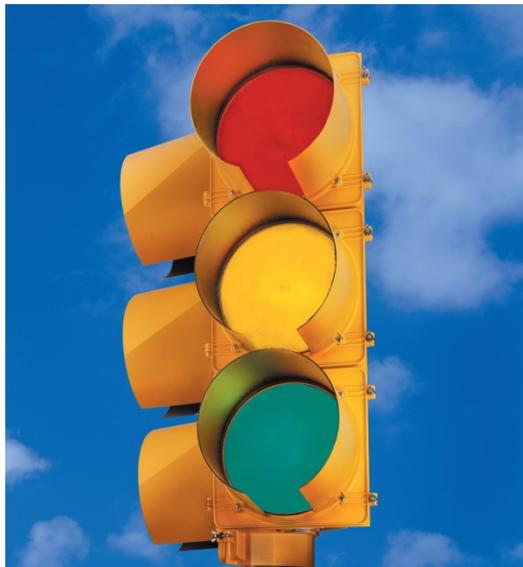


TRAFFIC SIGNAL DESIGN

Technical Design Manual #5



January 2020

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FOREWORD

The purpose of this manual is to assist developers and their consultants in the planning and design of traffic signals within the City of Chandler's right of way. The guidelines contained within this manual are intended for use by professional engineers and designers with a background in the underlying fundamentals in Traffic Engineering. This manual does not provide the answers for all situations involving the design of traffic signals. It does, however, provide the tools for solving most of them. It is expected that those designing traffic signals within the City of Chandler bring to each project the skills and abilities to provide the optimum traffic control device to the public. This may include any new signal design concepts that result in a higher quality of traffic control and/or cost effectiveness. Deviations from these standards must be approved by the City Transportation Engineer prior to submittal for review and approval.

Any questions regarding the signal design should be addressed to:

City Transportation Engineer
City of Chandler
215 East Buffalo Street
Mail Stop 402
P.O. Box 4008
Chandler, Arizona 85224-4008
Phone: (480) 782-3470

1. - DEVELOPER'S CHECKLIST

A checklist has been developed to assist developers/consultants in the design of traffic signals in the City of Chandler (City). This checklist is not intended to be all inclusive, but a helpful guide in the design of traffic signals.

The following items should be researched for inclusion into the traffic signal design plans or in the development of the plans:

- ❑ Contact Blue Stake (602-263-1100) to determine existing utilities in the area.
- ❑ Survey the intersection for the development of a base plan. This survey should be performed after the intersection has been Blue Staked by the utility companies. In addition to the utilities, the survey should locate all existing roadway features within the intersection and 200-feet up each leg of the intersection. This includes face-of-curb, back-of-sidewalk, curb inlets, pavement markings, signs, walls and any landscaping that may affect the location of traffic signal equipment.
- ❑ Conduct a field visit of the intersection to verify the survey.
- ❑ Obtain maps from the utility companies and roadway as-builts from the City to supplement the survey.
- ❑ Contact the electric service company Salt River Project (SRP) or Arizona Public Service (APS) to determine a power source location for the signal.
- ❑ Obtain existing and/or future right-of-way in the area and identify on the plans.

The developer/consultant should anticipate a minimum of two (2) submittals to the City prior to approval of the traffic signal. Upon approval of the signal, seven (7) sets of approved plans should be delivered to the City. These will be distributed as follows:

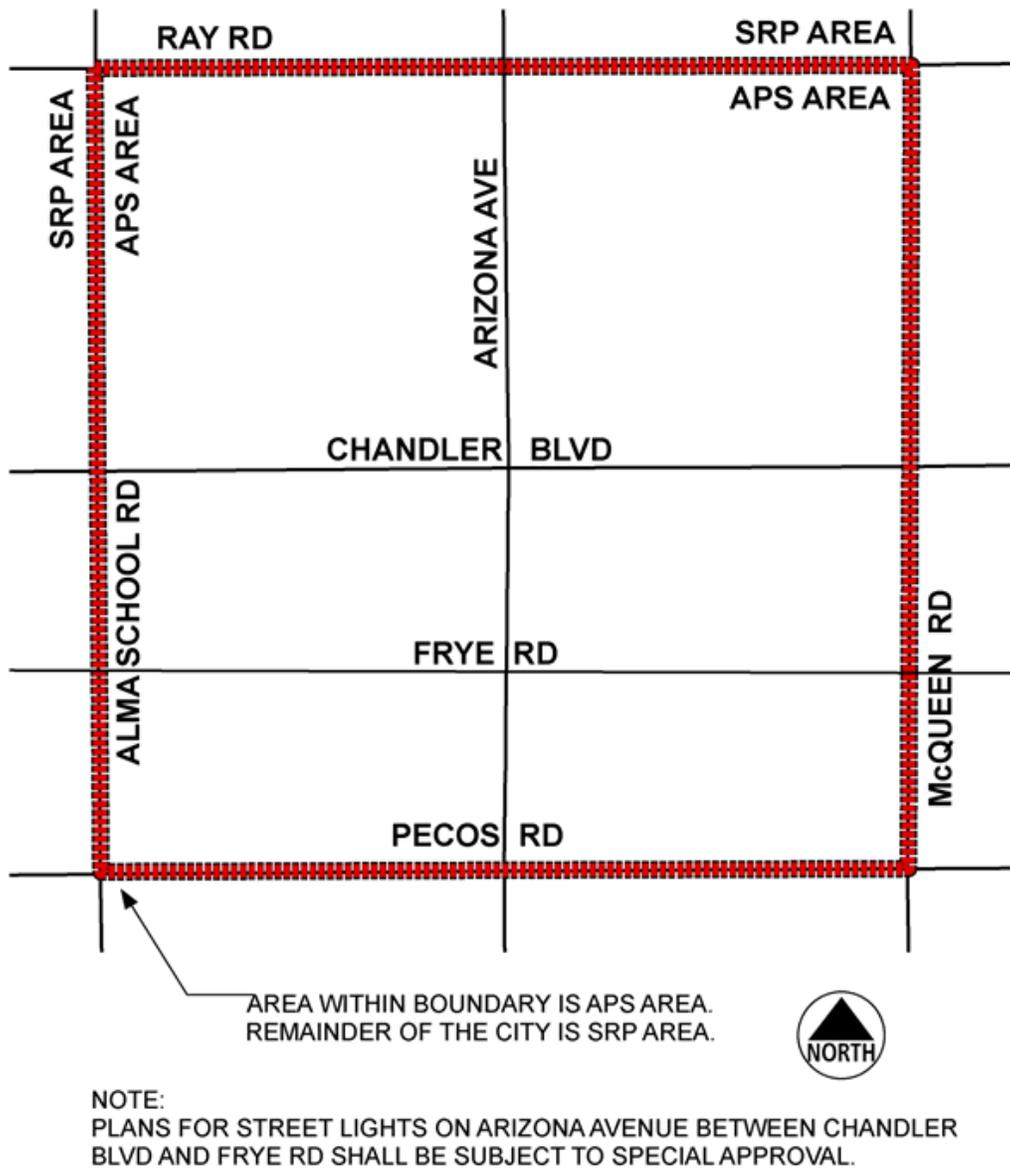
- 3 Sets - Development Services Plans Review Branch
- 2 Sets - Traffic Engineering Branch
- 1 Set - Signal Maintenance Shop
- 1 Set - Inspection

Plan approvals are limited to six (6) months after the approval date and may be renewed for another six (6) months if no changes to the existing or future intersection configuration have occurred.

2. - ELECTRICAL SERVICES

The City is served by two electrical service companies: Salt River Project (SRP) and Arizona Public Service (APS). All areas of the City are served by SRP except for the APS area shown on the map below. The signal designer should contact the appropriate utility company early in the design process so that a “point of service” location can be identified.

All new traffic signals shall use metered power service.



3. - PLAN DEVELOPMENT

Traffic signal plans submitted for approval by the City should be prepared using the Computer Aided Design and Drafting (CADD) software AutoCAD(r) and comply with the City's CADD Standards as indicated below.

The City uses a coversheet and two plan sheets for the design of traffic signals, see Figures TS-2, TS-5 and TS-6.

Coversheet (*Figure TS-2*) contains the project title, vicinity map and the general notes. Contact the City Development Services for format and content requirements.

Sheet 1 (*Figure TS-5*) is used for the signal layout and contains a legend and the notes to the contractor.

Sheet 2 (*Figure TS-6*) contains the pole and cabinet schedule, conductor schedule, phasing schedule and wiring diagrams.

The schedules and wiring diagrams in Fig. TS-6 are shown in greater detail in Figures TS-7 through 7-12. All symbols used in the design of traffic signals shall conform to ADOT standards. Some of these are summarized in Figures. TS-3 and TS-4.

AutoCAD(r) has the ability to place design information on several different layers in a file. This allows the separation of different design elements onto separate layers. The following is a recommended layering structure for the design of traffic signals:

SHEET 1 (*Plan View*)

Layer 1 (name - Title) shall be reserved for the border, title block, and legend.

Layer 2 (name - Ex. Roadway) shall be reserved for the existing roadway configuration including curbs, sidewalks, striping, signing and edge of pavements

Layer 3 (name - Utilities) shall be reserved for any existing signals, including pull boxes and conduit specifically used for traffic signal and communication cables.

Layer 5 (name - New Signal) shall be reserved for all new signal and communication equipment as part of the signal design. Any general notes shall be included on this layer.

Layer 6 (name - Striping) shall be used for any striping or signing changes to be added in conjunction with the signal design.

Layer 7 (name - Construction) shall be reserved for any roadway improvements needed in conjunction with signal installation.

Layer 8 (name - Future) shall be reserved for any future improvements to the roadway, traffic signal, etc.

SHEET 2 (*Schedules and Diagrams*)

Layer 1 (name - Title) shall be reserved for the border and title block.

Layer 2 (name - Schedules) shall be reserved for the pole and cabinet, conductor and phase schedules.

Layer 3 (name - Diagrams) shall be reserved for the wiring diagrams.

The Developer/Consultant shall submit electronic files to the City when plans are submitted for their approval signature. Approval of the design plans is contingent upon conformance to the above design formats.

4. - SIGNAL POLES

4.1 Signal Pole Types

The City uses standard Arizona Department of Transportation (ADOT) signal poles and foundations. It is recommended that the designer obtain a current copy of ADOT's "Traffic Signals & Lighting" Standard Drawings and the latest Special Provisions. All poles shall be per ADOT specifications. Traffic Signal Tenon layouts are shown in the Figures TS-17A and TS-17B.

TENON SCHEDULE

<u>Pole Type</u>	<u>Arm Length</u>	<u>No. of Tenons</u>
K, R	45', 50', 55'	3
J, Q	35', 40'	3
J, Q	25', 30'	2
E, F	15', 20'	1

4.2 Pole and Pushbutton Placement

The City typically requires one pole for each corner of the intersection. Where site condition dictates, two poles may be used. One pole shall be a type 'A' pole (or type 'G' pole depending on street lighting needs), while the other shall be a 'J' 'K' or 'Q' 'R' depending on mast arm length and whether or not a luminaire is included on the pole.

Typical two pole placement layout is shown in Figure TS-13. The desirable pole location is within 5-feet from crosswalk line and 10-feet from face-of-curb. A maximum of 10-feet from crosswalk line and 20-feet from face-of-curb is allowed with the approval of the City Engineer or designee.

5. - PULL BOXES

The City uses three sizes of pull boxes, No. 5, No. 7, and No. 9. The pull boxes shall meet the requirements of ADOT's Standards and Specifications.

The No. 5 pull box is placed adjacent to the electrical "point of service" location as agreed to by the utility company.

The No. 7 pull box is placed on all corners of the intersection, using a No. 7 with extension in front of the traffic signal cabinet. It is generally placed behind the sidewalk at the center of the radius. If no sidewalk or curbing exists or is planned with the signal installation, then the pull box should be placed as close as possible to the ultimate location.

The No. 9 pull boxes shall be installed at all arterial/arterial intersections, proposed and future splice locations as well as end of project conditions. ADOT standard No. 7 pull boxes with extension, shall be installed at ¼-mile intervals to help pull through the cable. All pull boxes containing interconnect cable shall be No. 7 with the 24-inch extension or No. 9, as determined by the City Transportation Engineer.

Figure TS-14 provides typical locations for pull boxes, meter pedestal, and controller.

6. - CONDUITS AND CONDUCTORS

6.1 Conduit

The City uses the following sizes of conduits for the traffic signal cables.

- One 2.5-inch conduit shall be used between the point of service and the meter pedestal.
- One 2-inch conduit shall be used between the meter pedestal and the traffic signal cabinet foundation.
- One 2-inch conduit shall be used between the meter pedestal and the No. 7 pull box to service streetlights and Illuminated Street Name Signs.
- One 3-inch conduit shall be used to connect the pull box and the signal pole foundation at each corner.
- One 4-inch conduit shall be used between the No. 7 pull boxes and is also used for any conduit run underneath the travelled way.
- Two 4-inch conduits shall be used between the No. 7 with extension pull box and the traffic signal cabinet foundation.

See figure TS-14 for Pull Box and Conduit Locations. All conduits entering the controller foundation shall be oriented per figure TS-19 Controller Foundation Conduit Layout Detail. All conduit runs shall be straight when possible.

Communication conduit shall be comprised of four 2-inch conduits, one black reserved for city use and the other unique colors. All conduits shall have 2500 pound detectable mule tape installed, with detectable members spliced across pull boxes using continuously detectable run. One 2-inch conduit (black) shall enter the pull boxes using 45-degree sweeps with no less than a 36-inch sweep radius. The other three 2-inch conduits shall run continuously under or adjacent to the pull boxes or vault, unless otherwise specified. All empty and occupied conduits shall include No. 8 AWG tracer wire. Install warning tape "Caution: Buried Fiber Optic cable" along the conduit alignment and 12-inches below the finish ground.

Communication conduit shall be installed at a depth no less than 36-inches. Every effort shall be made to minimize variations in the conduit profile (i.e. bends, vertical & horizontal shifts, etc.). Galvanized Rigid Conduits (GRC) elbows shall be used for the elbows/bends in the conduit. The elbows shall be wrapped in PVC tape. No more than 360-degree in total bends and no more than two 90-degree elbows/sweeps shall be used between pull boxes.

A 2-inch conduit shall be installed directly into the cabinet foundation exclusively for the communication cable. This 2-inch conduit shall run between the controller foundation and the communication pull box (or intersection pull box in the event that an exclusive communication pull box is unavailable in that corner).

6.2 Conductors

The City uses standard International Municipal Signal Association (IMSA) conductor cables for the traffic signal wiring. The following describes the type and use of conductors:

- No. 6 American Wire Gauge (AWG) solid or stranded, is used between the power supply and the cabinet.
- IMSA 20-1 signal cable, No. 14 AWG solid 20-conductor is used between the cabinet and each pole.
- No. 14 AWG, solid, 5-conductor AWG is used from signal pole to inside mast arm head.
- No. 14 AWG solid, 7-conductor is used from signal pole to outside mast arm head.
- No. 10 AWG solid or stranded, is used for the internally illuminated street name signs (IISNS) and the Luminaire.
- No. 8 AWG solid or stranded, bare bond (green) is used in all conduit runs.

In addition, a common shall be included in the runs. Streetlight Conduction shall be red and street name sign conduction shall be brown. Conductors shall be fused in the No. 7 pull box.

6.3 Communication Cables

The communication cable shall be fiber optic cable only. Communication cable shall be between 48 and 144 strands (as determined by the City Transportation Engineer) with 12 fibers per buffer tube, single mode, fiber optic cable meeting the specifications listed in below table.

The fiber optic communication cable shall run continuous for the complete extent of the project limits. Full splicing of the fiber optic communication cable mid-project will not be allowed. Any construction requiring the relocation or replacement of twisted-pair copper shall be replaced with fiber optic cables. All the infrastructure shall be constructed "fiber friendly".

Gator patch (12-port) shall be installed from the cabinet to the pull box or vault. The gator patch shall run continuous and unspliced between the cabinet and pull box.

The following equipment shall be installed in the No. 9 vault. Contact Traffic Engineering for the latest approved equipment list.

- Fiber optic splice enclosure (using gel cable sealing technology)
- Hanging bracket assembly.

Fibers per cable	48 to 144 strands for main trunkline cables 12 strands for branch cables
Cladding diameter:	125.0 microns
Core diameter:	8.3 microns nominal
Core eccentricity:	≤1.0 micron (0.3 typical)
Temperature range:	-34°C to +74°C
Coating thickness:	50±15 microns
Cable construction:	Loose tube
Outer jacket:	Polyethylene
Bending radius:	20 x Dia. minimum
Tensile strength:	600 pounds
Strength member:	Dielectric
Mode field diameter:	9.3±0.5 microns
Zero dispersion wavelength:	1300 to 1320 nm
Zero dispersion slope:	≤0.092 psec/nm ² -km
Cutoff wavelength	1260 nm
Point discontinuities at 1300 nm:	≤0.1dB

6.4 Fiber Support Equipment

The following equipment shall be installed in the traffic signal control cabinet. Contact Traffic Engineering for the latest approved equipment list.

- Ethernet Switch with 2-5 KM SFP Modules and power supply
- DeviceMaster RTS 4-port DB9
- Patch panel cables
- Line Interface Unit (LIU), if required

7. - CONTROLLER AND CABINET

7.1 Controller

The Controller Unit shall be MCCAIN ATC eX2 NEMA TS 2 Type 1 with Linux operating system, wired with an "A" connector and Systems Input/Output terminal facility.

7.2 Cabinet

The Controller Cabinet shall be a TS2 Type IV per ADOT Standard Specifications. It shall be fabricated from aluminum and the finish shall be unpainted and clean.

7.3 GPS

GPS Modules, microprocessor-based Universal Time Base (UTB) devices that provide accurate time-of-day information for traffic signal controllers shall be installed in the cabinet.

7.4 ARID Device

An Anonymous Re-identification Device shall be installed in the cabinet. Contact Traffic Engineering to confirm the project required ARID devices.

8. - DETECTORS

8.1 Video Detection

The City currently uses FLIR TraffiSense2 Dual at all intersections. Video detection cameras are typically mounted on the traffic signal luminaire arm. When a 'J' or 'K' pole is used the detection camera shall be mounted on the signal pole per the manufacturer requirements and compatible brackets.

Contact Traffic Engineering staff to confirm the project required video detection system.

8.2 Preemption Equipment

The City uses OPTICOM pre-emption equipment for emergency vehicles. OPTICOM detectors are mounted on the signal mast arms, centered between the two outside signal heads. Detectors shall be Global Traffic Technologies (GTT) model 700 series.

9. - CCTV CAMERA

The City uses CCTV traffic monitoring cameras at all intersections. The City currently uses AXIS P5635-E Mk II Pan-Tilt-Zoom (PTZ) camera with AXIS T8134 60W Midspan PoE mounted on AXIS T91L61 Wall-and-Pole Mount.

The camera shall be mounted on the luminaire with manufacturer supplied mounting equipment. The camera shall be installed to optimize the overall view of the intersection approaches. The designer shall ensure that the camera views are clear of obstructions such as trees, poles, building structures etc.

Contact Traffic Engineering staff to confirm the project required CCTV camera system.

10.- SIGNAL HEADS

10.1 Placement of Signal Heads

The placement of traffic signal heads shall follow the policy outlined below (see Detail No. TS-17A and TS-17B).

- For each unique signal display, there shall be a minimum of two (2) signal heads.
- For two-lane minor streets without left turn phase, two (2) Type F head shall be installed, one (1) on the mast arm and one (1) on the far left pole.
- For four or six-lane arterials without left turn phase, there shall be two (2) Type F heads on the mast arm.
- For left-turn control on two-lane minor streets, two (2) Flashing Yellow Arrow heads shall be installed, one (1) on the master arm and one (1) on the far left pole.
- For left-turn control on arterials, two (2) Flashing Yellow Arrow heads shall be installed, one (1) on the master arm and one (1) on the far left pole.
- For approaches with right turn deceleration lanes, one (1) signal head shall be installed on the far right pole.

10.2 Signal Lamps

10.2.1 Vehicle Signals

All signal lamps shall be LED and must comply with Vehicle Traffic Control Signal Heads (VTCSH) standards published in the Equipment and Materials Standards of the Institute of Transportation Engineers (ITE).

10.2.2 Pedestrian Signals

Pedestrian traffic signal lamps shall be LED type with pedestrian countdown timers and shall be enclosed in an 18-inch pedestrian signal housing built to the Pedestrian Traffic Control Signal Indicators (PTCSI) standards published in the Equipment and Materials Standards of the Institute of Transportation Engineers (ITE). "Hand" and "Man" symbols shall be 12-inches in height and conform to PTCSI standards.

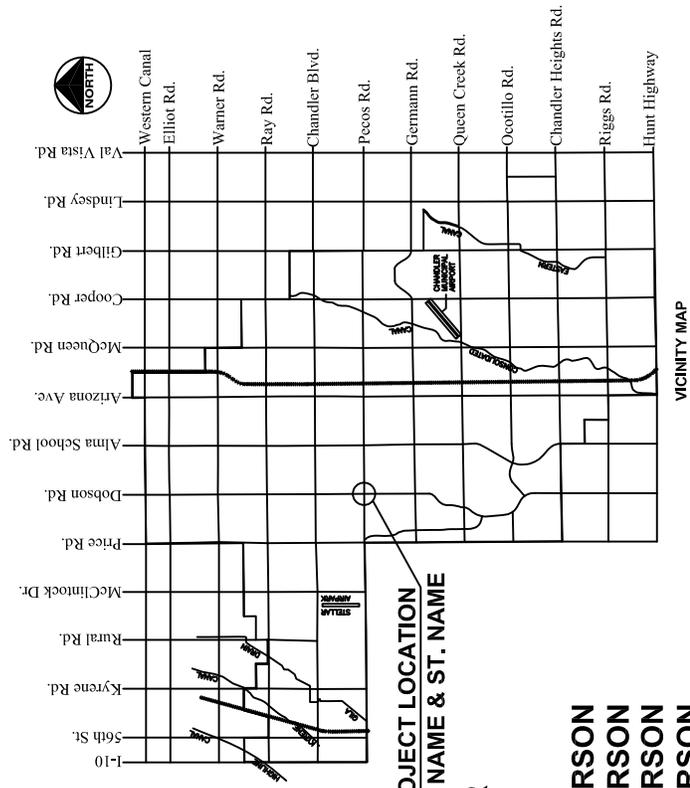
11.- INTERNALLY ILLUMINATED STREET NAME SIGNS

New traffic signal installations require internally illuminated street name signs for all roadways. Sign installations and placement shall conform to the standards and specifications outlined in the latest edition of the City's Standard Details, C-606 through C-610. If height restrictions and/or conflicts exist, the City may consider

alternatives to the details. All designs and installations must be approved by the City Transportation Engineer. Refer to Figure TS-18 for sign mounting details.

Chandler + Arizona
Where Values Make The Difference
City of Chandler
 Public Works Dept.
 215 East Buffalo Street
 Chandler, AZ 85225

CITY OF CHANDLER, ARIZONA
PROJECT TITLE HERE
PROJECT NO.



MAYOR
 CURRENT MAYOR
VICE MAYOR
 CURRENT VICE MAYOR
COUNCIL
 CURRENT COUNCIL PERSON
 CURRENT COUNCIL PERSON
 CURRENT COUNCIL PERSON
 CURRENT COUNCIL PERSON
 CURRENT COUNCIL PERSON

APPROVED:
 PUBLIC WORKS DIRECTOR _____ DATE _____
 CITY ENGINEER _____ DATE _____
 CITY TRANSPORTATION ENGINEER _____ DATE _____

PAGE 1 OF ____
 C.O.C. LOG NO. CIVXX-XXXX

Revised January 2020



COVER SHEET

DETAIL NO.
TS-2
 NTS

Proposed	Existing	
		No. 5 Pull Box
		No. 5 Pull Box w/ Extension
		No. 7 Pull Box
		No. 7 Pull Box w/ Extension
		No. 9 Pull Box
		Signal Luminaire on Pole
		Power Pole
		Control Cabinet
		Load Center Cabinet
		Railroad Cabinet
		Traffic Signal Pole
		Guy Anchor
		Conduit Run
		Luminaire on Mast Arm
		Luminaire on Pole w/ Mast Arm
		Preemption On Mast arm

Revised January 2020

 <p>City of Chandler Chandler + Arizona</p>	<p>PLAN SYMBOLS (1 OF 2)</p>	<p>DETAIL NO. TS-3 NTS</p>
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Proposed

Existing

		Pole with Mast Arm and Traffic Signal
		Pole with Mast Arms for a Luminaire and Traffic Signal
		Pole with Mast Arms for a Luminaire and Traffic Signal with Video Detection
		Traffic Signal Head
		Traffic Signal Head w/ Directional Arrow
FYA	FYA	Traffic Signal Head w/ Flashing Yellow Arrow
		Pedestrian Signal Head
		Closed Circuit Television Camera
		Video Detection Camera
		Pedestrian Push Button w/ Sign on Pole
		Signal Pole Number
		Conduit Run Number
		Gas Line
		Overhead Telephone Line
		Burried Telephone Line
		Cable Television Line
		Water Line
		Storm Drain
		Sanitary Sewer
		Overhead Electric
		Underground Electric
		Fiber Optic

Revised January 2020

 <p>City of Chandler Chandler + Arizona</p>	<p>PLAN SYMBOLS (2 OF 2)</p>	<p>DETAIL NO. TS-4 NTS</p>
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CONSTRUCTION NOTES:

SIGNAL PLAN VIEW
MIN SCALE 1"=20'
LEGEND
PULL BOX SCHEDULE
IISNS DETAILS
CONSTRUCTION NOTES
GENERAL NOTES
PHASING DIAGRAM
CABINET CORNER INSET/DETAILS



CITY OF CHANDLER Chandler, Arizona 85225	
PROJECT NO.	SCALE
ISSUED BY	DATE
DRAWN BY	PROJECT
REV.	REV.

Revised January 2020

City of Chandler



Chandler + Arizona

PLAN VIEW (SHEET 1)

DETAIL NO.

TS-5

NTS

CONSTRUCTION NOTES:

SEE TS-7

CABINET AND POLE SCHEDULE

SEE TS-12

TERMINAL WIRING DETAILS FOR SIGNALS

SEE TS-8

TRAFFIC SIGNAL METER PEDESTAL

SEE TS-11

INSTALLATION OF I.M.S.A. SIGNAL CABLES

SEE TS-9

CONDUCTOR SCHEDULE



CITY OF CHANDLER
Chandler, Arizona 85225

DETAILS AND SCHEDULES

PROJECT NO.	SCALE
ISSUED FOR	DATE
DESIGNED BY	DATE APPROVED
DRAWN BY	REV.
CHKD.	

Revised January 2020

City of Chandler



Chandler + Arizona

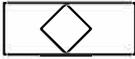
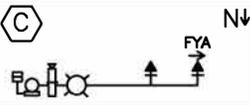
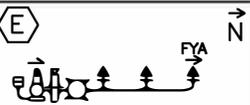
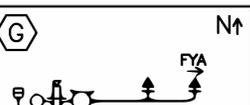
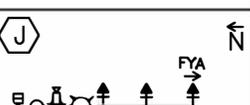
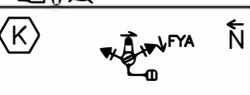
DETAILS AND SCHEDULES (SHEET 2)

DETAIL NO.

TS-6

NTS

CABINET AND POLE SCHEDULE

CABINETS						ASSEMBLY NOTES	LOCATION		
CABINET	TYPE	EQUIPMENT							
(A) 	METER PAD	TESCO OR MYERS				PEC SHALL FACE NORTH ELECTRIC SERVICE ADDRESS: _____	STATION AND OFFSET		
(B) 	IV	McCain ATC eX NEMA TS2 CONTROLLER				INSTALL 4' SQUARE X 4" CONCRETE WORK PAD IN FRONT OF FOUNDATION WITH 8" TOE IN FRONT	STATION AND OFFSET		
POLES			MAST ARMS		SIGNAL ASSEMBLIES		PED. DET. SIGN	NOTES	LOCATION
ORIENTATION PLAN	TYPE	SIG	LUM	MTG	FACE				
(C) 	Q	35'	12'	2-II 1-V	2-F 1-M/H			1,3,4,5,7	STATION AND OFFSET
(D) 	A 10'			1-IV 1-V	1-FYA 1-M/H	R10-4b		2,7	STATION AND OFFSET
(E) 	R	55'	20'	3-II 1-V	1-FYA 2-F 1-M/H	R10-4b		1,2,3,4,5,7	STATION AND OFFSET
(F) 	A 10'			1-VI 1-V	2-F 1-M/H			7	STATION AND OFFSET
(G) 	Q	35'	12'	2-II 1-V	2-F 1-M/H			1,3,4,5,7	STATION AND OFFSET
(H) 	A 10'			1-IV 1-V	1-FYA 1-M/H	R10-4b		2,7	STATION AND OFFSET
(J) 	R	55'	20'	3-II 1-V	1-FYA 2-F 1-M/H			1,3,4,5,7	STATION AND OFFSET
(K) 	A 10'			1-VI 1-V	2-F 1-M/H	R10-4b		2,7	STATION AND OFFSET

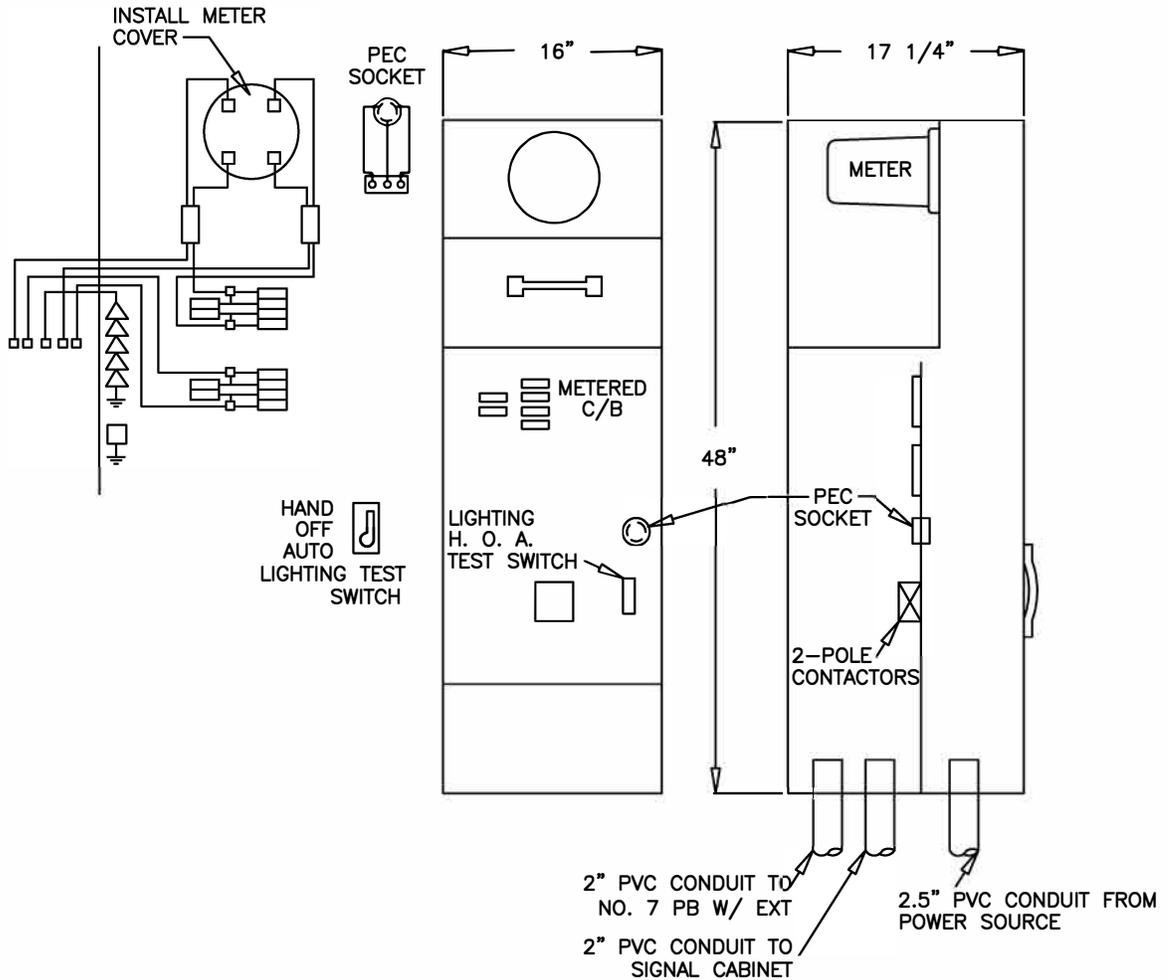
- NOTES: 1. INSTALL GTT "OPTICOM" 700 SERIES DETECTOR ON MAST ARM.
 2. TYPE I PEDESTRIAN PUSH BUTTON - T.S. 11 - 1.
 3. LED LUMINAIRE, TYPE III, MEDIUM CUTOFF, 120 VOLT.
 4. INSTALL ILLUMINATED STREET NAME SIGN.
 5. INSTALL FLIR TRAFFISENSE2 DUAL VIDEO DETECTION SYSTEM.
 6. INSTALL DEVICEMASTER RTS 4-PORT DB9, ETHERWAN SWITCH WITH 2-PORT SFP, 6-PORT GATOR PATCH.
 7. LED TYPE PEDESTRIAN TRAFFIC SIGNAL HEAD WITH COUNTDOWN TIMER.
 8. INSTALL AXIS P5635-E MK II CCTV WITH AXIS T8134 60W MIDSPAN POE MOUNTED ON AXIS T91L61 WALL-AND-POLE MOUNT.



R10-4b

PRIOR TO ORDERING, ALL TRAFFIC EQUIPMENT SHALL BE SUBMITTED FOR APPROVAL Revised January 2020

 City of Chandler Chandler + Arizona	CABINET AND POLE SCHEDULE	DETAIL NO. TS-7 NTS
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TYPICAL PEDESTAL LAYOUT

SEE DETAILS IN ADOT STANDARD DRAWING TS 3-5. LIGHTING CONTROL CONTACTOR (DOUBLE PULL 120V 60HZ) SHALL BE INSTALLED FOR SIGNAL WITH STREET LIGHT LUMINAIRES. PROVIDE 50 AMP BREAKER FOR SIGNAL SERVICE. PROVIDE DOUBLE PULL 20 AMP BREAKER FOR STREET LIGHTS.

Revised January 2020

 <p>City of Chandler Chandler + Arizona</p>	<p>METER PEDESTAL</p>	<p>DETAIL NO. TS-8 NTS</p>
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CONDUCTOR SCHEDULE																							
CONDUIT RUN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
CONDUIT SIZE (IN)	SEE SECTION 6.1 FOR CONDUIT SIZES																						
AWG																							
#14 AWG SOLID 20 CONDUCTOR 20-1 I.M.S.A. SIGNAL CABLES NOTES (2 & 4)	POLE C			1				1		1													
	POLE D			1				1		1													
	POLE E			1							1	1						1		1			
	POLE F			1								1	1					1		1			
	POLE G			1													1		1		1		
	POLE H			1														1	1		1		
	POLE J			1				1															
	POLE K			1		1																	
PER MANUFACTURER	VIDEO DETECTION Ø2																						
	VIDEO DETECTION Ø4																						
	VIDEO DETECTION Ø6																						
	VIDEO DETECTION Ø8																						
#6 AWG NOTE (1)	SERVICE 120/240V		3																				
BLACK-HOT WHITE-NEUTRAL GREEN-EQUIPMENT GROUND	SIGNAL CABINET 120V		2																	2			
STREET LIGHTING 120 V	# 10 AWG (RED)		1			1	1	1		1	1			1	1	1		1	1	1			
	COMMON (WHITE)		1			1	1	1		1	1			1	1	1		1	1	1			
STREET NAME SIGN LIGHTING 120 V	# 10 AWG (BROWN)		1			1	1	1		1	1			1	1	1		1	1	1			
	COMMON (WHITE)		1			1	1	1		1	1			1	1	1		1	1	1			
#8 AWG NOTE (1)	CONDUIT BOND (GREEN)	1	1	1	1	1	1	1		1	1	1	1	1	1	1		1	1	1	1	1	
FIRE DET. CABLE - 3M MODEL 205 CLIFFORD 3C2017; SUNSTATS 5-282	FIRE PREEMPT 1					1																	
	FIRE PREEMPT 2						1	1															
	FIRE PREEMPT 3											1	1					1		1			
	FIRE PREEMPT 4																1	1		1			
SEE NOTE 3	INTER CONNECT																						
	CCTV CAMERA																						

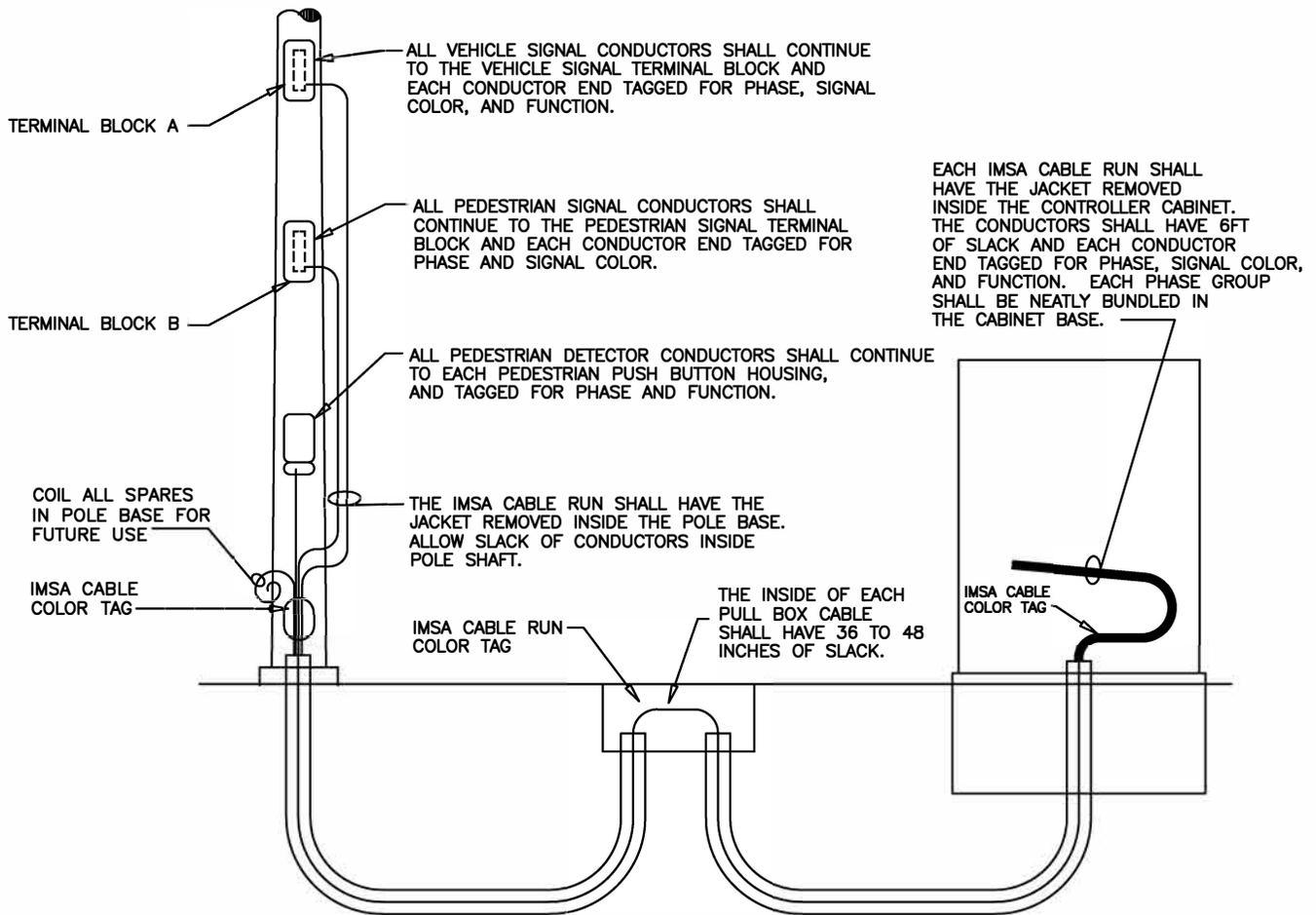
- - INSTALLED BY SRP
- * - EXISTING

CONDUCTOR NOTES:

- (1) MINIMUM NUMBER OF CONDUCTORS REQUIRED (NON-I.M.S.A. TYPE)
- (2) MINIMUM NUMBER OF CABLES REQUIRED (INCLUDING I.M.S.A. TYPES)
- (3) TWELVE-PORT GATOR PATCH
- (4) #14 AWG SOLID, 5-CONDUCTOR FROM SIGNAL POLE TO THE INSIDE MAST ARM SIGNAL HEADS
#14 AWG SOLID, 7-CONDUCTOR FROM SIGNAL POLE TO THE OUTSIDE MAST ARM SIGNAL HEADS

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 City of Chandler Chandler + Arizona	<h1 style="margin: 0;">CONDUCTOR SCHEDULE</h1>	DETAIL NO. <h1 style="margin: 0;">TS-9</h1> NTS
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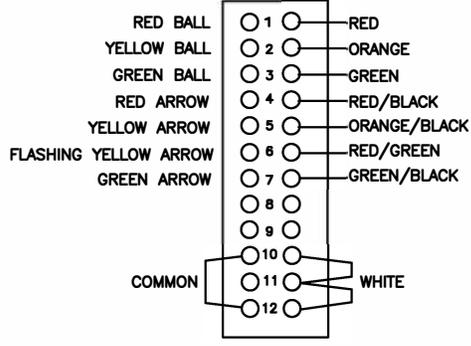


EACH IMSA 20-1 CABLE RUN SHALL BE CONTINUOUS FROM THE SPECIFIC TRAFFIC SIGNAL POLE TO THE TRAFFIC SIGNAL CONTROLLER CABINET, WITHOUT THE USE OF ANY SPLICES.

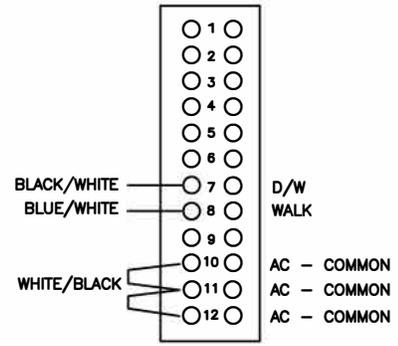


INSTALLATION OF I.M.S.A. SIGNAL CABLES

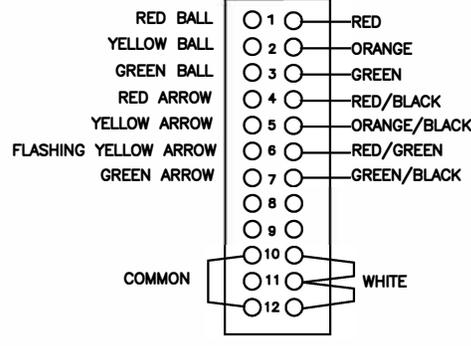
DETAIL NO.
TS-11
NTS



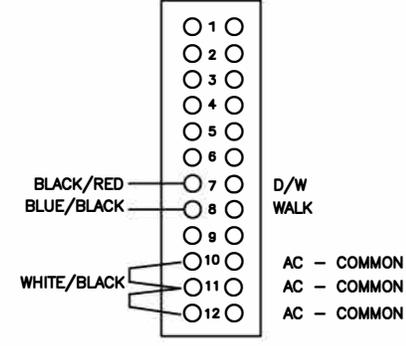
MAST ARM HEAD



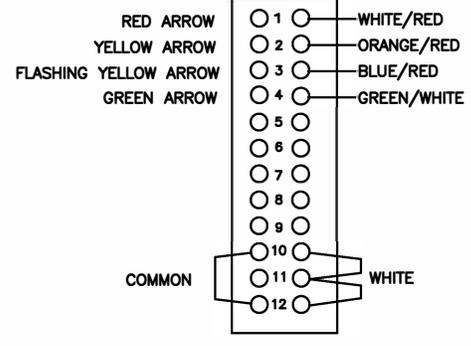
PEDESTRIAN NB/SB



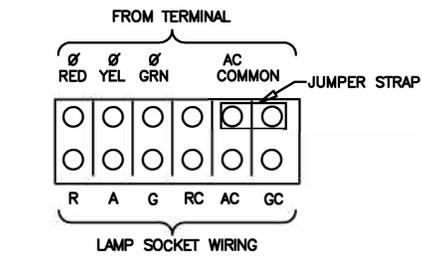
NEAR RIGHT SIDE MOUNTED HEAD
(FRONT & BACK)



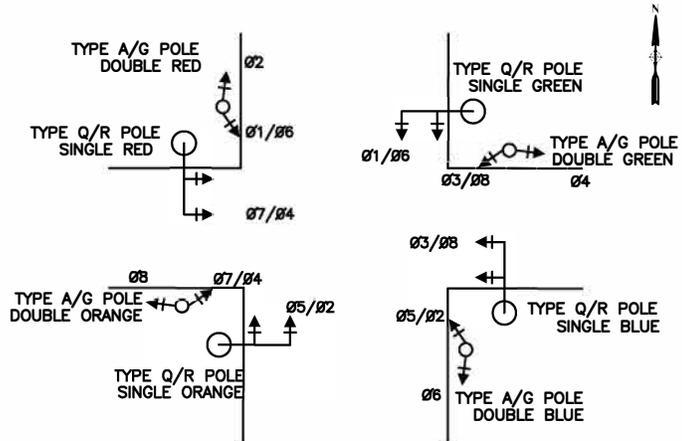
PEDESTRIAN EB/WB



FAR LEFT SIDE MOUNTED HEAD



TERMINAL BLOCK IN SIGNAL HEAD

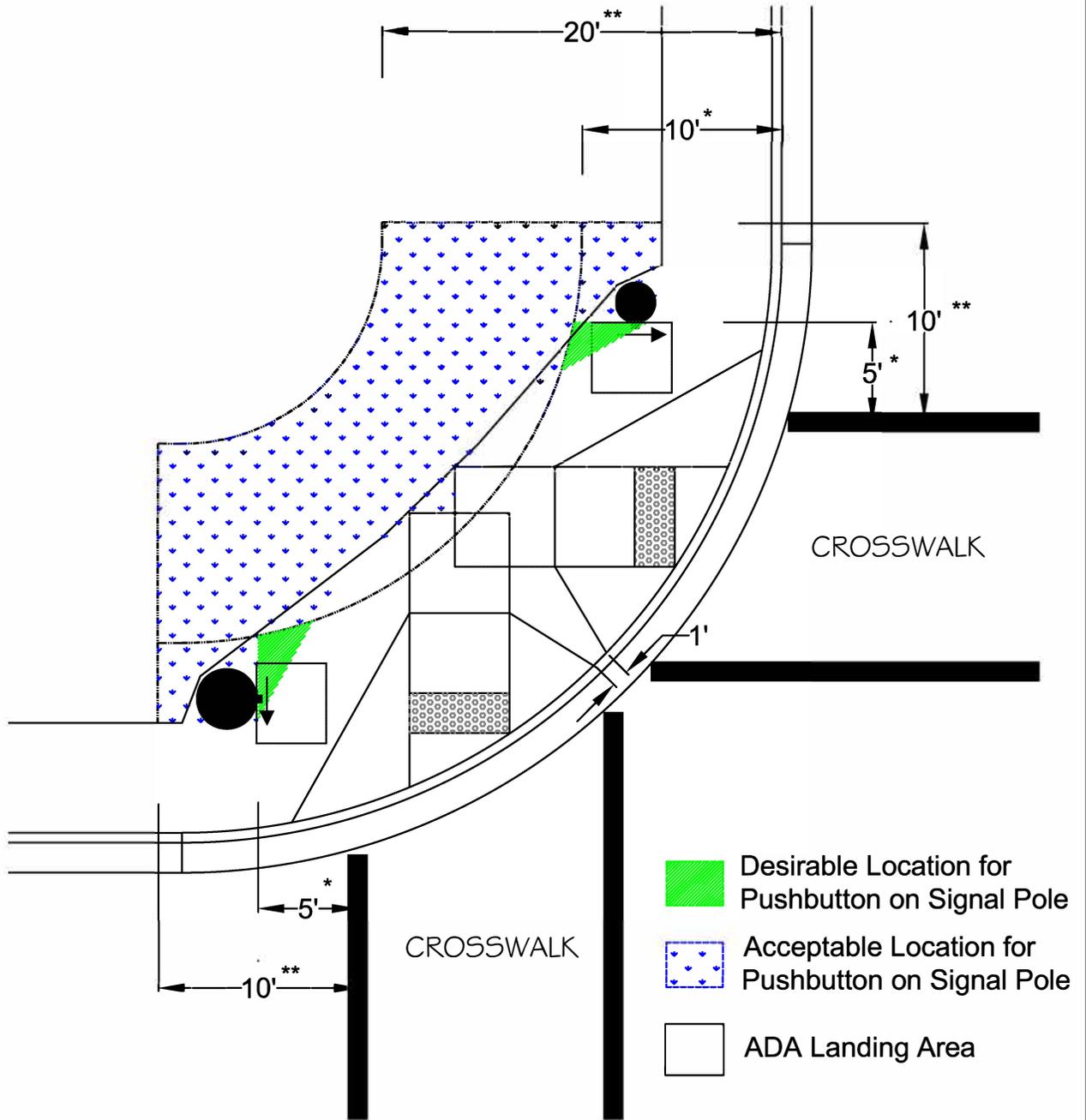


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TERMINAL BLOCK WIRING DETAILS

DETAIL NO.
TS-12
NTS



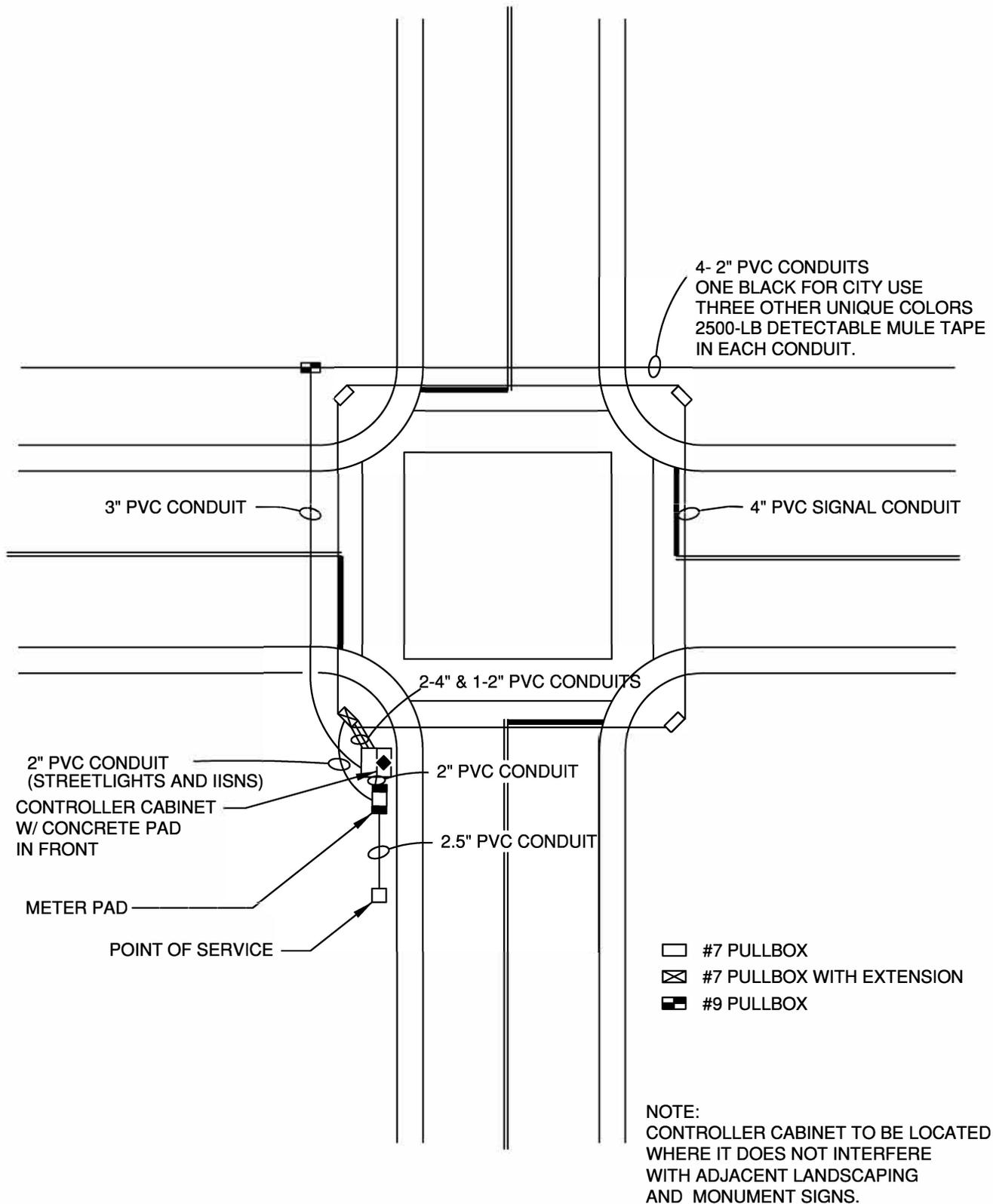
NOTES:

1. * DESIRABLE LOCATION IS WITHIN 5 FT OFFSET FROM CROSSWALK LINE AND 10 FT OFFSET FROM FACE-OF-CURB.
2. ** MAXIMUM OFFSET IS WITHIN 10 FT OFFSET FROM CROSSWALK LINE AND 20 FT OFFSET FROM FACE-OF-CURB WITH CITY ENGINEER APPROVED DESIGN EXCEPTION.
3. SIDEWALK EXTENSION REQUIREMENTS APPLIES TO ALL POLE LOCATIONS. MUST MEET ADA FOR CLEAR FLOOR SPACE, SLOPE, HEIGHT AND REACH REQUIREMENTS.



POLE PLACEMENT FOR ADA ACCESSIBILITY OF TRAFFIC SIGNAL PUSH BUTTONS

DETAIL NO.
TS-13
 NTS

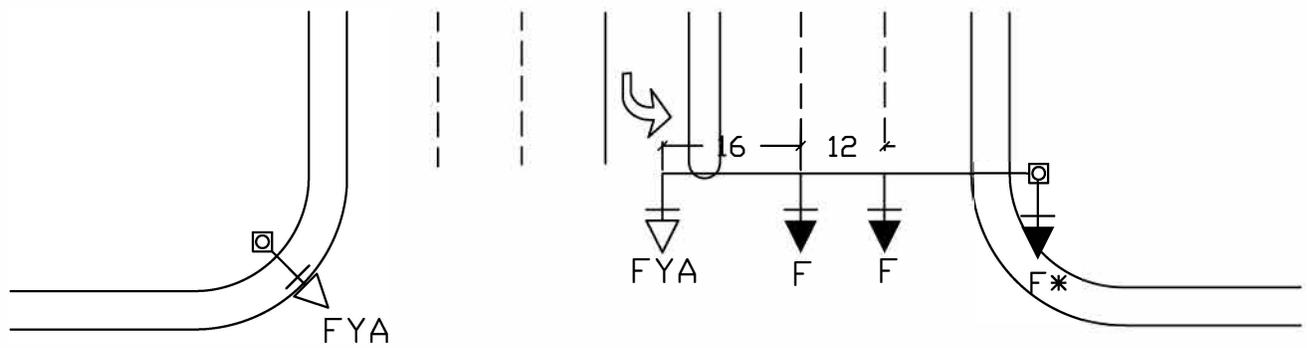


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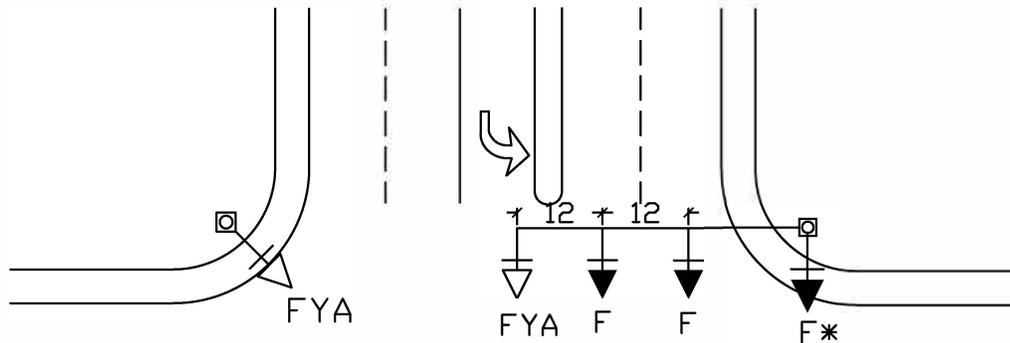


PULL BOX AND CONDUIT LOCATIONS

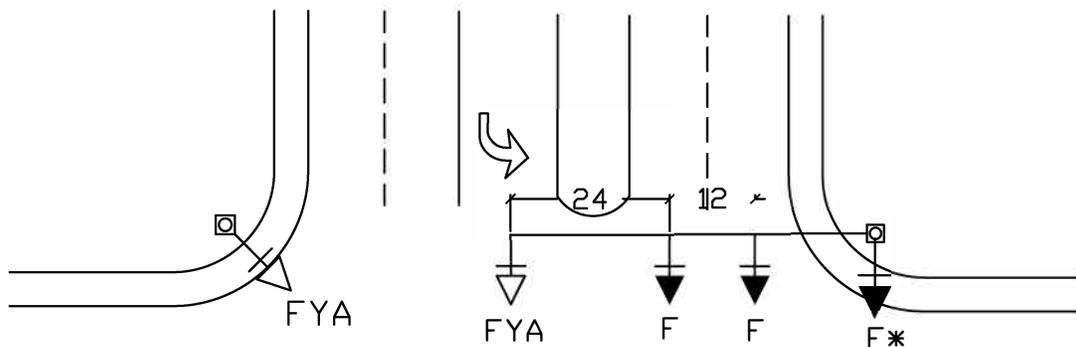
DETAIL NO.
TS-14
NTS



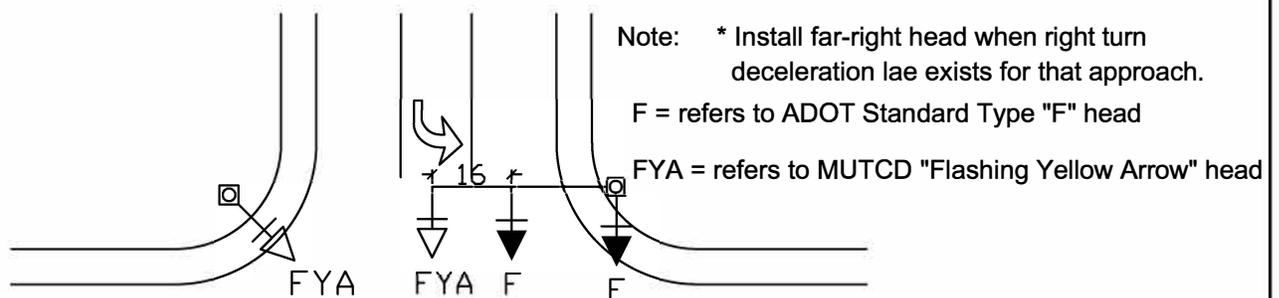
Six Lanes With Left Turn Phase



Four Lanes With Left Turn Phase



Four Lanes With Left Turn Phase and Wide Median



Two Lanes With Left Turn Phase

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Legend:



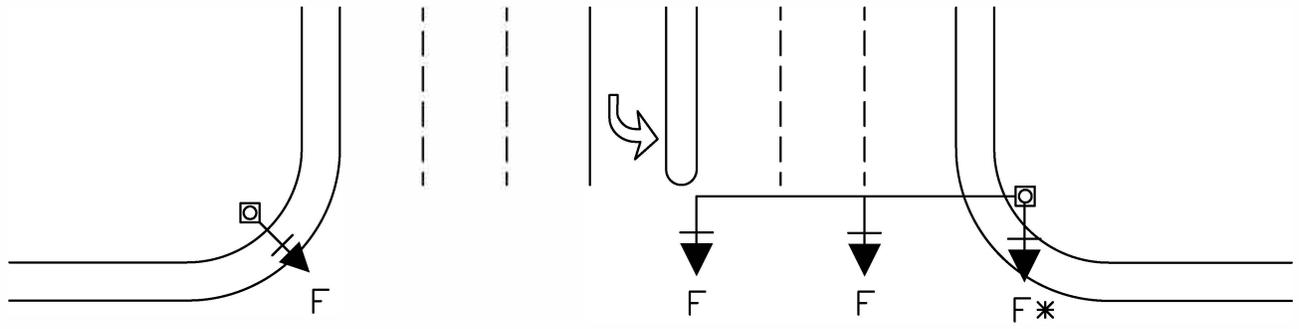
Chandler + Arizona

**SIGNAL HEAD PLACEMENT
WITH LEFT TURN PHASE**

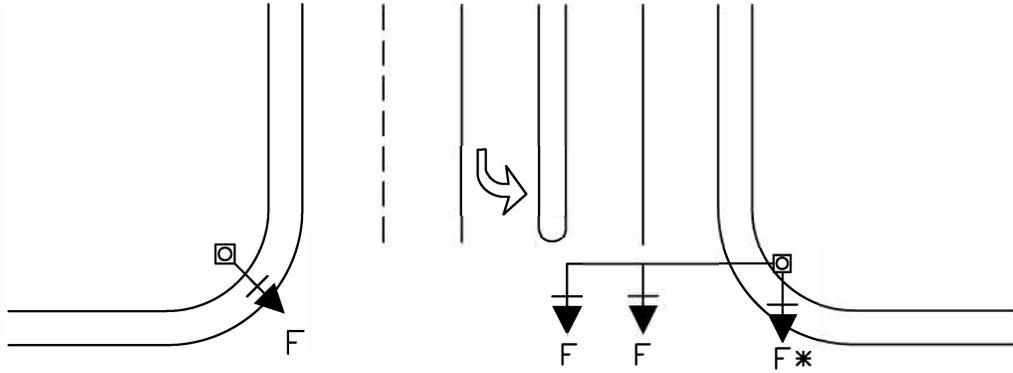
DETAIL NO.

TS-17A

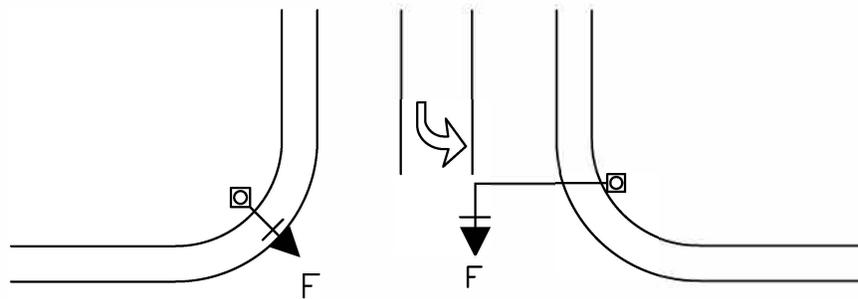
NTS



Six Lanes Without Left Turn Phase



Four Lanes Without Left Turn Phase



Two Lanes Without Left Turn Phase

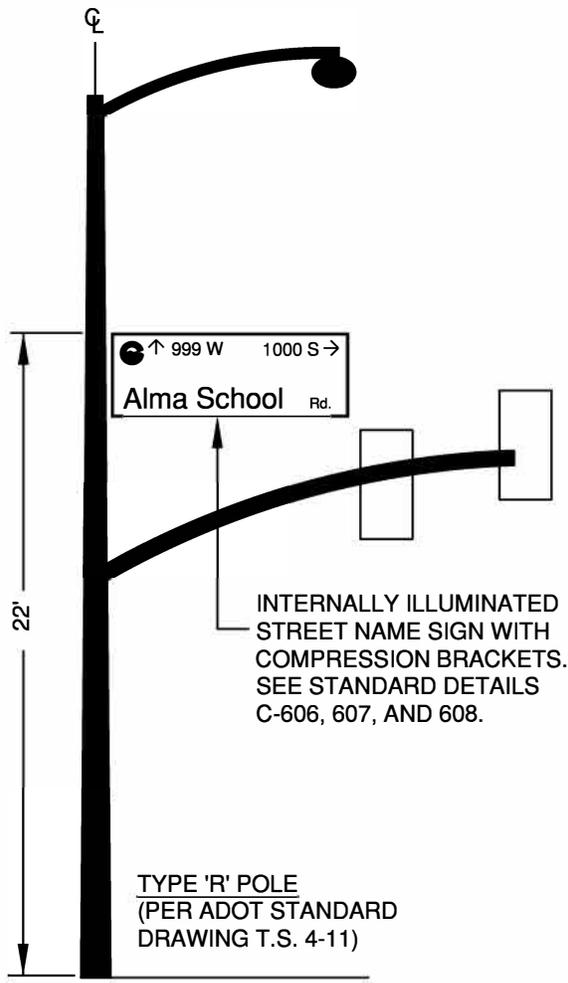
Note: * Install far-right signal head when right turn deceleration lane exists for that approach.

Legend: F = refers to ADOT Standard Details Type "F" head
 FYA = refers to MUTCD "Flashing Yellow Arrow" head

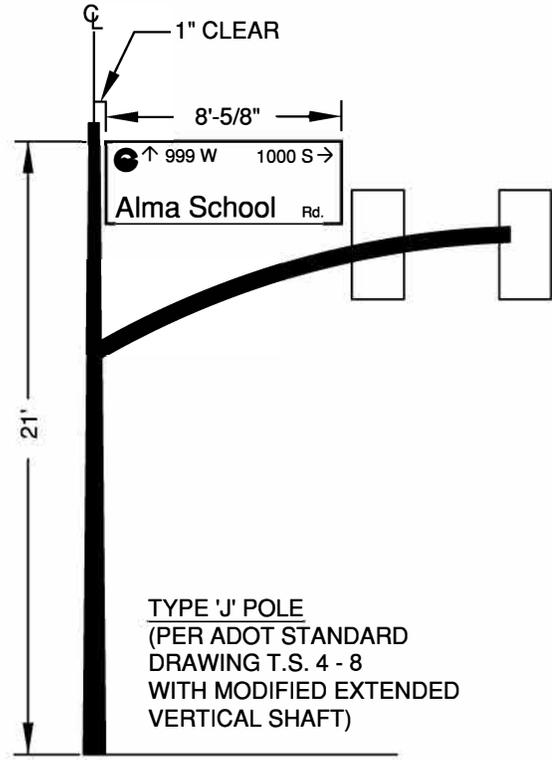


**SIGNAL HEAD PLACEMENT
 WITHOUT LEFT TURN PHASE**

DETAIL NO.
TS-17B
 NTS



ELEVATION

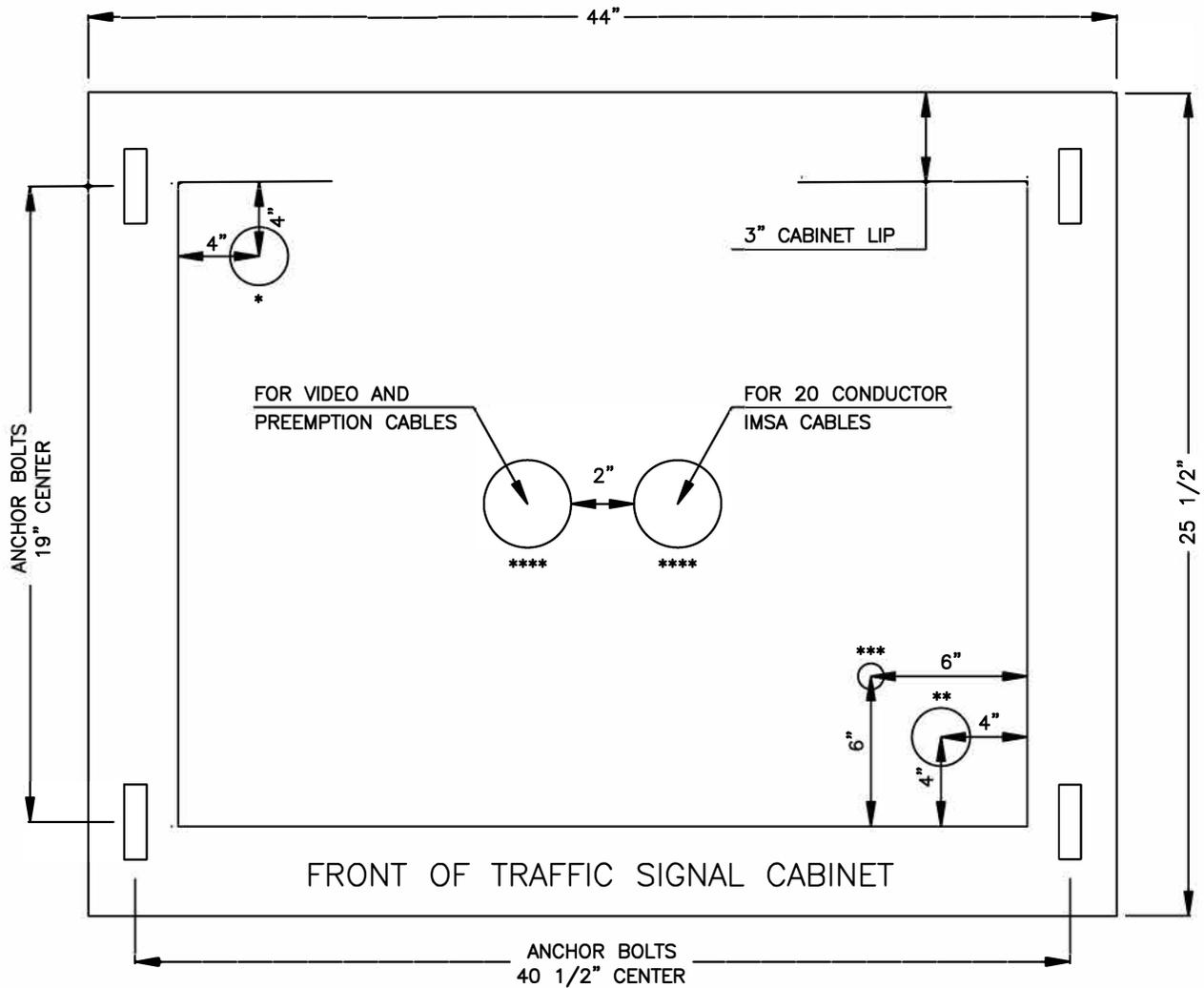


ELEVATION



INTERNALLY ILLUMINATED SIGNS

DETAIL NO.
TS-18
NTS



A RAISED PCC PAD 48"X48"X4" SHALL BE PLACED AT THE FRONT OF THE CABINET. PAD SHALL BE SET 2" BELOW THE FOUNDATION ELEVATION AND SLOPED AWAY FROM THE CABINET FOR DRAINAGE (2%).

- * 2.0" COMMUNICATIONS CONDUIT
- ** 2.0" SERVICE CONDUIT
- *** 1.5" CONDUIT FOR GROUND ROD
- **** 4.0" SIGNAL CONDUIT

Revised January 2020

 <p>City of Chandler Chandler + Arizona</p>	<p>CABINET FOUNDATION CONDUIT LAYOUT DETAIL</p>	<p>DETAIL NO. TS-19 NTS</p>
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