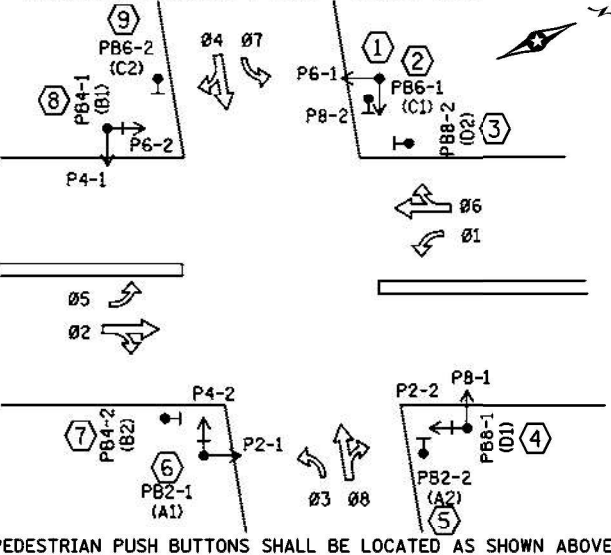


CONTROLLER PHASING, PEDESTRIAN INDICATIONS AND PUSH BUTTONS



PEDESTRIAN PUSH BUTTONS SHALL BE LOCATED AS SHOWN ABOVE

NOTES:

1. SEE SPECIAL PROVISIONS FOR COUNTY FURNISHED MATERIALS.
2. THE EXACT LOCATION OF HANDHOLES, POLES, LOOP DETECTORS, EQUIPMENT PAD, AND PEDESTRIAN CURB RAMPS SHALL BE VERIFIED IN THE FIELD BY ENGINEER.
3. NEW HANDHOLES SHALL BE PVC HANDHOLES WITH METAL FRAMES AND COVERS.
4. A 3/4" HALF COUPLING, 3/4" PIPE NIPPLE AND CONDUIT OUTLET BODY SHALL BE FURNISHED AND INSTALLED 6' FROM THE END OF EACH MAST ARM (FOR EVP).
5. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE CONNECTION OF THE POWER FOR THE TRAFFIC SIGNAL SYSTEM.
6. THE CONTRACTOR SHALL LOCATE AND VERIFY INPLACE UTILITIES PRIOR TO COMMENCING WORK.
7. FOR TYPE D SIGNS SEE DETAIL SHEET. SIGNS ON SIGNAL EQUIPMENT ARE INCLUDED IN THE COST OF THE SIGNAL SYSTEM. FOR PAVEMENT MARKINGS, SEE THE PAVEMENT MARKING PLAN.
8. EACH PEDESTRIAN INDICATION SHALL BE ONE SECTION "FILLED" COUNTDOWN TIMER HAND/WALKING PERSON INDICATION.
9. ALL VEHICLE SIGNAL INDICATIONS, AND ALL PEDESTRIAN SIGNAL INDICATIONS SHALL BE LED.
10. EACH SIGNAL FACE SHALL HAVE BACKGROUND SHIELD.
11. SEE DETAILS, SPECIAL PROVISIONS, AND STATEMENT OF ESTIMATED QUANTITIES REGARDING BATTERY BACK-UP SIGNAL SERVICE CABINET TO BE FURNISHED AND INSTALLED BY CONTRACTOR (SEPERATE FROM ITEM NO. 2565 FOR THIS SIGNAL SYSTEM).
12. LOOP DETECTOR WIRES SHALL BE CROSS-LINKED POLYETHYLENE (XLP) IN 3/4" N.M.C. SEE SPECIAL PROVISIONS.
13. ALL VEHICLE AND PEDESTRIAN SIGNAL HOUSINGS, BACKGROUND SHIELDS, AND VISORS SHALL BE FABRICATED USING BLACK POLYCARBONATE MATERIALS. SEE SPECIAL PROVISIONS.
14. THIS PLAN SPECIFIES CONDUIT SIZES, TYPES, AND GENERAL LOCATIONS. THE EXACT LOCATIONS WILL BE DETERMINED IN THE FIELD.
15. * DENOTES ITEMS TO BE FURNISHED & INSTALLED BY CONTRACTOR UNDER ITEM NO. 2565 (EMERGENCY VEHICLE PREEMPTION SYSTEM). SEE ESTIMATED QUANTITIES AND SPECIAL PROVISIONS.
16. ** DENOTES ITEMS TO BE FURNISHED OR SALVAEGD AND INSTALLED BY CONTRACTOR UNDER ITEM NO. 2565 (TRAFFIC CONTROL INTERCONNECT). SEE ESTIMATED QUANTITIES AND SPECIAL PROVISIONS.

MATCHLINE CSAH 78 NB
STA. 271+20.00 SEE SHEET 184

LED SIGNAL FACES
ALL SIGNAL INDICATIONS SHALL BE 12"

SIGNAL FACE	R	Y	FYA	G
1-1, 1-2	←	←	←	←
2-1, 2-2, 2-3	●	●	●	●
3-1, 3-2	←	←	←	←
4-1, 4-2	●	●	●	●
5-1, 5-2	←	←	←	←
6-1, 6-2, 6-3	●	●	●	●
7-1, 7-2	←	←	←	←
8-1, 8-2	●	●	●	●

SIGNAL SYSTEM OPERATION

- THE SIGNAL SYSTEM FLASH MODE IS ALL RED.
- NORMAL OPERATION IS 8 PHASE, WITH PHASE(S) 1, 3, 5 AND 7 BEING FLASHING YELLOW ARROWS BY TIME OF DAY.
- PHASES 2 AND 6 SHALL BE ON VEHICLE RECALL.

3" CONDUIT
2-12/C#14
2-4/C#14
* 1-3/C#14
1-3/C#14 (LUM)
* 1-3/C#20
2-2/C#14
1-1/C#6

3" CONDUIT
2-12/C#14
1-6/C#14
2-4/C#14
* 1-3/C#14
1-3/C#14 (LUM)
* 1-3/C#20
11-2/C#14
1-1/C#6

2-4" CONDUIT
4-12/C#14
1-6/C#14
4-4/C#14
* 2-3/C#14
2-3/C#14 (LUM)
* 2-3/C#20
9-2/C#14
1-1/C#6

4" CONDUIT
2-12/C#14
2-4/C#14
* 1-3/C#14
1-3/C#14 (LUM)
* 1-3/C#20
7-2/C#14
1-1/C#6

2-4" CONDUIT
4-12/C#14
1-6/C#14
4-4/C#14
* 2-3/C#14
2-3/C#14 (LUM)
* 2-3/C#20
1-1/C#6

2-4" CONDUIT
4-12/C#14
1-6/C#14
4-4/C#14
* 2-3/C#14
2-3/C#14 (LUM)
* 2-3/C#20
1-1/C#6

2-4" CONDUIT
4-12/C#14
1-6/C#14
4-4/C#14
* 2-3/C#14
2-3/C#14 (LUM)
* 2-3/C#20
1-1/C#6

2-4" CONDUIT
4-12/C#14
1-6/C#14
4-4/C#14
* 2-3/C#14
2-3/C#14 (LUM)
* 2-3/C#20
1-1/C#6

2-4" CONDUIT
4-12/C#14
1-6/C#14
4-4/C#14
* 2-3/C#14
2-3/C#14 (LUM)
* 2-3/C#20
1-1/C#6

2-4" CONDUIT
4-12/C#14
1-6/C#14
4-4/C#14
* 2-3/C#14
2-3/C#14 (LUM)
* 2-3/C#20
1-1/C#6

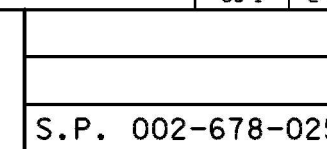
2-4" CONDUIT
4-12/C#14
1-6/C#14
4-4/C#14
* 2-3/C#14
2-3/C#14 (LUM)
* 2-3/C#20
1-1/C#6

N.M.C. LOOP DETECTORS			
NUMBER	SIZE (FT)	LOCATION	FUNCTION
D1-1	2-6x6	20 & 50	1
D1-2	2-6x6	5 & 35	1
D2-1	6x6	300	1
D2-2	6x6	300	1
D3-1	2-6x6	20 & 50	1
D3-2	2-6x6	5 & 35	1
D4-1	6x6	120	1
D4-2	2-6x6	5 & -5	7
D4-3	2-6x6	5 & 20	1
D5-1	2-6x6	20 & 50	1
D5-2	2-6x6	5 & 35	1
D6-1	6x6	300	1
D6-2	6x6	300	1
D7-1	2-6x6	20 & 50	1
D7-2	2-6x6	5 & 35	1
D8-1	6x6	250	1
D8-2	2-6x6	5 & -5	7
D8-3	2-6x6	5 & 20	1

NOTE: LOCATION-DISTANCE FROM STOP BAR TO FRONT OF LOOP DETECTOR.
LOOP DETECTOR FUNCTIONS:
1) CALL AND EXTEND
7) DELAY CALL - IMMEDIATE EXTEND

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.
NAME: ANDREW J. HENGEL LIC. NO. 52256
CERTIFIED BY: [Signature] 11/22/2019 DATE
LICENSED PROFESSIONAL ENGINEER

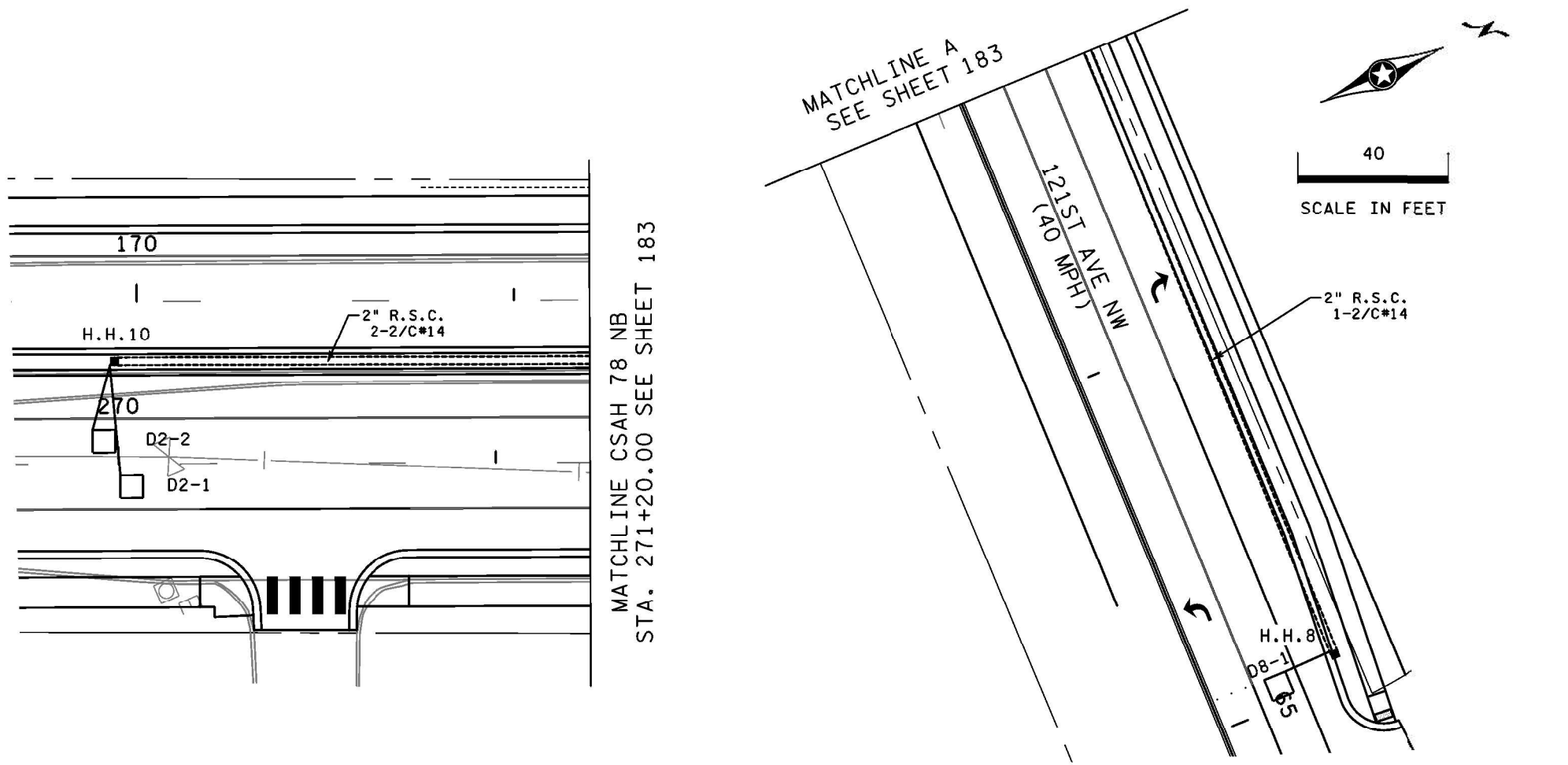
DRAWN BY: SY
DESIGNED BY: AJH
CHECKED BY: KAS



SYSTEM "A" INTERSECTION LAYOUT
SHEET NO. 183 OF 230 SHEETS
S.P. 002-678-025 (CSAH 78), S.P. 114-020-053

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CSAH 78 - Sheet 183 of 230

NO	DATE	BY	CKD	APPR	REVISION



- (A) INSTALL - CONTROLLER AND CABINET (FURNISHED BY COUNTY)
- F & I EQUIPMENT PAD FOUNDATION BBU SIGNAL SERVICE CABINET
- BETWEEN CONTROLLER CABINET AND SERVICE CABINET:
METERED SIGNAL SERVICE
2" CONDUIT
3-1/C#6
- CONTROLLER CABINET TO H.H.2:
4" CONDUIT 4" CONDUIT
2-12/C#14 2-12/C#14
1-6/C#14 2-4/C#14
2-4/C#14 * 1-3/C#14
* 1-3/C#14 * 1-3/C#20
* 1-3/C#20 2-2/C#14
11-2/C#14
1-1/C#6 (GRD)
- CONTROLLER CABINET TO H.H.3:
4" CONDUIT 4" CONDUIT
2-12/C#14 2-12/C#14
2-4/C#14 1-6/C#14
* 1-3/C#14 2-4/C#14
* 1-3/C#20 * 1-3/C#14
6-2/C#14 * 1-3/C#20
1-1/C#6 (GRD) 7-2/C#14
- CONTROLLER CABINET TO I/C H.H.105
**1 1/2" CONDUIT
**S&I 2-24 SM FIBER OPTIC CABLES
- F & I STUB OUT 3" CONDUIT FROM CONTROLLER CABINET (THREAD AND CAP - FOR FUTURE USE)
STUB OUT 1" CONDUIT FROM CONTROLLER CABINET (FOR FUTURE PHONE LINE BY OTHERS)
CONTROLLER CABINET TO SERVICE CABINET:
2" CONDUIT
3-1/C#6
CONTROLLER CABINET TO SERVICE CABINET (COMMS):
2" CONDUIT
1-4/C#14
SERVICE CABINET TO H.H.15:
2" CONDUIT
3-1/C#2
H.H.15 TO H.H.14:
2" CONDUIT
3-1/C#2
H.H.14 TO GROUND MOUNTED TRANSFORMER:
2" CONDUIT
3-1/C#2
- SERVICE CABINET TO H.H.2:
2" CONDUIT
2-3/C#14 (LUM)
SERVICE CABINET TO H.H.3:
2" CONDUIT
2-3/C#14 (LUM)
- (B) INPLACE S.O.P.-GROUND MOUNTED TRANSFORMER (CONNEXUS)
EXTEND INTO H.H.13 (BY CONNEXUS):
2" CONDUIT
3-1/C#2

INTERSECTION NOTES

- (1) INSTALL (FURNISHED BY COUNTY) * TYPE PA85-A-25-D30-9 (DAVIT AT 350 DEG)
1-ONE WAY EVP DETECTOR AND LED CONFIRMATORY LIGHT (PHA 1-1/C#6 (GRD) SES 3+8)
- F & I PA85 POLE FOUNDATION LUMINAIRE-LED
1-ANGLE MOUNT SIGNAL-OVERHEAD AT 0'
1-STRAIGHT MOUNT SIGNALS OVERHEAD AT 11.5'
2-ANGLE MOUNT SIGNALS AT 90 AND 180 DEG
2-ANGLE MOUNT C. D. PED HEADS-POLE MOUNTED AT 90 AND 180 DEG
1-R10-X12 SIGN ADJACENT TO HEAD (3-1)
1-TYPE D SIGN (D-1) (SEE SIGN DETAILS)
* ONE WAY EVP MOUNTING HARDWARE (FOR COUNTY FURNISHED DETECTOR AND CONFIRMATORY LIGHT)
EXTEND INTO H.H.1:
3" CONDUIT
2-12/C#14
2-4/C#14
* 1-3/C#14
1-3/C#14 (LUM)
* 1-3/C#20
- (2) F & I PEDESTRIAN PUSH BUTTON STATION (SEE DETAILS)
1-PEDESTRIAN PUSH BUTTON & SIGN (R10-3e) (LT ARROW)
EXTEND INTO H.H.2:
1" CONDUIT
1-2/C#14
- (3) F & I PEDESTRIAN PUSH BUTTON STATION (SEE DETAILS)
1-PEDESTRIAN PUSH BUTTON & SIGN (R10-3e) (RT ARROW)
EXTEND INTO H.H.2:
1" CONDUIT
1-2/C#14
- (4) INSTALL (FURNISHED BY COUNTY) * TYPE PA100-A-55-D30-9 (DAVIT AT 350 DEG)
1-ONE WAY EVP DETECTOR AND CONFIRMATORY LIGHT (PHASES 2+5)
- F & I PA100 POLE FOUNDATION LUMINAIRE-LED
1-ANGLE MOUNT SIGNAL OVERHEAD AT 0'
2-STRAIGHT MOUNT SIGNAL OVERHEAD AT 12.5' AND 24.5'
2-ANGLE MOUNT SIGNALS AT 90 AND 180 DEG
2-ANGLE MOUNT C. D. PED HEADS AT 90 AND 180 DEG
1-PEDESTRIAN PUSH BUTTON & SIGN (R10-3e) (LT ARROW)
1-R10-X12 SIGN ADJACENT TO HEAD (5-1)
1-TYPE D SIGN (D-2) (SEE SIGN DETAILS)
* ONE WAY EVP MOUNTING HARDWARE (FOR COUNTY FURNISHED DETECTOR AND CONFIRMATORY LIGHT)
EXTEND INTO H.H.6:
3" CONDUIT
2-12/C#14
1-6/C#14
2-4/C#14
* 1-3/C#14
1-3/C#14 (LUM)
* 1-3/C#20
1-2/C#14
1-1/C#6 (GRD)
- (5) F & I PEDESTRIAN PUSH BUTTON STATION (SEE DETAILS)
1-PEDESTRIAN PUSH BUTTON & SIGN (R10-3e) (RT ARROW)
EXTEND INTO H.H.6:
1" CONDUIT
1-2/C#14
- (6) INSTALL (FURNISHED BY COUNTY) * TYPE PA90-A-35-D30-9 (DAVIT AT 350 DEG)
1-ONE WAY EVP DETECTOR AND CONFIRMATORY LIGHT (PHASES 4+7)
- F & I PA90 POLE FOUNDATION LUMINAIRE-LED
1-ANGLE MOUNT SIGNAL OVERHEAD AT 0'
1-STRAIGHT MOUNT SIGNAL OVERHEAD AT 11'
2-ANGLE MOUNT SIGNALS AT 90 AND 180 DEG
2-ANGLE MOUNT C. D. PED HEADS AT 90 AND 180 DEG
1-PEDESTRIAN PUSH BUTTON & SIGN (R10-3e) (LT ARROW)
1-R10-X12 SIGN ADJACENT TO HEAD (7-1)
1-TYPE D SIGN (D-1) (SEE SIGN DETAILS)
* ONE WAY EVP MOUNTING HARDWARE (FOR COUNTY FURNISHED DETECTOR AND CONFIRMATORY LIGHT)
EXTEND INTO H.H.9:
3" CONDUIT
2-12/C#14
2-4/C#14
* 1-3/C#14
1-3/C#14 (LUM)
* 1-3/C#20
1-2/C#14
1-1/C#6 (GRD)
- (7) F & I PEDESTRIAN PUSH BUTTON STATION (SEE DETAILS)
1-PEDESTRIAN PUSH BUTTON & SIGN (R10-3e) (RT ARROW)
EXTEND INTO H.H.9:
1" CONDUIT
1-2/C#14
- (8) INSTALL (FURNISHED BY COUNTY) * TYPE PA100-A-50-D30-9 (DAVIT AT 350 DEG)
1-ONE WAY EVP DETECTOR AND CONFIRMATORY LIGHT (PHASES 1+6)
- F & I PA100 POLE FOUNDATION LUMINAIRE-LED
1-ANGLE MOUNT SIGNAL OVERHEAD AT 0'
2-STRAIGHT MOUNT SIGNALS OVERHEAD AT 12.5' AND 24.5'
2-ANGLE MOUNT SIGNALS AT 90 AND 180 DEG
2-ANGLE MOUNT C. D. PED HEADS AT 90 AND 180 DEG
1-PEDESTRIAN PUSH BUTTON & SIGN (R10-3e) (LT ARROW)
1-R10-X12 SIGN ADJACENT TO HEAD (1-1)
1-TYPE D SIGN (D-2) (SEE SIGN DETAILS)
* ONE WAY EVP MOUNTING HARDWARE (FOR COUNTY FURNISHED DETECTOR AND CONFIRMATORY LIGHT)
EXTEND INTO H.H.12:
3" CONDUIT
2-12/C#14
1-6/C#14
2-4/C#14
* 1-3/C#14
1-3/C#14 (LUM)
* 1-3/C#20
1-2/C#14
1-1/C#6 (GRD)
- (9) F & I PEDESTRIAN PUSH BUTTON STATION (SEE DETAILS)
1-PEDESTRIAN PUSH BUTTON & SIGN (R10-3e) (RT ARROW)
EXTEND INTO H.H.13:
1" CONDUIT
1-2/C#14

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NO	DATE	BY	CKD	APPR	REVISION

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

NAME: ANDREW J. HENGEL LIC. NO. 52256

CERTIFIED BY: [Signature] 11/22/2019 DATE

LICENSED PROFESSIONAL ENGINEER

DRAWN BY: SY

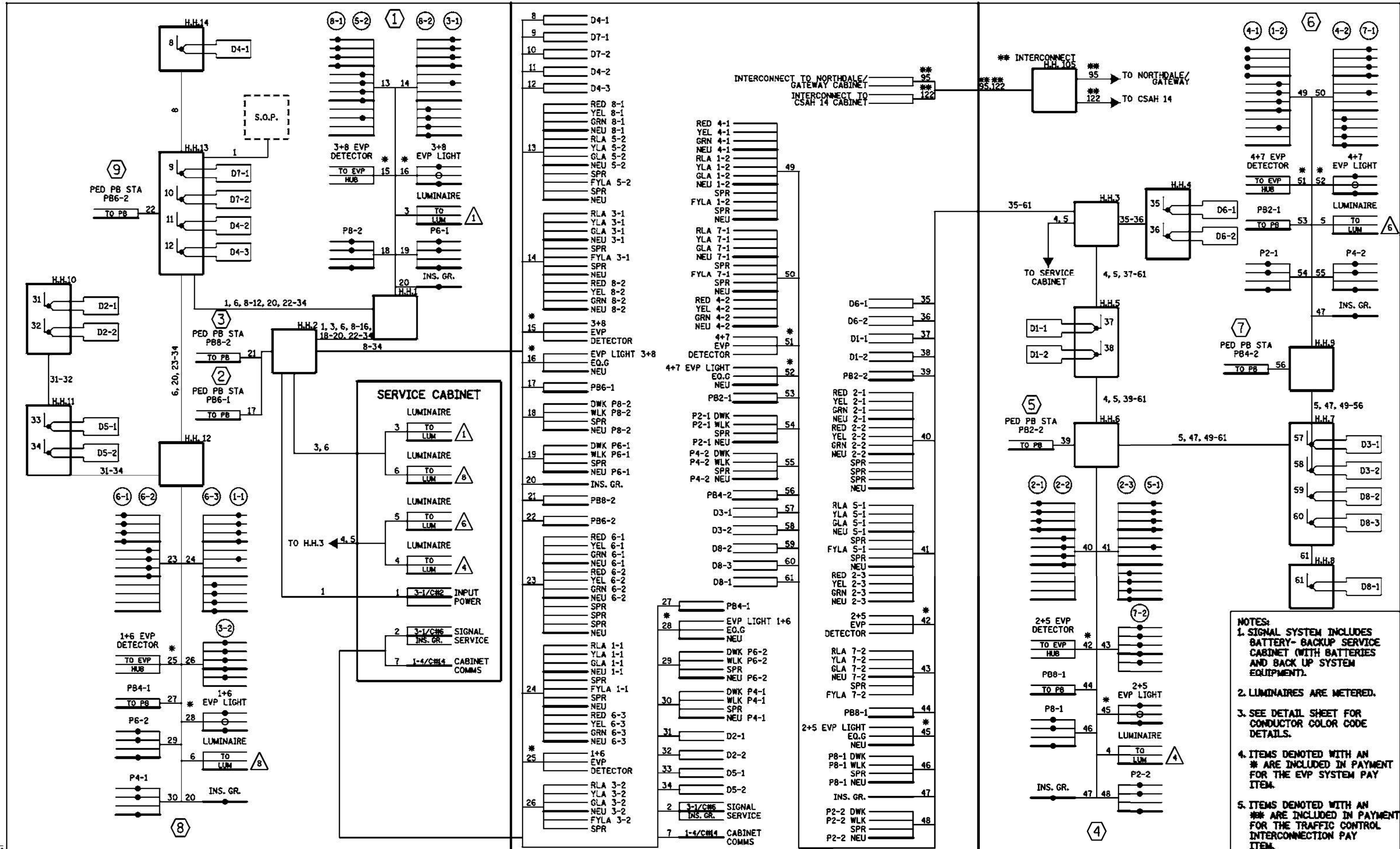
DESIGNED BY: AJH

CHECKED BY: KAS

SYSTEM "A" MATCHLINES AND POLE NOTES

SHEET NO. 184 OF 230 SHEETS

S.P. 002-678-025 (CSAH 78), S.P. 114-020-053



- NOTES:**
1. SIGNAL SYSTEM INCLUDES BATTERY-BACKUP SERVICE CABINET (WITH BATTERIES AND BACK UP SYSTEM EQUIPMENT).
 2. LUMINAIRES ARE METERED.
 3. SEE DETAIL SHEET FOR CONDUCTOR COLOR CODE DETAILS.
 4. ITEMS DENOTED WITH AN * ARE INCLUDED IN PAYMENT FOR THE EVP SYSTEM PAY ITEM.
 5. ITEMS DENOTED WITH AN ** ARE INCLUDED IN PAYMENT FOR THE TRAFFIC CONTROL INTERCONNECTION PAY ITEM.

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

NAME: ANDREW J. HENGEL LIC. NO. 52256

CERTIFIED BY: [Signature] 11/22/2019 DATE

LICENSED PROFESSIONAL ENGINEER

DRAWN BY: SY
 DESIGNED BY: AJH
 CHECKED BY: KAS

SYSTEM "A" WIRING DIAGRAM
 SHEET NO. 185 OF 230 SHEETS
 S.P. 002-678-025 (CSAH 78), S.P. 114-020-053

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