Review of Interconnected Highway-Rail Grade Crossing

DOT# 012203N

Main St

Norman, OK

BNSF Railway

LS 7400 MP 401.77, Red Rock Subdivision

Prepared by Benesch for

BNSF Railway

January 8, 2024

benesch

Review of Interconnected
Highway-Rail Grade Crossing

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Main Street
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Prepared by:

I hereby certify that this 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 Oklahoma. This report represents an electronic version of the original hard copy report, sealed, signed, and dated by Nicole L. Jackson, PE, PTOE. The content of the electronically transmitted report can be confirmed by referring to the original hard copy that will be kept on file with Benesch.

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Nicole L. Jackson, PE, PTOE
Oklahoma License No. 27442

TABLE OF CONTENTS

CONTENTS

1 INTRODUCTION

1.1 Project Information

Benesch conducted a review of the highway-rail grade crossing (DOT# 012203N) on the BNSF Railway (Railroad), Line Segment 7400, Red Rock Subdivision, located near the intersection of Main Street and James Garner Avenue in Norman, OK. The review incorporates an analysis of the design documents provided by the City of Norman (Agency), Kimley Horn (Agency Consultant), Oklahoma Department of Transportation (ODOT), and the Railroad.

Note: This highway-rail grade crossing is located downstream from an intersection controlled by a traffic signal. As a result, no queuing exists but the preemption would be used to prohibit turns towards the highway-rail grade crossing from the intersection through the use of turn restriction blank-out signs during a preemption event.

FIGURE 1 - MAIN ST @ JAMES GARNER AVE, DOT# 012203N

The Agency requested simultaneous preemption[1] for this highway-rail grade crossing. This report expands on the proposed preemption requirements and provides recommendations to improve the preemption operations in accordance with the referenced material, MUTCD, and industry best practices.

Benesch and the Railroad recognize that the decision to incorporate any recommendations made within this report is determined by the highway agency or authority with jurisdiction and the regulatory agency with statutory authority (where applicable) in accordance with requirements set forth in the 2009 MUTCD, Revision 2, Section 8A.01. The actions of the Railroad are limited.

1.2 References

The following documents were submitted by the Agency, Agency Consultant, ODOT, and Railroad to assist in the review:

- Traffic Signal Preemption Request Form dated August 18, 2023
- James Garner Ave Street Improvements and attached in Appendix E

Appendix A contains additional documents, reference material, and manuals on recommended practices which were utilized to further evaluate the interconnection design and operation of the highway-rail grade crossing.

2 PARTIES OF INTEREST

The main contact information for each entity during the preemption review process is outlined below:

TABLE 1 - CONTACT INFORMATION

Agency:	Paul D'Andrea, PE Capital Projects Engineer	City of Norman 201 W. Gray Street, Bldg. A Norman, OK 73069	405-366-5319 paul.dandrea@normanok.gov
ODOT:	Ryan Leonard Freight Mobility Manager	ODOT 200 NE 21st Street Oklahoma City, OK 73105	405-965-9722 rleonard@odot.org
Agency Consultant:	Luke Schmidt, PE, PTOE Project Manager	Kimley-Horn 4727 Gaillardia Parkway Suite 250 Oklahoma City, OK 73142	405-241-5447 luke.schmidt@kimley-horn.com
Railroad:	Tim Huya Manager Public Projects II	BNSF Railway 4200 Deen Road Fort Worth, TX 76106	817-352-2902 tim.huya@bnsf.com

[1] **Simultaneous Preemption** – Notification of an approaching train is forwarded to the highway traffic signal controller unit assembly and railroad active warning devices at the same time (AREMA Part 3.1.10, D. 15).

3 RAILROAD PREEMPTION DESIGN ELEMENTS

The Agency must take into account a number of design elements when providing preemption control[2] by interconnecting the railroad active warning system with the traffic signal equipment. The grade crossing circuit design, roadway layout, and traffic signal design all provide information on the existing and any proposed characteristics for the grade crossing and adjacent intersection. The following sections outline the railroad and traffic characteristics that were identified during the review.

3.1 Railroad Characteristics

- The Railroad operates on one main line track through the grade crossing.
- Flashing-light signals with automatic gates are provided at the grade crossing.
- Overhead flashing-light signals are provided for the eastbound multiple lane approach on Main Street.

3.2 Traffic Characteristics

- The roadway consists of three, one-way lanes over the tracks traveling away from the intersection with James Garner Avenue.
- The proposed traffic signal controller is Econolite Cobalt.
- The proposed traffic signal controller firmware is EOS 3.2.23.
- The minimum track clearance distance[3] (MTCD) is 24 feet.
- There is no right-of-way transfer time[4] (RWTT) since the preemption is only being used to illuminate turn restriction blank-out signs.

4 REQUESTED RAILROAD PREEMPTION TIME

The Agency requests 20 seconds of simultaneous preemption.

Note: This highway-rail grade crossing is located downstream from an intersection controlled by a traffic signal. As a result, no queuing exists but the preemption would be used to prohibit turns towards the highway-rail grade crossing from the intersection through the use of no turn blank-out signs during a preemption event.

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[2] **Preemption Control** – A special sequence of signal phases and timing to expedite and/or provide additional clearance time for vehicles to clear the tracks prior to the arrival of rail traffic (MUTCD, Chapter 4D, Section 4D.03).
[3] **Minimum Track Clearance Distance** – For standard two-quadrant warning devices, the minimum track clearance distance is the length along a highway at one or more railroad or light rail transit tracks, measured from the highway stop line, warning device, or 12 feet perpendicular to the track center line, to 6 feet beyond the furthest track(s) measured perpendicular to the far rail, along the center line or edge line of the highway, as appropriate, to obtain the longest distance (MUTCD, Chapter 1A, Section 1A.13).
[4] **Right-of-Way Transfer Time** – The maximum amount of time needed for the worst-case condition, prior to the display of the track clearance green interval. This includes any railroad or light rail transit or highway traffic signal control equipment time to react to the preemption call, and any traffic control signal green, pedestrian walk and clearance, yellow change, and red clearance intervals for conflicting traffic (MUTCD, Chapter 1A, Section 1A.13).

5 RECOMMENDATIONS

The following recommendations have been proposed to improve the railroad preemption operations and overall safety of the grade crossing in accordance with any applicable federal, state, or local regulations/guidelines and industry best or recommended practices. The MUTCD provides that the Agency has sole responsibility in determining the operational design and any time required for railroad preemption operations at an interconnected grade crossing. The Agency should carefully review each recommendation, as numerous solutions may exist for any problem identified.

Note: As Industry Standards, equipment and/or site conditions change, comments and/or recommendations may be revised. Such changes may require reconvening of the Diagnostic Team.

2009 MUTCD, Revision 2, Chapter 8C, Section 8C.09, Paragraph 6:

"The highway agency or authority with jurisdiction and the regulatory agency with statutory authority, if applicable, should jointly determine the preemption operation and the timing of traffic control signals interconnected with highway-rail grade crossings adjacent to signalized highway intersections."

5.1 Design Recommendations

In addition to the recommendations listed below, Appendix D (Resolution Summary) and Appendix E (Plan Sets) should be carefully reviewed for items listed as "Comment Remains". Any recommendations made throughout this report and the appendices should be addressed prior to the construction agreement with the Railroad.

- **The Agency has requested the following interconnection circuits[A] on the attached Traffic Signal Preemption Request Form (ITE). The Agency shall ensure the circuitry involving both the traffic signal and railroad are fully operational at the time of implementation:**
  - **Simultaneous Preemption Circuit**
- **The Agency has specified, on the attached Traffic Signal Preemption Request Form, an interconnection cable adequate for the requested interconnection circuits and configuration (ITE).** The Agency is responsible for providing and maintaining the interconnection cable, pull boxes, and conduit needed for the requested preemption operations from the traffic signal equipment to the Railroad equipment house. All equipment must be installed prior to the Railroad construction phase. *For safety purposes, it is required that the voltage provided for the interconnection circuits by the Agency not exceed 28 volts DC.*
- **Consider installation of a grade crossing advance pavement marking symbol for the southbound left turn lane on James Garner Avenue in accordance with the distances outlined in the MUTCD (MUTCD).**
- **Consider installation of a warning label for the traffic signal cabinet to notify personnel that the traffic signal is interconnected with the grade crossing warning system (US DOT TWG).**

- **Develop and follow a preemption operation and maintenance program[B].** The railroad preemption system should be tested on an annual basis. The Federal Railroad Administration (FRA) Safety Advisory 2010-02, details recommendations for annual joint testing of interconnected Railroad and Traffic Signal Systems. 2009 MUTCD, Revision 2, 4D.02 also provides operation and maintenance guidance. The Railroad will work with the Agency to ensure that the interconnected traffic signal continues to operate as designed and requests that any future changes are discussed and jointly approved in a collaborative manner.

  The Agency should develop a special preemption operation program in the event of operational failure of traffic signals or other events that may affect the operation of the interconnected highway by causing extended queues across the tracks. The events that could require use of this plan are emergency or planned construction and special events. The plan should include notifying the railroad and proceeding forward with a traffic management plan to mitigate the possible traffic queues across the tracks.

5.2 Implementation Recommendations

The Agency and Railroad should perform thorough joint testing upon implementation of the preemption timing and operation to confirm that the traffic signal controller hardware and firmware is operating according to the design. Some of the testing that should be conducted are outlined below.

- **Thoroughly test all interconnection circuits to ensure the circuitry involving both the traffic signal and railroad are fully operational at the time of implementation.** Testing should be conducted to evaluate communications between the traffic signal and railroad circuitry and ensure the requested circuits operate as designed.

6 CONCLUSION

Benesch is providing this report as recommendations for improvements to the traffic signal and railroad operations at this grade crossing location in regard to railroad preemption. Further discussion and collaboration should take place between the Agency and Railroad in order to address the concerns discussed in this report. Future changes in design outside the scope of this report or upgrades after implementation of the recommendations put forth in this report will require further collaborative work and review by the Agency and Railroad.

The Railroad respectfully requests that the Agency continue to consult and partner with them in this process. The Railroad requests that the Agency provide the traffic signal timing and wiring information with the construction schedule at least two months prior to the traffic signal controller bench testing (if required) and four months prior to the proposed cutover with the Railroad.

APPENDIX A – REFERENCES

- *23 C.F.R. 646, Subpart B, Railroad-Highway Projects.* Code of Federal Regulations (C.F.R.)
- *49 C.F.R. 392.10, Railroad Grade crossings; Stopping Required.* Code of Federal Regulations (C.F.R.)
- *17 U.S.C., Copyright.* United States Code (U.S.C.)
- *23 U.S.C. 407, Discovery and admission as evidence of certain reports and surveys.* United States Code (U.S.C.)
- AREMA (2022). *Manual for Communications and Signals, Volume 1, Section 3 (C&S Manual)*. Landover, MD: American Railway Engineering and Maintenance-of-Way Association (AREMA).
- BNSF (June 29, 2018). *BNSF Railway Public Projects Manual.* BNSF Railway (BNSF).
- FHWA (2019). *Highway-Rail Crossing Handbook – 3rd Edition*. Federal Highway Administration (FHWA).
- FHWA (May 2012). *2009 Manual on Uniform Traffic Control Devices* (MUTCD) - *Revision 2*. Federal Highway Administration (FHWA).
- FRA (July 25, 2012). *Technical Bulletin S-12-01, Guidance Regarding the Appropriate Processes for the Inspection of Highway-Rail Grade Crossing Warning System Pre-emption Interconnections with Highway Traffic Signals*. Federal Railroad Administration (FRA).
- FRA (October 1, 2010). *Federal Register Volume 75, Issue 190 - Safety Advisory 2010-02, Signal Recording Devices for Highway-Rail Grade Crossing Active Warning Systems that are Interconnected with Highway Traffic Signal Systems*. Federal Railroad Administration (FRA).
- ITE (April 2021). *Preemption of Traffic Signals Near Railroad Grade Crossings – A Recommended Practice of the Institute of Transportation Engineers.* Washington, DC. Institute of Transportation Engineers (ITE).
- NTSB (2003). *Collision Between Metrolink Train 210 and Ford Crew Cab, Stake Bed Truck at Highway-Rail Grade Crossing in Burbank, California, on January 6, 2003, Highway Accident Report NTSB/HAR-03/04*. Washington, DC: National Transportation Safety Board (NTSB).
- ODOT (February 6, 2023). *MUTCD Codes and Standard Highway Signs (www. https://oklahoma.gov/odot/about/contact-us/geospatial-data-management/gis-management/maps-and-data/mutcdcodesandstandardsigns.html).* Oklahoma Department of Transportation (ODOT).
- ODOT (October 27, 2022). *2009 Oklahoma Traffic Engineering Standards and Specifications – Revised.* Oklahoma Department of Transportation (ODOT).
- ODOT (2009). *Oklahoma Supplement to the 2009 Manual on Uniform Control Devices*. Oklahoma Department of Transportation (ODOT).
- TRB (2003). *National Cooperative Highway Research Program (NCHRP), Report 493, Evaluation of Traffic Signal Displays for Protected/Permissive Left-Turn Control.* Transportation Research Board (TRB).
- USDOT–TWG (June 1, 1997). *Implementation Report of the USDOT Grade Crossing Safety Task Force*. Department of Transportation – Technical Work Group (DOT-TWG).

APPENDIX B – END NOTES

[A] **Interconnection Circuits:**

The interconnection is the means by which information is shared between a grade crossing warning system and a traffic control device. While the most frequent use of an interconnection is for preemption of a traffic signal controller, other uses involve train activated advance warning beacons, illumination of blank-out signs, remote notification of a crossing occupied by a train or activation of a wayside horn.
Interconnection circuits are most commonly found as a combination of various individual control functions necessary to implement the desired preemption operation. They typically use one or more conductors in a cable to deliver the required function. However, some agencies utilize safety-critical data circuits to provide the interconnection. In some cases, these data circuits contain the vehicle and pedestrian signal status as a part of the message. This type of circuit is more commonly found where advanced monitoring or automated testing of the preemption operation is desired.

Excluding the data circuits, discrete interconnection circuits require a source of power from the traffic signal controller to operate. The power for the interconnection circuits must meet the following criteria:

- ***Applied energy must not exceed 28 VDC.*** *While many interconnection circuits have historically used 120 VAC, this presents a potential safety hazard to maintenance personnel in the railroad warning system enclosure.*
- *Applied energy should be from an isolated (non-grounded) source.*

The use of a simple 120 VAC to 28 VDC transformer or a DC power supply that incorporates a step-down transformer will satisfy the first two bullet points listed above.

The following is a listing of the most commonly encountered interconnection circuits in use. Because each grade crossing has preemption needs based on site-specific conditions, not all the circuits are used at every location. It is also possible that based on a specific need, an interconnection circuit other than those identified here may be implemented. Regardless, every circuit should be evaluated for necessity and where a special circuit is implemented, a hazard analysis should be performed to assess the failure modes and effects.
In reviewing the advance preemption circuits, three circuit types are identified, APP, AVP and AP. The actual usage is typically AP alone or AVP and APP together. Generally, the time provided by the grade crossing warning system where an AP circuit is used equals the sum of the time where an APP and AVP circuit are used. In many cases, where the preemption operation necessitates that additional time be provided for pedestrian change interval, separating the APP from AVP provides a means to maintain the AVP preemption time under the AREMA 50 second time limit for SDT – ERT.

[B] **Preemption Operation and Maintenance Program:**

To conform with the FRA Safety Advisory 2010-02, the Agency and the Railroad should establish a joint program to annually perform an operational test of the preemption system.

At a minimum the program should:

1. Ensure that no changes have been made to the traffic signal, grade crossing, active warning system, or roadway that would alter operations of the highway grade crossing system or traffic signal from the approved and agreed upon design.
2. Review any recorder logs (where available) to ensue correct operation.
3. Perform a test of the of the system when undergoing the maximum right-of-way transfer time.
4. Representatives from both the traffic agency and railroad should be accounted for at the joint inspection and test.

During traffic signal failure, the Agency should establish a plan of interim procedures until system issues can be addressed:

1. If the traffic signal is dark due to power loss/manual operation or in a flashing mode, notify the Railroad and provide flagger and/or law enforcement to monitor the grade crossing and ensure that highway users safely travel over the tracks.
2. The Agency should inform the Railroad when the traffic signal has been returned to normal operation.

Contact the Railroad when any changes are made to the traffic signal, roadway geometry, or preemption system. (See 2009 MUTCD, Section 8A.02 Paragraph 6)

The Railroad must be notified by the Agency if a joint test will be conducted on the railroad preemption system. If traffic density changes occur downstream of the crossing due to a lane closure or a high traffic volume event which could cause queueing onto the crossing, the railroad should be contacted, and the Agency should provide flagging or a temporary traffic control plan. (See 2009 MUTCD, Section 8A.08 for additional Information.)

APPENDIX C – DIAGNOSTIC NOTES

DOCUMENTS NOT PROVIDED

APPENDIX D – RESOLUTION SUMMARY

Grade Crossing Comment Resolution Summary DOT# 012203N, Main Street, Norman, OK				
No.	**Benesch Recommendations**	**Standard/ Reference**	**Agency Response**	**Benesch Response**
James Garner Ave Street Improvements - dated 8/22/2022				
1.	Include railroad interconnection run and cabling details. Identify the proposed interconnection circuits and interface method to be used. Note: voltage provided to interconnection circuits shall not exceed 28 VDC. Indicate voltage on plans.	BNSF Design Standard	Notes and wiring diagram added to plans.	Complete
2.	Consider adding backup power supply	MUTCD	Battery backup added to plans.	Complete
3.	Restrict right turns toward the grade crossing during preemption per MUTCD (options include turn restriction blank-out sign or traffic signal head and signage with exclusive right turn arrow indications).	MUTCD	Added turn restriction blank-out signs.	Complete
4.	Add a sheet showing preemption phasing diagram (no track clearance but dwelling in phases 4, 8, and blank-out sign).	Industry Best Practice	Preemption phasing diagram added to plans.	Complete
5.	Agency is responsible for all conduit, pull boxes and interconnection cable. Show conduit and cable run from traffic signal cabinet to Railroad house. Preemption cabling should be one continuous pull. BNSF requests interconnect cabling be coiled in a pull box nearest the final run to the railroad house with adequate cabling to make the final pull. Contact BNSF for right of entry requirements. If boring under the track is necessary, coordinate with BNSF.	Industry Best Practice BNSF Standard	Added note to plans.	Complete

APPENDIX E – PLAN SETS

SUMMARY OF PAY QUANTITIES

(TRAFFIC - 0300)

ODOT	SPEC	DESCRIPTION		UNIT	SIGNAL	ITS	PROJECT TOTAL
506(A)	7200	STRUCTURAL STEEL		LB	2625		2625
516(A)	8215	DRILLED SHAFTS 30" DIAMETER		LF	6		6
516(A)	8225	DRILLED SHAFTS 42" DIAMETER		LF	2		2
516(A)	8230	DRILLED SHAFTS 48" DIAMETER		LF	1		1
616(P)	4112	2" HDPE PIPE (BORED)	(SP-2)	LF	200	290	490
616(P)	4120	3" HDPE PIPE (BORED)		LF	40		40
616(P)	4132	4" HDPE PIPE (BORED)	(6)	LF	260		260
648	6400	ELECTRIC SERVICE	(TL-35)	EA	1		1
802(B)	2324	2" PVC SCH 40 TRENCHED		LF	470		470
803(A)	1220	PULL BOX (SIZE II)	(1,12)	EA	7		7
804(A)	2200	STRUCTURAL CONCRETE		CY	18.7		18.7
806(A)	4240	32'MH POLE,25'TS & 10'LMA(G.STL)	(2)	EA	1		1
806(A)	4248	32'MH POLE,35'TS & 10'LMA(G.STL)	(2)	EA	1		1
806(A)	4256	32'MH POLE,45'TS & 10'LMA(G.STL)	(2)	EA	1		1
806(B)	4408	10' MTG.HT.TS.PED.POLE(G.STL)	(2,4)	EA	6		6
809(A)	7200	ROADWAY LUMINAIRE	(5)	EA	3		3
811	9105	1/C NO.4 ELECTRICAL CONDUCTOR		LF	515		515
811	9130	1/C NO.10 ELECTRICAL CONDUCTOR		LF	450		450
818(A)	8710	(SP)FIBER OPTIC CABLE, 12 SMF	(ITS-2,6,7,12,15,22)(SP-1,3)	LF		745	745
818(B)	8740	(SP)FIBER OPTIC PATCH PANEL, 12 PORT	(ITS-2,6,7,12,15,22)(SP-1,3)	EA		1	1
818(C)	8735	(SP)FIBER OPTIC CABLE SPLICE	(ITS-2,6,7,12,15,22)(SP-1,3)	EA		8	8
818(D)	8740	(SP)FIBER OPTIC CABLE TERMINATION	(ITS-2,6,7,12,15,22)(SP-1,3)	EA		24	24
818(F)	8370	(SP) SHIELD ISOLATION PEDESTAL	(ITS-2,6,7,12,15,22)(SP-1,3)	EA		1	1
819	8780	(PL) FIBER OPTIC & COMMUNICATION EQUIPMENT	(ITS-2,6,7,12,15,22)(SP-1,3)	LSUM		1	1
824(C)	7400	(SP) CABINET	(7,8,9,10)	EA	1		1
825	8100	TRAFFIC SIGNAL CONTROLLER ASSEMBLY	(7,8,9,10)	EA	1		1
828	2100	(PL) DETECTION SYSTEM (VIDEO)		LSUM	1		1
830	2100	PEDESTRIAN PUSH BUTTON		EA	6		6
831	3116	1WAY 2SEC ADJ.PED.SIG.HD.S-20		EA	6		6
831	3120	1WAY 3SEC ADJ.SIG.HD.S-6		EA	6		6
831	3144	1WAY 4SEC ADJ.SIG.HD.S-13		EA	1		1
831	3156	1WAY 5SEC ADJ.SIG.HD.S-16		EA	1		1
833	5100	BACKPLATE		EA	8		8
834(A)	6200	3/C TRAFFIC SIGNAL ELECTRICAL CABLE		LF	36		36
834(A)	6205	5/C TRAFFIC SIGNAL ELECTRICAL CABLE		LF	350		350
834(A)	6210	7/C TRAFFIC SIGNAL ELECTRICAL CABLE		LF	140		140
834(A)	6235	21/C TRAFFIC SIGNAL ELECTRICAL CABLE		LF	320		320
840(D)	0510	E.P.S. 4 CHANNEL PHASE SELECTOR		EA	1		1
850(C)	1400	MAST ARM MOUNTED SIGNS(ALUM.)		SF	99		99
SPECIAL		LED BLANK-OUT SIGN	(11)	EA	1		1

SUMMARY OF PAY QUANTITIES

(CONSTRUCTION - 0940)

ODOT	SPEC	DESCRIPTION		UNIT	SIGNAL	ITS	PROJECT TOTAL
220	1100	SWPPP DOCUMENTATION AND MANAGEMENT		LSUM	1		1
221(B)	2300	TEMPORARY SILT FENCE		LF	500		500
641	2110	MOBILIZATION		LSUM	1		1
642(A)	3200	CONSTRUCTION STAKING LEVEL I		LSUM	1		1
880(J)	7100	CONSTRUCTION TRAFFIC CONTROL	(TC-25)	LSUM	1		1

TRAFFIC SIGNAL GENERAL CONSTRUCTION NOTES:

THE STRUCTURAL DESIGN OF ALL POLES, MAST ARMS, HIGH-MAST POLES, AND OTHER SUPPORTS FOR SIGNS, LUMINAIRES, AND SIGNALS, AS WELL AS THEIR CONNECTIONS, SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS. THE MANUFACTURER SHALL ENSURE THE FOLLOWING ARE APPLIED TO THE DESIGN:

THE MINIMUM DESIGN WIND SPEED AND DESIGN LIFE AS REQUIRED IN THE AASHTO SPECIFICATIONS:

THE CALCULATED STRESSES AND FORCES FROM THE DESIGN LOADINGS DO NOT EXCEED THOSE REQUIRED IN THE AASHTO SPECIFICATIONS:

A CATEGORY I FATIGUE IMPORTANCE FACTOR (IF) FOR ALL STRUCTURES: NO VIBRATORY MITIGATION SHALL BE ALLOWED. TRUCK-INDUCED GUSTS SHALL BE APPLIED TO ALL OVERHEAD TRAFFIC SIGNAL SUPPORTS.

ALL MEMBERS ARE AT LEAST THE MINIMUM THICKNESS AS REQUIRED IN THE AASHTO SPECIFICATIONS:

LUMINAIRE MAST ARMS SHALL BE DESIGNED TO SUPPORT AT LEAST A 50 LB. (22.7 KG) LUMINAIRE WITH AN EFFECTIVE PROJECTED AREA OF 2.5 FT2 (0.23 M2); THE ANCHOR BOLT DESIGN AND AMOUNT OF ANCHOR BOLTS TO BE USED SHALL BE AS REQUIRED IN THE AASHTO SPECIFICATIONS.

SIGNAL MAST ARMS AND POLES SHALL BE DESIGNED FOR SPECIFIC SIGNAL HEAD AND SIGN PLACEMENT.

UNLESS SITE SPECIFIC GEOTECHNICAL DATA IS AVAILABLE, FOUNDATIONS SHALL BE DESIGNED UTILIZING THESE PARAMETERS: SHEAR STRENGTH OF COHESIVE SOIL (C) OF 500 PSF. ANGLE OF INTERNAL FRICTION (*) OF 22 DEGREES. AND EFFECTIVE UNIT WEIGHT OF SOIL (*) OF 120 PCF.

MINIMUM HAND HOLE SIZE OF 3 INCH WIDTH BY 5 INCH HEIGHT.

SYMBOLS AND LEGENDS ARE DIAGRAMMATIC ONLY AND LOCATIONS SHALL BE ADJUSTED FOR EXISTING FIELD CONDITIONS. BUT NO MAJOR ALTERATIONS OR RELOCATIONS WILL BE MADE WITHOUT FIRST CONSULTING WITH THE CITY.

THIS PROJECT SHALL BE CONSTRUCTED WITHOUT CLOSING THE EXISTING ROAD TO LOCAL AND THROUGH TRAFFIC. SEE STANDARD SPECIFICATIONS FOR THE MAINTENANCE OF LOCAL AND THROUGH TRAFFIC.

ALL BROKEN CONCRETE, WASTE MATERIAL, AND DEBRIS SHALL BECOME THE PROPERTY OF THE CONTRACTOR, AND SHALL BE REMOVED FROM THE LIMITS OF THE PROJECT AND DISPOSED OF IN AN AREA APPROVED BY THE ENGINEER. NO PAYMENT WILL BE MADE FOR THE DISPOSAL OF THIS MATERIAL.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE HE MAY INFLICT TO THE EXISTING UNDERGROUND UTILITIES WITHIN THE PROJECT AREA AS A RESULT OF HIS DIGGING, TRENCHING, BORING, ETC. PRIOR TO DIGGING NEAR THE UTILITIES, THE CONTRACTOR SHALL CALL FOR A LIST OF ALL UNDERGROUND FACILITIES REGISTERED IN THE AREA OF CONSTRUCTION LISTED WITH THE FOLLOWING AGENCIES:
THE "OKIE" NOTIFICATION CENTER 811 OR (405) 522-6543 OR WWW.CALLOKIE.COM OR THE LOCAL COUNTY CLERK'S OFFICE.

TRAFFIC SIGNAL PAY QUANTITY NOTES

(ITS-2) THE INSTALLATION OF THE FIBER OPTIC CABLES, SPLICES, AND TERMINATIONS SHALL BE THE RESPONSIBILITY OF THE FIBER CONTRACTOR FOR THIS PORTION OF THE PROJECT. THE FIBER CONTRACTOR SHALL BE REQUIRED TO MEET ALL SPECIFICATIONS OF THE "FIBER OPTIC CABLE, TERMINATIONS, AND SPLICING REQUIREMENTS". NO WORK ON ANY PORTION OF THE FIBER OPTIC SYSTEM SHALL BE PERFORMED BY ANYONE OTHER THAN THE FIBER CONTRACTOR.

(ITS-6) THE FIBER OPTIC CABLE SHALL BE PULLED WITH MULE TAPE, BY NEPCO, INC., OR AN APPROVED EQUAL. NO GREATER THAN A 500 POUND PULL STRENGTH.

(ITS-7) THE INSTALLED FIBER OPTIC CABLE SHALL BE OTDR TESTED AND SHALL MEET INDUSTRY STANDARDS. LIGHT LOSS AS TESTED SHALL BE NO GREATER THAN .10 DB FOR THE ENTIRE FIBER RUN.

(ITS-12) SPLICING WILL BE DONE BY THE FUSION WELD METHOD AND THE WELDING PROCESS SHALL BE SPECIFICALLY DESIGNED FOR THE SPLICING SINGLE-MODE FIBERS IN BOTH THE LVD AND DVD DESIGN. OPTIC LOSS PER SPLICE SHALL BE EQUAL TO OR LESS THAN .10 DB. OPTICAL LOSS FOR PIGTAIL SPLICES IN THE FIBER TERMINATION BOW SHALL BE LESS THAN OR EQUAL TO .8 DB.

(ITS-15) THE CONTRACTOR SHALL PROVIDE "AS-BUILT" DOCUMENTATION FOR ALL FIBER OPTIC CABLE ROUTES (TO/FROM), INDIVIDUAL FIBERS, TERMINATIONS, SPLICES, FINAL DESTINATIONS, AND OTDR READINGS.

(ITS-22) THE COST BID FOR THIS ITEM SHALL INCLUDE THE COST OF SHIELD ISOLATION PEDESTAL (RELIABLE SIP40), THE W-FLANGE POST, 2.5 LBS. FT., TWO FIBER OPTIC SIGNS, TAGGING AND IDENTIFYING OF EACH FIBER OPTIC CABLE AND THE #6 AWG GROUND WIRE RUN BETWEEN THE SHIELD ISOLATION PEDESTAL AND THE SPLICE POINT REGARDLESS OF ITS LOCATION IN A SPLICE BOX, A GROUND BOX, A 332 CABINET, A COMMUNICATION HUT, ETC. COST TO INCLUDE ALL APPURTENANCES AND MATERIAL NECESSARY TO CONNECT ALL SPLICES TO THE SHIELD ISOLATION PEDESTAL. (PEDESTAL STAKE MARCONI MS1342; GROUND ROD ERICO 6138529).

(SP-1) THIS PROJECT INVOLVES THE INSTALLATION OF FIBER OPTIC CABLE TO INTERCONNECT THE TRAFFIC SIGNAL TO THE EXISTING SYSTEM ALONG MAIN ST.
A. PULL BOXES, SPLICES POINTS, FIBER LOCATING
1. ALL FIBER OPTIC GROUND BOXES SHALL BE GB36 (ODOT TYPICAL BG-36 GROUND BOX) POLYMER CONCRETE. ALL SPLICE POINT LOCATIONS SHALL BE IN R48 (ODOT TYPICAL R-48 GROUND BOX) POLYMER CONCRETE GROUND BOXES. THE 100-FOOT MAINTENANCE LOOP IN EACH R48 GROUND BOX SHALL BE COILED USING A FIGURE 8 METHOD TO PREVENT DAMAGE TO THE FIBERS AND SECURED TO THE SIDES OF THE GROUND BOX.
2. PAY ITEM IS FOR ONE (1), 12 STRAND ARMORED PIG TAILS TO BE INSTALLED ON THIS PROJECT TO RUN FROM THE SIGNAL CONTROLLER CABINET TO THE NEARBY R48. FIBER BOX LIDS SHALL READ 'CITY OF NORMAN FIBER'.
3. ALL FIBER OPTIC CABLE NEEDS TO BE ARMORED FIBER OPTIC CABLING. INSTALLATION DEPTH SHOULD BE BETWEEN 36" AND 48". IF INSTALLATION IS CONSTRAINED SUCH THAT THESE DEPTHS ARE NOT ACHIEVABLE. NO LESS THAN 24" DEPTH SHALL BE ALLOWED. COMMSCOPE TERRASPEED OR CORNING ODOT STANDARD WILL BE ACCEPTABLE. THE CITY REQUIRES NO. 14 GAUGE, STRANDED COPPER CABLE BE USED TO COMPLETE GROUNDING AND UTILITY LOCATE CAPABILITIES FROM THE CONTROLLER CABINET TO THE DISTANCE OF THE FIBER RUN. SHIELD ISOLATION PEDESTALS MUST BE USED TO PROVIDE EASE OF UTILITY LOCATING. CITY OF NORMAN FIBER OPTIC SIGNAGE (PAID FOR WITH PAY ITEM "818(G)5570(PL) FIBER OPTIC ROUTE SIGN AND INSTALLATION") PLACED ALONG THE PATH, AS WELL. THE CITY OF NORMAN CAN PROVIDE INFORMATION TO DEFINE THE SHIELD ISOLATION PEDESTALS, SIGNAGE, GROUND BOXES, ETC.
4. TWELVE (12) SPLICES REQUIRED. THE COLOR OF BUFFER TUBE TO BE USED FOR THE PROJECT WILL BE PROVIDED BY THE CITY OF NORMAN I.T. DEPARTMENT AS THE PROJECT PROGRESSES.

B. SPLICE ENCLOSURES
SPLICE ENCLOSURES SHALL BE FULL COYOTE SPLICE ENCLOSURES, OR APPROVED EQUAL.

C. SPLICING RESPONSIBILITY
1. SPLICING WILL BE REQUIRE INTO DESIGNATED PAIRS OF EXISTING FIBER. DIAGRAMS WILL BE PROVIDED WHEN NECESSARY TO THE SELECTED CONTRACTOR TO DEFINE THIS.
2. SPLICES WILL BE REQUIRED TO BE DONE IN THE GROUND BOXES NEAR NEAR THE SIGNAL CONTROLLED CABINET. THE TERMINATION POINTS WILL BE IN THE CONTROLLER CABINETS.

D. PATCH PANEL
1. PAY ITEM IS FOR THE INSTALLATION OF ONE (1) CORNING 12 PORT WALL-MOUNTABLE PATCH PANEL. ALL 12 FIBERS SHALL TERMINATE AT THE CONTROLLER USING SC CONNECTORS.
2. ALSO INCLUDED IN THE PRICE BID FOR THIS PANEL SHALL BE THE COST OF ONE 91) CISCO IE-2000-8TC-G-B SWITCH WITH LAN BASE IMAGE AND SD-1E-1GB SD MEMORY CARD. THIS SWITCH WILL BE BOUGHT FROM AN AUTHORIZED CISCO DISTRIBUTOR IN THE CITY OF NORMAN'S NAME. THE CISCO SWITCH WILL INCLUDE ONE YEAR OF SMARTNET SERVICES CON-SNT-1E2K8TCG (SNTC-8X5XNBD IE 8 10/1000, 2 TSFP) WITH EACH SMARTNET REGISTERED IN THE NAME OF CITY OF NORMAN.

(SP-2) THE 2-INCH HIGH DENSITY PE PIPE USED ON THIS PROJECT SHALL BE SDR 11.

(SP-3) FIBER SHOULD BE COMMSCOPE, LIGHTSCOPE, OUTSIDE PLANT, DOUBLE JACKET, SINGLE ARMORED, SINGLE MODE 144 STRAND AND 12 STRAND FIBER, OR APPROVED EQUAL.

(TL-35) SEE SERVICE POLE SCHEDULE; FOR ADDITIONAL INFORMATION CONCERNING THE SERVICE POLE, CONTACT THE FOLLOWING PRIOR TO INSTALLATION:
PERSON'S NAME....................DAVID RIESLAND.
WITH THE CITY OF...............................NORMAN.
CITY'S TELEPHONE NO...........405-217-7762.

(TC-25) CONSTRUCTION TRAFFIC CONTROL WILL BE INSTALLED IN A MANNER APPROVED BY THE ENGINEER, IN ACCORDANCE WITH CHAPTER VI OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, CURRENT EDITION, AND APPLICABLE O.D.O.T. STANDARD DRAWINGS. PRICE BID FOR THIS ITEM SHALL BE PAYMENT IN FULL FOR THE INSTALLATION, MAINTENANCE AND SUBSEQUENT REMOVAL OF ALL NECESSARY CONSTRUCTION TRAFFIC CONTROL DEVICES AND PAVEMENT MARKINGS REQUIRED FOR COMPLETION OF THE PROJECT.

(1) POLYMER CONCRETE PULL BOXES AND CONCRETE APRON SHALL BE USED.

(2) ALL SIGNAL POLE AND MAST ARM ASSEMBLIES SHALL CONFORM TO ODOT MINIMUM STANDARDS, INCLUDING WIND AND ICE LOADING. SIGNAL POLE, MAST ARM AND LUMINAIRE ARM ASSEMBLIES SHALL BE PELCO PART NUMBER PB-5384-P59 (BASE) AND SP-3136-OK-P59 (TOPPER), THAT INCLUDE THE ORNAMENTAL POLE TOPS, ORNAMENTAL POLE BASES AND ANCHOR BOLTS. ALUMINUM POLE TOPS AND POLE BASES SHALL BE POWDER COATED TEXTURED BLACK (P59) OVER HOT DIP GALVANIZE. ALL SIGNAL POLES THAT HAVE LUMINAIRES SHALL HAVE A 4"X6" REINFORCED HAND HOLE WITH GALVANIZED AND POWDER COATED P59 COVER AT THE MAST ARM. ALL SIGNAL POLES SHALL HAVE ITC ACCESS COMPARTMENT ASSEMBLY WITH TERMINAL STRIP BARRIER TYPE TERMINAL BLOCKS IN ACCORDANCE WITH PELCO PART NUMBER AP-1083, WITH PELCO COVER AP-1087-P59.

(3) THE HAND HOLES AT THE BASE OF THE POLES SHALL BE PLACED AT 135 DEGREES CLOCKWISE FROM THE MAST ARMS IN ORDER TO AVOID CONFLICTS WITH THE PEDESTRIAN PUSH BUTTONS AND SIGNS BEING INSTALLED ON THIS PROJECT. PELCO PART NO. AP-1074-PNC SHALL BE INSTALLED ON THIS PROJECT AND SHALL INCLUDE TERMINAL BLOCK ASSEMBLY WITH TERMINAL STRIP BARRIER TYPE.

(4) THE PEDESTRIAN POLES TO BE SUPPLIED ON THIS PROJECT SHALL BE A 10" DIAMETER POLES AND SHALL ALSO MATCH THE DECORATIVE DESIGN OF THE SIGNAL POLES DESCRIBED IN NOTE 2.

(5) THE LUMINAIRE FIXTURES TO BE INSTALLED ON THIS PROJECT SHALL BE PELCO PART NO. SP-3089-OK-10-P54. IN ORDER TO BE CONSIDERED AN EQUAL FIXTURE THE PROPOSED FIXTURE WILL NEED TO MEET THE FOLLOWING REQUIREMENTS.

VOLTAGE	= 120
CONTROLLED BY	= PHOTO CELL
LAMP TYPE	= LED
LAMP COLOR (NOMINAL)	= 4-4000K
VERTICAL DISTRIBUTION	= MEDIUM
LATERAL DISTRIBUTION	= TYPE 3
DISTRIBUTION CONTROL	= CUTOFF
STYLE	= CUTOFF DESIGN

LUMINAIRE FIXTURE TO BE HOLOPHANE MEMPHIS TEARDROP PART NO. MPL3-P30S-40K-MVOLT-TG3-QSM-BK-PR7E-WLDF-QSM-BK-PR7E-PCLL

(6) THIS PAY ITEM IS TO BRING POWER TO THE CONTROLLER CABINET FROM THE SERVICE POLE. THIS PAY ITEM SHALL BE THE COST OF TWO 1-CONDUCTOR NO. 4 WIRES FROM THE POWER POLE TO THE BREAKER BOX.

(7) THE CONTROLLER TO BE FURNISHED ON THIS PROJECT SHALL BE VEHICLE ACTUATED SOLID STATE DIGITAL CONTROLLER WITH VOLUME DENSITY FEATURES (ECONOLITE COBALT WITH EOS PLATFORM). THE CONTRACTOR SHALL FURNISH THE CONTROLLER AND MOUNTING FRAMES AS FOLLOWS:

INTERSECTION	TYPE	CONFLICT & USER FLASH
MAIN ST & JAMES GARNER AVE	8P	ALL RED

THE CONTROLLER WITH 2P-4P CAPABILITY SHALL BE FURNISHED WITH 8 LOAD RECEPTACLE BAYS. CONTROLLER WITH 5P-8P CAPABILITY SHALL BE FURNISHED WITH 16 LOAD SWITCH RECEPTACLE BAYS. ALL CORRESPONDING RECEPTACLE WIRING IN THE CABINET AND FIELD WIRING SHALL BE INSTALLED FOR THE CONTROLLER AS REQUIRED EXCEPT FOR ADDITIONAL DETECTOR CONNECTING CABLES WHEN THE CONTROLLER IS EXPANDED. THE CONTROLLER SHALL BE CAPABLE OF PERFORMING AS SHOWN ON PHASE & SEQUENCE DIAGRAMS. PEDESTRIAN ISOLATION SHALL BE PROVIDED IN THE CONTROLLER CABINET. ALL N.E.M.A. FUNCTIONS SHALL TERMINATE IN THE CONTROLLER CABINET. MMU SHALL BE EDI MMU2-16LEIP SMART MONITOR.

CABINET SHALL HAVE A 120V RECEPTACLE INSTALLED INSIDE OF THE CABINET IN ADDITION TO OR IN LIEU OF A RECEPTACLE INSTALLED ON THE DOOR. ALSO, ALL CABINETS SHALL HAVE A PULL-OUT COMPUTER SHELF AND DRAWER INSTALLED FOR LAPTOP USE AT THE CONTROLLER CABINET. CABINET TO BE POWDER COATED BLACK.

(8) CONTROLLER UNIT, CONFLICT MONITOR, AND VIDEO DETECTION SYSTEM SHALL EACH BE EQUIPPED WITH 10/100-TX ETHERNET COMMUNICATION PORT. CONTROLLER CABINET SYSTEM SHALL INCLUDE A CISCO IE-2000-8TC-G-B SWITCH WITH LAN BASE IMAGE AND SD-1E-1GB SD MEMORY CARD AND (2) 1000-FX SINGLE MODE FIBER OPTIC PORTS. FIBER OPTIC PORTS SHALL HAVE TYPE "SC" CONNECTORS. ETHERNET SWITCH SHALL BE SUPPLIED WITH (2) DUPLEX SINGLE MODE JUMPERS, WITH "SC MALE" CONNECTORS ON ONE END, AND "ST MALE" CONNECTORS ON THE OTHER END. EACH DEVICE SHALL COME WITH A 6 FOOT CAT 5 CABLE.

(9) ALSO INCLUDED IN THE PRICE BID FOR THIS PAY ITEM SHALL BE THE INSTALLATION OF AN UNINTERRUPTIBLE POWER SUPPLY FOR TRAFFIC APPLICATIONS. THIS UNIT SHALL MEET THE FOLLOW SPECIFICATIONS:

GENERAL DESCRIPTION:
THE EQUIPMENT FURNISHED UNDER THIS SPECIFICATION SHALL BE THE LATEST PRODUCTION MODELS CONFORMING TO THE LATEST STANDARD SPECIFICATIONS OF THE OKLAHOMA DEPARTMENT OF TRANSPORTATION AND THE CITY OF NORMAN.

THE EQUIPMENT TO BE SPECIFIED IS A TESCO CLASS 22-46 BATTERY BACKUP UNIT, OR AN APPROVED EQUAL. THE BELOW LISTED SPECIFICATIONS ARE THE DESIRED MINIMUM. BIDDER'S EQUIPMENT SHOULD EQUAL OR EXCEED THESE SPECIFICATIONS. DEVIATIONS MAY BE ACCEPTED ONLY AS APPROVED BY CITY TRAFFIC ENGINEER.

(10) FOR RAILROAD PREEMPTION, THE CONTROLLER CABINET SHALL INCLUDE AN ECONOLITE RAILROAD GATE DOWN PANEL. MANUFACTURER REPRESENTATIVE SHALL PROVIDE ASSISTANCE TO THE CONTRACTOR FOR THE INSTALLATION, PROGRAMMING AND TESTING TO VERIFY PROPER OPERATION.

(11) CONTRACTOR SHALL PROVIDE A R3-1 LED RIGHT TURN BLANK OUT SIGN TO MEET CITY STANDARDS. THIS SHOULD BE A SIGNAL-TECH PRODUCT NO. 57401 OR APPROVED EQUAL.

(12) GROUND BOX QUANTITY INCLUDES ONE GROUND BOX THAT IS 17"X30"X12".

1-0 GENERAL
THE EQUIPMENT SHALL CONFORM TO THE REQUIREMENTS OF THE NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA). ANY EQUIPMENT MANUFACTURER SHALL SUPPLY CERTIFICATION SHOWING THAT THE PARTICULAR MODEL OF EQUIPMENT INTENDED TO BE FURNISHED HAS BEEN TESTED AND APPROVED BY A QUALIFIED INDEPENDENT TESTING LABORATORY PER REQUIREMENTS SPECIFIED IN THE NEMA STANDARD. A "QUALIFIED" INDEPENDENT TESTING LABORATORY IS DEFINED AS A LABORATORY WHICH CLEARLY SHOWS THAT IT IS CAPABLE OF PERFORMING THE TEST IN ACCORDANCE WITH THE NEMA. THE MANUFACTURER SHALL SUPPLY QUALIFICATION STATEMENTS AND/OR OTHER DOCUMENTATION THAT INDICATES THE LABORATORY IS PROFESSIONALLY RECOGNIZED, REPUTABLE IN NATURE, AND EQUIPPED WITH OR HAS ACCESS TO ALL NECESSARY TESTING APPARATUS TO SUPPLY A CERTIFIED LETTER WITH DELIVERY OF THE EQUIPMENT (IDENTIFIED BY LOCATION AND SERIAL NUMBER) INDICATING THAT THE PARTICULAR EQUIPMENT FURNISHED IS IDENTICAL TO THE EQUIPMENT THAT WAS TESTED AND APPROVED AND THAT ALL "COMPONENTS AND PARTS" USED IN ASSEMBLING THE EQUIPMENT ARE EQUAL OR SUPERIOR IN QUALITY TO THE ONES USED IN THE TESTING OF THE EQUIPMENT.

1.1 THE BATTERY BACKUP SYSTEM SHALL HAVE MANUFACTURER'S CERTIFICATES (IF NEEDED), WARRANTY OF SERVICE, INSTRUCTION BOOKS, SERVICE MANUALS, A LIST OF GENERIC PART NUMBERS FOR SERVICE PERSONNEL, AND COMPLETE INSTALLATION INSTRUCTIONS.

1.2 THIS SPECIFICATION APPLICABLE TO A SPECIFIC INTERSECTION COVERS ONE COMPLETE UNIT OF UNINTERRUPTABLE POWER SUPPLY TO BE ATTACHED TO TRAFFIC SIGNAL CABINETS TO OPERATE THE SIGNAL DURING POWER FAILURES. EACH UNIT SHALL CONSIST OF ONE CONTROL ASSEMBLY, ONE POWER TRANSFER SWITCH, 24V STRING OF 18AH BATTERIES, ONE BATTERY CABINET WITH GENERATOR KIT INCLUDING BYPASS SWITCH AND RECEPTABLE COVER.

2-0 GENERAL EQUIPMENT

2.1 THE SYSTEM SHALL PROVIDE A 120 VAC 60 HZ PURE SINE WAVE. THE SYSTEM SHALL PROVIDE POWER FOR NORMAL SIGNAL OPERATION, FLASH OPERATION, AND NORMAL/FLASH COMBINATION MODE.

2.2 THE SYSTEM SHALL BE DESIGNED FOR OUTDOOR APPLICATIONS AND MEET THE ENVIRONMENTAL REQUIREMENTS AS IS STANDARD IN THE TRAFFIC INDUSTRY. IT SHALL CONFORM TO NEMA, NATIONAL ELECTRIC CODE (NEC), AND UNDERWRITERS LABORATORY (UL) STANDARDS.

2.3 THE UNINTERRUPTED POWER SUPPLY (UPS) SYSTEM SHALL INCLUDE ALL NECESSARY CABLES, WIRING HARNESS, BATTERY CABLES, AND ALL COMPONENTS FOR PROPER OPERATION.

3-0 UPS PANEL MINIMUM FEATURES

3.1 GENERATOR TRANSFER SWITCH WITH UPS BYPASS AND 30 AMP EXTERNAL REVERSE PLUG.

Kimley»Horn
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No.	Revision	By	Date

PRELIMINARY
NOT FOR CONSTRUCTION

JAMES GARNER AVE. STREET IMPROVEMENTS

DUFFY STREET TO ACRES STREET
NORMAN, CLEVELAND COUNTY, OKLAHOMA

PAY QUANTITIES AND NOTES (TRAFFIC)

DESIGNED BY	LAS
DRAWN BY	DCM
REVIEWED BY	LAS
PROJECT NUMBER	061309500
DATE	8/18/2023

REVISIONS

SHEET NUMBER
05

3.2 UPS BYASS AND UPS ISOLATION SWITCH.

3.3 DEADFRONT SAFETY PANEL BOARD WITH ALL SWITCHES, INDICATING FUSES, PLUGS, AND ISOLATION FUSES FOR EACH BATTERY PER-WIRED WITH PHENOLIC NAMEPLATES.

3.4 ALL NAME PLATES SHALL BE SCREWED ON PHENOLIC ENGRAVED TYPE.

3.5 ALL WIRE TERMINATING LUGS SHALL BE FULL WRAP AROUND TYPE.

3.6 ALL BATTERIES SHALL BE CAPTIVE SPACED FROM EXTERNAL CABINET SIDES IN EARTHQUAKE PROOF BUCKETS.

3.7 CABINET VENTILATION SHALL BE BY TWO (2) 4" X ¼" LOUVERS TOP AND BOTTOM WITH ENCAPSULATED BUG SCREENS. CLEANABLE FILTERS, AND A 100CFM FAN TO COMPLETELY EXCHANGE AIR A MINIMUM OF 25 TIMES PER MINUTE.

3.8 ALL DC TERMINALS AND CONNECTIONS SHALL INCORPORATE SAFETY COVERS SUCH THAT THE SAFETY COVERS ARE IN A PLACE FOR EVERY NORMAL MAINTENANCE MODE.

3.9 EVENT COUNTERS AND TOTAL RUN TIME COUNTERS.

4–0 UPS UNIT MINIMUM FEATURES

4.1 1400 VA SHALL PROVIDE A TRUE SINE-WAVE OUTPUT WITH A MINIMUM RATING FOR WATTAGE OUTPUT OF 950 WATTS. UPS WILL FEATURE QUICK MAKE/BREAK CONNECTORS AND PLUGS (SYSTEMS REQUIRING HARD WIRING TERMINATION TO/FROM THE INVERTER ARE UNACCEPTABLE).

4.2 UPS MUST PROVIDE FOR UTILITY SERVICE ISOLATION WHEN IN OPERATION.

4.3 SURGE ENERGY WITHSTAND 480 JOULES, 6.5KA.

4.4 COMMON MODE CLAMPING 0 NS * 5 NS, TYPICAL UL 1449.

4.5 CONDITIONED POWER – COMPUTER QUALITY.

4.6 TRANSIENT LIGHTING PROTECTION = 160 JOULES.

4.7 TRANSFER TO BATTERY TIME = 2 MS AND RETRANSFER TO UTILITY = 2 MS.

4.8 EACH BATTERY SHALL BE 24 VOLTS 18 AH WITH HEAVY DUTY ANDERSON PLUGS AND ISOLATED FUSED (DEAD FRONT PANEL MOUNTED 30 AMP) CONNECTIONS TO THE UPS FOR GREATER SYSTEM RELIABILITY AND EASE OF MAINTENANCE SERIES WIRING IS UNACCEPTABLE.

4.9 FAN COOLING SHALL BE FUSED FOR LOCKED ROTOR CURRENT.

4.10 COOLING AIR SHALL BE DUCTED TO COOL THE FRONT AND BACK OF EACH BATTERY WITH AIR SPACE ON ALL FOUR SIDES AND TOP OF EACH BATTERY.

4.11 UPS COVERS SHALL BE 60% OPEN ON BOTH SIDES TO DIMINISH THE ENVIRONMENTAL EFFECTS OF EXTREME TEMPERATURE.

4.12 INCLUDES RS-232. USB, AND DB9 COMPUTER INTERFACE PORTS.

4.13 LOW VOLTAGE SAFETY DESIGN OF 24V DC (HIGHER VOLTAGE DC SYSTEMS ARE UNACCEPTABLE).

4.14 TYPICAL BATTERY RECHARGE TIME: FROM FULL DISCHARGE TO 95% CAPACITY WITHIN 6 HOURS.

4.15 WARRANTY: TWO (2) YEARS ON ALL BATTERY BACKUP SYSTEM COMPONENTS.

5–0 BATTERY SYSTEM

5.1 BATTERIES SHALL BE MAINTENANCE-FREE AND SEALED 24V TYPE. ABSORBED GLASS MAT/VALVE REGULATED LEAD ACID (AGM/VRLA) AND CERTIFIED TO OPERATE IN TEMPERATURE RANGE OF -13 TO + 165.2 DEGREES F.

5.2 NUMBER OF BATTERIES AND AMP-HOUR RATING SHALL BE SUFFICIENT TO OPERATE THE BATTERY BACKUP SYSTEM IN FULL TIME SIGNAL OPERATION AT 950 WATTS FOR A MINIMUM OF 6 HOURS.

5.3 BATTERIES SHALL BE PROVIDED WITH APPROPRIATE INTERCONNECT WIRING AND CORROSION-RESISTANT MOUNTING TRAYS AND BRACKETS FOR THE CABINET INTO WHICH THEY WILL BE INSTALLED.

5.4 BATTERY CHARGING SYSTEM SHALL BE REGULATED AND TEMPERATURE COMPENSATED.

5.5 ALL INVERTER CONNECTIONS SHALL BE MADE WITHOUT THE USE OF TOOLS INCLUDING A/C INPUT, A/C OUTPUT, NORMALLY-OPEN, AND NORMALLY-CLOSED PROGRAMMABLE CONTACTS.

5.6 BATTERIES SHALL BE FURNISHED WITH HEAVY DUTY 50 AMP RATED SILVER-PLATED ANDERSON CONNECTORS AND A 100 AMP INTERNAL FUSE.

5.7 BATTERIES SHALL BE WARRANTED FOR FULL REPLACEMENT FOR TWO (2) FULL YEARS.

5.8 SYSTEM SHALL HAVE A HOT-SWAPPABLE BATTERY REPLACEMENT SYSTEM.

5.9 BATTERY REPLACEMENT WARNING SYSTEM AUTOMATICALLY PERFORMS A SELF-TEST EVERY TWO WEEKS.

6–0 BATTERY CABINET

6.1 BATTERY CABINET SHALL NOT EXCEED 46.0 INCHES H X 20.0 INCHES W X 11.0 INCHES D AND SHALL HOUSE ALL UNITS ASSOCIATED WITH BATTERY BACK-UP.

6.2 BATTERY CABINET SHALL BE COMPLETELY ENCLOSED NEMA CABINET WITH FOUR SIDES. WELDED SEAMS DETACHED FOR NEW INSTALLATIONS OR MOUNTABLE TO SIDE OF CONTROLLER CABINET FOR RETROFIT INSTALLATIONS. 0.125-INCH THICK ALUMINUM TYPE 5052-H32. POWDER COATED BLACK (UNLESS SPECIFIED OTHERWISE ON THE PLANS), AND STURDY ALUMINUM SHELVES.

6.3 ALL COVERS OR DOORS SHALL BE LOCKABLE. GENERATOR SET OPTION SHALL INCLUDE RECEPTACLE AND MANUAL TRANSFER SWITCH WITH PROPER CIRCUIT BREAKERS.

6.4 SHALL BE EQUIPPED WITH A LOCK KEYED WITH A #2 SIGNAL CABINET KEY. CABINET SHALL INCORPORATE A FULL-LENGTH PIANO HINGE. PAD-LOCKABLE DRAW LATCH AND PAD-LOCKABLE WELDED IN PLACE VANDAL-PROOF TABS RATED AT 2,000 POUNDS.

6.5 AUTOMATIC TRANSFER SWITCH AND GENERATOR 30 AMP EXTERNAL REVERSE SERVICE PLUG.

6.6 HEATER WITH THERMOSTAT.

6.7 EXTERNAL INDICATING LIGHT.

(11) THE CONTROLLER CABINET AND BATTERY BACKUP UNIT CABINET SUPPLIED ON THIS PROJECT SHALL BE BLACK POWDER COAT. PELCO POWDER COAT NUMBER P-59. IN ORDER TO MATCH THE TRAFFIC SIGNAL POLE EXACTLY.

(12) PAY ITEM TO INCLUDE A SURGE PROTECTOR TO BE INSTALLED INSIDE THE CONTROLLER CABINET. THE SURGE PROTECTOR TO BE SUPPLIED ON THIS PROJECT SHALL BE EATON INNOVATIVE TECHNOLOGY 60 AMP MODEL NO. HS-P-SP-120-60-RJ, OR APPROVED EQUAL.

(13) THIS PROJECT INVOLVES THE INSTALLATION OF A VIDEO VEHICLE DETECTION SYSTEM. THEREFORE THE CONTRACTOR SHALL FURNISH AND INSTALL AN ECONOLITE AUTOSCOPE VISION SYSTEM OR APPROVED EQUAL. ALL NECESSARY CABLES, HARNESSES, MATERIALS AND FITTINGS NECESSARY TO PROVIDE A COMPLETE AND OPERATING SYSTEM AT THE INTERSECTION. THE CAMERAS TO BE SUPPLIED ON THIS PROJECT SHALL BE SUPPLIED WITH EASYLOCK CONNECTORS. CAMERAS AND MOUNTING HARDWARE ARE TO BE ALL BLACK.

1. VIDEO DETECTION – GENERAL

THIS SPECIFICATION SETS FORTH THE MINIMUM REQUIREMENTS FOR A SYSTEM THAT MONITORS VEHICLES ON A ROADWAY VIA PROCESSING OF VIDEO IMAGES. THE DETECTION OF VEHICLES PASSING THROUGH THE FIELD-OF-VIEW OF AN IMAGE SENSOR SHALL BE MADE AVAILABLE TO A LARGE VARIETY OF END USER APPLICATIONS AS SIMPLE CONTACT CLOSURE OUTPUTS THAT REFLECT THE CURRENT REALOTIME DETECTOR OR ALARM STATES (ON/OFF) OR AS SUMMARY TRAFFIC STATISTICS THAT ARE REPORTED LOCALLY OR REMOTELY. THE CONTACT CLOSURE OUTPUTS SHALL BE PROVIDED TO A TRAFFIC SIGNAL CONTROLLER AND COMPLY WITH THE NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) TYPE C OR D DETECTOR RACK OR 170 INPUT FILE RACK STANDARDS.

THE SYSTEM ARCHITECTURE SHALL FULLY SUPPORT ETHERNET NETWORKING OF SYSTEM COMPONENTS THROUGH A VARIETY OF INDUSTRY STANDARD AND COMMERCIALLY AVAILABLE INFRASTRUCTURES THAT ARE USED IN THE TRAFFIC INDUSTRY. THE DATA COMMUNICATIONS SHALL SUPPORT DIRECT CONNECT [MODEM.] AND MULTI-DROP INTERCONNECTS SIMPLE STANDARD ETHERNET WIRING SHALL BE SUPPORTED TO MINIMIZE OVERALL SYSTEM COST AND IMPROVE RELIABILITY UTILIZING EXISTING INFRASTRUCTURE AND EASE OF SYSTEM INSTALLATION AND MAINTENANCE. BOTH STREAMING VIDEO AND DATA COMMUNICATIONS SHALL OPTIONALLY BE INTERCONNECTED OVER LONG DISTANCES THROUGH FIBER OPTIC, MICROWAVE, OR OTHER COMMONLY USED DIGITAL COMMUNICATIONS TRANSPORT CONFIGURATIONS. ON THE SOFTWARE APPLICATION SIDE OF THE NETWORK THE SYSTEM SHALL BE INTEGRATED THROUGH A CLIENT-SERVER RELATIONSHIP. A COMMUNICATIONS SERVER APPLICATION SHALL PROVIDE THE DATA COMMUNICATIONS INTERFACE BETWEEN AS FEW AS ONE TO AS MANY AS HUNDREDS OF MACHINE VISION PROCESSOR (MVP) SENSORS AND A NUMBER OF CLIENT APPLICATIONS. THE CLIENT APPLICATIONS SHALL EITHER BE HOSTED ON THE SAME PC AS THE COMMUNICATIONS SERVER OR MAY BE DISTRIBUTED OVER A LOCAL AREA NETWORK OF PC'S USING THE INDUSTRY STANDARD TCP/IP NETWORK PROTOCOL. MULTIPLE CLIENT APPLICATIONS SHALL EXECUTE SIMULTANEOUSLY ON THE SAME HOST OR MULTIPLE HOSTS. DEPENDING ON THE NETWORK CONFIGURATION ADDITIONALLY A WEB-BROWSER INTERFACE SHALL ALLOW USE OF INDUSTRY STANDARD INTERNET WEB BROWSERS TO CONNECT TO MVP SENSORS FOR SETUP, MAINTENANCE AND PLANNING DIGITAL STREAMING VIDEO.

1.1 SYSTEM HARDWARE

THE MACHINE VISION SYSTEM HARDWARE SHALL CONSIST OF THREE COMPONENTS: 1) A COLOR 22X ZOOM MVP SENSOR 2) A MODULAR CABINET INTERFACE UNIT 3) A COMMUNICATION INTERFACE PANEL. ADDITIONALLY, AN OPTIONAL PERSONAL COMPUTER (PC) SHALL HOST THE SERVER AND CLIENT APPLICATIONS THAT ARE USED TO PROGRAM AND MONITOR THE SYSTEM COMPONENTS. THE CONTRACTOR SHALL NOT BE REQUIRED TO SUPPLY A PC TO THE CITY UNLESS SPECIFICALLY MENTIONED BY SPECIAL PROVISIONS AND/OR CONTRACT BID ITEM. THE REAL-TIME PERFORMANCE SHALL BE OBSERVED BY VIEWING THE VIDEO OUTPUT FROM THE SENSOR WITH OVERLAID FLASHING DETECTORS TO INDICATE THE CURRENT DETECTION STATE (ON/OFF). THE MVP SENSOR SHALL OPTIONALLY STORE CUMULATIVE TRAFFIC STATISTICS INTERNAL IN NON-VOLATILE MEMORY FOR LATER RETRIEVAL AND ANALYSIS.

THE MVP SHALL COMMUNICATE TO THE MODULAR CABINET INTERFACE UNIT VIA THE COMMUNICATIONS INTERFACE PANEL AND THE SOFTWARE APPLICATIONS USING THE INDUSTRY STANDARD TCP/IP NETWORK PROTOCOL. THE MVP SHALL HAVE A BUILT-IN, ETHERNET READY, INTERNET PROTOCOL (IP) ADDRESS AND SHALL BE ADDRESSABLE WITH NO PLUG IN DEVICES OR CONVERTERS REQUIRED. THE MVP SHALL PROVIDE STANDARD MPEG-4 STREAMING DIGITAL VIDEO. ACHIEVABLE FRAME RATES SHALL VARY FROM 5 TO 30 FRAMES/SEC AS A FUNCTION OF VIDEO QUALITY AND AVAILABLE BANDWIDTH.

THE MODULAR CABINET INTERFACE UNIT SHALL COMMUNICATE DIRECTLY WITH UP 20 EIGHT (8) MVP SENSORS AND SHALL COMPLY WITH THE FORM FACTOR AND ELECTRICAL CHARACTERISTICS TO PLUG DIRECTLY INTO A NEMA TYPE C OR D DETECTOR RACK PROVIDING UP TO THIRTY-TWO (32) INPUTS AND SIXTY-FOUR (64) OUTPUTS OR A 170 INPUT FILE RACK PROVIDING UP TO SIXTEEN (16) CONTACT CLOSURE INPUTS AND TWENTY-FOUR (24) CONTACT CLOSURE OUTPUTS TO A TRAFFIC SIGNAL CONTROLLER.

THE COMMUNICATION INTERFACE PANEL SHALL PROVIDE FOUR (4) SETS OF THREE (3) ELECTRICAL TERMINATIONS FOR THREE-WIRE POWER CABLES FOR UP TO EIGHT (8) MVP SENSORS THAT MAY BE MOUNTED ON A POLE OR MAST ARM WITH A TRAFFIC SIGNAL CABINET OR JUNCTION BOX. THE COMMUNICATION INTERFACE PANEL SHALL PROVIDE HIGH-ENERGY TRANSIENT PROTECTION TO ELECTRICALLY PROTECT THE MODULAR CABINET INTERFACE UNIT AND CONNECTED MVP SENSORS. THE COMMUNICATIONS INTERFACE PANEL SHALL PROVIDE SINGLE-POINT ETHERNET CONNECTIVITY VIA RJ45 CONNECTOR FOR COMMUNICATION TO AND BETWEEN THE MODULAR CABINET INTERFACE MODULE AND THE MVP SENSORS.

1.2 SYSTEM SOFTWARE

THE MVP SENSOR EMBEDDED SOFTWARE SHALL INCORPORATE MULTIPLE APPLICATIONS THAT PERFORM A VARIETY OF DIAGNOSTIC INSTALLATION, FAULT TOLERANT OPERATIONS, DATA COMMUNICATIONS, DIGITAL VIDEO STREAMING, AND VEHICLE DETECTION PROCESSING. THE DETECTION SHALL BE RELIABLE, CONSISTENT, AND PERFORM UNDER ALL WEATHER, LIGHTING, AND TRAFFIC CONGESTION LEVELS. AN EMBEDDED WEB SERVER SHALL PERMIT STANDARD INTERNET BROWSERS TO CONNECT AND PERFORM BASIC CONFIGURATION, MAINTENANCE, AND VIDEO STREAMING SERVICES.

THERE SHALL BE A SUITE OF CLIENT APPLICATIONS THAT RESIDE ON THE HOST CLIENT/SERVER PC. THE APPLICATION SHALL EXECUTE UNDER THE LATEST MICROSOFT WINDOWS PLATFORM. AVAILABLE CLIENT APPLICATIONS SHALL INCLUDE: MASTER NETWORK BROWSER: LEARN A NETWORK OF CONNECTED MODULAR CABINET INTERFACE UNITS AND MVP SENSORS, DISPLAY BASIC INFORMATION, AND LAUNCH APPLICATIONS SOFTWARE TO PERFORM OPERATIONS WITHIN THAT SYSTEM OF SENSORS.

CONFIGURATION SETUP: CREATE AND MODIFY DETECTOR CONFIGURATIONS TO BE EXECUTED ON THE MVP SENSOR AND THE MODULAR CABINET INTERFACE UNIT

OPERATION LOG: RETRIEVE, DISPLAY, AND SAVE FIELD HARDWARE RUN-TIME OPERATION LOGS OF SPECIAL EVENTS THAT HAVE OCCURRED

SOFTWARE INSTALL: RECONFIGURE ONE OR MORE MVP SENSORS WITH A NEWER RELEASE OF EMBEDDED SYSTEM SOFTWARE.

STREAMING VIDEO PLAYER: PLAY AND RECORD STREAMING VIDEO WITH FLASHING DETECTOR OVERLAY.

DATA RETRIEVAL: FETCH ONCE OR POLL FOR TRAFFIC DATA AND ALARMS AND STORE ON PC STORAGE MEDIA.

COMMUNICATIONS SERVER: PROVIDE FAULT-TOLERANT REAL TIME TCP/IP COMMUNICATIONS TO/FROM ALL DEVICES AND CLIENT APPLICATIONS WITH FULL LOGGING CAPABILITY FOR SYSTEMS INTEGRATION

2. FUNCTIONAL CAPABILITIES

2.1 MVP SENSORS

THE MVP SENSOR SHALL BE AN INTEGRATE IMAGING COLOR CCD ARRAY WITH ZOOM LENS OPTICS. HIGH SPEED, DUAL-CORE IMAGE PROCESSING HARDWARE BUNDLED INTO A SEALED ENCLOSURE. THE CCD ARRAY SHALL BE DIRECTLY CONTROLLED BY THE DUAL-CORE PROCESSOR. THIS PROVIDING HIGH-QUALITY VIDEO FOR DETECTION THAT HAS VIRTUALLY NO NOISE TO DEGRADE DETECTION PERFORMANCE. IT SHALL BE POSSIBLE TO ZOOM THE LENS AS REQUIRED FOR SETUP AND OPERATIONS. IT SHALL PROVIDE JPEG VIDEO COMPRESSION AS WELL AS STANDARD MPEG-4 DIGITAL STREAMING VIDEO WITH FLASHING DETECTOR OVERLAY. THE MVP SHALL PROVIDE DIRECT REAL-TIME IRIS AND SHUTTER SPEED CONTROL. THE MVP SENSOR SHALL BE EQUIPPED WITH AN INTEGRATED 22X ZOOM LENS THAT CAN BE CHANGED USING EITHER CONFIGURATION COMPUTER SOFTWARE. THE DIGITAL STREAMING VIDEO OUTPUT AND ALL DATA COMMUNICATIONS SHALL BE TRANSMITTED OVER THREE-WIRE POWER CABLE.

2.1.2 POWER

THE MVP SENSOR SHALL OPERATE ON 110/220 VAC 50/60HZ AT A MINIMUM OF 25 WATTS. THE CAMERA AND PROCESSOR ELECTRONICS SHALL CONSUME A MAXIMUM OF 10 WATTS AND THE REMAINING 15 WATTS SHALL SUPPORT AN ENCLOSURE HEATER.

2.1.3 DETECTION ZONE PROGRAMMING

PLACEMENT OF DETECTION ZONES SHALL BE BY MEANS OF A PERSONAL COMPUTER (PC) WITH THE LATEST MICROSOFT WINDOWS PLATFORM OPERATING SYSTEM, A KEYBOARD, AND A MOUSE. THE PC MONITOR SHALL BE ABLE TO SHOW THE DETECTION ZONES SUPERIMPOSED ON IMAGES OF TRAFFIC SCENES.

THE DETECTION ZONES SHALL BE CREATED BY USING A MOUSE TO DRAW DETECTION ZONES ON THE PC MONITOR. USING THE MOUSE AND KEYBOARD IT SHALL BE POSSIBLE TO PLACE, SIZE, AND ORIENT DETECTION ZONES TO PROVIDE OPTIMAL ROAD COVERAGE FOR VEHICLE DETECTION. IT SHALL BE POSSIBLE TO DOWNLOAD DETECTOR CONFIGURATIONS FROM THE PC TO THE MVP SENSOR AND CABINET INTERFACE MODULE, TO RETRIEVE THE DETECTOR CONFIGURATION THAT IS CURRENTLY RUNNING IN THE MVP SENSOR, AND TO BACK UP DETECTOR CONFIGURATIONS BY SAVING THEM TO THE PC FIXED DISKS OR OTHER REMOVABLE STORAGE MEDIA.

2.2 MODULAR CABINET INTERFACE UNIT THE MODULAR CABINET INTERFACE UNIT SHALL PROVIDE THE HARDWARE AND SOFTWARE MEANS FOR UP TO EIGHT (8) MVP SENSORS TO COMMUNICATE REAL-TIME DETECTION STATES AND ALARMS TO A LOCAL TRAFFIC SIGNAL CONTROLLER. IT SHALL COMPLY WITH THE ELECTRICAL AND PROTOCOL SPECIFICATIONS OF THE DETECTOR RACK STANDARDS. THE CARD SHALL HAVE 1500 VRMS ISOLATION BETWEEN RACK LOGIC GROUND AND STREET WIRING.

THE MODULAR CABINET INTERFACE UNIT SHALL BE A SIMPLE INTERFACE CARD THAT PLUGS DIRECTLY INTO A 170 INPUT FILE RACK OR A NEMA TYPE C OR D DETECTOR RACK. THE MODULAR CABINET INTERFACE UNIT SHALL OCCUPY ONLY 2 SLOTS OF THE DETECTOR RACK. THE MODULAR CABINET INTERFACE UNIT SHALL ACCEPT UP TO SIXTEEN (16) PHASE INPUTS AND SHALL PROVIDE UP TO TWENTY-FOUR (24) DETECTOR OUTPUTS.

2.3 COMMUNICATIONS INTERFACE PANEL THE COMMUNICATIONS INTERFACE PANEL SHALL SUPPORT UP TO EIGHT MVPS. THE COMMUNICATIONS INTERFACE PANEL SHALL ACCEPT 110/220 VAC. 50/60 HZ POWER AND PROVIDE PREDEFINED WIRE TERMINATION BLOCKS FOR MVP POWER CONNECTIONS, A BROADBAND-OVER-POWER-LINE (BPL) TRANSCEIVER TO SUPPORT UP TO 10 MB/S INTERDEVICE COMMUNICATIONS, ELECTRICAL SURGE PROTECTORS TO ISOLATE THE MODULAR CABINET INTERFACE UNIT AND MVP SENSORS, AND AN INTERFACE CONNECTOR TO CABLE DIRECTLY TO THE MODULAR CABINET INTERFACE UNIT.

THE INTERFACE PANEL SHALL PROVIDE POWER FOR UP TO EIGHT (8) MVP SENSORS, TAKING LOCAL LINE VOLTAGE 110/220 VAC, 50/60 HZ AND PRODUCING 110/220 VAC, 50/60 HZ, AT ABOUT 30 WATTS TO EACH MVP SENSOR. TWO 1/2-AMP SLO-BLO FUSES SHALL PROTECT THE COMMUNICATIONS INTERFACE PANEL.

3. SYSTEM INSTALLATION & TRAINING THE SUPPLIER OF THE VIDEO DETECTION SYSTEM SHALL SUPERVISE THE INSTALLATION AND TESTING OF THE VIDEO DETECTION SYSTEM AS REQUIRED BY THE CITY OF NORMAN.

TRAINING, IF SPECIFICALLY REQUIRED BY THE CONTRACT, SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE FOR "VIDEO DETECTION SYSTEM TRAINING". THE MVP SENSOR AND ITS SUPPORT HARDWARE / SOFTWARE IS A SOPHISTICATED LEADING-EDGE TECHNOLOGY SYSTEM; THEREFORE, PROPER INSTRUCTION FROM CERTIFIED INSTRUCTORS IS RECOMMENDED TO ENSURE THAT THE END USER HAS COMPLETE COMPETENCY IN SYSTEM OPERATION. TRAINING SHALL CONSIST OF CURRICULUM TAUGHT BY A REPRESENTATIVE OF THE VIDEO DETECTION SYSTEM MANUFACTURER WITH CERTIFICATION TO TRAIN ON SUCH EQUIPMENT. MATERIALS AND TRAINING SHALL BE PROVIDED FOR UP TO TEN (10) CITY OF NORMAN PERSONNEL. IS AVAILABLE TO PERSONNEL OF THE CONTRACTING AGENCY IN THE OPERATION, SET UP, AND MAINTENANCE OF THE VIDEO DETECTION SYSTEM. THE USER'S GUIDE IS NOT AN ADEQUATE SUBSTITUTE FOR PRACTICAL CLASSROOM TRAINING AND FORMAL CERTIFICATION BY AN APPROVED AGENCY.

4. WARRANTY, SERVICE, & SUPPORT FOR A MINIMUM OF TWO (2) YEARS, THE SUPPLIER SHALL WARRANT THE VIDEO DETECTION SYSTEM. ONGOING SOFTWARE SUPPORT BY THE SUPPLIER SHALL INCLUDE SOFTWARE UPDATES OF THE MVP SENSOR, MODULAR CABINET INTERFACE UNIT, AND SUPERVISOR COMPUTER APPLICATIONS. THESE UPDATES SHALL BE PROVIDED FREE OF CHARGE DURING THE WARRANTY PERIOD. THE SUPPLIER SHALL MAINTAIN A PROGRAM FOR TECHNICAL SUPPORT AND SOFTWARE UPDATES FOLLOWING EXPIRATION OF THE WARRANTY PERIOD. THIS PROGRAM SHALL BE AVAILABLE TO THE CONTRACTING AGENCY IN THE FORM OF A SEPARATE AGREEMENT FOR CONTINUING SUPPORT.

(1) THIS PROJECT WILL REQUIRE AUDIBLE SIGNAL CAPABILITIES. THE PEDESTRIAN PUSH BUTTON ASSEMBLY SHALL BE THE 2-WIRE NAVIGATOR ACCESSIBLE PEDESTRIAN SIGNAL (APS) AS MANUFACTURED BY POLARA ENGINEERING INC. OF FULLERTON CA. OR APPROVED EQUAL. THESE NAVIGATOR PUSH BUTTONS SHALL BE BLACK IN COLOR.

(2) RED, YELLOW AND GREEN LED TRAFFIC SIGNAL HEADS SHALL BE CLEAR LENS AND INCANDESCENT LOOK FURNISHED AND INSTALLED ON THIS PROJECT. THE LED TRAFFIC MODULES, LENSES, AND ALL ASSOCIATED MATERIAL AND EQUIPMENT SHALL CONFORM TO I.T.E. VEHICLE TRAFFIC CONTROL SIGNAL HEAD (VTCSH) STANDARDS IN EFFECT AT THE TIME THAT THE ORDER IS PLACED. LED HEADS SHALL BE CAPABLE OF OPERATING WITHOUT A REFLECTOR. THE SIGNAL HEADS SHALL HAVE A BLACK BODY, BLACK DOORS AND BLACK TUNNEL VISORS.

(16) LED INTERNATIONAL HEADS DISPLAYING INCANDESCENT LOOKING FULLY-ILLUMINATED SYMBOLS (WALKING PERSON AND UPRAISED HAND) SHALL BE REQUIRED ON THIS PROJECT.

THE UNITS TO BE INSTALLED ON THIS PROJECT SHALL BE GT1 LED COUNTDOWN PEDESTRIAN SIGNAL MODULES (16" X 18") MANUFACTURED BY GENERAL ELECTRIC OR AN APPROVED EQUAL. R10-3E PEDESTRIAN PUSH BUTTON SIGNS SHALL BE USED.

(17) REFLECTORIZED BACKPLATES SHALL BE SUPPLIED ON THIS PROJECT IN ACCORDANCE WITH GENERAL NOTE 4 ON ODOT STANDARD DRAWINGSA1-1-(LATEST REVISION)

(18) PAY ITEM IS TO RUN FROM THE PEDESTRIAN PUSH BUTTONS TO THE TERMINAL STRIP AT THE BASE OF THE POLES.

(19) THE PREEMPTION CONTROL SYSTEM SHALL INTERFACE WITH THE TRAFFIC CONTROLLER TO GIVE EMERGENCY VEHICLES APPROACHING THE INTERSECTION A GREEN INDICATION WITH ALL OTHER INDICATIONS BEING RED. ALL EQUIPMENT IN THE SYSTEM SHALL MEET NEMA ENVIRONMENTAL STANDARDS.

THE SYSTEM SHALL USE AN OPTICOM MULTIMODE EMITTER CAPABLE OF OPERATING IN BOTH INFRARED (IR) OR GPS MODES. EQUIPMENT AT THE INTERSECTION SHALL INCLUDE A PHASE SELECTOR (MODEL 764), AN AUXILIARY INTERFACE PANEL (MODEL 768), A GPS RECEIVER/RADIO UNIT (MODEL 3100), AND A CONNECTION BETWEEN THE GPS RECEIVER/RADIO UNIT AND THE PHASE SELECTOR WITH MODEL 1070 CABLE. THE OPTICOM MULTIMODE MODEL 764 PHASE SELECTOR MAY BE USED IN IR ONLY APPLICATIONS, IN GPS ONLY APPLICATIONS, OR IN IR/GPS APPLICATION SIMULTANEOUSLY.

THE MANUFACTURER OR THE MANUFACTURER'S REPRESENTATIVE SHALL PROVIDE ASSISTANCE TO THE CONTRACTOR OR AGENCY INSTALLING THE EQUIPMENT AS TO THE BEST LOCATION FOR THE DETECTOR PLACEMENT AT EACH INTERSECTION INVOLVED WITH THE PROJECT. COSTS ASSOCIATED WITH THIS ASSISTANCE SHALL BE INCLUDED IN THE COST OF OTHER ITEMS. ALL EQUIPMENT MUST BE PLAINLY MARKED AS TO THE MANUFACTURER OF THE EQUIPMENT TO PROVIDE CLEAR IDENTIFICATION AS TO THE MANUFACTURER'S MODEL AND SERIAL NUMBER OF EACH UNIT. NEMA CERTIFICATION AND TEST REPORTS SHALL BE PROVIDED UPON REQUEST BY THE ENGINEER.

(20) THE STREET NAME SIGNS FOR THIS PROJECT SHALL BE "CLEAN PROFILE INTERNALLY-ILLUMINATED LED SIGNS" BY SOUTHERN MANUFACTURING, OR AN APPROVED EQUAL. THE SIGNS SHALL BE MOUNTED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS. THE PRICE BID FOR THIS ITEM SHALL INCLUDE ALL CONDUIT, CONNECTORS, WIRE AND INCIDENTAL EQUIPMENT TO MAKE THE SIGNS OPERATIONAL. EACH STREET NAME SIGN SHALL HAVE AN INDIVIDUAL PHOTO CONTROLLER.

THE CONTRACTOR SHALL ALSO VERIFY WITH THE POLE MANUFACTURER THAT THE SIGNAL MAST ARMS ARE DESIGNED FOR THE ADDITIONAL WEIGHT OF THESE ILLUMINATED SIGNS.

THE CITY OF NORMAN SHALL PROVIDE THE CITY LOGO DESIGN IN ELECTRONIC FORMAT TO THE CONTRACTOR SO THAT THE SIGN MANUFACTURER CAN FABRICATE THE ILLUMINATED SIGN PANELS IN ACCORDANCE WITH THE SIGN DETAILS IN THE PLANS.

(21) MAST ARM MOUNTED INTERNALLY ILLUMINATED STREET NAME SIGNS SHOWN ON THE PLANS ARE LARGER THAN THE MAXIMUM SIZE USED IN STANDARD ODOT POLE AND FOOTING DESIGNS. THE CONTRACTOR AND SUPPLIER SHALL PROVIDE CERTIFICATION AND DESIGN CALCULATIONS FOR HIGHER LOADING REQUIREMENTS.

(22) PAY ITEM IS FOR THE INSTALLATION OF 17"X30"X12" PULL BOX IN ACCORDANCE WITH THE CURRENT CITY OF NORMAN STANDARD SPECIFICATIONS.

(23) POWER FOR INTERSECTION TO BE SUPPLIED BY OG&E.

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No.	Revision	By	Date

PRELIMINARY
NOT FOR CONSTRUCTION

JAMES GARNER AVE. STREET IMPROVEMENTS

DUFFY STREET TO ACRES STREET

NORMAN, CLEVELAND COUNTY, OKLAHOMA

K:\OKC_TPTO\061309500 – COWAN – NORMAN – JAMES GARNER SIGNALS\CADD\PLANSHEETS\SIGNAL LAYOUT SHEET-CGE – ONE WAY.DWG

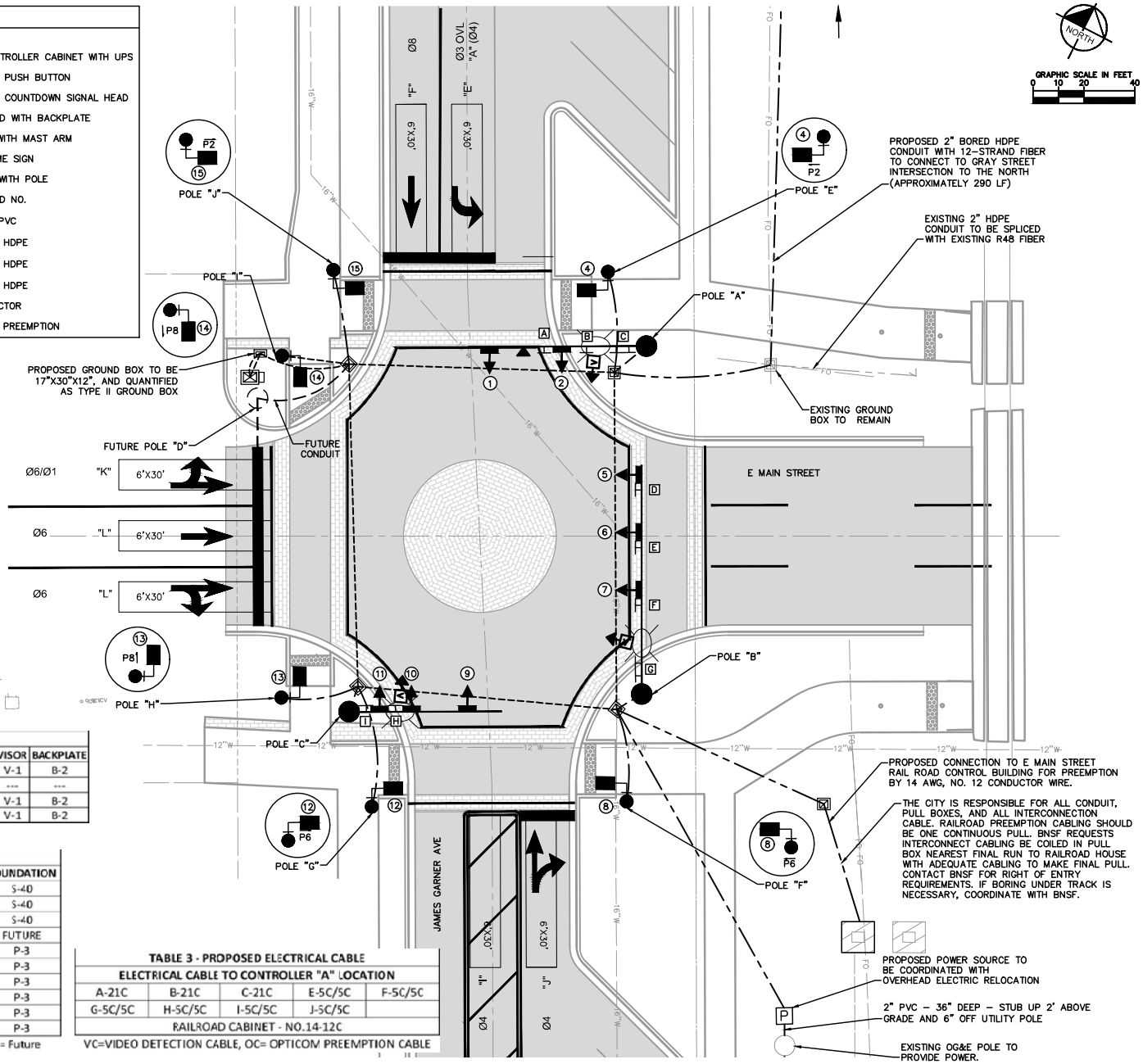
PAY QUANTITIES AND NOTES (TRAFFIC)

DESIGNED BY	LAS
DRAWN BY	DCM
REVIEWED BY	LAS
PROJECT NUMBER	061309500
DATE	8/18/2023

REVISIONS

SHEET NUMBER
06

Friday, August 18, 2023 10:15:35 AM



NOTES:

1. THE CONTRACTOR SHALL FURNISH AND INSTALL THE FOLLOWING TRAFFIC SIGNAL CABINET AND COMPONENTS, CONSISTENT WITH THE CITY OF NORMAN STANDARDS:
   - 332 TRAFFIC SIGNAL CONTROLLER CABINET
   - ECONOLITE COBALT CONTROLLER WITH EOS PLATFORM
   - TESCO CLASS 22-40 BATTERY BACKUP
   - ECONOLITE RAILROAD GATE DOWN PANEL
2. THE CONTRACTOR SHALL CONTACT THE CITY AND UTILITY COMPANIES FOR POSSIBLE UNDERGROUND EXISTING UTILITIES NOT SHOWN ON THE PLANS. THIS SHOULD BE DONE BEFORE TRENCHING OR INSTALLING ELECTRICAL CONDUITS.
3. THE CONTRACTOR SHALL INSTALL ADA ACCESSIBLE AUDIBLE PEDESTRIAN PUSH BUTTONS STATIONS, ADA COMPLIANT SIDEWALKS, AND ADA COMPLIANT BARRIER FREE PEDESTRIAN CURB RAMPS PER THE PLANS.
4. VIDEO VEHICLE DETECTION WILL BE PROVIDED FOR THIS INTERSECTION. THE DETECTOR LOOPS SHOWN ON THE PAVEMENT ARE SHOWN ONLY TO DEPICT THE AREAS OF DETECTION FOR THE VIDEO DETECTION UNITS ALONG WITH THE PHASES THAT EACH VIDEO DETECTOR UNIT WILL CALL.
5. THE POLE ENLARGEMENT DETAIL IS PROVIDED FOR INFORMATION PURPOSES ONLY. THE PLACEMENT OF THE PEDESTRIAN PUSH BUTTONS AND SIGNAL HEADS SHALL BE INSTALLED ON THE POLES SUCH THAT THE SIGNAL HEADS ARE VISIBLE FROM THE CROSSWALK AND THE PUSH BUTTONS ARE ACCESSIBLE FROM THE ADJACENT SIDEWALK. THE HANDHOLD SHALL NOT CONFLICT WITH THE PUSH BUTTON LOCATIONS AS SHOWN.
6. OPTICAL DETECTORS SHALL BE MOUNTED ON A 5' RISER ABOVE THE PROPOSED LUMINAIRE ARMS, SUBSIDIARY TO THE INSTALLATION OF THE OPTICAL DETECTOR.
7. POLE B SHALL HAVE A BLACK BREAKER BOX SUBSIDIARY TO THE INSTALLATION OF THE POLE AND MAST ARM ASSEMBLY.
8. FOR RAIL GRADE CROSSING TRAFFIC SIGNAL PREEMPTION, A SINGLE BREAK CROSSING ACTIVE (XR) CIRCUIT WITH SIMULTANEOUS PREEMPTION IS REQUESTED.
9. VOLTAGE FOR THE PREEMPTION INTERCONNECT CIRCUIT SHALL BE 28 VDC MAXIMUM. CONTRACTOR SHALL VERIFY THAT THE INTERCONNECTION VOLTAGE DOES NOT EXCEED THIS MAXIMUM.

TABLE 1 - PROPOSED SIGNAL HEADS

SIGNAL HEAD NUMBER	STATUS	NUMBER & TYPE	MOUNTING	VISOR	BACKPLATE
1,2,6,7,10,11	I	7 - ONEWAY (S-6)	MAST ARM	V-1	B-2
4,8,12,13,14,15	I	6 - ONEWAY (S-20)	BOLT	---	---
5	I	1 - ONEWAY (S-19)L	MAST ARM	V-1	B-2
9	I	1 - ONEWAY (S-13)L	MAST ARM	V-1	B-2

TABLES 2 - PROPOSED MAST ARMS AND POLES

LOCATION	STATUS	MOUNTING HT.	MAST ARM LENGTHS	FOUNDATION
A	I	32'	35' T.S. & 10' LUM.	S-40
B	I	32'	45' T.S. & 10' LUM.	S-40
C	I	32'	30' T.S. & 10' LUM.	S-40
D	F	32'	30' T.S. & 10' LUM.	FUTURE
E	I	10'	PED. POLE	P-3
F	I	10'	PED. POLE	P-3
G	I	10'	PED. POLE	P-3
H	I	10'	PED. POLE	P-3
I	I	10'	PED. POLE	P-3
J	I	10'	PED. POLE	P-3

E = Existing to Remain, R = Existing to Remove, I = Furnish/Install, F = Future

TABLE 3 - PROPOSED ELECTRICAL CABLE

ELECTRICAL CABLE TO CONTROLLER "A" LOCATION				
A-21C	B-21C	C-21C	E-5C/5C	F-5C/5C
G-5C/5C	H-5C/5C	I-5C/5C	J-5C/5C	
RAILROAD CABINET - NO.14-12C				

VC=VIDEO DETECTION CABLE, OC= OPTICOM PREEMPTION CABLE

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No.	Revision	By	Date

PRELIMINARY
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JAMES GARNER AVE. STREET IMPROVEMENTS

DUFFY STREET TO ACRES STREET
NORMAN, CLEVELAND COUNTY, OKLAHOMA

TRAFFIC SIGNAL LAYOUT

DESIGNED BY	LAS
DRAWN BY	DCM
REVIEWED BY	LAS
PROJECT NUMBER	061309500
DATE	8/18/2023

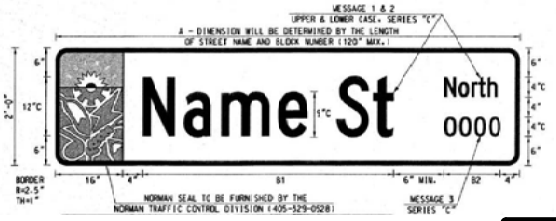
REVISIONS

SHEET NUMBER 52

K:\OKC_DPTO\061309500 - COMAN - NORMAN - JAMES GARNER SIGNALS\CADD PLANSHEETS\SIGNAL LAYOUT SHEET-CDE - ONE WAY.DWG

Friday, August 18, 2023 3:34:38 PM

LED INTERNALLY LIT STREET NAME SIGN



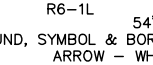
SUMMARY OF MAST ARM MOUNTED SIGNS

SIGN	STATUS	QTY	MESSAGE 1	2	3	POLE LOCATION	A (IN.)	HEIGHT (IN.)	B1 (IN.)	B2 (IN.)	SIGN AREA (S.F.)	TOTAL AREA (S.F.)
A	I	1	R6-1R			A	48	24			8	8
B	I	1	R3-1 (LED BLANK-OUT)			A	36	36			9	9
C	I	1	MAIN ST	WEST	100	A	120	24	85.9	11	20	20
D	I	1	R3-6L			B	30	36			7.5	7.5
E	I	1	R3-5A			B	30	36			7.5	7.5
F	I	1	R3-6R			B	30	36			7.5	7.5
G	I	1	JAMES GARNER AVE	SOUTH	100	B	120	24	85.9	11	20	20
H	I	1	R6-1L			C	48	24			8	8
I	I	1	MAIN ST	WEST	100	C	120	24	85.9	11	20	20
TOTAL SIGN AREA TO INSTALL												98.5

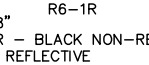
I = FURNISH AND INSTALL; E = EXISTING TO REMAIN; E/R = EXISTING TO REPLACE; R = RELOCATE

SEQUENCE CHART

PHASE	BLOCK NO.	ø1	ø3	ø4	ø6	ø8	BLANK OUT	P2	P6	P8
		SIGNAL HEAD NUMBER								
PHASE		5	9	1,2	6,7	10,11	–	4,15	8,12	13,14
ø1, ø6 RCW	1	G	R	R	G	R	OFF	DW	DW	DW
ø1 CL, ø6 ROW	2	Y	R	R	G	R	OFF	DW	DW	DW
ø6, P2, P8 ROW	3	G	R	R	G	R	OFF	W	W	DW
ø1, P2, P8 CL, ø6 ROW	4	G	R	R	G	R	OFF	FDW	FDW	DW
ø1, ø6 CL	5	Y	R	R	Y	R	OFF	DW	DW	DW
ALL RED	6	R	R	R	R	R	OFF	DW	DW	DW
ø3, ø8 ROW	7	R	G	R	R	G	OFF	DW	DW	DW
ø3 CL, ø8 ROW	8	R	Y	R	R	G	OFF	DW	DW	DW
ø8, P4, P8 ROW	9	R	R	R	R	G	OFF	DW	DW	W
ø3, P4, P8 CL, ø4, ø8 ROW	10	R	FY	G	R	G	OFF	DW	DW	FDW
ø3 CL, ø4 ø8 CL	11	R	Y	Y	R	Y	OFF	DW	DW	DW
ALL RED	12	R	R	R	R	R	OFF	DW	DW	DW
ø4, ø8	C1	R	R	G	G	R	ON	DW	DW	DW
ø4 CL, ø8 CL	C2	R	R	Y	Y	R	ON	DW	DW	DW
ALL RED	C3	R	R	R	R	R	ON	DW	DW	DW

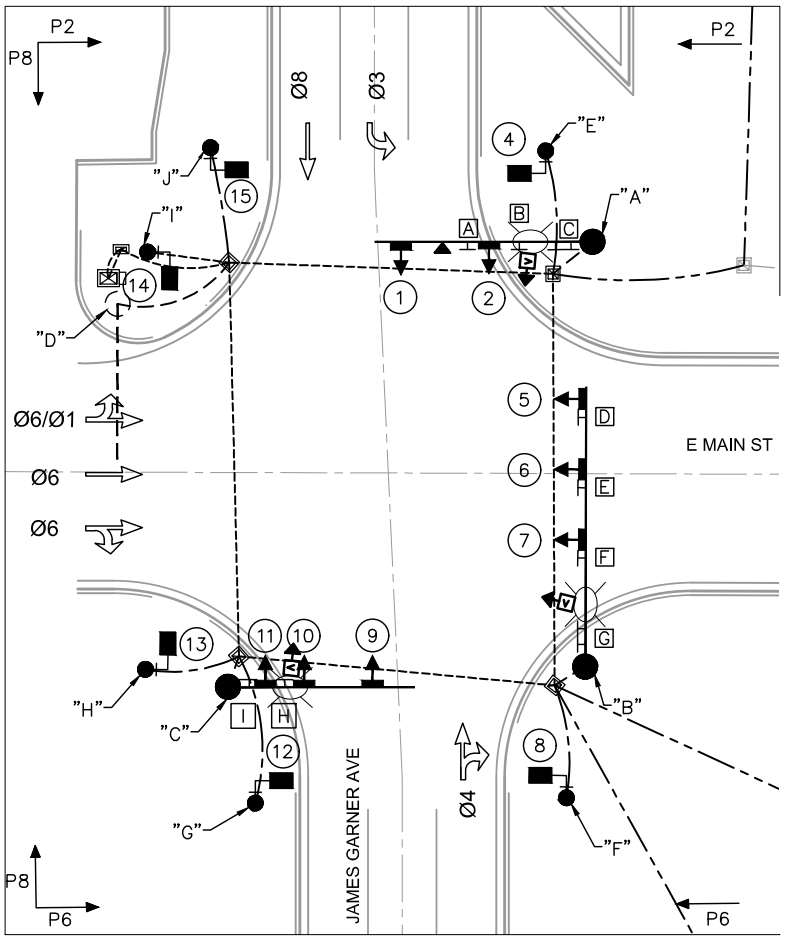


R6-1L

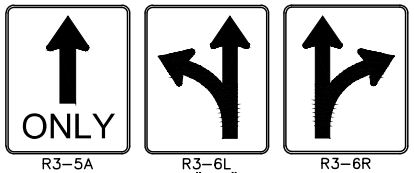


R6-1R

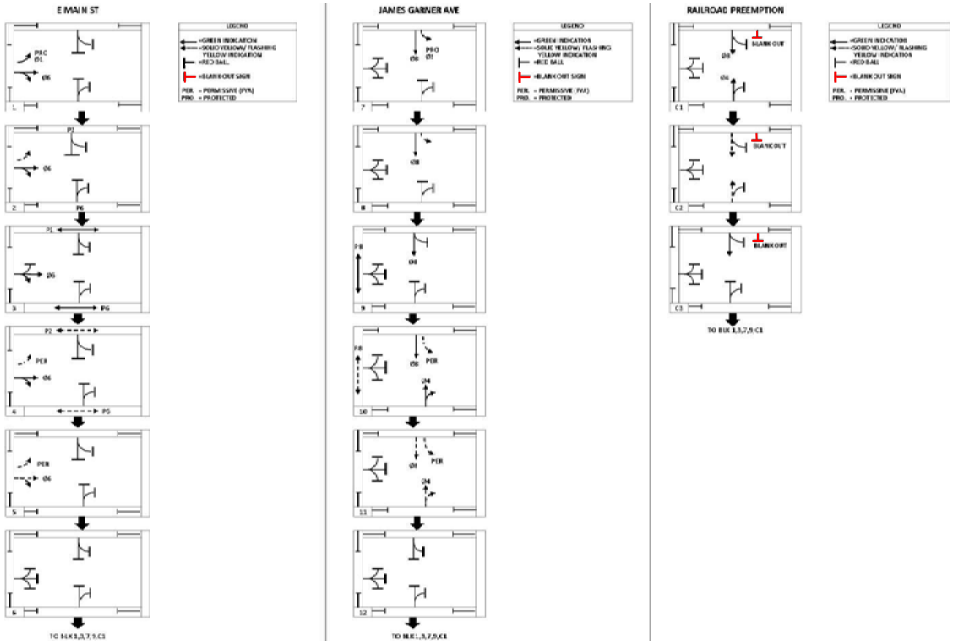
54"X18"
BACKGROUND, SYMBOL & BORDER – BLACK NON-REFLECTIVE
ARROW – WHITE REFLECTIVE



R3-1 (LED BLANK-OUT)
36"X36"
SIGNAL-TECH PRODUCT NO. 57401 OR
APPROVED EQUAL



R3-5A R3-6L R3-6R
30"X36"
ARROW, SYMBOL & BORDER – BLACK NON-REFLECTIVE
BACKGROUND – WHITE REFLECTIVE



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No.	Revision	By	Date

PRELIMINARY
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JAMES GARNER AVE. STREET IMPROVEMENTS

DUFFY STREET TO ACRES STREET
NORMAN, CLEVELAND COUNTY, OKLAHOMA

TRAFFIC SIGNAL TABLES

DESIGNED BY	LAS
DRAWN BY	DCM
REVIEWED BY	LAS
PROJECT NUMBER	061309500
DATE	8/18/2023

REVISIONS

SHEET NUMBER 53

K:\OKC_TPTO\061309500 - COMAN - NORMAN - JAMES GARNER SIGNALS\CADD\PLANSHEETS\SIGNAL LAYOUT SHEET-CDE - ONE WAY.DWG

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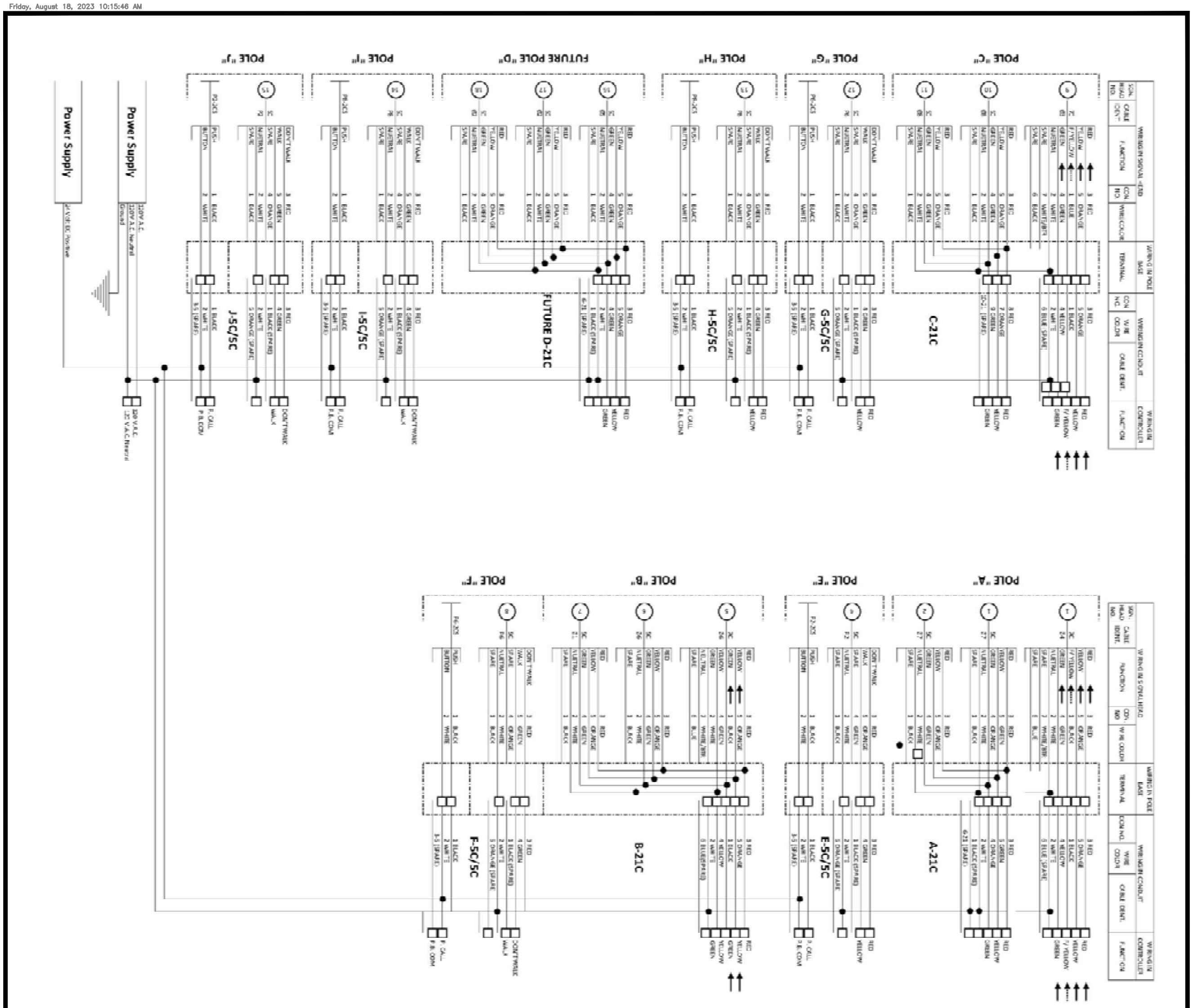
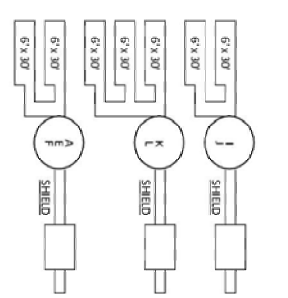
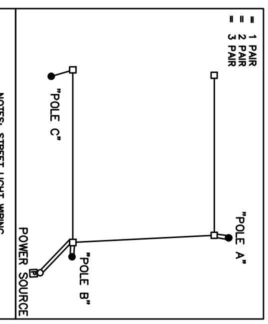




INTERSECTION PHASE	DIRECTION OF TRAVEL	LUMINAIRE ARM
Ø4	NBT/NBR	POLE "A"
Ø5 Ø1	EBT/EBR EBL	POLE "B"
Ø3 Ø8	SBL SBT	POLE "C"



NOTES: STREET LIGHT WIRING

ONE PAIR EQUALS TWO CONDUCTORS (1/C-10AWG COPPER) ONE BLACK, ONE WHITE. CONDUCTOR SHALL BE SPLICED ONLY AT THE TERMINAL BLOCK AT EACH POLE BASE. A FUSE HOLDER SHALL BE PROVIDED IN THE HANDHOLE OF EACH COMBINATION TRAFFIC SIGNAL AND STREET LIGHT POLE. THE FUSE HOLDER SHALL BE INSTALLED IN THE LINE SIDE CONDUCTOR FOR THE LUMINARIE. THE FUSE HOLDER SHALL BE A WATERPROOF INLINE FUSE HOLDER. IT SHALL BE SIMILAR TO BUSSMAN MFG. CO. TYPE "TRON" HEB, OR OTHER APPROVED EQUAL, COMPLETE WITH A PROPERLY SIZED TYPE KTK FUSE.

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JAMES GARNER AVE. STREET IMPROVEMENTS

DUFFY STREET TO ACRES STREET

NORMAN, CLEVELAND COUNTY, OKLAHOMA

TRAFFIC SIGNAL WIRING DIAGRAM

DESIGNED BY	LAS
DRAWN BY	DCM
REVIEWED BY	LAS
PROJECT NUMBER	061309500
DATE	8/18/2023

REVISIONS

SHEET NUMBER 54

APPENDIX F – TRAFFIC SIGNAL PREEMPTION REQUEST FORM

Version 09/2021

HIGHWAY-RAIL GRADE CROSSING
TRAFFIC SIGNAL PREEMPTION REQUEST FORM

The Road Authority traffic controller circuitry requires railroad preemption contacts to initiate the preemption sequence. Per BNSF standard, we will provide normally closed "dry" preemption relay contacts to interconnect the railroad active warning system to the Road Authority traffic signal controller assembly. These contacts are rated at 4 amps, and the source voltage from the traffic signal controller must not exceed 30 volts DC. Only DC voltage should be supplied by the Road Authority traffic signal controller assembly for preemption circuits, AC voltage will not be accepted. With no trains in the area, these contacts remain closed. The Road Authority Traffic Department will be responsible for installing the interconnection cable between the traffic signal controller and the crossing warning signal control housing.

To estimate and or design the crossing warning system, BNSF needs to know certain timing parameters.

Definitions:

"Advance Preemption" – The system will be designed to open the preemption contacts for a predetermined amount of time (Advance Preemption Time) prior to activation of the warning devices (flashing lights).

"Advance Pedestrian Preemption" – The system will be designed to open the pedestrian preemption contacts for a predetermined amount of time (Advance Pedestrian Preemption Time) prior to opening of preemption contacts (advance preemption), where advance preemption is used.

"Simultaneous Preemption" – The system will be designed to open the preemption contact at the same time the warning devices (flashing lights) are activated. Additional warning time may be requested.

"Supervised Circuit" – Supervision is an additional circuit from the grade crossing warning system that verifies the integrity of the interconnection circuits by comparing inputs to detect faults when the two circuits are in the same state. Supervision of the Advance Preemption circuit is required for single-break configurations and recommended for double-break configurations. Supervision can be requested for other circuit configurations.

"Gate Down Logic" – Per BNSF standard, we will provide normally open "dry" gate down relay contacts to interconnect the crossing warning system to the Road Authority traffic signal controller assembly. The system will be designed to close the gate down contacts upon the gates arrival in the down position. This logic is normally utilized to hold track clearance green until the gates are down since the time from preemption to gate down will vary depending upon the traffic signal cycle. In the event the gate does not descend; BNSF provides a parallel island circuit that provides input to terminate track clearance green once track occupies the crossing (island). This circuit will reduce parallel street delays by allowing the traffic signal to exit the track clearance phase after railroad gate is horizontal and providing a green indication for parallel street.

"Minimum Warning Time" – Per the MUTCD and FRA regulations, BNSF must provide at least 20 seconds of warning time for through trains (typically main track applications). However, per BNSF standards for constant warning time train detection equipment, the system will be designed to provide a "nominal" warning time of 30 seconds to ensure MUTCD/FRA minimums are met and to compensate for accelerating trains and ballast conditions.

"Minimum Track Clearance Distance" – For standard two-quadrant railroad warning devices, the minimum track clearance distance is the length along a highway at one or more railroad tracks, measured either from the railroad stop line, warning device or 12 ft. perpendicular to the far rail, along the centerline or edge line of the highway, as appropriate, to obtain the longer distance. For locations with exit gate warning devices, the minimum track clearance distance is the length along a highway at one or more railroad tracks, measured either from the railroad stop line or entrance warning device to the point clear of the exit gate. Note that in cases where the exit gate arm is parallel to the track(s) and/or not perpendicular to the roadway, clearance will be either along the centerline or edge line of the highway, as appropriate, to obtain the longer distance.

When (entrance) gates are used they are typically designed to start their decent within 3 to 5 seconds of the warning lights flashing, descend in an additional 10 to 15 seconds, and reach horizontal at least 5 seconds prior to train arrival per FRA regulations.

The length of the railroad's control circuit approach distance is directly related to the amount of requested "Advanced Preemption Time" (APT). Typically, the longer the APT requirement is, the longer the approach distance, and thus the more control equipment that will be required.

Please provide the following information in order to process your request:

Date of Request: 8/18/23
Requesting Agency: Oklahoma DOT

Requested by: Ryan Leonard
Title: Freight Mobility Manager

E-mail: rleonard@odot.org
Phone: 405-965-9722

Grade Crossing Information:

State: OK
City: Norman
County: Cleveland
Crossing Street Name: Main Street
Parallel Street Name: James Garner Avenue

DOT #: 012203N
Agency District: 3
RR Subdivision: Red Rock
Mile Post: 401.77

Signalized Intersection Information:

1) Is a Crossing Active (XR) circuit being requested? ☑ Yes ☐ No

a) What is your requested circuit configuration? ☑ Single Break ☐ Double Break ☐ Supervised

b) Is this a request for simultaneous preemption? ☑ Yes ☐ No

If "Yes": What is your requested Additional Warning Time? (if needed) 0 Seconds

2) Is this request for Advance Preemption? ☐ Yes ☑ No

If "Yes": a) What is your requested Advance Preemption Time (APT)? _____ Seconds

b) What is your requested circuit configuration? ☐ Single Break ☐ Double Break ☐ Supervised

3) Is a Gate Down circuit being requested? ☐ Yes ☑ No

If "Yes": What is your requested circuit configuration? ☐ Single Break ☐ Double Break ☐ Supervised

** The purpose of the gate-down circuit is to comply with the Institute of Traffic Engineers (ITE) recommended practice to ensure that the Track Clearance Green interval remains on until gates are fully lowered to prevent a "preempt trap". Railroad will provide relay contacts for the gate down circuit.*

4) Is this request for additional time for Advance Pedestrian Preemption? ☐ Yes ☑ No

If "Yes": What is your requested additional time for Advance Pedestrian Preemption time (APPT)? _____ Seconds

** Note: The time listed above is the requested time above the requested APT time (where APT is requested).*
** Note: Double-break with supervision is not an option when using Advance Pedestrian Preemption.*
** Note: Pedestrian Detection is required when using Advance Pedestrian Preemption.*

5) Is a Traffic Signal Health circuit being requested? ☐ Yes ☑ No

** Note: A Traffic Signal Health circuit is required when requesting Advance Preemption.*

6) Indicate the interconnection wire size & number of conductors: 14 AWG 12 Conductors

Comments / Additional Info:
Crossing is downstream from traffic signal and will only require simultaneous preemption to restrict movements toward the crossing during a train event.

The above information has been completed by the undersigned representative of the public agency responsible for the traffic signal. The public agency agrees to have all work related to the preemption of the traffic signal complete and operational prior to the activation of the railroad signal system. The public agency further agrees to not change any traffic signal design or timing parameters which may affect the preemption operation without coordinating said change with Railroad.

Signature of public agency representative

Paul D'Andrea
Print or type name of public agency representative

8-18-23
Date

Please sign, scan this page, and submit electronically along with support documentation to appropriate Manager of Industry and Public Projects.