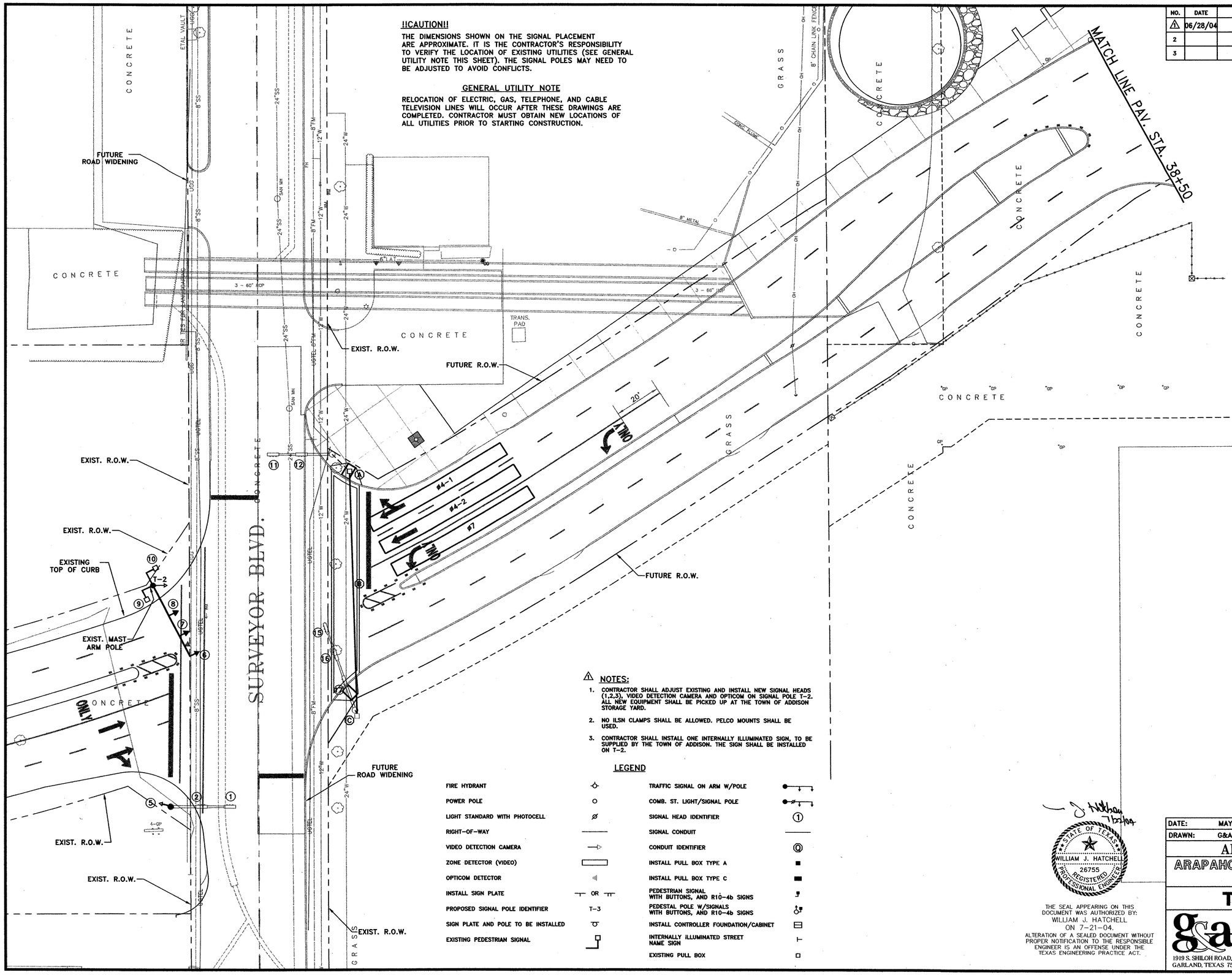
NO.	DATE	REVISION	APPROV.
1	06/28/04	REVISED PER G & A	A.K.C.
2			
3			

!!CAUTION!!

THE DIMENSIONS SHOWN ON THE SIGNAL PLACEMENT ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATION OF EXISTING UTILITIES (SEE GENERAL UTILITY NOTE THIS SHEET). THE SIGNAL POLES MAY NEED TO BE ADJUSTED TO AVOID CONFLICTS.

GENERAL UTILITY NOTE

RELOCATION OF ELECTRIC, GAS, TELEPHONE, AND CABLE TELEVISION LINES WILL OCCUR AFTER THESE DRAWINGS ARE COMPLETED. CONTRACTOR MUST OBTAIN NEW LOCATIONS OF ALL UTILITIES PRIOR TO STARTING CONSTRUCTION.



⚠ NOTES:

1. **CONTRACTOR SHALL ADJUST EXISTING AND INSTALL NEW SIGNAL HEADS (1,2,3), VIDEO DETECTION CAMERA AND OPTICOM ON SIGNAL POLE T-2. ALL NEW EQUIPMENT SHALL BE PICKED UP AT THE TOWN OF ADDISON STORAGE YARD.**
2. **NO ILSN CLAMPS SHALL BE ALLOWED. PELCO MOUNTS SHALL BE USED.**
3. **CONTRACTOR SHALL INSTALL ONE INTERNALLY ILLUMINATED SIGN, TO BE SUPPLIED BY THE TOWN OF ADDISON. THE SIGN SHALL BE INSTALLED ON T-2.**

LEGEND

FIRE HYDRANT	⊙	TRAFFIC SIGNAL ON ARM W/POLE	●—↓
POWER POLE	○	COMB. ST. LIGHT/SIGNAL POLE	●—↓
LIGHT STANDARD WITH PHOTOCELL	⌀	SIGNAL HEAD IDENTIFIER	①
RIGHT-OF-WAY	——	SIGNAL CONDUIT	——
VIDEO DETECTION CAMERA	—▷	CONDUIT IDENTIFIER	⓪
ZONE DETECTOR (VIDEO)	▭	INSTALL PULL BOX TYPE A	■
OPTICOM DETECTOR	⫷	INSTALL PULL BOX TYPE C	▬
INSTALL SIGN PLATE	⊤ OR ⊤	PEDESTRIAN SIGNAL WITH BUTTONS, AND R10-4b SIGNS	
PROPOSED SIGNAL POLE IDENTIFIER	T-3	PEDESTAL POLE W/SIGNALS WITH BUTTONS, AND R10-4b SIGNS	
SIGN PLATE AND POLE TO BE INSTALLED	⊙	INSTALL CONTROLLER FOUNDATION/CABINET	▭
EXISTING PEDESTRIAN SIGNAL		INTERNALLY ILLUMINATED STREET NAME SIGN	⊢
		EXISTING PULL BOX	□

20 0 20 40
scale feet
1"=20'

GENERAL TRAFFIC NOTE:

1. **ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH TOWN OF ADDISON AND TXDOT STANDARDS AND SPECIFICATIONS. IN THE EVENT OF A CONFLICT, TOWN OF ADDISON STANDARDS SHALL GOVERN.**
2. **ALL TRAFFIC SIGNAL WORK SHALL BE BID UNDER THE LUMP SUM BID ITEMS.**

STATE OF TEXAS
WILLIAM J. HATCHELL
26755
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY: WILLIAM J. HATCHELL ON 7-21-04.

ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

163

DATE:	MAY 2004	SCALE:	1"=20'	JOB NO.:	02-320
DRAWN:	G&A	DESIGN:	WJH	REVIEWED:	DWG: 320SIGNAL01.DWG

ARAPAHO ROAD PHASE III

ARAPAHO ROAD AT SURVEYOR BOULEVARD TRAFFIC SIGNAL PLAN

TOWN OF ADDISON

g&a Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS-1

NO.	DATE	REVISION	APPROV.
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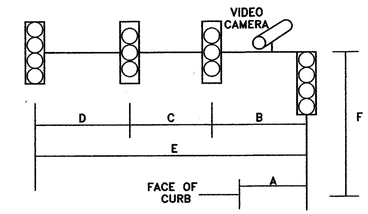
SIGNAL HEAD AND POLE PLACEMENT



SIGNAL HEAD AND POLE PLACEMENT (FEET)							
POLE NO.	A	B	C	D	E	F	FND
T-2	5	15	11	10	36	19	36-A

CABLE TERMINATION CHART

CABLE CONDUCTOR	T-2 (16 CNDR)	
	S.H. NO.	INDICATION
BLACK	1	~~Y~~
WHITE		COMMON
RED	1-3	R
GREEN	1-3	G
ORANGE	1-3	Y
BLUE	1	~~G~~
WHT/BLK		PB COMMON
RED/BLK	9	DW
GRN/BLK	9	W
ORN/BLK	SPARE	
BLUE/BLK	SPARE	
BLK/WHT	PB10	
RED/WHT	10	DW
GRN/BLK	10	W
BLUE/WHT	PB9	
BLK/RED	SPARE	

E = EXISTING

CONDUIT SUMMARY

SIZE	TYPE	LENGTH(LF)
4"	TRENCH	105'

SIGNAL HEADS*

NO.	TYPE	PHASE	BACKPLATE		SIGNAL HEAD		PED. SIG. SEC.
			3 SEC.	4 SEC.	3 SEC.	4 SEC.	
6	V4LT	ø7		1		1	
7-8	V3	ø4	2		2		
TOTALS							

* INSTALLATION ONLY

CONDUIT RUNS

RUN NO.	QUANTITY	SIZE	TYPE	METHOD	#4 XHHW	#12 XHHW	#6 BARE	COAX CABLE	4 CNDR OPTICOM	3 CNDR (VIDEO)	6 CNDR	9 CNDR	16 CNDR	CONDUIT LENGTH	CABLE LENGTH	RUN NO.
A	1	3"	PVC	EXISTING			1	1	1	1			1	10'	15'	A
B	1	4"	PVC	TRENCH			1	1	1	1		1	1	105'	115'	B
C	1	3"	PVC	EXISTING			1	1	1	1			1	8'	12'	C
TOTAL(LF)							147'	147'	147'	147'		105'	147'			

RAILROAD PRE-EMPTION SEQUENCE

NOTES:

1. UPON TRACK CLOSURE, THE CONTROLLER WILL IMMEDIATELY TIME THE APPROPRIATE YELLOW INTERVAL AND TRANSFER TO THE PRE-EMPTION SEQUENCE.
2. THE PRE-EMPTION SEQUENCE WILL DISPLAY THE FOLLOWING SIGNAL HEAD COLORS.
   - SIGNAL HEADS 11, 12, AND 15 RED
   - SIGNAL HEADS 1, 2, 6, 7, 8, 16, AND 17 GREEN
3. WHEN THE TRACK CIRCUIT RELEASES, THE CONTROLLER WILL PLACE A CALL ON ALL PHASES, TIME THE AMBER FOR ø 8, RETURN TO ø 1+6 AND RESUME NORMAL OPERATION.

STATE OF TEXAS
WILLIAM J. HATCHELL
26755
REGISTERED PROFESSIONAL ENGINEER

7/22/04

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WILLIAM J. HATCHELL
ON 7-21-04.
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164

DATE:	MAY 2004	SCALE:	1"=20'	JOB NO.:	02-320
DRAWN:	G&A	DESIGN:	WJH	REVIEWED:	DWG: 320SIGNAL01.DWG

ARAPAHO ROAD PHASE III

ARAPAHO ROAD AT SURVEYOR BOULEVARD SIGNAL LAYOUT TABLE

TOWN OF ADDISON

g&a Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS-2

NO.	DATE	REVISION	APPROV.
1			
2			
3			

20 0 20 40
scale feet

!!CAUTION!!

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GENERAL UTILITY NOTE

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STATE OF TEXAS
WILLIAM J. HATCHELL
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REGISTERED PROFESSIONAL ENGINEER

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WILLIAM J. HATCHELL
ON 7-14-04.
ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

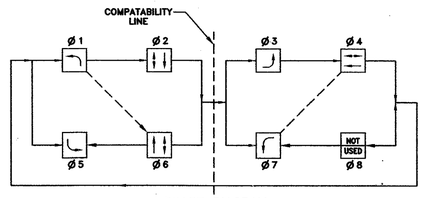
GENERAL TRAFFIC NOTE:

1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH TOWN OF ADDISON AND TXDOT STANDARDS AND SPECIFICATIONS. IN THE EVENT OF A CONFLICT, TOWN OF ADDISON STANDARDS SHALL GOVERN.
2. ALL TRAFFIC SIGNAL WORK SHALL BE BID UNDER THE LUMP SUM BID ITEMS.

PHASE 4 RIGHT TURN WILL OVERLAP WITH PHASE 5

PHASE 5 IS PROTECTED

PHASE 8 RIGHT TURN WILL OVERLAP WITH PHASE 1



PHASE DIAGRAM

LEGEND

FIRE HYDRANT		TRAFFIC SIGNAL ON ARM W/POLE	
POWER POLE		COMB. ST. LIGHT/SIGNAL POLE	
LIGHT STANDARD WITH PHOTOCELL		SIGNAL HEAD IDENTIFIER	①
RIGHT-OF-WAY		SIGNAL CONDUIT	
VIDEO DETECTION CAMERA		CONDUIT IDENTIFIER	
ZONE DETECTOR (VIDEO)		INSTALL PULL BOX TYPE A	
OPTICOM DETECTOR		INSTALL PULL BOX TYPE C	
INSTALL SIGN PLATE	OR	PEDESTRIAN SIGNAL WITH BUTTONS, AND R10-4b SIGNS	
PROPOSED SIGNAL POLE IDENTIFIER	T-3	PEDESTAL POLE W/SIGNALS WITH BUTTONS, AND R10-4b SIGNS	
SIGN PLATE AND POLE TO BE INSTALLED		INSTALL CONTROLLER FOUNDATION/CABINET	
EXISTING CONDUIT		INTERNALLY ILLUMINATED STREET NAME SIGN	
EXISTING TRAFFIC SIGNAL		EXISTING PULL BOX	
EXISTING PEDESTRIAN SIGNAL			

165

DATE:	MAY 2004	SCALE:	1"=20'	JOB NO.:	02-320
DRAWN:	G&A	DESIGN:	WJH	REVIEWED:	DWG: 320SIGNAL02.DWG

ARAPAHO ROAD PHASE III

ARAPAHO ROAD AT ADDISON ROAD TRAFFIC SIGNAL PLAN

TOWN OF ADDISON

Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS-3

NO.	DATE	REVISION	APPROV.
1			
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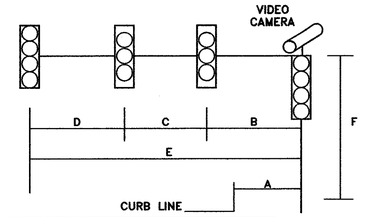
SIGNAL HEAD AND POLE PLACEMENT



SIGNAL HEAD AND POLE PLACEMENT (FEET)							
POLE NO.	A	B	C	D	E		FNA
**T-1	7	27	12	10	44		36-A
*T-2	9	16	–	12	32		
*T-3	9	24	12	12	48		
**T-4	6	15	11	11	40		36-A

* EXISTING
** RELOCATED

SIGNAL POLE CONDUCTORS					
POLE NUMBER	4-CNDR	5-CNDR	7-CNDR		
T-1	65	70	140		
T-3	65	100	140		
T-4	40	100	60		
TOTAL (LF)	170	270	340		

CABLE TERMINATION CHART

CABLE CONDUCTOR	T-1 (16 CNDR)	T-2 (16 CNDR)	*T-3 (16 CNDR)	T-4 (16 CNDR)
	S.H. NO.	S.H. NO.	S.H. NO.	S.H. NO.
WHT/BLK	SPARE	SPARE	SPARE	SPARE
WHITE	COMMON	COMMON	COMMON	COMMON
RED	1-4 R	5-7 R	8-10, 22 R	11-13 R
ORANGE	1-4 Y	5-7 Y	8-10, 22 Y	11-13 Y
GREEN	1-4 G	5-7 G	8-10, 22 G	11-13 G
BLUE	1 ~~G~~	5 ~~G~~	8 ~~G~~	11 ~~G~~
BLACK	1 ~~Y~~	5 ~~Y~~	8 ~~Y~~	11 ~~Y~~
BLUE/BLK	4 ~~G~~	SPARE	22 ~~G~~	SPARE
BLK/WHT	4 ~~Y~~	SPARE	22 ~~Y~~	SPARE
GRN/BLK	14 W	16 W	18 W	20 W
GRN/WHT	21 W	15 W	17 W	19 W
RED/BLK	21 DW	15 DW	17 DW	19 DW
RED/WHT	14 DW	16 DW	18 DW	20 DW
ORN/BLK	PB21 #2	PB16 #4	PB17 #6	PB19 #8
BLUE/WHT	PB14 #4	PB15	PB18 #8	PB20 #2
BLK/RED	P.B. COM	P.B. COM	P.B. COM	P.B. COM

SIGNAL HEADS*

NO.	TYPE	PHASE	BACKPLATE		SIGNAL HEAD		PED. SIG. SEC.
			3 SEC.	4 SEC.	3 SEC.	4 SEC.	
1	V4LT	#7		1		1	
2*	V3	#4		1		1	
3	V3	#4	1		1		
4	V4RT	#4		1		1	
5	V4LT	#1		1		1	
6	V3	#6	1		1		
7	V4RT	#6		1		1	
8	V4LT	#3					
9	V3	#8					
10	V3	#8					
11	V4LT	#5		1		1	
12	V3	#2	1		1		
13	V3	#2	1		1		
14,15	PED	#4P					2
16,17	PED	#6P					2
18,19	PED	#8P					2
20,21	PED	#2P					
22	V4RT	#8		1		1	
TOTALS			4	7	4	7	6

* NEW, ALL OTHERS ARE EXISTING

CONDUIT RUNS

RUN NO.	QUANTITY	SIZE	TYPE	METHOD	*4 XHHW	*12 XHHW	*6 BARE	COAX CABLE	4 CNDR OPTICOM	3 CNDR (VIDEO)	7 CNDR	9 CNDR	16 CNDR	CONDUIT LENGTH	CABLE LENGTH	RUN NO.
A	1	3"	PVC	TRENCH		2	1	1	1	1			1	8'	13'	A
B	1	4"	PVC	BORE		2	1	1	1	1			1	95'	100'	B
C	EXISTING	3"					1	2	2	2			2	10'	15'	C
D	1	3"	PVC	TRENCH			1	1	1	1			1	25'	30'	D
E	1	4"	PVC	BORE		2	1	2	2	2			2	80'	85'	E
F	EXISTING					2	1	2	2	2			2	5'	10'	F
G	EXISTING														10'	G
H	EXISTING					2		2	2	2			2		127'	H
TOTAL(LF)						670	253	617	617	617	0	0	617			

CONDUIT SUMMARY

SIZE	TYPE	LENGTH(LF)
3"	TRENCH	25'
4"	BORE	210'
4"	TRENCH	45'

GROUND BOX SUMMARY

TYPE	EA.
A	2

GENERAL TRAFFIC NOTE:

1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH TOWN OF ADDISON AND TXDOT STANDARDS AND SPECIFICATIONS. IN THE EVENT OF A CONFLICT, TOWN OF ADDISON STANDARDS SHALL GOVERN.
2. ALL TRAFFIC SIGNAL WORK SHALL BE BID UNDER THE LUMP SUM BID ITEMS.

STATE OF TEXAS
WILLIAM J. HATCHELL
26755
REGISTERED PROFESSIONAL ENGINEER

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7/22/04

166

DATE:	MAY 2004	SCALE:	1"=20'	JOB NO.:	02-320
DRAWN:	G&A	DESIGN:	WJH	REVIEWED:	DWG: 320SIGNAL02.DWG

ARAPAHO ROAD PHASE II

ARAPAHO ROAD AT ADDISON ROAD SIGNAL LAYOUT TABLE

TOWN OF ADDISON

g&a Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS-4

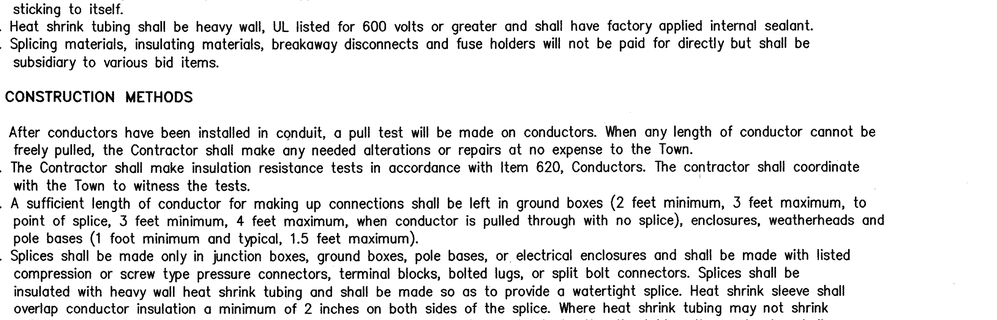
I. ELECTRICAL CONDUCTORS

A. MATERIALS

1. Insulated conductors shall be NEC Type XHHW. Conductors shall be color coded in accordance with the NEC, articles 200, 250, and 310; i.e. Grounded conductors (neutrals) shall be white, Grounding conductors (ground wires) shall be bare or green, Ungrounded conductors (hots) shall be any color except green, white, or gray. Identification of conductors #10 AWG and smaller shall be by continuous jacket color. Color coding of electrical conductors #8 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.
2. 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.
3. Grounding electrode conductor #6 AWG for bonding to ground rod at electrical service, shall be solid. Connection of conductor to ground rod shall be made using UL Listed connectors designed for such purposes.
4. 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 may be either 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.
5. Heat shrink tubing shall be heavy wall, UL listed for 600 volts or greater and shall have factory applied internal sealant.
6. Splicing materials, insulating materials, breakaway disconnects and fuse holders will not be paid for directly but shall be subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. After conductors have been installed in conduit, a pull test will 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 Town.
2. The Contractor shall make insulation resistance tests in accordance with Item 620, Conductors. The contractor shall coordinate with the Town to witness the tests.
3. 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 splice), enclosures, weatherheads and pole bases (1 foot minimum and typical, 1.5 feet maximum).
4. 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 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 build up the conductors insulation 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 Town shall approve each individual splice by conducting a physical inspection of each splice. Heat shrink tape shall be either butyl rubber. When it appears the tubing has been burned, or overheated the tubing shall be considered to be defective.
5. No wire nuts may be used for #8 AWG or smaller conductors in above-ground junction boxes, nor in pole bases or ground boxes.
6. Conductors in illumination poles shall be supported by a J-hook in the top of the pole.
7. All conductors bid under Item 620 shall have breakaway electrical disconnects installed anytime conductors pass through a break-away support.
8. 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.
9. When a conductor or cable has been damaged, or fails to pass an insulation resistance test, the conductor will be replaced.
10. Duct tape, black electrical tape, or wire nuts shall not be allowed to repair a damaged conductor.
11. 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.
12. Conductors connected to break-away in line fuse holders must be installed in accordance with the specific manufactures 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.
13. 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. Water proofing 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.



SPLICE OPTION 1

C-CLAMP

NO.	DATE	REVISION	APPROV.
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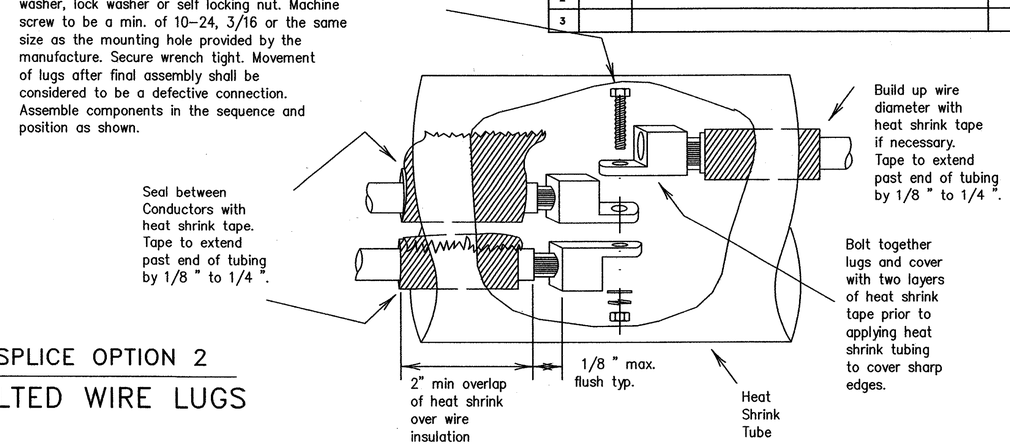
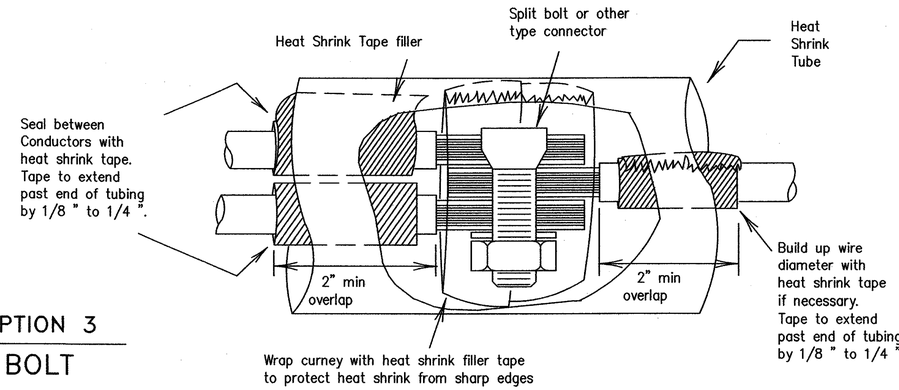


SPLICE OPTION 2

BOLTED WIRE LUGS



SPLICE OPTION 3

SPLIT BOLT

C. TEMPORARY WIRING

1. 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 out doors at grade, supplied from a utility power source, shall be provided with a ground fault circuit interrupter.
2. Residual current protective devices (GFCI) may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Where wire nuts are approved for temporary wiring, they shall be of the self-sealing type.
4. All conductor splices must be contained within a listed enclosure, ground box or 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 a 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.

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THIS DETAIL SHEET WAS OBTAINED FROM TXDOT

167

DATE:	MAY 2004	SCALE:	NOT TO SCALE	JOB NO.:	320
DRAWN:	G&A	DESIGN:	BRG	REVIEWED:	BRG	DWG:	320DETAILS-ELEC

ARAPAHO ROAD PHASE III

STANDARD CONSTRUCTION DETAILS
TRAFFIC SIGNAL ELECTRICAL - SHEET 1

TOWN OF ADDISON

g&a Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS-5

NO.	DATE	REVISION	APPROV.
1			
2			
3			

II. GROUND RODS

A. MATERIALS

1. 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 coated steel and listed by a NRTL. 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.
2. 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

1. 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 by 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 timber pole.
2. Ground rods shall be installed such that the end imprinted with the rod's part number is installed as being the upper end.
3. Non-conductive coatings such as concrete splatter shall be removed from the rod at the clamp location.
4. 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.
5. 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.
6. 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 Town must be aquired.

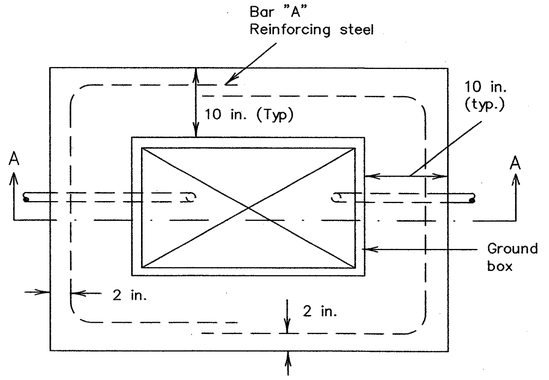
III. GROUND BOX

A. MATERIALS

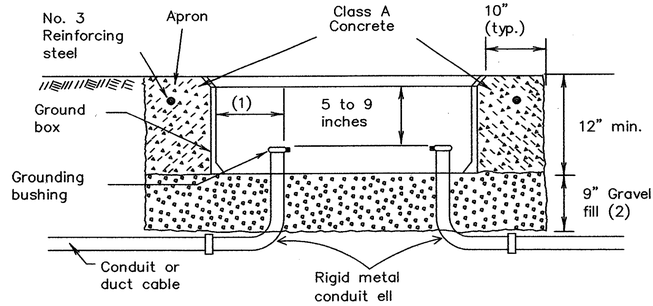
1. Ground boxes 16x30x24 inches (WxLxD) or smaller shall be polymer concrete of the type required by the descriptive code shown elsewhere. Larger ground boxes shall be as shown elsewhere in the plans.
2. All ground boxes and covers shall be permanently marked either by impress or by permanent ink, with manufacturer's model number and manufacturer's name or logo.
3. Covers shall be bolted down, and bolt holes in the box shall be arranged to drain dirt.
4. Ground box Types A, B, C, D & E shall meet the following requirements:
   a. Ground boxes and covers will 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 fiberglass reinforced plastic is not acceptable.
   b. 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)
   c. Bottom edge of box or extension shall be footed with a minimum 1 1/4 inch flange.
   d. 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.
   e. 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 750 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 Signals.
      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.

B. CONSTRUCTION METHODS

1. Ground boxes shall be set on a 9 inch (minimum) bed of coarse No. 1 aggregate as defined by Item 421. Gravel shall be in place prior to setting box and conduits shall be capped. Any gravel or dirt in conduit shall be removed.
2. 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.
3. Conduit holes may be cut in the walls of type B & D boxes at least 18 inches beneath the cover.
4. 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 standed 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.
5. 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.
6. Termination to metal ground box covers shall be made using a tank ground type lug.



PLAN VIEW

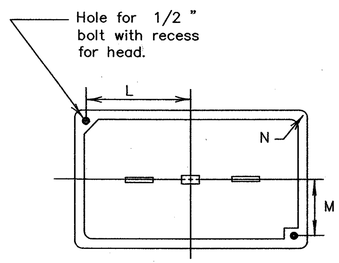


SECTION A – A

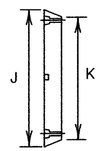
APRON FOR GROUND BOXES

(Where required)

(1) Final position of end of conduit shall not exceed one-half the distance to the side of box opposite the conduit entry.
(2) Place gravel "under" the box. not "in" the box. Gravel should not encroach on the interior volume of the box.
(3) Install bushing on the upper end of all ells.
(4) Where a ground rod is present in the ground box, connect it to any and all equipment grounding conductors using a listed connector.
(5) Maintain sufficient space between all conduits so as to allow for proper installation of bushings.
(6) All conduits shall be installed in a neat and workmanlike manner.



PLAN VIEW



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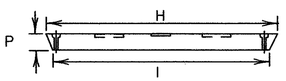

SIDE

GROUND BOX COVER

GROUND BOX COVER DIMENSIONS								
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 7/8	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

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY: WILLIAM J. HATCHELL ON 7-21-04.

ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

THIS DETAIL SHEET WAS OBTAINED FROM TXDOT

168

DATE:	MAY 2004	SCALE:	NOT TO SCALE	JOB NO.:	320
DRAWN:	G&A	DESIGN:	BRG	REVIEWED:	BRG

DWG: 320DETAILS-ELEC

ARAPAHO ROAD PHASE III

STANDARD CONSTRUCTION DETAILS
TRAFFIC SIGNAL ELECTRICAL - SHEET 2

TOWN OF ADDISON

Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS-6

NOTES:

1. Luminaire conductors shall not be looped through controller cabinet.
2. Electrical system to include an equipment grounding conductor noted here as "G". All exposed metal parts are to be bonded to grounding conductor.
3. Photocell, when required, shall be mounted at top of pole or in enclosure as shown on TS-8 and TS-9 and as required by descriptive code.
4. 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.
5. 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.
6. Install ground rod at alternate location when directed by the Town. Maintain a minimum of 8 ft in contact with the earth.
7. Liquidtight flexible metal conduit, may be used when meter and service enclosure are mounted 90 to 180 degrees to each other. LFMC shall not exceed 3 ft. and shall be securely supported within one ft. of each end. 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.
8. Minimum embedment depth as per item 627 Treated Timber Poles.
9. Pole to be set plumb.
10. 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.
11. Excess pole length shall be trimmed from the top at a slope to aid water run off.
12. Gain pole two places for each meter, service, separate or auxiliary enclosure. See ED(4) for details.
13. All illumination and power conductors to be pull tested and megged. Do not meg traffic signal cable.
14. Enclosures are to be locked, and ground box covers are to be bolted before power is applied to the circuit.
15. 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-pressure 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.

ELECTRICAL SERVICE

(TYPE T TIMBER POLE SHOWN AS EXAMPLE, SEE ELECTRICAL DETAILS, LAYOUT SHEETS, AND ELECTRICAL SERVICE DATA SHEET FOR SERVICE REQUIRED AND FOR DETAILS.)

NO.	DATE	REVISION	APPROV.
1			
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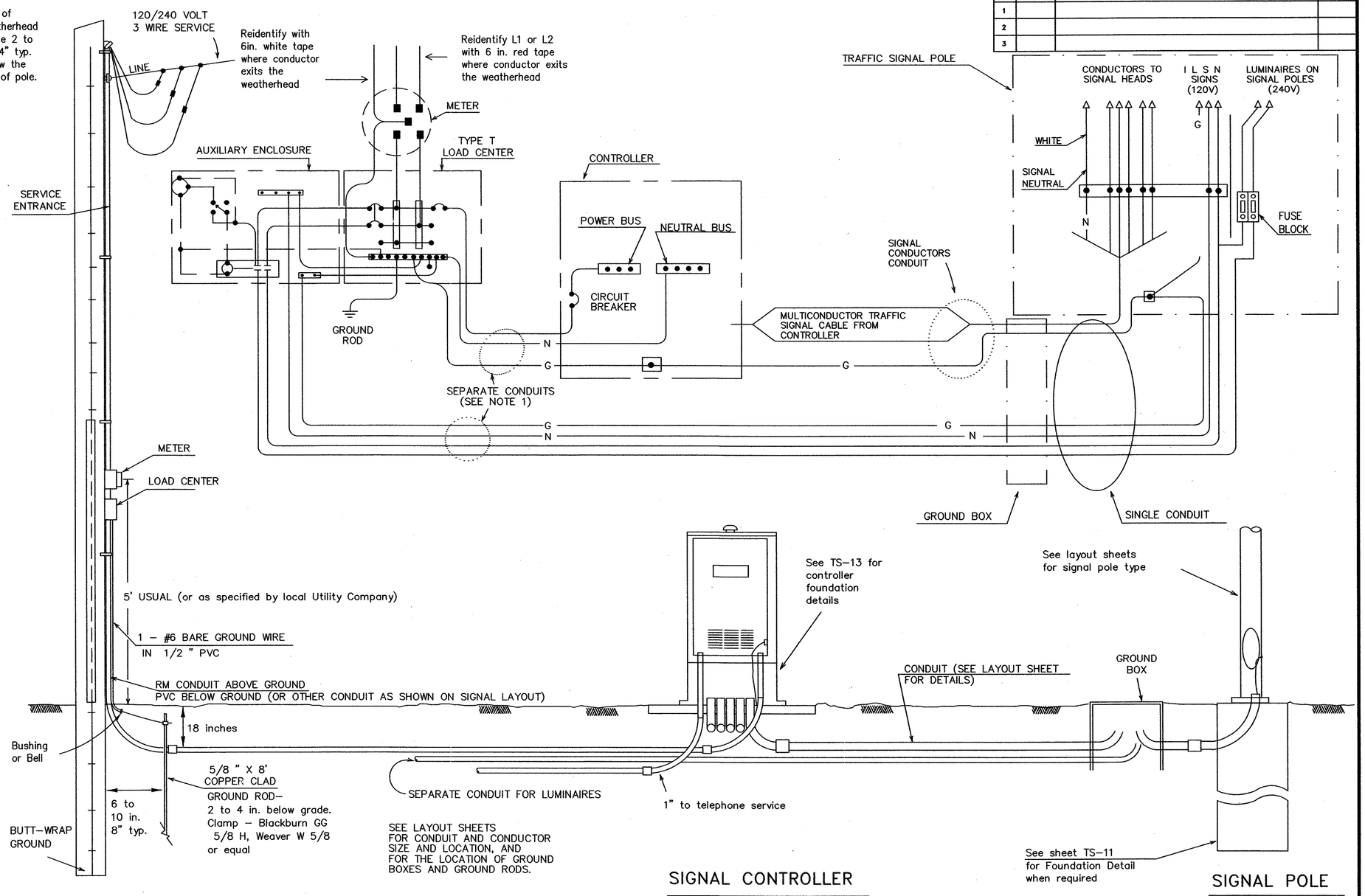

Unless shown elsewhere in the plans, electrical service data for Types D and T shall be as follows.

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)GS(E)**(*)	1 1/2	3/#4	N/A	2P/70	30	70	T.S. Lighting	1P/50 2P/15	<7.1
TY T (120/240)000(NS)GS(E)**(*)	1 1/2	3/#4	N/A	None	30	70	T.S. Lighting	1P/50 2P/15	<7.1

*** Eliminate photocell, contactor and seperate 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.

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DRAWN:	G&A	DESIGN:	BRG	REVIEWED:	BRG	DWG:	320DETAILS-ELEC

ARAPAHO ROAD PHASE III

STANDARD CONSTRUCTION DETAILS
TRAFFIC SIGNAL ELECTRICAL - SHEET 3

TOWN OF ADDISON

g&a Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS-7

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 (except extending primary lines to electrical service) 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, when required, shall be paid for under Force Account 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 conduits, conductors, disconnects, contactors, 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 manufacturer's 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. Unless otherwise approved by the Town, 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 duo-colored plastic labels. Color shall be white letters with red background. 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.

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

I. 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 padlockable in the "on" position.

II. Service Type. Electrical service types A, C, D, and T shall be as schematically detailed on TS-8 or TS-9. Other service types shall be as detailed elsewhere on the plans.

III. 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 attached. Circuit breakers shall be UL Listed to UL489.

IV. Circuit Breaker Panelboard. Panelboards shall be UL Listed and shall meet Federal Specification W-P-115b, Type 1, Class 1 requirements. Panelboards shall have copper busses, 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 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.

V. Circuit Breaker Load Center. Load centers shall be UL Listed, and shall meet Federal Specification W-P-115c, Type 1, Class 2 requirements. Load centers shall have copper busses, 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 accomodate a maximum of 6 one-pole breakers.

VI. Separate or Auxiliary Enclosure. Separate enclosures for HOA, photocell and lighting contactors for types D & T Services shall be a UL Listed assembly and shall have dead front trim. HOA 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 VII. E. except that separate enclosure shall not have external operating handle, need not have a data pocket and door may latch at only one point. Contractor may install all equipment in one enclosure instead of two, when approved by the Engineer.

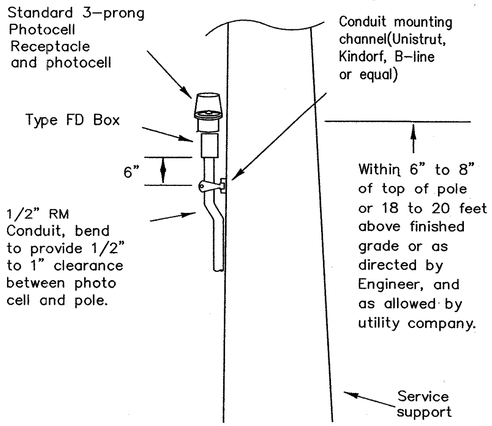
VII. Where a Type D or T service is provided, laminated "as built" drawings are required as shown on TS-9 VIII E; shall be delivered before completion of the work, to the Engineer in lieu of placement within these smaller enclosures. Conduit may not enter the back wall of a service enclosure penetrating 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

ELEC SERV TY X (XXX/XXX) XXX (XX) XX (X) XX (X)

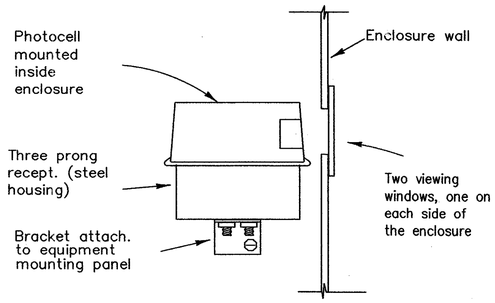
- Schematic Type
- Service Voltage (V / V)
- Disconnect Amp Rating (000 indicates main lug only)
  - SS= Safety switch ahead of meter
  - NS= No switch ahead of meter and/or no meter required
- Enclosure Type
  - GS= Galvanized steel
  - SS= Stainless steel
  - AL= Aluminum
- Photocell Mounting Location
  - T= Top of pole
  - E= Inside service/separate enclosure
  - L= Luminaire mounted
  - N= None
- Service Support Type
  - GC= Granite concrete
  - OC= Other concrete
  - TP= Timber pole
  - SP= Steel pole
  - SF= Steel frame
  - OT= Pole by others or paid for separately
  - EX= Existing pole
  - TS= Switch gear to be placed on traffic signal pole
  - RT= Rectangular structural tubing
  - PS= Pedestal Service
- O= Overhead service
- U= Underground service

Example: ELEC SERV TY D(120/240)070(NS)GS(T)TP(0)



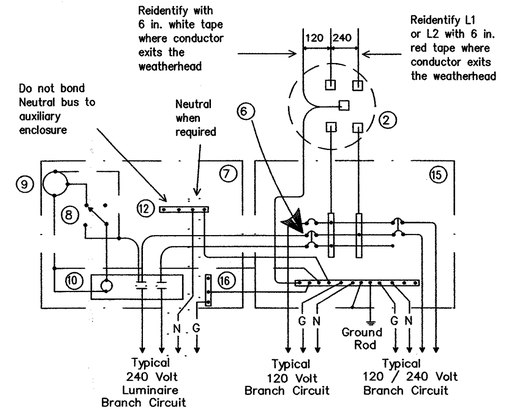
TOP MOUNTED PHOTOCELL

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



ENCLOSURE MOUNTED PHOTOCELL

For photocell specifications see ED(5),XIII.



SCHEMATIC TYPE T

120/240 VOLTS -THREE WIRE

Install photocell and lighting contactor when shown on Electrical Service Data.

SCHEMATIC LEGEND

1 - omitted
2 - Meter (when required)
3 - Service Assembly Enclosure
4 - Main Disconnect Breaker (See Electrical Service Data)
5 - omitted
6 - Circuit Breaker, 15A typical and max. for control circuit wiring
7 - Auxiliary Enclosure
8 - Control Station ("H-O-A" Switch)
9 - Photo Electric Control (enclosure-mounted shown)
10 - Lighting Contactor
11 - Power Distribution Terminal Blocks
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 (See Electrical Service Data)
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

⚠1 12-22-00 Revision
Modify legend numbers

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NO.	DATE	REVISION	APPROV.
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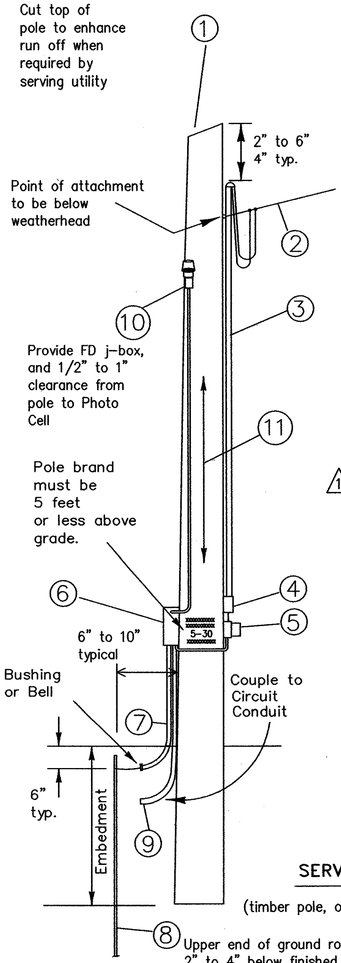
3			



1 - Class 5 pole, height as required
2 - Service drop from utility company (attached below weatherhead)
3 - Service conduit and service entrance conductors(RMC) (See Electrical Service Data)
4 - Safety switch (when required)
5 - Meter (when required)
6 - Service enclosure
7 - No. 6 bare grounding electrode conductor in 1/2 " PVC to ground rod - extend 1/2 " PVC 6" underground.
8 - 5/8 " x 8' Copper clad ground rod - drive ground rod completely underground unless otherwise approved by the Engineer.
9 - RM conduit - same size as branch circuit conduit.
10 - Photocell and conduit - if top mounted. (See Electrical Service Data)
11 - When required by the serving utility provide bare #6 awg copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor to a height of 8 ft above finish grade.

⚠1 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

(If applicable)

- Liquidtight flexible metal conduit, may be used when meter and service enclosure are mounted 90 to 180 degrees to each other.
- LFMC shall not exceed 3 ft. and shall be securely supported within one ft. of each end.
- 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 (0)

(timber pole, overhead service, typical arrangement)

8 Upper end of ground rod to be 2" to 4" below finished grade

TIMBER POLE NOTES

1. Conduit and conductors attached to service pole and underground within 12 inches of service pole shall not be paid for directly but shall be subsidiary to the service pole.
2. Pole top mounted photocell, install on north side of pole or in service enclosure as required. See Electrical Service Data.
3. 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 workman-like manner.
4. Embedment depth shall be as required in Item 627 Treated Timber Poles.
5. Poles trimmed for excess length shall be trimmed from the top end only.

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DWG: 320DETAILS-ELEC

ARAPAHO ROAD PHASE III

STANDARD CONSTRUCTION DETAILS
TRAFFIC SIGNAL ELECTRICAL - SHEET 4

TOWN OF ADDISON

g&a Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS-8

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 T and Type D without lighting contactor) and all auxilliary equipment enclosures mounted with service equipment and paid for as part of Item 628, "Electrical Services", shall be built or assembled by a UL Listed Industrial Control Panel shop and shall have a unique serial numbered UL Label with the words "LISTED ENCLOSED INDUSTRIAL CONTROL PANEL". 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 enclosure shall also be labeled "SUITABLE ONLY FOR USE AS SERVICE EQUIPMENT".

B. Conduit entries into the top of all enclosures shall have threaded hubs. No conduit entries through the equipment mounting back plate will 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 Type T 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 spray painted stenciled letters or self adhesive vinyl weather resistant labels, minimum of 1 inch high; applied in a neat and workman like manner, identifying the load served specifically such as 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 for service types D, T, and the circuit breaker panelboard of service type C shall be made from pre-galvanized steel sheeting, hot dipped galvanized steel, or powder coat painted steel. Painted enclosures shall be painted inside and outside; galvanized enclosures may be painted. Unless otherwise approved by the Engineer, painted enclosures shall be gray, beige, or white. Panelboard/loadcenter enclosures shall be UL type 3R, 4, 4X or 12 modified or built as shown in paragraph E (below), shall have a dead front trim, and shall have a door with provisions for padlocking. Types D and T shall not have a loadcenter exterior "can" mounted inside another enclosure meeting these specifications. The loadcenter shall be interior mounted in an enclosure with properly adapted dead front trim.

E. Type GS enclosures for service types A and C shall be a UL type 3R, 4, 4X or 12 enclosure and shall meet additional requirements of this paragraph. UL type 12 enclosures marked for indoor use only are approved for outdoor use when a drip shield or rolled lip is provided and drain fitting is supplied as specified. The enclosure door shall have a rolled lip around all sides of the enclosure opening and a padlock handle. All enclosures may have a continuous stainless steel piano hinge with stainless steel pin, 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 3/8" minimum diameter electro-zinc plated steel pin or a stainless steel pin. Two point hinged doors shall be rated for 56 lbs of loading. Three point hinged doors shall be rated for 90 lbs of loading. The door shall have a mechanically 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. The main disconnect remote operator shall be flange-mounted, shall interlock the door when in the "on" position, and shall be pad lockable in both the "on" or the "off" positions. Enclosure shall include an equipment mounting panel installed inside the enclosure on collar studs or tapped bosses, and constructed of either 12-gauge steel or 0.10"-thick aluminum. Equipment mounting panels shall not be painted, but shall be hot-dipped galvanized or made from pre-galvanized sheeting. Enclosure shall have factory installed external mounting feet. Enclosure door shall be capable of opening at least 130 degrees, with arm to hold the door open. Door latch shall latch at two or more points, operate by a handle separate from disconnect switch and be capable of being locked. Lock must be keyed to Master #2195. Door shall be bonded with a #8 ground wire to the grounding bus or from door to enclosure grounding point if one is provided in enclosure. Enclosure shall be either hot dip galvanized, pre-galvanized sheeting or prime and painted. Paint shall be powder coat paint as shown below. Color shall be white or gray. Condensation drainage shall be provided by installation of a drain fitting (Crouse-Hinds CH-ECD11, Appleton ECDB or equal) in the bottom of the enclosure. The Contractor shall place in the service enclosure a laminated copy of the "as built" electrical plans showing the equipment supplied for that electrical service and all applicable wiring diagrams, layouts, and TS-8, TS-9, and TS-10 when standard sheets are in the plan set.

F. Type SS Stainless steel enclosure shall meet all the requirements above for the respective type GS except that the enclosure shall be UL type 4X conforming to UL 50. Type GS circuit breaker panel interiors and load center interiors housed in a stainless steel UL type 4X enclosure conforming to UL 50 shall be considered complying with the Type SS requirements for service types D & T.

IX. Powder Coat Paint. Powder coating shall be either a polyester thermosetting resin, a zinc rich primer with a TGIC (triglycidyl isocyanurate) powder overcoating, or a zinc-rich epoxy powder, applied 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 amperage specified. Circuit breaker shall be a UL Listed thermal-magnetic circuit breaker with flange-mounted remote operator in the service assembly enclosure. Circuit breakers shall have a minimum interrupting rating of 10,000 Amps. 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 amps 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 as main disconnects will be allowed.

XI. Control Circuit. Control circuit protection shall be either a 10 or 15 amp circuit breaker.

XII. Control Station ("H-O-A" Switch). Control station shall be a maintained-contact, three position selector switch in a 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 molded 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 paned 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. 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 multipole 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.

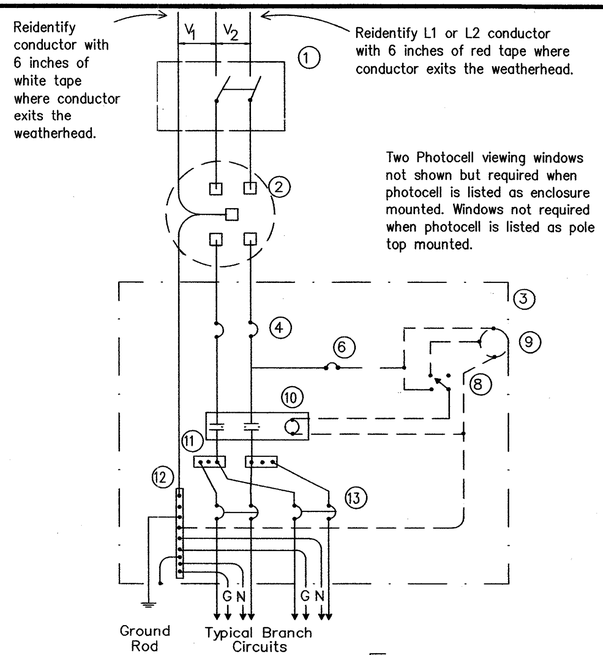
XV. Power Distribution Terminal Blocks. Power distribution terminal blocks shall be rated for 600 volts and shall be used for line side connections to branch circuit breakers where more than one circuit breaker is required. Lugs on blocks shall be properly sized for conductors being used. Only one conductor 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

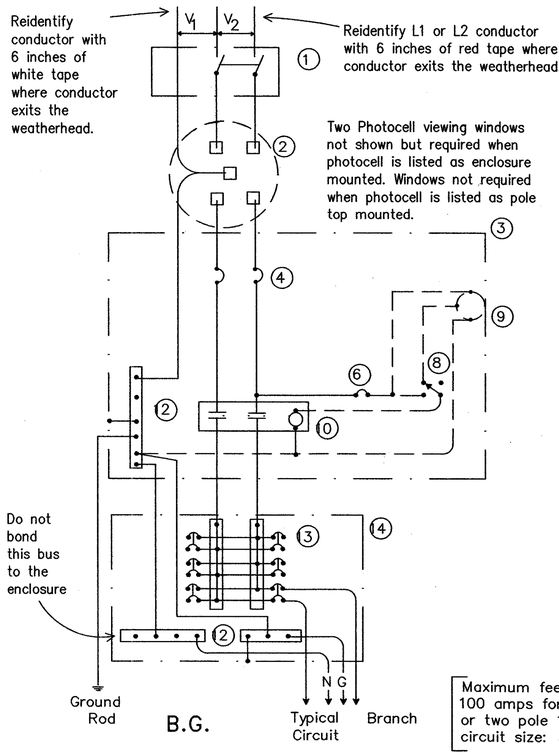
1 – Safety Switch (when required)
2 – Meter (when required)
3 – Service Assembly Enclosure
4 – Main Disconnect Breaker (See Electrical Service Data)
5 – Omit
6 – Circuit Breaker, 15A Typical for control wiring
7 – Auxiliary Enclosure
8 – Contcol Station ("H-O-A" Switch)
9 – Photo Electric Control (enclosure-mounted shown)
10 – Lighting Contactor
11 – Power Distribution Terminal Blocks
12 – Neutral/Ground Bus
13 – Branch Circuit Breaker (See Electrical Service Data)
14 – Circuit Breaker Panelboard (See Electrical Service Data)
15 – Load Center

———— Power Wiring
— — — — Control Wiring
——N—— Neutral Conductor (when required) serve 120 v. loads only)
——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.

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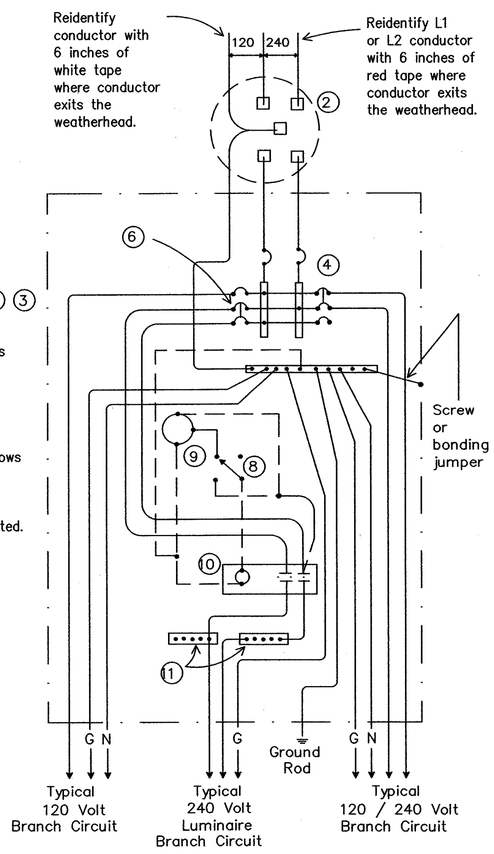

SCHEMATIC TYPE D
120/240 VOLTS –THREE WIRE

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. Photocells shall have a window on each side of enclosure to allow operation. 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 16 inches in width unless approved by the Town.
Ty D load center with lighting controls or TY D seperate lighting control enclosure shall have power distribution blocks for a minimum of 4, #8 conductors per phase.

STATE OF TEXAS
WILLIAM J. HATCHELL
26755
REGISTERED PROFESSIONAL ENGINEER
7/22/04

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY:
WILLIAM J. HATCHELL
ON 7-21-04.
ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

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DATE:	MAY 2004	SCALE:	NOT TO SCALE	JOB NO.:	320
DRAWN:	G&A	DESIGN:	BRG	REVIEWED:	BRG	DWG:	320DETAILS-ELEC

ARAPAHO ROAD PHASE III
STANDARD CONSTRUCTION DETAILS
TRAFFIC SIGNAL ELECTRICAL - SHEET 5

TOWN OF ADDISON

g&a Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS-9

NO.	DATE	REVISION	APPROV.
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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.

Unless high strength bolts are are specified stainless steel hardware and miscellaneous nuts and bolts may be provided when galvanized is specified by the plans 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 will submit for approval six (6) copies of catalog cut sheets for each of the following three (3) categories.
Category 1. Electrical services including photocell.
Catagory 2. Breakaway disconnects, heat shrink tubing, heat shrink filler tape and ground boxes which will include loading capacity certification.
Category 3. Highmast assembly kits, when applicable. See Item 614 "Texas Standard Specifications". 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 Owners 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

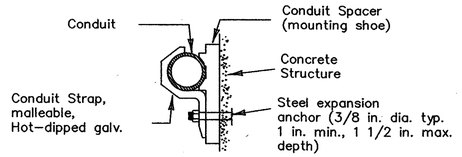
1. Conduit and fittings shall be UL Listed for the intended use shown on plan sheets.
2. Conduit shall be the type shown by descriptive code or shown elsewhere on the plans. Substitution of the various types of conduits will not be permitted. All flexible conduit in rigid metallic conduit systems shall be Liquidtight Flexible Metal (LFMC) conduit. All flexible conduit in PVC systems shall be Liquidtight Flexible Non–metallic conduit. Neither aluminum conduit, electrical metallic tubing (EMT), nor intermediate metal conduit (IMC) shall be permitted.
3. All exposed conduits shall be RMC, unless otherwise specifically shown on the plans. All metal conduit shall be properly grounded.
4. Couplings, connectors, conduit bodies, grounding bushings, and offset nipples for RMC shall be electro–zinc plated steel or hot dipped galvanized malleable iron, threaded or threadless compression type, rain–tight and shall be UL listed for the intended use.
5. Expansion joints for metal conduit shall be provided with an internal or external bonding jumper and shall be UL listed.
6. Unless otherwise shown on the plans, junction box minimum sizes shall be in accordance with the following table which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes are present, the conductors shall be counted as if all are of the larger size. Situations not applicable to the table shall be sized in accordance with NEC 370–28.

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"

7. RMC system junction boxes equal to or smaller, in any dimension, than 12 x 12 x 6 (HxWxD), 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/Gedney Type YS 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 (HxWxD) shall be 14–ga. stainless steel; RMC system junction boxes larger than 18 x 18 x 6 (HxWxD) 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.
8. Junction boxes containing only #10 or #12 AWG conductors shall be Crouse Hinds Type GRFX, Appleton Type JBOX, two–gang FD, or similar approved cast iron box. Boxes shall be sized according to NEC Table 370–16(a).
9. 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.
10. Junction boxes in PVC conduit systems shall be PVC, intended for outdoor use, unless otherwise noted on plans.
11. 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 will be grounded. Grounding will 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.
12. HDPE conduit shall meet the requirements of Item 622, Duct Cable, except that the HDPE conduit, when bid under Item 618, 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 back to PVC (or RMC elbow when required) of the size and schedule shown on the plans at the bore pit. 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.
13. 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. Stamped–cadmium plated straps will not be allowed. Straps having only one mounting hole shall not be allowed for use on conduits 2 inches and larger. Two piece conduit straps designed to be used with a mounting shoe shall be installed only with the correctly sized shoe.

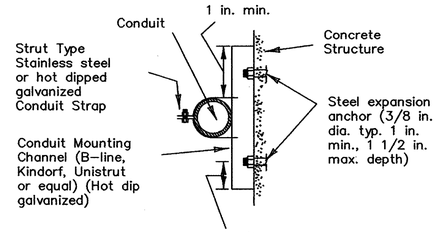
B. CONSTRUCTION METHODS

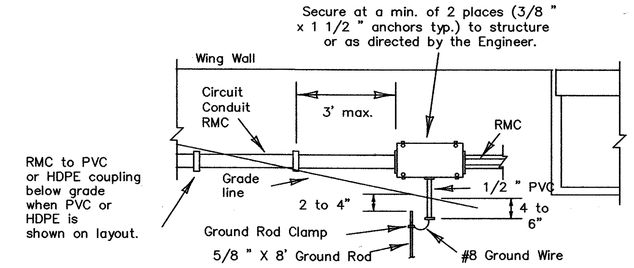
1. Conduit in structures shall have expansion fittings at structure expansion joints. All straight runs of RMC conduit exposed on structures such as bridges shall have expansion joints installed at maximum intervals of 150 feet. Expansion joints shall be installed so they allow for movement of the conduit. Installation of the joint in such a manner that will not allow for movement shall be repaired 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.
2. 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).
3. Conduit supports shall not be attached directly to prestressed concrete beams except as shown specifically in the plans and approved by the Engineer.
4. 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.
5. Conduit trenched in the subgrade of new roadways shall be back filled with excavated material, unless otherwise noted on the plans. Conduit trenched in the sub–base of new roadways shall be back filled with cement–stabilized base.
6. 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.
7. 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.
8. 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 a solid Copper #6 AWG.
9. Metal junction boxes shall be bonded to the grounding conductor in accordance with the NEC.
10. Conduits entering ground boxes shall be placed so that the conduit ends shall be not less than 5 inches nor more than 9 inches from the box cover (See ground box detail on sheet TS–7.
11. 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.
12. 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.



CONDUIT MOUNTING OPTIONS

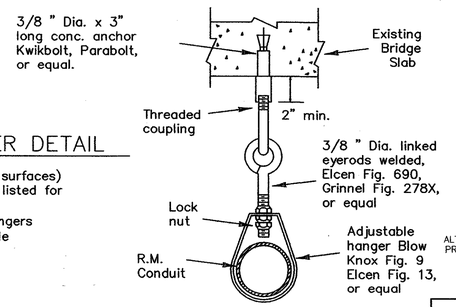
(Attachment to concrete surfaces)
(See para. II.B.2)





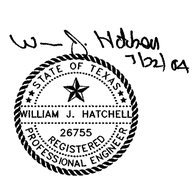
TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

NOTES
1. Ground rod clamp to be Blackburn GG 5/8H, Weaver W5/8 or equal.
2. Surface mounting shown, for conduit to be placed in structure, use flush–mounted box.
3. Bond junction box and metal conduits to equipment grounding conductor and grounding electrode conductor using listed connector.
4. Seal all conduits entering the junction box from underground.
5. Install bell end or bushing on 1/2 " PVC conduit both ends.
6. Ground rod to be driven within 8 inches of 1/2 inch PVC conduit end.



CONDUIT HANGER DETAIL

(Attachment to horizontal surfaces)
Hangers need not be UL listed for electrical use
ie: plumber pipe hangers are acceptable



THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY:
WILLIAM J. HATCHELL
ON 7–21–04.
ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

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DATE:	MAY 2004	SCALE:	NOT TO SCALE	JOB NO.:	320
DRAWN:	G&A	DESIGN:	BRG	REVIEWED:	BRG

DWG: 320DETAILS–ELEC

ARAPAHO ROAD PHASE III

STANDARD CONSTRUCTION DETAILS
TRAFFIC SIGNAL ELECTRICAL - SHEET 6

TOWN OF ADDISON

Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS–10

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FOUNDATION DESIGN TABLE

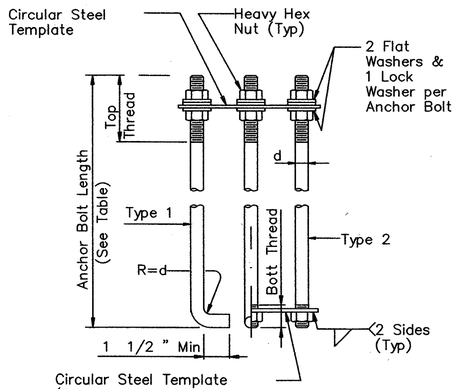
FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		DRILLED SHAFT LENGTH–ft ④, ⑤, ⑥ TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DESIGN ①				FOUNDATION DESIGN LOAD ②		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	10	15	40	ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K–ft	SHEAR Kips	
24–A	24"	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)

		FDN 30–A	FDN 36–A	FDN 36–B	FDN 42–A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32' ⚠1	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	⚠1	36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'

EXAMPLE:

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

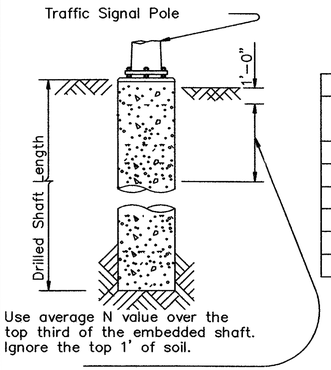


HOOKED ANCHOR (TYPE 1) NUT ANCHOR (TYPE 2)

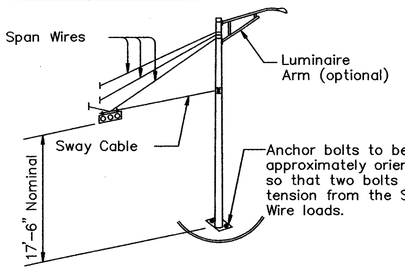
ANCHOR BOLT ASSEMBLY

INSTALLATION PROCEDURE :

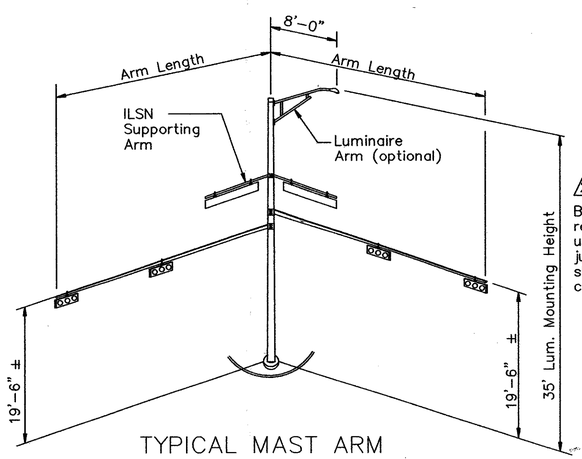
Threads of anchor bolts shall be coated with pipe joint compound prior to installation of upper nuts when erecting pole. After pole is plumbed and in permanent alignment, the exposed threads of painted bolts shall be cleaned and an additional coating of zinc–rich paint applied to seal the bolt thread–nut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



Use average N value over the top third of the embedded shaft. Ignore the top 1' of soil.



TYPICAL STRAIN POLE ASSEMBLY



TYPICAL MAST ARM ASSEMBLY

NOTES:

① Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

② Foundation Design Loads are the allowable moments and shears at the base of the structure.

③ Foundations may be listed seperately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

④ Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

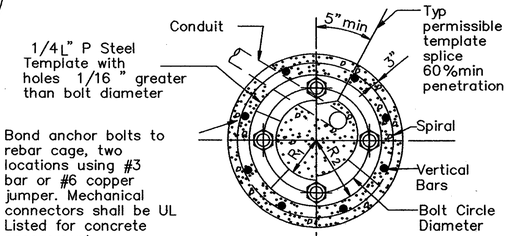
⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

ANCHOR BOLT & TEMPLATE SIZES

BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTT THREAD	BOLT CIRCLE	R2	R1
3/4 "	1'–6"	3"	—	12 3/4 "	7 1/8 "	5 5/8 "
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 "

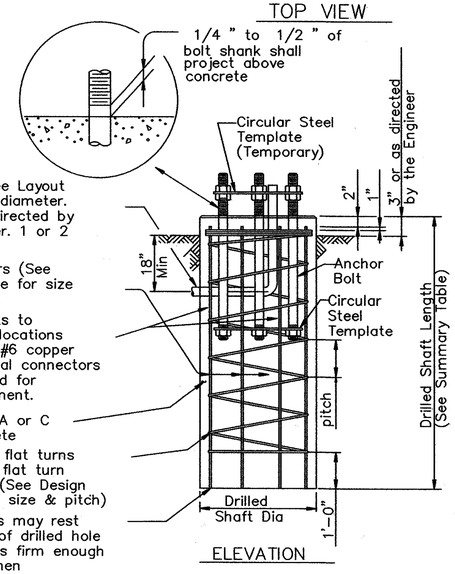
⑦ Min dimensions given, longer bolts are acceptable.



⚠2 Bond anchor bolts to rebar cage, two locations using #3 bar or #6 copper jumper. Mechanical connectors shall be UL Listed for concrete encasement.

R_1 may equal R_2 if plate is welded of 3 or more segments.

TOP VIEW



ELEVATION

FOUNDATION DETAILS

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	36–B	42–A
ADDISON								
T–1		36–A				12.0		
T–4		36–A				12.0		
TOTAL DRILLED SHAFT LENGTHS						24.0		

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 tapped 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 embeded nuts need not be galvanized.

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY: WILLIAM J. HATCHELL ON 7–21–04.

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THIS DETAIL SHEET WAS OBTAINED FROM TXDOT

173

DATE:	MAY 2004	SCALE:	NOT TO SCALE	JOB NO.:	320
DRAWN:	G&A	DESIGN:	BRG	REVIEWED:	BRG

DWG: 320DETAILS–TRAF

ARAPAHO ROAD PHASE III

TRAFFIC SIGNAL POLE FOUNDATION

TOWN OF ADDISON

Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS–11

NO.	DATE	REVISION	APPROV.
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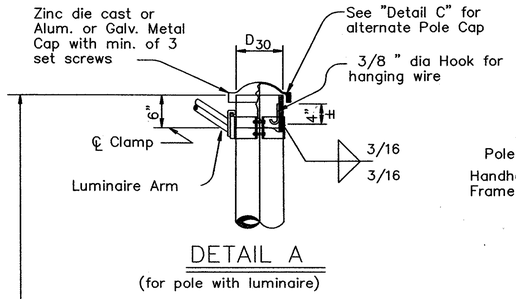
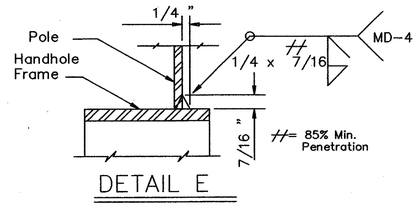
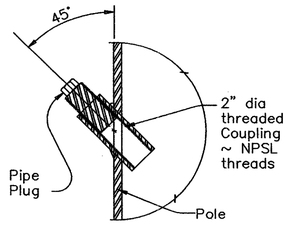


DETAIL A

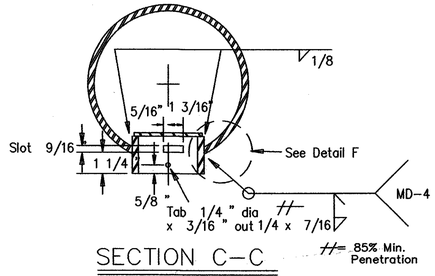
(for pole with luminaire)



DETAIL E

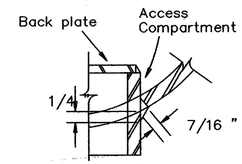


COUPLING DETAIL

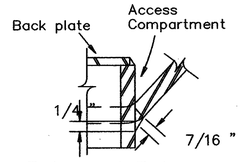


SECTION C–C

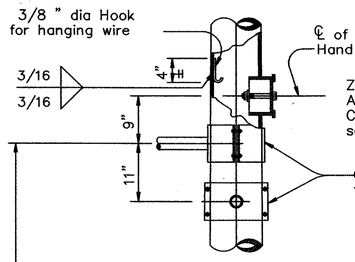
Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.



Round Pole

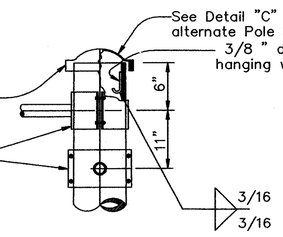


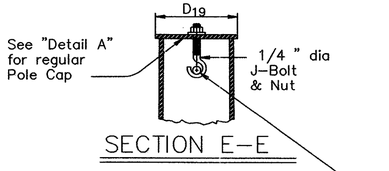
Polygonal Pole



DETAIL J

(If ILSN applied)

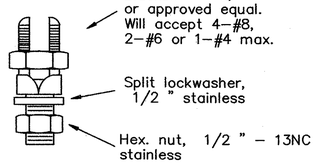




SECTION E–E

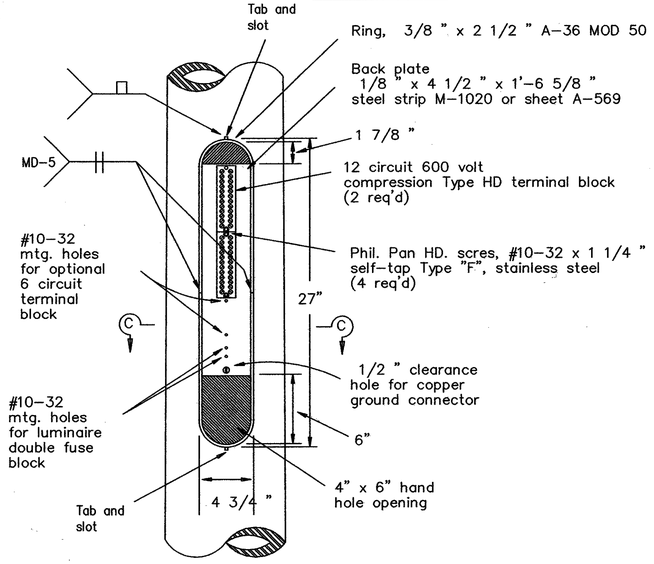
DOUBLE FUSE BLOCK

For luminaire fuses Littelfuse #L60030M–2SQ or equal, supplied and installed by field contractor when required.



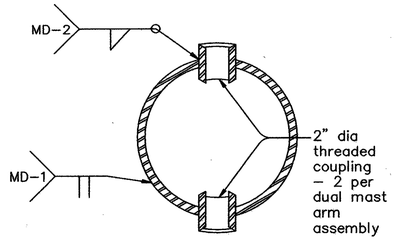
COPPER GROUND CONNECTOR

DETAIL F

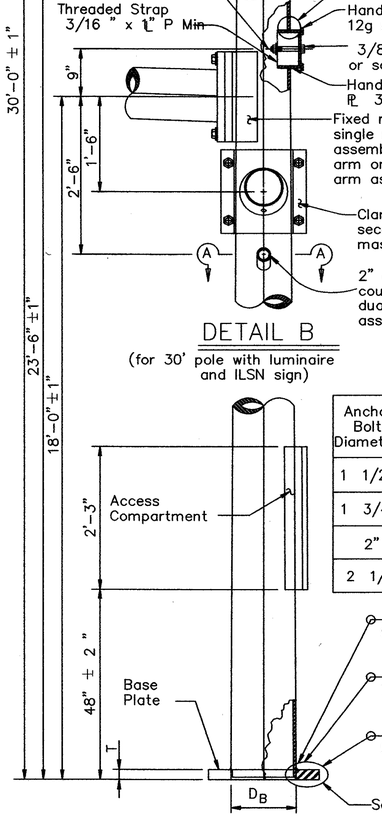


ACCESS COMPARTMENT

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4–20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #10–32 x 1 1/4 " self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS–5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Littelfuse #L60030M–2SQ fuse block. Arrangement of the items shall be as shown in the Access Compartment detail.

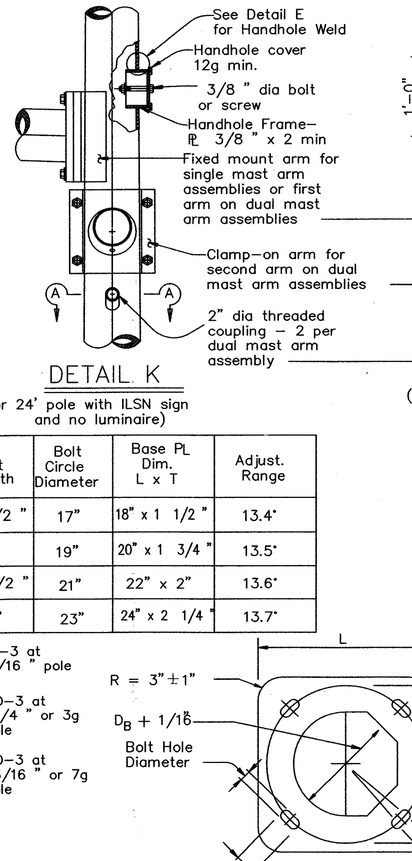


SECTION A–A



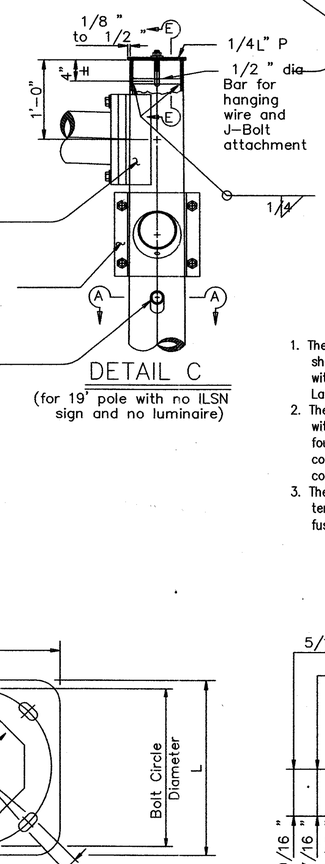
DETAIL B

(for 30' pole with luminaire and ILSN sign)



DETAIL K

(for 24' pole with ILSN sign and no luminaire)



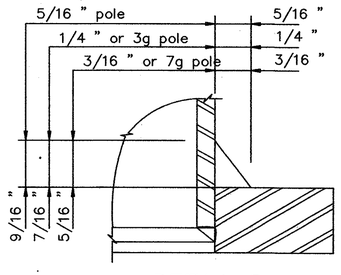
DETAIL C

(for 19' pole with no ILSN sign and no luminaire)

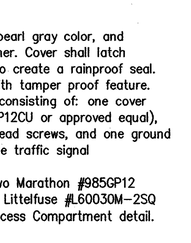
Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base PL Dim. L x T	Adjust. Range
1 1/2 "	1 3/4 "	3 1/2 "	17"	18" x 1 1/2 "	13.4°
1 3/4 "	2"	4"	19"	20" x 1 3/4 "	13.5°
2"	2 1/4 "	4 1/2 "	21"	22" x 2"	13.6°
2 1/4 "	2 1/2 "	5"	23"	24" x 2 1/4 "	13.7°

POLE ELEVATION

BASE PLATE PLAN



DETAIL D



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174

DATE:	MAY 2004	SCALE:	NOT TO SCALE	JOB NO.:	320
DRAWN:	G&A	DESIGN:	BRG	REVIEWED:	BRG

DWG: 320DETAILS–ELEC

ARAPAHO ROAD PHASE III

TRAFFIC SIGNAL - SUPPORT STRUCTURES MAST ARM POLE DETAILS

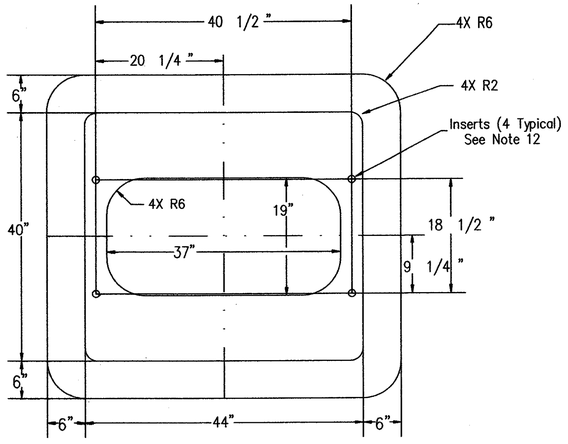
TOWN OF ADDISON

g&a Grantham & Associates, Inc.

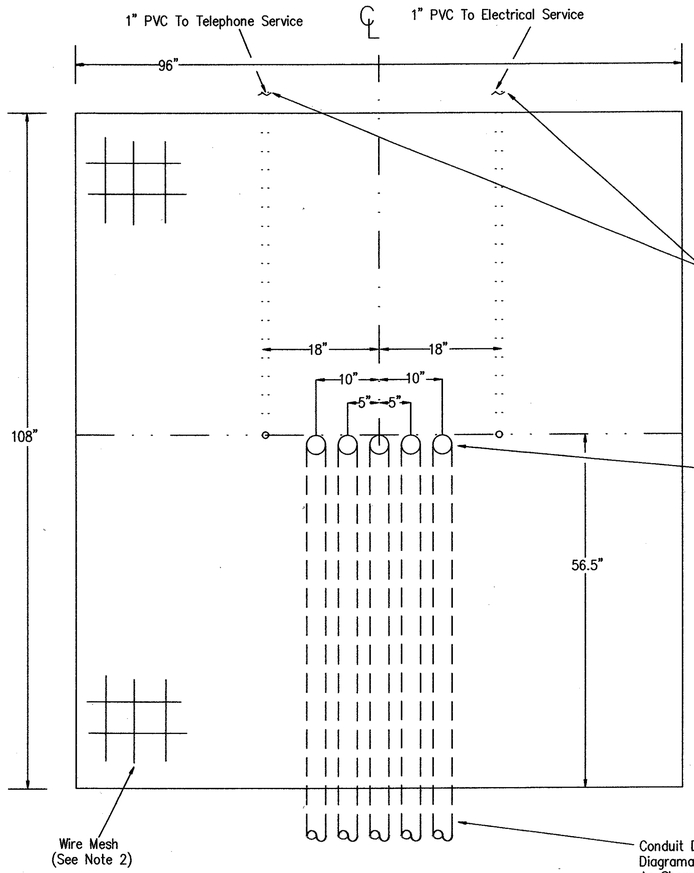
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042

(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS–12



TOP VIEW
(Base Only)



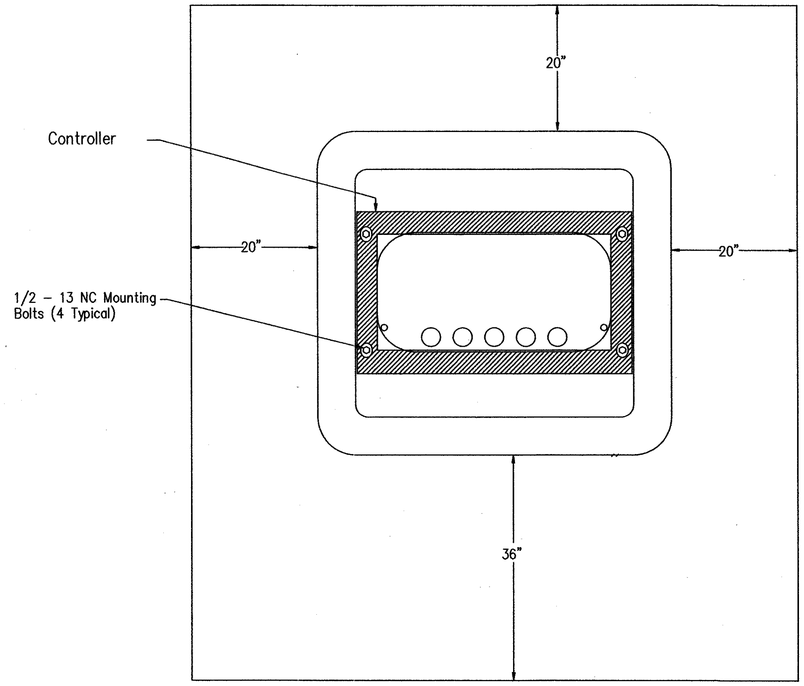
Conduit Direction Leaving Foundation Are Diagramatic Only And May Be Adjusted As Shown On Layouts.

Number of Conduits To Be As Shown on Layouts Plus Two For Future Use.

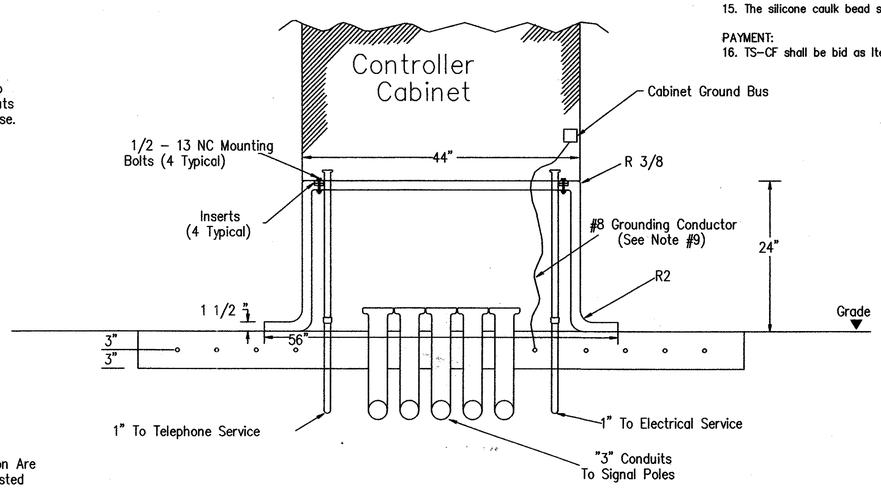
Wire Mesh (See Note 2)

Conduit Direction Leaving Foundation Are Diagramatic Only And May Be Adjusted As Shown On Layouts.

TOP VIEW
(Slab Only)



TOP VIEW
(Slab & Base)



SIDE VIEW
(Slab & Base)

NO.	DATE	REVISION	APPROV.
1			
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GENERAL NOTES

CONCRETE:
1. Concrete shall be class B minimum in accordance with Item 421. Slab shall be constructed in accordance with Item 531.

2. Reinforcement shall be welded wire mesh 6X6–W2.9 X W2.9. Joints and splices in the mesh shall have a minimum 6–inch overlap.

3. Mesh shall have a minimum 3 inch cover on the edges and shall be centered between top and bottom.

CONDUITS:
4. 3–inch conduits shall be stubbed up through the slab and run to the various traffic signal poles and ground boxes as shown on the layouts. Contractor shall install the number of conduits as shown on layouts plus two additional 3 inch conduits for future use. Conduits shall be terminated with a bushing between 2 and 4–inches above the slab.

5. Future use conduits shall be extended at least 18–inches from the edge of the slab, shall be terminated underground with a coupling, and shall be capped and sealed so that the seal can be removed without damaging the coupling.

6. Two separate 1–inch conduits shall be stubbed up through the slab from the electrical and telephone services. The conduit for the electrical feed shall be run directly to the electrical service enclosure.

7. The conduit for the telephone line shall be run directly to the telephone service, usually located on the same pole as the electrical service. Telephone shall not under any circumstance share a conduit with any other function. Telephone conduit not used at this time shall be capped and sealed, the same as the 3" future use conduits.

8. Electric and telephone conduits shall terminate above the slab with a coupling. After the base is installed, the conduits shall be extended above the top of the base and shall be secured to the base using a steel one–hole strap or similar suitable substitute.

9. A #8 AWG copper ground wire shall be bonded to the reinforcing mesh by a suitable clamp UL Listed for encasement in concrete and terminated to the cabinet grounding bus for the purpose of providing a local ground for the electrical grounding conductor. The electrical grounding conductor specified in Item 680–4(4) is still required and shall be terminated to the cabinet ground bus.

BASE:
10. The base shall be constructed of reinforced polymer concrete reinforced with continuous strands of borosilicate fiberglass cloth. Concrete shall be made from catalyzed polyester resin and aggregate, and shall have a minimum comprehensive strength of 11,000 psi. Polymer concrete containing chopped fiber or fiber reinforced plastic shall not be acceptable.

11. The base shall be permanently marked either by impress or by permanent ink with the manufacturer's model number and name or logo.

12. The base shall conform to the dimensions shown. Four (4) 1/2–13 NC stainless steel self cleaning inserts shall be provided to secure the controller to the base. Inserts shall withstand a minimum torque of 50 ft–lb and a minimum straight pull out strength of 750 lbs. The base, secured to the concrete slab per the manufacturer's instructions and with a controller cabinet attached, shall withstand a minimum wind load of 125 mph. Manufacturer shall supply certification sealed by a Texas Licensed Professional Engineer.

13. The base shall be sealed to the concrete with a silicone caulk bead and fastened to the slab per manufacturer's instructions.

CONTROLLER CABINET:
14. The controller cabinet shall be anchored to the base using four 1/2–13 NC bolts.

15. The silicone caulk bead specified in Item 680.5 shall be RTV 133.

PAYMENT:
16. TS–CF shall be bid as Item 656.

7/22/04

STATE OF TEXAS
WILLIAM J. HATCHELL
26755
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY:
WILLIAM J. HATCHELL
ON 7–21–04.
ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

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175

DATE:	MAY 2004	SCALE:	NOT TO SCALE	JOB NO.:	320
DRAWN:	G&A	DESIGN: BRG	REVIEWED: BRG	DWG:	320DETAILS–ELEC

ARAPAHO ROAD PHASE III
TRAFFIC SIGNAL - CONTROLLER SLAB AND BASE
TOWN OF ADDISON

g&a Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS–13

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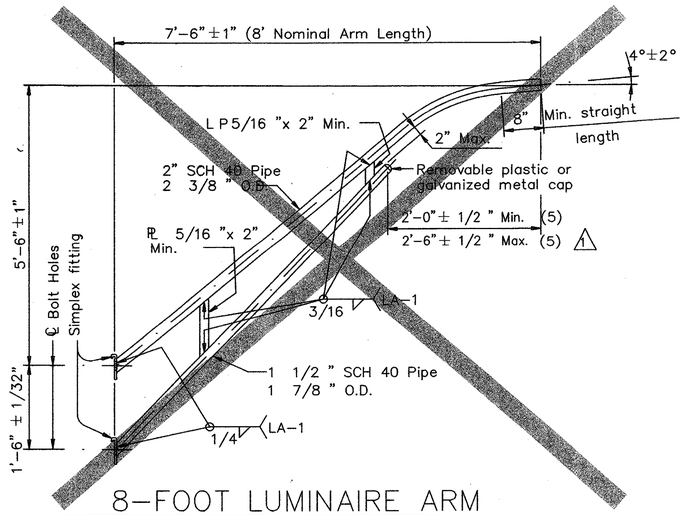
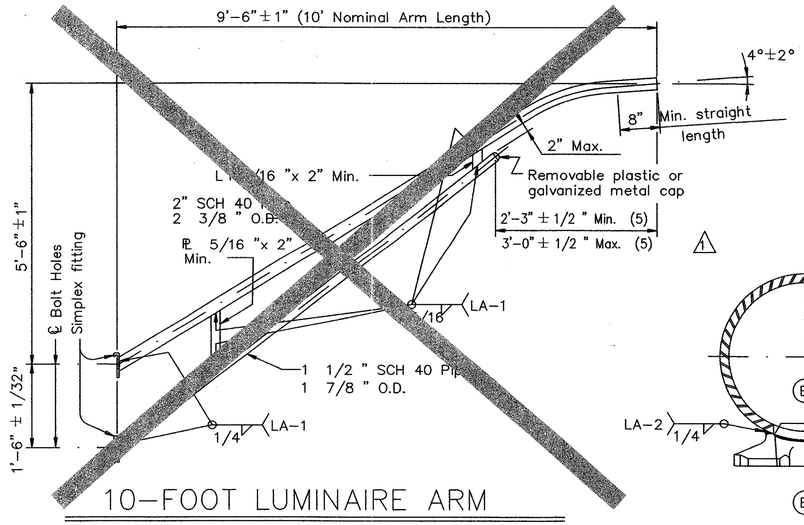


8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM

MATERIALS	
Pole or Arm Simplex	ASTM A27 GR 65-35 or A148 GR 80-50 or A576 GR 1021 (4) or A36 (Arm only)
Arm Pipes	ASTM A53 GR A or B or A500 GR B or A501 or A595 (2) or A715 GR 50
Arm Plates (3)	ASTM A36 or A572 GR50 (1) or A595 GR A or A588
Misc.	ASTM designations as noted

DIRECT ATTACHMENT DETAIL

(1) ASTM A36M50 steel as described in Item 442 "Metal for Structures" may be used in lieu of A 572 GR 50.

(2) If A595 GR A material is used, arm need not be cold worked to A595 requiremants, but material must have 40 ksi minimum yield prior to fabrication.

(3) Either of the materials listed for pates may be used where the drawings do not specify a particular ASTM designation.

(4) A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

(5) Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 75 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.5 sq. ft.

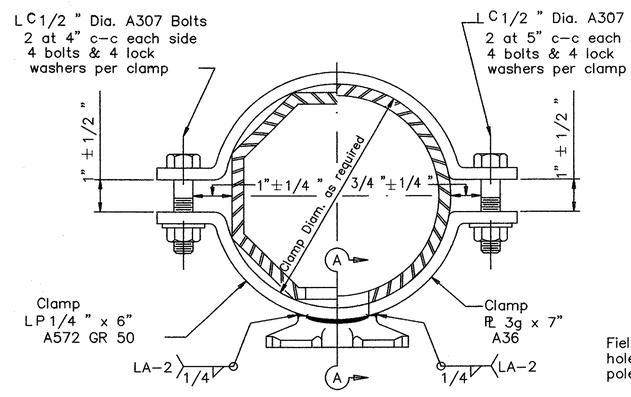
Materials and fabrication shall be in accordance with the Specificatons and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absense of specified Fabricaton tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

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

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

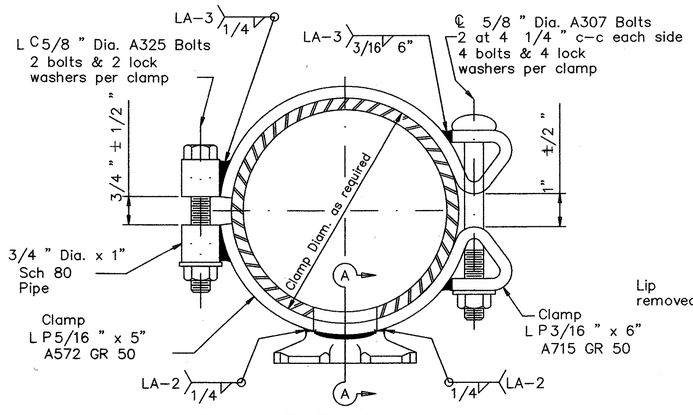
Each pole simplex fitting shall be supplied with 2 A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

If clamp assemblies are ordered without poles, the Fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.



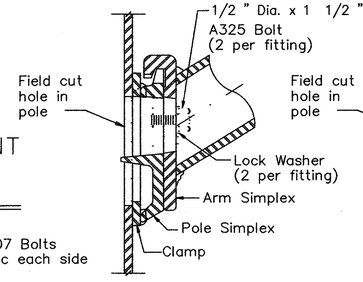
CLAMP ATTACHMENT DETAIL NO.1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO.2 (HALF SECTION)

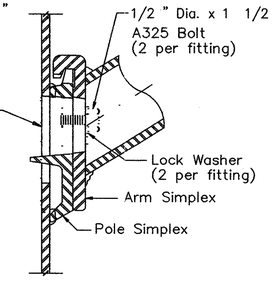


CLAMP ATTACHMENT DETAIL NO.3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO.4 (HALF SECTION)



UPPER SIMPLEX FITTING



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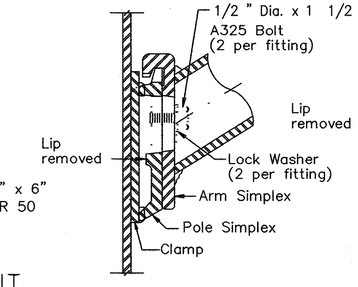
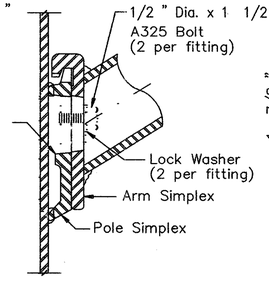


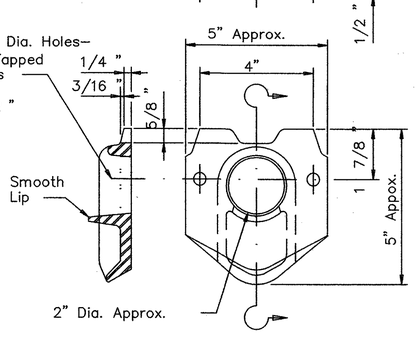
LOWER SIMPLEX FITTING

SECTON A-A

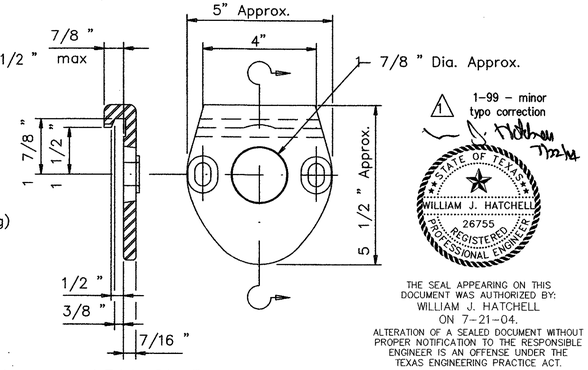


LOWER SIMPLEX FITTING

SECTON B-B



POLE SIMPLEX DETAIL



ARM SIMPLEX DETAIL

1-99 - minor typo correction

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY: WILLIAM J. HATCHELL ON 7-21-04.

ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

THIS DETAIL SHEET WAS OBTAINED FROM TXDOT

176

DATE:	MAY 2004	SCALE:	NOT TO SCALE	JOB NO.:	320
DRAWN:	G&A	DESIGN:	BRG	REVIEWED: BRG	DWG: 320DETAILS-ELEC

ARAPAHO ROAD PHASE III

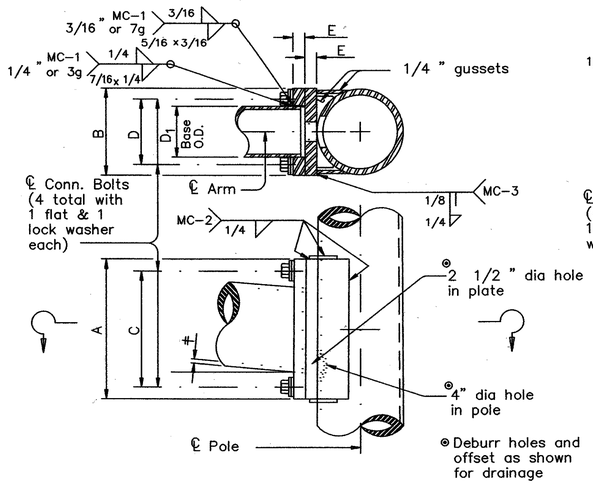
STANDARD CONSTRUCTION DETAILS
SUPPORT STRUCTURES - ARM DETAILS

TOWN OF ADDISON

Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS-14

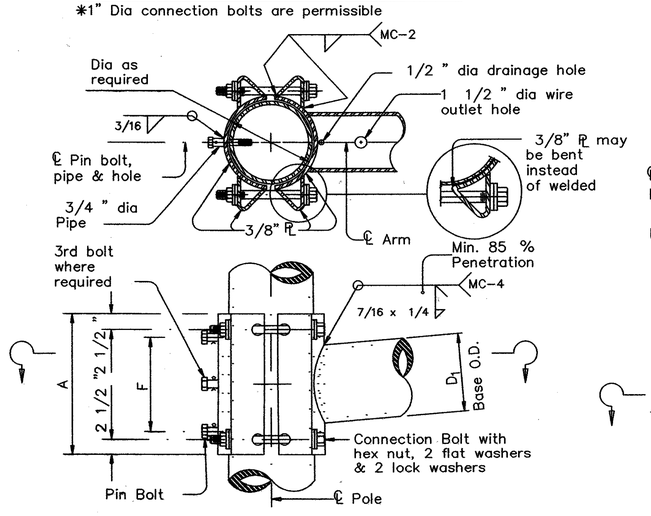
ARM SIZE D_1	ARM SIZE ℄	A	B	C	D	E	CONN BOLT DIA
in.	in.	in.	in.	in.	in.	in.	in.
6.5	.179	12	9	9	6	1	1
7.5	.179	13	9	10	6	1	1
8.0	.179	14	10	11	7	1 1/4	1 1/4
9.0	.179	16	11	13	8	1 1/4	1 1/4
9.5	.179	17	12	14	9	1 1/4	1 1/4
9.5	.239	18	12	15	9	1 1/4	1 1/4
10.0	.239	18	12	15	9	1 1/4	1 1/4
10.5	.239	18	13	15	10	1 1/2	1 1/2
11.0	.239	18	13	15	10	1 1/2	1 1/2



FIXED MOUNT DETAIL 1

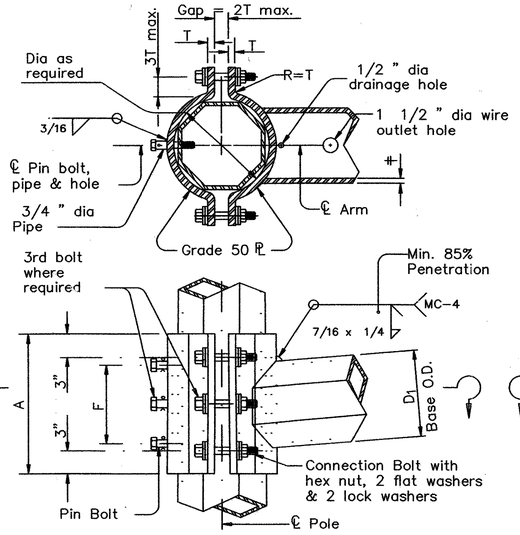
ARM SIZE D_1	ARM SIZE ℄	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	8	4	✱7/8	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1 1/4	3	5/8
9.5	.239	18	12	4	1 1/4	3	5/8
10.0	.239	18	12	4	1 1/4	3	5/8

✱1" Dia connection bolts are permissible



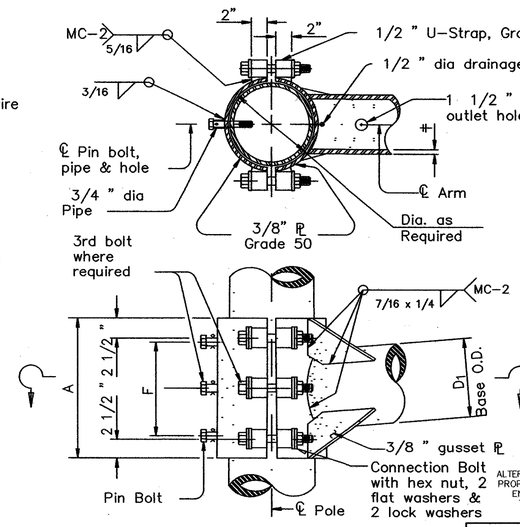
CLAMP–ON DETAIL 1

ARM SIZE D_1	ARM SIZE ℄	A	F	T	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	in.	ea.	in.	ea.	in.
7.0	.179	12	8	3/4	4	3/4	2	5/8
7.5	.179	14	8	3/4	4	3/4	2	5/8
8.0	.179	14	8	3/4	4	3/4	2	5/8
9.0	.179	16	10	7/8	4	1	2	5/8
10.0	.179	18	10	7/8	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8

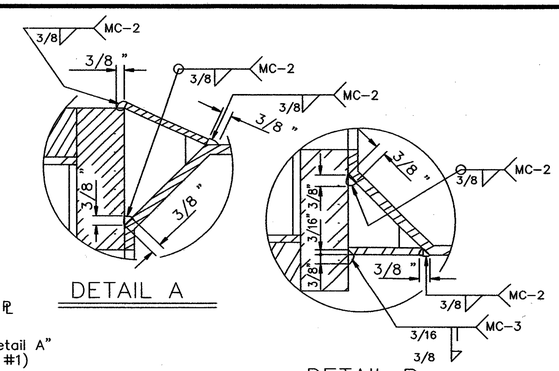


CLAMP–ON DETAIL 2

ARM SIZE D_1	ARM SIZE ℄	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	8	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8



CLAMP–ON DETAIL 3



DETAIL A

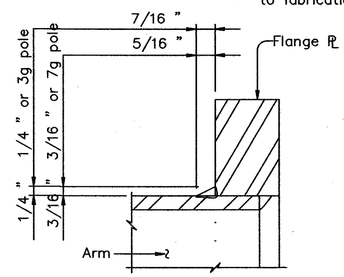
DETAIL B

NO.	DATE	REVISION	APPROV.
1			
2			
3			

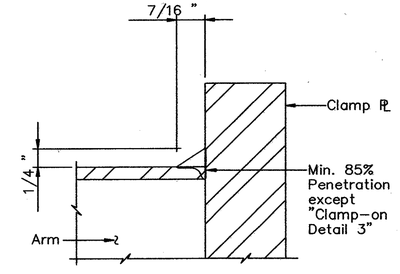
MATERIALS	
Round Shafts or Polygonal Shafts	ASTM A595 GR A, ASTM A570 GR 50, ASTM A607 GR 50, ASTM A572 GR 50 or A36M50
Plates (1)	ASTM A36 OR A572 GR 50 or A595 (2) or A36M50
Connection Bolts	ASTM A325 except where noted
Pin Bolts	ASTM A325
Pipe	ASTM A53 GR A or B, or A501
Misc. Hardware	Galvanized 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 requirments, but material must have 40 ksi minimum yield prior to fabrication.



FIXED MOUNT ARM



CLAMP–ON ARM

ARM BASE WELD DETAILS

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 arm 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.

NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and 3/4 " dia pipe shall have 3/16 " dia holes for a 1/8 " dia galvanized cotter pin. Back clamp plate shall be furnished with a 3/4 " dia hole for each pin bolt. An 11/16 " dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY: WILLIAM J. HATCHELL ON 7–21–04.

ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

THIS DETAIL SHEET WAS OBTAINED FROM TXDOT

177

DATE: MAY 2004	SCALE: NOT TO SCALE	JOB NO.: 320
DRAWN: G&A	DESIGN: BRG	REVIEWED: BRG	DWG: 320DETAILS–TRAF

ARAPAHO ROAD PHASE III

TRAFFIC SIGNAL SUPPORT STRUCTURES STANDARD DETAIL

TOWN OF ADDISON

Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS–15

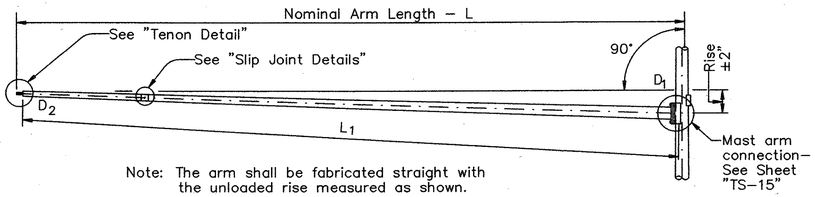
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	10.5	7.8	7.1	6.3	.179	11.5	8.5	7.7	6.8	.179	30–A
24	11.0	8.3	7.6	6.8	.179	12.0	9.0	8.2	7.3	.179	30–A
28	11.5	8.8	8.1	7.3	.179	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	30–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				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'–9"	19.1	7.0	3.5	.179	1'–8"
24	23.1	7.5	4.3	.179	1'–10"	23.1	7.5	3.5	.179	1'–9"
28	27.1	8.0	4.2	.179	1'–11"	27.1	8.0	3.5	.179	1'–10"
32	31.0	9.0	4.7	.179	2'–1"	31.0	9.0	3.5	.179	2'–0"
36	35.0	9.5	4.6	.179	2'–4"	35.0	10.0	3.5	.179	2'–1"
40	39.0	9.5	4.1	.239	2'–8"	39.0	9.5	3.5	.239	2'–3"
44	43.0	10.0	4.1	.239	2'–11"	43.0	10.0	3.5	.239	2'–6"
48	47.0	10.5	4.1	.239	3'–4"	47.0	11.0	3.5	.239	2'–9"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)

NOTE:
1. INTERNALLY ILLUMINATED STREET SIGN TO BE SUPPLIED BY THE TOWN AND INSTALLED BY CONTRACTOR, ON SIGNAL POLE T–2 AT SURVEYOR INTERSECTION.

VIBRATION WARNING

Mast 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 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.

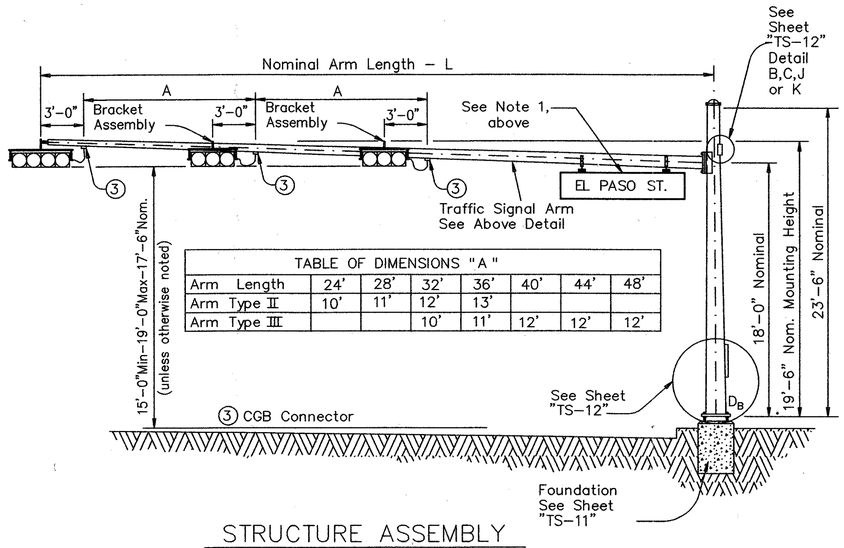


TABLE OF DIMENSIONS "A"							
Arm Length	24'	28'	32'	36'	40'	44'	48'
Arm Type II	10'	11'	12'	13'			
Arm Type III			10'	11'	12'	12'	12'

STRUCTURE ASSEMBLY

NOTE:
ALL SIGNAL HEADS TO BE VERTICAL MOUNT WITH BACKPLATES. ALL SIGNAL HEADS SHALL BE BLACK POLYCARBONATE (CHAPEL HILL–TCT–CROUSE HINDS OR APPROVED EQUAL)

NO.	DATE	REVISION	APPROV.
1			
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3			

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: Above hardware plus: One (or two if ILSN attached) small hand hole, clamp–on simplex		24' Poles With ILSN: Above hardware plus one small hand hole		19' Poles With No Luminaire and No ILSN: 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		32–80	
36	36L–80		36S–80		36–80	
40	40L–80		40S–80		40–80	1
44	44L–80		44S–80		44–80	1
48	48L–80		48S–80		48–80	

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

Nominal Arm Length	Type I Arm (1 Signal): 1 CGB connector		Type II Arm (2 Signals): 1 Bracket Assembly and 2 CGB Connectors ④		Type III Arm (3 Signals): 2 Bracket Assemblies and 3 CGB Connectors ④	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I–80					
24	24I–80		24II–80			
28	28I–80		28II–80			
32			32II–80		32III–80	
36			36II–80		36III–80	
40					40III–80	1
44					44III–80	1
48					48III–80	

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"	2

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–11".

Templates may be removed for shipment.

STATE OF TEXAS
WILLIAM J. HATCHELL
26755
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY:
WILLIAM J. HATCHELL
ON 7–21–04.

THIS DETAIL SHEET WAS OBTAINED FROM TXDOT

178

DATE:	MAY 2004	SCALE:	NOT TO SCALE	JOB NO.:	320
DRAWN:	G&A	DESIGN:	BRG	REVIEWED:	BRG	DWG:	320DETAILS–SIGN

ARAPAHO ROAD PHASE III

TRAFFIC SIGNAL SUPPORT STRUCTURES
SIGNAL MAST ARM ASSEMBLY - 1 of 2

TOWN OF ADDISON

g&a Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS–16

NO.	DATE	REVISION	APPROV.
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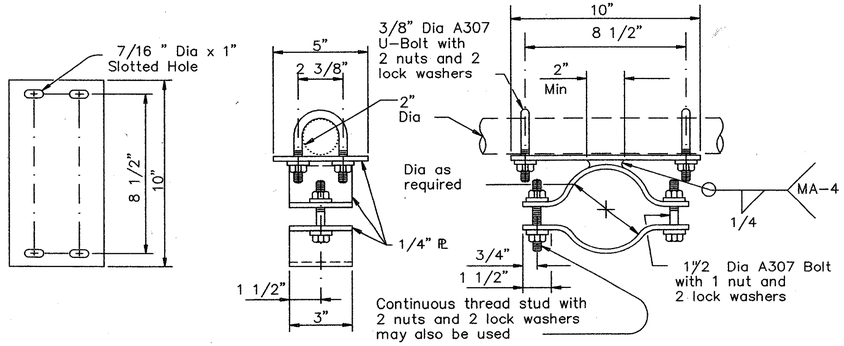
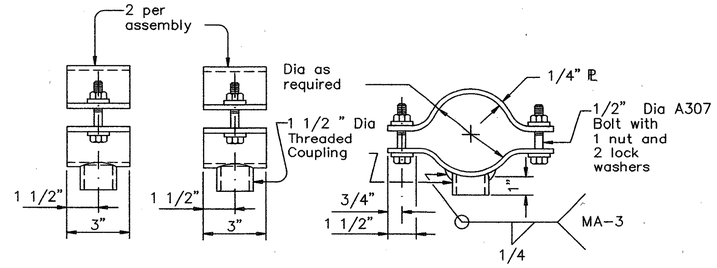


BRACKET ASSEMBLY DETAILS OPTION A

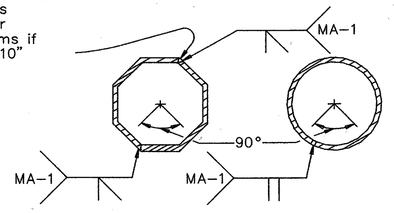


BRACKET ASSEMBLY DETAILS OPTION B

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

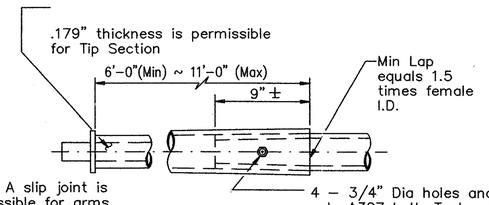
BRACKET ASSEMBLY OPTION C

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.

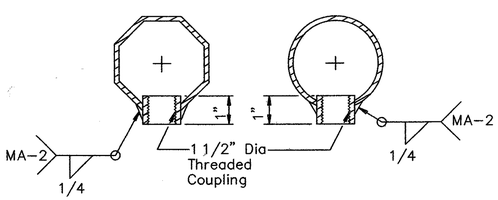
ARM WELD DETAIL



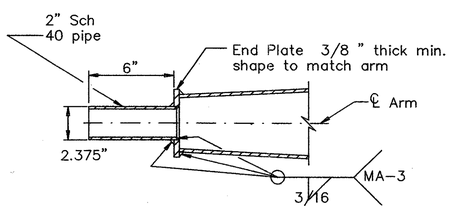
Note: A slip joint is permissible for arms 40' and greater in length. The slip joint shall be made in the shop, but may be match marked and shipped disassembled.

4 – 3/4" Dia holes and 1– 5/8" Dia galv A307 bolt. Tack weld nut to thread projection after making joint. Repair damaged galvanizing in accordance with the specifications.

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 "TS–12" for pole details, "TS–16" for traffic signal arm connection details, "TS–15" for internally lighted street name sign arm connection details, "TS–14" for luminaire arm and connection details, "TS–21" for internally lighted street name sign details, and "TS–11" for anchor bolt and foundation details. See "TS–16" 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".

All mounting brackets for signal heads to be Pelco Astro–BRAC or approved equal.

All mounting brackets for internal illiminated signs are also Pelco harware.

STATE OF TEXAS
WILLIAM J. HATCHELL
26755
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY:
WILLIAM J. HATCHELL
ON 7–21–04.

THIS DETAIL SHEET WAS OBTAINED FROM TXDOT

179

DATE:	MAY 2004	SCALE:	NOT TO SCALE	JOB NO.:	320
DRAWN:	G&A	DESIGN:	BRG	REVIEWED:	BRG	DWG:	320DETAILS–SIGN

ARAPAHO ROAD PHASE III

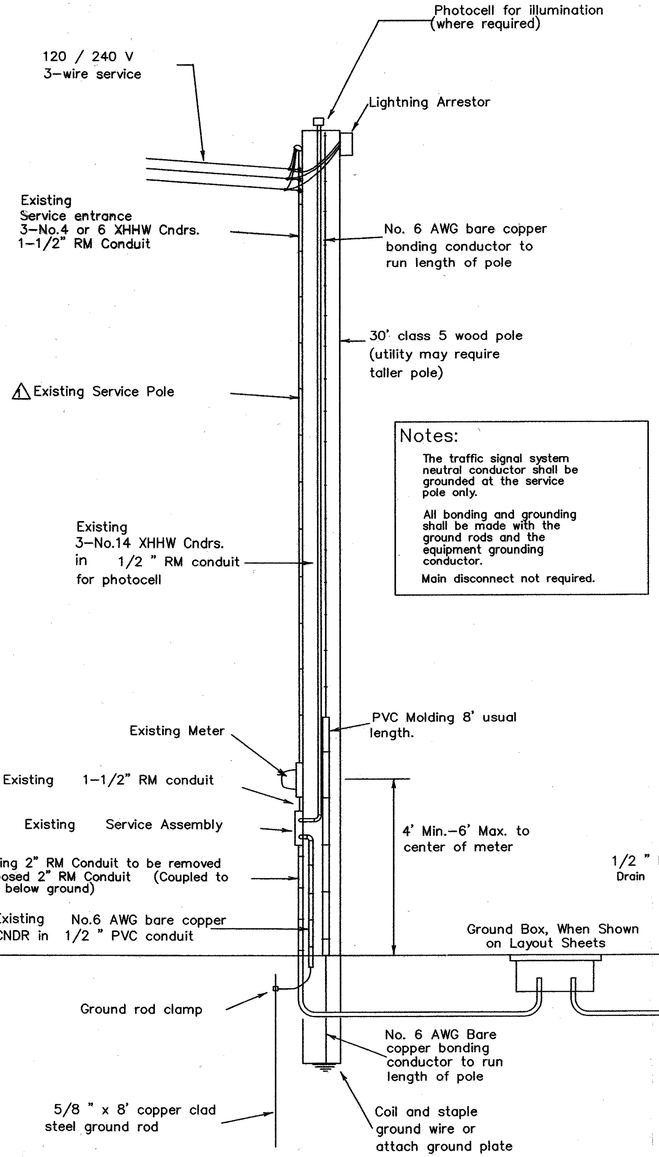
TRAFFIC SIGNAL SUPPORT STRUCTURES
SIGNAL MAST ARM ASSEMBLY - 2 of 2

TOWN OF ADDISON

g&a Grantham & Associates, Inc.
1919 S. SHILOH ROAD, SUITE 310, L.B. 8
GARLAND, TEXAS 75042
(972) 864-2333 (TEL)
(972) 864-2334 (FAX)

SHT. TS–17

NO.	DATE	REVISION	APPROV.
1			
2			
3			



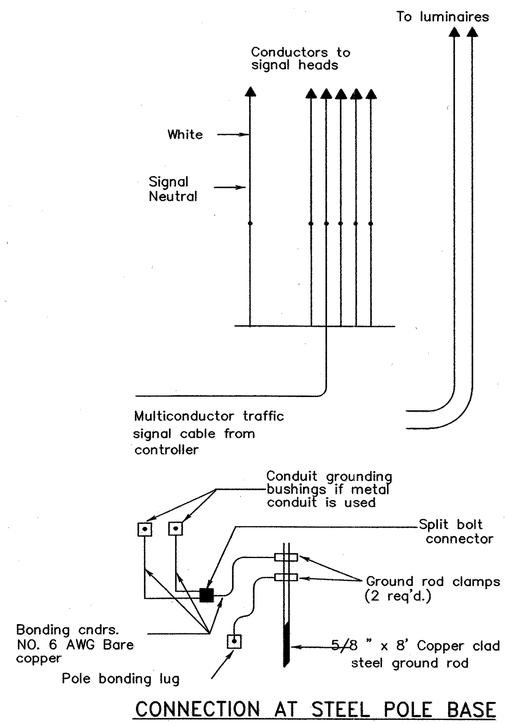
Notes:

The traffic signal system neutral conductor shall be grounded at the service pole only.

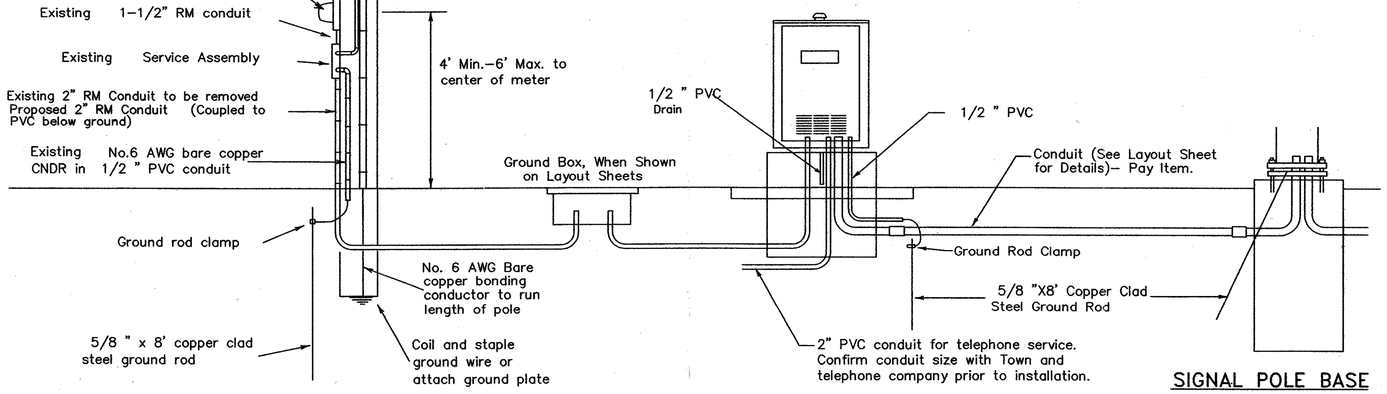
All bonding and grounding shall be made with the ground rods and the equipment grounding conductor.

Main disconnect not required.

SERVICE POLE

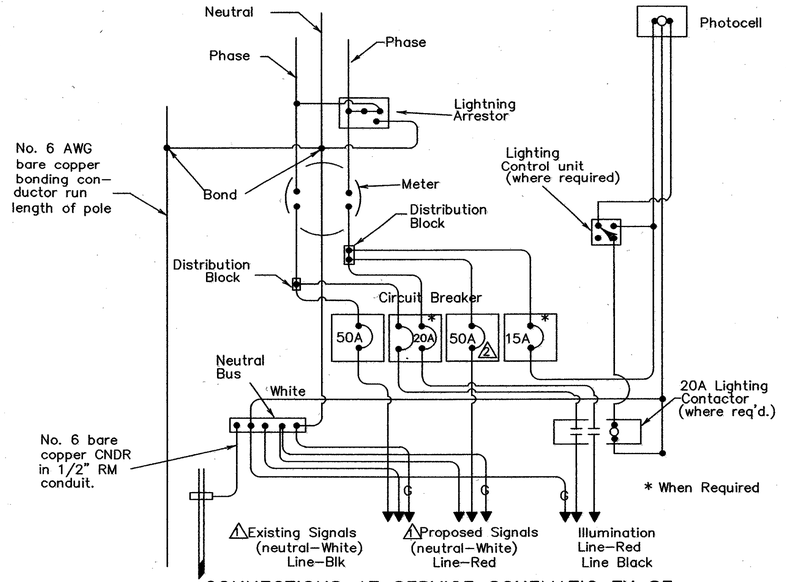


CONNECTION AT STEEL POLE BASE



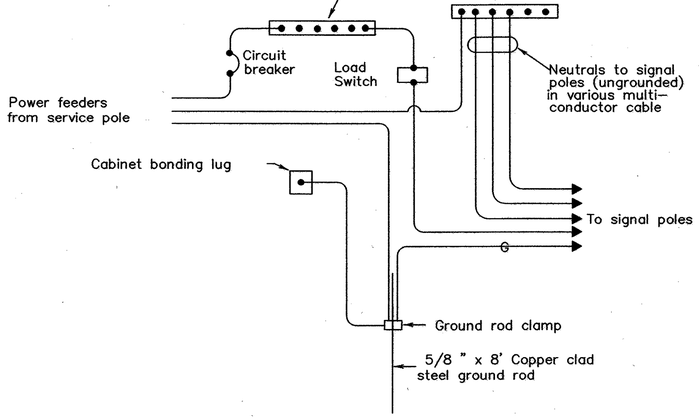
SIGNAL POLE BASE

SIGNAL CONTROLLER



CONNECTIONS AT SERVICE SCHEMATIC TY SE
120/240 VOLT – THREE WIRE SERVICE

⚠ All circuit breakers are existing. The contractor shall install a new 50 AMP breaker for the new controller and remove the existing 50 AMP breaker for the existing controller after signals are operational.



CONNECTIONS AT SIGNAL CONTROLLERS

STATE OF TEXAS
WILLIAM J. HATCHELL
26755
REGISTERED PROFESSIONAL ENGINEER

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ON 7–21–04.

THIS DETAIL SHEET WAS OBTAINED FROM TXDOT

180

DATE:	MAY 2004	SCALE:	NOT TO SCALE	JOB NO.:	320
DRAWN:	G&A	DESIGN:	BRG	REVIEWED:	BRG	DWG:	320DETAILS–TRAF

ARAPAHO ROAD PHASE III

SERVICE POLE DETAILS

TOWN OF ADDISON

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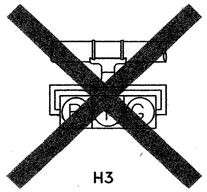
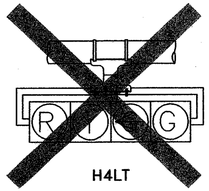
SHT. TS–18

NO.	DATE	REVISION	APPROV.
1			
2			
3			

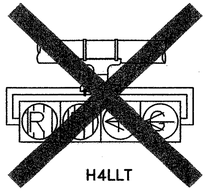
NOTE:
ALL SIGNAL HEADS TO BE MOUNTED VERTICALLY
ON MAST ARM PER MANUFACTURERS SPECIFICATIONS.



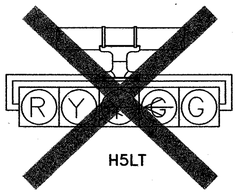
H3



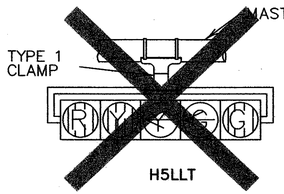
H4LT



H4LLT



H5LT



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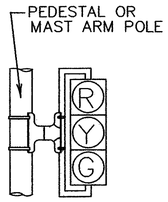
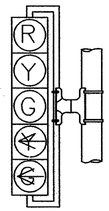
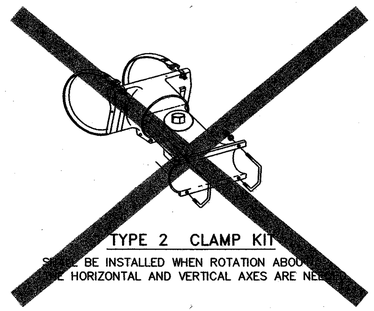


V3



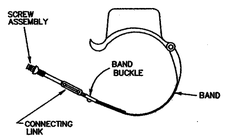
V5LT

NOTE:
VERTICAL LOUVERS SHALL BE INSTALLED
ON HORIZONTAL MOUNTED SIGNALS, HORIZONTAL
LOUVERS SHALL BE INSTALLED ON VERTICAL
MOUNTED SIGNAL WHEN NEEDED.



TYPE 2 CLAMP KIT

SHALL BE INSTALLED WHEN ROTATION ABOUT BOTH
THE HORIZONTAL AND VERTICAL AXES ARE NEEDED.

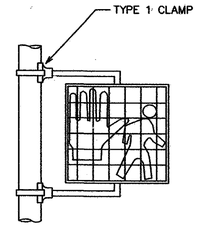


TYPE 1 AND 2 CLAMPS

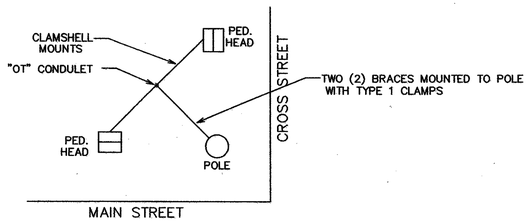
⚠ NOTE: CLAM SHELL MOUNTING HARDWARE SHALL
BE USED INSTEAD OF MOUNTING HARDWARE SHOWN
ABOVE, AS APPROVED BY THE ENGINEER.
ICC P/N 4805 DH OR APPROVED EQUAL.

NOTES:

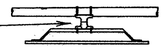
1. PEDESTRIAN SIGNAL HEADS SHALL BE MOUNTED WITH TYPE 1 CLAMPS AND APPROPRIATE TUBING.
2. ALL PEDESTRIAN SIGNAL HEADS SHALL BE INSTALLED ON THE AWAY–FROM–TRAFFIC SIDE OF THE PEDESTAL OR MAST ARM POLE.
3. ALL WIRING FOR PEDESTRIAN SIGNALS SHALL BE TOTALLY ENCLOSED WITHIN THE SIGNAL MOUNTING HARDWARE.
4. ALL PEDESTRIAN SIGNAL HEADS AND PUSH BUTTON SIGNS SHALL DISPLAY THE SYMBOLIZED MESSAGES SHOWN ABOVE.



PEDESTRIAN SIGNAL HEAD MOUNTING
FOR ONE PEDESTRIAN SIGNAL HEAD
152A

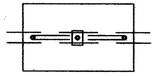


PEDESTRIAN SIGNAL HEAD MOUNTING
FOR TWO PEDESTRIAN SIGNAL HEADS
143C

TYPE 1 CLAMP 

* ONE (1) CLAMP SHALL BE USED ON SIGNS LESS THAN OR EQUAL TO 10'–0" IN LENGTH.

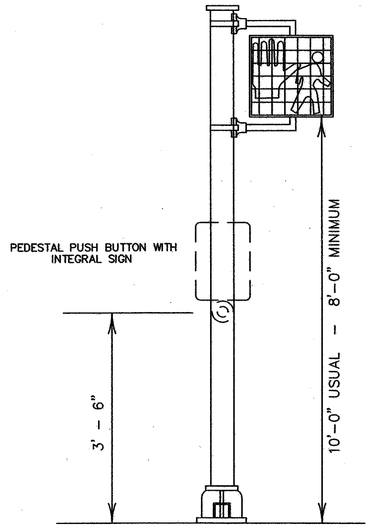
* TWO (2) CLAMPS SHALL BE USED ON SIGNS GREATER THAN 10'–0" IN LENGTH.



SIGN OR DAMPENING DEVICE
ATTACHMENT FOR MAST ARMS

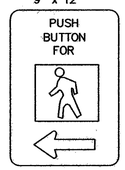
NOTE:

THE POLE ON THIS DRAWING IS SHOWN AS AN EXAMPLE ONLY. POLES OF SIMILAR DESIGN FOR ANY CROSS SECTION WHICH MEET THE SPECIFICATIONS AND REQUIREMENTS SHOWN ON THESE DRAWINGS AND ARE APPROVED BY THE TOWN WILL BE DEEMED ACCEPTABLE.



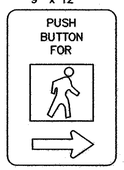
PEDESTAL POLE

SIGN R10–4bL
9" x 12"



PEDESTRIAN PUSHBUTTON
SIGN DETAILS

SIGN R10–4bR
9" x 12"



PEDESTRIAN PUSHBUTTON
SIGN DETAILS

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WILLIAM J. HATCHELL
ON 7–21–04.
ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

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DATE:	MAY 2004	SCALE:	NOT TO SCALE	JOB NO.:	320
DRAWN:	G&A	DESIGN:	BRG	REVIEWED:	BRG	DWG:	320DETAILS–TRAF
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ARAPAHO ROAD PHASE III

TRAFFIC AND PEDESTRIAN SIGNAL HEAD IDENTIFICATION

TOWN OF ADDISON

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1919 S. SHILOH ROAD, SUITE 310, L.B. 8
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SHT. TS–19