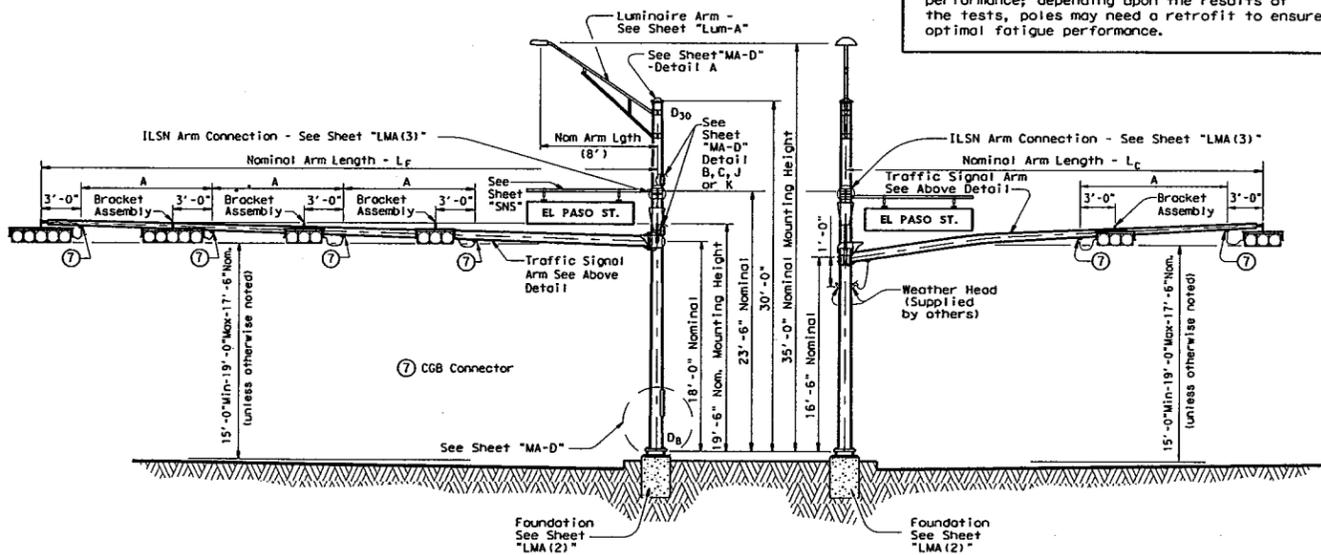


FIXED MOUNT TRAFFIC SIGNAL ARM

CLAMP-ON TRAFFIC SIGNAL ARM

(If required, See DMA-80 or DMA-100 Standard Sheets for Clamp-on Arm Details)

Design also conforms to NCHRP Report 412 for fatigue resistance except that there are no stiffeners at the base plate. TxDOT is conducting tests to determine if stiffeners at the base plate will or will not result in optimal performance; depending upon the results of the tests, poles may need a retrofit to ensure optimal fatigue performance.



ELEVATION
(Showing fixed mount arm)

STRUCTURE ASSEMBLY

ELEVATION
(Showing clamp mount arm)

TABLE OF DIMENSIONS "A"

| | | | | | | | | | | |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Arm Length | 24' | 28' | 32' | 36' | 40' | 44' | 50' | 55' | 60' | 65' |
| Arm Type II | 10' | 11' | 12' | 13' | | | | | | |
| Arm Type III | | | 10' | 11' | 12' | 12' | | | | |
| Arm Type IV | | | | | | | 12' | 12' | 12' | 12' |

VIBRATION WARNING

Mast Arms of approximately 40'-0" or longer are subject to possible harmonic vertical vibrations in light wind conditions due to unusual combinations of signal numbers, weights or positions, arm-wind orientation, and arm-pole stiffness.
 Arms shall be visually inspected in 5 to 20 mph wind conditions after signal head installation and, if vertical movements with a total excursion (max positive to max negative) of more than approximately 8" are observed at arm tip, damping devices or other means shall be fitted to the arm(s).
 The necessary damping device(s) or other remedial measures shall be as recommended by the fabricator. Excessive vibrations shall not be allowed to continue for more than two days.
 If damping plate is used, the size shall be 16" x 66". The plate must be installed directly above traffic light located nearest the free end.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed can be either 100 mph or 80 mph plus a 1.3 gust factor. If clamp-on traffic signal is required, designs are based on an arm included angle of 90 degrees or more. Angles of less than approximately 75 degrees will require a special design.
 Poles are designed to support one 8'-0" luminaire arm, two 9'-0" internally lighted street name signs and two traffic signal arms with limited length combinations. The specified luminaire load applied at the end of luminaire arm equals 75 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.5 sq ft. The specified internally lighted street name sign applied 4'-6" from the centerline of the pole equals 85 lbs vertical dead load plus the horizontal wind load on an effective projected area of 11.5 sq ft. For 50 ft. to 65 ft. fixed-mount mast arm the specified signal load applied at the end of the traffic signal arm equals 310 lbs vertical dead load plus the horizontal wind load on an effective projected area of 52.0 sq ft. (actual area times drag coefficient). For clamp-on mast arm, the specified signal load applied at the end of the traffic signal arms equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft. (actual area times drag coefficient).
 Except as noted in sheets 1 thru 3 of 3, also refer to Standard Sheet "MA-D" for pole details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "IS-FD" for anchor bolt and foundation details.

Fabrication shall be in accordance with the Specifications and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the fabricator must obtain prior to fabrication. Miscellaneous welds which do not call for preapproved weld procedures are nevertheless subject to rejection for poor workmanship. Material, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and the Specifications.

Unless otherwise noted, all parts shall be galvanized in accordance with the Specifications.

Special designs require submission of shop drawings in accordance with the item "Steel Structures".

Texas Department of Transportation
 Traffic Operations Division
TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY
(50 TO 65 FT)
(80 AND 100 MPH WIND ZONE)
 Sheet 1 of 4 LMA(1)-01

| | | | | |
|-------------------|-----------|-----------|-----------|-----------|
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| 4-20-01 | REVISIONS | CONC SECT | JOB | HIGHWAY |
| | | DIST | COUNTY | SHEET NO. |

131A

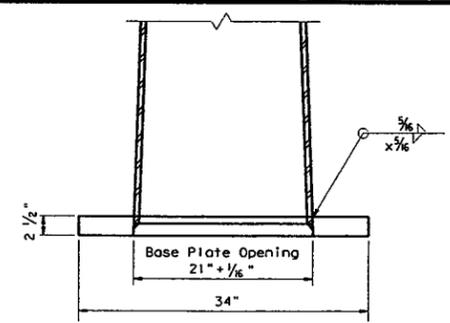
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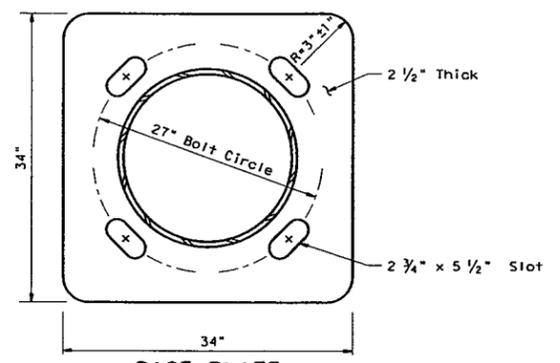
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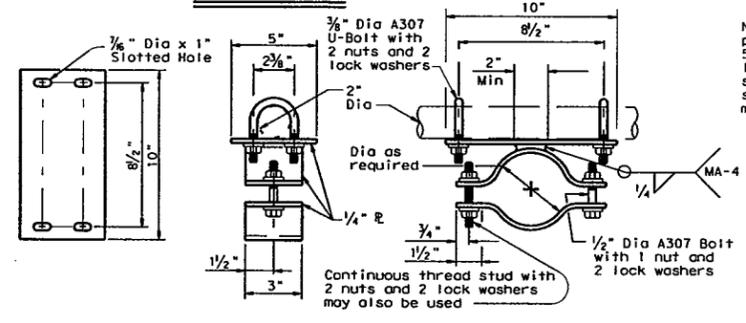
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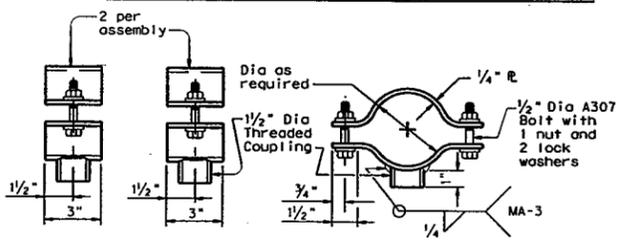
POLE CONNECTION TO BASE PLATE



BASE PLATE



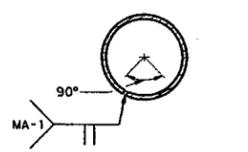
BRACKET ASSEMBLY DETAILS OPTION A



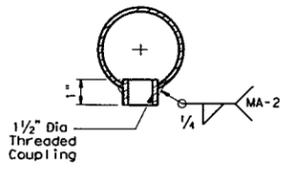
BRACKET ASSEMBLY DETAILS OPTION B



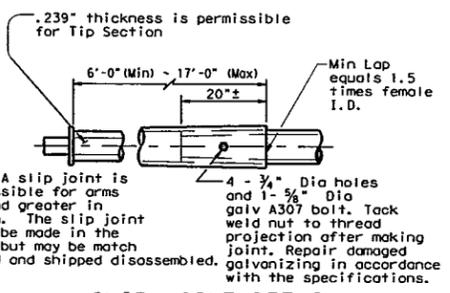
BRACKET ASSEMBLY OPTION C



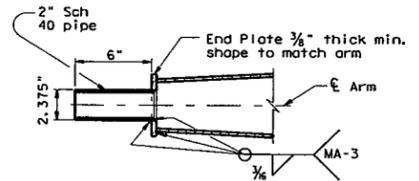
ARM WELD DETAIL



COUPLING DETAIL



SLIP JOINT DETAIL



TENON DETAIL

| Arm Length ft. | ROUND POLES | | | | Foundation Type |
|-------------------|-----------------------|------------------------|------------------------|------------------------|-----------------|
| | D _B in. | D ₁₉ in. | D ₂₄ in. | D ₃₀ in. | |
| 50, 55, 60, 65' | 21.0 | 18.3 | 17.6 | 16.8 | 48-A |

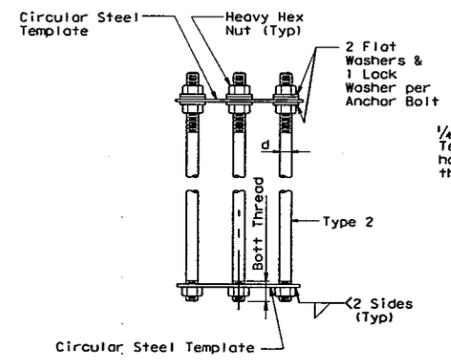
| Arm Length ft. | ROUND ARMS | | | | Rise (±2") |
|-------------------|-----------------------|-----------------------|-----------------------|-------------------------|---------------|
| | L ₁ ft. | D ₁ in. | D ₂ in. | ① <thk </thk in. | |
| 50 | 49 | 18.5 | 11.7 | .3125 | 3'-3" |
| 55 | 54 | 18.5 | 11.0 | .3125 | 3'-7" |
| 60 | 59 | 18.5 | 10.3 | .3125 | 3'-11" |
| 65 | 64 | 18.5 | 9.6 | .3125 | 4'-4" |

D_B = Pole Base O.D.
 D₁₉ = Pole Top O.D. with no Luminaire and no ILSN
 D₂₄ = Pole Top O.D. with ILSN w/out Luminaire
 D₃₀ = Pole Top O.D. with Luminaire
 D₁ = Arm Base O.D.
 D₂ = Arm End O.D.
 L₁ = Shaft Length
 L = Nominal Arm Length

① Thickness shown is minimum, thicker materials may be used.

| FDN TYPE | DRILLED SHAFT DIA | REINFORCING STEEL | | DRILLED SHAFT LENGTH-FT | | | ANCHOR BOLT DESIGN | | | FOUNDATION DESIGN LOAD | | TYPICAL APPLICATION | |
|----------|-------------------|-------------------|----------------|------------------------------------|-----------------|----------------------|--------------------|-------------|-------------|------------------------|-----|---------------------|--------------------|
| | | VERT BARS | SPIRAL & PITCH | TEXAS CONE PENETROMETER N Blows/ft | ANCHOR BOLT DIA | F _y (ksi) | BOLT CIR DIA | ANCHOR TYPE | MOMENT K-ft | SHEAR Kips | | | |
| 48-A | 48" | 20 #9 | #4 at 6" | 21.9 | 19.5 | 14.7 | 2 1/2" | 55 | 27" | 2 | 490 | 10 | Most arm assembly. |

SEE SHEET "TS-FD" FOR ADDITIONAL DETAILS.

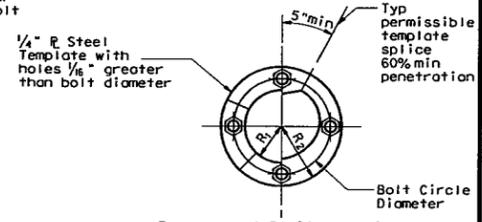


ANCHOR BOLT ASSEMBLY

| ANCHOR BOLT & TEMPLATE SIZE | | | | | | |
|-----------------------------|----------|------------|---------------|-------------|----------------|----------------|
| Bolt Dia in | Length † | Top Thread | Bottom Thread | Bolt Circle | R ₁ | R ₂ |
| 2 1/2" | 5'-3" | 10" | 3" | 27" | 16" | 11" |

† Min dimension given, longer bolts are acceptable.

- Anchor bolt design develops the foundation capacity given under Foundation Design Loads.
- Foundation Design Loads are the allowable moments and shears at the base of the structure.
- Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.
- If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.
- Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.



TEMPLATE DETAIL

Texas Department of Transportation
 Traffic Operations Division
TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY
(50 TO 65 FT)
(80 AND 100 MPH WIND ZONE)
LMA (2) - 01
 Sheet 2 of 4

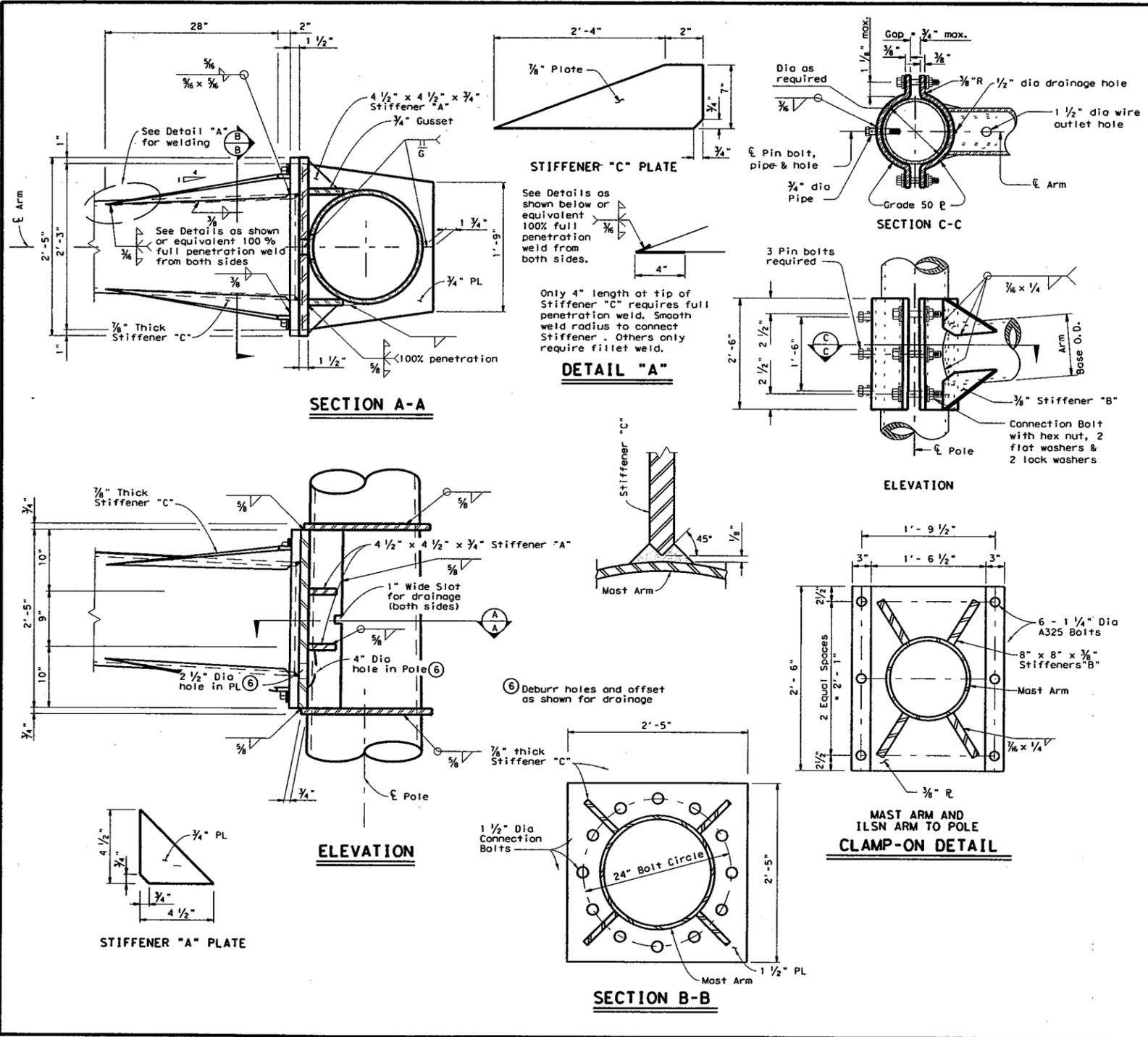
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 CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT
FORT SAM HOUSTON TRANSPORTATION PROJECTS
LMA (2) - 01
 WINANS RD. & HARRY WURZBACH INTERSECTION

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| MATERIALS | |
|----------------------------------|---|
| Round Shafts or Polygonal Shafts | ASTM A595 GR A, ASTM A570 GR 50, ASTM A607 GR 50, ASTM A572 GR 50 or A36M50 |
| Plates (1) | ASTM A36 OR A572 GR 50 OR A595(2) OR A36M50 |
| Connection Bolts | ASTM A325 except where noted |
| Pin Bolts | ASTM A325 |
| Pipe | ASTM A53 GR A or B, or A501 |
| Misc. Hardware | Galvanized steel or stainless steel or as noted |

(1) Any of the materials listed for plates may be used where the drawings do not specify a particular Grade designation.
 (2) If A595 material is used, it need not be cold worked to A595 requirements, but material must have 40 ksi minimum yield prior to fabrication.

GENERAL NOTES:
 Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1 1/2" wide vertical slotted hole may be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1".
 Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast assemblies.
 Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.
 Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

Texas Department of Transportation
 Traffic Operations Division
TRAFFIC SIGNAL SUPPORT STRUCTURES
LONG MAST ARM ASSEMBLY
(50 TO 65 FT)
(80 AND 100 MPH WIND ZONE)
LMA (3) - 01
 Sheet 3 of 4

| | | | | |
|-------------------|-----------|---------|---------|-----------|
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