TRAFFIC DESIGN MANUAL

APPENDIX B

Traffic Signal Installation Inspection Forms

Traffic Operations Division
Traffic Engineering Office

SHEET 1 OF 3

TRAFFIC SIGNAL INSTALLATION - PRELIMINARY HARDWARE INSPECTION CHECKLIST

AGENCY / CONTRACTOR LOGO	
	INTERSECTION LOCATION:
	DATE:
	CONTRACTOR:
	INSPECTOR:

PULL BOXES

ACCEPT	DECLINE	N/A			COMMENTS
			1	Check size, type and location as detailed in the plans and specifications, or "as builts"	
			2	Check pull box is leveled, flush with ground or sidewalk (not on street or driveway)	
			3	Check for at least 12 inches of gravel in the bottom of the box (drainage)	
			4	Check pull box cover – metal or fiberglass	
			5	Check pull box cover – labeled "TRAFFIC SIGNAL"	
			6	Check for spare length of cables inside pull box	
			7	Check for sodding or seeding around pull boxes being completed	
			8	Check if splice wires (if spliced) in pull boxes are labeled	
			9	Check if proper splicing method used in each pull box	
			10	Check for no splices in any pull box for video or opticom cabling (if used)	

CONDUITS

ACCEPT	DECLINE	N/A		
			11	Check size and type as detailed in the plans and specifications
			12	Check if conduits are at proper height inside pull box
			13	Check for conduit terminations to be free of sharp edges
			14	Check for bushings, if metal conduit

POLES AND PEDESTALS

ACCEPT	DECLINE	N/A		
			15	Check for proper type as detailed in the plans
			16	Check for proper position as detailed in the plans
			17	Check for proper grade as detailed in the plans
			18	Check for proper height as detailed in the plans
			19	Check that the load face of the pole is oriented towards the load
			20	Check for proper clearance from overhead utilities and cables
			21	Check anchor bolt size, number and placement
			22	Check that anchor bolts are cut with footcovers installed and secured
			23	Check for extra conduit being placed in pole foundation
			24	Check for concrete being completed around poles and pedestals
			25	Check for caps being in place to prevent water from entering the poles/pedestals
			26	Check for all openings on pole/pedestal being plugged if not used
			27	Check for wiring inside handholes with proper splicing method
			28	Check for all handhole covers being in place for pole/pedestals
			29	Check for ground rod being installed at each pole/pedestal
			30	Check for monkey face to be installed on each weatherhead
			31	Check for loop & signal wiring being labeled (only if spliced) inside handholes
			32	Check for no splices in opticom cabling or video cabling (if used)

SHEET 2 OF 3

ACCEPT	DECLINE	N/A	LOOP DETECTION
			75 Check if loops are located as per plan
			76 Check if loops are correct size as per plan
			77 Check if loops are sealed properly in roadway
			78 Check for correct wiring and splicing (if spliced) at pull boxes

ACCEPT	DECLINE	N/A	VIDEO DETECTION
			79 Check if detection zones are located as per plan
			80 Check if video cameras meet minimum height requirements (24 ft)
			81 Check if equipment is securely fastened
			82 Check if correct IMSA cabling is used
			83 Check that video cable is routed neatly and secured properly

ACCEPT	DECLINE	N/A	SIGNS
			84 Check if span and pole mounted signs are located as per plan
			85 Check if span and pole mounted signs have correct lettering and/or symbols as per plan
			86 Check if sign saddles are tight with lockwasher(s) in place
			87 Check if signs are properly attached to tethers with lockwasher(s) in place
			88 Check if signs are in alignment with proper lane(s)
			89 Check if signsdo not restrict view of any signals

ACCEPT	DECLINE	N/A	PREEMPTION EQUIPMENT
			90 Check if detectors, confirmation lamps, and beacons are located as per plans
			91 Check if detectors have weep holes opened on each unit
			92 Check if detectors are aligned properly, both horizontally and vertically with roadway
			93 Check if the correct attachment hardware is used on all detectors and confirmation lamps
			94 Check if locking rings on confirmation lamps and detectors are tightened

ACCEPT	DECLINE	N/A	PAVEMENT MARKINGS
			95 Check if correct material is used on stripping (Thermoplastic)
			96 Check if all crosswalks are located as per plan
			97 Check if all stop lines are located as per plan
			98 Check if all lane stripping are located as per plan
			99 Check if gore markings, if used, are located as per plan

ACCEPT	DECLINE	N/A	FIBER OPTIC CABLING
			100 Check if fiber optic routing located as per plan
			101 Check if overhead cabling (if routed) is secured with proper hardware
			102 Check if cabling meets minimum bend radius requirements throughout according to specifications
			103 Check if specified cabling is used as per plan and marked on outer jacket
			104 Check if proper splicing method used in each pull box (if used)
			105 Check if proper amount of slack is provided in pull boxes and at cabinet
			106 Check if proper tracer is provided (minimum 14 gauge) on in ground conduits

ACCEPT	DECLINE	N/A	MISCELLANEOUS
			107 Check that overhead service wire meets the pole at a point that is less than 2 feet from the weatherhead
			108 Check if overhead cabling (if routed) is secured with proper hardware

COMMENTS

INSPECTOR SIGNATURE: _____

SHEET 3 OF 3

CABINET			
ACCEPT	DECLINE	N/A	
			33 Check that cabinet is leveled and sealed at the base
			34 Check that concrete is completed around cabinet base and pad
			35 Check that cabinet bolts are tight
			36 Check that ground rod is present and wired to ground buss
			37 Check that future conduit is installed in cabinet base (one required)
			38 Check that all cabling entering and exiting the cabinet meets IMSA specs
			39 Check that conduits, if metal, have bushings installed
			40 Check that service wires are neatly routed and phased properly to neutral buss and breaker
			41 Check that serviced wires are phased properly at top of pole or from pull box
			42 Check that AC power is present at breaker in the cabinet
			43 Check that banana plug is present inside police panel
			44 Check that conflict monitor is inside the cabinet
			45 Check that cabinet wiring is neat and all wires from the field are labeled
			46 Check that cabinet has sticker "Call Before You Dig"

SIGNALS AND SPANS			
ACCEPT	DECLINE	N/A	
			47 Check that signal heads are located as per plans
			48 Check that signal heads are no lower than 17'6" & plumbed with ground
			49 Check for proper clearance from overhead utilities and cables
			50 Check that pole/pedestal mounted signals are no lower than 10' and aligned with appropriate lanes
			51 Check that pole/pedestal mounted signals are banded properly
			52 Check that no open holes on any signal sections exist
			53 Check that rubber grommets are in place on all goosenecks
			54 Check that saddles are tight with lockwasher(s) in place
			55 Check that goosenecks are tight with cotter pin and set screw in place
			56 Check for correct drip loops for goosenecks
			57 Check that metal plates have been installed and bolted in red sections on span mounted signals
			58 Check that tether bracket(s) in green sections are tight with lockwasher in place
			59 Check that pipedowns are painted and all associated hardware is tight, set screws in place
			60 Check that backplates are properly installed
			61 Check that correct lashing rods are used throughout installation
			62 Check that signal heads are wired and terminated properly
			63 Check that drip loops are in place neatly with tie wraps
			64 Check that span wires are attached properly at poles
			65 Check that insulators (if used) are installed below utility primary lines
			66 Check that spans are grounded to poles and terminated properly
			67 Check that deadends are closed at tethers and spans
			68 Check that thimbles are used at tether brackets mounted to poles
			69 Check that tethers are tighten with minimum slack

PEDESTRIAN SIGNAL HEADS AND PUSHBUTTONS			
ACCEPT	DECLINE	N/A	
			70 Check if pedestrian displays are mounted at the proper height (minimum 8')
			71 Check if pedestrian pushbuttons are the proper type according to plans
			72 Check if pedestrian pushbuttons are mounted at the proper height (minimum 3'6")
			73 Check if pedestrian placards are the correct type and positioned properly
			74 Check for no open holes on pedestrian indications

COMMENTS

SHEET 1 OF 2

TRAFFIC SIGNAL INSTALLATION - ACTIVATION DAY INSPECTION CHECKLIST

AGENCY / CONTRACTOR LOGO

INTERSECTION LOCATION:

DATE: | ACTIVATION TIME:

CONTRACTOR:

INSPECTOR:

CABINET

ACCEPT	DECLINE	N/A		COMMENTS
			1 Signal timing received from Traffic Engineer DATE:	
			2 Signal timing properly installed on traffic signal controller DATE:	
			3 Check that cabinet prints are provided and in place in the cabinet	
			4 Check that equipment manuals are provided and in place in the cabinet	
			5 Check that intersection plans or "as built" plans are provided and in place in the cabinet	
			6 Check that timing directives are provided and in place in the cabinet	
			7 Check that program card has all jumpers soldered in proper place	
			8 Check that conflict monitor flash time is set for 10 seconds	
			9 Check that cabinet has been "flashed out" for conflict monitor verification	
			10 Check that all load switches are in place	
			11 Check that cabinet fan is operational via thermostat	
			12 Check that special detectors are wired correctly on "D" connector	
			13 Check that all wires are routed neatly, tie wrapped and labeled properly (signal, detection, etc)	
			14 Check that signal wiring is terminated properly on field terminal strip and at busses	
			15 Check that battery backup system is operational with utility power failure	
			16 Check that cabinet keys have been provided	
			17 Check that cabinet lights are working properly	
			18 Check that all cabinet door switches operate properly	

SIGNALS AND SPANS

ACCEPT	DECLINE	N/A	
			19 Check that the correct indications are displayed
			20 Check that intersection flashes as per print/time sheet

PEDESTRIAN SIGNAL HEADS AND PUSHBUTTONS

ACCEPT	DECLINE	N/A	
			21 Check that pedestrian indications are clearly visible at any point within appropriate crosswalk area
			22 Check that pedestrian detection is calling proper phase

LOOP DETECTION

ACCEPT	DECLINE	N/A	
			23 Check that detection loops lead in is twisted in the cabinet
			24 Check that vehicle detection is calling proper phase

SHEET 2 OF 2

VIDEO DETECTION

ACCEPT	DECLINE	N/A	
			25 Check that field of view is horizontal to roadway with no horizon
			26 Check that field of view is focused clearly with sufficient area for "down" algorithm
			27 Check if fog zones are drawn for each camera view
			28 Check that detection zones call proper vehicle phases when occupied
			29 Check that surge supression is in place for each coaxial line within cabinet
			30 Check that surge supression is used for AC power line on camera power panel
			31 Check that stop line detection zones set up for each direction via "D" connector when advanced
			32 detection is used
			33 Check that BNC connectors are crimped properly and surge supression installed on coax cables

PREEMPTION EQUIPMENT

ACCEPT	DECLINE	N/A	
			34 Check if preemption box is grounded and detector wires are labeled as per direction
			35 Check that equipment communicates to all detectors
			36 Check that preemption calls proper phase when activated from field
			37 Check that proper Hi/Lo is displayed based on preempt received
			38 Check that confirmation lamps are operational for specified direction
			39 Check that beacons work properly on all preempts

FIBER OPTIC CABLING

ACCEPT	DECLINE	N/A	
			40 Check that fiber optic cabling is terminated properly at WIC box
			41 Check that fiber jumpers are provided within cabinet
			42 Test fiber optics from nearest intersection

MISCELLANEOUS

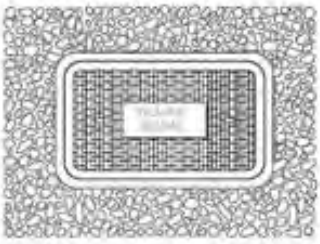
ACCEPT	DECLINE	N/A	
			43 Check that Stop signs have been removed
			44 Check that police equipment operates properly
			45 Check that vehicular signal heads and pedestrian signal heads work properly at nighttime
			46 Check if entire construction site is clean of debris

COMMENTS

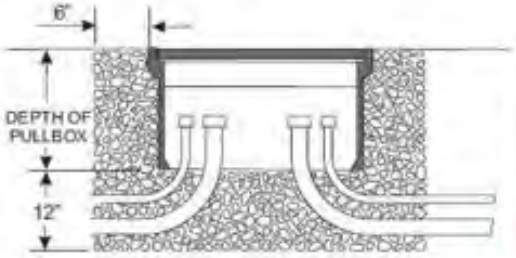
INSPECTOR SIGNATURE: _____

PULL BOXES

TRAFFIC SIGNAL PULL BOX DETAILS



TOP VIEW



SIDE VIEW

Extend the end of the conduit in the pull box above the drainage material by 1 to 2 inches, but don't go all the way to the top!

TYPE	MIN. DIMENSIONS		
	LENGTH	WIDTH	DEPTH
A	12"	12"	6"
B	28"	16"	12"

Type "A" Pull Boxes are used for splicing loop lead-ins.
Type "B" Pull Boxes are used for all signal cable routing.

PULLBOX NOTES:
1. GRAVEL, 12" DEEP, IS REQUIRED UNDER PULLBOXES FOR DRAINAGE
2. TRAFFIC SIGNAL, TRAFFIC OR SIGNAL LEGEND REQUIRED.
3. COVERS SHALL BOLT DOWN.
4. PULL BOXES AND COVERS SHALL MEET TIER 15 REQUIREMENTS PER ANSI/SCTE 77 2002 STANDARDS.
5. TYPE A PULL BOXES TO BE USED FOR SPLICING LOOP LEAD IN WIRES TO SHIELDED CABLE ONLY.

   TYPE B PULL BOXES TO BE USED FOR ALL OTHER TRAFFIC SIGNAL APPLICATIONS.
6. RIGID CONDUIT TO BE GROUNDED WITH NO. 6 SOLID BARE COPPER WIRE ATTACHED TO GROUNDING BUSHINGS IN PULL BOX.

Considerations

Approximately 3 feet (1 meter) of slack cable must be left in each handhole that houses a cable run and approximately 2 feet (600 millimeters) of slack cable must be left in each mast arm pole base, light standard base and pedestal base.

CONDUITS

Material

- Rigid Nonmetallic Conduit (RNMC or RNC)
  - PVC (Polyvinyl Chloride)
    - Schedule 40 – belowground applications
    - Schedule 80 – above and belowground (roadways) applications
- Rigid Galvanized Steel Conduit (RGSC) – aboveground applications
- High-density Polyethylene (HDPE)

Note: do NOT use schedule 40 and schedule 80 conduit together on the same run – different inside diameter!

Use multiple conduit runs if larger conduit capacity is needed; The sizing of conduit should be such as to not fill over 40% internal area of the conduit.

NEC Usable area of conduit:
- 1 conductor: 53%
- 2 conductors: 31%
- 3 or more: 40%

POLES AND PEDESTALS

The access door of the base must be oriented away from traffic to allow maintenance personnel to see the intersection while servicing the base.

Weatherhead

Pedestal cap

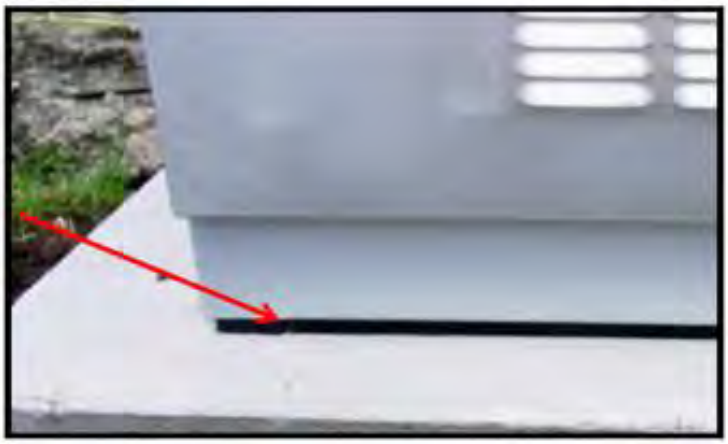
CABINETS

Before the cabinet is installed, make sure that all proper conduits are in place and the anchor bolts fit the cabinet. Refer to the Contract Documents for details. Clean any dirt and debris from the top of the foundation.

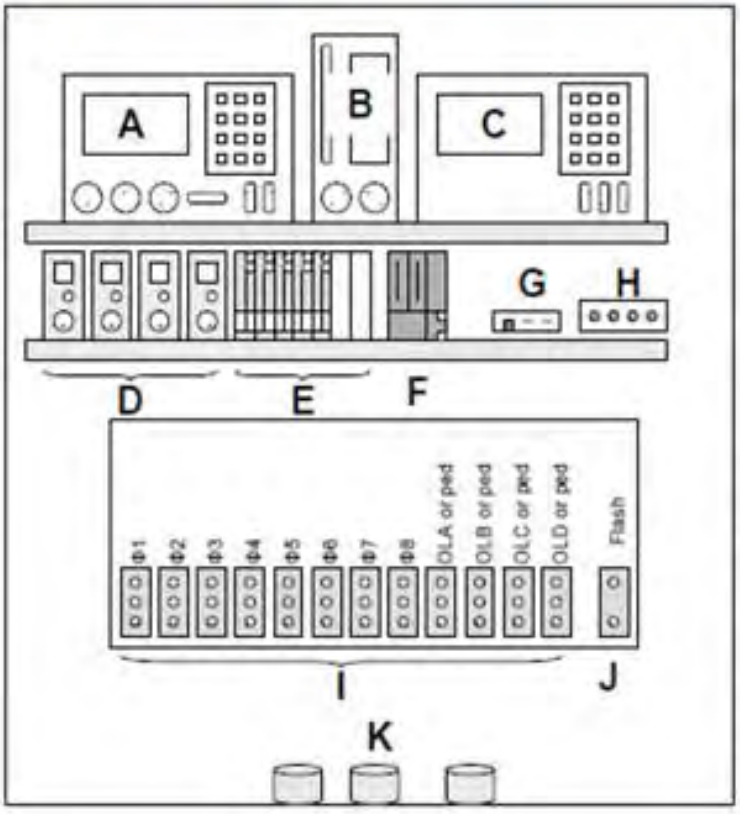
- A four Section Rubber Gasket, and four Anchor Bolts including nuts and stainless steel washers.

Lay the rubber gasket carefully in place and set the cabinet on top of the gasket, making sure the gasket is neatly positioned under the cabinet.

The cabinet must be securely bolted to the cast in-place pad with anchor bolts.



CABINETS



A. Local controller

B. Conflict monitor

C. Master controller

D. Single channel loop detector amplifiers

E. Multi-channel detector rack

F. Pre-emption phase selector

G. Telephone modem

H. Fiber-optic modem

I. Load switches

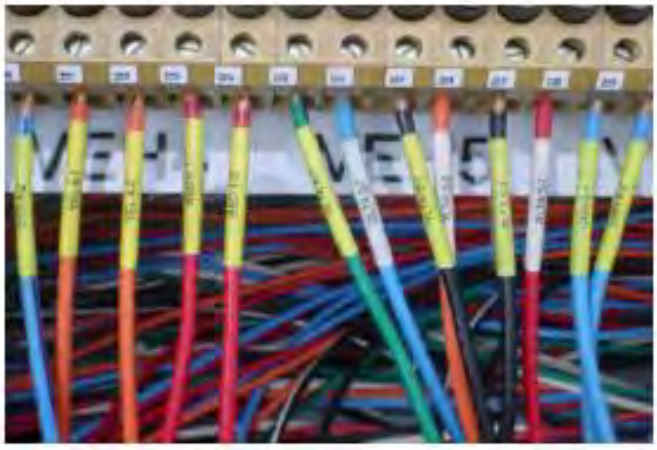
J. Flasher

K. Conduits

CABINETS

Neatly wired

Labeling



SIGNALS AND SPANS

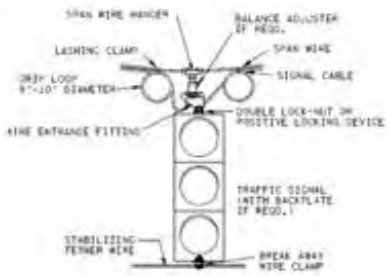
The LED signal indication must operate on a nominal 120 VAC power source.

Spanwire Cable Clamps

Disconnect Hangers

Drip Loops

Used to avoid water to get into electrical connections inside the signal head.



TYPICAL SIGNAL MOUNTING HARDWARE DETAIL