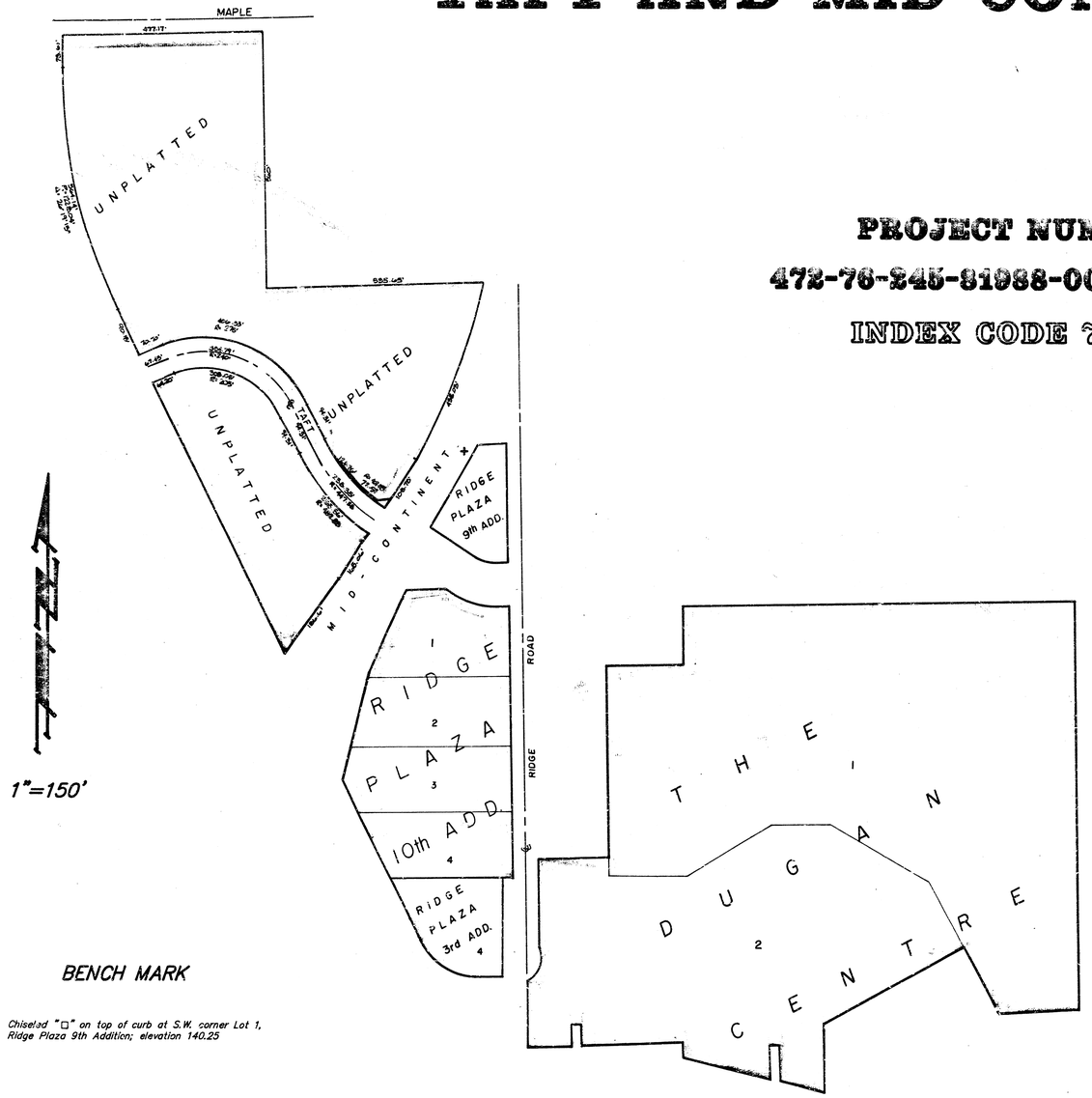
# TRAFFIC SIGNAL IMPROVEMENTS
# TAFT AND MID-CONTINENT ROAD




1"=150'

**BENCH MARK**

*Chiseled "□" on top of curb at S.W. corner Lot 1, Ridge Plaza 9th Addition; elevation 140.25*

**IMPROVEMENT DISTRICT**

**PROJECT NUMBER**

**472-76-245-81988-000-000-001**

**INDEX CODE 710053**

## INDEX


1 TITLE SHEET
2 SIGNAL AND MARKING PLAN
3 SIGNAL WIRING AND QUANTITIES
4-7 SIGNAL DETAILS
8-12 SIGNAL SPECIFICATIONS
13 PAVEMENT MARKING SUMMARY


Revised June 14, 1990

THOMAS CHARLES BAUGHMAN LICENSED 9521 KANSAS PROFESSIONAL ENGINEER

Revised June 5, 1990
May 14, 1990

89-12-E998
TOM\MCTAFT\COV

TITLE SHEET

BAUGHMAN COMPANY P. A.
ENGINEERING & SURVEYING
316/262-7271 • 315 ELLIS • WICHITA, KANSAS 67211

REV.

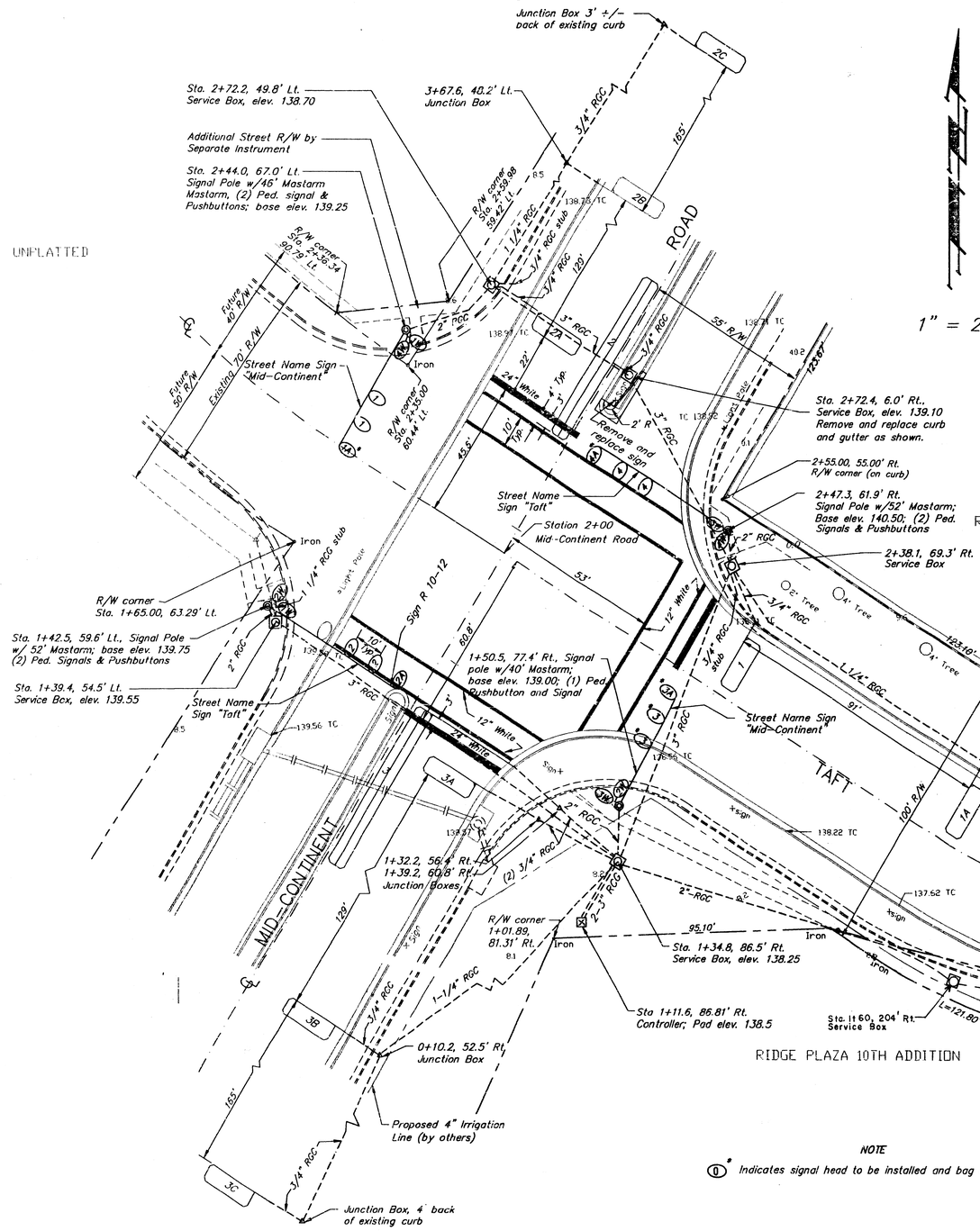
PROJECT NUMBER
472-76-245-81988-000-000-001

SHEET 1 OF 13

| DESIGN | DRAWN | APPROVED | DATE | SCALE |
|---|---|---|---|---|
| TCR | TCR | | 3-16-90 | 1" = 40' |


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RIDGE PLAZA 9TH ADDITION

## SIGNAL FACE SUMMARY

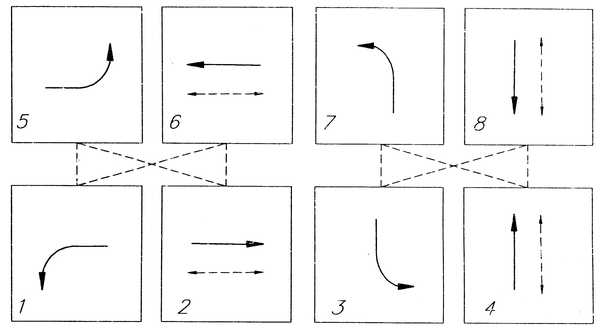
| HEAD | TYPE | # REQ'D |
|---|---|---|
| 1 | A | 2 |
| 1A | I | 1 * |
| 1W | L | 2 |
| 2 | A | 2 |
| 2A | I | 1 |
| 2W | L | 2 |
| 3 | A | 2 * |
| 3A | I | 1 * |
| 3W | L | 2 |
| 4 | A | 2 |
| 4A | I | 1 |
| 4W | L | 2 |

* Indicates signal head to be installed and bag covered.

## VEHICLE DETECTOR SUMMARY

| LOOP NUMBER | SIZE ( W X L ) | NO. OF TURNS | PHASE CALLED |
|---|---|---|---|
| 1 | 18 X 6 | 4 | 6 |
| 1A | 18 X 6 | 4 | 6 |
| 1B | 18 X 6 | 4 | 6 |
| 2 | 6 X 60 | 2-4-2 | 3 |
| 2A | 18 X 6 | 4 | 8 |
| 2B | 18 X 6 | 4 | 8 |
| 2C | 18 X 6 | 4 | 8 |
| 3 | 6 X 60 | 2-4-2 | 7 |
| 3A | 18 X 6 | 4 | 4 |
| 3B | 18 X 6 | 4 | 4 |
| 3C | 18 X 6 | 4 | 4 |

## PHASE DIAGRAM




## LEGEND

- Future Curb and Gutter
- Existing Curb and Gutter
- Steel Signal Pole and Mastarm
- Signal Head
- Pedestrian Signal and Pushbutton
- Controller
- Service Box
- Junction Box
- Conduit
- Vehicle Detector Loop (Loop number)

NOTE

(0) Indicates signal head to be installed and bag covered.

89-12-E998
TOM\MCTAFT\SIGPLAN

REVISED 7-2-90

# SIGNALIZATION AND MARKING PLAN MID-CONTINENT & TAFT

BAUGHMAN COMPANY P. A.
SURVEYING & ENGINEERING
316/262-7271 • 315 ELLIS • WICHITA, KANSAS 67211

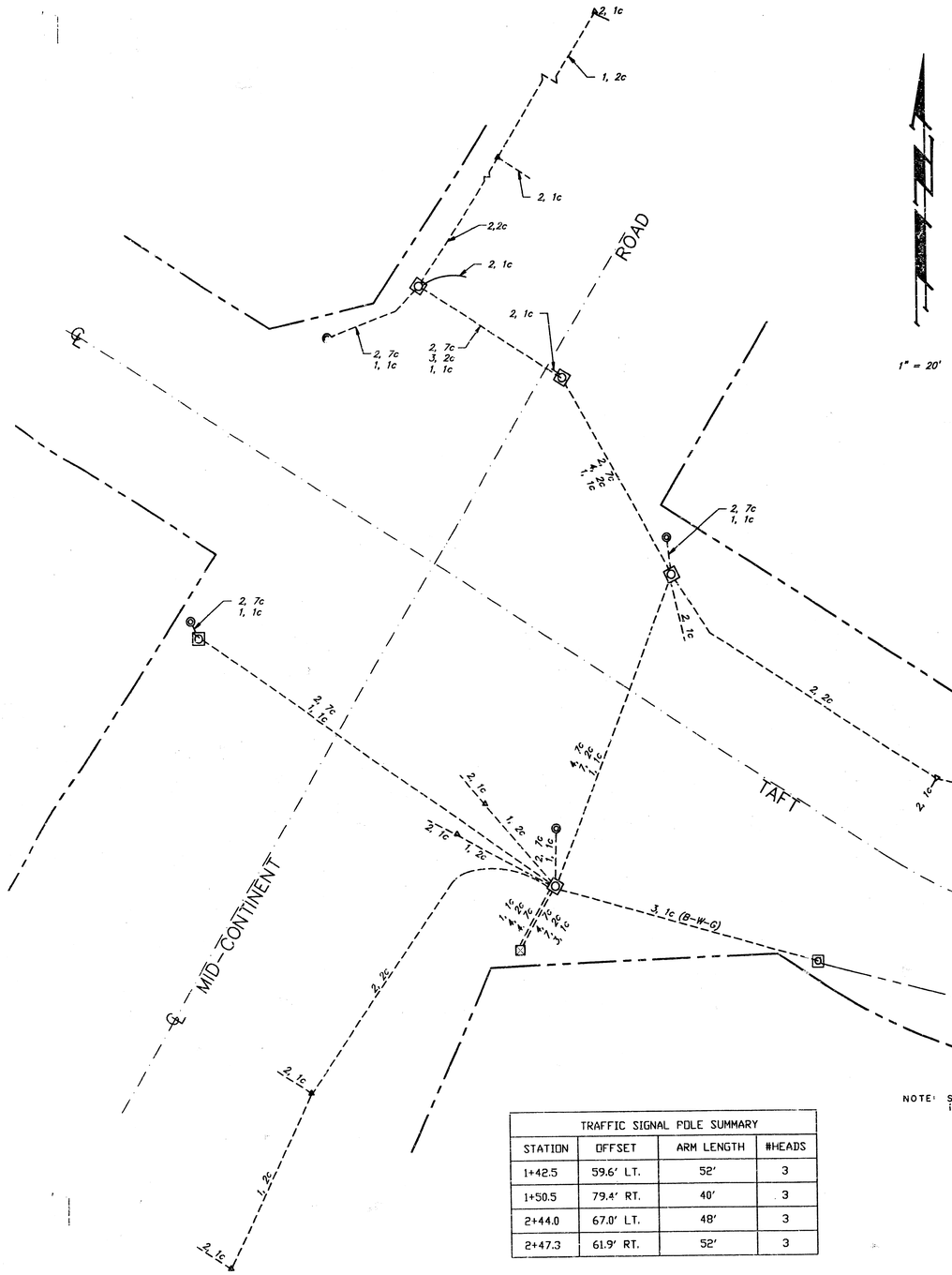
REV.

PROJECT NUMBER 472-76-245-81988-000-000-001

SHEET 2 OF 13

| DESIGN | DRAWN | APPROVED | DATE | SCALE |
|---|---|---|---|---|
| TCR | TCR | | 5-7-90 | 1" = 20' |

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1" = 20'

NOTE: Service neutral conductor shall be identified in all service boxes.

| TRAFFIC SIGNAL POLE SUMMARY | | | |
|---|---|---|---|
| STATION | OFFSET | ARM LENGTH | #HEADS |
| 1+42.5 | 59.6' LT. | 52' | 3 |
| 1+50.5 | 79.4' RT. | 40' | 3 |
| 2+44.0 | 67.0' LT. | 48' | 3 |
| 2+47.3 | 61.9' RT. | 52' | 3 |

* THE MODEL 170 CONTROLLER AND SOFTWARE WILL BE FURNISHED AND INSTALLED BY THE CITY OF WICHITA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING AND INSTALLING THE CONTROLLER CABINET AND CONCRETE BASE, AND FOR ALL EQUIPMENT NECESSARY FOR THE COMPLETE AND SATISFACTORY OPERATION OF THE TRAFFIC SIGNAL, WHETHER SAID EQUIPMENT IS SPECIFICALLY MENTIONED OR NOT.

## WIRING NOTES

THE CONTRACTOR SHALL FURNISH AND INSTALL ALL LOOP WIRE, SHIELDED LOOP LEAD-IN WIRE, POWER SUPPLY CABLE, AND TRAFFIC SIGNAL CABLE FOR THE COMPLETE OPERATION OF THE TRAFFIC SIGNAL. NO SPLICES WILL BE ALLOWED OUTSIDE POLE BASES, SERVICE BOXES, OR JUNCTION BOXES.

EACH SEPARATE MAST ARM-MOUNTED SIGNAL HEAD SHALL HAVE ONE CONTINUOUS RUN OF MULTI-CONDUCTOR FROM THE POLE BASE TO THE SIGNAL HEAD. A ONE-CONDUCTOR #8 AWG (GREEN) SHALL BE INSTALLED TO CONNECT ALL GROUNDING LUGS IN POLE BASES AND CONTROLLER BASE.

ONE, SEVEN-CONDUCTOR CABLE SHALL BE RUN FROM THE CONTROLLER TO EACH POLE SUPPORTING A MAST ARM-MOUNTED LEFT TURN INDICTION. THE FOLLOWING COLOR CODE SHALL BE USED:

| | |
|---|---|
| BLACK | YELLOW ARROW |
| WHITE | COMMON |
| RED | RED BALL |
| GREEN | GREEN BALL |
| ORANGE | YELLOW BALL |
| BLUE | GREEN ARROW |
| WHITE/BLACK | UNUSED SPARE |

ONE, SEVEN CONDUCTOR CABLE SHALL BE RUN FROM THE CONTROLLER TO EACH POLE SUPPORTING PEDESTRIAN INDICATIONS. THE FOLLOWING COLOR CODE SHALL BE USED:

| | | |
|---|---|---|
| WHITE | COMMON | |
| RED | DON'T WALK | PH 2,6 |
| GREEN | WALK | PH 2,6 |
| ORANGE | PUSHBUTTON | PH 2,6 |
| WHITE/BLACK | DON'T WALK | PH 4,8 |
| BLUE | WALK | PH 4,8 |
| BLACK | PUSHBUTTON | PH 4,8 |

ONE, SEVEN-CONDUCTOR CABLE SHALL BE RUN FROM EACH 5-SECTION LEFT TURN SIGNAL HEAD TO THE POLE BASE. ONE, FIVE-CONDUCTOR CABLE SHALL BE RUN FROM EACH 3-SECTION THRU SIGNAL HEAD TO THE POLE BASE.

ONE, 5-CONDUCTOR CABLE SHALL BE RUN FROM EACH 2-WAY SIDE-OF-POLE PEDESTRIAN SIGNAL TO THE POLE BASE. THE FOLLOWING COLOR CODE SHALL BE USED:

| | | |
|---|---|---|
| RED | DON'T WALK | PH 2,6 |
| GREEN | WALK | PH 2,6 |
| ORANGE | DON'T WALK | PH 4,8 |
| BLACK | WALK | PH 4,8 |
| WHITE | COMMON | |

BILL OF MATERIALS

| ITEM | UNIT | QUANTITY |
|---|---|---|
| *MODEL 170 CONTROLLER | | SEE NOTE |
| CONTROLLER CABINET | EACH | 1 |
| CONCRETE BASE FOR CONTROLLER | EACH | 1 |
| METER BOX | EACH | 1 |
| POWER DISCONNECT W\ BREAKER | EACH | 1 |
| TRAFFIC SIGNAL POLE | EACH | 4 |
| TRAFFIC SIGNAL MAST ARM (40') | EACH | 1 |
| TRAFFIC SIGNAL MAST ARM (45') | EACH | 1 |
| TRAFFIC SIGNAL MAST ARM (52') | EACH | 2 |
| CONCRETE BASE FOR TRAFFIC SIGNAL POLE | EACH | 4 |
| TRAFFIC SIGNAL HEAD (TYPE A) | EACH | 8 |
| TRAFFIC SIGNAL HEAD (TYPE I) | EACH | 4 |
| TRAFFIC SIGNAL HEAD MTG. BRACKET | EACH | 12 |
| PEDESTRIAN SIGNAL HEAD (TYPE L) | EACH | 8 |
| PEDESTRIAN PUSHBUTTON W/SIGN (ONE PC.) | EACH | 8 |
| TRAFFIC SIGNAL LAMP | EACH | 44 |
| GROUND ROD AND CLAMP | EACH | 6 |
| SERVICE BOX | EACH | 7 |
| JUNCTION BOX | EACH | 8 |
| 3" RGC CONDUIT | L.F. | 426 |
| 2" RGC CONDUIT | L.F. | 400 |
| 1-1/4" RGC CONDUIT | L.F. | 399 |
| POWER SUPPLY WIRE (THW#2AWG) | L.F. | 800 |
| 3/4" RGC CONDUIT | L.F. | 620 |
| MULTI-CONDUCTOR CABLE 7C #14 AWG | L.F. | 410 |
| MULTI-CONDUCTOR CABLE 5C #14 AWG | L.F. | 1580 |
| GROUND WIRE (THHN #8 AWG) | L.F. | 532 |
| POWER SUPPLY WIRE (THWN#6 AWG) | L.F. | 400 |
| SHIELDED LOOP FEEDER CABLE | L.F. | 2920 |
| LOOP DETECTOR WIRE (THHN #14 AWG) | L.F. | 2670 |
| STREET NAME SIGN | EACH | 4 |
| SIGN R10-12 | EACH | 1 |

*QUANTITIES FOR INFORMATION ONLY*

| SUMMARY OF SERVICE AND JUNCTION BOXES | | | |
|---|---|---|---|
| JUNCTION BOXES | | SERVICE BOXES | |
| STATION | OFFSET | STATION | OFFSET |
| ~~0+54.8~~ | ~~55'+/- RT.~~ | ~~1+34.8~~ | ~~86.5' RT.~~ |
| 0+10.2 | 52.5' RT. | 1+39.4 | 54.5' LT. |
| 1+32.2 | 56.4' RT. | 2+38.1 | 69.3' RT. |
| 1+39.2 | 60.8' RT. | 2+72.2 | 49.8' LT. |
| 2+29.0 | 177' RT. | 2+72.4 | 6.0' RT. |
| 2+60.0 | 267' RT. | 1160 | 204' Rt. |
| 3+96.6 | 48.2' LT. | 2109 | 316.5 Rt. |
| 5+61.6 | 44.3' LT. | | |

REVISED 7-2-90

SIGNAL WIRING AND TIMING
MID-CONTINENT & TAFT

BAUGHMAN COMPANY P. A.
SURVEYING & ENGINEERING
316/262-7271 • 315 ELLIS • WICHITA, KANSAS 67211

REV.

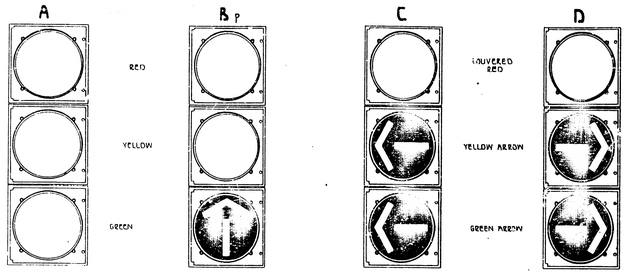
PROJECT NUMBER
472-76-245-81998-000-000-001

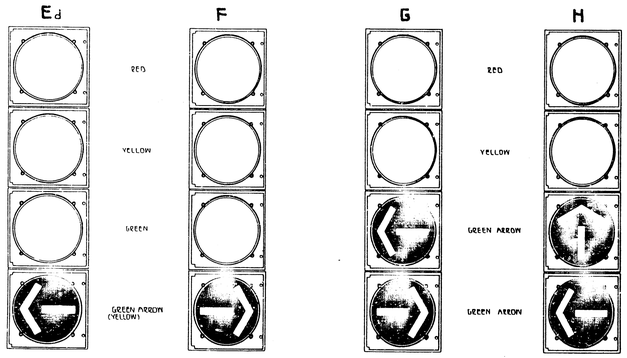
SHEET 3 OF 13

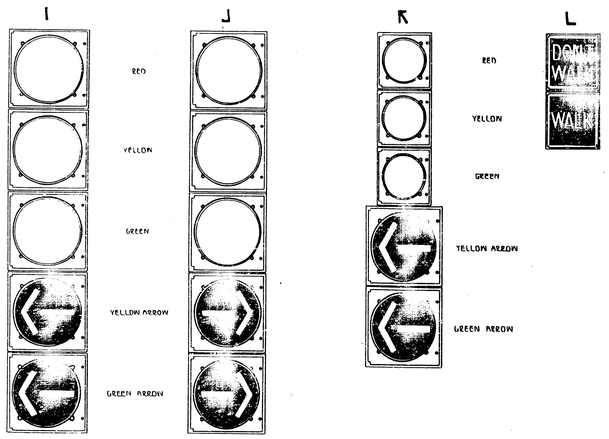
| DESIGN | DRAWN | APPROVED | DATE | SCALE |
|---|---|---|---|---|
| TCR | TCR | | 5-9-90 | 1" = 20' |

MCTAFT/CONDUCT

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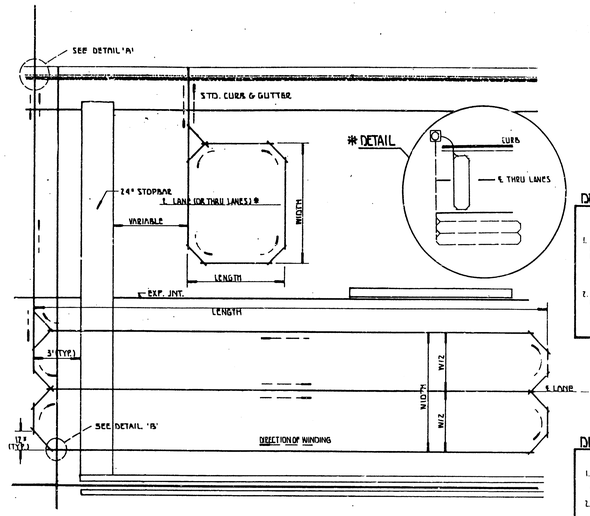



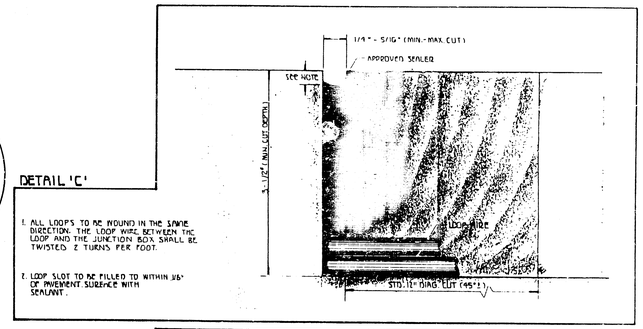




## SIGNAL FACE ARRANGEMENT

SIGNAL 'B' IS PROGRAMMED TYPE(p).
SIGNAL 'E' IS DUAL-MODE GREEN/YELLOW ARROW SECTION TYPE (d)
SIGNAL 'K' IS TYPICAL 5-SECTION ARRANGEMENT USED BY C. of W.
(8" 3-SECT. w/ 12" ARROWS.)

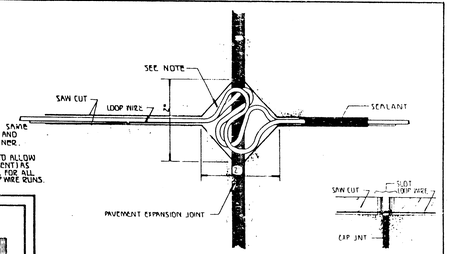
## LOOP CONSTRUCTION/INSTALLATION DETAILS



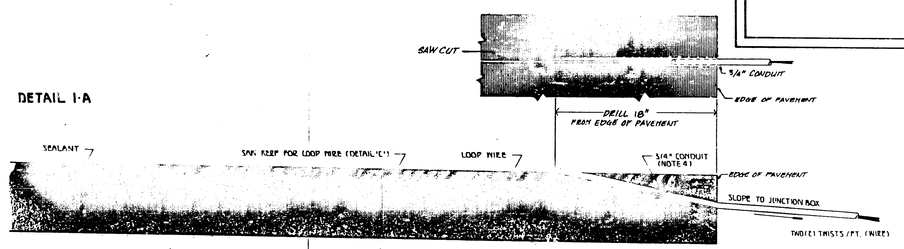

### DETAIL 'C'

1. ALL LOOPS TO BE WOUND IN THE SAME DIRECTION. THE LOOP WIRE BETWEEN THE LOOP AND THE JUNCTION BOX SHALL BE TWISTED 2 TURNS PER FOOT.
2. LOOP SLOT TO BE FILLED TO WITHIN 1/8" OF PAVEMENT SURFACE WITH SEALANT.




### DETAIL 'B'

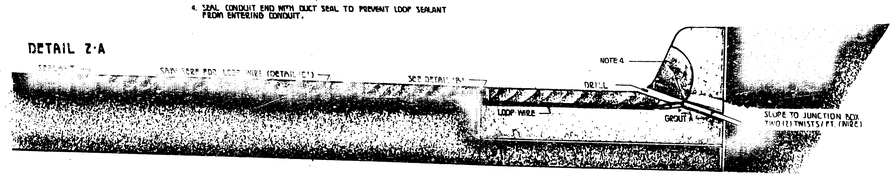
1. THE AREA REMOVED SHALL BE TO THE SAME DEPTH AS THE LOOP OR LEAD-IN WIRE AND SHALL BE SEALED IN THE SAME MANNER.
2. THE LOOP WIRE SHALL HAVE 2" SLACK (TO ALLOW FOR EXPANSION / CONTRACTION OF PAVEMENT) AS SHOWN IN SLOT TREATMENT IS TYPICAL FOR ALL INTERSECTIONS OF PAVT. JOINTS AND LOOP WIRE RUNS.

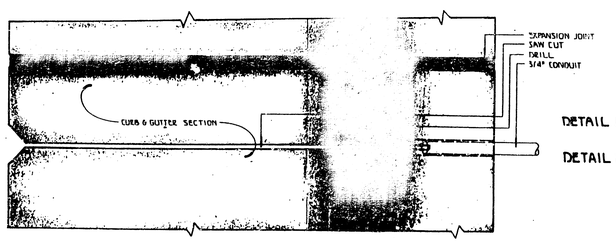



### DETAIL 1-A

* 1. 3/4" CONDUIT TO BE INSTALLED INTO PAVEMENT 8-16" DOWN FROM SURFACE OF PAVEMENT.
2. THE CONDUIT (3/4") SHALL SLOPE DOWNWARD FROM FACE OF CURB OR EDGE OF PAVEMENT) INTO THE JUNCTION BOX. SEE DETAIL SHEET FOR SERVICE/JUNCTION BOX CONSTRUCTION/INSTALLATION FOR HOOK-UP DETAILS.
3. NO EXPANSION JOINT IN THE PAVEMENT OR CURB & GUTTER SHALL BE UTILIZED IN THE PLACEMENT OF LOOP WIRE RUNS OR CONDUIT ENVELOPING; NOR SHALL THE LOOP WIRE OR CONDUIT PASS THRU THE CURB & GUTTER OR EDGE OF PAVEMENT IN ANY PART OF ANY DRIVE APPROACH AND/OR CORNER RADII.
4. SEAL CONDUIT END WITH DUCT SEAL TO PREVENT LOOP SEALANT FROM ENTERING CONDUIT.

### DETAIL 2-A




DETAIL 1-A : ASPHALT MAT PAVEMENT (NO C & G)

DETAIL 2-A: ASPH. OR CONC. PAVEMENT (FULL C & G)

### NOTES:

1. LOOP FEEDER CONDUIT THROUGH CURB SHALL BE MINIMUM 12" FROM ANY OTHER LOOP FEEDER CONDUIT THROUGH CURB.
2. SAW CUT RUNNING PARALLEL WITH EXPANSION JOINT OR ANY OTHER SAW CUT SHALL BE MINIMUM 12" APART.

| REV. DATE | COMMENTS | INT. |
|---|---|---|
| AUG. 87 | REVISE DETAIL 'A' & 1-A, TRENCH NOTE AND DRILL | JD |
| FEB. 87 | ADD "SAWCUT" TO KEEP OR REMOVE, ETC. | JD |
| NOV. 86 | REVISE LOOP SPACE & SOLID WIRE - DETAIL 'C' | JD |
| JAN. 86 | ADD NOTES 1 & 2 | VD |
| MAR. 85 | DRAW 'C' - DUAL SLOT DEPTH TO 5-1/2" | TD |
| JAN. 85 | PR. AC DETAIL ADDED 1-A; CALLOUT 3" REQ. 2-A | JD |

PROJECT DESCRIPTION
SIGNAL FACE ARRANGEMENT / LOOP DETECTOR CONSTRUCTION AND INSTALLATION DETAILS

PROJECT NUMBER
472-76-245-81988-000-000-001

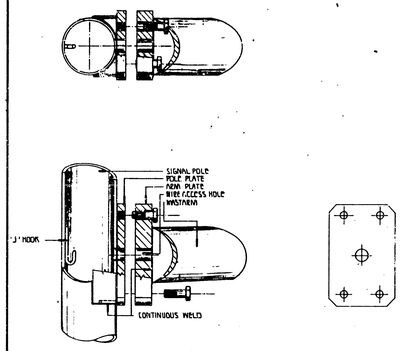
| BOOK NO. | APPROVED BY | DATE SEPT. 85 |
|---|---|---|
| DRAWN BY SEAL | | REVISED |

CITY OF WICHITA
DEPARTMENT OF PUBLIC WORKS
TRAFFIC ENGINEERING
WM. G. MCKINLEY - TRAFFIC ENGINEER
SCALE: DO NOT SCALE. FOR INFORMATION ONLY



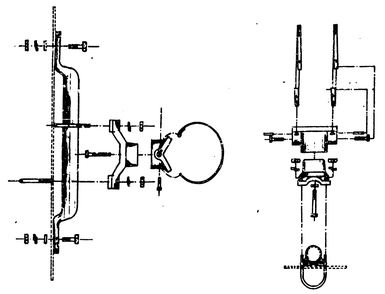
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## MASTARM MOUNTING DETAIL



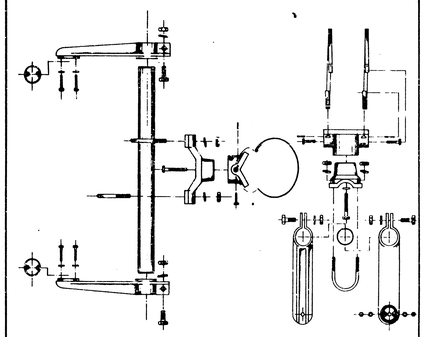

A

## BANDED SIGN MOUNTING BRACKET DETAIL



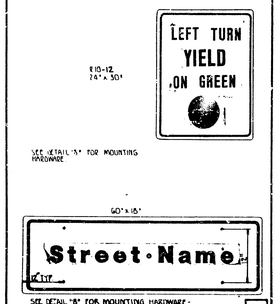
B

## TYPE I SIGNAL MOUNTING BRACKET ASSEMBLY DETAIL

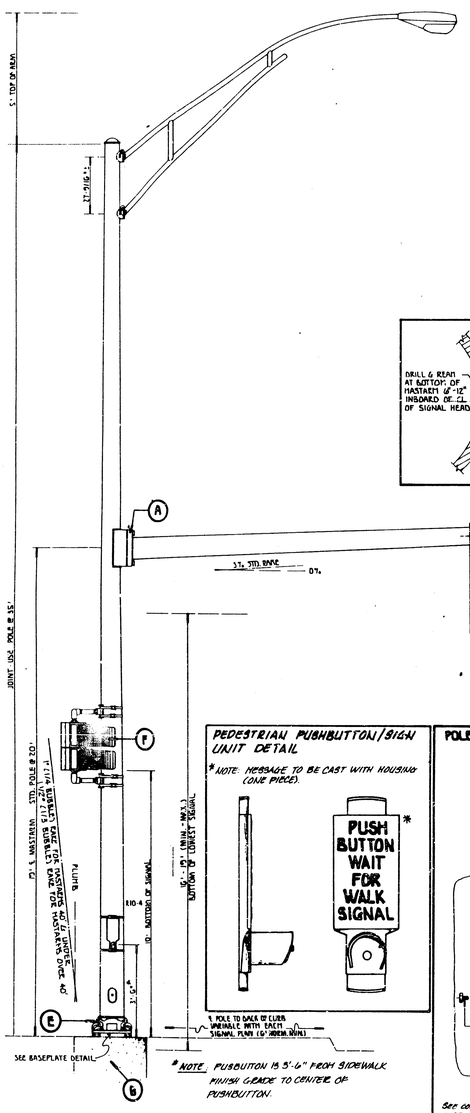


C1

## STANDARD SIGNING




D

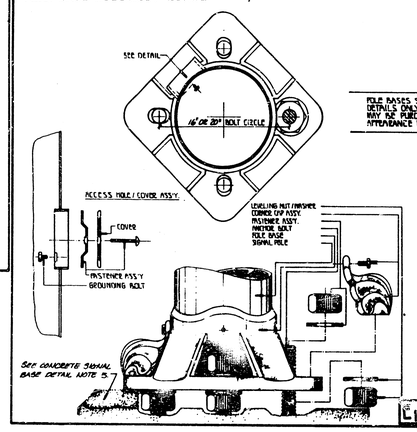



## PEDESTRIAN PUSHBUTTON/SIGN UNIT DETAIL

* NOTE: MESSAGE TO BE CAST WITH HOUSING (ONE PIECE).



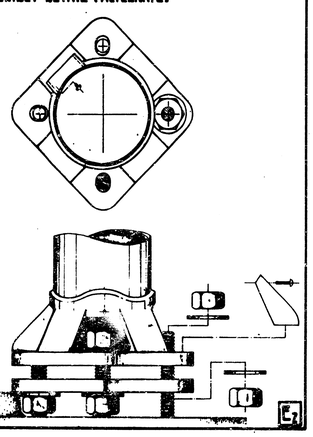

## POLE BASE ASSEMBLY DETAIL




POLE BASES SHOWN ARE FOR ASSEMBLY DETAILS ONLY. OPTIONAL BASES THAT MAY BE PURCHASED MAY VARY IN ACTUAL APPEARANCE WITH MFR'S. CO.

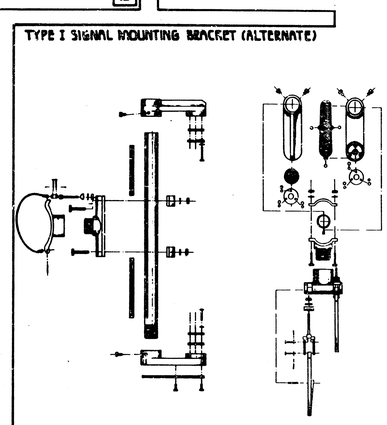
E1

## POLE BASE ASSEMBLY DETAIL (ALTERNATE)



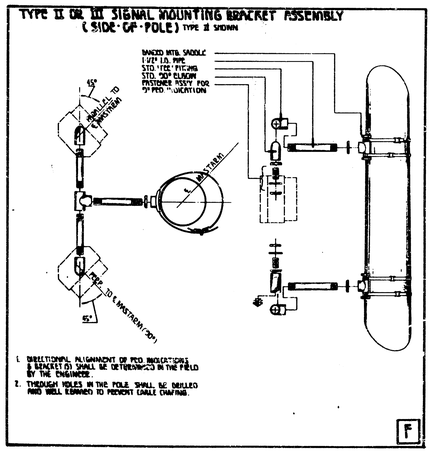
E2

## TYPE I SIGNAL MOUNTING BRACKET (ALTERNATE)



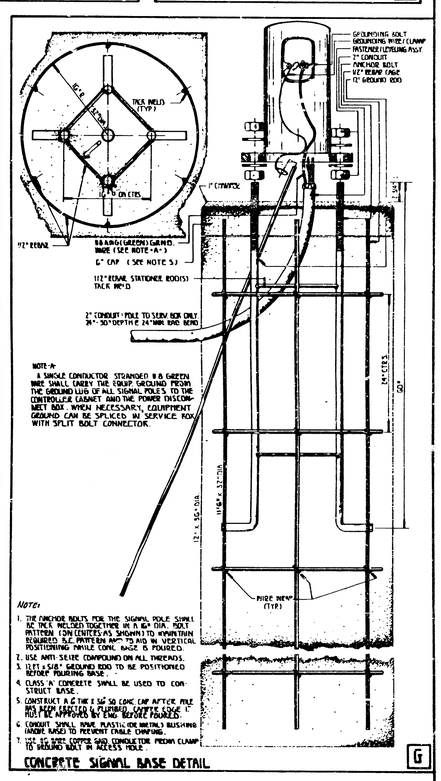
C2

## TYPE II OR III SIGNAL MOUNTING BRACKET ASSEMBLY (SIDE OF POLE) TYPE II SHOWN




1. DIRECTIONAL ALIGNMENT OF PED INDICATORS & BRACKET (S) SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER.
2. THROUGH HOLES IN THE POLE SHALL BE DRILLED AND WELL REAMED TO PREVENT CABLE CHAFING.

F




CONCRETE SIGNAL BASE DETAIL

G

| NO. | DATE | REVISIONS TO UNDOCK PW CURRICULUM | BY |
|---|---|---|---|
| 1 | 3/3 | ADD "A" ARM LENGTH TO MASTARM NOTE | GAS |
| 2 | 3/3 | ADD 8" BAR LENGTH TO MASTARM NOTE | GAS |
| 3 | 3/3 | DETAIL "A" NOTE: CHANGE 200 POSITION TO 60 FOR NEW MOUNTING | LD |
| 4 | 8/8 | ADD 12" TAIL SIGN & 2 PLATES TO DETAIL "B" | LD |
| 5 | 8/8 | ADD 12" LENSES TO DETAIL "D" & "E" | LD |
| 6 | 8/8 | ADD "F" DIMENSIONS TO DETAIL "C" | LD |
| 7 | 8/8 | ADD "G" CONCRETE SIGNAL BASE DETAIL | LD |
| 8 | 8/8 | ADD NOTE TO DETAIL "A" | LD |
| 9 | 8/8 | ADD NOTE TO DETAIL "B" | LD |
| 10 | 8/8 | ADD NOTE TO DETAIL "C" | LD |
| 11 | 8/8 | ADD NOTE TO DETAIL "D" | LD |
| 12 | 8/8 | ADD NOTE TO DETAIL "E" | LD |
| 13 | 8/8 | ADD NOTE TO DETAIL "F" | LD |
| 14 | 8/8 | ADD NOTE TO DETAIL "G" | LD |

PROJECT DESCRIPTION

STEEL SIGNAL POLE ASSEMBLY DETAILS

PROJECT NUMBER

472-76-245-81988-000-000-001

| BOOK NO. | APPROVED BY | DATE AUG. 83 |
|---|---|---|
| DRAWN BY SCAL | | REVISED |

CITY OF WICHITA
DEPARTMENT OF PUBLIC WORKS

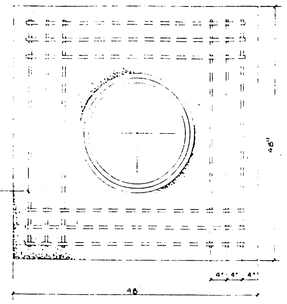
| DIVISION OF TRAFFIC ENGINEERING | SCALE |
|---|---|
| WM G MCKINLEY TRAFFIC ENGINEER | |

5/13

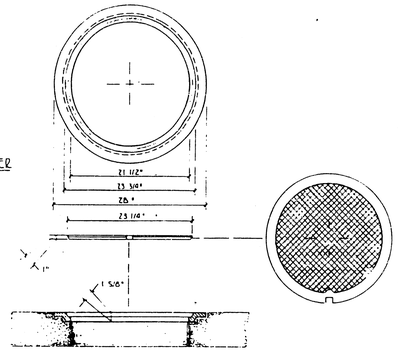
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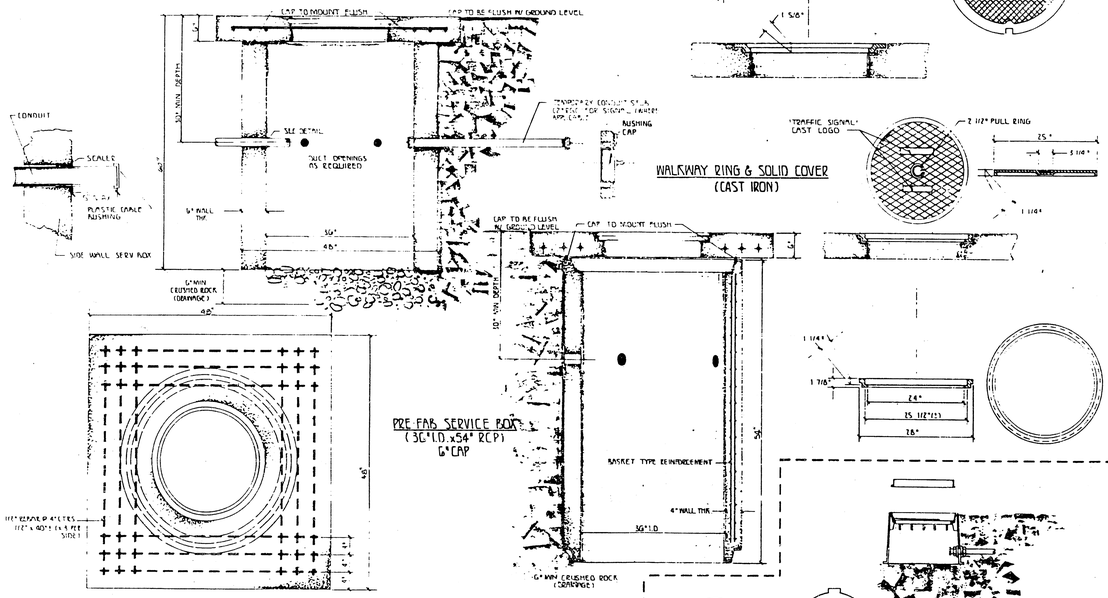
# · SERVICE BOX CONSTRUCTION / INSTALLATION DETAILS ·

STD. CONC. SERVICE BOX
(48"x 48"x 54" BOX)
6" CAP



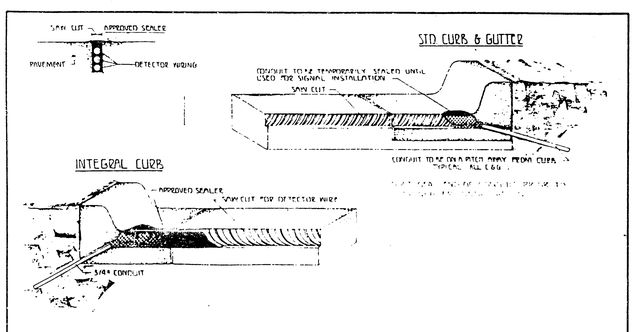

MANHOLE RING & SOLID COVER
(CAST IRON)



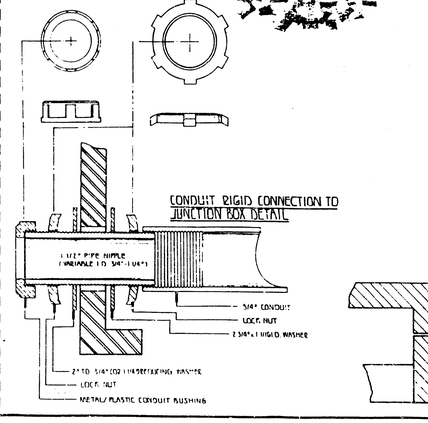



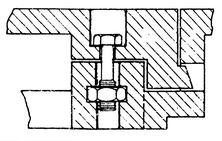

WALKWAY RING & SOLID COVER
(CAST IRON)



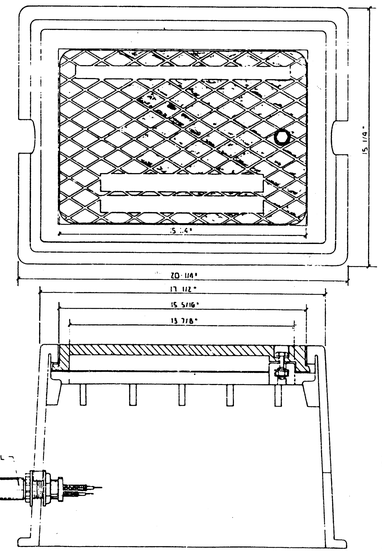

· CONDUIT / DETECTOR WIRE INSTALLATION DETAILS ·

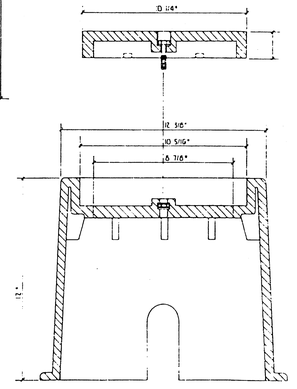


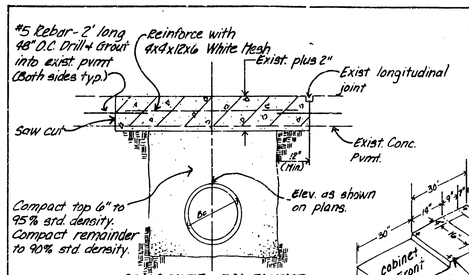
JUNCTION BOX TYPICAL FASTENER ASSEMBLY DETAIL (BOX LID)

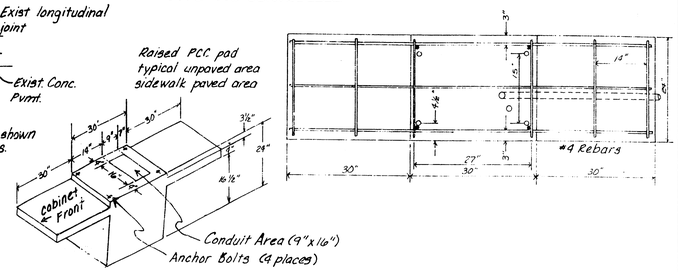
# · JUNCTION BOX DETAILS ·




# CONTROLLER PAD DETAILS FOR TYPE 170 CONTROLLER




## NOTES:

**SERVICE BOX:**

1. CONDUIT CONNECTION TO BE FLUSH TO WITHIN 5" OF INSIDE FACE OF SIDE WALL WITH ABILITY TO DRAIN CONDUIT INTO SERVICE BOX.
2. CONDUIT CONNECTIONS TO SERVICE BOX SHALL BE TERMINATED WITH PLASTIC CABLE BUSHING.
3. CONDUIT SHALL BE SEALED WITH APPROVED SEALER AT INSIDE WALL FACE.
4. A PRE CAST SERVICE BOX WITH OPEN BOTTOM WILL BE ACCEPTED AS ALTERNATE: SUBJECT TO APPROVAL BY ENGINEER.

**JUNCTION BOX:**

1. BOX TO BE INSTALLED FLUSH WITH GROUND LEVEL (VARIABLE WITH BOX HEIGHT.)
2. A.B.S.(PLASTIC) JUNCTION BOX TO BE USED. OTHER DESIGNS OF SIMILAR SIZE & SHAPE MAY BE USED AS ACCEPTABLE ALTERNATIVE: SUBJECT TO APPROVAL.

**TRENCHING:**

1. CONDUIT DEPTH TO BE 30" MINIMUM AS SHOWN WITH ROCK & STUBBLE FREE BACKFILL TO SERVE AS BEDDING MAT'L. MAINTAIN MINIMUM CONDUIT DEPTH IN TRENCH.
2. BACKFILL TO BE COMPACTED IN 6" LOOSE LIFTS BY HAND OR MECHANICAL TAMPING TO A 95% STANDARD DENSITY.
3. SLOPE CONDUIT TO DRAIN AS DIRECTED BY THE ENGINEER.
4. 3" RIGID GALV STL CONDUIT · BETWEEN SERV. BOXES
   1 1/4" " " " " · BTWN S/B & JUNC BOXES
   3/4" " " " " · BTWN J/B & CURB FACE

| REVISION DATE | COMMENTS | BY |
|---|---|---|
| OCT. 82 | [illegible] | [illegible] |
| OCT. 82 | ADD'L INFO SHEET | [illegible] |
| JAN. 83 | CHANGE LOWER FRAME SIZE TO [illegible] | [illegible] |
| JUL. 83 | ADD: BEND LIFT [illegible] TO FIT CONTROLLER | [illegible] |
| APR. 88 | CHANGED CONTROLLER BASE TO BE ACCEPTABLE TO KDOT | JD |
| JAN. 89 | CHANGE TOP CONTROLLER PAD DIM TO 3/16 | JD |
| JUL. 89 | CHANGE TOP CONT. PAD WIDTH DIM. TO 11" | JD |
| AUG. 89 | REMOVE ASPHALT (AS USED) CONDUIT DETAIL CLARIFY CONTROLLER CLEARANCE | JD |

PROJECT DESCRIPTION
**SERVICE / JUNCTION BOX / CONTROLLER PAD CONSTRUCTION / INSTALLATION DETAILS**

PROJECT NUMBER
472-76-245-81988-000-000-001

| BOOK NO | APPROVED BY | DATE AUG 83 |
|---|---|---|
| DRAWN BY SEAL | | REVISED |

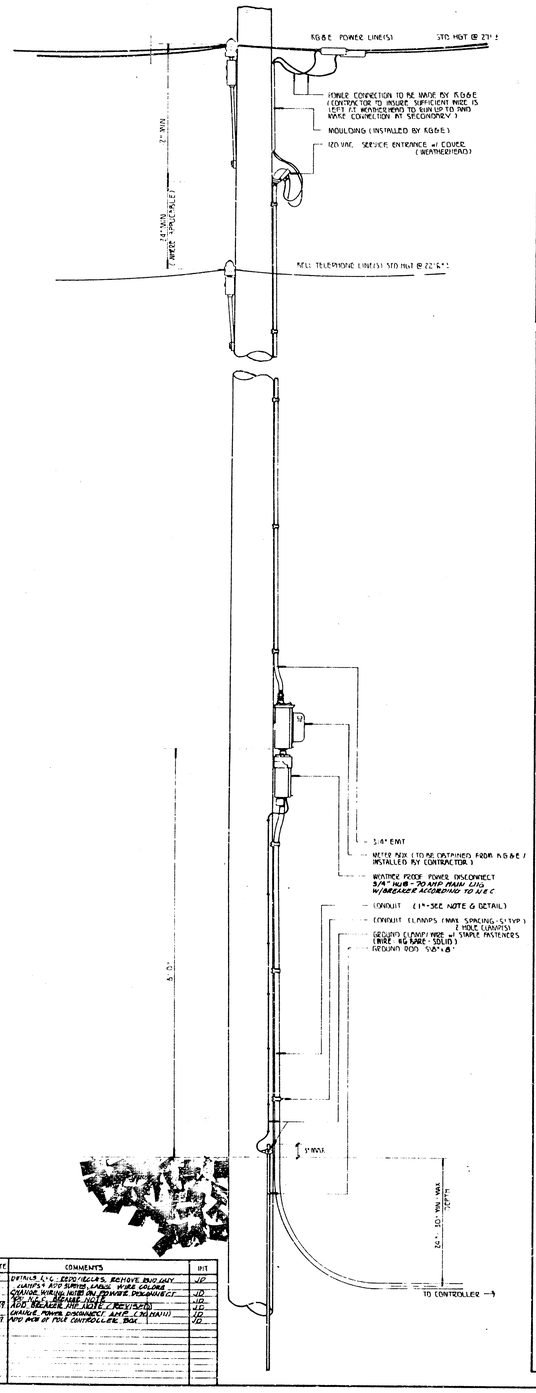
**CITY OF WICHITA**
*DEPARTMENT OF PUBLIC WORKS*

| TRAFFIC ENGINEERING DIVISION | SCALE |
|---|---|
| WM G. MCKINLEY TRAFFIC ENGINEER | NO SCALE |

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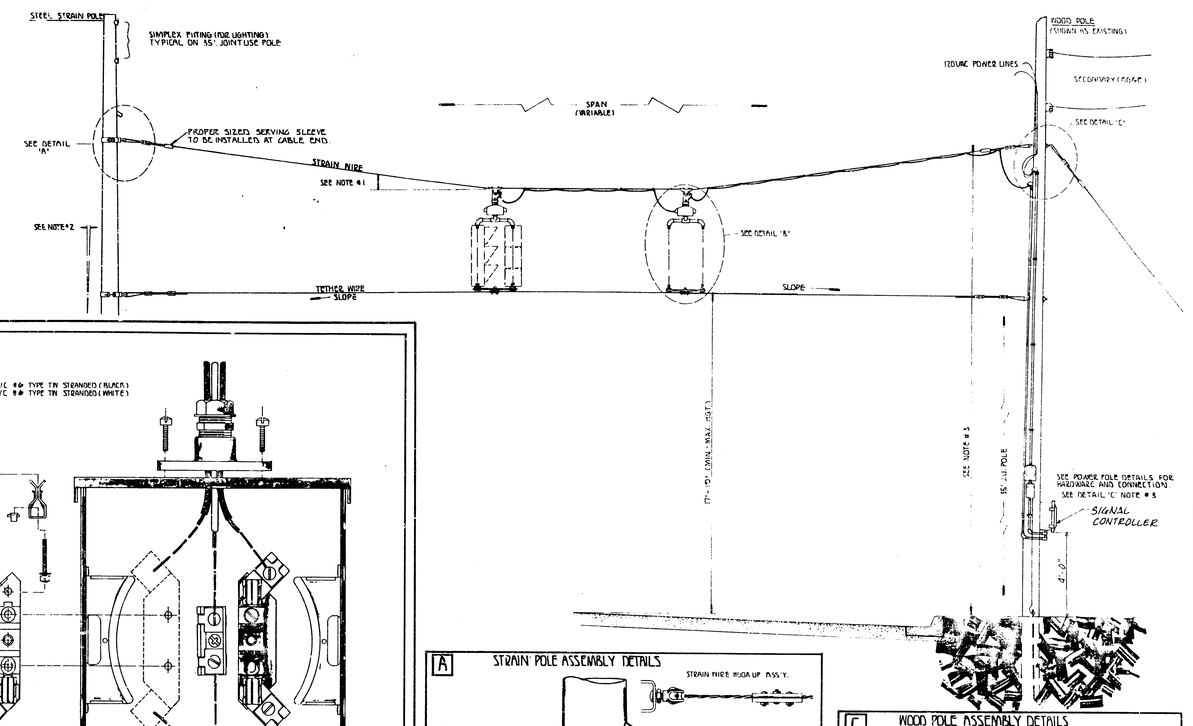
## POWER POLE DETAILS



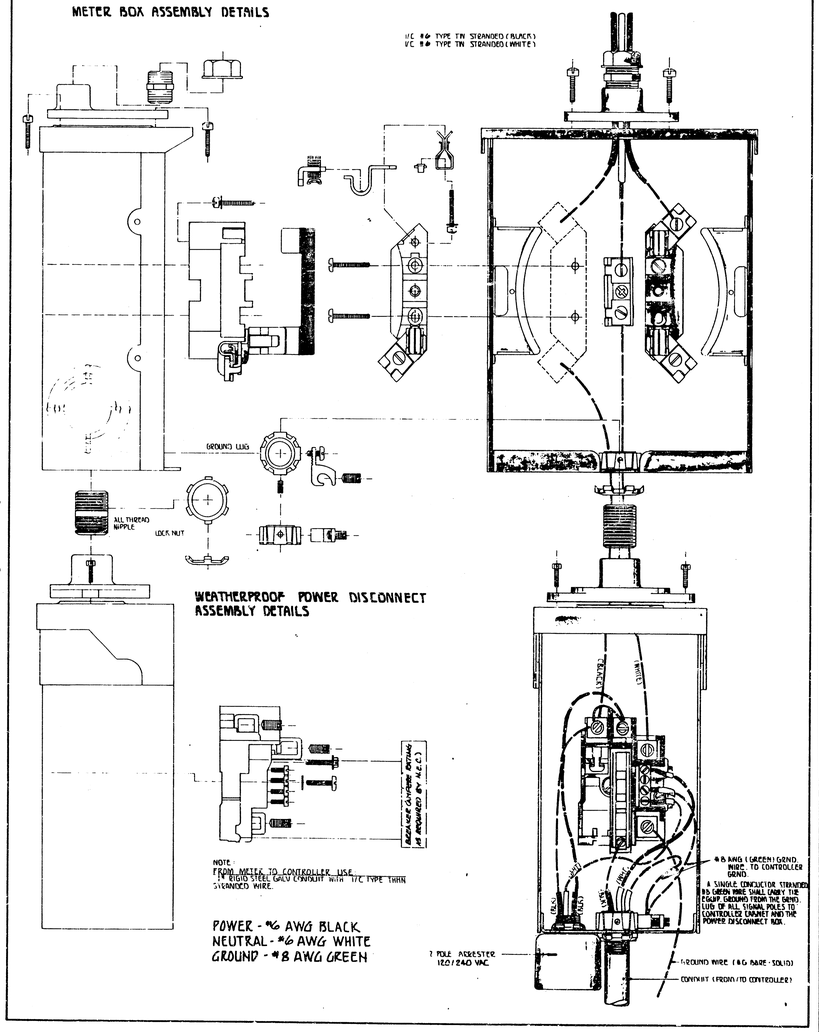

| REV DATE | COMMENTS | INIT |
|---|---|---|
| AUG. 81 | DETAILS C-1, C-2, C-3 & C-5 REMOVE AND ADD NOTE. | JD |
| OCT. 84 | CHANGE WIRING NOTES ON POWER DISCONNECT. | JD |
| JAN. 91 | ADD N.E.C. BREAKER NOTE | JD |
| AUG. 97 | ADD WRENCH JOINT NOTE & REVISION | JD |
| AU. 01 | CHANGE POWER DISCONNECT AND CONDUIT(1) | JD |
| DEC. 01 | ADD NOTE AT POLE CONTROLLER BOX. | JD |

## SPANWIRE ASSEMBLY DETAILS

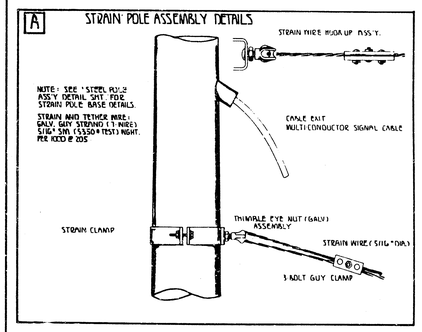
1. DROP MAX. AT 5% OF SPAN. (% SAG)
2. STD. RAKE AT 3%
3. HEIGHT OF STRAIN WIRE HOOK-UP TO BE DETERMINED BY FIELD ENGINEER. TRAFFIC SIGNAL CABLE TO BE SECURED TO STRAIN (SPAN) WIRE w/ NON-CORR. NYLON CABLE HANGERS. (12" CTRS.) DETAIL 'B'
4. TETHER CLAMP TO BE DESIGNED TO RELEASE UNDER 'HIGH WIND LOAD' TO PERMIT SIGNAL 'FREE-SWING'.
5. CONTRACTOR TO GIVE 24 HR. NOTICE TO ENGINEER PRIOR TO POURING ANY SIGNAL BASE OR CONTROLLER PAD.



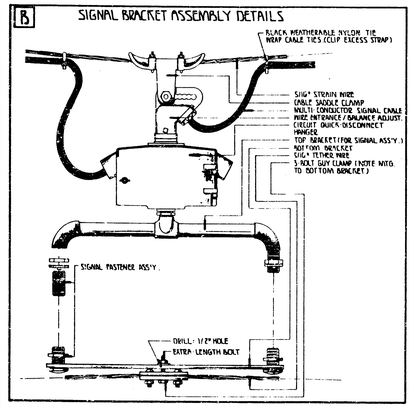

## METER BOX ASSEMBLY DETAILS



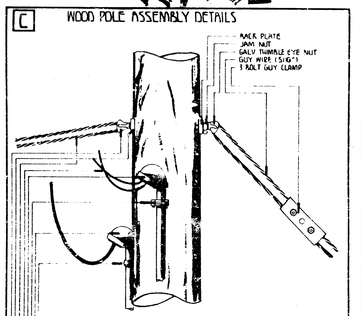

## A STRAIN POLE ASSEMBLY DETAILS




## B SIGNAL BRACKET ASSEMBLY DETAILS




## C WOOD POLE ASSEMBLY DETAILS




NOTE: GALV THIMBLE EYE ANCHOR BOLT AND EXPANDING ANCHOR (NOT SHOWN) TO STABILIZE WOOD POLE (WHERE APPLICABLE)

2. ANY COMBINATION OF ROUND / THIMBLE EYE NUTS AND NUTS MAY BE UTILIZED AS APPLICATION MAY VARY. FIELD ENGINEER TO DETERMINE TYPE OF HARDWARE USED.

3. HARDWARE SHOWN IS TRANSFERRABLE TO STEEL POLE IN WHOLE OR PART WHERE STEEL STRAIN POLE IS USED (POWER, SIGNAL CABLE, METER / PIL.) FIELD ENGINEER TO MAKE DETERMINATION. STEEL STRAIN POLE APPLICATION'S MAY VARY AS TO MOUNTINGS ON POLE (USE OF CLAMPS, BANDED BRACKETS, ETC. ARE STD. - FIELD ENGINEER TO DETERMINE BEST TYPE APPLICATIONS.

PROJECT DESCRIPTION
**POWER POLE AND SPAN POLE ASSEMBLY DETAILS**
- STANDARD APPLICATIONS -
PROJECT NUMBER
472-76-245-81988-000-000-001

| BOOK NO. | APPROVED BY | DATE SEPT 83 |
|---|---|---|
| DRAWN BY SEAL | | REVISED 4-85 (WHITE BOX) |

CITY OF WICHITA
DEPARTMENT OF PUBLIC WORKS
TRAFFIC ENGINEERING
WM. G. MCKINLEY, TRAFFIC ENGINEER
SCALE DO NOT SCALE - INFO ONLY

7/13

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| FHWA REGION NO. | STATE | PROJECT NO. | YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 7 | KANSAS | | 19 | | |

SPECIFICATIONS FOR
TYPE 170 TRAFFIC SIGNAL CONTROLLER SYSTEMS

City of Wichita, Kansas
April, 1989

Each Type 170 Traffic Signal Controller System shall meet the applicable specifications detailed in FHWA-IP-78-16 "Type 170 Traffic Signal Controller System - Hardware Specifications" as well as the additional requirements noted below:

A. Controller Unit

The Model 170 controller unit shall contain a single MPU with at least 2K of RAM memory on a separate board apart from the Input/Output logic board. Power supply shall be ferro-resonant design.

Output interface - The output interface shall consist of 56 bits of buffered storage consisting of seven (7) 8-bit ports. Output data shall be latched at the time of writing from the MPU. This interface shall provide an NPN open collector output capable of driving up to 50 volts DC and sinking up to 100 milliamperes. The output shall be an open collector inverter (diode clamped to ground and +30VDC) with a latched buffer or a latched buffer driver. The diode clamped to ground and +30VDC shall have copper runs of less than 3 inches in length. A logic state one from the MPU shall be presented as a grounded collector (0 to 2 volts), and a logic state zero presented as an open circuit. Once a port is written into, the data will remain present and stable until either another port is written into it, or until the power is turned off. The state of these output ports at the time of power up or power down shall be an open circuit.

Provide adjustable AC threshold voltage indicator on power supply.

Provide socket mounted IC chips on input/output logic board.

The Model 170 controller shall include a Model 412 System memory module of same manufacturer as specified in FHWA-IP-78-16 (November, 1978, Addendum) in lieu of the Traffic PROM Module. The Model 412 System memory module shall include 8 PROM-(2816).

B. Conflict Monitor

The Model 210 conflict monitor(s) supplied shall meet requirements outlined in Chapter 3 of the Traffic Signal Control Hardware Specifications detailed in FHWA-IP-78-16 published by the Federal Highway Administration and dated December, 1978, and the following requirements:

1. Any dark signal head (that is, loss of signal output to field terminals) shall cause the monitor to trip.

2. Any yellow time less than 3.8 seconds shall cause the monitor to trip.

3. The green, yellow and red indications for each phase shall be brought into the monitor individually and shall be monitored separately with respect to a loss of signal on any of the three inputs per channel.

4. The monitor shall have the required circuitry to allow the early detection of a conflict caused by a green or yellow signal "hang up" (that is, any green or yellow output which shall remain on when the controller has transferred to a yellow or all red output) by starting the fault timers as soon as yellow appears with the corresponding green still energized. The monitor shall not wait until a conflicting green is displayed to time the conflict. This shall preclude the presentation of a conflicting signal display at the intersection.

5. During the "all red" clearance period (if used), the monitor shall check all inputs for faulty signal display and shall react to these faulty indications during the all red clearance period.

   Since during this period the only inputs that should be active would be the reds, the monitor shall detect any faults such as red/green, red/yellow, green/yellow and green/red/yellow.

6. The monitor shall be capable of monitoring for incorrect signals applied at the field terminals of each vehicular movement (green, yellow, red). Should a voltage be present on more than one, or none, of the inputs (green, yellow, red) of a channel, the unit shall begin timing the duration of this condition. If this condition exists for less than 700 milliseconds, the unit shall not trigger. If this condition exists for 700 milliseconds or more, but less than 1,000 milliseconds, the unit may or may not trigger.

7. When the unit triggers, it shall cause the output relay contacts to transfer. These contacts shall remain in this state until the unit is reset by the activation of the panel control, or the activation of the external reset input. Power interruption shall not reset the conflict monitor when it has been triggered by detection of a faulty load switch output.

8. The minimum indicators shall be as follows:

   a. Power - shall be illuminated when the 24VDC input from the controller is present and the AC- is applied to the monitor.

   b. Watch Dog Error - shall illuminate when the monitor detects a watch dog error.

   c. Conflict - shall illuminate when a conflict has been detected by the monitor.

   d. Red Failure - shall illuminate when a red failure has been detected by the monitor.

   e. Switch Fail - shall illuminate when a faulty load switch has been detected by the monitor.

   f. PCA - shall illuminate when the program board if not installed or is not installed properly.

   g. PIAF - shall illuminate when the unit has detected a failure and then experiences a power interruption.

   h. The monitor shall include signal status indicators. These indications (one per channel) shall illuminate when a proceed signal is present on the corresponding channel during normal operation. If the unit trips due to a conflict, the signal status shall lock up, displaying the status of each channel at the time the conflict occurred. Should the monitor trip due to the absence of red or a faulty load switch output, the signal status indicators shall display the channel (channels) which is (are) at fault.

   i. YELLOW (SHORT YELLOW TIME)

9. If the monitor detects a load switch fault condition, the switch failure indicator shall be illuminated and the signal status indicators will display the exact channel of the load switch that failed.

10. The red inputs shall be brought into the monitor via a front panel connector.

11. The Red Enable shall be brought into the monitor via the same front panel connector as the red inputs.

12. A Red Interface Adapter shall be wired in and tested.

13. Conflict monitor to be capable of monitoring four (4) red, yellow and green outputs from the Model 420 auxiliary output file.

14. COMMUNICATIONS SOFTWARE COMPATIBLE WITH WARKS SOFTWARE.

C. Detectors

The Model 222 Two-Channel Loop Detector as specified in Chapter 4 FHWA-IP-78-16 shall provide for a "failsafe" continuous output in response to an open loop or open lead-in wire.

Each detector unit shall provide SIXTEEN SENSITIVITY SETTINGS VIA THUMBWHEEL SWITCHES.

Each detector unit shall be provided with a test switch position to verify loop system integrity. The open loop test position shall indicate a previous fault via the front panel indicator. The memory shall remain intact and can be queried repeatedly. Existing detections shall not be reset and the memory shall only be reset by removing and reinserting the detector unit.

Each detector unit shall provide for selection of delay time of 0 to 30 seconds in 2.0 second increments and/or extension time of 0 to 7 1/2 seconds in 0.5 second increments or off if no timing is desired.

Each timer (delay and extension) shall be provided with buffer circuitry to enable or disable the timer based on an external signal output. Each channel shall include an external input to gate the timing. PROVIDE FOR CROSS-TALK ELIMINATION WITH ONLY ONE CHANNEL ON AT A TIME WHILE SCANNING.

D. Controller Cabinet

The Model 332 Cabinet shall be unpainted natural aluminum. The output file must be capable of flashing all 8 phases red or yellow. The three-point locking mechanism shall be fabricated so that it may be actuated by rotating a removable 5/8 inch hex key. The hex socket and locking cam shall rotate on a 3/4 inch minimum diameter shaft. The socket and shaft shall be field-replaceable with common tools. The socket head shall be protected from being rotated with a pipe wrench or similar tool. One hex wrench shall be provided with each cabinet.

A combination power supply and distribution assembly shall be provided to supply +24 VDC to the input and output files for use by their associated devices. The power supply shall be of ferro-resonant design having no active components and conform to the following requirements:

Line Regulation - 2% from 90 to 135 VAC at 60 Hz, plus an additional 1.6% for each additional 1.0% frequency change.

Load Regulation - 5% from 1 ampere to 5 amperes with a maximum temperature rise of 30° C above ambient.

Design Voltage - +24 (± 0.5) VDC at full load, 30° C, 115 VAC incoming after a 30 minute warmup period.

Full Load Current - 5 amperes, minimum.

Ripple Noise - 2 volts peak-to-peak and 500 millivolts RMS at full load.

Line Voltage - 90 to 135 VAC.

Efficiency - 70% minimum.

Minimum Voltage - +22.8 VDC.

Circuit capacitors shall be rated for 40 volts, minimum.

The assembly shall have a maximum depth of 5.5 inches.

The front panel shall include a fuse or circuit breaker, power ON light and test points or meter for monitoring the output voltages.

The assembly including terminals shall be protected to prevent accidental contact with energized parts.

The power supply cage and transformer shall be securely braced to prevent damage in transit.

The following equipment shall be provided:

1 - Duplex NEMA 5-15R Controller Receptacle
2 - Duplex NEMA 5-15R Equipment Receptacle (one with GFI)
1 - 1 Pole 50 Amperes minimum, 120 VAC Main Circuit Breaker
6 - Single Pole, 15 Amperes, Circuit Breakers with Auxiliary Switch Feature and Medium Trip Delay Characteristic
1 - 2 Pole Ganged, 20 Amperes, 120 VAC Flash Bus Circuit Breaker
1 - Mercury Contactor - rated minimum 60 Amperes, 120 VAC
2 - Model 204 Flasher Unit and Socket
1 - Model 206 Power Supply Module and Socket
1 - Auto/Flash Control Switch
1 - Flash On Indicator Light
3 - 10 Position TBK T1, T2 and T4
1 - 4 Position TBK T3

Rating of breakers shall be shown on face of breaker or handle. Breaker function shall be labeled below breakers on front panel.

The first equipment receptacle in the circuit shall have ground-fault circuit interruption as defined in the National Electrical Code. Circuit interruption shall occur on 6 ma of ground-fault current and shall not occur on less than 4 ma of ground-fault current.

An "Auto/Flash" switch shall be provided which, when placed in "Flash" position (down), shall energize the Mercury Contactor (MC) Coil. When the switch is placed in the "Auto" position (up), the switch packs shall control the signal indications. The switch shall be a SPST Toggle Control Switch.

The flash indicator light labeled "Flash On" shall be mounted on the PDA Front Panel. The lamp shall be driven by Flasher Unit/Output per Circuit Breaker Option.

All conductors from the power distribution assembly routed to the cabinet wiring shall be connected to the terminal block on the common side, except for the AC power conductor between the service terminal block and main circuit breaker. All internal conductors terminating at the blocks shall be connected to the other side of the blocks.

The breaker auxiliary switch circuit shall be open when the breaker is in "On" position. The auxiliary circuits shall be wired in parallel so that any tripped breaker shall energize the Mercury Contactor Coil, Flash Transfer Relay Coils and the "Flash On" Indicator. The Auxiliary Contacts shall be rated at 5 Ampheres, 120 VAC Minimum (fast on type connection).

Field wiring to be directly connected to input files.

Each terminal on output terminal blocks to be SILKSCREENED BY THE MANUFACTURER AS PER PHASE FUNCTION.

Jumper I 13-K to I 13-E to I 12-E to I 12-K to I 16-2.

Provide Fiberglas disposable filters in lieu of metal filters.

The lifting eyes shall be removable.

Interchangeability of the Isolation Relay and Logic Relay shall not be possible.

~~Each terminal on output terminal blocks to be marked as per phase function.~~

Anchor bolts to be provided.

-End of Specification-

TRAFFIC SIGNAL SPECIFICATIONS

SH. 8 OF 13

DEPARTMENT OF PUBLIC WORKS
CITY OF WICHITA
TRAFFIC ENGINEERING — W. D. McKINLEY, TRAFFIC ENG.

| | | | |
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| Designed by | | Checked by | J.A.V. |
| Drawn by | | Date | Job No. 81988 |

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## SECTION 1 - TRAFFIC SIGNAL INSTALLATION

01. GENERAL. THIS SPECIFICATION IS INTENDED TO DESCRIBE THE METHOD AND CONSTRUCTION REQUIREMENTS FOR THE INSTALLATION OF A TRAFFIC SIGNAL. THE INSTALLATION SHALL INCLUDE ALL POLES, BASES, CABINETS, CONTROLLERS, CABLES, CONDUITS, SERVICE BOXES, JUNCTION BOXES, WIRING, SIGNAL HEADS, DETECTORS AND SUCH OTHER MISCELLANEOUS PARTS OR MATERIALS AS SHOWN ON THE PLANS OR AS OTHERWISE REQUIRED OR SPECIFIED.

THE CONTRACTOR SHALL BE RESPONSIBLE TO FURNISH AND INSTALL ALL EQUIPMENT NECESSARY FOR THE COMPLETE AND SATISFACTORY OPERATION OF THE TRAFFIC SIGNAL, WHETHER SAID EQUIPMENT IS SPECIFICALLY MENTIONED OR NOT.

THE CONTRACTOR SHALL CONTACT ANY AND ALL LOCAL AGENCIES HAVING JURISDICTION OVER SUCH INSTALLATIONS AND ACQUIRE ANY PERMITS OR LICENSES THAT MAY BE REQUIRED. COPIES OF ANY PERMITS OR LICENSES SHALL BE SUPPLIED TO THE ENGINEER PRIOR TO BEGINNING ANY CONSTRUCTION OR INSTALLATION. THE CONTRACTOR SHALL COMPLY WITH ALL LOCAL ORDINANCES OR APPLICABLE BUILDING CODES.

THE CONTRACTOR SHALL NOTIFY THE APPROPRIATE POWER COMPANY PRIOR TO ANY SERVICE CONNECTION TO DETERMINE THE PROPER TYPE AND METHOD OF HOOK-UP FOR THE PARTICULAR LOCALE. THE COST OF ANY INITIAL HOOK-UP CHARGE SHALL BE BORNE BY THE CONTRACTOR. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, THE COST OF POWER SUPPLIED FOR ALL TESTING UNTIL THE SIGNAL INSTALLATION IS ACCEPTED.

IN SO FAR AS PRACTICABLE, MAJOR ITEMS OF ELECTRONIC EQUIPMENT SUCH AS THE TRAFFIC SIGNAL CONTROLLER AND LOOP DETECTOR AMPLIFIERS PROVIDED AND INSTALLED UNDER THIS CONTRACT SHALL BE OF ONE TYPE AND CONSIST OF PRODUCTS OF THE SAME SUPPLIER IN ORDER TO SECURE UNIFORMITY, SINGLE RESPONSIBILITY, AND MOST SATISFACTORY SERVICE.

THE CONTRACTOR SHALL ARRANGE FOR THE SUPPLIER OF THE MAJOR ITEMS OF ELECTRONIC EQUIPMENT TO HAVE A REPRESENTATIVE AT THE SITE *TO ENERGIZE THE SIGNAL. ENERGIZING OF SIGNAL TO OCCUR MON. - THURS. 9am - 3pm.*
THE CONTRACTOR SHALL NOTIFY ANY UTILITY COMPANIES WHICH MAY HAVE FACILITIES IN THE WORK AREA. ALL COSTS OF UTILITY RELOCATION SHALL BE BORNE BY THE OWNER. ADJUSTMENTS IN ELEVATION OF SERVICE BOXES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

02. CONDUIT. ALL CONDUCTORS SHALL BE RUN BETWEEN BASES, JUNCTION BOXES, PULL BOXES, AND SERVICES BOXES IN RIGID CONDUIT CONFORMING TO THE PROVISIONS OF SECTION 2 OF THESE SPECIFICATIONS. THE SIZE OF THE CONDUIT USED SHALL BE OF THE SIZE AS SHOWN ON THE PLANS

THE ENDS OF ALL CONDUIT SHALL BE WELL REAMED TO REMOVE BURRS AND ROUGH EDGES. FIELD CUTS SHALL BE MADE SQUARE AND TRUE SO THAT THE ENDS WILL BUTT OR COME TOGETHER FOR THE FULL DIAMETER THEROF. SLIP JOINTS OR RUNNING THREADS WILL NOT BE PERMITTED FOR COUPLING CONDUIT. WHEN A STANDARD COUPLING CANNOT BE USED, AN APPROVED THREADED UNION *SHALL BE USED.* THE THREADS ON ALL CONDUIT SHALL BE PAINTED WITH A GOOD QUALITY OF LEAD OR RUST PREVENTATIVE PAINT BEFORE COUPLINGS ARE MADE. ALL COUPLINGS SHALL BE FITTED AND TIGHTENED UNTIL THE END OF THE CONDUITS ARE BROUGHT TOGETHER. WHERE COATING ON CONDUIT HAS BEEN INJURED IN HANDLING, OR INSTALLING, SUCH INJURED PLACES SHALL BE THOROUGHLY PAINTED WITH RUST PREVENTATIVE PAINT.

ALL CONDUIT ENDS SHALL BE THREADED AND CAPPED WITH STANDARD PIPE CAPS UNTIL WIRING IS STARTED. WHEN CAPS ARE REMOVED, THE THREADED ENDS SHALL BE PROVIDED WITH APPROVED CONDUIT BUSHINGS.

THE LOCATION OF ENDS OF ALL CONDUIT FOR FUTURE ELECTRICAL CIRCUITS IN STRUCTURES SHALL BE MARKED BY A "Y" AT LEAST THREE INCHES (3") HIGH CUT INTO THE FACE OF CURB, SIDEWALK, GUTTER OR WALL DIRECTLY ABOVE THE CONDUIT.

CONDUIT BENDS, EXCEPT FACTORY BENDS, SHALL HAVE A RADIUS OF NOT LESS THAN SIX (6) TIMES THE INSIDE DIAMETER OF THE CONDUIT. WHERE FACTORY BENDS ARE NOT USED, CONDUIT BENDS SHALL BE MADE WITHOUT CRIMPING OR FLATTENING, USING THE LONGEST RADIUS PRACTICABLE.

CONDUIT SET IN BASES SHALL EXTEND TWO TO THREE INCHES (2" TO 3") VERTICALLY FROM THE TOP OF THE BASE. A PLASTIC OR METAL CONDUIT BUSHING SHALL BE INSTALLED ON THE END OF ALL CONDUIT TERMINATING WITHIN A BASE. CONDUIT ENTERING THROUGH THE SIDES OF A PULL BOX SHALL BE LOCATED NEAR THE ENDS TO LEAVE THE MAJOR PORTION OF THE BOX CLEAR. CONDUIT ENTERING CONCRETE SERVICE BOXES SHALL NOT EXTEND MORE THAN 5" INSIDE OF SERVICE BOX. CONDUIT ENTERING PULL BOXES SHALL TERMINATE IN A THREADED BELL FITTING FLUSH WITH THE INSIDE OF THE BOX WALL AND NOT LESS THAN SIX INCHES *(6") ABOVE THE CRUSHED ROCK BOTTOM OF THE SERVICE HOLE.* CONDUIT SHOULD BE SLOPED TO DRAIN AS DIRECTED BY THE ENGINEER. AT ALL OUTLETS, CONDUITS SHALL ENTER FROM THE DIRECTION OF THE RUN.

WHEREVER POSSIBLE, THE CONDUIT SHALL BE INSTALLED BY TRENCHING. TRENCHES SHALL RUN IN STRAIGHT LINES BETWEEN PULL BOXES AND BASES. THE LOCATION OF THE CONDUIT SHALL BE AS SHOWN ON THE PLANS, EXCEPT THAT WHERE PHYSICAL OBSTRUCTIONS DICTATE, THE LOCATION SHALL BE DETERMINED BY THE ENGINEER. CONDUIT SHALL BE INSTALLED TO A DEPTH OF AT LEAST THIRTY INCHES (30") BELOW FINISH GRADE. THIS REQUIREMENT MAY BE WAIVED BY THE ENGINEER WHERE PHYSICAL CONDITIONS OR OBSTRUCTIONS WARRANT.

TRENCHES SHALL BE BACKFILLED WITH MATERIAL FREE OF ROCK AND COMPACTED IN LIFTS BY HAND TAMPING OR WITH MECHANICAL TAMPERS TO THE DENSITY NOTED ON THE PLANS. IF A DENSITY IS NOT SPECIFIED ON THE PLANS, TRENCH BACKFILL SHALL BE COMPACTED UNTIL, IN THE OPINION OF THE ENGINEER, NO SIGNIFICANT FUTURE SETTLEMENT WILL OCCUR.

EXISTING UNDERGROUND CONDUIT TO BE INCORPORATED INTO A NEW SYSTEM SHALL BE CLEANED WITH A MANDREL AND BLOWN OUT WITH COMPRESSED AIR.

CONDUIT RUNS SHOWN ON THE PLANS ARE FOR BIDDING PURPOSES ONLY, AND MAY BE CHANGED WITH PERMISSION OF THE ENGINEER TO AVOID UNDERGROUND OBSTRUCTIONS.

CONDUIT PLACED UNDER EXISTING PAVEMENT OR SIDEWALK SHALL BE INSTALLED BY AN APPROVED JACKING OR DRILLING METHOD. THE EXISTING PAVEMENT SHALL NOT BE DISTURBED UNLESS OTHERWISE NOTED ON THE PLANS OR APPROVED BY THE ENGINEER. EXCESSIVE USE OF WATER SUCH THAT THE PAVEMENT MIGHT BE UNDERMINED, OR THE SUBGRADE SOFTENED, WILL NOT BE PERMITTED.

03. CONCRETE BASE FOR POLES AND CONTROLLER CABINET. BASES FOR POLES AND CABINETS SHALL BE REINFORCED CONCRETE AS DETAILED ON THE PLANS. THE CONCRETE SHALL BE CLASS 1. THE REINFORCING BARS SHALL BE FREE OF RUST AND DIRT AND SHALL BE OF THE SIZE, NUMBER AND DIMENSIONS SHOWN ON THE PLANS.

ANCHOR BOLTS SHALL BE OF THE SIZE AND DESIGN RECOMMENDED BY THE MANUFACTURER OF THE PARTICULAR POLE TO BE INSTALLED. THEY SHALL EXTEND UNIFORMILY ABOVE THE TOP OF THE CONCRETE BASE A HEIGHT EQUAL TO THE MANUFACTURERS RECOMMENDATIONS.

A 5/8" X 12'-0" COOPERWELD GROUND ROD SHALL BE INSTALLED IN EACH BASE AS SHOWN ON THE PLANS.

THE CONTRACTOR SHALL DESIGN AN ANCHOR BOLT ASSEMBLY WHICH SHALL BE WELDED TO THE REBAR CAGE AND THE RESULTING UNIT INSERTED IN THE FORM FOR THE CONCRETE BASE. THE UNIT SHALL BE DESIGNED AND CONSTRUCTED SUCH THAT, AFTER INSERTION IN THE FORM, IT CAN BE CHECKED FOR PROPER ORIENTATION, ELEVATION AND VERTICALITY. "STABBING" OF ANCHOR BOLTS OR GROUND RODS WILL NOT BE PERMITTED.

THE LOCATION OF THE BASES SHALL BE AS SHOWN ON THE PLANS. ANY VARIATION FROM THE PLAN LOCATION SHALL BE ONLY WITH THE APPROVAL OF THE ENGINEER.

STEEL TRAFFIC SIGNAL POLE BASES SHALL BE CONSTRUCTED IN TWO POURS. THE INITIAL CONCRETE PLACEMENT SHALL END SIX INCHES (6") BELOW FINISH GRADE. *A 6" THICK, 36" SQUARE CONCRETE CAP SHALL BE POURED WHEN THE POLE HAS BEEN ERECTED, PLUMBED, AND APPROVED BY ENGINEER.* THE TOP OF THE BASE SHALL BE SLIGHTLY (1/8" TO 1/2") HIGHER THAN THE ADJACENT CURB AND GUTTER, OR FINISH GRADE IF NO CURB AND GUTTER. ALUMINUM PEDESTAL BASES SHALL BE CONSTRUCTED IN ONE POUR AS DETAILED ON THE PLANS.

04. WIRING. WIRING SHALL CONFORM TO THE APPROPRIATE ARTICLES OF THE NATIONAL ELECTRIC CODE OR SUBSEQUENT REVISIONS. WHEREVER POSSIBLE, THE CONDUCTOR FROM THE TERMINAL BLOCK IN THE CONTROLLER TO THE SIGNAL BASE SHALL BE A CONTINUOUS RUN. NO SPLICES OF CABLE WILL BE PERMITTED IN CONDUIT OR OUT-SIDE OF JUNCTION BOXES, SERVICE BOXES OR POLE BASES UNLESS OTHERWISE SPECIFIED IN THE SUPPLEMENTAL SPECIFICATIONS, SPECIAL PROVISIONS, OR ON THE PLANS FOR AN OVERHEAD WIRING SYSTEM. WHEN POSSIBLE, ALL SPLICES SHALL BE MADE ABOVE GROUND IN POLE OR PEDESTAL BASES.

WHEN CONDUCTORS AND CABLES ARE PULLED INTO THE CONDUIT, ALL ENDS SHALL BE TAPED TO EXCLUDE MOISTURE, AND SHALL BE SO KEPT UNTIL THE SPLICES ARE MADE OR TERMINAL APPLIANCES ATTACHED. ENDS OF SPARE CONDUCTORS SHALL REMAIN TAPED.

WHEN PULLING CONDUCTORS THROUGH CONDUITS, A POWDERED SOAPSTONE, TALC OR OTHER APPROVED LUBRICANT SHALL BE USED.

SIX FEET (6') OF SLACK OR EXCESS CABLE, AS APPLICABLE, SHALL BE LEFT IN EACH SERVICE BOX FOR TRAFFIC SIGNAL CABLE, AND DETECTOR LEAD-IN WIRE.

ALL CABLES SHALL BE UNIFORMLY BUNDLED AND SECURED AS CLOSE AS POSSIBLE TO THE TOP OF SERVICE HOLE OR JUNCTION BOX WITH ONE-HOLE CONDUIT STRAPS OF ADEQUATE SIZE.

A. SPLICES.

(1) SIGNAL CONDUCTOR CABLE. CONDUCTORS SHALL BE JOINED BY TWISTING THE CONDUCTORS. CONDUCTOR INSULATION SHALL BE PENCILED, TRIMMED TO CONICAL SHAPE, BEFORE APPLYING SPLICE INSULATION. SPLICE INSULATION SHALL CONSIST OF LAYERS OF THERMOPLASTIC OR NEOPRENE INSULATION ELECTRICAL TYPE BEARING THE LABEL OF THE UNDERWRITERS LABORATORIES, INC., APPLIED TO A THICKNESS EQUAL TO AND WELL LAPPED OVER THE ORIGINAL INSULATION, EXCEPT THAT ON HIGH VOLTAGE SPLICES TWO LAYERS OF RUBBER TAPE CONFORMING TO THE REQUIREMENTS AT A.S.T.M. DESIGNATION: D 119 SHALL BE APPLIED OVER THE CONDUCTOR BEFORE PLACING THE THERMOPLASTIC TAPE. THE SPLICE SHALL THEN BE WELL COVERED WITH TWO LAYERS OF FRICTION OR OTHER APPROVED TAPE. AT LEAST TWO FEET (2') OF SLACK SHALL BE LEFT FOR EACH CABLE AT EACH SPLICE.

(2)
WHEN TERMINATING ENDS OF CABLE AT ALL TERMINAL BLOCKS AN APPROVED #14 INSULATED SPADE TERMINAL SHALL BE PROPERLY CRIMPED ON END OF EACH CONDUCTOR TO PROVIDE A SECURE CONNECTION.

05. TRAFFIC SIGNAL HEADS. TRAFFIC SIGNAL HEADS MOUNTED ON THE SIDE OF POLES OR ON PEDESTALS SHALL BE TEN FEET (10') FROM THE GROUND TO THE BOTTOM OF THE SIGNAL HEAD.

TRAFFIC SIGNAL HEADS MOUNTED ON MAST ARMS OR SPAN WIRE SHALL BE NO LESS THAN SIXTEEN FEET (16') AND NO MORE THAN NINETEEN FEET (19') FROM THE PAVEMENT TO THE BOTTOM OF THE SIGNAL HEAD. IN SOME INSTANCES THE ENGINEER MAY REQUIRE THE SIGNAL TO BE MOUNTED ABOVE SIXTEEN FEET (16') FOR BETTER VISIBILITY. UNDER NO CIRCUMSTANCES SHALL THE BOTTOM OF THE SIGNAL BE MORE THAN NINETEEN FEET (19') ABOVE THE PAVEMENT.

THE ENGINEER SHALL DIRECT THE FINAL POSITIONING OF THE SIGNAL HEADS. SIGNAL HEADS SHALL NOT BE INSTALLED AT ANY INTERSECTION UNTIL ALL OTHER SIGNAL EQUIPMENT, INCLUDING THE CONTROLLER, IS IN PLACE AND READY FOR OPERATION AT THAT INTERSECTION, EXCEPT THAT THE SIGNAL HEADS MAY BE MOUNTED IF THE FACES ARE NOT DIRECTED TOWARD TRAFFIC OR IF THE FACES ARE COVERED.

06. POLE INSTALLATION. WHEN INSTALLED, THE TRAFFIC SIGNAL POLES SHALL BE BACK RAKED ACCORDING TO THE MANUFACTURER'S RECOMMENDATION TO ALLOW FOR DEFLECTION, SUCH THAT THE POLE WILL BE PLUMB WHEN LOADED.

## SECTION 2 - TRAFFIC SIGNAL EQUIPMENT

01. EACH TYPE 170 TRAFFIC SIGNAL CONTROLLER SYSTEM SHALL MEET THE APPLICABLE SPECIFICATIONS DETAILED IN FHWA-IP-78-16 "TYPE 170 TRAFFIC SIGNAL CONTROLLER SYSTEM - HARDWARE SPECIFICATIONS" AS WELL AS THE ADDITIONAL REQUIREMENTS NOTED BELOW:

A. CONTROLLER UNIT

THE MODEL 170 CONTROLLER UNIT SHALL CONTAIN A SINGLE MPU WITH AT LEAST 2K OF RAM MEMORY ON A SEPARATE BOARD APART FROM THE INPUT/OUTPUT LOGIC BOARD.

THE MODEL 170 CONTROLLER SHALL INCLUDE A MODEL 412 SYSTEM MEMORY MODULE ~~WITH 2764 PROM CHIPS~~ AS SPECIFIED IN FHWA-IP-78-16 (NOVEMBER, 1978, ADDENDUM) IN LIEU OF THE TRAFFIC PROM MODULE. THE 412 SYSTEM MEMORY MODULE SHALL INCLUDE $E^2$ PROM-(2816).

B. CONFLICT MONITOR

THE MODEL 210 CONFLICT MONITOR(S) SUPPLIED SHALL MEET REQUIREMENTS OUTLINED IN CHAPTER 3 OF THE TRAFFIC SIGNAL CONTROL HARDWARE SPECIFICATIONS DETAILED IN FHWA-IP-78-16 PUBLISHED BY THE FEDERAL ADMINISTRATION AND DATED DECEMBER, 1978, AND THE FOLLOWING REQUIREMENTS:

1. ANY DARK SIGNAL HEAD (THAT IS, LOSS OF SIGNAL OUTPUT TO FIELD TERMINALS) SHALL CAUSE THE MONITOR TO TRIP.

2. THE GREEN, YELLOW AND RED INDICATIONS FOR EACH PHASE SHALL BE BROUGHT INTO THE MONITOR INDIVIDUALLY AND SHALL BE MONITORED SEPARATELY WITH RESPECT TO A LOSS OF SIGNAL ON ANY OF THE THREE IN-PUTS PER CHANNEL.

3. THE MONITOR SHALL HAVE THE REQUIRED CIRCUITRY TO ALLOW THE EARLY DETECTION OF A CONFLICT CAUSED BY A GREEN OR YELLOW SIGNAL "HANG UP" (THAT IS, ANY GREEN OR YELLOW OUTPUT WHICH SHALL REMAIN ON WHEN THE CONTROLLER HAS TRANSFERRED TO A YELLOW OR ALL RED OUTPUT RESPECTIVELY) BY STARTING THE FAULT TIMERS AS SOON AS YELLOW APPEARS WITH THE CORRESPONDING GREEN STILL ENERGIZED. THE MONITOR SHALL NOT WAIT UNTIL A CONFLICTING GREEN IS DISPLAYED TO TIME THE CONFLICT. THIS SHALL PRECLUDE THE PRESENTATION OF A CONFLICTING SIGNAL DISPLAY AT THE INTERSECTION.

4. DURING THE "ALL RED" CLEARANCE PERIOD (IF USED), THE MONITOR SHALL CHECK ALL INPUTS FOR FAULTY SIGNAL DISPLAY AND SHALL REACT TO THESE FAULTY INDICATIONS DURING THE ALL RED CLEARANCE PERIOD.

SINCE DURING THIS PERIOD THE ONLY INPUTS THAT SHOULD BE ACTIVE WOULD BE THE REDS, THE MONITOR SHALL DETECT ANY FAULTS SUCH AS RED/GREEN, RED/YELLOW, GREEN/YELLOW AND GREEN/RED/YELLOW.

TRAFFIC SIGNAL SPECIFICATIONS

SH 9 OF 13

DEPARTMENT OF PUBLIC WORKS
CITY OF WICHITA
TRAFFIC ENGINEERING — WM. D. MCKINLEY, TRAFFIC ENG.

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5. THE MONITOR SHALL BE CAPABLE OF MONITORING FOR INCORRECT SIGNALS APPLIED AT THE FIELD TERMINALS OF EACH VEHICULAR MOVEMENT (GREEN, YELLOW, RED). SHOULD A VOLTAGE BE PRESENT ON MORE THAN ONE, OR NONE, OF THE INPUTS (GREEN, YELLOW, RED) OF A CHANNEL, THE UNIT SHALL BEGIN TIMING THE DURATION OF THIS CONDITION. IF THIS CONDITION EXISTS FOR LESS THAN 700 MILLISECONDS, THE UNIT SHALL NOT TRIGGER. IF THIS CONDITION EXISTS FOR 700 MILLISECONDS OR MORE, BUT LESS THAN 1,000 MILLISECONDS, THE UNIT MAY OR MAY NOT TRIGGER.

6. WHEN THE UNIT TRIGGERS, IT SHALL CAUSE THE OUTPUT RELAY CONTACTS TO TRANSFER. THESE CONTACTS SHALL REMAIN IN THIS STATE UNTIL THE UNIT IS RESET BY THE ACTIVATION OF THE PANEL CONTROL, OR THE ACTIVATION OF THE EXTERNAL RESET INPUT. POWER INTERRUPTION SHALL NOT RESET THE CONFLICT MONITOR WHEN IT HAS BEEN TRIGGERED BY DETECTION OF A FAULTY LOAD SWITCH OUTPUT.

7. THE MINIMUM INDICATORS SHALL BE AS FOLLOWS:

   A. POWER - SHALL BE ILLUMINATED WHEN THE 24VDC INPUT FROM THE CONTROLLER IS PRESENT AND AC+ IS APPLIED TO THE MONITOR.

   B. WATCH DOG ERROR - SHALL ILLUMINATE WHEN THE MONITOR DETECTS A WATCH DOG ERROR.

   C. CONFLICT - SHALL ILLUMINATE WHEN A CONFLICT HAS BEEN DETECTED BY THE MONITOR.

   D. RED FAILURE - SHALL ILLUMINATE WHEN A RED FAILURE HAS BEEN DETECTED BY THE MONITOR.

   E. SWITCH FAIL - SHALL ILLUMINATE WHEN A FAULTY LOAD SWITCH HAS BEEN DETECTED BY THE MONITOR.

   F. PCA - SHALL ILLUMINATE WHEN THE PROGRAM BOARD IF NOT INSTALLED OR NOT INSTALLED PROPERLY.

   G. PIAF - SHALL ILLUMINATE WHEN THE UNIT HAS DETECTED A FAILURE AND THEN EXPERIENCES A POWER INTERRUPTION.

   H. THE MONITOR SHALL INCLUDE SIGNAL STATUS INDICATORS. THESE INDICATIONS (ONE PER CHANNEL) SHALL ILLUMINATE WHEN A PROCEED SIGNAL IS PRESENT ON THE CORRESPONDING CHANNEL DURING NORMAL OPERATION. IF THE UNIT TRIPS DUE TO A CONFLICT, THE SIGNAL STATUS SHALL LOCK UP, DISPLAYING THE STATUS OF EACH CHANNEL AT THE TIME THE CONFLICT OCCURRED. SHOULD THE MONITOR TRIP DUE TO THE ABSENCE OF RED OR A FAULTY SWITCH OUTPUT, THE SIGNAL STATUS INDICATORS SHALL DISPLAY THE CHANNEL (CHANNELS) WHICH IS (ARE) AT FAULT.

8. IF THE MONITOR DETECTS A LOAD SWITCH FAULT CONDITION, THE SWITCH FAILURE INDICATOR SHALL BE ILLUMINATED AND THE SIGNAL STATUS INDICATORS WILL DISPLAY THE EXACT CHANNEL OF THE LOAD SWITCH THAT FAILED.

9. THE RED INPUTS SHALL BE BROUGHT INTO THE MONITOR VIA A FRONT PANEL CONNECTOR.

10. THE RED ENABLE SHALL BE BROUGHT INTO THE MONITOR VIA THE SAME FRONT PANEL CONNECTOR AS THE RED INPUTS.

11. A RED INTERFACE ADAPTER SHALL BE WIRED IN AND TESTED.

12. CONFLICT MONITOR TO BE CAPABLE OF MONITORING FOUR (4) RED, YELLOW AND GREEN OUTPUTS FROM THE MODEL 400 AUXILIARY OUTPUT FILE.

13. CAPABLE OF MONITORING YELLOW CLEARANCE INTERNAL TIMING.

C. DETECTORS

THE MODEL 222 TWO-CHANNEL LOOP DETECTOR AS SPECIFIED IN CHAPTER 8 FHWA-IP-78-16 SHALL COMPLY WITH ALL PERFORMANCE REQUIREMENTS WHEN CONNECTED TO AN INDUCTANCE OF FROM 20 - 2000 MICROHENRIES AND SHALL PROVIDE FOR A "FAILSAFE" CONTINUOUS OUTPUT IN RESPONSE TO AN OPEN LOOP OR OPEN LEAD-IN WIRE. EACH DETECTOR SHALL BE PROVIDED WITH A TEST SWITCH WHICH SHALL INDICATE A PREVIOUS FAULT VIA THE FRONT PANEL INDICATOR.

D. CONTROLLER CABINET

THE MODEL 332 CABINET SHALL BE UNPAINTED NATURAL ALUMINUM.
THE OUTPUT FILE MUST BE CAPABLE OF FLASHING ALL 8 PHASES RED OR YELLOW AND HOOK-UP DIRECT TO INPUT FILE.
THE THREE-POINT LOCKING MECHANISM SHALL BE.
FABRICATED SO THAT IT MAY BE ACTUATED BY ROTATING A REMOVABLE 5/8 INCH HEX KEY. THE HEX SOCKET AND LOCKING CAM SHALL ROTATE ON A 3/8 INCH MINIMUM DIAMETER SHAFT. THE SOCKET AND SHAFT SHALL BE FIELD-REPLACEABLE WITH COMMON TOOLS.
THE SOCKET HEAD SHALL BE PROTECTED FROM BEING ROTATED WITH A PIPE WRENCH OR SIMILAR TOOL. ONE HEX WRENCH SHALL BE PROVIDED WITH EACH CABINET.
FIELD WIRING TO BE DIRECTLY CONNECTED TO INPUT FILES
THE LIFTING EYES SHALL BE REMOVABLE. INTERCHANGEABILITY OF THE ISOLATION RELAY AND LOGIC RELAY SHALL NOT BE POSSIBLE.

ANCHOR BOLTS TO BE PROVIDED.

03. TRAFFIC SIGNAL LAMPS. LAMPS FOR VEHICULAR AND PEDESTRIAN SIGNALS SHALL MEET THE FOLLOWING REQUIREMENTS:

A. 8" AND 9" SIGNALS

A NOMINAL 60 WATT, 120 VOLT, A19 CLEAR TRAFFIC SIGNAL LAMP OF 8,000 HOUR LIFE RATING GUARANTEED BY THE MANUFACTURER, TO BE USED IN ALL 8" VEHICULAR AND 9" PEDESTRIAN INDICATIONS. *LAMPS SHALL BE 80% KRYPTON FILLED WITH HEAT REFLECTION.*

B. 12" SIGNALS

A NOMINAL 135 WATT, 120 VOLT, A21 CLEAR TRAFFIC SIGNAL LAMP OF 6,000 HOUR LIFE RATING GUARANTEED BY THE MANUFACTURER, TO BE USED IN ALL 12" VEHICULAR AND PEDESTRIAN INDICATIONS. *LAMPS SHALL BE 80% KRYPTON FILLED WITH HEAT REFLECTION.*

C. CANDLEPOWER

ALL TRAFFIC SIGNAL LAMPS MUST MEET BEAM CANDLEPOWER SPECIFICATION OF ITE-1110(1970).

03. BACK PLATES. WHERE SHOWN ON THE PLANS, 8" BACK PLATES SHALL BE FURNISHED AND ATTACHED TO THE SIGNAL FACES TO PROVIDE A DARK BACKGROUND FOR SIGNAL INDICATIONS. BACK PLATES SHALL BE CONSTRUCTED OF ALUMINUM ALLOY SHEET OR DURABLE PLASTIC CAPABLE OF WITHSTANDING A 100 M.P.H. WIND.

WHERE A BACK PLATE CONSISTS OF TWO OR MORE SECTIONS, THE SECTIONS SHALL BE FASTENED WITH RIVETS, STAINLESS STEEL OR ALUMINUM BOLTS, PEENED AFTER ASSEMBLY TO PREVENT LOOSENING.

04. ALUMINUM TRAFFIC SIGNAL PEDESTALS

UNLESS OTHERWISE SPECIFIED ON THE PLANS, THE FOLLOWING SPECIFICATIONS SHALL GOVERN THE DESIGN OF ALUMINUM TRAFFIC SIGNAL PEDESTALS.

A. SHAFT

THE SHAFT SHALL BE A ONE-PIECE TUBE OF 6063-T6 ALUMINUM ALLOY WITH A MINIMUM WALL THICKNESS OF 0.237". THE SHAFT SHALL BE OF UNIFORM DIAMETER THROUGHOUT ITS LENGTH. THE SHAFT OUTSIDE DIAMETER AT THE TOP SHALL BE APPROXIMATELY 4.5". OVERALL HEIGHT OF THE SHAFT AND BASE SHALL BE 10 FEET. THE SHAFT SHALL HAVE A SATIN BRUSH FINISH. THE SHAFT SHALL BE THREADED WITH A NOMINAL 4" PIPE THPEAD AND BE THREADED INTO THE BASE. THE BASE AND SHAFT ARE TO *BE TAPPED* AND FITTED WITH A 3/8" SET SCREW.

B. BASE

THE BASE SHALL BE EQUIPPED WITH A HANDHOLE AND DOOR FOR ACCESS TO THE INTERIOR OF THE BASE. THE HANDHOLE SHALL HAVE A MINIMUM DIMENSION OF 7-3/4" BY 8". THE DOOR SHALL BE FASTENED IN PLACE BY A SINGLE BOLT WHICH SHALL HAVE AN ALLENHEAD TO DISCOURAGE UNAUTHORIZED PERSONNEL FROM GAINING ACCESS TO THE WIRING COMPARTMENT IN THE PEDESTAL BASE. THE PEDESTAL BASE SHALL BE MOUNTED TO A POURED CONCRETE PAD BY MEANS OF FOUR ANCHOR RODS SET IN A BOLT CIRCLE OF 13½" DIAMETER. THERE SHALL BE A PROVISION IN THE BASE FOR THE ATTACHMENT OF A GROUND *WIRE.*

C. HARDWARE

ANCHOR RODS SHALL BE 5/8" DIAMETER BY 18" LONG PLATED, AND SHALL BE SUPPLIED WITH NUTS, LOCK WASHERS AND FLAT WASHERS. THE SHAFT SHALL BE SECURED TO THE BASE BY A 3/8" BOLT TO PREVENT LOOSENING OF THE SHAFT DUE TO VIBRATION, WIND, ETC.

D. GENERAL

THE PEDESTAL AND BASE SHALL BE DESIGNED TO WITHSTAND A WIND LOAD OF 100 MPH WITH A 25 PERCENT GUST FACTOR WHILE SUPPORTING A ONE-WAY, THREE-SECTION, 12" ALUMINUM TRAFFIC SIGNAL HEAD. THE SHAFT SHALL BE WRAPPED WITH PROTECTIVE PAPER FOR SHIPMENT. LARGE SCRATCHES OR GOUGES IN THE ALUMINUM MATERIAL SHALL BE CAUSE FOR REJECTION.

05. AC SERVICE INPUT. EACH SERVICE DISCONNECT MUST BE FURNISHED WITH AN INSTALLED LIGHTNING ARRESTOR ON THE AC SERVICE INPUT WHICH MEETS OR EXCEEDS THE FOLLOWING REQUIREMENTS:

(A) THE UNIT MUST BE CAPABLE OF WITHSTANDING REPEATED 20,000 AMPERE SURGES (MINIMUM OF 20).

(B) THE UNIT MUST HAVE INTERNAL FOLLOW - CURRENT LIMITERS (RESISTIVE ELEMENTS).

(C) THE UNIT MUST CONTAIN THREE ACTIVE CLAMPING STAGES MINIMUM.

(D) THE UNIT MUST SELF-EXTINGUISH WITHIN 8.3 MILLISECONDS AFTER THE TRAILING EDGE OF THE SURGE.

(E) THE PARALLEL IMPEDANCE OF LIMITERS MUST BE LESS THAN 0.15 OHMS.

*(F) THE UNIT SHALL BE UL APPROVED.*

*EACH SERVICE DISCONNECT TO HAVE 70 AMP MAIN LUGS WITH NO MORE THAN 4 CIRCUITS.*

06. ELECTRICAL WIRE AND CABLE. ALL WIRE AND CABLE SUPPLIED UNDER THIS SPECIFICATION SHALL BE APPROVED BASED UPON CATALOG CUTS SUBMITTED TO THE ENGINEER. IN ADDITION, ALL WIRE AND CABLE SHALL BE VISUALLY INSPECTED BY THE ENGINEER. ANY APPARENT DEFECT THAT MAY SHORTEN THE SERVICE LIFE OF THE WIRE OR CABLE SHALL BE CAUSE FOR REJECTION.

A. SHIELDED LOOP DETECTOR LEAD-IN CABLE. UNLESS OTHERWISE SPECIFIED, SHIELDED LOOP DETECTOR LEAD-IN CABLE SHALL BE BELDON 8720 #14 AWG.

B. LOOP DETECTOR WIRE. UNLESS OTHERWISE SPECIFIED, LOOP DETECTOR WIRE SHALL BE STRANDED, #14 AWG. TYPE THHN-75° C, MEETING THE REQUIREMENTS OF ASTM B-8 AND U.L. STANDARD 44.

C. MULTI-CONDUCTOR CABLE. ALL CONDUCTOR CABLE FOR INTERSECTION SIGNALIZATION AND INTERSECTION INTERCONNECTION SHALL BE MULTICONDUCTOR CABLE OF THE SIZE SPECIFIED ON THE PLANS FOR OPERATION ON A 600V MAXIMUM, AND SUITABLE FOR USE AT CONDUCTOR TEMPERATURES NOT EXCEEDING 75° C. MATERIAL, CONSTRUCTION AND TESTS SHALL BE IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF THE INSULATED CABLE ENGINEERS ASSOCIATION STANDARD S-61-402 "THERMOPLASTIC INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY".

CONDUCTORS SHALL BE STRANDED, ANNEALED UNCOATED COPPER OR ANNEALED COATED COPPER. COPPER WIRE BEFORE INSULATING OR STRANDING SHALL MEET THE REQUIREMENTS OF THE LATEST EDITION OF ASTM B-33 (FOR COATED WIRE) OR ASTM B-3 (FOR UNCOATED WIRE). STRANDING SHALL BE CLASS B, IN ACCORDANCE WITH THE LATEST EDITION OF ASTM B-8.

INSULATION FOR THE INDIVIDUAL CONDUCTORS SHALL CONSIST OF A 20 MIL THICKNESS OF POLYETHYLENE, AND AN INSULATION COVERING OF A POLYVINYL CHLORIDE COMPOUND WITH A 10 MIL THICKNESS.

THE POLYETHYLENE INSULATION SHALL MEET THE REQUIREMENTS OF PARAGRAPH 3.9 OF ICEA STANDARD S-61-402 BEFORE APPLICATION TO THE CONDUCTOR, AND PARAGRAPH 3.9.1 AFTER APPLICATION TO THE CONDUCTOR.

THE POLYVINYL CHLORIDE INSULATION COVERING SHALL MEET THE REQUIREMENTS OF PARAGRAPH 4.3.1 OF ICEA STANDARD S-61-402, AND SHALL BE COLOR CODED IN ACCORDANCE WITH METHOD 1, PART 5 OF ICEA STANDARD S-61-402.

THE OVERALL CABLE JACKET SHALL CONSIST OF A POLYVINYL CHLORIDE COMPOUND WHICH WILL PROVIDE A TOUGH, HEAT, MOISTURE, OZONE, AND FLAME RESISTANT COVERING MEETING THE REQUIREMENTS OF PARAGRAPH 4.3.1 OF ICEA STANDARD S-61-402. THE OVERALL JACKET THICKNESS SHALL BE IN ACCORDANCE WITH TABLE 18, PART 4, ICEA STANDARD S-61-402.

CONDUCTOR CABLE USED FOR THE SIGNAL CONTROL CIRCUITS SHALL BE #14 AWG MULTI-CONDUCTOR CABLE, MEETING THE ABOVE REQUIREMENTS.

CONDUCTOR CABLE USED FOR INTERSECTION INTERCONNECTION SHALL BE #12 AWG MULTI-CONDUCTOR CABLE, MEETING THE ABOVE REQUIREMENTS.

D. POWER SUPPLY WIRE. INTERSECTION SIGNALIZATION POWER SUPPLY WIRE SHALL BE SINGLE CONDUCTOR WIRE FOR OPERATION ON A 600V MAXIMUM, AND SUITABLE FOR USE AT CONDUCTOR TEMPERATURES NOT EXCEEDING 75° C. MATERIAL, CONSTRUCTION AND TESTS SHALL BE IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF THE ICEA STANDARD S-66-524 "CROSS-LINKED-THERMOSETTING-POLYETHYLENE-INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY".

CONDUCTORS SHALL BE STRANDED, ANNEALED COATED COPPER. COPPER WIRE BEFORE INSULATING OR STRANDING, SHALL MEET THE REQUIREMENTS OF THE LATEST EDITION OF ASTM B-33 (FOR COATED WIRE). STRANDING SHALL BE CLASS B, IN ACCORDANCE WITH THE LATEST EDITION OF ASTM B-8.

REFER TO DRAWINGS FOR SIZE AND TYPE OF WIRE REQUIRED.

TRAFFIC SIGNAL SPECIFICATIONS

SH. 10 OF 13

DEPARTMENT OF PUBLIC WORKS
CITY OF WICHITA
TRAFFIC ENGINEERING — WM. D. MAXIM, P.E. TRAFFIC ENG.

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07. Steel Mast Arm Type Traffic Signal Standards

The following specification shall govern the design of steel mast arms with poles and bases unless otherwise specified on the plans.

A. Complete Assembly - All items for complete assembly shall be furnished including, but not limited to:

1. Arm with support shaft and base.
2. Flange plates and bolts for attachment of mast arm to shaft.
3. Anchor bolts with nuts and washers.
4. Cover(s) for the exposed anchor bolts.
5. Cap for top of pole *and mastarm end.*

B. Design - The complete assembly shall be designed to support standard one-way, multi-section signals rigidly mounted in the specified locations. All traffic Signal Poles shall conform to the 1985 AASHTO "Standard Specification for Structural Support for Highway Signs, Luminaires and Traffic Signals" Handbook with a wind load of 80 MPH and 1.3 gust factor.

The shaft and mast arm shall each be made of only one length of best grade hot rolled, basic open hearth steel of not less than #7 manufacturer's steel gauge. Only one longitudinal weld, and no transverse welds shall be permitted in the fabrication of the shaft and mast arms. After being formed and welded, the shaft shall then be longitudinally cold rolled under sufficient pressure to flatten the weld, form a round tapered tube and increase its physical characteristics so the metal will have a guaranteed minimum yield strength of 55,000 psi. The shaft and arms shall have a uniform taper of 0.14 inches of diameter change per foot of length.

C. Anchor Bolts - Four high-strength steel anchor bolts, each fitted with two nuts and two washers shall be furnished with each pole. Each anchor bolt shall have an "L" bend at the bottom end and shall be threaded at the top end. Only the top ten inches on the threaded ends of the anchor bolts need be galvanized. The manufacturer shall properly machine or otherwise ensure that the nuts and washers shall easily fit the anchor bolts after the galvanizing process. The bolts, nuts and washers shall be delivered soon after receipt of order.

D. Anchor Base - A one-piece steel anchor base with 16" bolt *circle for mastarms under 40' and 20" bolt circle for mastarms over 40', except where otherwise noted or adequate strength, shape, and size shall telescope and be welded to the lower end of the shaft using two continuous welds.*

E. Pole Shaft - A handhole with a minimum area of 25 square inches shall be welded into the shaft a short distance above the base. A cover shall be provided for the handhole.

Pole top caps shall be provided and shall be secured in place with set screws or other suitable fasteners.

A "J-hook" wire support shall be provided in each pole shaft.

Provision shall be made for a grounding attachment.

F. Mast Arm - The mast arm shall have a horizontal length as called for on the plans.

A 1½" through hole shall be drilled in the arm at the location of each signal head, internally illuminated street name sign or other required fixture. The hole shall be well reamed and fitted with a wiring grommet to prevent the chafing of cables.

G. Mast Arm Attachment - Arm and pole mounting plates shall be provided. The mast arm plate shall telescope the mast arm and be circumferentially welded inside and out. The pole plates shall be attached to the shaft by welded gusset plate top, bottom and sides. Four high-strength bolts meeting ASTM A-325 shall be furnished fully threaded into pole plates to attach the arm to the shaft. Smooth holes shall be provided in the two plates to allow the signal cable to go from the shaft to the arm without exposure to the outside weather.

H. Identification - The manufacturer shall permanently mark each mast arm and pole to identify them with their corresponding Traffic Signal Pole Summary Item number.

I. Finish - The manufacturer shall provide an information sheet showing design details of the mast arm, pole, anchor bolts, flange construction, orientation of anchor bolts to mast arm and pole, and any other pertinent installation instruction.

All members and hardware shall be hot-dipped galvanized according to ASTM A153 for hardware.

J. Joint Use - When a joint-use pole is specified, the length shall be 35 feet. In addition to the mast arm(s), it shall be designed to support truss-type luminaire arms with a five foot upsweep (40 foot mounting height) with each arm supporting a 70 pound luminaire with 3.2 square feet of wind load area. Two simplex-type fittings shall be provided for each luminaire arm. The distance between the bolt holes on the simplex fittings shall be 27 9/16". The directional alignment of the luminaire arm(s) shall be parallel with the mast arm.

K. Street Name Signs - When specified, the complete assembly shall also be designed to support either: (1) A 2' x 6' free-swinging, 65 pound internally illuminated street name sign mounted at the location as shown on the plans. A wiring grom met shall be provided in the location specified. (2) An 18" x 60" rigid mounted 15 pound reflective street name sign mounted between the outer two signals, or if only one signal is specified, the sign center will be approximately 8' from the mast arm tip. The sign will be mounted to the mast arm in such a manner that torsion or torque forces acting on the mast arm shall be held to a minimum.

08. STEEL SPAN WIRE POLES. THE FOLLOWING SPECIFICATION SHALL GOVERN THE DESIGN OF STEEL SPAN WIRE POLES AND APPURTENANCES UNLESS OTHERWISE SPECIFIED ON THE PLANS.

A. COMPLETE ASSEMBLY. THE COMPLETE ASSEMBLY SHALL INCLUDE, BUT NOT BE LIMITED TO:

(1) TAPERED STEEL SHAFT WITH BASE
(2) HANDHOLE WITH COVER
(3) CAP FOR TOP OF POLE
(4) SPAN WIRE CLAMPS
(5) STEEL WIRE ENTRANCE (WEATHERHEAD)
(6) ANCHOR BOLTS WITH NUTS AND WASHERS
(7) COVERS FOR EXPOSED ANCHOR BOLTS

B. DESIGN. THE TOTAL ASSEMBLY SHALL BE DESIGNED TO SUPPORT, BY MEANS OF A SPAN WIRE AND TETHER, THE VARIOUS EQUIPMENT SHOWN ON THE PLANS. THE POLE SHALL PROVIDE A MINIMUM CLEARANCE OF SEVENTEEN FEET (17') (AT MID-SPAN) FROM THE POLE BASE ELEVATION TO THE TETHER WIRE, WITH A SPAN WIRE SAG OF FIVE PERCENT.

CORNER POLES SHALL BE TAPERED AND HAVE A MINIMUM SECTION MODULUS AT THE BASE OF THE POLE 23.0 $IN^3$. THE LENGTH OF THE CORNER POLE SHALL BE TWENTY-SIX FEET (26') FOR STANDARD INSTALLATIONS, AND THIRTY-FIVE FEET (35') FOR JOINT USE INSTALLATIONS. (SEE PARAGRAPH H BELOW FOR OTHER JOINT USE RE- QUIREMENTS.)

END POLES SHALL BE TAPERED AND HAVE A MINIMUM SECTION MODULUS AT THE BASE OF THE POLE OF 15.0 $IN^3$. THE LENGTH OF THE END POLE SHALL BE TWENTY-SIX FEET (26').

THE MANUFACTURER SHALL PROVIDE AN INFORMATION SHEET SHOWING DESIGN DETAILS OF THE POLE, ANCHOR BOLTS, FLANGE CONSTRUCTION, ORIENTATION OF ANCHOR BOLTS, RECOMMENDATION FOR BACK RAKE, AND ANY OTHER PERTINENT INSTALLATION INSTRUCTIONS.

C. ANCHOR BOLTS. FOUR HIGH STRENGTH STEEL ANCHOR BOLTS, EACH FITTED WITH TWO NUTS AND TWO WASHERS SHALL BE FURNISHED WITH EACH POLE. EACH ANCHOR BOLT SHALL HAVE AN "L" BEND AT THE BOTTOM END AND SHALL BE THREADED AT THE TOP END. ONLY THE TOP TEN INCHES IN THE THREADED ENDS OF THE ANCHOR BOLTS NEED BE GALVANIZED. THE MANUFACTURER SHALL PROPERLY MACHINE OR OTHERWISE INSURE THAT THE NUTS AND WASHERS SHALL READILY FIT THE ANCHOR BOLTS AFTER THE GALVANIZING PROCESS.

D. ANCHOR BASE. A ONE-PIECE STEEL ANCHOR BASE WITH A SIXTEEN INCH (16") BOLT CIRCLE, CONFORMING TO REQUIREMENTS OF ASTM A-36, OF ADEQUATE STRENGTH, SHAPE AND SIZE SHALL TELESCOPE AND BE WELDED TO THE LOWER END OF THE SHAFT USING TWO CONTINUOUS WELDS.

E. POLE SHAFT. THE SHAFTS SHALL BE FABRICATED FROM ASTM A-595 GRADE A STEEL.

A HANDHOLE WITH A MINIMUM AREA OF 25 SQUARE INCHES SHALL BE WELDED INTO THE SHAFT A SHORT DISTANCE ABOVE THE BASE. A COVER SHALL BE PROVIDED FOR THE HANDHOLE.

POLE TOP CAPS SHALL BE PROVIDED AND SHALL BE SECURED IN PLACE WITH SET SCREWS OR OTHER SUITABLE FASTENERS.

A "J-HOOK" WIRE SUPPORT SHALL BE PROVIDED IN EACH POLE SHAFT.

PROVISION SHALL BE MADE FOR A GROUNDING ATTACHMENT.

SPAN WIRE CLAMPS SHALL BE PROVIDED TO ATTACH TWO SPAN WIRES MEETING AT 90 DEGREES AND TWO TETHER WIRES MEETING AT 90 DEGREES.

A STEEL, WIRE ENTRANCE (WEATHERHEAD) SHALL BE PROVIDED FOR EACH POLE.

F. IDENTIFICATION. THE MANUFACTURER SHALL PERMANENTLY MARK EACH POLE TO IDENTIFY IT WITH THE CORRESPONDING TRAFFIC SIGNAL POLE SUMMARY ITEM NUMBER.

G. FINISH. ALL MEMBERS AND HARDWARE SHALL BE HOT DIPPED GALVANIZED ACCORDING TO ASTM A-123 FOR SHAFTS, AND ACCORDING TO ASTM A-153 FOR HARDWARE.

H. JOINT USE. WHEN A JOINT USE POLE IS SPECIFIED, THE LENGTH SHALL BE THIRTY-FIVE FEET (35'). IN ADDITION TO THE SPAN WIRE, IT SHALL BE DESIGNED TO SUPPORT TRUSS TYPE LUMINAIRE ARMS WITH A FIVE FOOT (5') UPSWEEP (40 FOOT MOUNTING HEIGHT) WITH EACH ARM SUPPORTING A 70 POUND LUMINAIRE WITH 3.2 SQUARE FEET OF WIND LOAD AREA. TWO SIMPLEX TYPE FITTINGS SHALL BE PROVIDED FOR EACH LUMINIARE ARM. THE DISTANCE BETWEEN THE BOLT HOLES ON THE SIMPLEX FITTINGS SHALL BE 27 9/16". THE DIRECTIONAL ALIGNMENT OF THE LUMINAIRE ARM(S) SHALL BE AS SHOWN ON THE PLANS.

09. 8" AND 12" POLYCARBONATE TRAFFIC SIGNAL HEADS.

THIS SPECIFICATION IS INTENDED TO PROVIDE THE MINIMUM ACCEPTABLE REQUIREMENTS FOR POLYCARBONATE TRAFFIC SIGNAL HEADS.

(1) THE HOUSING SHALL BE SCREW-INJECTION MOLDED POLYCARBONATE RESIN AND SHALL BE OF SECTIONAL CONSTRUCTION TO PERMIT THE INSTALLATION OF ADDITIONAL SECTIONS FOR FUTURE NEEDS.

(2) THE DOORS SHALL BE SCREW-INJECTION MOLDED POLYCARBONATE RESIN WHICH SHALL BE HINGED AT THE LEFT SIDE AND WITH SUBSTANTIAL SCREW OR WINGNUT TYPE FASTENERS OF STAINLESS STEEL AT THE RIGHT SIDE. CAM TYPE FASTENERS WILL NOT BE PERMITTED. THE VISOR SHALL BE OF POLYCARBONATE RESIN.

(3) ALL HOUSINGS AND DOORS SHALL BE INTERCHANGEABLE.

(4) THE LENSES SHALL BE GASKETED WITH A *GASKET TO EXCLUDE* DUST AND MOISTURE. THE LENS, REFLECTOR, SOCKET AND GASKETING MUST MAKE A WATERPROOF ASSEMBLY.

(5) THE HOUSING SHALL BE YELLOW WITH SIGNAL DOORS AND VISORS A FLAT BLACK. NO PAINTING SHALL BE PERMITTED. COLOR MUST BE MOLDED COMPLETELY THROUGH THE POLYCARBONATE MATERIAL AND SHALL NOT REQUIRE PAINTING IN FUTURE YEARS.

(6) THE LENSES SHALL BE NOMINAL 8"-3/8" OR 12" DIAMETER, THE EXTERIOR OR CONVEX SURFACE SHALL BE SMOOTH. THE LENSES SHALL BE UNLETTERED RED, YELLOW, GREEN AND GREEN ARROW WHEN REQUIRED AND SHALL CONFORM TO THE SPECIFICATIONS OF THE INSTITUTE OF TRANSPORTATION ENGINEER'S ADJUSTABLE FACE VEHICULAR TRAFFIC CONTROL SIGNAL HEADS. LENSES MUST BE OF POLYCARBONATE MATERIAL.

(7) "ALZAK" ALUMINUM REFLECTORS MEETING THE SPECIFICATIONS OF THE INSTITUTE OF TRANSPORTATION ENGINEER'S ADJUSTABLE FACE VEHICULAR TRAFFIC CONTROL SIGNAL HEADS SHALL BE FURNISHED. ONLY HIGH PURITY ALUMINUM SHALL BE USED. SCRATCHES OR DULLNESS OF REFLECTORS SHALL BE CAUSE FOR REJECTION. THE REFLECTOR SHALL EITHER BE GASKETED TO THE DOOR WITHOUT ADDITIONAL SPRINGS OR OTHER TYPE FASTENERS OR IT SHALL BE HINGED FROM THE SECTION HOUSING. SPRING OR PRESSURE TYPE FASTENERS THAT REQUIRE REMOVAL PRIOR TO CHANGING A BULB ARE NOT ACCEPTABLE.

(8) THE LAMP RECEPTACLE SHALL CONFORM TO THE INSTITUTE OF TRANSPORTATION ENGINEERS (ITE) TECHNICAL REPORT NUMBER ONE AND TO THE SUPPLEMENT TO TECHNICAL REPORT NUMBER ONE.

(9) THE OPTICAL UNIT SHALL PROVIDE FOR ANTI-SUN PHANTOM.

(10) THERE SHALL BE A TERMINAL BLOCK IN EACH HEAD.

(11) ALL SIGNALS SHALL BE ADJUSTABLE TYPE.

(12) ALL GASKETS SHALL BE NEOPRENE OR RUBBER.

(13) ALL SIGNALS SHALL BE SHIPPED ASSEMBLED WITH VISORS ATTACHED. VISORS SHALL BE CUT-AWAY DESIGN FOR EIGHT-INCH (8") SIGNAL HEADS AND TUNNEL DESIGN FOR TWELVE-INCH (12") SIGNAL HEADS.

(14) THE FRONT OF EACH SIGNAL SECTION SHALL BE SQUARE IN APPEARANCE TO PROVIDE MAXIMUM TARGET VALUE".

(15) EACH SIGNAL SECTION SHALL HAVE INTERNAL REINFORCING WEBS ADJACENT TO THE MOUNTING HOLES OR ALUMINUM SUPPORT PLATES TO PROVIDE ADDITIONAL STRENGTH AND RIGIDITY. THE SUPPORT PLATES SHALL BE APPROXIMATELY THE SAME SIZE AND SHAPE AS THE SIGNAL CROSS-SECTION AND SHALL BE PROVIDED AS DESCRIBED BELOW.

~~(A) FOR MOUNTING WITH AN ELEVATOR PLUMBIZER, ONE SUPPORT PLATE SHALL BE PROVIDED INSIDE THE RED SIGNAL SECTION AT THE BOTTOM AND ONE SUPPORT PLATE SHALL BE PROVIDED INSIDE THE YELLOW SIGNAL SECTION AT THE TOP. IF CALLED OUT ON THE BID REQUEST THE PLATES MAY BE REQUIRED BETWEEN THE YELLOW AND GREEN SECTIONS INSTEAD OF BETWEEN THE RED AND YELLOW SECTIONS.~~

~~(B) FOR MOUNTING WITH A RIGID FITTING AT THE TOP, ONE SUPPORT PLATE SHALL BE PROVIDED OUTSIDE THE RED SECTION ON TOP AND ONE SUPPORT PLATE SHALL BE PROVIDED INSIDE THE RED SECTION AT THE TOP.~~

(A) FOR RIGID MOUNTING ON A PEDESTAL, ONE SUPPORT PLATE SHALL BE PROVIDED OUTSIDE THE BOTTOM SECTION AT THE BOTTOM AND ONE SUPPORT PLATE SHALL BE PROVIDED INSIDE THE BOTTOM SECTION AT THE BOTTOM.

(B) FOR SPAN WIRE MOUNTING, TWO SUPPORT PLATES SHALL BE PROVIDED OUTSIDE, ONE ON TOP OF THE TOP SECTION AND ONE ON THE BOTTOM OF THE BOTTOM SECTION. ONE SUPPORT PLATE SHALL BE PROVIDED INSIDE THE TOP SECTION AT THE TOP AND ONE SUPPORT PLATE SHALL BE PROVIDED INSIDE THE BOTTOM SECTION AT THE BOTTOM.

(16) SIGNAL END CLOSURES, SIMILAR TO EAGLE'S PINNACLE ASSEMBLY OR CROUSE HINDS' ROSSETA CAP AND LOCKNUT, SHALL BE PROVIDED AS FOLLOWS:

(A) NO END CLOSURES WILL BE REQUIRED FOR A SIGNAL HEAD MOUNTED WITH AN ASTRO-BRAC OR SUPER-BRAC ASSEMBLY.

(B) ONE END CLOSURE WILL BE REQUIRED FOR A SIGNAL HEAD MOUNTED WITH TOP-OF-POLE BRACKET.

(C) TWO END CLOSURES WILL BE REQUIRED FOR A SIGNAL HEAD MOUNTED WITH A TENNON ASSEMBLY.

TRAFFIC SIGNAL SPECIFICATIONS

SH 11 OF 13

DEPARTMENT OF PUBLIC WORKS
CITY OF WICHITA
W. D. McKINLEY, TRAFFIC ENG.
TRAFFIC ENGINEERING

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| Drawn by | | Date | Job No. 81388 |

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(17) EACH BOX SHALL BE MARKED TO INDICATE THE TYPE OF MOUNTING THE SIGNAL IS INTENDED FOR AND THE BID ITEM NUMBER.

(18) A BLANK SIGNAL SECTION SHALL CONSIST OF HOUDING, DOOR AND BOTH LENS AND DOOR GASKETS.

10. POLYCARBONATE PEDESTRIAN SIGNAL HEADS.

THESE SPECIFICATIONS ARE INTENDED TO PROVIDE THE MINIMUM ACCEPTABLE REQUIREMENTS FOR POLYCARBONATE PEDESTRIAN SIGNAL HEADS.

(1) A PEDESTRIAN SIGNAL SHALL CONSIST OF TWO IDENTICAL SECTIONS, ONE TO INDICATE "WALK" AND THE OTHER TO INDICATE "DON'T WALK" WHEN ILLUMINATED BY A SINGLE STANDARD INCANDESCENT TRAFFIC SIGNAL LAMP CONTAINED IN EACH SECTION. THE DESIGN OF THE SIGNAL SHALL BE SUCH THAT THE TWO SECTIONS CAN BE HELD FIRMLY TOGETHER IN A MANNER THAT THEY CAN BE READILY DISASSEMBLED AND REASSEMBLED FOR REPAIR AND REVISION.

(2) THE HOUSING SHALL BE SCREW INJECTION MOLDED POLYCARBONATE RESIN AND SHALL BE OF SECTIONAL CONSTRUCTION. THE TOP AND BOTTOM OF EACH SECTION SHALL HAVE SERRATIONS MOLDED IN TO FACILITATE ADJUSTMENT AND ATTACHING TO OTHER SECTIONS.

(3) THE DOORS SHALL BE SCREW INJECTED MOLDED POLYCARBONATE RESIN AND SHALL BE HINGED AT THE LEFT SIDE WITH SUBSTANTIAL SCREW TYPE FASTENERS OF STAINLESS STEEL AT THE RIGHT SIDE. CAM TYPE FASTENERS WILL NOT BE PERMITTED. THE VISOR SHALL BE OF POLYCARBONATE RESIN.

(4) ALL HOUSINGS AND DOORS SHALL BE INTERCHANGEABLE.

(5) THE HOUSINGS SHALL BE YELLOW WITH SIGNAL DOORS AND VISORS A FLAT BLACK. NO PAINTING SHALL BE PERMITTED. COLOR SHALL BE MOLDED COMPLETELY THROUGH THE POLYCARBONATE MATERIAL TO ELIMINATE ANY FUTURE PAINTING.

(6) EACH LENS SHALL BE FLAT WITH A SMOOTH OUTSIDE SURFACE. WHEN NOT ILLUMINATED, THE LETTERING ON EACH LENS SHALL BE WELL OBSCURED. THE LETTERING SHALL BE IN A STRAIGHT LINE WITH A MINIMUM HEIGHT OF 7" AND A 3/8" WIDE STROKE FOR 9" LENSES AND A 1/2" AND A 7/16" WIDE STROKE FOR 12" LENSES. LETTERING STYLE SHALL CONFORM TO INSTITUTE OF TRANSPORTATION ENGINEERS (ITE) ADJUSTABLE FACE PEDESTRIAN SIGNAL HEAD STANDARD.

(7) THE LENSES SHALL BE LETTERED "DON'T WALK" AND "WALK". "DON'T WALK" LENSES SHALL BE PORTLAND ORANGE IN COLOR AND WALK LENSES SHALL BE LUNAR WHITE IN COLOR. LENSES MUST BE OF POLYCARBONATE MATERIAL AND SHALL CONFORM TO ITE ADJUSTABLE FACE PEDESTRIAN SIGNAL HEAD STANDARD.

(8) THE LENSES SHALL BE GASKETED WITH A *GASKET TO EXCLUDE* DUST AND MOISTURE. THE LENS, REFLECTOR, SOCKET AND GASKETING MUST MAKE A WATERPROOF ASSEMBLY.

(9) ALZAK ALUMINUM REFLECTORS MEETING THE SPECIFICATIONS OF THE ITE SHALL BE FURNISHED. SCRATCHES OR DULLNESS OF THE REFLECTORS SHALL BE CAUSE FOR REJECTION.

(10) THE LAMP RECEPTACLE SHALL CONFORM TO ITE ADJUSTABLE FACE PEDESTRIAN SIGNAL HEAD STANDARD WITH THE PROPER SIZE FOCAL LENGTH BULB.

(11) EACH SECTION SHALL HAVE A VISOR (MINIMUM 8") WHICH SHALL BE SQUARE IN APPEARANCE.

(12) ALL SIGNALS SHALL BE ADJUSTABLE AND SHALL CONTAIN A TERMINAL BLOCK IN EACH HEAD.

(13) ALL GASKETS SHALL BE NEOPRENE *OR RUBBER*.

(14) ALL SIGNALS SHALL BE SHIPPED ASSEMBLED WITH VISORS ATTACHED.

(15) THE OPTICAL UNIT SHALL PROVIDE FOR ANTI-SUN PHANTOM WITH THE LENSES HAVING BLACK OPAQUE BACKGROUNDS.

(16) IF AVAILABLE, THE MANUFACTURER SHALL SUPPLY EXTRA ALUMINUM SUPPORT PLATES IN THE TOP OF THE TOP SECTION WHEN THE BID REQUEST CALLS FOR X8 BRACKETS AND IN THE BOTTOM OF THE BOTTOM SECTION WHEN THE BID REQUEST CALLS FOR A ONE-WAY POST TOP MOUNT.

11. BRACKETS AND MOUNTING ATTACHMENTS. BRACKETS, CLAMPS, ETC., SHALL BE FURNISHED IN ACCORDANCE WITH THE DETAILS ON THE PLANS AND/OR ITEMS LISTED IN THE BILL OF MATERIALS. THE CONTRACTOR SHALL BE RESPONSIBLE TO ADVISE THE SUPPLIER OF THE EXACT INTENT OF THE PLANS WITH REGARD TO PROPOSED SIGNAL MOUNTING COMBINATIONS AND THEIR CORRESPONDING SIGNAL ORIENTATIONS AND SIGNAL HEAD TYPES AS WELL AS THE REQUIREMENTS FOR OTHER APPURTENANCES SUCH AS CABINETS OR SIGNS. IN THIS MANNER, IT IS INTENDED THAT ALL FITTINGS, SPACERS, BOLTS, CLAMPS, ETC., SHALL BE FURNISHED IN SUFFICIENT QUANTITY TO EFFECT COMPLETE MOUNTING OF THE SIGNAL HEAD(S) OR OTHER APPURTENANCES WHETHER OR NOT EACH INDIVIDUAL ELEMENT IS DELINEATED OR ITEMIZED ON THE PLANS.

(1) BRACKET ASSEMBLIES SHALL CONFORM TO THE FOLLOWING PROVISIONS UNLESS OTHERWISE NOTED ON THE PLANS.

(A) CONSTRUCTION SHALL BE FROM MALLEABLE IRON.

(B) PROVISIONS SHALL BE MADE FOR ACCEPTING AND DIRECTING WIRE FEEDS COMING FROM INSIDE THE SIGNAL SUPPORT POLE.

(C) IRON BRACKETS SHALL BE SHOP PAINTED FEDERAL YELLOW.

(2) POLE MOUNTED FITTINGS SHALL BE EITHER CAST ALUMINUM OR CAST IRON.

(3) BANDING MATERIAL *SHALL BE 3/4" STAINLESS STEEL WITH STAINLESS STEEL BUCKLES OF THE SAME SIZE.*

12. RIGID GALVANIZED STEEL CONDUIT. ALL CONDUIT SHALL BE HOT DIPPED GALVANIZED RIGID STEEL CONDUIT, UL APPROVED, AND MEET FEDERAL SPECIFICATIONS WW. C-581-D AND/OR AMERICAN STANDARD #080-1.

13. LOOP DETECTORS

A. WIRE. THE LOOP WIRE SHALL BE NO. 14AWG STRANDED COPPER WITH TYPE THWN OR THHN INSULATION WITH UL APPROVAL AND 600v RATING.

B. INSTALLATION. THE FIELD LOOP CONDUCTOR INSTALLED IN THE PAVEMENT SHALL RUN CONTINUOUSLY FROM THE TERMINATING SERVICE BOX, JUNCTION BOX, OR BASE WITH NO SPLICES PERMITTED. THE FIELD LOOP CONDUCTORS SHALL BE SPLICED TO THE LEAD-IN CABLE AND THE LEAD-IN CABLE SHALL RUN CONTINUOUSLY FROM THE TERMINATING SERVICE BOX, JUNCTION BOX, OR BASE TO THE DETECTOR SENSING UNIT EXCEPT ON MULTIPLE LOOP INSTALLATIONS WHERE ADDITIONAL LOOP CONDUCTORS MAY BE SPLICED TO THE LEAD-IN CABLE AS DIRECTED BY THE ENGINEER.

ALL LENGTHS OF LOOP WIRES THAT ARE NOT INBEDDED IN THE PAVEMENT SHALL BE TWISTED WITH AT LEAST TWO (2) TURNS PER FOOT, INCLUDING LENGTHS IN CONDUITS AND HANDHOLES.

THE ELECTRICAL SPLICE BETWEEN THE LOOP LEAD-IN CABLE TO THE CONTROLLER AND THE LOOP WIRE SHALL BE MADE BY THE FOLLOWING METHOD:

(1) REMOVE ALL LEAD-IN CABLE COVERINGS AND GROUNDWIRE, LEAVING FOUR (4) INCHES OF INSULATED WIRE EXPOSED.

(2) REMOVE THE INSULATION FROM EACH CONDUCTOR OF THE LEAD-IN CABLE AND SCRAPE BOTH COPPER CONDUCTORS WITH KNIFE UNTIL BRIGHT.

(3) REMOVE APPROPRIATE LENGTH OF INSULATION FROM THE ENDS OF THE LOOP WIRES AND SCRAPE BOTH COPPER CONDUCTORS WITH KNIFE UNTIL BRIGHT.

(4) CONDUCTORS SHALL BE JOINED BY USING A #14 BUTT SPLICE. THE TWO SPLICES SHALL BE STAGGERED TO PROVIDE ADEQUATE INSULATION. EACH SPLICE SHALL BE INSULATED WITH LAYERS OF THERMOPLASTIC OR NEOPRENE INSULATION ELECTRICAL TAPE BEARING THE LABEL OF THE UNDERWRITERS LABORATORIES, INC., APPLIED TO A THICKNESS EQUAL TO AND WELL LOOPED OVER THE ORIGINAL INSULATION. THE TWO SPLICES SHALL THEN BE OVER WRAPPED WITH LAYERS OF THERMOPLASTIC OR NEOFRENE INSULATION AS ABOVE AND THEN COATED THOROUGHLY WITH A WATER PROOF ELECTRICAL COATING.

THE LOCATION OF EACH LOOP SHALL BE MARKED ON THE PAVEMENT WITH CRAYON OR SPRAY PAINT. THE CONTRACTOR SHALL OBTAIN THE APPROVAL OF THE ENGINEER PRIOR TO CUTTING THE SAW SLOTS.

THE SAW SHALL BE EQUIPPED WITH A DEPTH GAUGE AND HORIZONTAL GUIDE TO ASSURE PROPER DEPTH AND ALIGNMENT OF THE SLOT. THE BLADE USED FOR THE SAW CUT SHALL PROVIDE A CLEAN, STRAIGHT, WELL-DEFINED ONE FOURTH (1/4) INCH WIDE SAW CUT WITHOUT DAMAGE TO ADJACENT AREAS. THE DEPTH OF THE SAW CUT SHALL BE 3½ INCHES DEEP. WHERE THE LOOP CHANGES DIRECTION, THE SAW CUTS SHALL BE OVERLAPPED TO PROVIDE FULL DEPTH AT ALL CORNERS. RIGHT ANGLE OR CORNERS LESS THAN 90° SHALL NOT BE USED.

BEFORE INSTALLING THE LOOP WIRE, THE SAW CUTS SHALL BE CHECKED FOR THE PRESENCE OF JAGGED EDGES OR PROTRUSIONS. SHOULD THESE EXIST, THEY MUST BE REMOVED. THE SLOTS MUST BE CLEANED AND DRIED TO REMOVE CUTTING DUST, GRIT, OIL, MOISTURE OR OTHER CONTAMINENTS. CLEANING SHALL BE ACHIEVED BY FLUSHING CLEAN WITH A STREAM OF WATER, AND FOLLOWING THIS, THE SLOTS SHOULD BE CLEARED OF WATER AND DRIED USING OIL-FREE COMPRESSED AIR.

LOOP DETECTOR CONDUCTOR SHALL BE INSTALLED USING A ONE-EIGHTH (1/8) INCH TO THREE-SIXTEENTH (3/16) INCH THICK WOOD PADDLE. IF THE WIRE DOES NOT LAY CLOSE TO THE BOTTOM OF THE SAW CUT, IT SHALL BE HELD DOWN BY MEANS OF A MATERIAL SUCH AS TAPE OR DOUBLED-OVER PIECES OF PLASTIC.

EACH LOOP SHALL BE COILED CLOCKWISE (OR PER MANUFACTURERS RECOMMENDED PRACTICE) AND THE BEGINNING CONDUCTOR BANDED IN THE TERMINATING HANDHOLE OR BASE WITH A SYMBOL "S" TO DENOTE START OF CONDUCTOR. EACH LOOP SHALL BE FURTHER IDENTIFIED BY PHASE OR FUNCTION AS SHOWN ON THE PROJECT PLANS, WITH DURABLE TAGS, OR AS DIRECTED BY THE ENGINEER.

EACH LOOP SPLICED TO LEAD-IN CABLE, CHECKED AT CONTROL CABINET, SHALL NOT MEASURE LESS THAN *100* MEGOHMS TO GROUND.

14. STREET NAME SIGN

A. GENERAL. THIS SPECIFICATION COVERS FINISHED REFLECTORIZED STREET NAME SIGNS SPECIFICALLY DESIGNED TO INFORM A MOTORIST OF THE IDENTITY OF A STREET HE IS APPROACHING.

B. MATERIAL.

METAL BACKING - THE MATERIAL SHALL BE .125 GAUGE, ALUMINUM ALLOY 6063-T6 OR ALUMINUM ALLOY 5052-H38, 18" X 60" WITH ALL CORNERS ROUNDED.

REFLECTIVE SHEETING - FACES FABRICATED FROM REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH "STANDARD SPECIFICATIONS FOR CONSTRUCTION OF ROAD AND BRIDGES ON FEDERAL HIGHWAY PROJECTS FP-79 1979 SECTION 633.06 - SHEET REFLECTIVE MATERIALS"; TABLE V, TYPE IIIA REFERRED TO AS HIGH-INTENSITY. ALL LEGENDS AND BORDERS SHALL BE SILVER IN COLOR WHILE BACKGROUNDS SHALL BE GREEN IN COLOR.

ALL SIGNS SHALL HAVE SILVER LEGENDS AND BORDERS ON GREEN BACKGROUNDS ON ONLY ONE SIDE OF THE ALUMINUM BLANK.

LEGEND - ALL UPPER CASE LETTERS SHALL BE 8" SERIES E MODIFIED. ALL LOWER CASE LETTERS SHALL BE 8" SERIES E MODIFIED.

BORDER - ALL BORDERS SHALL BE 3/8" WIDE SILVER MATERIAL.

ALL SIGNS SHALL HAVE LEGENDS CENTERED ON FACE WITH THE LETTERS SIZED AND SPACED TO PRODUCE A READABLE, PROFESSIONAL QUALITY SIGN.

THE FINISHED SIGNS SHALL BE OF GOOD APPEARANCE, FREE FROM RAGGED EDGES, CRACKS, SCALES OR BLISTERS, AND THE LEGEND SHALL BE CLEAR-CUT.

15. VEHICLE DETECTOR LOOP WIRE SEALANT

A. THE SAW SLOT FILLER AND ENCAPSULANT SHALL BE A ONE-PART POLYURETHANE, *MOISTURE CURING*, ELASTOMERIC COMPOUND REQUIRING NO MIXING, MEASURING OR APPLICATION OF HEAT PRIOR TO OR DURING ITS INSTALLATION AND DESIGNED SPECIFICALLY FOR SEALING AND PROTECTING VEHICLE DETECTOR LOOP WIRES INSTALLED IN SAWCUTS 1/4" TO 3/8" WIDE AND 3½" *DEEP*.

B. THE ENCAPSULANT IS INTENDED TO PROVIDE COMPRESSIVE YEILD STRENGTH TO WITHSTAND NORMAL VEHICULAR TRAFFIC AS WELL AS SUFFICIENT FLEXIBILITY TO WITHSTAND NORMAL MOVEMENT IN ASPHALTIC AND CONCRETE PAVEMENTS, WHILE PROTECTING THE LOOP WIRE FROM MOISTURE PENETRATION, FRACTURE AND SHEAR.

C. THE ENCAPSULANT SHALL BE DESIGNED FOR ROADWAY INSTALLATION WHEN SURFACE TEMPERATURE IS BETWEEN 40 AND 140 DEGREES F AND ENABLE VEHICULAR TRAFFIC TO PASS OVER THE SAWCUT IMMEDIATELY AFTER INSTALLATION WITHOUT TRACKING OR STRINGING OF THE MATERIAL. THE ENCAPSULANT SHALL FORM A SURFACE SKIN ALLOWING EXPOSURE TO VEHICULAR TRAFFIC WITHIN 30 MINUTES AT 75°F AND COMPLETELY CURE TO A TOUGH, RUBBER-LIKE CONSISTENCY IN TWO (2) TO SEVEN (7) DAYS AFTER INSTALLATION.

D. CURED ENCAPSULANT SHALL EXHIBIT RESISTANCE TO EFFECTS OF WEATHER, VEHICULAR ABRASION, MOTOR OILS, GASOLINE, ANTIFREEZE SOLUTION, BRAKE FLUID, DEICING CHEMICALS AND SALT NORMALLY ENCOUNTERED, IN SUCH A MANNER THAT THE PERFORMANCE OF THE VEHICLE DETECTOR LOOP WIRE IS NOT ADVERSELY AFFECTED.

E. FILLING OF THE SAWCUT SHALL BE IN ACCORDANCE WITH THE DIRECTIONS OF THE MANUFACTURER.

16. NUTS AND BOLTS. WHEN USED IN MAST ARM ATTACHMENTS TO THE POLE OR IN ANCHORING THE POLE TO THE CONCRETE BASE, THE NUTS AND BOLTS SHALL BE RATED HIGH STRENGTH AND CONFORM TO SECTION 1513, TYPE II OF THE 1980 KDOT STANDARD SPECIFICATIONS. AN ANTI-SIEZE COMPOUND SHALL BE USED ON ALL BOLTS, SCREWS, ETC.

17. SHIELDED DETECTOR LEAD-IN ELECTRICAL CABLE THE CONDUCTOR AND DRAIN WIRES, SHALL BE TINNED COPPER WIRES. THE CONDUCTORS SHALL BE SHIELDED BY A LAYER OF ALUMINUM BONDED TO POLYESTER FILM. ALL WIRES SHALL HAVE POLYETHYLENE INSULATION AND A JACKET OF VINYL.

IN ADDITION, THE CABLE SHALL MEET THE FOLLOWING REQUIREMENTS:

| | |
|---|---|
| 18 | AWG (STRANDED) DRAIN WIRE |
| 14 | AWG (STRANDED) |
| 025 | INSULATION THICKNESS (1 INCH) |
| 030 | JACKET THICKNESS (1 INCH) |
| 270 | NOM. O.D. (1 INCH) |
| BLACK & CLEAR | CONDUCTOR COLOR CODE |
| 100 | PERCENT SHIELD COVERAGE |
| 28 | NOM * CAP (PF/FT) |
| 47 | NOM ** CAP (PF/FT) |
| 600 | SUGGESTED WORKING VOLTAGE |

*CAPACITANCE BETWEEN CONDUCTORS

**CAPACITANCE BETWEEN ONE CONDUCTOR AND THE OTHER CONDUCTOR CONNECTED TO SHIELD.

TRAFFIC SIGNAL SPECIFICATIONS

SH. 12 OF 13

DEPARTMENT OF PUBLIC WORKS
CITY OF WICHITA

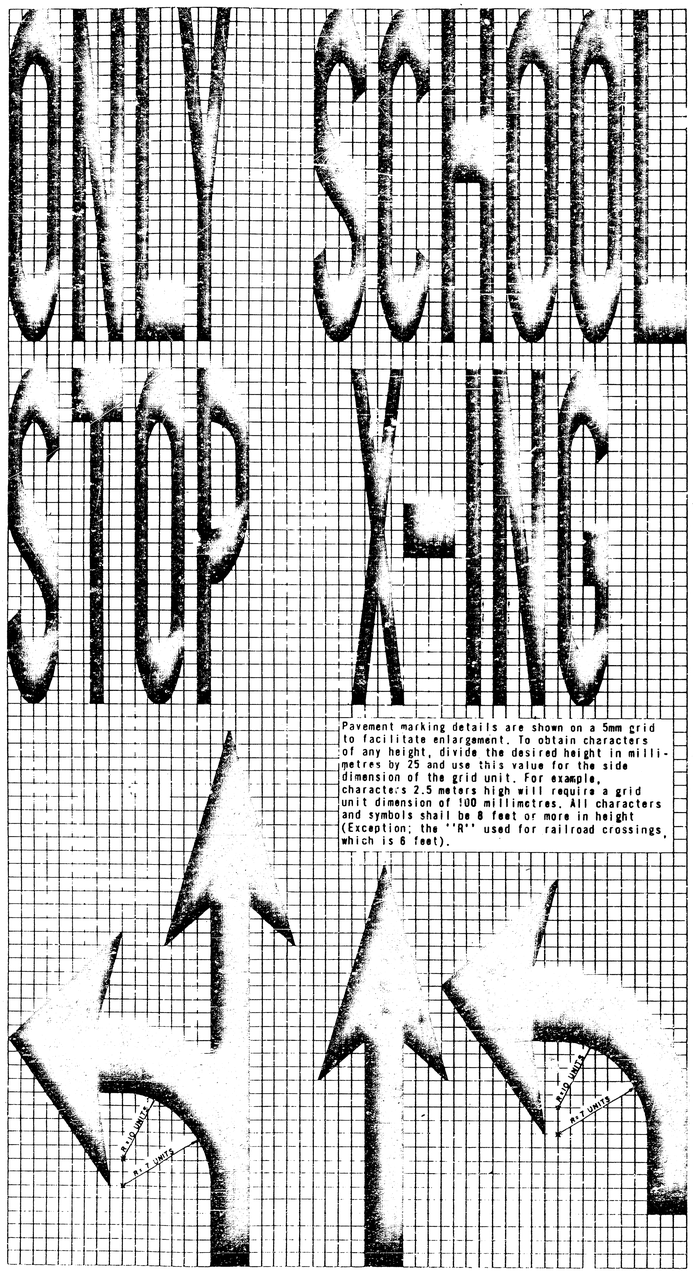
TRAFFIC ENGINEERING — JOHN D. MYERLY, TRAFFIC ENGINEER

Designed by | Checked by J.A.V. | Date | Job No. 81088

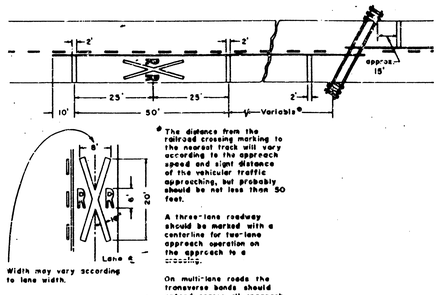
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| FHWA REGION NO. | STATE | PROJECT NO. | YEAR | SHEET NO | TOTAL SHEETS |
|---|---|---|---|---|---|
| 7 | KANSAS | #81988 | 19 | 13 | 13 |

## WORD & SYMBOL DETAILS (WHITE)




## RAILROAD CROSSING DETAIL



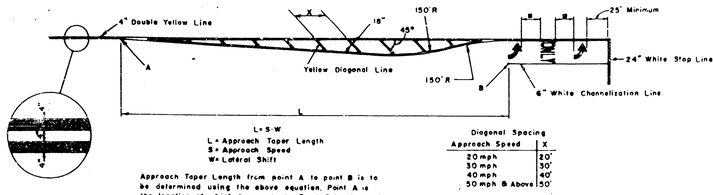

*The distance from the railroad crossing marking to the nearest track will vary according to the approach speed and sight distance of the vehicular traffic approaching, but probably should be not less than 50 feet.

A three-lane roadway should be marked with a centerline for two-lane approach operation on the approach to a crossing.

On multi-lane roads the transverse bands should extend across all approach lanes, and individual RXR symbols should be used in each approach lane.

Refer to Standard Alphabet for Highway Signs and Markings for RXR symbols details.

## TYPICAL APPROACH TAPER DETAIL




L = Approach Taper Length
S = Approach Speed
W = Lateral Shift

Approach Taper Length from point A to point B is to be determined using the above equation. Point A is the location at which taper starts. Point B is the end of full width left turn channelization.

| Diagonal Spacing | |
|---|---|
| Approach Speed | X |
| 20 mph | 20' |
| 30 mph | 30' |
| 40 mph | 40' |
| 50 mph & Above | 50' |

*Unless otherwise specified the space between lines should be at least four times the height of the characters for low speed roads but not more than ten times the height of the characters, under any conditions.

**For specific pavement marking details and dimensions see plan sheets.**

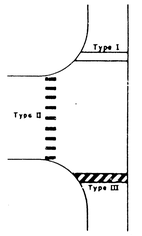
## PAVEMENT MARKINGS

| LOCATION | Solid WHITE Edge Line | Broken WHITE Lane Line | Dotted WHITE Extension | Solid WHITE Channelization | Solid WHITE Diagonal | Solid WHITE Crosswalk | Solid WHITE Stop Line | | Solid YELLOW Median | Solid YELLOW Edge Line | Solid YELLOW Double | Solid YELLOW Diagonal | Broken YELLOW | Solid YELLOW No Passing |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1+372, 11'Lt. to 36'Rt. | | | | | | | 53' | | | | | | | |
| 1+99 to 2+26, 71'Rt. | | | | | | | 27' | | | | | | | |
| 2+47, 36'Lt. to 2'Rt. | | | | | | | 58' | | | | | | | |
| 1+44, 34'Lt. to 59'Rt. | | | | | | 73' | | | | | | | | |
| 1+56, 24'Lt. to 45'Rt. | | | | | | 79' | | | | | | | | |
| 1+84 to 2+28, 52'Rt. | | | | | | 65' | | | | | | | | |
| 1+71 to 2+28, 65'Rt. | | | | | | 57' | | | | | | | | |
| 2+29, 34'Lt. to 54'Rt. | | | | | | 88' | | | | | | | | |
| 2+40, 34'Lt. to 46'Rt. | | | | | | 82' | | | | | | | | |

## WORD & SYMBOL MARKINGS

| LOCATION | | | | | | | RXR | STOP | ONLY | X-ING | SCHOOL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

## TYPICAL CROSSWALKS




Type I: Crosswalk lines shall be solid white lines. They shall not be less than 6" wide and should not be spaced less than 6' apart.

Type II: These lines should be solid white 24" wide placed parallel to the direction of traffic flow. The line placement is determined by lane line, center line, and wheel path in such a manner as to minimize traffic wear. The crosswalk width should be not less than 6'. The transverse crosswalk lines may be omitted.

Type III: These lines should be solid white 12" to 24" wide, spaced 12" to 24" apart placed at a 45° angle to the line of the crosswalk. The crosswalk width should be not less than 6'. The transverse crosswalk lines may be omitted.

## BILL OF MATERIALS

| ITEMS | TOTAL | UNITS |
|---|---|---|
| COLD PLASTIC MARKING (CL. A)(4") | | LIN. FT. |
| COLD PLASTIC MARKING (CL. A)(6") | | LIN. FT. |
| COLD PLASTIC MARKING (CL. A)(12") | 444 | LIN. FT. |
| COLD PLASTIC MARKING (CL. A)(18") | 103 | LIN. FT. |
| COLD PLASTIC MARKING (CL. A)(24") | | LIN. FT. |
| | | LIN. FT. |
| COLD PLASTIC MARKING (CL. B)(4") | | LIN. FT. |
| COLD PLASTIC MARKING (CL. B)(18") | | LIN. FT. |
| | | LIN. FT. |
| COLD PLASTIC MARKING (CL. A) | | EACH |
| | | EACH |
| COLD PLASTIC MARKING (CL. A) | | EACH |
| | | EACH |
| COLD PLASTIC MARKING (CL. A) | | EACH |
| | | EACH |
| COLD PLASTIC MARKING (CL. A) | | EACH |
| | | EACH |
| COLD PLASTIC MARKING (CL. A) | | EACH |
| | | EACH |

| NO. | DATE | REVISIONS | BY | APP'D |
|---|---|---|---|---|
| 3 | | | | |
| 2 | 7/17/80 | RR X-ing Detail | JFF | |
| 1 | 7/17/80 | Word & Symbol Details | JFF | |

KANSAS DEPARTMENT OF TRANSPORTATION

COLD PLASTIC

**PAVEMENT MARKING**

13

URBAN HIGHWAYS DEPARTMENT STD. NO. 21 7/80

| SHEET NO. OF | SCALE | APP'D Fred C. Murray | |
|---|---|---|---|
| DESIGNED | DETAILED J.F.F. | QUANTITIES | TRACED |
| DESIGN CK. | DETAIL CK. F.E.T. | QUAN. CK. | TRACE CK. |

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