State of Nebraska - INVITATION TO BID
CONTRACT

Date	May 30, 2024	**Page**	1 of 2
Solicitation Number	6890 OF		
Opening Date and Time	June 26, 2024 2:00 pm		
Buyer	BRENDA SENSIBAUGH (AS)		

DESTINATION OF GOODS
MULTIPLE DELIVERY LOCATIONS
PLEASE REFER TO DOCUMENTATION FOR DELIVERY ADDRESSES.

Per Nebraska's Transparency in Government Procurement Act, DAS is required to collect statistical information regarding the number of contracts awarded to Nebraska contractors. This information is for statistical purposes only and will not be considered for contract award purposes.

_____NEBRASKA CONTRACTOR AFFIDAVIT: Bidder hereby attests that bidder is a Nebraska Contractor. "Nebraska Contractor" shall mean any bidder who has maintained a bona fide place of business and at least one employee within this state for at least the six (6) months immediately preceding the posting date of this ITB.

_____ I hereby certify that I am a Resident disabled veteran or business located in a designated enterprise zone in accordance with Neb. Rev. Stat. §73-107 and wish to have preference, if applicable, considered in the award of this contract.

Contract to supply and deliver Dynamic Message Signs (DMS) to the State of Nebraska as per the attached specifications for a Three (3) year period from date of award. The contract may be renewed for Two (2) additional One (1) year periods when mutually agreeable to the vendor and the State of Nebraska.

(5-2-24 bms)

INVITATION

Line	Description	Quantity	Unit of Measure	Unit Price	Extended Price
1	**DMS SIGN 89 X 347 PIXEL FULL** MATRIX LED 3 LINE 17 CHAR	**20.0000**	**EA**	$63,748	$1,247,960
2	**DMS SIGN 89 X 245 PIXEL FULL** MATRIX LED 3 LINE 12 CHAR	**30.0000**	**EA**	$51,771	$1,553,130
3	**TRAINING**	**10.0000**	**DY**	$250	$2,500

BIDDER MUST COMPLETE THE FOLLOWING

DISCOUNT PAYMENT TERMS: 2 % 20 DAYS

By signing this Invitation to Bid form, the bidder guarantees compliance with the provisions stated in this Invitation to Bid, agrees to the terms and conditions unless otherwise agreed to and certifies that bidder maintains a drug free work place environment. Vendor will furnish the items requested within 90 days after receipt of order. Failure to enter Delivery Date may cause quotation to be REJECTED.

Sign Here 6/26/2024

(Authorized Signature Mandatory – Form must be signed manually in ink or by DocuSign)

Enter Contact Information Below

VENDOR#

VENDOR: Swarco McCain Inc.

Address: 2365 Oak Ridge Way
Vista, CA 92081

Contact Justin Sigel
Telephone 760-734-5035
Email justin.sigel@swarco.com

State of Nebraska - INVITATION TO BID
CONTRACT

Date	May 30, 2024	**Page**	2 of 2
Solicitation Number	6890 OF		
Opening Date and Time	June 26, 2024 2:00 pm		
Buyer	BRENDA SENSIBAUGH (AS)		

DESTINATION OF GOODS
MULTIPLE DELIVERY LOCATIONS
PLEASE REFER TO DOCUMENTATION
FOR DELIVERY ADDRESSES.

INVITATION

Line	Description	Quantity	Unit of Measure	Unit Price	Extended Price
	OPTIONAL				
4	**EXTENDED WARRANTY** OPTIONAL	**11.0000**	**YR**	$5,000	$55,000
5	**SIGN PAINTING BACK OF SIGN** OPTIONAL	**100.0000**	**EA**	$500	50,000
6	**PARTS/CIRCUIT BOARD** CONTROL BOARD	**100.0000**	**EA**	$400	$40,000
7	**PARTS/COMM.MODEM**	**100.0000**	**EA**	$100	$10,000
8	**PARTS/RELAYS CONTROL RELAY/ALL**	**100.0000**	**EA**	$75	$7,500
9	**PARTS/PIXIL OR PIXIL MODULE,** MODULE GROUP, OR BOARD	**100.0000**	**EA**	$100	$10,000
10	**PARTS/PRESSURE FAN FORCED AIR** BLOWING DEVICE	**100.0000**	**EA**	$80	$8,000

State of Nebraska (State Purchasing Bureau)
INVITATION TO BID FOR COMMODITIES CONTRACT

INVITATION TO BID NUMBER	RELEASE DATE
ITB 6890 OF	May 30, 2024
OPENING DATE AND TIME	**PROCUREMENT CONTACT**
June 26, 2024, 2:00 p.m. Central Time	Brenda Sensibaugh

PLEASE READ CAREFULLY

SCOPE

The State of Nebraska (State), Department of Administrative Services (DAS), Materiel Division, State Purchasing Bureau (SPB), is issuing this solicitation for a commodity contract, ITB Number 6890 OF for the purpose of selecting a qualified Contractor to provide Dynamic Message Signs (DMS). A more detailed description can be found in Sections V & VI. The resulting contract may not be an exclusive contract as the State reserves the right to contract for the same or similar goods from other sources now or in the future.

The term of the contract will be three (3) years commencing upon execution of the contract by the State and the Contractor. The Contract includes the option to renew for two (2) additional one (1) year periods upon mutual agreement of the Parties. The State reserves the right to extend the period of this contract beyond the termination date when mutually agreeable to the Parties.

In the event that a contract with the awarded bidder(s) is cancelled or in the event that the State needs additional contractors to supply the solicited commodities, this ITB may be used to procure the solicited goods for up to eighteen (18) months from the date the Intent to Award is posted, provided that 1) the solicited goods will be provided by a bidder (or a successive owner) who submitted a bid pursuant to this ITB, 2) the bidder's bid was evaluated, and 3) the bidder will honor the bidder's original bid, including the proposed cost, allowing for any price increases that would have otherwise been allowed if the bidder would have received the initial award.

INFORMATION PERTINENT TO THIS INVITATION TO BID CAN BE FOUND ON THE INTERNET AT: https://das.nebraska.gov/materiel/bidopps.html

IMPORTANT NOTICE: Pursuant to Neb. Rev. Stat. § 84-602.04, State contracts in effect as of January 1, 2014, and contracts entered into thereafter must be posted to a public website. The resulting contract, the solicitation and the successful Contractor's bid or response will be posted to a public website managed by DAS, which can be found at: https://statecontracts.nebraska.gov and https://www.nebraska.gov/das/materiel/purchasing/contract_search/index.php.

In addition and in furtherance of the State's public records statute (Neb. Rev. Stat. § 84-712 et seq.) all bids or responses received regarding this solicitation will be posted to the SPB website.

These postings will include the entire bid or response. Bidders must request that proprietary information be excluded from the posting. The bidder must identify the proprietary information, mark the proprietary information according to state law, and submit the proprietary information in a separate file named conspicuously as "PROPRIETARY INFORMATION." The bidder should submit a detailed written document showing that the release of the proprietary information would give a business advantage to named business competitor(s) and explain how the named business competitor(s) will gain an actual business advantage by disclosure of information. The mere assertion that information is proprietary or that a speculative business advantage might be gained is not sufficient. (See Attorney General Opinion No. 92068, April 27, 1992). **THE BIDDER MAY NOT ASSERT THAT THE ENTIRE BID IS PROPRIETARY. COST WILL NOT BE CONSIDERED PROPRIETARY AND ARE A PUBLIC RECORD IN THE STATE OF NEBRASKA.** The State will determine, in its sole discretion, if the disclosure of the information designated by the Bidder as proprietary would 1) give advantage to business competitors and 2) serve no public purpose. The Bidder will be notified of the State's decision. Absent a determination by the State that the information may be withheld pursuant to Neb. Rev. Stat. § 84-712.05, the State will consider all information a public record subject to disclosure.

If the State determines it is required to release withheld proprietary information, the bidder will be informed. It will be the bidder's responsibility to defend the bidder's asserted interest in non-disclosure.

To facilitate public postings, with the exception of proprietary information, the State of Nebraska reserves a royalty-free, nonexclusive, and irrevocable right to copy, reproduce, publish, post to a website, or otherwise use any contract, bid, or response to this Invitation to Bid for any purpose, and to authorize others to use the documents. Any individual or entity awarded a contract, or who submits a bid or response to this Invitation to Bid, specifically waives any copyright or other protection the contract, bid, or response to the Invitation to Bid may have; and, acknowledges that they have the ability and authority to enter into such waiver. This reservation and waiver is a prerequisite for submitting a bid or response to this Invitation to Bid, and award of a contract. Failure to agree to the reservation and waiver will result in the bid or response to the Invitation to Bid being found non-responsive and rejected.

Any entity awarded a contract or submitting a bid or response to the Invitation to Bid agrees not to sue, file a claim, or make a demand of any kind, and will indemnify and hold harmless the State and its employees, volunteers, agents, and its elected and appointed officials from and against any and all claims, liens, demands, damages, liability, actions, causes of action, losses, judgments, costs, and expenses of every nature, including investigation costs and expenses, settlement costs, and attorney fees and expenses, sustained or asserted against the State, arising out of, resulting from, or attributable to the posting of the contract or the bids and responses to the Invitation to Bid, awards, and other documents.

TABLE OF CONTENTS

GLOSSARY OF TERMS

Acceptance Test Procedure: Benchmarks and other performance criteria, developed by the State or other sources of testing standards, for measuring the effectiveness of products or goods and the means used for testing such performance

Addendum: Something to be added or deleted to an existing document; a supplement

After Receipt of Order (ARO): After Receipt of Order

Agency: Using agencies shall mean and include all officers of the state, departments, bureaus, boards, commissions, councils, and institutions receiving legislative appropriations

Agent/Representative: A person authorized to act on behalf of another

Amend: To alter or change by adding, subtracting, or substituting

Amendment: A written correction or alteration to a document

Appropriation: Legislative authorization to expend public funds for a specific purpose; money set apart for a specific use

Automated Clearing House (ACH): Electronic network for financial transactions in the United States

Award: All purchases, leases, or contracts which are based on competitive bids will be awarded according to the provisions in the solicitation

Best and Final Offer (BAFO): In a competitive bid, the final offer submitted which contains contractor's most favorable terms for price

Bid: An offer, bid, or quote submitted by a contractor in a response to a written solicitation

Bid Bond: An insurance agreement, accompanied by a monetary commitment, by which a third party (the surety) accepts liability and guarantees that the contractor will not withdraw the bid

Bidder: A contractor who submits an offer bid in response to a written solicitation

Breach: Violation of a contractual obligation by failing to perform or repudiation of one's own promise

Business: Any corporation, partnership, individual, sole proprietorship, joint-stock company, joint venture, or any other private legal entity

Business Day: Any weekday, except State-recognized holidays

Calendar Day: Every day shown on the calendar including Saturdays, Sundays, and State/Federal holidays

Cancellation: To call off or revoke a bid, purchase order or contract without expectation of conducting or performing at a later time

Catalog/Non-Core: A printed or electronic list of products a contractor may provide at a discounted rate or discount off list price to the State. Initial contract award(s) is not based on Catalog/Non-Core items

Central Processing Unit (CPU): Any computer or computer system that is used by the State to store, process, or retrieve data or perform other functions using Operating Systems and applications software

Change Order: Document that provides amendments to an executed purchase order

Collusion: An agreement or cooperation between two or more persons or entities to accomplish a fraudulent, deceitful, or unlawful purpose

Commodities: Any equipment, material, supply or goods; anything movable or tangible that is provided or sold

Commodities Description: Detailed descriptions of the items to be purchased; may include information necessary to obtain the desired quality, type, color, size, shape, or special characteristics necessary to perform the work intended to produce the desired results

Competition: The effort or action of two or more commercial interests to obtain the same business from third parties

Confidential Information: Unless otherwise defined below, "Confidential Information" shall also mean proprietary trade secrets, academic and scientific research work which is in progress and unpublished, and other information which if released would give advantage to business competitors and serve no public purpose (see Neb. Rev. Stat. § 84-712.05(3)). In accordance with Nebraska Attorney General Opinions 92068 and 97033, proof that information is proprietary requires identification of specific, named competitor(s) who would be advantaged by release of the information and the specific advantage the competitor(s) would receive.

Contract: An agreement between two or more parties creating obligations that are enforceable or otherwise recognizable at law; the writing that sets forth such an agreement

Contract Administration: The management of the contract which includes and is not limited to contract signing, contract amendments and any necessary legal actions

Contract Management: The management of day to day activities at the agency which includes and is not limited to ensuring deliverables are received, specifications are met, handling meetings and making payments to the Contractor

Contract Period: The duration of the contract

Contractor: An individual or entity lawfully conducting business in the State, who seeks or agrees to provide goods or services under the terms of a written contract

Cooperative Purchasing: The combining of requirements of two or more political entities to obtain advantages of volume purchases, reduction in administrative expenses or other public benefits

Copyright: A property right in an original work of authorship fixed in any tangible medium of expression, giving the holder the exclusive right to reproduce, adapt and distribute the work

Core List: Items specifically listed on the solicitation upon which a bid is evaluated for award.

Critical Program Error: Any Program Error, whether or not known to the State, which prohibits or significantly impairs use of the Licensed Software as set forth in the documentation and intended in the contract

Customer Service: The process of ensuring customer satisfaction by providing assistance and advice on those products or goods provided by a Contractor

Default: The omission or failure to perform a contractual duty

Deviation: Any proposed change(s) or alteration(s) to either the terms and conditions or deliverables within the scope of the written solicitation or contract

Evaluation: The process of examining an offer after opening to determine the contractor's responsibility, responsiveness to requirements, and to ascertain other characteristics of the offer that relate to determination of the successful award

Evaluation Committee: Committee(s) appointed by the requesting agency that advises and assists the procuring office in the evaluation of bids (offers made in response to written solicitations)

Extension: Continuance of a contract for a specified duration upon the agreement of the parties beyond the original Contract Period; not to be confused with "Renewal Period"

Free on Board (F.O.B.) Destination: The delivery charges are included in the quoted price and prepaid by the contractor. Contractor is responsible for all claims associated with damages during delivery of product.

Free on Board (F.O.B.) Point of Origin: The delivery charges are not included in the quoted price and are the responsibility of the agency. Agency is responsible for all claims associated with damages during delivery of product

Foreign Corporation: A foreign corporation that was organized and chartered under the laws of another state, government, or country

Installation Date: The date when the procedures described in "Installation by Contractor" and "Installation by State" as found in the solicitation or contract are completed

Interested Party: A person acting in their personal capacity or an entity entering into a contract or other agreement creating a legal interest therein

Invalid Bid: A bid that does not meet the requirements of the solicitation or cannot be evaluated against the other bids

Invitation to Bid (ITB): A written solicitation used for obtaining competitive offers for Services or Goods

Late Bid: An offer received after the Opening Date and Time

Licensed Software Documentation: The user manuals and any other materials in any form or medium customarily provided by the Contractor to the users of the Licensed Software which will provide the State with sufficient information to operate, diagnose, and maintain the Licensed Software properly, safely, and efficiently

Mandatory/Must: Required, compulsory, or obligatory

May: Discretionary, permitted; used to express possibility

Module (see System): A collection of routines and data structures that perform a specific function of software

Must: See Mandatory/Must and Shall/Will/Must

National Institute for Governmental Purchasing (NIGP): National Institute of Governmental Purchasing – Source used for assignment of universal commodity codes to goods and services

Non-core: See Catalog

Nonnegotiable: These clauses are controlled by state law and are not subject to negotiation

Open Market Purchase: Authorization may be given to an agency to purchase items above direct purchase authority due to the unique nature, price, quantity, location of the using agency, or time limitations by the AS Materiel Division, State Purchasing Bureau

Opening Date and Time: Specified date and time for the public opening of received, labeled, and sealed formal bids

Operating System: The control program in a computer that provides the interface to the computer hardware and peripheral devices, and the usage and allocation of memory resources, processor resources, input/output resources, and security resources

Outsourcing: The contracting out of a business process that an organization may have previously performed internally or for which an organization has a new need to an independent organization from which the process is purchased back

Payroll & Financial Center (PFC): Electronic procurement system of record

Performance Bond: An insurance agreement accompanied by a monetary commitment by which a third party (the surety) accepts liability and guarantees that the Contractor fulfills any and all obligations under the contract

Platform: A specific hardware and Operating System combination that is different from other hardware and Operating System combinations to the extent that a different version of the Licensed Software product is required to execute properly in the environment established by such hardware and Operating System combination

Point of Contact (POC): The person designated to receive communications and to communicate

Pre-Bid Conference: A meeting scheduled for the purpose of clarifying a written solicitation and related expectations

Product: Something that is distributed commercially for use or consumption and that is usually (1) tangible personal property, (2) the result of fabrication or processing, and (3) an item that has passed through a chain of commercial distribution before ultimate use or consumption

Program Error: Code in Licensed Software that produces unintended results or actions or that produces results or actions other than those described in the specifications. A program error includes, without limitation, any Critical Program Error.

Program Set: The group of programs and products, including the Licensed Software specified in the solicitation, plus any additional programs and products licensed by the State under the contract for use by the State

Project: The total scheme, program, or method worked out for the accomplishment of an objective, including all documentation, commodities, and goods to be provided under the contract

Proprietary Information: Trade secrets, academic and scientific research work that is in progress and unpublished or other information that if released would give advantage to business competitors and service no public purpose. See Neb. Rev. Stat. § 84-712.05(3). In accordance with Attorney General Opinions 92068 and 97033, proof that information is proprietary requires identification of specific named competitor(s) advantaged by release of the information and the demonstrated advantage the named competitor(s) would gain by the release of information.

Protest/Grievance: A complaint about a governmental action or decision related to the solicitation or resultant contract, brought by a contractor who has timely submitted a bid response in connection with the award in question to AS Materiel Division or another designated agency with the intention of achieving a remedial result

Public Bid Opening: The process of opening correctly submitted offers at the time and place specified in the written solicitation and in the presence of anyone who wished to attend

Quote: See Bid

Recommended Hardware Configuration: The data processing hardware (including all terminals, auxiliary storage, communication, and other peripheral devices) to the extent used by the State as recommended by the Contractor

Release Date: The date of public release of the written solicitation to seek offers

Renewal Period: Optional contract periods subsequent to the original Contract Period for a specified duration with previously agreed to terms and conditions; not to be confused with “Extension”

Responsible Contractor: A Contractor who has the capability in all respects to perform fully and lawfully all requirements with integrity and reliability to assure good faith performance

Responsive Contractor: A Contractor who has submitted a bid which conforms to all requirements of the solicitation document

Shall: See Must

Should: Expected; suggested, but not necessarily mandatory

Software License: Legal instrument with or without printed material that governs the use or redistribution of licensed software

Sole Source – Commodity: When an item is available from only one source due to the unique nature of the requirement, its contractor, or market conditions

Sole Source – Service: A service of such a unique nature that the contractor selected is clearly and justifiably the only practical source to provide the service. Determination that the contractor selected is justifiably the sole source is based on either the uniqueness of the service or sole availability at the location required

Specifications: The detailed statement, especially of the measurements, quality, materials, and functional characteristics, or other items to be provided under a contract

Subcontractor: Individual or entity with whom the contractor enters a contract to perform a portion of the work awarded to the contractor

System (see Module): Any collection or aggregation of two (2) or more Modules that is designed to function, or is represented by the Contractor as functioning or being capable of functioning, as an entity

Termination: Occurs when the contract expires or either party, pursuant to a power created by agreement or law, puts an end to the contract prior to the stated expiration date; all obligations that are still executory on both sides are discharged but any right based on prior breach or performance survives

Third-Party: Any person or entity, including but not limited to fiduciaries, shareholders, owners, officers, managers, employees, legally disinterested persons, and subcontractors or agents, and their employees. It shall not include any entity or person who is an interested party to the contract or agreement

Trade Secret: Information, including but not limited to, a drawing, formula, pattern, compilation, program, device, method, technique, code, or process that (a) derives independent economic value, actual or potential, from not being known to, and not being ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use; and (b) is the subject of efforts that are reasonable under the circumstances to maintain its secrecy (see Neb. Rev. Stat. § 87-502(4))

Trademark: A word, phrase, logo, or other graphic symbol used by a manufacturer or contractor to distinguish its product from those of others, registered with the U.S. Patent and Trademark Office

Upgrade: Any change that improves or alters the basic function of a product of service

Vendor: Inclusive term for any Bidder or Contractor.

Will: See Mandatory/Must/Shall

Work Day: See Business Day

ACRONYM LIST

ARO – After Receipt of Order

ACH – Automated Clearing House

ASN – Abstract Syntax Notation

AWS – American Welding Society

BAFO – Best and Final Offer

CDMA – Code-Division Multiple Access

COI – Certificate of Insurance

CPU – Central Processing Unit

DAS – Department of Administrative Services

DMS – Dynamic Message Signs

F.O.B. – Free on Board

GSM – Global System for Mobile Communication

ICT – Information and Communication Technology

ITB – Invitation to Bid

KBPS – Kilobits per Second

MIB – Management Information Base

NTCIP – National Transportation Communications for ITS (Intelligent Transportation Protocol)

NIGP – National Institute for Governmental Purchasing

NDOT - Nebraska Department of Transportation

NEMA – National Electrical Manufacturers Association

PA – Participating Addendum

POC – Point of Contact

PMPP – Point to Multi Point Protocol

PPP – Point to Point Protocol

SPB – State Purchasing Bureau

I. PROCUREMENT PROCEDURE

A. GENERAL INFORMATION

This Invitation to Bid is designed to solicit bids from qualified Contractors who will be responsible for providing Dynamic Message Signs (DMS) at a competitive and reasonable cost. Terms and Conditions, Project Description and Scope of Work, Bid instructions, and Cost Bid Requirements may be found in Sections II through VI.

Bids shall conform to all instructions, conditions, and requirements included in the solicitation. Prospective Contractors are expected to carefully examine all documents, schedules, and requirements in this solicitation, and respond to each requirement in the format prescribed. Bids may be found non-responsive if they do not conform to the solicitation.

B. PROCURING OFFICE AND COMMUNICATION WITH STATE STAFF AND EVALUATORS

Procurement responsibilities related to this solicitation reside with SPB. The point of contact (POC) for the procurement is as follows:

ITB Number:	6890 OF
Name:	Brenda Sensibaugh, Procurement Contract Officer(s)
Agency:	State Purchasing Bureau
Address:	1526 K Street, Suite 130
	Lincoln, NE 68508
Telephone:	402-471-6500
E-Mail:	as.materielpurchasing@nebraska.gov

From the date the solicitation is issued until the Intent to Award is issued, communication from the Contractor is limited to the POC listed above. After the Intent to Award is issued, the Contractor may communicate with individuals the State has designated as responsible for negotiating the contract on behalf of the State. No member of the State Government, employee of the State, or member of the Evaluation Committee is empowered to make binding statements regarding this solicitation. The POC will issue any answers, clarifications or amendments regarding this solicitation in writing. Only the SPB or awarding agency can award a contract. Contractors shall not have any communication with, or attempt to communicate or influence any evaluator involved in this solicitation.

The following exceptions to these restrictions are permitted:

1. Contact made pursuant to pre-existing contracts or obligations;
2. Contact required by the schedule of events or an event scheduled later by POC; and
3. Contact required for negotiation and execution of the final contract.

The State reserves the right to reject a contractor's bid, withdraw an Intent to Award, or terminate a contract if the State determines there has been a violation of these procurement procedures.

C. SCHEDULE OF EVENTS

The State expects to adhere to the procurement schedule shown below, but all dates are approximate and subject to change.

ACTIVITY		DATE/TIME
1.	Release solicitation	May 30 2024
2.	Last day to submit written questions **Upload questions for 6890 OF via ShareFile to:** https://nebraska.sharefile.com/r-rf910692426e14ff2986279ecc4bb1340	June 10, 2024
3.	State responds to written questions through a solicitation "Addendum" and/or "Amendment" to be posted to the Internet at: https://das.nebraska.gov/materiel/bidopps.html	June 14, 2024
4.	Electronic Bid Opening via Zoom Meeting Join Zoom Meeting https://us02web.zoom.us/j/2629176739?pwd=NkhobXNpOU94UmFmTG1wYmJqTXhpUT09 Meeting ID: 262 917 6739 Passcode: 5VwBuR **Upload electronic Bid submissions for** 6890 **OF via ShareFile to:** https://nebraska.sharefile.com/r-rfc45e471147040fea4b50c9371db1bc1	June 26 , 2024 2:00 PM Central Time
6	Post "Notification of Intent to Award" to Internet at: http://das.nebraska.gov/materiel/purchasing.html	TBD

D. WRITTEN QUESTIONS AND ANSWERS

Questions regarding the meaning or interpretation of any solicitation provision must be submitted in writing to SPB and clearly marked "ITB Number 6890 OF; Dynamic Message Signs (DMS) questions". POC is not obligated to respond to questions that are received late per the Schedule of Events.

Contractors should present, as questions, any assumptions upon which the Contractor's bid is or might be developed. Bids will be evaluated without consideration of any known or unknown assumptions of a Contractor. The contract will not incorporate any known or unknown assumptions of a Contractor.

Questions should be uploaded using the ShareFile link provided in the ITB Schedule of Events, Section I.C. It is recommended that Contractors submit questions using the following format.

Solicitation Section Reference	Solicitation Page Number	Question

Written answers will be posted at https://das.nebraska.gov/materiel/bidopps.html per the Schedule of Events.

E. RECYCLING (§ 81-15,159(d)(2))

Preference will be given to items that are manufactured or produced from recycled material or that can be readily reused or recycled after their normal use. Preference will also be given to purchases of corn-based biodegradable plastics and road deicers if available and suitable. No preference shall be given if such preference would result in the purchase of products, materials, or supplies that are of inadequate quality or of substantially higher cost.

F. SECRETARY OF STATE/TAX COMMISSIONER REGISTRATION REQUIREMENTS (Nonnegotiable)

All Contractors must be authorized to transact business in the State and comply with all Nebraska Secretary of State Registration requirements. The Contractor who is the recipient of an Intent to Award will be required to certify that it has complied and produce a true and correct copy of its current (within ninety (90) calendar days of the intent to award) Certificate or Letter of Good Standing, or in the case of a sole proprietorship, provide written documentation of sole proprietorship and the United States Citizenship Attestation Form, available on the DAS website at: http://das.nebraska.gov/materiel/purchasing.html. This must be accomplished prior to execution of the contract.

G. ETHICS IN PUBLIC CONTRACTING

The State reserves the right to reject bids, withdraw an intent to award or award, or terminate a contract if a Contractor commits or has committed ethical violations, which include, but are not limited to:

1. Offering or giving, directly or indirectly, a bribe, fee, commission, compensation, gift, gratuity, or anything of value to any person or entity in an attempt to influence the bidding process;
2. Using the services of lobbyists, attorneys, political activists, or consultants to influence or subvert the bidding process;
3. Being considered for, presently being, or becoming debarred, suspended, ineligible, or excluded from contracting with any state or federal entity:
4. Submitting a bid on behalf of another party or entity;
5. Colluding with any person or entity to influence the bidding process, submit sham bids, preclude bidding, fix pricing or costs, create an unfair advantage, subvert the bid, or prejudice the State.

The Contractor shall include this clause in any subcontract entered into for the exclusive purpose of performing this contract.

Contractor shall report any violations of this clause throughout the bidding process and throughout the term of this contract for both the successful Contractor and its subcontractors.

H. DEVIATIONS FROM THE INVITATION TO BID

The requirements contained in the solicitation (Sections II through VI) become a part of the terms and conditions of the contract resulting from this solicitation. Any deviations from the solicitation in Sections II through VI must be clearly defined by the bidder in its bid and, if accepted by the State, will become part of the contract. Any specifically defined deviations must not be in conflict with the basic nature of the solicitation, solicitation requirements, or applicable state or federal laws or statutes. The State discourages deviations and reserves the right to reject proposed deviations.

I. SUBMISSION OF BIDS

The State is only accepting electronic responses submitted in accordance with this ITB. The State will not accept bids by mail, email, voice, or telephone, unless otherwise explicitly stated in writing by the State. Bids must be submitted via ShareFile by the date and time of the bid opening per the Schedule of Events. No late bids will be accepted.

Pages may be consecutively numbered for the entire bid or may be numbered consecutively within sections. Figures and tables should be numbered and referenced in the text by that number. They should be placed as close as possible to the referencing text.

It is the responsibility of the bidder to check the website for all information relevant to this ITB to include addenda and/or amendments issued prior to the opening date. The website can be found here: https://das.nebraska.gov/materiel/bidopps.html. If the bidder's bid is presented in such a fashion that makes evaluation difficult or overly time consuming the State reserves the right to reject the bid as non-conforming.

Note to bidders: Not all browsers are compatible with ShareFile. Currently Chrome, Internet Explorer and Firefox are compatible. After the bidder clicks the bid submission link, the bidder will be prompted to enter contact information including an e-mail address. By entering an e-mail address, the bidder should receive a confirmation email confirming the successful upload directly from ShareFile.

The ShareFile link for uploading ITB response(s) is provided in the ITB Schedule of Events, Section I.C.

*****UNLESS OTHERWISE NOTED, DO NOT SUBMIT DOCUMENTS THAT CAN ONLY BE ACCESSED WITH A PASSWORD*****

1. The Bid and Proprietary information should be uploaded as separate and distinct files.
   - **a.** If duplicated bids are submitted, the State will retain only the most recently submitted response.
   - **b.** If it is the bidder's intent to submit multiple bids, the bidder must clearly identify the separate submissions.
   - **c.** It is the bidder's responsibility to allow time for electronic uploading. All file uploads must be completed by the Opening date and time per the Schedule of Events. No late bids will be accepted.

2. ELECTRONIC BID FILE NAMES The bidder should clearly identify the uploaded ITB bid files. To assist in identification the bidder should use the following naming convention:
   - **a.** 65890 OF, Dynamic Message Signs (DMS) NAME OF BIDDER Bid
   - **b.** If multiple files are submitted for one bid, add number of files to file names, e.g.,
     - **i.** 6590 OF, Dynamic Message Signs (DMS) NAME OF BIDDER Bid File 1 of 2;
     - **ii.** 6890 OF, Dynamic Message Signs (DMS) NAME OF BIDDER Bid File 2 of 2, etc.

The “Invitation to Bid for Commodities Contract” form must be signed manually in ink or by DocuSign and returned by the bid opening date and time along with the bidder’s bid and any other requirements as stated in the Invitation to Bid document in order for the bidder’s Invitation to Bid response to be evaluated.

By signing the “Invitation to Bid for Commodities Contract” form, the bidder guarantees compliance with the provisions stated in this Invitation to Bid.

J. BID PREPARATION COSTS

The State shall not incur any liability for any costs incurred by Contractors in replying to this solicitation, including any activity related to bidding on this solicitation.

K. FAILURE TO COMPLY WITH INVITATION TO BID

Violation of the terms and conditions contained in this solicitation or any resultant contract, at any time before or after the award, shall be grounds for action by the State which may include, but is not limited to, the following:

1. Rejection of a Contractor’s bid;
2. Withdrawal of the Intent to Award;
3. Withdrawal of the Award;
4. Negative documentation regarding vendor performance;
5. Termination of the resulting contract;
6. Legal action; or,
7. Suspension of the Contractor from further bidding with the State for the period of time relative to the seriousness of the violation, such period to be within the sole discretion of the State.

L. BID CORRECTIONS

A contractor may correct a mistake in a bid prior to the time of opening by giving written notice to the State of intent to withdraw the bid for modification or to withdraw the bid completely. Changing a bid after opening may be permitted if the change is made to correct a minor error that does not affect price, quantity, quality, delivery, or contractual conditions. In case of a mathematical error in extension of price, unit price shall govern.

M. LATE BIDS

Bids received after the time and date of the bid opening will be considered late bids. Late bids will be returned unopened, if requested by the Contractor and at Contractor's expense. The State is not responsible for bids that are late or lost regardless of cause or fault.

N. BID OPENING

Anyone may attend the opening. It is considered a public opening. The Buyer will read the names of the respondents. Depending upon the complexity of the bid for goods, the Buyer may read the bids aloud or allow bids be available for viewing by the public during the bid opening. Once the bid opening has concluded, the bids will not be available for viewing until the Intent to Award has been posted. An initial bid tabulation will be posted to the website as soon as feasible. Information identified as proprietary by the submitting contractor, in accordance with the solicitation and state statute, will not be posted. If the state determines submitted information should not be withheld, in accordance with the Public Records Act, or if ordered to release any withheld information, said information may then be released. The submitting contractor will be notified of the release and it shall be the obligation of the submitting contractor to take further action, if it believes the information should not be released.

O. INVITATION TO BID REQUIREMENTS

The bids will first be examined to determine if all requirements listed below have been addressed and whether further evaluation is warranted. Bids not meeting the requirements may be rejected as non-responsive. The requirements are as follows:

1. Original Commodity ITB form signed using an indelible method (electronic signatures approved by the Nebraska Secretary of State are acceptable);
2. Clarity and responsiveness of the bid;
3. Completed Sections II through VI;
4. State’s Bid Sheet.

P. EVALUATION OF BIDS

All bids that are responsive to the solicitation will be evaluated based on the following:

1. Neb. Rev. Stat. § 81-161 allows the State to consider a variety of factors, including, but not limited to, the quality of performance of previous contracts to be considered when evaluating responses to competitively bid solicitations in determining the lowest responsible bidder. Information obtained from any Vendor Performance Notice or any Vendor Improvement Request (See Terms & Conditions, Section H) may be used in evaluating responses to solicitations for goods and services to determine the best value for the State.

2. Neb. Rev. Stat. § 73-107 allows for a preference for a resident disabled veteran or business located in a designated enterprise zone. When a state contract is to be awarded to the lowest responsible contractor, a resident disabled veteran or a business located in a designated enterprise zone under the Enterprise Zone Act shall be allowed a preference over any other resident or nonresident contractor, if all other factors are equal.

Resident disabled veterans means any person (a) who resides in the State of Nebraska, who served in the United States Armed Forces, including any reserve component or the National Guard, who was discharged or otherwise separated with a characterization of honorable or general (under honorable conditions), and who possesses a disability rating letter issued by the United States Department of Veterans Affairs establishing a service-connected disability or a disability determination from the United States Department of Defense and (b)(i) who owns and controls a business or, in the case of a publicly owned business, more than fifty percent of the stock is owned by one or more persons described in subdivision (a) of this subsection and (ii) the management and daily business operations of the business are controlled by one or more persons described in subdivision(a) of this subsection. Any contract entered into without compliance with this section shall be null and void.

Therefore, if a resident disabled veteran or business located in a designated enterprise zone submits a bid in accordance with Neb. Rev. Stat. § 73-107 and has so indicated on the ITB cover page under "Contractor must complete the following" requesting priority/preference to be considered in the award of this contract, the following will need to be submitted by the contractor within ten (10) business days of request:

a. Documentation from the United States Armed Forces confirming service;
b. Documentation of discharge or otherwise separated characterization of honorable or general (under honorable conditions);
c. Disability rating letter issued by the United States Department of Veterans Affairs establishing a service-connected disability or a disability determination from the United States Department of Defense; and
d. Documentation which shows ownership and control of a business or, in the case of a publicly owned business, more than fifty percent of the stock is owned by one or more persons described in subdivision (a) of this subsection; and the management and daily business operations of the business are controlled by one or more persons described in subdivision (a) of this subsection.

Failure to submit the requested documentation within ten (10) business days of notice will disqualify the contractor from consideration of the preference.

Q. ORAL INTERVIEWS/PRESENTATIONS AND/OR DEMONSTRATIONS

The State may determine that oral interviews/presentations and/or demonstrations are required. Every contractor may not be given an opportunity to interview/present and/or give demonstrations; the State reserves the right, in its discretion, to select contractors to present/give oral interviews. The evaluations from the oral interviews/presentations and/or demonstrations will be combined with the previous evaluations if there were previous evaluations. The presentation process will allow the contractors to demonstrate their bid offering, explaining and/or clarifying any unusual or significant elements related to their bids. Contractors' key personnel, identified in their bid, may be requested to participate in a structured interview to determine their understanding of the requirements of this bid, their authority and reporting relationships within their firm, and their management style and philosophy. Only representatives of the State and the presenting contractor will be permitted to attend the oral interviews/presentations and/or demonstrations. A written copy or summary of the presentation, and demonstrative information (such as briefing charts, etc.) may be offered by the contractor, but the State reserves the right to refuse or not consider the offered materials. Contractors shall not be allowed to alter or amend their bids.

Once the oral interviews/presentations and/or demonstrations have been completed, the State reserves the right to make an award without any further discussion with the contractors regarding the bids received.

Any cost incidental to the oral interviews/presentations and/or demonstrations shall be borne entirely by the contractor and will not be compensated by the State.

R. BEST AND FINAL OFFER

If best and final offers (BAFO) are requested by the State and submitted by the contractor, they will be evaluated (using the stated BAFO criteria) and ranked by the Evaluation Committee. The State reserves the right to conduct

more than one BAFO. The award will then be granted to the lowest responsible contractor. However, a contractor should provide its best offer in its original bid. Contractors should not expect that the State will request a BAFO.

S. REFERENCE AND CREDIT CHECKS

The State reserves the right to conduct and consider reference and credit checks. The State reserves the right to use third parties to conduct reference and credit checks. By submitting a bid in response to this solicitation, the contractor grants to the State the right to contact or arrange a visit in person with any or all of the contractor's clients. Reference and credit checks may be grounds to reject a bid, withdraw an intent to award, or rescind the award of a contract.

T. AWARD

The State reserves the right to evaluate bids and award contracts in a manner using criteria selected at the State's discretion and in the State's best interest. After evaluation of the bids, or at any point in the solicitation process, the State of Nebraska may take one or more of the following actions:

1. Amend the solicitation;
2. Extend the time of or establish a new bid opening time;
3. Waive deviations or errors in the State's solicitation process and in contractor bids that are not material, do not compromise the solicitation process or a contractor's bid, and do not improve a contractor's competitive position;
4. Accept or reject a portion of or all of a bid;
5. Accept or reject all bids;
6. Withdraw the solicitation;
7. Elect to rebid the solicitation;
8. Award single lines or multiple lines to one or more contractors; or,
9. Award one or more all-inclusive contracts.

The State of Nebraska may consider, but is not limited to considering, one or more of the following award criteria:

1. Price;
2. Location;
3. Quality;
4. Delivery time;
5. Contractor qualifications and capabilities;
6. State contract management requirements and/or costs; and,

The solicitation does not commit the State to award a contract. Once intent to award decision has been determined, it will be posted to the internet at: https://das.nebraska.gov/materiel/bidopps.html

Any protests must be filed by a contractor within ten (10) business days after the intent to award decision is posted to the internet. Grievance and protest procedure is available on the internet at: https://das.nebraska.gov/materiel/docs/pdf/ProtestGrievanceWithGuidance_08042021.pdf

U. SPECIFICATIONS

Any manufacturer's names, trade names, brand names, information and/or catalog numbers listed in a specification are for reference and not intended to limit competition, but will be used as the standard by which equivalent material offered will be judged. The Materiel Administrator or his or her designee will be the sole judge of equivalency. The Contractor may offer any brands which meets or exceeds the specification. When a specific product is required, the solicitation will so state. Any item bid is to be the latest current model under standard production at the time of order. No used or refurbished equipment will be accepted, unless otherwise stated.

V. SAMPLES

When requested, samples should be furnished at the Contractor's expense prior to the opening of the bid, unless another time is specified. Each sample should be labeled clearly, and identify the Contractor's name, the ITB number, item number, and the brand and model number, if applicable. Samples submitted must be the commodities or equipment which would be delivered if awarded the bid. The State reserves the right to request samples even though this may not have been set forth in the solicitation. Samples may be destroyed in testing. If a sample is not destroyed in testing and a Contractor wishes to have the sample returned, it will be returned at the Contractor's expense upon request. The sample will not be returned until thirty (30) calendar days after any bid protest or, the execution of a contract. The Contractor shall have ten (10) calendar days to arrange for the return of the sample to the Contractor following any of the above dates. If no request from the Contractor is received within the above dates, the State reserves the right to use, donate, or surplus the samples in accordance with the State's policies.

W. ALTERNATE/EQUIVALENT BIDS

Contractor may offer bids which are at variance from the express specifications of the solicitation. The State reserves the right to consider and accept such bids if, in the judgment of SPB, the bid will result in goods and/or services equivalent to or better than those which would be supplied in the original bid specifications. Contractor must indicate on the solicitation the manufacturer's name, number and shall submit with their bid, sketches, descriptive literature and/or complete specifications. Reference to literature submitted with a previous bid will not satisfy this provision. Bids which do not comply with these requirements are subject to rejection. In the absence of any stated deviation or exception, the bid will be accepted as in strict compliance with all terms, conditions and specification, and the Contractor shall be held liable therefore.

X. LUMP SUM OR "ALL OR NONE" BIDS

The State reserves the right to purchase item-by-item, by groups or as a total when the State may benefit by so doing. Contractors may submit a bid on an "all or none" or "lump sum" basis, but should also submit a bid on an item-by-item basis. The term "all or none" means a conditional bid which requires the purchase of all items on which bids are offered and bidder declines to accept award on individual items; a "lump sum" bid is one in which the bidder offers a lower price than the sum of the individual bids if all items are purchased, but agrees to deliver individual items at the prices quoted.

"LUMP SUM" OR "ALL OR NONE" BIDS SHOULD BE CONSPICUOUSLY MARKED ON THE FIRST PAGE OF THE ITB AND BID SHEET (IF APPLICABLE)

Y. ALTERNATIVE SUBMISSION METHODS PROHIBITED

SPB will not accept bids by mail, email, voice, or telephone bid **except** for one-time purchases under $50,000.00.

Z. BID TABULATIONS

Bid tabulations are available on the website at: https://das.nebraska.gov/materiel/bidopps.html.

AA. REJECTION OF BIDS

The State reserves the right to reject any or all bids, wholly or in part, in the best interest of the State.

BB. RESIDENT BIDDER

Pursuant to Neb. Rev. Stat. §§ 73-101.01 through 73-101.02, a resident bidder shall be allowed a preference against a non-resident bidder from a state which gives or requires a preference to bidders from that state. The preference shall be equal to the preference given or required by the state of the nonresident bidders. Where the lowest responsible bid from a resident bidder is equal in all respects to one from a nonresident bidder from a state which has no preference law, the resident bidder shall be awarded the contract. The provision of this preference shall not apply to any contract for any project upon which federal funds would be withheld because of the provisions of this preference.

II. TERMS AND CONDITIONS

By signing the solicitation, Contractor agrees to be legally bound by all the accepted terms and conditions as well as any proposed alternative terms and conditions submitted with the bid. The State reserves the right to negotiate rejected or proposed alternative language. If the State and Contractor fail to agree on the final Terms and Conditions, the State reserves the right to reject the bid. The State is soliciting bids in response to the solicitation. The State reserves the right to reject bids that attempt to substitute the Contractor's commercial contracts and/or documents for this solicitation.

The Contractor should submit with their bid any license, user agreement, service level agreement, or similar documents that the Contractor wants incorporated in the Contract. Upon notice of Intent to Award, the Contractor must submit a copy of these documents in an editable Word format. The State will not consider incorporation of any document not submitted with the Contractor's bid. These documents shall be subject to negotiation and will be incorporated as addendums if agreed to by the Parties.

If a conflict or ambiguity arises after the addendums have been negotiated and agreed to, the addendums shall be interpreted as follows:

1. If only one (1) Party's document has a particular clause then that clause shall control;
2. If both Party's documents have a similar clause, but the clauses do not conflict, the clauses shall be read together;
3. If both Party's documents have a similar clause, but the clauses conflict, the State's clause shall control.

A. GENERAL

The contract resulting from this solicitation shall incorporate the following documents:

1. Invitation to Bid and Addenda;
2. Amendments to the solicitation;
3. Questions and Answers;
4. Contractor's bid response;
5. The executed Contract and any Addenda, if applicable, and properly submitted documents; and,
6. Amendments to the Contract

These documents constitute the entirety of the contract.

Unless otherwise specifically stated in a future contract amendment, in case of any conflict between the incorporated documents, the documents shall govern in the following order of preference with number one (1) receiving preference over all other documents and with each lower numbered document having preference over any higher numbered document: 1) Amendment to the executed Contract with the most recent dated amendment having the highest priority, 2) executed Contract and any attached Addenda, 3) Amendments to solicitation and any Questions and Answers, 4) the original solicitation document and any Addenda, and 5) the Contractor's submitted Bid.

Any ambiguity or conflict in the contract discovered after its execution, not otherwise addressed herein, shall be resolved in accordance with the rules of contract interpretation as established in the State.

B. NOTIFICATION

Contractor and State shall identify the contract manager who shall serve as the point of contact for the executed contract.

Communications regarding the executed contract shall be in writing and shall be deemed to have been given if delivered personally; electronically, return receipt requested; or mailed, return receipt requested. All notices, requests, or communications shall be deemed effective upon receipt. Either Party may change its address for notification purposes by giving notice of the change, and setting forth the new address and an effective date.

C. NOTICE (POC)

The State reserves the right to appoint a Buyer's Representative to manage [or assist the Buyer in managing] the contract on behalf of the State. The Buyer's Representative will be appointed in writing, and the appointment document will specify the extent of the Buyer's Representative authority and responsibilities. If a Buyer's Representative is appointed, the Contractor will be provided a copy of the appointment document and is expected to cooperate accordingly with the Buyer's Representative. The Buyer's Representative has no authority to bind the State to a contract, amendment, addendum, or other change or addition to the contract.

D. GOVERNING LAW (Nonnegotiable)

Notwithstanding any other provision of this contract, or any amendment or addendum(s) entered into contemporaneously or at a later time, the parties understand and agree that, (1) the State of Nebraska is a sovereign state and its authority to contract is therefore subject to limitation by the State's Constitution, statutes, common law, and regulation; (2) this contract will be interpreted and enforced under the laws of the State of Nebraska; (3) any

action to enforce the provisions of this contract must be brought in the State of Nebraska per state law; (4) the person signing this contract on behalf of the State of Nebraska does not have the authority to waive the State's sovereign immunity, statutes, common law, or regulations; (5) the indemnity, limitation of liability, remedy, and other similar provisions of the final contract, if any, are entered into subject to the State's Constitution, statutes, common law, regulations, and sovereign immunity; and, (6) all terms and conditions of the final contract, including but not limited to the clauses concerning third-party use, licenses, warranties, limitations of liability, governing law and venue, usage verification, indemnity, liability, remedy or other similar provisions of the final contract are entered into specifically subject to the State's Constitution, statutes, common law, regulations, and sovereign immunity.

The Parties must comply with all applicable local, state and federal laws, ordinances, rules, orders, and regulations.

E. BEGINNING OF WORK

The Contractor shall not commence any billable work until a valid contract has been fully executed by the State and the successful Contractor. The Contractor will be notified in writing when work may begin.

F. AMENDMENT

This Contract may be amended in writing, within scope, upon the agreement of both parties.

G. CHANGE ORDERS OR SUBSTITUTIONS

The State and the Contractor, upon the written agreement, may make changes to the contract within the general scope of the solicitation. Changes may involve specifications, the quantity of work, or such other items as the State may find necessary or desirable. Corrections of any deliverable, service, or work required pursuant to the contract shall not be deemed a change. The Contractor may not claim forfeiture of the contract by reasons of such changes.

The Contractor shall prepare a written description of the work required due to the change and an itemized cost sheet for the change. Changes in work and the amount of compensation to be paid to the Contractor shall be determined in accordance with applicable unit prices if any, a pro-rated value, or through negotiations. The State shall not incur a price increase for changes that should have been included in the Contractor's bid, were foreseeable, or result from difficulties with or failure of the Contractor's bid or performance.

No change shall be implemented by the Contractor until approved by the State, and the Contract is amended to reflect the change and associated costs, if any. If there is a dispute regarding the cost, but both parties agree that immediate implementation is necessary, the change may be implemented, and cost negotiations may continue with both Parties retaining all remedies under the contract and law.

In the event any product is discontinued or replaced upon mutual consent during the contract period or prior to delivery, the State reserves the right to amend the contract or purchase order to include the alternate product at the same price.

*****Contractor will not substitute any item that has been awarded without prior written approval of SPB*****

H. RECORD OF VENDOR PERFORMANCE

The State may document the vendor's performance, which may include, but is not limited to, the customer service provided by the vendor, the ability of the vendor, the skill of the vendor, and any instance(s) of products or services delivered or performed which fail to meet the terms of the purchase order, contract, and/or Invitation to Bid specifications. In addition to other remedies and options available to the State, the State may issue one or more notices to the vendor outlining any issues the State has regarding the vendor's performance for a specific contract ("Vendor Performance Notice"). The State may also document the Vendor's performance in a report, which may or may not be provided to the vendor ("Vendor Improvement Request"). The Vendor shall respond to any Vendor Performance Notice or Vendor Improvement Request in accordance with such notice or request. At the sole discretion of the State, such Vendor Performance Notices and Vendor Improvement Requests may be placed in the State's records regarding the vendor and may be considered by the State and held against the vendor in any future contract or award opportunity.

I. NOTICE OF POTENTIAL CONTRACTOR BREACH

If Contractor breaches the contract or anticipates breaching the contract, the Contractor shall immediately give written notice to the State. The notice shall explain the breach or potential breach, a proposed cure, and may include a request for a waiver of the breach if so desired. The State may, in its discretion, temporarily or permanently waive the breach. By granting a waiver, the State does not forfeit any rights or remedies to which the State is entitled by law or equity, or pursuant to the provisions of the contract. Failure to give immediate notice, however, may be grounds for denial of any request for a waiver of a breach.

J. BREACH

Either Party may terminate the contract, in whole or in part, if the other Party breaches its duty to perform its obligations under the contract in a timely and proper manner. Termination requires written notice of default and a thirty (30) calendar day (or longer at the non-breaching Party's discretion considering the gravity and nature of the default) cure period. Said notice shall be delivered by email, read-receipt requested; Certified Mail, Return Receipt Requested; or in person with proof of delivery. Allowing time to cure a failure or breach of contract does not waive the right to immediately terminate the contract for the same or different contract breach which may occur at a different time.

In case of breach by the Contractor, the State may, without unreasonable delay, make a good faith effort to make a reasonable purchase or contract to purchased goods in substitution of those due from the contractor. The State may recover from the Contractor as damages the difference between the costs of covering the breach. Notwithstanding any clause to the contrary, the State may also recover the contract price together with any incidental or consequential damages defined in UCC Section 2-715, but less expenses saved in consequence of Contractor's breach. OR In case of default of the Contractor, the State may contract the service from other sources and hold the Contractor responsible for any excess cost occasioned thereby.

The State's failure to make payment shall not be a breach, and the Contractor shall retain all available statutory remedies. (See Indemnity - Self-Insurance and Payment)

K. NON-WAIVER OF BREACH

The acceptance of late performance with or without objection or reservation by a Party shall not waive any rights of the Party nor constitute a waiver of the requirement of timely performance of any obligations remaining to be performed.

L. SEVERABILITY

If any term or condition of the contract is declared by a court of competent jurisdiction to be illegal or in conflict with any law, the validity of the remaining terms and conditions shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if the contract did not contain the provision held to be invalid or illegal.

M. INDEMNIFICATION

1. GENERAL

The Contractor agrees to defend, indemnify, and hold harmless the State and its employees, volunteers, agents, and its elected and appointed officials ("the indemnified parties") from and against any and all claims, liens, demands, damages, liability, actions, causes of action, losses, judgments, costs, and expenses of every nature, including investigation costs and expenses, settlement costs, and attorney fees and expenses ("the claims"), sustained or asserted against the State for personal injury, death, or property loss or damage, arising out of, resulting from, or attributable to the willful misconduct, negligence, error, or omission of the Contractor, its employees, subcontractors, consultants, representatives, and agents, resulting from this contract, except to the extent such Contractor liability is attenuated by any action of the State which directly and proximately contributed to the claims.

2. INTELLECTUAL PROPERTY

The Contractor agrees it will, at its sole cost and expense, defend, indemnify, and hold harmless the indemnified parties from and against any and all claims, to the extent such claims arise out of, result from, or are attributable to, the actual or alleged infringement or misappropriation of any patent, copyright, trade secret, trademark, or confidential information of any third party by the Contractor or its employees, subcontractors, consultants, representatives, and agents; provided, however, the State gives the Contractor prompt notice in writing of the claim. The Contractor may not settle any infringement claim that will affect the State's use of the Licensed Software without the State's prior written consent, which consent may be withheld for any reason.

If a judgment or settlement is obtained or reasonably anticipated against the State's use of any intellectual property for which the Contractor has indemnified the State, the Contractor shall, at the Contractor's sole cost and expense, promptly modify the item or items which were determined to be infringing, acquire a license or licenses on the State's behalf to provide the necessary rights to the State to eliminate the infringement, or provide the State with a non-infringing substitute that provides the State the same functionality. At the State's election, the actual or anticipated judgment may be treated as a breach of warranty by the Contractor, and the State may receive the remedies provided under this solicitation.

3. SELF-INSURANCE (Statutory)

The State is self-insured for any loss and purchases excess insurance coverage pursuant to Neb. Rev. Stat. § 81-8,239.01. If there is a presumed loss under the provisions of this contract, Contractor may file a claim with the Office of Risk Management pursuant to Neb. Rev. Stat. §§ 81-8,829 through 81-8,306 for review by the State Claims Board. The State retains all rights and immunities under the State Miscellaneous (§ 81-8,294), Tort (§ 81-8,209), and Contract Claim Acts (§ 81-8,302), as outlined in Neb. Rev. Stat. § 81-8,209 et seq. and under any other provisions of law and accepts liability under this contract to the extent provided by law.

N. ATTORNEY'S FEES

In the event of any litigation, appeal, or other legal action to enforce any provision of the contract, the Parties agree to pay all expenses of such action, as permitted by law and if ordered by the court, including attorney's fees and costs, if the other Party prevails.

O. ASSIGNMENT, SALE, OR MERGER

Either Party may assign the contract upon mutual written agreement of the other Party. Such agreement shall not be unreasonably withheld.

The Contractor retains the right to enter into a sale, merger, acquisition, internal reorganization, or similar transaction involving Contractor's business. Contractor agrees to cooperate with the State in executing amendments to the contract to allow for the transaction. If a third party or entity is involved in the transaction, the Contractor will remain responsible for performance of the contract until such time as the person or entity involved in the transaction agrees in writing to be contractually bound by this contract and perform all obligations of the contract.

P. CONTRACTING WITH OTHER POLITICAL SUBDIVISIONS OF THE STATE OR ANOTHER STATE

The Contractor may, but shall not be required to, allow agencies, as defined in Neb. Rev. Stat. § 81-145, to use this contract. The terms and conditions, including price, of the contract may not be amended. The State shall not be contractually obligated or liable for any contract entered into pursuant to this clause.

The Contractor may, but shall not be required to, allow other states, agencies or divisions of other states, or political subdivisions of other states to use this contract. The terms and conditions, including price, of this contract shall apply to any such contract, but may be amended upon mutual consent of the Parties. The State of Nebraska shall not be contractually or otherwise obligated or liable under any contract entered into pursuant to this clause. The State shall be notified if a contract is executed based upon this contract.

Q. FORCE MAJEURE

Neither Party shall be liable for any costs or damages, or for default resulting from its inability to perform any of its obligations under the contract due to an unforeseeable natural or man-made event outside the control and not the fault of the affected Party ("Force Majeure Event"). The Party so affected shall immediately make a written request for relief to the other Party, and shall have the burden of proof to justify the request. The other Party may granted the relief requested; relief may not be unreasonably withheld. Labor disputes with the impacted Party's own employees will not be considered a Force Majeure Event.

R. CONFIDENTIALITY

All materials and information provided by the Parties or acquired by a Party on behalf of the other Party shall be regarded as confidential information. All materials and information provided or acquired shall be handled in accordance with federal and state law, and ethical standards. Should said confidentiality be breached by a Party, the Party shall notify the other Party immediately of said breach and take immediate corrective action.

It is incumbent upon the Parties to inform their officers and employees of the penalties for improper disclosure imposed by the Privacy Act of 1974, 5 U.S.C. 552a. Specifically, 5 U.S.C. 552a (i)(1), which is made applicable by 5 U.S.C. 552a (m)(1), provides that any officer or employee, who by virtue of his/her employment or official position has possession of or access to agency records which contain individually identifiable information, the disclosure of which is prohibited by the Privacy Act or regulations established thereunder, and who knowing that disclosure of the specific material is prohibited, willfully discloses the material in any manner to any person or agency not entitled to receive it, shall be guilty of a misdemeanor and fined not more than $5,000.

S. EARLY TERMINATION

The contract may be terminated as follows:

1. The State and the Contractor, by mutual written agreement, may terminate the contract at any time.

2. The State, at its sole discretion, may terminate the contract for any reason upon thirty (30) calendar days' written notice to the Contractor. Such termination shall not relieve the Contractor of warranty or other service obligations incurred under the terms of the contract. In the event of termination the Contractor shall be entitled to payment, determined on a pro rata basis, for products or services satisfactorily performed or provided.

3. The State may terminate the contract immediately for the following reasons:

- **a.** if directed to do so by statute;
- **b.** Contractor has made an assignment for the benefit of creditors, has admitted in writing its inability to pay debts as they mature, or has ceased operating in the normal course of business;
- **c.** a trustee or receiver of the Contractor or of any substantial part of the Contractor's assets has been appointed by a court;
- **d.** fraud, misappropriation, embezzlement, malfeasance, misfeasance, or illegal conduct pertaining to performance under the contract by its Contractor, its employees, officers, directors, or shareholders;
- **e.** an involuntary proceeding has been commenced by any party against the Contractor under any one of the chapters of Title 11 of the United States Code and (i) the proceeding has been pending for at least sixty (60) calendar days; or (ii) the Contractor has consented, either expressly or by operation of law, to the entry of an order for relief; or (iii) the Contractor has been decreed or adjudged a debtor;
- **f.** a voluntary petition has been filed by the Contractor under any of the chapters of Title 11 of the United States Code;
- **g.** Contractor intentionally discloses confidential information;
- **h.** Contractor has or announces it will discontinue support of the deliverable; and,
- **i.** In the event funding is no longer available.

T. CONTRACT CLOSEOUT

Upon termination of the contract for any reason the Contractor shall within thirty (30) days, unless stated otherwise herein:

1. Transfer all completed or partially completed deliverables to the State;
2. Transfer ownership and title to all completed or partially completed deliverables to the State;
3. Return to the State all information and data, unless the Contractor is permitted to keep the information or data by contract or rule of law. Contractor may retain one copy of any information or data as required to comply with applicable work product documentation standards or as are automatically retained in the course of Contractor's routine back up procedures;
4. Cooperate with any successor contactor, person or entity in the assumption of any or all of the obligations of this contract;
5. Cooperate with any successor contactor, person or entity with the transfer of information or data related to this contract;
6. Return or vacate any state owned real or personal property; and,
7. Return all data in a mutually acceptable format and manner.

Nothing in this section should be construed to require the Contractor to surrender intellectual property, real or person property, or information or data owned by the Contractor for which the State has no legal claim.

III. CONTRACTOR DUTIES

A. INDEPENDENT CONTRACTOR / OBLIGATIONS

It is agreed that the Contractor is an independent contractor and that nothing contained herein is intended or should be construed as creating or establishing a relationship of employment, agency, or a partnership.

The Contractor is solely responsible for fulfilling the contract. The Contractor or the Contractor's representative shall be the sole point of contact regarding all contractual matters.

The Contractor shall secure, at its own expense, all personnel required to perform the services under the contract. The personnel the Contractor uses to fulfill the contract shall have no contractual or other legal relationship with the State; they shall not be considered employees of the State and shall not be entitled to any compensation, rights or benefits from the State, including but not limited to, tenure rights, medical and hospital care, sick and vacation leave, severance pay, or retirement benefits.

By-name personnel commitments made in the Contractor's bid shall not be changed without the prior written approval of the State. Replacement of these personnel, if approved by the State, shall be with personnel of equal or greater ability and qualifications.

The Contractor warrants that all persons assigned to the project shall be employees of the Contractor or a subcontractor and shall be fully qualified to perform the work required herein. Personnel employed by the Contractor or a subcontractor to fulfill the terms of the contract shall remain under the sole direction and control of the Contractor or the subcontractor respectively.

With respect to its employees, the Contractor agrees to be solely responsible for the following:

1. Any and all pay, benefits, and employment taxes and/or other payroll withholding;
2. Any and all vehicles used by the Contractor's employees, including all insurance required by state law;
3. Damages incurred by Contractor's employees within the scope of their duties under the contract;
4. Maintaining Workers' Compensation and health insurance that complies with state and federal law and submitting any reports on such insurance to the extent required by governing law;
5. Determining the hours to be worked and the duties to be performed by the Contractor's employees; and,
6. All claims on behalf of any person arising out of employment or alleged employment (including without limit claims of discrimination alleged against the Contractor, its officers, agents, or subcontractors or subcontractor's employees).

If the Contractor intends to use any subcontractor, the subcontractor's level of effort, tasks, and time allocation must be clearly defined in the Contractor's bid. The Contractor shall agree that it will not utilize any subcontractors not specifically included in its bid in the performance of the contract without the prior written authorization of the State. If the Contractor subcontracts any of the work, the Contractor agrees to pay any and all subcontractors in accordance with the Contractor's agreement with the respective subcontractor(s).

The State reserves the right to require the Contractor to reassign or remove from the project any Contractor or subcontractor employee.

Contractor shall insure that the terms and conditions contained in any contract with a subcontractor does not conflict with the terms and conditions of this contract.

The Contractor shall include a similar provision, for the protection of the State, in the contract with any subcontractor engaged to perform work on this contract.

B. EMPLOYEE WORK ELIGIBILITY STATUS

The Contractor is required and hereby agrees to use a federal immigration verification system to determine the work eligibility status of employees physically performing work within the State. A federal immigration verification system means the electronic verification of the work authorization program authorized by the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, 8 U.S.C. 1324a, known as the E-Verify Program, or an equivalent federal program designated by the United States Department of Homeland Security or other federal agency authorized to verify the work eligibility status of an employee.

If the Contractor is an individual or sole proprietorship, the following applies:

1. The Contractor must complete the United States Citizenship Attestation Form, available on the DAS website at https://das.nebraska.gov/materiel/purchase_bureau/vendor-info.html. The completed United States Attestation Form should be submitted with the solicitation response.

2. If the Contractor indicates on the attestation form that he or she is a qualified alien, the Contractor agrees to provide the U.S. Citizenship and Immigration Services documentation required to verify the Contractor's lawful presence in the United States using the Systematic Alien Verification for Entitlements (SAVE) Program.

3. The Contractor understands and agrees that lawful presence in the United States is required and the Contractor may be disqualified or the contract terminated if such lawful presence cannot be verified as required by Neb. Rev. Stat. § 4-108.

C. COMPLIANCE WITH CIVIL RIGHTS LAWS AND EQUAL OPPORTUNITY EMPLOYMENT/NONDISCRIMINATION (Statutory)

The Contractor shall comply with all applicable local, state, and federal statutes and regulations regarding civil rights laws and equal opportunity employment. The Nebraska Fair Employment Practice Act prohibits Contractors of the State, and their subcontractors, from discriminating against any employee or applicant for employment, with respect to hire, tenure, terms, conditions, compensation, or privileges of employment because of race, color, religion, sex, disability, marital status, or national origin (Neb. Rev. Stat. §§ 48-1101 through 48-1125). The Contractor guarantees compliance with the Nebraska Fair Employment Practice Act, and breach of this provision shall be regarded as a material breach of contract. The Contractor shall insert a similar provision in all subcontracts for goods or services to be covered by any contract resulting from this solicitation.

D. COOPERATION WITH OTHER CONTRACTORS

Contractor may be required to work with or in close proximity to other contractors or individuals that may be working on the same or different projects. The Contractor shall agree to cooperate with such other contractors or individuals, and shall not commit or permit any act which may interfere with the performance of work by any other contractor or individual. Contractor is not required to compromise Contractor's intellectual property or proprietary information unless expressly required to do so by this contract.

E. DISCOUNTS

Prices quoted shall be inclusive of ALL trade discounts. Cash discount terms of less than thirty (30) days will not be considered as part of the bid. Cash discount periods will be computed from the date of receipt of a properly executed claim voucher or the date of completion of delivery of all items in a satisfactory condition, whichever is later.

F. PRICES

This summary shall present the total fixed price to perform all of the requirements of the Invitation to Bid. The bidder must include details in the Cost Proposal supporting any and all costs. These details must include, at a minimum, detailed descriptions and/or specifications of the goods and/or services to be provided, quantities, and timing and unit costs, if applicable.

Pricing for each Dynamic Message Sign unit shall include the following:

1. Dynamic Message Signs (DMS)
2. Mounting Hardware
3. Sign Controller, including communication modem(s), firmware, and other associated communication equipment.
4. DMS internal cabling.
5. DMS schematic diagrams and user documentation
6. Delivery and Transportation
7. Testing
8. Training

Prices submitted on the cost proposal form shall remain fixed for the first three (3) years of the contract. Any request for a price increase subsequent to the first three (3) years of the contract shall not exceed five percent (5%) of the previous Contract period. Increases will be cumulative across the remaining periods of the contract. Requests for an increase must be submitted in writing to the State Purchasing Bureau a minimum of one hundred twenty (120) days prior to the end of the current contract period. Documentation may be required by the State to support the price increase.

The State reserves the right to deny any requested price increase. No price increases are to be effective or billed to any State Agencies prior to written amendment of the contract by the parties.

The State will be given full proportionate benefit of any decreases for the term of the contract.

G. COST CLARIFICATION

The State reserves the right to review all aspects of cost for reasonableness and to request clarification of any bid where the cost component shows significant and unsupported deviation from industry standards or in areas where detailed pricing is required.

H. PERMITS, REGULATIONS, LAWS

The contract price shall include the cost of all royalties, licenses, permits, and approvals, whether arising from patents, trademarks, copyrights or otherwise, that are in any way involved in the contract. The Contractor shall obtain and pay for all royalties, licenses, and permits, and approvals necessary for the performance of the contract. The Contractor must guarantee that it has the full legal right to the materials, supplies, equipment, software, and other items used to execute this contract.

I. OWNERSHIP OF INFORMATION AND DATA / DELIVERABLES

The State shall have the unlimited right to publish, duplicate, use, and disclose all information and data developed or obtained by the Contractor on behalf of the State pursuant to this contract.

The State shall own and hold exclusive title to any deliverable developed as a result of this contract. Contractor shall have no ownership interest or title, and shall not patent, license, or copyright, duplicate, transfer, sell, or exchange, the design, specifications, concept, or deliverable.

J. NOTICE OF POTENTIAL CONTRACTOR BREACH

If Contractor breaches the contract or anticipates breaching the contract the Contractor shall immediately give written notice to the State. The notice shall explain the breach or potential breach, and may include a request for a waiver of the breach if so desired. The State may, at its discretion, temporarily or permanently waive the breach. By granting a temporary waiver, the State does not forfeit any rights or remedies to which the State is entitled by law or equity, or pursuant to the provisions of the contract. Failure to give immediate notice, however, may be grounds for denial of any request for a waiver of a breach.

K. ANTITRUST

The Contractor hereby assigns to the State any and all claims for overcharges as to goods and/or services provided in connection with this contract resulting from antitrust violations which arise under antitrust laws of the United States and the antitrust laws of the State.

L. CONFLICT OF INTEREST

By submitting a bid, bidder certifies that no relationship exists between the bidder and any person or entity which either is, or gives the appearance of, a conflict of interest related to this Invitation to Bid or project.

Bidder further certifies that bidder will not employ any individual known by bidder to have a conflict of interest nor shall bidder take any action or acquire any interest, either directly or indirectly, which will conflict in any manner or degree with the performance of its contractual obligations hereunder or which creates an actual or appearance of conflict of interest.

If there is an actual or perceived conflict of interest, bidder shall provide with its bid a full disclosure of the facts describing such actual or perceived conflict of interest and a proposed mitigation plan for consideration. The State will then consider such disclosure and proposed mitigation plan and either approve or reject as part of the overall bid evaluation.

M. STATE PROPERTY

The Contractor shall be responsible for the proper care and custody of any State-owned property which is furnished for the Contractor's use during the performance of the contract. The Contractor shall reimburse the State for any loss or damage of such property; normal wear and tear is expected.

N. SITE RULES AND REGULATIONS

The Contractor shall use its best efforts to ensure that its employees, agents, and subcontractors comply with site rules and regulations while on State premises. If the Contractor must perform on-site work outside of the daily operational hours set forth by the State, it must make arrangements with the State to ensure access to the facility and the equipment has been arranged. No additional payment will be made by the State on the basis of lack of access, unless the State fails to provide access as agreed to in writing between the State and the Contractor.

O. ADVERTISING

The Contractor agrees not to refer to the contract award in advertising in such a manner as to state or imply that the company or its goods and services are endorsed or preferred by the State. Any publicity releases pertaining to the project shall not be issued without prior written approval from the State.

P. NEBRASKA TECHNOLOGY ACCESS STANDARDS (Nonnegotiable)

The State of Nebraska is committed to ensuring that all information and communication technology (ICT), developed, leased, or owned by the State of Nebraska, affords equivalent access to employees, program participants and members of the public who have disabilities as it affords to employees, program participants and members of the public who do not have disabilities.

ICT means information technology and other equipment, systems, technologies, or processes, for which the principal function is the creation, manipulation, storage, display, receipt, or transmission of electronic data and information, as well as any associated content. Contractor hereby agrees ICT includes computers and peripheral equipment, information kiosks and transaction machines, telecommunications equipment, customer premises equipment, multifunction office machines, software, applications, web sites, videos, and electronic documents. For the purposes of these assurances, ICT does not include ICT that is used exclusively by a contractor.

If the Contractor is providing a product or service that contains ICT and if the provided ICT is public-facing or the user will directly interact with it, the provided ICT must provide equivalent access or be modified during implementation to afford equivalent access to employees, program participants, and members of the public who have and who do not have disabilities. The Contractor may comply with this section by complying with Section 508 of the Rehabilitation Act of 1973, as amended, and its implementing standards adopted and promulgated by the U.S. Access Board.

Q. DISASTER RECOVERY/BACK UP PLAN

The Contractor shall have a disaster recovery and back-up plan to allow for continued delivery of goods or services under the specifications of the contract in the event of a disaster. The plan should include disaster contingency details related to equipment, personnel, facilities, and transportation. A copy of the disaster recovery and back-up plan should be provided upon request to the State.

R. DRUG POLICY

Contractor certifies it maintains a drug free work place environment to ensure worker safety and workplace integrity. Contractor agrees to provide a copy of its drug free workplace policy at any time upon request by the State.

S. WARRANTY

Despite any clause to the contrary, the Contractor represents and warrants that its services hereunder shall be performed by competent personnel and shall be of professional quality consistent with generally accepted industry standards for the performance of such services and shall comply in all respects with the requirements of this Contract. For any breach of this warranty, the Contractor shall, for a period of ninety (90) days from performance of the service, perform the services again, at no cost to the State, or if Contractor is unable to perform the services as warranted, Contractor shall reimburse the State for all fees paid to Contractor for the unsatisfactory services. The rights and remedies of the parties under this warranty are in addition to any other rights and remedies of the parties provided by law or equity, including, without limitation actual damages, and, as applicable and awarded under the law, to a prevailing Party, reasonable attorneys' fees and costs.

T. TIME IS OF THE ESSENCE

Time is of the essence with respect to Contractor's performance and deliverables pursuant to this contract.

IV. PAYMENT

A. PROHIBITION AGAINST ADVANCE PAYMENT (Nonnegotiable)

Neb. Rev. Stat. § 81-2403 states, "[n]o goods or services shall be deemed to be received by an agency until all such goods or services are completely delivered and finally accepted by the agency."

B. TAXES (Nonnegotiable)

The State is not required to pay taxes and assumes no such liability as a result of this solicitation. The Contractor may request a copy of the Nebraska Department of Revenue, Nebraska Resale or Exempt Sale Certificate for Sales Tax Exemption, Form 13 for their records. Any property tax payable on the Contractor's equipment which may be installed in a state-owned facility is the responsibility of the Contractor.

C. INVOICES (Nonnegotiable)

Invoices for payments must be submitted by the Contractor to the agency requesting the goods or services with sufficient detail to support payment. The terms and conditions included in the Contractor's invoice shall be deemed to be solely for the convenience of the parties. No terms or conditions of any such invoice shall be binding upon the State, and no action by the State, including without limitation the payment of any such invoice in whole or in part, shall be construed as binding or estopping the State with respect to any such term or condition, unless the invoice term or condition has been previously agreed to by the State as an amendment to the contract. **The State shall have forty-five (45) calendar days to pay after a valid and accurate invoice is received by the State.**

D. INSPECTION AND APPROVAL

Final inspection and approval of all work required under the contract shall be performed by the designated State officials.

The State and/or its authorized representatives shall have the right to enter any premises where the Contractor or subcontractor duties under the contract are being performed, and to inspect, monitor or otherwise evaluate the work being performed. All inspections and evaluations shall be at reasonable times and in a manner that will not unreasonably delay work.

E. PAYMENT (Nonnegotiable)

Payment will be made by the responsible agency in compliance with the State of Nebraska Prompt Payment Act. See Neb. Rev. Stat. § 81-2403. The State may require the Contractor to accept payment by electronic means such as ACH deposit. In no event shall the State be responsible or liable to pay for any goods and services provided by the Contractor prior to the effective date of the contract, and the Contractor hereby waives any claim or cause of action for any such services.

F. LATE PAYMENT (Nonnegotiable)

The Contractor may charge the responsible agency interest for late payment in compliance with the State of Nebraska Prompt Payment Act. See Neb. Rev. Stat. §§ 81-2401 through 81-2408.

G. SUBJECT TO FUNDING / FUNDING OUT CLAUSE FOR LOSS OF APPROPRIATIONS (Nonnegotiable)

The State's obligation to pay amounts due on the Contract for a fiscal years following the current fiscal year is contingent upon legislative appropriation of funds. Should funds not be appropriated, the State may terminate the contract with respect to those payments for the fiscal year(s) for which such funds are not appropriated. The State will give the Contractor written notice thirty (30) calendar days prior to the effective date of termination. All obligations of the State to make payments after the termination date will cease. The Contractor shall be entitled to receive just and equitable compensation for any authorized work which has been satisfactorily completed as of the termination date. In no event shall the Contractor be paid for a loss of anticipated profit.

H. RIGHT TO AUDIT (First Paragraph is Nonnegotiable)

The State shall have the right to audit the Contractor's performance of this contract upon a thirty (30) day written notice. Contractor shall use generally accepted accounting principles, and shall maintain the accounting records, and other records and information relevant to the contract (Information) to enable the State to audit the contract. See Neb. Rev. Stat. § 84-304 et seq. The State may audit and the Contractor shall maintain the information during the term of the contract and for a period of five (5) years after the completion of this contract or until all issues or litigation are resolved, whichever is later. The Contractor shall make the Information available to the State at Contractor's place of business or a location acceptable to both Parties during normal business hours. If this is not practical or the Contractor so elects, the Contractor may provide electronic or paper copies of the Information. The State reserves the right to examine, make copies of, and take notes on any Information relevant to this contract, regardless of the form or the Information, how it is stored, or who possesses the Information. In no circumstances will Contractor be required to create or maintain documents not kept in the ordinary course of Contractor's business operations, nor will Contractor

be required to disclose any information, including but not limited to product cost data, which is confidential or proprietary to Contractor.

The Parties shall pay their own costs of the audit unless the audit finds a previously undisclosed overpayment by the State. If a previously undisclosed overpayment exceeds three percent (3%) of the total contract billings, or if fraud, material misrepresentations, or non-performance is discovered on the part of the Contractor, the Contractor shall reimburse the State for the total costs of the audit. Overpayments and audit costs owed to the State shall be paid within ninety (90) days of written notice of the claim. The Contractor agrees to correct any material weaknesses or condition found as a result of the audit.

V. SCOPE OF WORK

The Contractor must provide the following information in response to this solicitation.

A. SCOPE

It is the intent of this bid invitation to establish a contract to supply Dynamic Message Signs (DMS) per the attached specifications from date of award for a period of three (3) years with the option to renew for an additional two (2) one (1)-year periods when mutually agreeable to the contractor and the State. The State reserves the right to extend the period of this contract beyond the end date when mutually agreeable to the contractor and the State.

B. REQUIRED DMS TYPE:

NDOT intends to procure full color , full matrix, LED (light emitting diode) Dynamic Message Signs (DMS) under this contract. The DMS will be installed on permanent over-the-roadway sign structures, road side posts, or cantilever structures.

Each DMS is typically installed prior to a major traffic interchange to allow ample time for motorists to make timely decisions to reach destinations in the event that an incident has occurred.

The proposed DMS shall have the following requirements.

1. Produce full color Display
2. Use LED technology
3. Possess full matrix capability
4. Generate variable height characters.
5. Produce a variable number of characters per line.
6. Produce 3 lines per display.
7. DMS Board

C. PROJECT ENVIRONMENT

All field equipment shall remain fully functional without any decrease in performance over an ambient temperature range of -40° to +140° and an outdoor ambient humidity range of 0%-99%, non-condensing. All field equipment shall be designed to and shall withstand at a minimum 90-mph winds with 30% gust factors.

The sign housing shall be engineered and P.E. certified to the latest edition AASHHTO and NCHRP Report 411 specifications for AASHTO basic wind speeds. The sign housing shall also be engineered and P.E. certified to withstand group loading combinations as outlined in the latest edition AASHTO including: sign weight, repair as specified in NCHRP Report 412. The sign housing face shall be engineered to withstand snow loading of (3 pounds per square foot).

D. FIELD CONTRACTOR REPSONISIBILITIES UNDER SEPARATE CONTRACT

The field contractor will be responsible for the following:

1. Accept delivery, unload, and provide off-site storage of all DMS assemblies for each project
2. Furnish and install all conduits and cabling for power and communications to the DMS.
3. Furnish and install the sign structure (e.g., overhead sign support system) on which the DMS shall be mounted, mounting assemblies, brackets, exterior maintenance walkway and foundations.
4. Install the DMS case onto the sign structure, including the exterior maintenance walkway
5. Provide the necessary traffic control for the installation of the DMS and support structure.
6. Provide the traffic control and bucket/lift truck required for each DMS installation and testing.
7. Provide the DMS Vendor with an installation date for the DMS case a minimum of four weeks in advance of installation.
8. Deliver the DMS assembly from the storage to the installation site.
9. Furnish and/or install a communications interface for each DMS.

E. AMENDMENT

This Contract may be amended in writing, within scope, upon agreement of both parties.
All items proposed shall be of the latest manufacture in production as of the date of the solicitation and be of proven performance and under standard design complete as regularly advertised and marketed. All necessary materials for satisfactory performance of the supplies shall be incorporated into the Dynamic Message Signs (DMS) whether or not they may be specifically mentioned below.

Complete specifications, manufacturer's current descriptive literature and/or advertising data sheets with cuts or photographs must be included with the bid for the IDENTICAL items proposed. Any information necessary to show compliance with these specifications not given on the manufacturer's descriptive literature and/or advertising data sheets must be supplied in writing on or attached to the bid document. If manufacturer's information necessary to show compliance with these specifications is not attached to the bid document, the Contractor may be required to submit requested information within three (3) business days of a written request. Failure to submit requested descriptive literature or advertising data sheets may be grounds to reject the bid.

F. REVISIONS

In the event any product is discontinued or replaced upon mutual consent during the contract period, the State reserves the right to amend this contract to include the alternate product at the same price.

VI. TECHNICAL SPECIFICATIONS

A. CONTRACTOR INSTRUCTIONS

Contractor must respond to each of the following statements. Specifications listed are minimum conditions that must be met in order for a Contractor to qualify for the award.

"YES" response means the Contractor guarantees they can meet this condition.

"NO" response means the Contractor cannot meet this condition and will not be considered.

"NO & PROVIDE ALTERNATIVE" responses should be used only with a narrative response in the NOTES/COMMENTS section explaining in detail any deviation from the Contractor's ability to meet the condition, and an explanation of how this would be determined to be an acceptable alternative to meeting the condition. Alternatives must be detailed in such a way that allows such deviations to be fully evaluated. The State shall determine at its sole discretion whether or not the Contractor's alternative is an acceptable alternative.

B. NON-COMPLIANCE STATEMENT

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**1.** Read these specifications carefully. Any and all exceptions to these specifications must be written on or attached to solicitation response. Any noncompliance may void your bid. Non-compliance to any single specification can void your bid.
X			**2.** It is the responsibility of Contractors to obtain information and clarifications as provided below. The State is not responsible for any erroneous or incomplete understandings or wrongful interpretations of this solicitation by any Contractor.
X			**3.** No interpretation related to the meaning of solicitation specifications or other pre-bid documents will be made orally to any Contractor by the State. Any solicitation interpretation must be put in writing by the Contractor to: the State Purchasing Bureau, email questions to SPB. as.materielpurchasing@nebraska.gov by the last day to submit written questions per the Schedule of Events. (Inquiries received after the last day to submit written questions may not be addressed).
NOTES/COMMENTS:			

C. TECHNICAL SPECIFICATIONS: DMS VENDOR RESPONSIBILITIES

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**1.** For each DMS installation, the DMS Vendor shall coordinate and work closely with the field contractor selected by NDOT under separate contract and be responsible for the following: a) Furnish and deliver a complete and operational DMS assembly to a specified location for installation by a field contractor, following the receipt of purchase order and structural drawings within on hundred fifty (150) days or less. b) NDOT may request the DMS Vendor to delay the delivery of the DMS assembly to a date later than the one hundred fifty (150 day period specified above at no additional cost to NDOT, provided such request is made within sixty (60) days of the order.

X			**2.** Develop and deliver shop drawings that illustrate in detail how to mount and connect the DMS unit to the sign structure ninety (90) days in advance of the DMS delivery date.
X			**3.** Be present during the installation of every DMS and their corresponding components by the field contractor.
X			**4.** Develop and deliver all shop drawings of the wiring connections in the DMS.
X			**5.** Furnish the complete structural support mechanism (mounting brackets and accessories) to permit the field contractor to install the DMS case on the structure.
X			**6.** Provide documentation related to the operation, installation and maintenance of the DMS to NDOT and the field contractor.
X			**7.** Perform stand-alone and system acceptance testing.
X			**8.** Provide and install system software.
X			**9.** Communications shall be provided through a single ethernet connection to the DMS housed inside the case.
NOTES/COMMENTS:			

D. TECHNICAL SPECIFICATION: DYNAMIC MESSAGE SIGN REQUIREMENTS

YES	NO	NO & PROVIDE ALTERNATIVE		
X			**1.** Sign1 – DMS cases shall not exceed a length of twenty-six (26) feet and a height of nine (9) feet.	
		96 x 336	a) Pixels Row/Column	89 x 347
X			b) Lines	3
X			c) Char. Per Line	17
X			d) Nom. Character Height	18 Inches
		2600	e) Max Weight	4400
X			f) Access	Walk In
X			**2.** Sign 2 – DMS cases shall not exceed a length of nineteen (19) feet and a height of nine (9) feet.	
		96 x 240	a) Pixels Row/Column	89 x 245
X			b) Lines	3
X			c) Char.Per Line	12
X			d) Nom. Character Height	18 Inches
		1852	e) Max Weight	4400
X			f) Access	Walk In

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**3.** **FULL DISPLAY MATRIX**: The DMS to furnished under this contract shall be the full matrix type. The DMS shall have the ability to create one (1) to three (3) rows of horizontal messages per page. Each row shall be capable of displaying a user-selected number of alphanumeric graphic characters. Each alphanumeric character shall be formed by a matrix of individual light-emitting pixels in the following text formats: 23 pixel by 17 pixel (7x5 standard), 20 pixel by 14 pixel (6x4), 30 pixel by 20 pixel (9x6) and 36 pixel by 23 pixel (11x7). In addition, the DMS shall support bitmap images (graphics) ranging from 6 pixels wide to be the full display. The entire display area shall contain pixels equally spaced both horizontally and vertically. Pixel monitoring shall be remotely available. The characters forming words shall be readable by a person with 20/20 correct vision within a range of 100 feet to 1,000 feet in advance of the sign at an eye height of 3.5 feet within a 30° cone of vision about the optical axis. Operating contrast values between 6 and 25 shall be demonstrated for each lighting condition. Writing speed shall appear to write the entire sign instantaneously and shall write a minimum of 80 characters per second. All Pixel modules, assemblies, and components shall be compatible and interchangeable between signs.

		Each LED is a 3 in 1 (RGB) SMD design. From Datasheet: Dominant Wavelength: Red (619 - 624nm) Green (520 - 540nm) Blue (460 - 480nm)	**4.** **LIGHT EMITTING DIODE**: All LED pixels shall consist of a high-density LED configured in a circular cluster. Each Pixel shall contain the quantity of discrete LEDs needed to output white colored light at a minimum luminous intensity of 12,400 candelas per square meter when measured using a photometric meter through the DMS front face pane assembly. Each LED shall be encapsulated to provide environmental protection. The LEDs shall be non-tinted, non-diffused, solid-state lamps using aluminum indium gallium phosphide (AlInGaP) or indium gallium aluminum phosphide (InGaAlP) technology or equivalent technology. LEDs shall emit red light at 618-630 nm, green light at 519-539 nm and blue at 460-480 nm peak wavelengths. Each Pixel shall have equal color on-axis intensity. LEDs shall consist of a 30° viewing angle without the aid of lens. Pixels shall be equally spaced at .79 inches on center both vertically and horizontally. LEDs shall be directly visible to the roadway when “on”. Fiber optic, flip disk and shutters shall not be accepted. Each pixel should contain interlaced strings of LEDs. Pixels shall contain the quantity of discrete LEDs needed to generate a nominal luminous intensity of 8,000 mcd, when each pixel is driven forward current of 20mA and a voltage drop not to exceed 24 VDC The 18-inch characters formed by the ”on” pixels shall be readable from any point on the approach roadway up to 720 feet away under all weather and lighting conditions. Pixels and modules shall be aligned such that there is no visible difference in illumination between pixels within the same modules or in a different module. Minor is measured differences shall be allowed if visible differences are undetectable. Each LED cluster shall be rated for outdoor usage over environmental range expected for the sign locations (including heat absorption and heat absorption due to sunlight). All materials used in the fabrication of the LED clusters shall not be damaged by direct exposure to sunlight. Each pixel shall be rated for 100,000 hours of operation under field operating conditions without serious degradation. All assemblies shall be rated for high-pressure washing.
x			**5.** **LED MODULE MOUNTING**: Each LED cluster shall include a housing extending beyond the sign face to shade the pixel from the sun. LEDs shall be mounted to a vertical or angled plane. LEDs shall be mounted parallel to the front wall and use of a three (3) degree to four degree forward tilt front face. LEDs shall be mounted to the panel with proper gaskets and protection from the internal wiring and components from environmental damage.

X			**6.** **LED DISPLAY MODULES**: Modules shall be rectangular and shall have an identical horizontal and vertical pitch between pixels. Separation between the last column of one module and the first column of the next shall be equal to the horizontal distance between the columns of a single display module. LED Boards shall contain pixels arranged in a full matrix display Each LED display module may consist of one or two circuit boards. If the boards are used, they shall be mounted physically to each using durable non-corrosive hardware. They shall be electronically connected one or more header type connectors. The header connectors shall be keyed such that the boards cannot be connected incorrectly. Individual addressing of each LED display module shall be configured via the communication wiring harness and connector. No on board addressing jumpers or switches shall be allowed. Each LED display module shall be mounted to the rear of the display's front face panels using durable non-corrosive hardware. The modules shall be mounted such that the LEDs emit light through the face panel's pixel holes and such that the face panel does not block any part of the viewing cone of any of the LEDs in any pixels. Front side of the aluminum module panel, which faces the viewing motorists, shall be flat black. LED display module electrical and signal connections shall be the quick-disconnect locking connector type. Removal or failure of any LED module shall not affect the operation of any other LED module or sign component. Removal of one or more LED modules shall not affect the structural integrity of any part of the sign. Display modules shall mount to the inside of the front face panels using either standard hand tools or no tools for removal and replacement. All LED display modules, as well as the LED pixel boards and driver circuit boards, shall be identical and interchangeable throughout the DMS.
		LED display module and driver electronics are integrated into one board.	**7.** **LED PIXEL BOARDS**: Each pixel shall have a devise that protects the LEDs. Each display module shall contain two electronic subassemblies, a LED board and a driver board. All LEDs shall be individually and directly mounted to the LED circuit board to form the LED board. LED circuit board laminate shall be single FR-4 fiberglass that black printed circuit board. The LED package style shall be either through-hole flush mount or surface-mount. Through-hole LEDs with standoffs will not be accepted. All LED pixel boards shall be identical and interchangeable.

		LED driver is built into LED display module.	**8.** **DRIVING ELECTRONICS**: The driving electronics shall generate the signals to the devices controlling the pixels to be illuminated. These signals shall be based on commands received from the sign controller. The driving circuitry shall be located in the sign case. LED pixels shall be directly driven using pulse with modulation with a minimum of 20-mA forward current. The drive method varies the current pulse width in order to achieve the proper display intensity level for a given ambient light condition. The drive current pule shall be modulated from a 10-millisecond period, and pulse amplitude shall not be allowed to exceed 30mA per LED string. For Example, the maximum current draw for a single two-string pixel shall not exceed 60 mA. Driver printed circuit board laminate shall be FR-4 fiberglass. The printed circuit board shall be plated on both sides with a copper trace thickness of two ounces per square foot of plated area. Printed circuit through-holes shall be plated with one ounce of copper per square foot of plated area. A diagnostic indicator shall be included on each Led driver circuit board. This diagnostic indicator shall be in the form of a single-digit LED display approximately 0.7 inches or greater in height. This digit shall provide visual indication of the operational status of the LED module. At a minimum, this shall indicate failed pixel, improper supply voltage, and failed communications conditions. All exposed metal on both sides of the LED driver circuit board, except power and signal connectors, shall be protected from water and humidity exposure by a through application of suitable conformal coating. LED drive circuitry shall support a minimum refresh rate of 100 frames per second. Removal or failure of a single driver circuit board shall not affect the performance of any LED display module, except the module that it drives. All driver circuit boards shall be identical and interchangeable throughout the sign.
X			**9.** **AMBIANT LIGHT PHOTOSENSOR SYSTEM**: The sign shall incorporate a means of changing the lighting level provided by the pixels automatically in response to ambient lighting conditions as detected by the photocell system and remotely in response to commands received from the central control system. The Photocell system shall be positioned to sense in three directions: a) behind the sign b) in front of the sign, and c) alongside or bottom of sign, with north being one of the three directions. A minimum of three settings (providing 2 decades of adjustment for each setting) shall be remotely functional: Setting 1- shall before night use, Setting 2- shall be for overbright, and Setting 3- shall be for normal daytime. Photoelectric cells shall be provided integral to the DMS. These devises shall direct the sign controller to modify the intensity of the light produced by the pixel elements orientation.
X			**10.** **FUTURE REQUIREMENTS**: The Department reserves the right to purchase additional, enhancements, products, training, services, etc., which directly related to the items purchased under this contract for a period of five years from the date of award. The DMS Vendor shall notify NDOT of all enhancements made to the DMS assemblies once a year. If an enhancement can be demonstrated to be beneficial to NDOT, NDOT may elect or to purchase the enhancement.

X			**11.** **NEW EQUIPMENT**: All items supplied pursuant to the resultant contract shall be new, unused, current production models installed and operational in a user (paying customer) environment and be an item currently in distribution. The equipment specified herein shall be equipped in accordance with the specifications with items normally supplied in the stream of commerce.
NOTES/COMMENTS:			

E. TECHNICAL SPECIFICATION: DMS CASE

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**1.** The DMS case and all of its equipment and materials shall be designed and constructed so that all maintenance and repair is performed from within the sign case, with the exception of structural members. All DMS cases shall be dust and water resistant. The minimum distance from the interior rear wall of the DMS case to the closest display components shall be maintained across the entire interior of the DMS case., with the exception of the structural members. Structural members shall be designed and positioned such that they are not an obstruction to free movement of maintenance personnel throughout the interior of the case.
X			**2.** A level interior walkway shall be installed in the bottom of the DMS case on which maintenance personnel can walk. This interior walkway shall be a minimum of 24 inches wide and shall run the entire distance from side to side of the DMS case. The interior walkway's top surface shall be nearly flush with the bottom of the DMS case access door and be free of obstructions that would present a tripping hazard to maintenance personnel. The internal walkway shall have a non-slip surface and shall not be uncomfortable for kneeling. Access to the interior of the case for access door shall be mounted on the right hand side of the DMS. The access door shall open outward and have stops to retain the door open at the 90° and 120° positions. Doorway shall have a removable fall protection railing across opening on the inside of the sign case. Door shall be keyed with a Corbin #2 key.
X			**3.** The field contractor shall provide an exterior maintenance walkway. The exterior maintenance walkway shall be a minimum of 36 inches wide and extend from the access door to the vertical support member of the overhead sign structure. The external maintenance walkway shall be 2 inches. The top surface of the external maintenance walkway shall be nearly flush with the bottom of the DMS case access door, thus eliminating any steps when entering or exiting the sign. Fold-down safety railings shall be provided for the external maintenance walkway. The DMS Vendor shall closely coordinate its design activities with the field contractor to eliminate any constructability of operability conflicts.
X			**4.** Access to pixel modules for maintenance, repair, or replacement must be accomplished from the interior of the DMS case. The pixel modules shall be adequately addressed and physically identified inside the DMS case shall be in accord with the Pixel Failure Table Parameter (Pixel Failure Table object contained in the Status Err Objects of NTCIP 1203

X			**5.**	All DMS cases shall be fabricated from 0.125 inch thick (minimum) 3003-H14 or 5052-H32 aluminum alloy and shall conform to the latest AASHTO publication entitled Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. All exterior seams shall be continuously welded and each weld shall exhibit uniform flow. All welds shall be neatly formed and free of cracks, blowholes and other irregularities. Welding on aluminum alloy DMS cases shall be done by gas metal arc or gas tungsten arc process using bare aluminum welding electrodes. The electrodes shall conform to the requirements of the AWS A5.10 for ER5356 aluminum alloy bare welding electrodes. Procedures and welders used for welding on aluminum shall be qualified in accordance with the requirements of AWS B3.0, Welding Procedure and Performance Qualification, and to practices recommended in AWS C5.6. Provisions shall be made to fit the DMS with knockouts for two three-inch conduits and one two-inch conduit.
X			**6.**	The DMS shall be designed for attachment to a sign support structure of type and design indicated in the design detail drawings provided by NDOT. Any welding associated with the sign structural support mechanism fabrication (i.e., mounting frames, brackets, and other accessories shall be performed in accordance with ANSI/AASHTO/AWS D1.5-88 Bridge Welding Code unless otherwise specified.
		With our lens technology, our signs do not require the need for any sheeting.	**7.**	The sign face shall be manufactured of ¼ inch thick, weather-tight, non-glare, UV-stabilized polycarbonate, polymethacrylate, or other approved substitute sheeting, exceeding the ASSHTO wind loading requirements. The UV-stabilized polycarbonate or polymethacrylate sheets, subsequent to being exposed to conditions per ASTM G53 for 1,500 hours, shall meet or exceed the following requirements: a) Haze per ASTM D1003 > 6 b) Yellowness index per ASTM D1925 > 5
X			**8.**	For substitute approvals, the DMS Vendor shall submit one sample (12”x12” of the proposed materials together, with a description of the materials attributes to the Department or review and approval in conjunction with the design approval test. All front face panel surfaces not directly in front of a light-emitting pixel, shall be covered with a flat black material to reduce glare and increase the contract ratio. The display face of the DMS shall have a minimum 12-inch outer black border around the perimeter (top, bottom, and sides) of the full matrix display.
X			**9.**	All DMS equipment, components, assemblies, and other materials located in the DMS case shall be removable, transportable, and capable of being installed by a single maintenance person utilizing a one-person aerial lift truck with a sufficient clearance between the ground and the bottom of the DMS case to safely reach the external maintenance walkway.
X			**10.**	Differential expansion of the sign case and the display panel shall not cause damage to either component. Waterproof measures shall be implemented for all sign face panels. To allow for the vacuum effect of the passage of large trucks, the sign face shall be designed for and shall withstand a negative (outward) pressure of 50 percent of the design inward wind pressure. The Department will provide the DMS Vendor with a required angle of tilt for each display. Typically, a three to four-degree till will be required.
X			**11.**	The DMS case shall have interior, no-corrosive, metal cage support frames to mount the display elements. The cage support frame shall be designed to minimize vibrational effects to the display an electronic elements. The cage support frame shall withstand vibrations as specified by NEMA TS-4, subsection 2.2.8.

X			**12.**	The mounting hardware for the entire sign or for each line of the sign shall be designed to provide a nominal downward tilt of three to four degrees about the horizontal axis with the top of the sign forward. Means shall be provided to allow adjustment of plus-or-minus six degrees about the horizontal axis. The sign shall operate properly at all these positions.
X			**13.**	The sign housing shall come equipped with slotted aluminum extrusions mounted across the back of the sign in the vertical position. Each extrusion shall accept manufacturer-supplied stainless steel mounting bolts and nuts with the heads fitted to slide within the extrusion for complete adjustability in the vertical direction. This configuration shall allow the sign to be mounted to horizontal members on the structure and mounting plates attached to "U-bolts" or hardware supplied by others. Bottom side shall contain small weep holes for draining any water that accumulates due to condensation. Weep holes shall be screened to prevent the entrance of insects or small animals.
X			**14.**	The DMS Case shall include a weather and vermin proof penetration for physical installation of fiber or ethernet cable to external communication system components. If the case does not have an existing penetration, instructions shall be provided for the installation contractor regarding the recommenced locations, dimensions, and methods of creating this penetration.
NOTES/COMMENTS:				

F. TECHNICAL SPECIFICATION: VENTILATION

YES	NO	NO & PROVIDE ALTERNATIVE		
X			**1.**	The DMS shall contain a thermostatically controlled ventilation system designed to keep the internal DMS air temperature lower than +140°F when the outdoor ambient temperature is +115°F or less The ventilation system shall consist of two or more intake ports. Intake ports shall be located near the bottom of the DMS rear wall. Each intake port shall be covered with a filter that removes airborne particles measuring 500 microns in diameter and larger. One or more ball bearing type fans shall be mounted at each intake port. These fans shall positively pressure the DMS cabinet.
X			**2.**	The ventilation system shall include a thermostat to control the activation of the system. The thermostat shall be located near the top of the DMS interior. The thermostat shall have a minimum adjustable temperature range between 50°F to 110°F. If a fan or forced air devise fails, it shall automatically be deselected and another fan or forced air device selected, and an error message shall be sent to the sign controller. The sign controller shall transmit the failure state back to the NDOT Traffic Management Center and the central control system.
X			**3.**	All intake and exhaust vents shall meet the NEMA 3R requirements with and without powering the ventilation system. All exhaust vents shall be furnished with screen to prevent insects from entering the DMS case. Additional fans shall be installed inside the DMS case to circulate air internally. The internal air circulating system shall be capable of maintaining air differential temperatures throughout the DMS case under 35°F with all electrical equipment functioning and all display pixels turned on at maximum level.

X			**4.**	The DMS case shall be equipped with an adjustable timer that shall be located just inside the DMS case Door and within easy reach of maintenance personnel standing outside the DMS case to activate the ventilation and internal air circulating system. The timer shall be adjustable up to a maximum of four hours and shall turn off the fans when time expires. When activated (i.e., turned to the "On" position and set to an unspecified time), the adjustable timer shall overrider the thermostat(s) and cause the ventilation system to turn on immediately and remain on until the timer is deactivated manually or until the time setting has expired. When the timer is deactivated or turns off automatically, control of the ventilation system shall be restored to the thermostat(s).
X			**5.**	Both the ventilation and internal air circulating system shall utilize easily removable, standard sized air filters. Air filters shall be replaceable from within the DMS case. The air filters shall have an average rated efficiency of 30% and an arrestance of 90% when tested in accordance with the ANSI/ASHRAE 52.1-1992 (Gravimetric and Dust Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter) published standard. The filters shall be listed and rated Class 2 by UL. A minimum of 7 ft^3 of effective filter media shall be provided for every 106 ft^3 per minute of airflow. All fans or blowing devices shall be located downstream from air filters.
X			**6.**	The equipment located within case shall be protected from moisture, dust, dirt, and corrosion through the proper installation of gaskets, seals and filters at all case openings Each ventilation fan shall contain a sensor to monitor rotational speed, measured in revolutions per minute. The fan speed shall be reported to the sign controller upon request. Air conditioning shall not be permitted.
X			**7.**	HEATING: The sign case shall protect the sign and its contents from malfunctions due to the effects of cold weather commonly encountered during winter in Nebraska. Thermostatically controlled heaters shall be provided to keep the front face from condensation and prevention of the vital components from freezing. In addition, the sign case shall have adequate heating to raise the temperature 32°F over ambient during maintenance (walk in sign requirement). The heaters shall be controllable remotely from either the central computer or a laptop connected at the sign controller, and manually from inside the sign using an adjustable timer.
NOTES/COMMENTS:				

G. TECHNICAL SPECIFICATION: POWER AND LIGHTING REQUIREMENTS

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**1.** The incoming power to the sign controller will be single-phase, 120/240 ±15 VAC, 50 or 60 ±3 Hz. The total power requirement for the DMS sign and sign controller shall not exceed 4,000 watts during the operation of a user-selected message with all 60 characters (3 lines and 20 characters per line) being displayed, and with all ventilation and heaters on. An average of thirty-three (33) pixels per character shall be used for calculation verification. The use of solar panels to provide power will not be permitted.
X			**2.** Two 120-VAC, duplex convenience outlets shall be provided with integral ground-fault interrupt, and shall be protected by a circuit breaker. The receptacles shall be NEMA Type 5-15 R, and shall have a spring-loaded cap and be positioned so that no electrical hazard shall exist when used by maintenance personnel. One duplex outlet shall be located on each end of the DMS case.
X			**3.** The DMS Vendor shall provide an internal fluorescent or (LED equivalent) lighting system with a fixture spaced approximately every eight (8) feet along the full length of the interior of the sign case to provide maintenance personnel with a minimum of 30 watts of evenly distributed lighting within each DMS case. Control for the internal maintenance lighting system shall be through an adjustable timer. The timer shall be adjustable to a minimum of four hours and shall be located just inside the DMS case door, and within easy reach of maintenance personnel standing outside the DMS case.
X			**4.** The DMS case shall be equipped with a surge protector conforming to the requirements of NDOT Standard Specifications for Highway Construction, and shall operate within temperatures ranging from +0° F to + 165° F. All DMS wiring shall also conform to NDOT Standard Specifications for Highway Construction. Power line surge protectors shall be installed between both line conductors and equipment ground. All conductors entering and leaving the DMS shall be protected by surge protectors and lightening arrestors. Power line surge protection (e.g. Edco 1210 SHA) shall conform to the following requirements: a) Peak surge current occurrences — 20 Minimum b) Peak 8 x 20 msec wave shape — 20K amps c) Response — 250 Maximum d) Maximum current at 120-VAC, 60Hz — 10 amps e) Series inductance — 200 microhenries f) Temperature — NEMA TS-1 g) Maximum dimensions — 3.3-inch x 15.0-inch x 2.6 inch

X			**5.**	A series-connected surge suppressor capable of passing 15 amps of current shall protect the sign controller and other control and communication equipment. This device shall conform to the following requirements: a) Withstand a peak 50,000 ampere surge current for an 8x20 microsecond wave form b) Maximum continuous operating current of 15 amps at 120 VAC 60Hz c) Series inductance of 200 microhenries nominal d) Temperature range of -40°F to +158°F (-40°C to +70°C) e) The device shall be UL-1449 recognized f) UL 1449 surge rating of 400 V or less Transient voltage surge suppressors shall protect all communication signals connecting to the control equipment from off-site sources using copper cables. Transient Voltage surge processors shall protect all copper communication lines used to pass data between the sign controller and sign. The Power line surge protector shall be a two-stage device that allows the connection of radio interference filter in the circuit between the stages. Each DMS shall be equipped with one or more radio interference filters in the power line surge protector. The filter shall provide attenuation of at least 50 dB over a range of 50 kHz to 20 MHz.
X			**6.**	The field contractor shall ground the DMS per NDOT requirements. The DMS Vendor shall verify and inspect all existing ground connections to ensure acceptability for the installation and operation of the DMS control equipment. The grounding system in the DMS shall be divided into separate and distinct circuits, connected together at a single point. This requirement shall eliminate ground loops, adequately direct transients to ground, and allow for testing of the separation between the grounding circuits by temporarily removing the jumpers.
NOTES/COMMENTS:				

H. TECHNICAL SPECIFICATION: SIGN CONTROLLER REQUIREMENTS

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**1.** The sign controller shall receive commands to place messages in its memory buffer, confirm message content, and display a stored message on the sign. The sign controller shall consist of a solid-state electronic device dedicated to the operation of the DMS. The rated life of all components in the sign controller shall be a minimum of ten years under 24-hour-a-day operation. Semiconductor devices shall be used exclusively, and solid-state components shall be standard production types and readily available. The sign controller's front panel shall include a keyboard and LCD display. These devices shall be used to perform the following functions with the sign controller and DMS: **a.** Monitor the current status of the sign controller, including the status of all sensors and a monochromatic (WYSIWYG) representation of the message visible on the display face. **b.** Perform diagnostics testing of various system components including pixels, power systems, sensors, and more. **c.** Activate messages stored in memory. **d.** Configure display parameters, including display size and colors. **e.** Configure communication port settings and NTCIP options.
X			**2.** A CAT6 ethernet cable with transparent Male RJ-45 termination shall be furnished to allow for the laptop operation of the sign controller from within the sign case. Sufficient slack shall be provided in the sign case for reaching all areas within the sign case.

X			**3.** The sign controller firmware shall make the sign controller operate the DMS; monitor the status of all sign hardware; and communicate with remote and local computers. The sign controller firmware shall accomplish the following sign operations: a. Cause the sign to display static messages and two alternating messages formed by two static messages. The time required to display a new 60-alphanumeric character message shall not exceed 0.9 second from a blank state and 2.3 seconds from any non-blank state. b. Erase the previous message prior to the writing of a new message. c. Alternating (two-phase) messages: provide selection of the display time for each phase and the blank-out time between messages in tenths of a second between 0.3 and 12.0 seconds. d. Provide selectable message display time, including unlimited display time for each message. e. Cause all pixels to be activated at selectable intervals as a self-maintenance measure. The DMS Vendor shall develop a test pattern and receive approval from the Department before installation. f. Provide diagnostic routines that report failures and malfunctions in the sign and in the sign controller upon inquiry from the central control system. Detected failure conditions shall be automatically returned to the central control system.
X			**4.** The DMS sign controller shall use whatever addressing scheme is appropriate for the NTCIP network types used for communications. NTCIP 2101 (PMPP) networks shall be configured with an address in the range1 to 255 with a default address of 1.NTCIP 2104 (Ethernet) networks shall use a static IP address. Both the IP address and subnet shall be configurable. NTCIP21033 (PPP) networks shall not require network addressing. A unique address shall be assigned to each sign controller. All commands from the central control location to this sign will be prefaced with this address. The sign controller shall compare this received address with the assigned address and shall accept the command only if the addresses match.

X			**5.**	The sign controller shall have sufficient memory to store a minimum of 16 two-phase messages, with each consisting of up to three (3) lines with 20 characters. A two-phase message is defined as a continuous statement that requires two separate displays on the sign face. Either EPROM or EEPROM shall be used to store messages in the sign controller. Internal circuitry shall be provided to replace stored messages with new messages received locally and remotely. A long-life battery shall back up the sign controller's RAM such that no loss of memory occurs during power outages of 24-hour duration. The battery backup system shall return to utility power upon the battery backup system be drained of power. Upon external command, the sign controller shall allow any message stored in memory to be displayed on the sign face, or replaced with a new message. The sign controller shall receive messages through the communications unit from the traffic management center, and shall store the received messages and in its memory buffer. The sign controller shall transmit confirmation of message content back to the traffic management center for received messages and stored messages when requested to do so. During uploading and downloading of messages normal sign operations shall not be suspended and the current message display shall not be interrupted.
X			**6.**	Upon termination of the display time for a message, the sign controller shall either blank the sign, or place the sign in a neutral condition (a predefined message selected for inactive periods). Message writing and erasure shall be accomplished in a left-to-right column scan, which shall appear to be simultaneous for all characters and shall be at a minimum scan rate of 45 characters per second. In the event of a loss of communications with the central control system, the sign controller shall maintain the originally commanded message for a user-specified period, after which time the sign shall go blank pending the resumption of communications. The period shall be adjustable over the range of 0 to 255 minutes.
X			**7.**	For each message, the operator shall be able to direct the controller to set a display time as either being unlimited or defined. If defined, it shall have a maximum of at least 64,800 minutes or 45 days. For information messages, the operator shall be able to select independent display times for each alternating segment and the blank-out time between messages. These times shall be 0.1-second increments from 0.1 to 25.5 seconds, for each part.
X			**8.**	Static Message a) Alternating Message (two-state): For alternating messages, selected portion of the chosen sign shall display two messages alternately with a repetition interval from one to ten seconds. The duration of each message displayed shall be independently selectable in 0.5-second increment.

X			**9.**	The sign controller shall transmit a return message to the central control system whenever it receives a valid transmission and when it is being addressed. The return message format shall contain the sign address, sign message being displayed, mode of operation, contents of any message stored in memory, and the presence and type of error detected. a) The operational status of the ventilation system, including the fans and filters, shall be automatically tested once a day and tested on command from the central control center or laptop computer on site. b) In the event the central control center fails to communicate with the sign controller within a programmable time limit, the sign shall activate a programmable default message (which can be a blank). This function shall apply only when the sign controller is in central control mode. c) Failure of any sign shall not affect the operation of any other sign in the system. d) The sign controller shall perform a consistency check of messages downloaded from the central control center or laptop computer on site to ensure that the message will fit in the display area of the sign. If any part of the message fails this check, the downloaded message shall not be displayed.
X			**10.**	The DMS Vendor shall fully furnish the equipment as a part of the DMS. As a minimum, the DMS Vendor shall provide the following for each DMS. a) Microprocessor-based controller. b) Communications interfaces. c) Three fully adjustable photo sensor controls, allowing adjustment from the inputs of the three photo sensors on the sign. d) Lightning protection and termination for the communications lines. e) Verification of grounding performed by the field contractor. f) Termination panel and termination blocks. g) Harnesses and connectors. Provide each DMS with an uninterruptible power supply (UPS) capable of maintaining and continuing the controller and communication equipment for a minimum of two hours for polling and alarms. Provide sealed AGM type batteries that are maintenance free. The battery backup system shall return to utility power upon the battery backup system be drained of power.

X			**11.**	The sign controller shall respond to the central control center whenever it receives a request for status (a poll). The return message shall be capable of providing the following information. a) Actual message (TMDV) that is visibly displayed on the sign on an individual pixel basis (full-on, half-on or off). b) Current sign illumination level. c) Control mode (central, local or local override mode). d) Error and failure reports. e) Temperature readings f) LED power supply voltage levels. g) Origin of display message transmission (laptop on site, sign controller, or central). h) Fan status i) Uninterruptable power supply status j) AC Surge protection status. k) Communication line surge protection status.
X			**12.**	Severe error condition response: in polling mode, the sign controller shall report severe error conditions to the central control center during the next polling. The severe conditions are: a) AC power failure b) AC power recovery c) Surge protection has been tripped d) The walk in door is open.
X			**13.**	Each time the sign controller is polled by the central control center or laptop computer on site, the sign controller shall test the operational status of the sensors listed below and return this information to the central control center. This operational status test shall determine if each of the following sensors are functioning properly: a) Each temperature sensor b) Each photocell c) Humidity sensor d) Each airflow sensor (if so equipped in accordance with the specifications). e) Each LED power supply sensor
NOTES/COMMENTS:				

I. TECHNICAL SPECIFICATION: TRAINING

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**1.** The DMS Vendor shall provide training in support of the DMS assembly and firmware system. The training shall be conducted at the NDOT District Offices and shall take place at a time mutually agreeable to the DMS Vendor and NDOT. a) Each training course shall include, at a minimum, four hours of user training and four hours of maintenance training for maintenance and engineering personnel. The training shall cover system operation and system maintenance for serviceable equipment, trouble-shooting, bench-repairable equipment, and system performance and operating parameter development
X			**2.** All DMS Vendor training personnel shall be qualified instructors who are familiar with and have thorough understanding of the subject matter to be presented. A minimum of two weeks prior to the start of training, a summary of the experience and qualifications of the proposed instructor(s) shall be submitted to NDOT for approval.
X			**3.** The DMS Vendor shall submit a syllabus for each course to the Department for review and approval 45 days prior to the start of any training. The Department will notify the DMS Vendor of acceptability within 15 days after the syllabus was received. Training materials shall include the course outline and material, operations and maintenance manuals, and any additional information needed to adequately describe the subject matter being taught. Training materials shall not be copyrighted.
X			**4.** The DMS Vendor shall deliver a set of training materials for each person being trained (as many as 15 NDOT staff may participate in the training) plus an additional four sets for future use. Each set of training materials shall be individually bound in three-ring, loose-leaf binders with a table of contents and section dividers. The DMS Vendor shall also retain updated versions of the training materials on its website.
X			**5.** The DMS Vendor shall visually record the training sessions in a visual format agreed upon by NDOT. The DMS Vendor shall also be responsible for providing the equipment needed to produce the visual recording.
X			**6.** The training courses are paid on a per-session basis. NDOT may elect to purchase training courses with the initial order, with subsequent orders, annually, as needed, or not at all. The cost paid for training shall include the cost of providing training materials, travel, and related expenses associated with the course. Training for any updates or enhancements generated at the request of the DMS Vendor shall be performed at no cost to NDOT.
NOTES/COMMENTS:			

J. TECHNICAL SPECIFICATION: SUBMITTALS

<table>
<tr><th>YES</th><th>NO</th><th>NO & PROVIDE ALTERNATIVE</th><th></th></tr>
<tr><td>X</td><td></td><td></td><td>1. The DMS Vendor shall prepare and submit detailed shop drawings for each DMS unit, indicating the types of materials proposed for each component of the sign, parts lists, assembly techniques, layout of all display elements, and wiring schematics. These drawings shall be submitted to the Department for review and approval within 60 days from the date of receipt of purchase order and prior to fabrication of any sign. Parts lists shall include circuit and board designation, part type and class, power rating, component manufacturer, and mechanical part manufacturer.</td></tr>
<tr><td>X</td><td></td><td></td><td>2. As part of the submittals for the DMS assembly, the DMS Vendor shall submit an engineering drawing, illustrating the DMS character set as shown below, for review and approval by NDOT. Prior to finalization of the DMS character set, NDOT reserves the right to modify the DMS character set and add up to 12 additional characters or bitmap images.
<table>
<tr><td>26 upper-case letters, 10 numerals</td></tr>
<tr><td>an exclamation mark (!)</td></tr>
<tr><td>a degree (°)</td></tr>
<tr><td>a hyphen (-)</td></tr>
<tr><td>a plus sign (+)</td></tr>
<tr><td>a colon (:)</td></tr>
<tr><td>two chevrons (<) and (>)</td></tr>
<tr><td>and (&)</td></tr>
<tr><td>a forward slash (/)</td></tr>
<tr><td>the following arrows (↓), (↑), (←), (→), (↗), (↖), (↘), and (↙)</td></tr>
<tr><td>up to 10 traffic-related bitmap images (to be determined by NDOT)</td></tr>
</table></td></tr>
<tr><td>X</td><td></td><td></td><td>3. The DMS Vendor shall also submit complete technical information, shop drawings, photographs, graphs, circuit diagrams, instruction manuals, security provisions, and any other necessary documents to fully describe the DMS and associated equipment. Five copies of all submittal information shall be furnished.</td></tr>
<tr><td colspan="4">NOTES/COMMENTS:</td></tr>
</table>

K. TECHNICAL SPECIFICATION: NATIONAL TRANSPORTATION COMMUNICATIONS FOR INTELLIGENT TRANSPORTATION SYSTEM (ITS) PROTOCOL, OR NTCIP REQUIREMENTS

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**1.** **References**: These specifications reference several standards through their NTCIP-designated names. In many cases, the standard is more widely known by its original NEMA number, which is also identified. Each NTCIP component covered by these project specifications shall implement the most recent version of the standard that is at the stage of Recommended or Higher as of DATE OF THE RFP, including any and all Approved or Recommended Amendments to these standards as of the same date. It is the responsibility of the DMS Vendor to monitor the NTCIP activities to discover any recent additional documents (these shall include minutes from the NTCIP Working Group)
X			**2.** **General Requirements: Subnet Level** a) Each NTCIP Component shall support NTCIP 2102 (SP-PMPP/FSK with data rates from 1.2 kbps to 56 kbps b) NTCIP components may support additional Subnet Profile Standards at the manufacturer's option. At any one time, only one Subnet Profile shall be active on a given serial port of the NTCIP Component. If the NTCIP Component has a serial port that supports multiple Subnet Profile Standards, the NTCIP Component shall be configurable to allow the field technician to activate the desired Subnet Profile and shall provide a visual indication of the currently selected Subnet Profile.
X			**3.** **Transport Level**: a) Each NTCIP Component shall comply with NTCIP 2202 (*TCP/IP and UDP/IP*). The NTCIP components may support additional Transport Profile Standards at the manufacturer's option. b) Response datagrams shall use the same Transport Profile Standard used in the request c) Each NTCIP Component shall support the receipt of datagrams conforming to any of the identified Transport Profile Standards at any time.
X			**4.** **Application Level**: a) Each NTCIP Component shall comply with the NTCIP 1101 (*STMF*) and shall meet the requirements for Conformance Level 1. b) An NTCIP Component may support additional Application Profile Standards at the manufacturer's option. c) Response datagrams shall use the same Transport Profile Standard used in the request. d) Each NTCIP Component shall support the receipt of Application data packets at any time allowed by the identified standards.
X			**5.** **Information Level**: a) Each NTCIP Component shall provide Full, Standardized Object Range Support (FSORS) of all objects required by this RFP, unless otherwise indicated below, or approved by the Department. b) The maximum Response Time for any object or group of objects shall be 200 milliseconds.

X			**6.**	The DMS shall support all mandatory objects of all mandatory Conformance Groups as defined in NTCIP 1201 (*Global Object Definitions*) and NTCIP 1203 (*Object Definitions for DMS).* Exhibit 2 indicates the modified object requirements for these mandatory objects.
X			**7.**	**Other Requirements**: The NTCIP Component shall also implement all mandatory objects of the following optional conformance groups. a) Time management as defined in NTCIP 1201 b) Required Multi-Tags as defined in Exhibit 3. c) Time base Event Schedule as defined in NTCIP 1201. Exhibit 4 indicates the modified object requirements for this conformance group. d) Font Configuration, as defined in NTCIP 1203. e) Multi-Error Configuration, as defined in NTCIP 1203 f) Multi-Configuration as defined in NTCIP 1203. Exhibit 5 indicates the modified object requirements for this conformance group. g) Illumination/Brightness Control, as defined in NTCIP 1203. Exhibit 6 indicates the modified object requirements for this conformance group. h) Scheduling as defined in NTCIP 1203. Exhibit 7 indicates the modified object requirements for this conformance group. i) Status Error, as defined in NTCIP 1203. j) Lamp Error Status as defined in NTCIP 1203. The NTCIP Component shall also implement the optional objects shown in Exhibit 8
X			**8.**	**NTCIP Support**: The NTCIP Component developer shall provide software upgrades at no cost to the Department for the period of the contract for both central software and field units. All modified software shall be provided with full description of modifications. Implementation of this software shall be at the discretion of the Department.
X			**9.**	**Interpretation Resolution**: If the Department or NTCIP component developer discovers a statement that cannot be implemented or is ambiguous in the standards referenced by this RFP, the issue shall be submitted to the appropriate NTCIP Working Group for resolution. If the Working Group fails to respond within 90 days, the Department shall provide an interpretation of the specification for use on the project.
NOTES/COMMENTS:				

L. EXHIBIT ONE (1): NTCIP STANDARDS (EXHIBIT ONE(1) PROVIDES THE FULL REFERENCE TO THE CURRENT VERSION OF EACH OF THESE STANDARDS

Abbreviated Number	Full Number (NEMA Number)	Title
NTCIP 1101	**NTCIP 1101:1996v01.12** (NEMA TS 3.2-1996)	Simple Transportation Management Framework (STMF)
NTCIP 1201	**NTCIP 1201:1996v01.10** (NEMA TS 3.4-1996)	Global Object (GO) Definitions
NTCIP1203	**NTCIP 1203:1997v01.15** (NEMA TS 3.6-1997)	Object Definitions for Dynamic Message Signs (DMS)
NTCIP 2103	**NTCIP 2103:2003v01.14** (NEMA TS 3.SP-PPP)	Point-to-Point Protocol (PPP) using RS-232 Subnetwork Profile
NTCIP 2202	**NTCIP 2202:2001v01.05** (NEMA TS 3.TP-Internet v99.01.03)	Transmission Control Protocol/Internet Protocol (TCP/IP) and User Datagram Protocol/Internet Protocol (UDP/IP)

M. EXHIBIT TWO (2): MODIFIED OBJECT RANGES FOR MANDATORY OBJECTS

Object	Reference	Project Requirement
Module Table Entry	NTCIP 1201 Clause 2.2.3	Shall contain at least one row with module Type equal to 3 (software). The module Make shall specify the name of the manufacturer, the module Model shall specify the manufacturer's name of the component and the model Version shall indicate the model version number of the component.
Vms Character Height Pixels	NTCIP 1203 Clause 2.3.1.1.1.1	Shall contain the value zero (0) to indicate a variable character height.
Vms Character Width Pixels	NTCIP 1203 Clause 2.3.1.1.1.2	Shall contain the value zero (0) to indicate a variable character width.
Dms Max Changeable Msg	NTCIP 1203 Clause 2.6.1.1.1.3	Shall be at least 16
Dms Free Changeable Memory	NTCIP 1203 Clause 2.6.1.1.1.4	Shall be at least 32 when no messages are stored.
Dms Message Multi String	NTCIP 1203 Clause 2.6.1.1.1.8.3	The DMS shall support any valid Markup Language for Transportation Information (MULTI) string containing any subset of those MULTI tags listed in Exhibit 3 • local • external • central
Dms Control Mode	NTCIP 1203 Clause 2.7.1.1.1.1	The DMS shall support the following control modes: • local (2) • external (3) • central (4) • simulation (6)

N. EXHIBIT 3: REQUIRED MULTI-TAGS

Tag	Description
cb	color - background
cf	color - foreground
f1,5	time, 12 hour format
f2,5	time, 24 hour format
f3,4	temperature, °C
f4,4	temperature, °F
f7,3	day of week
f8,2	day of month
f9,3	month of year
f11,4	year, 4 digits
fl (and /fl)	flashing text
jl2	justification line - left
jl3	justification line - center
jl4	justification line - right
jp2	justification page - top
jp3	justification page - middle
jp4	justification page - bottom
mvcl60,1,4,xxxx	circular text (indicated by “xxxx”) tag moving left to right
nl	new line
np	new page
pt	page time
sc	spacing character

O. EXHIBIT 4: MODIFIED OBJECT RANGES FOR TIMEBASE EVENT SCHEDULE CONFORMANCE GROUP

Object	Reference	Project Requirement
MaxTime Base Schedule Entries	NTCIP 1201 Clause 2.4.3.1	Shall be at least 30
maxDayPlans	NTCIP 1201 Clause 2.4.4.1	Shall be at least 16
maxDayPlanEvents	NTCIP 1201 Clause 2.4.4.2	Shall be at least 10

P. EXHIBIT 5: MODIFIED OBJECT RANGES FOR MULTI-CONFIGURATION CONFORMANCE GROUP

object	Reference	Project Requirement
Default Justification Line	NTCIP 1203 Clause 2.5.1.1.1.6	The DMS shall support the following forms of line justification: • left • center • right • full
Default Justification Page	NTCIP 1203 Clause 2.5.1.1.1.7	The DMS shall support the following forms of page justification: • top • middle • bottom
Default Page On Time	NTCIP 1203 Clause 2.5.1.1.1.8	The DMS shall support the full range of these objects with step sizes no larger than 0.1 seconds
Default Page Off Time	NTCIP 1203 Clause 2.5.1.1.1.9	The DMS shall support the full range of these objects with step sizes no larger than 0.1 seconds
Default Character Set	NTCIP 1203 Clause 2.5.1.1.1.10	The DMS shall support the following character sets: 8-bit value

Q. EXHIBIT 6: MODIFIED OBJECT RANGES FOR ILLUMINATION/BRIGHTNESS CONTROL

Object	Reference	Project Requirement
Dms Illum Control	NTCIP 1203 Clause 2.8.1.1.1.1	The DMS shall support the following illumination control modes: • photocell • timer • manual
Dms Illum Num Bright Levels	NTCIP 1203 Clause 2.8.1.1.1.4	Shall be at least 7

R. EXHIBIT 7: MODIFIED OBJECT RANGES FOR SCHEDULING CONFORMANCE GROUP

Object	Reference	Project Requirement
Num Action Table Entries	NTCIP 1203 Clause 2.9.1.1.1.1	Shall be at least 24

S. EXHIBIT 8: OPTIONAL OBJECT REQUIRMENTS

Default Flash On	NTCIP 1203 Clause 2.5.1.1.1.3	The DMS shall support the full range of these objects with step sizes no larger than 0.1 seconds
Default Flash Off	NTCIP 1203 Clause 2.5.1.1.1.4	The DMS shall support the full range of these objects with step sizes no larger than 0.1 second.
Dms Message Pixel Service	NTCIP 1203 Clause 2.6.1.1.1.8.7	The DMS shall have the pixel service enabled (1) during a blank message and disabled (0) when an active message is being displayed.
Dms SW Reset	NTCIP 1203 Clause 2.7.1.1.1.2	FSORS
Dms Multi Other Error Description	NTCIP 1203 Clause 2.7.1.1.1.20	If the Vendor implements any vendor-specific MULTI tags, the DMS shall provide meaningful error messages within this object whenever one of these tags generates an error.
Watch dog Failure Count	NTCIP 1203 Clause 2.11.1.1.1.5	FSORS
Fan Failures	NTCIP 1203 Clause 2.11.2.1.1.8	FSORS
Fan Test Activation	NTCIP 1203 Clause 2.11.2.1.1.9	FSORS
Temp Min Ctrl Cabinet	NTCIP 1203 Clause 2.11.4.1.1.1	FSORS
Temp Max Ctrl Cabinet	NTCIP 1203 Clause 2.11.4.1.1.2	FSORS
Temp Min Sign Housing	NTCIP 1203 Clause 2.11.4.1.1.5	FSORS
Temp Max Sign Housing	NTCIP 1203 Clause 2.11.4.1.1.6	FSORS

T. ANNUAL USAGE, ESTIMATED

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**1.** Annual usage figures provided are estimates and are not to be construed as either a minimum or maximum purchase quantity. The orders shall be for the actual quantities of each item ordered by or for any agency during the life of the contract. Contractor shall not impose minimum order requirements.
X			**2.** Annual estimated usage will be a 5 DMS units.
NOTES/COMMENTS:			

U. USAGE REPORT

YES	NO	NO & PROVIDE ALTERNATIVE	
x			**1.** The contractor shall, upon request, provide a usage report of this contract by state agencies and political subdivisions. Information will include agency name, item(s), and dollar amount and shall include the information of the time period requested. Information may be requested at any time by the SPB.
NOTES/COMMENTS:			

V. DELIVERY AND INSTALLATION

YES	NO	NO & PROVIDE ALTERNATIVE		
X			**1.**	The Field contractor for each DMS installation project is responsible for identifying a location, (approved by and coordinated with the Department) for accepting delivery of the DMS, controllers, and other shipped accessories required for complete installation and operation of the DMS. The field contractor will receive a 24-hour notice prior to delivery of each sign. Within three hours of delivery, the field contractor is required to remove and unload the complete contents delivered, and clean out any shipping material. The DMS and all its associated components will be the responsibility of the field contractor from the moment the field contractor begins handling the equipment in any manner. It is therefore the responsibility of the field contractor to thoroughly inspect all DMS equipment for any possible damage before the delivery vehicle departs, and obtain documentation of any damage on the bill of lading. In the event of the presence of damage, the field contractor shall be responsible for notifying the Department and initiate the replacement procedures. In the event no damage claim is filed with the Department within three days of delivery, it shall be assumed that the received equipment had no observable physical damage. The field contractor shall be responsible for storage and protection of all materials shipped from the time of delivery until installation. All shipped DMS equipment shall be transported to the site, unloaded, installed, and erected by the field contractor. The field contractor shall provide traffic control (lane closures) and a bucket truck (including an operator) for use by the DMS Vendor's representative during the installation and testing of each DMS. The DMS Vendor shall give the field contractor a minimum of three week notice prior to each requested closure, and attempt to utilize lane closures when established for the field contractor's activities, whenever possible. The DMS Vendor shall have a qualified representative present at the time of delivery and installation. The DMS Vendor's representative and the field contractor will together inspect the delivered equipment, following that, the field contractor will note and document any damage in writing, which shall be initialed by both parties. Any damaged equipment shall be the responsibility of the DMS Vendor.

NOTES/COMMENTS:

Delivery Date - 90-110 days from release of order.

W. PACKAGING

YES	NO	NO & PROVIDE ALTERNATIVE		
X			**1.**	Packages are to be clearly marked with size, weight, color, quantity, and the purchase order number.
X			**2.**	Packaging must be of suitable size and of sufficient strength to protect the contents during shipping, handling and storage.

NOTES/COMMENTS:

X. ORDERS

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**1.** Orders will be placed either by, phone, e-mail or Internet (if available and not to the exclusion of the other methods).
X			**2.** All orders must reference a purchase order number and the purchase order number must be referenced on the packing slip, and invoice. Invoices are to be sent to the "Invoice to" address on the purchase order.
NOTES/COMMENTS:			

Y. QUALITY ASSURANCE AND DOCUMENTATION

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**1.** The DMS Vendor shall maintain a Quality Management System (QMS) as a means of ensuring product conformation to specified requirements through quality planning. The vendor's QMS shall have been in place for a minimum of five (5) years prior to the bid date for this project. The scope of the QMS shall include design, manufacture, installation, maintenance, and sales of DMS. The vendor's pre-build technical submittal shall provide a copy of the company's quality manual, which shall detail the various components of the QMS.
X			**2.** Documentation: In addition to the requirements of the Standard Specifications, documentation for the DMS assembly shall include complete and comprehensive information on all equipment components and accessories. The DMS Vendor shall provide blueprints, line drawings and descriptive text sufficient to allow a technician of average skill to diagnose, repair, and maintain the equipment and its components. Firmware documentation shall include description of all functions that explain how operations are related to remote and local commands; all program source-codes in both printed and machine-readable form, detailed memory maps, and detailed communications protocol documentation. Computer-generated text shall be printed in 10-point Arial font or larger, using laser-printed quality unless otherwise approved by NDOT in advance. NDOT shall have the right to reproduce any material for its educational and maintenance purposes only. The books and manuals shall be delivered to NDOT upon delivery of the first unit. Acceptance and payment cannot be approved until NDOT has received acceptable manuals. The DMS Vendor shall furnish five copies of all documentation.

X			**3.** The DMS Vendor shall supply the software with full documentation, containing ASCII versions of the following MIB files in ASN.1 format, as listed below. a) The relevant version of each official standard MIB Module referenced by the device functionality. b) If the device does not support the full range of any given object within a Standard MIB Module, a manufacturer-specific version of the official Standard MIB Module with the supported range, indicated in ASN.1 format in the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE macro. The name of this file shall be identical to the standard MIB Module, except that it will have the extension "man". c) A MIB Module in ASN.1 format containing any and all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros. d) A MIB containing any other objects supported by the device (these to include any proprietary manufacturer-specific objects). The manufacturer shall allow the use of any and all of this documentation by any party authorized by the Nebraska of Transportation for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.
NOTES/COMMENTS:			

Z. PRICES

YES	NO	NO & PROVIDE ALTERNATIVE	
X			1. Price quoted shall be unit price and shall be firm for Three (3) years from date of an award and are to be net; including transportation and delivery charges fully prepaid by the Bidder F.O.B. Destination as specified. No additional charges will be allowed for packing, handling, fuel surcharge, or partial delivery costs. Any request for an increase must be submitted in writing to the SPB a minimum of one hundred twenty (120) days prior to proposed effective date of increase, and must show cause and be accompanied by supporting documentation (such as notification letter from manufacturer). Further documentation may be required by the State, to authenticate the increase (such as manufacturer invoices). Failure to supply any requested supporting documentation may be grounds to cancel the contract. In no instance may a price increases be billed to the State until the contract is amended. The State further reserves the right to reject any proposed price increase(s), cancel the contract and re-bid if determined to be in the best interest of the State. The State will be given full proportionate benefit of any decrease for the term of the contract. Contract supplier or suppliers may honor pricing and extend the contract to political sub-divisions, cities, and counties. Terms and conditions of the contract must be met by political sub-divisions, cities, and counties.
NOTES/COMMENTS:			

AA. PROHIBITED PRODUCTS

YES	NO			
X			**1.**	The State will not accept Gray Market Products for this solicitation. Gray Market is defined as the trade of a commodity through distribution channels which, while legal, are unofficial, unauthorized, or unintended by the original manufacturer. Gray Market items are not designed to be sold in a particular market and cannot be supported by the authorized importer because of various reasons.
X			**2.**	The State will not accept any products made by a company owned by the Chinese Communist Party. Furthermore, pursuant to Executive Order No. 23-05, the State will not accept any communications equipment or services developed by organizations on the Federal Communications Commission's Covered List.
X			**3.**	The State will not accept goods from countries or persons identified on the Office of Foreign Assets Control Sanctions List.
NOTES/COMMENTS:				

BB. AUTHORIZED DEALER & WARRANTY

YES	NO	NO & PROVIDE ALTERNATIVE		
X			**1.**	To the extent required by the manufacturer, the Contractor shall be an authorized dealer. Contractor may be required to substantiate that he/she is an authorized dealer. Proof, if required, must be submitted to SPB within three (3) business days of the request and prior to the award of any contract.
X			**2.**	The terms of the original manufacturer's standard warranty shall apply to all equipment acquired from this solicitation for the entire warranty period.
NOTES/COMMENTS:				

CC. WARRANTY

YES	NO	NO & PROVIDE ALTERNATIVE		
X			**1.**	Each DMS unit and all of its associated equipment shall be warranted against all defects in materials and workmanship for a minimum of one year from the date of acceptance, as recorded by NDOT. The warranty shall be a full warranty and shall include warranties of merchantability and fitness for particular purpose.
X			**2.**	The Warranty shall provide that in the event of a malfunction during the warranty period, the defective component, card, module, subassembly, or auxiliary device shall be replaced with a working component within five (5) working days for use, while the warranted component is being repaired.

X			**3.**	Any component of equipment, which, in the opinion of the Department, fails three (3) or more times prior to the expiration of the warranty, shall be judged as unsuitable. With the Department's approval, it shall be replaced by the DMS Vendor with a new component of the same type at no cost to NDOT. The unsuitable component shall be permanently removed from the project. A failure shall also be defined as the sign becoming unreadable or illegible, as determined by the Department.
X			**4.**	A qualified, authorized representative of the DMS Vendor, who has been trained by the DMS manufacturer, shall perform all diagnoses and repairs during the warranty period. With the Proposal, the DMS Vendor shall furnish a signed letter to NDOT , designating the authorized representative of the DMS Vendor who will perform the warranty and maintenance work. An assessment and on-site inspection shall be conducted within twenty-four (24) hours of notification and repairs completed within seventy-two (72) hours. Failure to comply within the time frame may result in a $50.00 per day penalty, excluding failure to perform arising from causes beyond control such as acts of God, floods, fires or unusually severe weather.
X			**5.**	There shall be no maintenance charges during the term of warranty. The DMS Vendor agrees to provide all the required labor and parts (at no cost to NDOT) to remove, repair or replace, and reinstall any such defective workmanship and/or materials, which becomes or is found to be defective during the term of this warranty. The DMS Vendor shall warrant: a) That all services performed hereafter shall conform to the requirements of this contract and shall be performed by qualified personnel in accordance with the highest professional standards. b) That all items furnished conform to the requirements of this contract and shall be free from defects in design materials and workmanship. c) That it has ownership and/or marketing rights for all items, including intellectual property, provided pursuant to this contract. d) That the supplied equipment is in compliance with all applicable regulations.
NOTES/COMMENTS:				

DD. ACCEPTANCE AND TESTING REQUIREMENTS

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**1.** Each item delivered will be subject to a systems acceptance test in accordance with the specifications, following successful completion of the subsystem test. The Department may permit correction of deficiencies during the system acceptance test; however, in the event that a major failure identified, the NDOT Contract Officer (in writing) of the DMS Vendor's successful testing of such remedy. If the remedy is acceptable, the Contract Officer will allow resumption of the system acceptance test at the point deemed appropriate by the Contract Officer. In the event the DMS Vendor does not provide a timely and acceptable remedy, the Contract Officer may, at his or her option, resort to any single or combinate of the following remedies: a) Specify a remedy for failures and begin a new acceptance test upon successful testing of the remedy. b) Terminate the contract and return all items without incurring any liability. c) Reserve rights or claims for breach of any covenant of the contract.
X			**2.** General: the required performance testing of all materials and equipment not previously tested and approved by NDOT. The DMS Vendor shall demonstrate that the equipment and the systems furnished and installed under this contract shall function in full compliance with the requirements of the contract documents. This demonstration(s) shall be conducted in the presence of the Department and shall be conducted in the State of Nebraska. The DMS Vendor shall develop all of the required test procedures and data forms and shall submit them for the Department's approval at least twenty-one (21) days prior to performing the associated tests. All testing shall be conducted Monday through Friday between 8:00 a.m. and 5:00 p.m., unless otherwise approved by the Department reviewing the test results. A DMS Vendor's representative shall be present at all tests. If the equipment or systems fail any part of the test, the entire test shall be repeated, at the option of the Department. The DMS Vendor shall furnish and maintain all test equipment and services. The DMS Vendor shall notify the Department of the time, date and place of each test at least fourteen (14) days prior to the date on which the test is planned. Neither witnessing of the tests by NDOT nor the waiving of the right to do so will relieve the DMS Vendor of the responsibility to furnish and install the work in accordance with the contract documents. Such actions by the NDOT representatives, or approval of any test results by them, will not be deemed as acceptance of the equipment or systems tested until the successful completion of the System Acceptance Test. The contract period will not be extended for time loss or delays related to testing. The cost for testing shall be considered as part of the unit cost for the item tested and no direct payment will be made for them.

X			**3.** **TEST PROCEDURES AND TEST DATA FORMS**: The DMS Vendor shall prepare and submit all of the test procedures and test data forms for the Department's approval at least twenty-one (21) calendar days before the scheduled testing. The Department will review the submitted test procedures and return them to the DMS Vendor. If re-submittal of the test procedures is not required, the DMS Vendor may conduct the test as scheduled. At a minimum, the test procedures and data forms shall include the following: a) A step-by-step outline of the test sequence to be followed, showing a test of every function of the equipment or system to be tested. b) A description of the expected operation output and test results. c) An estimate of the test duration and a proposed test schedule. d) A data form to be used to record all data and quantitative results obtained during the test. e) A description of any special equipment, setup, manpower, or conditions required for the test. Except otherwise noted, the submission of test procedures shall be made by the DMS Vendor and processed by the Department as "Submittal Data".
X			**4.** **TESTING EQUIPMENT AND SOFTWARE**: As part of the testing requirements, the DMS Vendor shall furnish all testing software and equipment required for testing and developing it, as needed. All testing software shall be submitted along with the test procedures and shall be subject to the approval of the Department. Testing software, including the source code, shall be furnished on CD-ROM and in printed form. The DMS Vendor shall provide thorough documentation and user instructions for the test software.
X			**5.** **Test Categories** a) Design Approval and Pre-installation Demonstration Test b) Field Acceptance Test c) System Acceptance Test
X			**6.** **DESIGN APPROVAL (DA)**: Design Approval shall be conducted at independent testing facilities in accordance with the approved test procedures for all equipment comprising the DMS assembly. The DMS Vendor shall certify the rated life of the DMS assembly and that software will be developed without the use of proprietary protocols. Certification of Design Approval, performed previously for similar equipment, may be accepted in lieu of performing new tests at the discretion of the Department. When submitting certifications for previously conducted tests, the DMS Vendor shall state any and all differences between the equipment previously tested, and the equipment proposed under this contract.
NOTES/COMMENTS:			

EE. REQUIREMENT TEST

<table>
<tr><th>YES</th><th>NO</th><th>NO & PROVIDE ALTERNATIVE</th><th></th></tr>
<tr><td>X</td><td></td><td></td><td>1. The test shall be successfully completed prior to award of contract. The Winning Bidder will be required to provide documentation supporting the system requirements as listed in the following chart. Documents can include Professional Engineer stamped shop drawings (PE), certificate of manufacture testing (CM), or the contractual agreement that results from this ITB.</td></tr>
<tr><td>X</td><td></td><td></td><td>
<table>
<tr><th>Requirement Test</th><th>Doc Type</th><th>Approve (Yes/No)</th></tr>
<tr><td>The field system shall not decrease performance under these listed environmental conditions:</td><td>PE</td><td></td></tr>
<tr><td>Temperature range of -40°F to +140°F</td><td>PE</td><td></td></tr>
<tr><td>Humidity range of 0% to 99%, non-condensing</td><td>PE</td><td></td></tr>
<tr><td>Minimum winds of 90-mph including 30% gust factors</td><td>PE</td><td></td></tr>
<tr><td>Designed to withstand a negative (outward) pressure of 50 percent of the design inward wind pressure due to truck traffic.</td><td>PE</td><td></td></tr>
<tr><td>Withstand snow load of 3 lbs/sqft</td><td>PE</td><td></td></tr>
<tr><td>The DMS shall be installed on permanent over-the-roadway sign structures or side of the road posts</td><td>PE</td><td></td></tr>
<tr><td>Overhead DMS 4400 pounds max weight</td><td>PE</td><td></td></tr>
<tr><td>System shall run on single phase 120/240 VAC, 60Hz.</td><td>PE</td><td></td></tr>
<tr><td>DMS case shall not reflect glare from the sun onto traveling public.</td><td>PE</td><td></td></tr>
<tr><td>DMS system shall be surge protected.</td><td>PE</td><td></td></tr>
<tr><td>DMS system shall include lightning arrestors.</td><td>PE</td><td></td></tr>
<tr><td>All cases shall provide environmental protection from conditions listed under current NEMA TS-4 standards.</td><td>PE</td><td></td></tr>
<tr><td>The cage support frame shall withstand vibrations as specified by NEMA TS-4, subsection 2.2.8</td><td>PE</td><td></td></tr>
<tr><td>All case assemblies shall be rated for high-pressure washing.</td><td>PE</td><td></td></tr>
<tr><td>UPS shall use maintenance free batteries.</td><td>CM</td><td></td></tr>
</table>
</td></tr>
</table>

X			Ventilation system designed to keep the internal DMS air temperature lower than +140°F when the outdoor ambient temperature is +115°F or less.	PE	
			Air conditioning shall not be permitted.	PE	
			Filters shall be listed and rated Class 2 by UL.	CM	
			Filter that removes airborne particles measuring 500 microns in diameter and larger.	CM	
			The internal air circulating system shall be capable of maintaining air differential temperatures throughout the DMS case under 35°F.	PE	
			Sign shall use high intensity Light Emitting Diode (LED) technology.	PE	
			LEDs shall be AlInGaP or InGaN semiconductor technology.	CM	
			LEDs shall emit red light at a peak wavelength of 624 ± 6 nm.	CM	
			LEDs shall emit green light at a peak wavelength of 529 ± 10 nm.	CM	
			LEDs shall emit blue light at a peak wavelength of 470 ± 10 nm.	CM	
			LEDs shall consist of a 30° viewing angle.	CM	
			6 or more LEDs shall be used in a circular cluster to form a pixel.	PE	
			Pixels shall have equal numbers of each set of colored LEDs.	PE	
			Pixels shall be equally spaced horizontally and vertically.	PE	
			Each pixel shall have equal color and on-axis intensity.	PE	
			Each pixel shall be rated for 100,000 hours of operation under field conditions at 70% or higher of original brightness.	CM	
			The DMS controller shall be able to interface with NDOT's ATMS software.	CM	
			DMS controller shall communicate using NTCIP protocol.	PE	
			Available supply of parts for maintenance and repairs/replacements.	ITB	
			In-house field service calls for technology specific repairs.	ITB	
			Available software upgrades.	ITB	
			Available software support.	ITB	
			Purchased parts are new, unused current production models.	ITB	
			Perform stand-alone and system acceptance testing.	ITB	
			Provide training for software use.	ITB	
			Provide training for maintenance and repair work.	ITB	
			Provide shop drawings for all wiring connection in the system.	ITB	
			Provide instruction manuals for operation, maintenance, repair activities of the system.	ITB	

NOTES/COMMENTS:

FF. PRE-INSTALLATION DEMONSTRATION TEST

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**1. A Demonstration Test** shall be conducted on a DMS assembly production unit to demonstrate to the Department that all contract documents are satisfied. The Demonstration Test shall include verification of proper operation of the DMS assembly for at least two hours after the following: • Having been stabilized at the maximum specified temperature, humidity, and voltage. • Having been stabilized at the minimum specified temperature, humidity, and voltage. • Having been stabilized at +70°F and nominal input voltage of 120/240 ±15 VAC, 60 ±3Hz The DMS Vendor shall pay for the full cost of transportation and lodging for two Department representatives to attend the DT. The DT shall be completed within five consecutive workdays at the manufacturer's facility. All DT shall be conducted in accordance with the approved test procedures. The DT shall be conducted on a DMS assembly completely interconnected to represent the final field installation. The set-up shall include the sign, sign controller, laptop computer or central system, and photoelectric switch. If a component fails to pass its DT, the component shall be corrected or replaced and the test repeated until proven successful, as approved by the Department. The DMS Vendor shall provide diagnostic hardware and software to test the DMS remote control and communications functions. The diagnostic hardware and software shall exercise all of the remote control functions of the DMS. The diagnostic hardware and software shall remain the property of the DMS Vendor. The following chart will serve as a minimum check list of requirements for the DT:

					Approve (Yes/No)
				Walk in case for DMS.	
				Access doors on both sides of the sign case.	
				Doors shall have a removable railing across opening to prevent falling out of case.	
				Doors shall be keyed with a Corbin #2 key.	
				Doorway opening shall be minimum of 72" high by 24" wide.	
				Door shall open outward.	
				Have stops to retain the door open at the 90° and 120° positions.	
				Include level interior walkway along the bottom of the DMS case.	
				Interior walkway shall be non-slip surface.	
				Interior walkway shall not be uncomfortable for kneeling.	
				The minimum distance from the interior rear wall of the DMS case to the closest display components shall be 24 inches	
				Maintenance is performed from inside the sign case for DMS, with the exception of structural members	
				DMS case attachment to overhead sign structure shall allow for up to a 3° tilt in the vertical axis.	
				Max length of 26/19 feet for DMS.	
				Max height of 9 feet for overhead DMS.	
				Sign case max operation shall not exceed 40 amps per leg (3-wire plus ground).	
				Include knockouts for two 3" conduits and one 2" conduit.	
				Include weep holes at the bottom of the case.	

			One 15 amp, 120 VAC duplex outlet shall be located on each end of the DMS case.	
			Include internal lighting system.	
			Minimum of 30 watts for internal lighting in all areas inside case.	
			Lights controlled by up to 4 hour adjustable timer.	
			Timer located just inside the DMS case door.	
			No internal lighting shall be visible to motorists.	
			Front side of the DMS shall be flat black.	
			The display face of the DMS shall have a minimum 12-inch outer flat black border around the perimeter of pixel matrix.	
			All DMS equipment, components, and assemblies located in the DMS case shall be removable and capable of being installed and transported by one person.	
			Include ethernet port inside of DMS case for laptop control of DMS system.	
			DMS controller shall be located in the sign case.	
			Max controller power use shall not exceed 20 amps per leg (3-wire).	
			Provide sign controller with an uninterruptible power supply (UPS) capable of operating the cabinet for a minimum of two hours. (allows the next poll to send alarms)	
			Include sign case heaters to keep inside front face free from condensation.	
			Anti-condensation heaters shall be controlled by humidity sensors in the sign case.	
			Walk in sign case heaters for maintenance work.	
			Work heaters can be controlled by adjustable timer up to 4 hours.	
			Timer located just inside the DMS case door.	
			Heaters shall return to thermostat control when timer expires.	
			All heaters to be controlled by thermostat located inside the case.	
			Ventilation system shall consist of two or more intake ports.	
			Intake ports shall be located near the bottom of the case rear wall.	
			Ventilation system shall positively pressure the case.	
			Ventilation fans shall be located downstream from air filters.	
			Ventilation system shall use non-proprietary air filters.	
			Air filters shall be replaceable from within the DMS case.	
			Internal fans shall circulate air inside of case.	
			Thermostat adjustable temperature range between 50°F to 110°F	
			Ventilation and circulation system can be controlled by an adjustable timer for up to 4 hours.	
			Timer control located just inside the DMS case door	
			Ventilation and circulation system shall return to thermostat control when timer expires.	
			Pixels and modules shall be aligned such that there is no visible difference in illumination.	
			Modules shall mount or be removed using either standard hand tools or no tools.	
			Module electrical and signal connections shall be the quick-disconnect locking connector type.	
			All pixel modules, assemblies, and components shall be compatible and interchangeable.	

Removal or failure of any pixel or module shall not affect the operation of any other module or sign component.	
LEDs pixels shall meet requirements without the use of lenses, fiber optic, or shutters.	
Photo sensor shall detect and compare conditions from at least 3 directions.	
One of the three directions shall be behind the DMS case.	
One of the three directions shall be in front of the DMS case.	
Display shall be full matrix.	
Display shall be 89 x 347 pixels for overhead DMS. (sign 1)	
Display shall be 89 x 245 pixels for side mount DMS. (sign 2)	
Capable of shall up to three rows of text per page.	
Each row shall show up to 17 characters for overhead DMS.	
Each row shall show up to 12 characters for side mount DMS.	
Each row shall be capable of displaying a user-selected number of characters.	
Character height shall be 18 inches.	
Each character shall be formed by a matrix of individual pixels	
Characters shall include 26 upper-case letters	
Characters shall include 10 numerals	
Characters shall include exclamation mark (!), degree (°),hyphen (-), plus sign (+),colon (:), two chevrons (<) and (>), and (&), forward slash (/)	
DMS shall display bitmap images.	
Images shall range from six (6) pixels high by six (6) pixels wide to the full display.	
Shall images include arrows pointing at each multiple of 45°	
The characters forming words shall be readable by a person with 20/20 corrected vision within a range of 100 feet to 1,000 feet in advance of the sign at an eye-height of 3.5 feet within a 30° cone of vision about the optical axis.	
Door will have a door ajar sensor that reports to the sign controller.	
Include a controller dedicated to operation of the DMS system.	
DMS system shall be independent in operation of any other DMS.	
All heaters can be controlled by sign controller.	
Sensors shall monitor fan rotational speed.	
Fan speed shall be reported to the sign controller.	
If a fan fails, it shall automatically be deselected and another fan activated.	
Fan error message shall be sent to the sign controller.	
Ventilation and circulation system will be thermostatically controlled.	
Thermostat reading shall be sent to sign controller.	
Thermostat shall be located near the top of the DMS interior	
The modules shall be adequately addressed and physically identified inside the DMS.	
LED sensors shall be incorporated into each module.	
At a minimum, LED sensors shall indicate a failed LED, improper supply voltage, and failed communications conditions.	
LED sensor data shall be sent to the sign controller.	

DMS system shall include control software to be installed on a PC.	
Allow display time configuration including unlimited time in minutes.	
Controller shall change to neutral message after time expires.	
Allow use of a neutral message to be displayed at all times unless commanded otherwise. Neutral message can be blank sign.	
Command the sign to display at least two alternating static messages.	
Allow configuration of alternating message delay time.	
Delay time shall be configurable in tenths of a second between .3 and 12.0 seconds.	
Controller shall blank sign before displaying new message.	
Controller shall execute the change from blank display to new message in under .9 seconds.	
Controller shall execute the change from existing message to new message in under 2.3 seconds.	
Command the sign to display a message from memory.	
Store minimum of 16 2-phase full messages in memory.	
Memory shall be battery backed for power loss of up to 24 hours. The battery back system shall return to utility power once the battery backup system has been drained of power	
Controller operations shall not disrupt current sign message.	
Controller shall continue last display command if communications are lost.	
Controller shall check message format for compliance with display constraints.	
Controller shall reject any command to display a message that doesn't follow display constraints.	
Controller shall execute periodic tests of all sensors for diagnostics.	
Allow every system sensor to have at least 2 reading levels that trigger an alarm in the controller.	
Every alarm setting shall be user configurable.	
Sign controller shall respond to a request of status (a poll).	
At a minimum the poll reply shall include the following:	
Assigned DMS location address.	
Messages currently stored in memory.	
Current message command being displayed on the DMS including the start time and duration.	
Current message reply shall be delivered as a full matrix diagram showing all on or off pixels.	
Thermostat readings.	
Display illumination level.	
Photocell readings.	
LED power supply voltage levels.	
UPS status. (battery level)	
Fan rotation sensor readings.	
Humidity sensor readings.	
The sign controller shall automatically include the following during the next polling.	
LED failure.	
AC power failure	
AC power recovery.	
Surge protection has been tripped.	

The walk in door is ajar.	
Any sensor alarm has been triggered.	
Message command does not meet display constraints.	
DMS controller shall use a photo sensor to automatically change the pixel intensity in response to ambient lighting conditions.	
Pixel intensity shall be based on at least 3 different settings. (night use, over bright, and normal daytime)	
Each intensity setting shall range on contrast values between 6 and 25.	

X			**2.** **READABILITY TEST**: This test will be conducted using five individuals with 20/20 vision (corrected 20/20 vision shall be acceptable), selected by the Department. Messages shall be read at distances of 100 feet and 1,000 feet, with the sun at a low angle both in front and behind the sign. Eighty-percent correct response shall be considered passing.

X			**3. POWER LINE TRANSIENT TEST**: A transient generator shall be connected to the AC input service of the sign controller and test pulses applied under the following conditions:
			• With power to the sign controller assembly turned off, apply 1000 volts of both positive and negative polarity to the AC input every two seconds for a maximum of three applications of each polarity. The energy source shall be a fully charged 15-microfarad capacitor.
			• With power to With power to the sign controller turned on and the sign display continuously (every three seconds) responding to commands for new messages from the communications unit, apply test pulses as follows:
			  • Amplitude – 300V both positive and negative polarity
			  • Peak power – 2500 watts
			• Repetition: One pulse approximately every other cycle moving uniformly over the full wave in order to sweep over the line cycle once every three seconds:
			  • Pulse rise time: One (1) microsecond
			  • Pulse width: Ten (10) microseconds
			• With Power to the sign controller turned on, and the sign display continually (every three seconds) responding to commands for new messages from the communications unit, apply test pulses as follows:
			• Amplitude: 600V both positive and negative polarity
			• Energy Source: Oil filled, Ten (10) microfarad capacitor with internal surge impedance less than one ohm
			• Repetition: One discharge every ten (10) seconds randomly across 360° of the line cycle.

X			**4. INTENSITY AND CHROMATICITY**: Tests shall be conducted to verify chromaticity and intensity over the temperature spectrum. Seven stages shall be tested to simulate this condition; they shall include night (approximately 0.2-footcandles), low light (a normally lit office), overbright (bright sunlight), and four additional light settings approved by the Department. The tests shall be repeated at two temperatures separated by the test day's low and high temperatures or 40°, whichever is greater **FIELD ACCEPTANCE TEST**: Following the installation, the DMS Vendor shall conduct an approved field acceptance test for each DMS assembly and the laptop computer to verify that the units operate as specified. The test shall exercise all stand-alone (non-network) functional operations of the equipment installed in accordance with the Plans, or as directed by the Department. The field test for each DMS shall be completed within two weeks following the installation of the DMS, power, and communication medium by the field contractor. If a unit fails to pass its field acceptance test, it shall be corrected or replaced, and the test repeated until proven successful. The field acceptance test for the DMS assembly shall be performed using both the sign controller front display panel, the laptop computer, and test any remote functions from the central control software. At a minimum, the test shall verify the following in addition to the checklist provided in the Pre-Demonstration Test:
x			**5. SYSTEM ACCEPTANCE TEST**: After the field acceptance test is completed and all communications and central control equipment are in place, the system acceptance test (SAT) shall begin, consisting of a 30-day test period of operations without major failure of DMS Vendor-supplied equipment or software. The purpose of the test is to demonstrate that the total system (hardware, software, materials and construction) is properly installed, is free

Requirement Test	Approve (Yes/No)
The DMS shall be installed on permanent over-the-roadway sign structures or side of the road posts	
System shall run on single phase 120/240 VAC, 60Hz.	
DMS system shall be surge protected.	
DMS system shall include lightning arrestors.	
All cases shall prevent entrance of insect and small animals.	

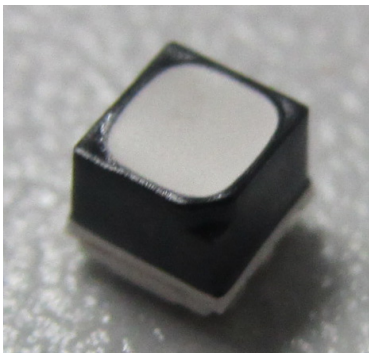
			from identified problems, exhibits stable and reliable performance, and complies with the contract documents. The following, in addition to the checklist provided in the Pre-demonstration Test, shall be tested during the SAT: **Requirement Test** / **Approve (Yes/No)** The DMS controller shall be able to interface with NDOT's ATMS software. DMS system shall communicate through NDOT's communication network. Sign controller shall reply to polls prompted from users with laptops or through NDOT's ATMS software.
X			**6.** All system documentation errors, omissions and changes occurring prior to and during the SAT shall be corrected, resubmitted, and retested before the system acceptance is complete. Upon successful completion of the system acceptance test for each DMS under the given procurement, the project will be considered complete, and the warranty period will commence.
NOTES/COMMENTS:			

GG. SUBSTITUTIONS

YES	NO	NO & PROVIDE ALTERNATIVE	
X			**1.** Vendor will not substitute any item that has been awarded without prior written approval of SPB.
NOTES/COMMENTS:			

CLD-CT1321.008

Cree® PLCC6 3 in 1 SMD LED CLY6D-FKC



PRODUCT DESCRIPTION

This SMD LED features an IPx8 water resistant rating in a PLCC6 package. These high performance tricolor SMT LEDs are designed to work in a wide range of applications. A wide viewing angle and high brightness make these LEDs suitable for outdoor and full color video signage applications.

The encapsulation resin contains UV inhibitors to minimize the effects of long-term exposure to direct sunlight, resulting in stable light output over the life of the LED. This PLCC6 package has an increased package height to ease in the manufacturing process.

FEATURES

- Size (mm):2.8x2.8x2.5
- Dominant Wavelength:
  Red (619 - 624nm)
  Green (520 - 540nm)
  Blue (460 - 480nm)
- Luminous Intensity (mcd)
  Red (560 - 1120)
  Green (900 - 1800)
  Blue (140 - 355)
- Water-Resistant (IPx8)*
- Moisture Sensitivity Level: 5a
- Lead-Free
- RoHS Compliant

APPLICATIONS

- Outdoor Full-Color Video Screen
- Decorative lighting
- Amusement

*:This part is tested under the condition of assembling it on a PCB with isolating the electrical path by silicone. The leads area of the LED is not IPx8 rated and it's required to insulate for moisture by customer in outdoor application.

Cree, Inc.
4600 Silicon Drive
Durham, NC 27703
USA Tel: +1.919.313.5300

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Items	Symbol	Absolute Maximum Rating			Unit
		R	G	B	
Forward Current Note 1	I_F	50	35	20	mA
Peak Forward Current Note 2	I_{FP}	200	100	100	mA
Reverse Voltage	V_R	5	5	5	V
Power Dissipation	P_D	130	119	76	mW
Operation Temperature	T_{opr}	-40 ~ +85			°C
Storage Temperature	T_{stg}	-40 ~ +100			°C
Junction Temperature	T_J	110	110	110	°C
Junction/ambient	R_{THJA}	440	480	420	°C/W
Junction/solder point	R_{THJS}	180	230	200	°C/W
Electrostatic Discharge Classification(MIL-STD-883E)	ESD	1000 V			

Note: 1.Single-color light.
2.Pulse width ≤0.1 msec, duty ≤1/10.

TYPICAL ELECTRICAL & OPTICAL CHARACTERISTICS (T_A = 25°C)

Characteristics	Condition	Symbol	Values			Unit
			R	G	B	
Dominant Wavelength	I_F = 15 mA(R) I_F = 10 mA(G) I_F = 10 mA(B)	λ_{DOM}	619~624	520~540	460~480	nm
Spectral bandwidth at 50% I_{REL} max	I_F = 15 mA(R) I_F = 10 mA(G) I_F = 10 mA(B)	Δ λ	24	38	28	nm
Forward Voltage	I_F = 15 mA(R) I_F = 10 mA(G) I_F = 10 mA(B)	$V_{F(avg)}$	2.1	2.7	3.0	V
		$V_{F(max)}$	2.6	3.4	3.8	V
Luminous Intensity	I_F = 15 mA(R) I_F = 10 mA(G) I_F = 10 mA(B)	$I_{V(min)}$	560	900	140	mcd
		$I_{V(avg)}$	750	1350	240	mcd
Luminous Intensity(Reference)	I_F = 20 mA(R/G/B)	$I_{V(avg)}$	1000	2250	460	mcd
Reverse Current (max)	V_R = 5 V	I_R	10	10	10	μA

Note: Continuous reverse voltage can cause LED damage.

INTENSITY BIN LIMIT (RED I_F = 15 mA, GREEN I_F = 10 mA, BLUE I_F = 10 mA)

Red

Bin Code	Min.(mcd)	Max.(mcd)
K	560	710
np	635	805
M	710	900
qr	805	1010
N	900	1120

Green

Bin Code	Min.(mcd)	Max.(mcd)
N	900	1120
st	1010	1260
P	1120	1400
vw	1260	1600
Q	1400	1800

Blue

Bin Code	Min.(mcd)	Max.(mcd)
D	140	180
9a	160	202
E	180	224
bc	202	252
F	224	280
de	252	318
G	280	355

Tolerance of measurement of luminous intensity is ±10%.

COLOR BIN LIMIT (RED I_F = 15 mA, GREEN I_F = 10 mA, BLUE I_F = 10 mA)

Red

Bin Code	Min.(nm)	Max.(nm)
RB	619	624

Green

Bin Code	Min.(nm)	Max.(nm)
G7	520	525
G23	522.5	527.5
G8	525	530
G45	527.5	532.5
G9	530	535
G67	532.5	537.5
Ga	535	540

Blue

Bin Code	Min.(nm)	Max.(nm)
B3	460	465
B23	462.5	467.5
B4	465	470
B45	467.5	472.5
B5	470	475
B67	472.5	477.5
B6	475	480

Tolerance of measurement of dominant wavelength is ±1 nm.

ORDER CODE TABLE*

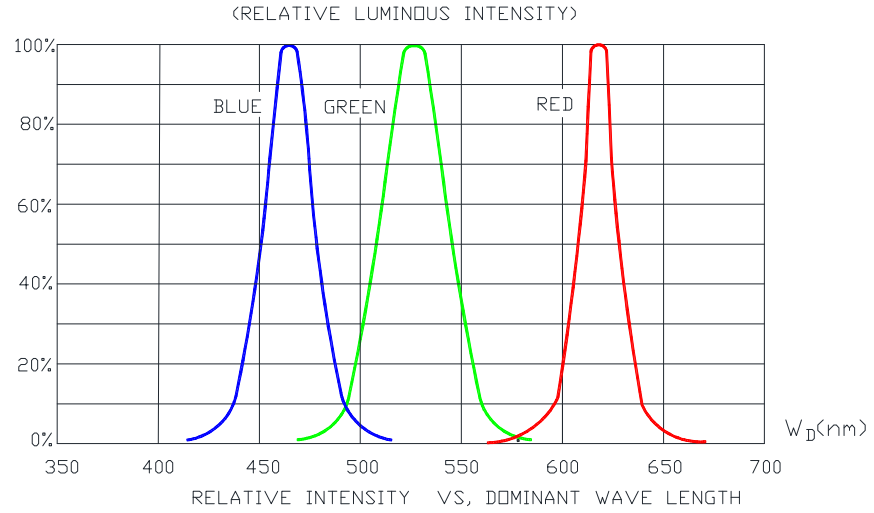
Kit Number	Color	Luminous Intensity (mcd)		Dominant Wavelength (nm)				Package
		Min.	Max.	Color Bin	Min. (nm)	Color Bin	Max. (nm)	
CLY6D-FKC-CKNNQDGBB7a363	Red	560	1120	RB	619	RB	624	Reel
	Green	900	1800	G7	520	Ga	540	Reel
	Blue	140	355	B3	460	B6	480	Reel
CLY6D-FKC-CK1N1D1BB7D3D3	Red	Any 1 Intensity bin from K(560) - N(1120)		RB	619	RB	624	Reel
	Green	Any 1 Intensity bin from N(900) - Q(1800)		Any 1 hue bin from G7(520) - Ga(540)				Reel
	Blue	Any 1 Intensity bin from D(140) - G(355)		Any 1 hue bin from B3(460) - B6(480)				Reel
CLY6D-FKC-Cnp1st1E1BB7D3D3	Red	Any 1 Intensity bin from np(635) - N(1120)		RB	619	RB	624	Reel
	Green	Any 1 Intensity bin from st(1010) - Q(1800)		Any 1 hue bin from G7(520) - Ga(540)				Reel
	Blue	Any 1 Intensity bin from E(180) - G(355)		Any 1 hue bin from B3(460) - B6(480)				Reel

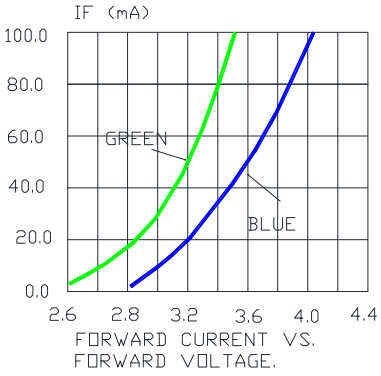
Notes:
1. The above kit numbers represent the order codes which include multiple intensity-bin and color-bin codes. Only one intensity-bin code and one color-bin code will be shipped on each reel. Single intensity-bin code and single color-bin code will be orderable in certain quantities. For example, any 1 intensity bin from N - Q means only 1 intensity bin (N or st or P or vw or Q) will be shipped by Cree. For example, any 1 color bin from G7 - Ga means only 1 color bin (G7 or G23 or G8 or G45 or G9 or G67 or Ga) will be shipped by Cree.
2. Please refer to the "Cree LED Lamp Reliability Test Standards" document [#1] for reliability test conditions.
3. Please refer to the "Cree LED Lamp Soldering & Handling" document[#2] for information about how to use this LED product safely.

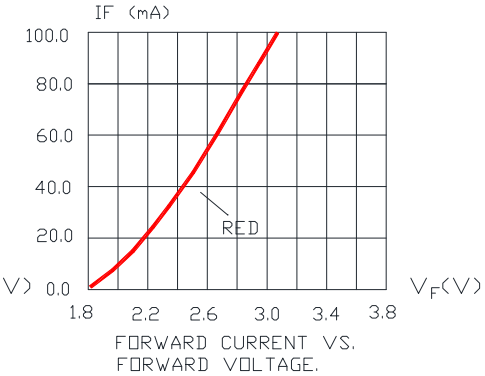
#1: Refer to http://www.cree.com/led-components/media/documents/LED_Lamp_Reliability_Test_Standard.pdf

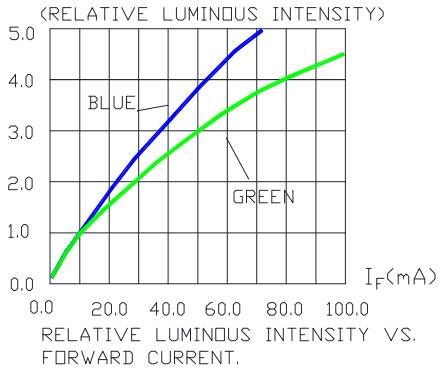
#2: Refer to http://www.cree.com/led-components/media/documents/sh-HB.pdf

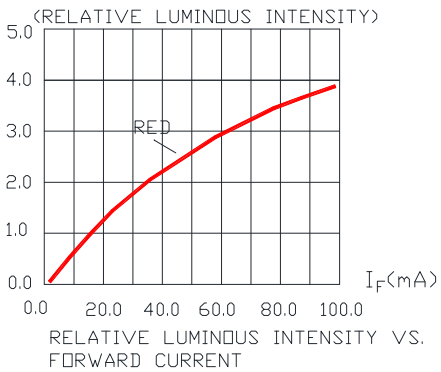
GRAPHS





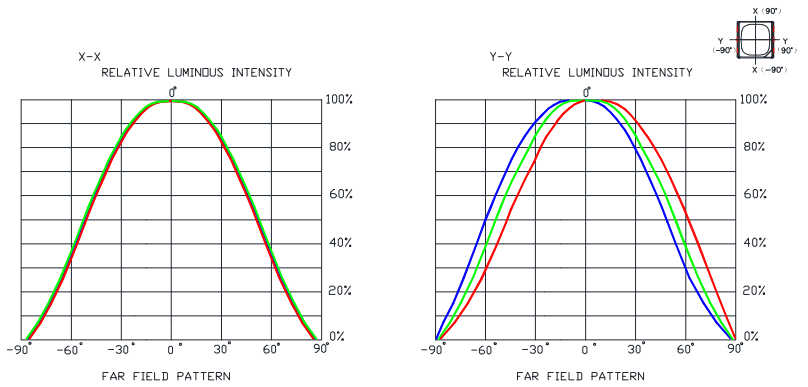




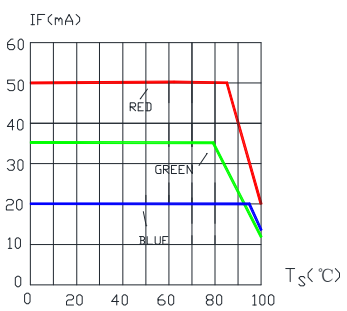


The above data are collected from statistical figures that do not necessarily correspond to the actual parameters of each single LED. Hence, these data will be changed without further notice.

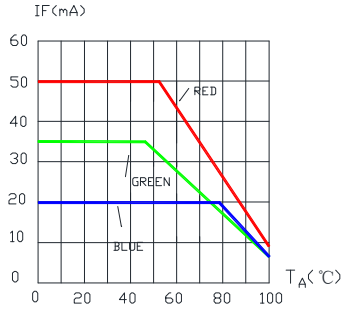
GRAPHS



FAR FIELD PATTERN



MAXIMUM FORWARD DC CURRENT
VS, SOLDER POINT TEMPERATURE.

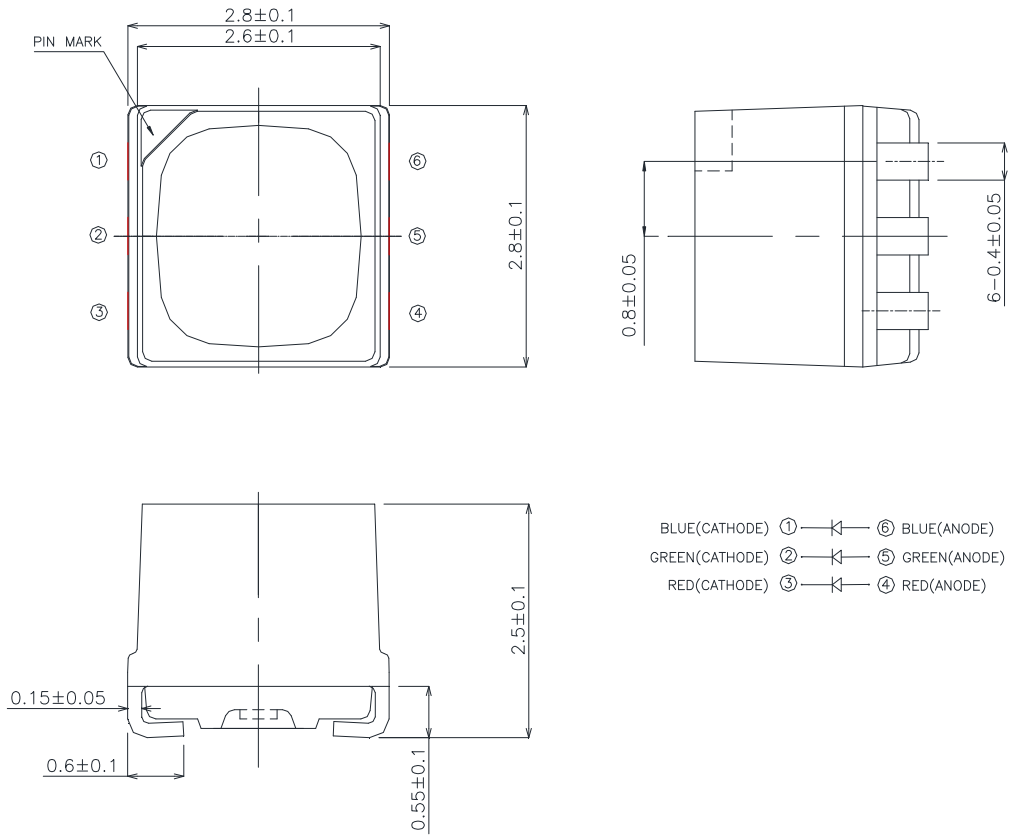


MAXIMUM FORWARD DC CURRENT
VS, AMBIENT TEMPERATURE.

The above data are collected from statistical figures that do not necessarily correspond to the actual parameters of each single LED. Hence, these data will be changed without further notice.

MECHANICAL DIMENSIONS

All dimensions are in mm.



NOTES

RoHS Compliance

The levels of environmentally sensitive, persistent biologically toxic (PBT), persistent organic pollutants (POP), or otherwise restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended through April 21, 2006.

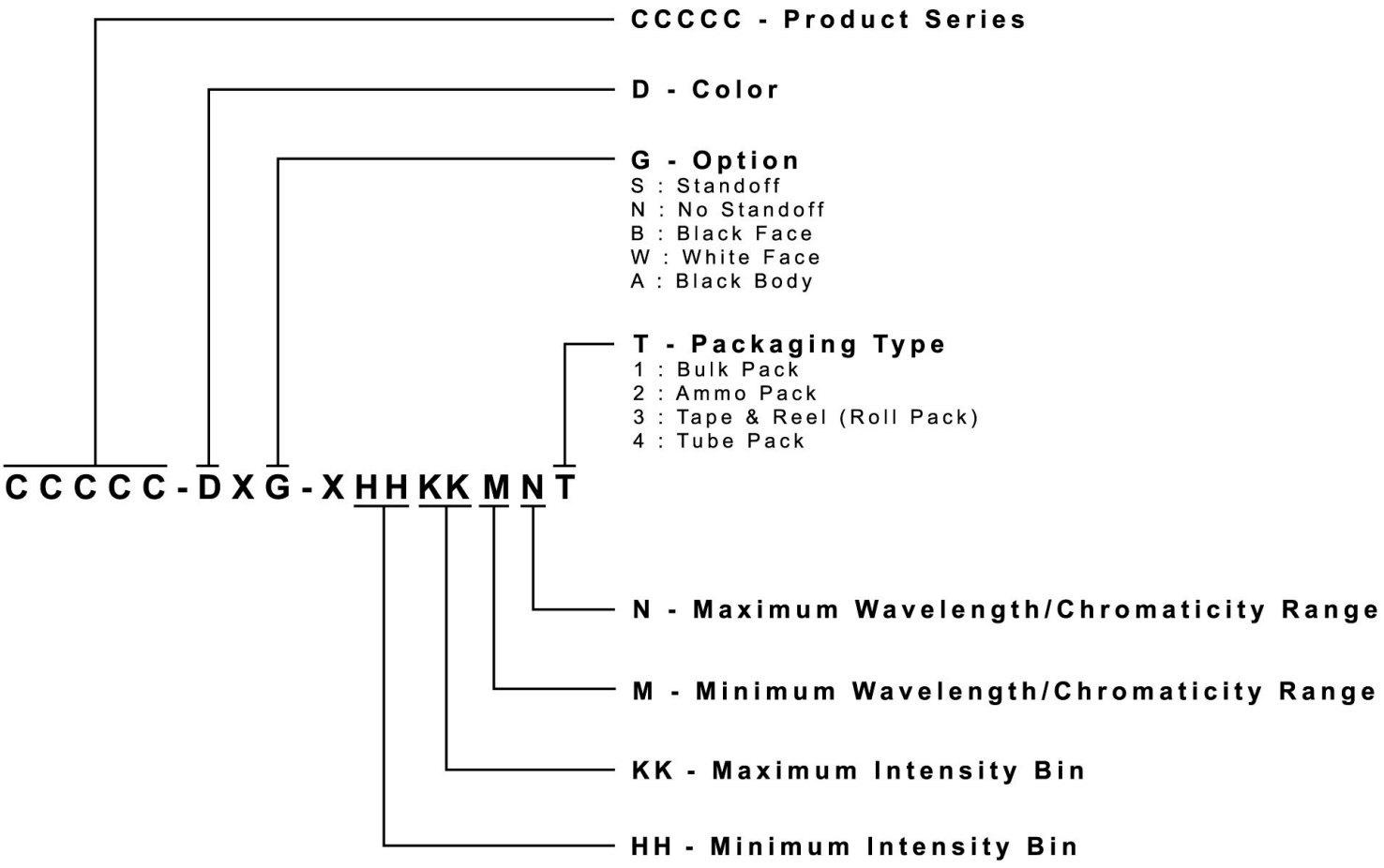
Vision Advisory Claim

Users should be cautioned not to stare at the light of this LED product. The bright light can damage the eye.

KIT NUMBER SYSTEM

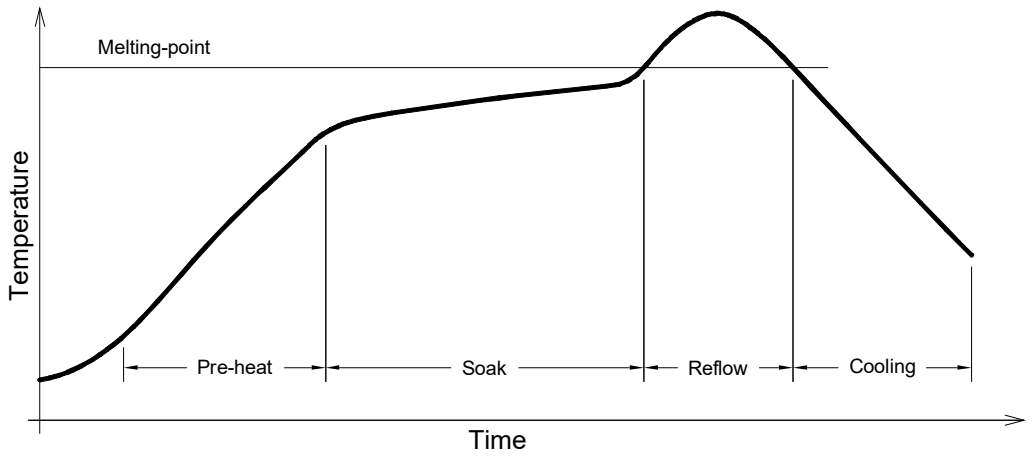
Cree LED lamps are tested and sorted into performance bins. A bin is specified by ranges of color, forward voltage, and brightness. Sorted LEDs are packaged for shipping in various convenient options. Please refer to the "Cree LED Lamp Packaging Standard" document for more information about shipping and packaging options.

Cree LEDs are sold by order codes in combinations of bins called kits. Order codes are configured in the following manner:



REFLOW SOLDERING

- The CLY6D-FKC is rated as a MSL 5a product.
- The recommended floor life out of bag is 24hrs.
- The temperature profile is as below.



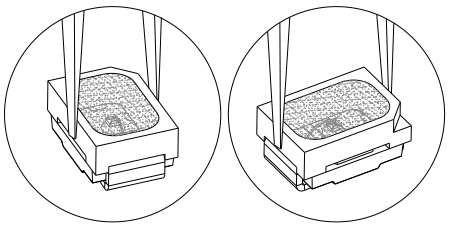
Use only with CLY6D-FKC

Solder
Average ramp-up rate = 4ºC/s max
Preheat temperature = 150ºC ~200ºC
Preheat time = 120s max
Ramp-down rate = 6ºC/s max
Peak temperature = 235ºC max
Time within 5ºC of actual Peak Temperature = 10s max
Duration above 217ºC is 45s max

Refer to "http://www.cree.com/led-components/media/documents/sh-HB.pdf" for soldering & handling details.

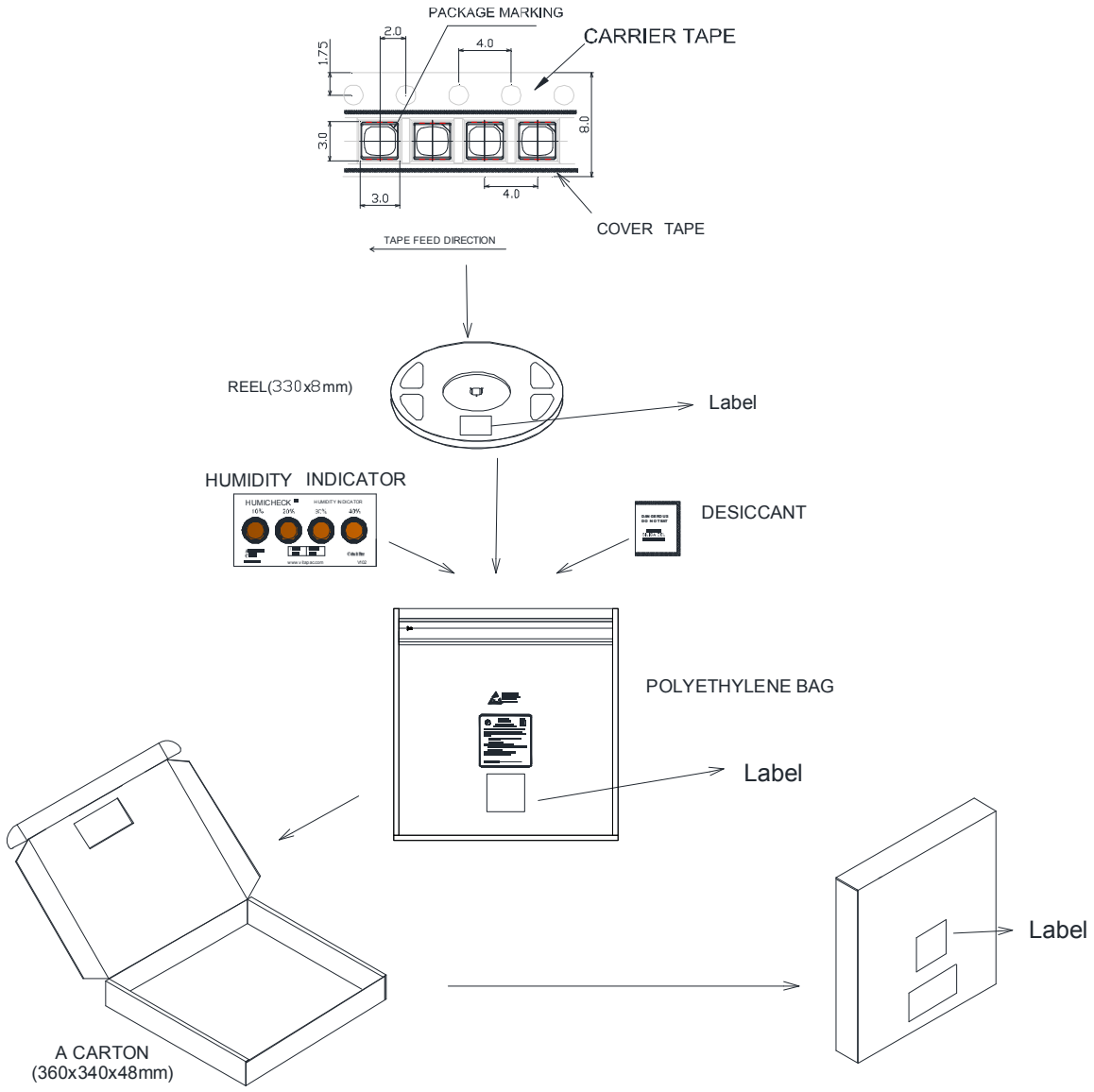
NOTES

- The packaging sizes of these SMD products are very small and the resin is still soft after solidification. Users are required to handle with care. Never touch the resin surface of SMD products.
- To avoid damaging the product's surface and interior device, it is recommended to choose a special nozzle to pick up the SMD products during the process of SMT production. If handling is necessary, take special care when picking up these products. The following method is necessary:



PACKAGING

- The boxes are not water resistant and they must be kept away from water and moisture.
- The LEDs are packed in cardboard boxes after packaging in normal or anti-electrostatic bags.
- Cardboard boxes will be used to protect the LEDs from mechanical shocks during transportation.
- The reel pack is applied in SMD LED.
- Max 6500 pcs per reel.



Product datasheet

PRODUCT:	**FC.2 and MC.2** ECO family of LED modules
FILENAME:	UTI0567600A0-ECO LED modules FC2 MC2 product datasheet.docx
DATE:	27.5.2020
VERSION:	1.1
AUTHOR:	A. Stojan
APPROVED:	C.Wolf

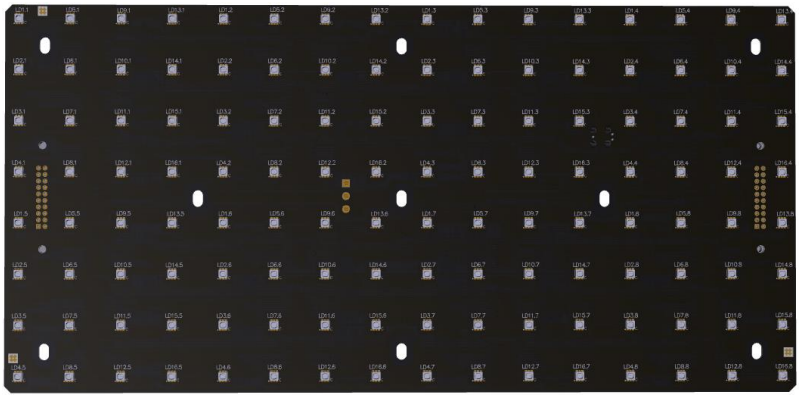


TABLE OF CONTENTS

SWARCO FUTURIT Verkehrssignalsysteme GmbH
Manfred-Swarovski-Strasse 1
A-7343 Neutal
TEL.: +43-2618-200 25-0
FAX: +43-2618-200 25-50
URL: www.swarco.com

SWARCO LEA d.o.o.
Finžgarjeva ulica 1a
SI-4248 Lesce
TEL.: +386-4-5353-653
FAX: +386-4-5353-633
URL: www.swarco.com

LIST OF FIGURES

LIST OF TABLES

GLOSSARY OF TERMS

ACHILLES	**A**dvanced **C**ontroller for **H**igh **I**ntegrity **L**ong **L**asting **E**conomical **S**igns
EMC	Electro Magnetic Compatibility
I/O	Input / Output
LED	Light Emitting Diode
MTBF	Mean Time Between Failures
PCB	Printed Circuit Board
PWM	Pulse-Width Modulation
SMD/SMT	Surface Mount Device/Technology
THD/THT	Through Hole Device/Technology
THR	Through Hole Reflow
VMS	Variable Message Sign
CLK	Clock signal (control, synchronisation signal)
GCLK	Clock signal (control, synchronisation signal for PWM counter)
LAT	Latch signal (control, synchronisation signal)
EN/ENABLE	Enable signal (control, synchronisation signal)
GND	Ground
RoHS	Restriction of the use of certain hazardous substances
VCC	Power supply (voltage) for logic – integrated circuits
VLED	Power supply (voltage) for LEDs
DAC	Digital to analog converter
ADC	Analog to digital converter

CHANGES OF DOCUMENT

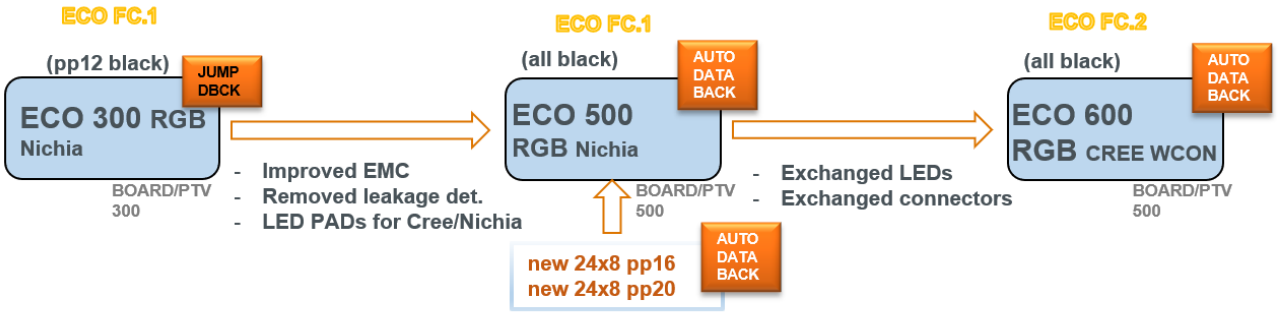
Version	Date	Changes	Responsibility
1.0	6.5.2020	Initial version	A.Stojan
1.1	27.5.2020	Added VCC tolerances, inrush currents for HWS50	A.Stojan

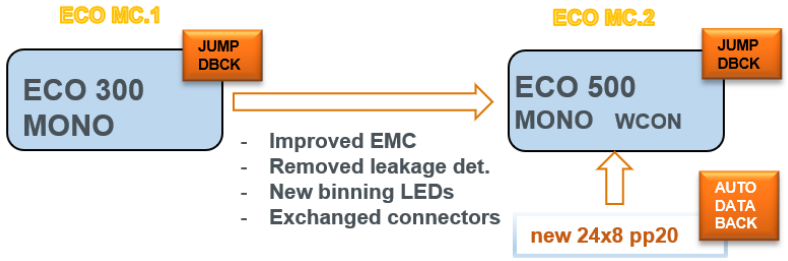
1 General characteristics

Product datasheets describes characteristics of all ECO FC.2 (full color) and MC.2 (mono color) LED modules with Achilles LED driver. Detailed list of modules can be found in chapter 6.

Main differences to previous generation of FC.1 and MC.1 LED modules are:

- New LEDs: CREE instead of Nichia for RGB and higher intensity ranks of mono LEDs
- All RGB boards (FC.2) are now black
- Auto data back on FC.2 modules – jumper for data back on last board in row not needed
- WCON data connectors
- Improved signal integrity
- Reduced EM noise
- Reduced inrush current
- Leakage detection circuitry not equipped by default





General features of ECO LED modules are:

- 16-bit constant current PWM LED drivers
- 3-wire power supply
- Various LED error detections (see chapter 2.1)
- Adjustment of current in small steps to allow precise color tuning
- Big thermal PADs at bigger pixel pitches to decrease LED temperature
- Watchdog – see chapter 2.8
- Serial connection of LED modules (in chain)
- Blank picture if data cable is off
- Arrows in white print (BOT) are used to indicate upper board side (proper orientation)
- Protection against blink at turn ON or turn OFF
- HW on LED modules support frame refresh rates up to 100 frames per second; LED detection could be performed every 10 ms, if supported by processor.
- Possibility to turn off VLED on only one particular board
- LEDs disabled at start up for at least 100 ms
- Capacitors on VLED slowly discharge via resistor when VLED is missing (disconnected, failure), to allow detection of such error
- DATA_BACK is synchronised with incoming CLK on each LED module
- Design is optimized for small power consumption of VCC
- Non- tantalum capacitors are used
- Slow start feature on VCC and VLED to reduce inrush current

Achilles LED driver has 16 bit register for PWM modulation of each output. 8 bits will be used for generation of colours (8 bit per colour means 16,7 mil. Of colours) and 8 bits for setting day/night luminance.
Gamma correction has to be used to have proper ratio between high and low colour shades. Final value which is stored into 16 bit registers is product of: (*colour_ shade* * *gamma_ correction)* * *luminance_ level*.

We can disregard one LSB bit in the final value and set it to 0 all the time. In this case GCLK can be set for frame refresh of 50 Hz, because 2rd LSB byte will already have refresh of 100 Hz. By this we can reduce EM noise and reduce power consumption. We can synchronise picture refresh of 10 animations per second with 50 Hz frame refresh.

2 Hardware details

Description	Type/Value
Power Supply	Nominal VCC= 3V3 (3,1 V – 3,5 V) 4V0 (3,7 V - 4,2 V) 5V0 (4,5 V – 5,2 V) VCC range = 3,1 V to 5,2 V VLED= **5 V DC** (standard; voltages 3 V to 17 V are possible, depends on LEDs used)
Input fuse	VCC: 3 A SMT; VLED: 3 A SMT (5A for some pp)
Inrush current (see chapter 2.7)	I_{VCCMAX} < 1 A; I_{VCCTYP} = 0,6 A $I_{VLEDMAX}$ <3 A; $I_{VLEDTYP}$ = 2,5 A
Maximum frequency of signals	7 MHz ; 3,3 MHz recommended as maximum
Minimum leakage detection current (VLED-whole LED module)	25 µA (if equipped)
Frequencies of GCLK for refresh 100 Hz	LSB set to0: 2^{15} x 100= 3,27 MHz LSB used: 2^{16} x 100= 6,55 MHz*
I/O data signal levels	CMOS
Max. number of LED modules in chain	50
Overvoltage protection	5 V suppressor diode on VCC and VLED, 5 V suppressor diodes on all data & control signals
Reverse voltage protection	Suppressor diode on VCC and on VLED. In case of wrong polarity, input fuses blow.
Intensity control	PWM
PCB color	FC.2: black MC.2 :green
LED detection	Several detections supported, see chapters 2.1-2.3
Coating	Coated
Temperature range	-40 °C to +85 °C ; Achilles set internal temperature flag at 140 °C and turn off at 160 °C
Dimensions	Depends on type of board, see chapter 4

Table 1: Rated values

2.1 Status information (LED error detection etc)

List of all possible status information which is supported in HW on board and/or by LED driver:

Status information	Description
Compulsory open LED error detection	Check all LEDs and detect which are broken in a way that they are internally open – high impedance
Compulsory short LED error detection	Check all LEDs and detect which are broken in a way that they make internal short circuit
Leakage+short2gnd LED error detection	Check all LEDs (driver pins) and detect which are directly short circuited to GND or connected via some resistance
In message open Led error detection	Check active LEDs and detect which are broken in a way that they are internally open – high impedance
Data integrity	Read out data from output register of LED driver, with purpose to verify which information is actually showing
External leakage detection*	Check if there is any leakage current from VLED (via LEDs) to GND
GCLK w-dog	Triggers if GCLK signal is not present
Thermal protection	First warning triggers if LED driver temperature is above 140°C, second if it is above 160°C
Rext open	Information that reference resistor is not connected – in that case all LEDs on particular driver are not operational
Thermostat 90°C	Triggers if temperature on board is above certain temperature (optional)

*not equipped by default

Table 2: Status Information

2.2 Behaviour in case of data cable failure – line monitoring

LED module has defined response in case of error on data cable (signal missing etc) and it allow detection whether cables are OK or not.

- If CLK, LAT or GCLK is not present for 250 ms +/- 50ms, on board W-DOG triggers and VLED is switched off
- If GCLK is not present for 80- 160 ms typ. internal WDOG in Achilles triggers and disables outputs
- If on board W-DOG triggers, data back line is broken at that LED module. This allows detecting that W-DOG was triggered
- Blank picture if data cable is off (VLED off)

2.3 Behaviour in case of other failure cases

Failure case	Response
VCC not present (VCC fuse blow out)	All LEDs OFF; VLED turn off; data_back is set to logic L
VLED not present	All LEDs OFF; possibility to detect absence of VLED via status register or LED error detection
One of control signals missing on one or more LED drivers	All LEDs OFF; possibility to detect absence of control signal because data_back is set to logic L and/or because result of LED error detection is not proper
On board WDOG failure	LEDs status ON/OFF unknown; possibility to detect failure in cases when data_back is set to logic L

Table 3: Possible failure cases

2.4 Interconnection of LED modules and Jumper settings

A number of LED modules can get connected in a kind of “chain”. This means that the output connector from the first board in the chain gets connected to the input connector of the second one. To obtain a closed data loop pins 10 and 12 in the output connector of the last board have to be connected via a jumper.

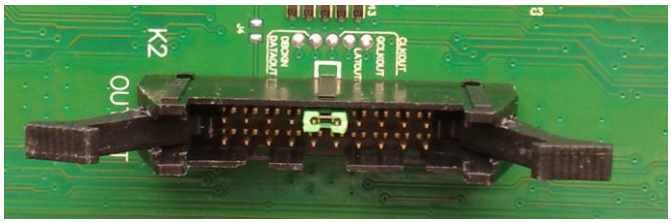


Figure 1: Jumper pin 10/12 in the output connector

For FC.2 version of LED modules jumper is not needed anymore, semiconductor switch automatically connects DATA OUT and DATA BACKIN when VCC from LED module ahead is not detected. It does not harm if placed by mistake.

2.5 Power consumption: current peaks

On small pixel pitches we have to increase LED currents to achieve better uniformity and then decrease luminance with PWM (change of duty cycle on/off) to get into the prescribed range. This influence on calculation how many power supplies we need within the sign.

Current peaks do lower with smaller duty cycle (see report IMP 0081), but not in the same way as we decrease duty cycle.
For example: if duty cycle decreases to 50%, current peaks decrease only for about 12-25%:

PWM	Derating 16x8	Derating 24x8
25 - 10%	22	25
64 - 25%	53	48
125 - 50%	88	75
255 - 100%	100	100

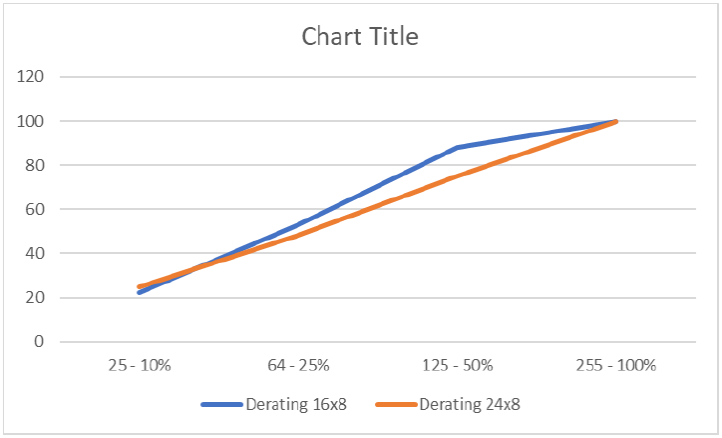


Table 4: Current peaks vs. duty cycle

2.6 Current ranges

Achilles has current settings done with two slopes; at smaller DAC values steps are smaller. External resistors for setting current ranges were chosen in a way to make best compromise between maximum current and current step, which should be as small as possible to allow better color tuning.

☞ Default current at start up is 10% of Imax.

☞ When choosing very low current values we have to consider also:

- minimal current values for LED prescribed by LED manufacturers and
- fact, that LEDs have bigger tolerances of luminous intensity at lower currents (uniformity is poorer).

Rext	R12	R16	R20	R25	R30	R35
R	**4750**	**3010**	**3010**	**2490**	**2000**	
G	**6810**	**3920**	**3920**	**3650**	**2490**	
B	**6810**	**4750**	**4750**	**6810**	**6810**	
W	**4750**	**3650**	**2490**	**2000**	**1210**	**910**
Y	**4750**	**3650**	**2490**	**2000**	**1210**	**910**

Imax	R12	R16	R20	R25	R30	R35
	mA	mA	mA	mA	mA	mA
R	5,63	8,89	8,89	10,74	13,37	
G	3,93	6,82	6,82	7,33	10,74	
B	3,93	5,63	5,63	3,93	3,93	
W	5,63	7,33	10,74	13,37	22,10	29,39
Y	5,63	7,33	10,74	13,37	22,10	29,39

Imin	R12	R16	R20	R25	R30	R35
	mA	mA	mA	mA	mA	mA
R	0,36	0,57	0,57	0,69	0,86	
G	0,25	0,44	0,44	0,47	0,69	
B	0,25	0,36	0,36	0,25	0,25	
W	0,36	0,47	0,69	0,86	1,43	1,90
Y	0,36	0,47	0,69	0,86	1,43	1,90

Table 5: LED current: reference resistor, Imax, Imin, Istep

2.7 Inrush current

ECO LED modules have on VCC and VLED power supply soft start unit, which prevents high current spikes when we connect power supply. Second case, where we also generate current spikes, is external leakage detection.
Measurements were done at room temperatures, examples of oscillograms are for LED module 16x8 R20 RGB and power supply Lambda HWS150-5.

Current on	I typ. [A]
VLED	1,7 -2,3
VCC	1

Table 6: Inrush current of one LED module

Values may differ due to various lengths of wires.

Cases measured on 44 LED modules	Peak current [A]
Leakage	25
Start-up VLED	33
Start-up VCC	10

Table 7: Inrush current of 44 LED modules

Nr.boards	Ipeak [A]
16	18
12	15

Table 8: Inrush current of LED modules (VCC+VLED) on HWS50A-5

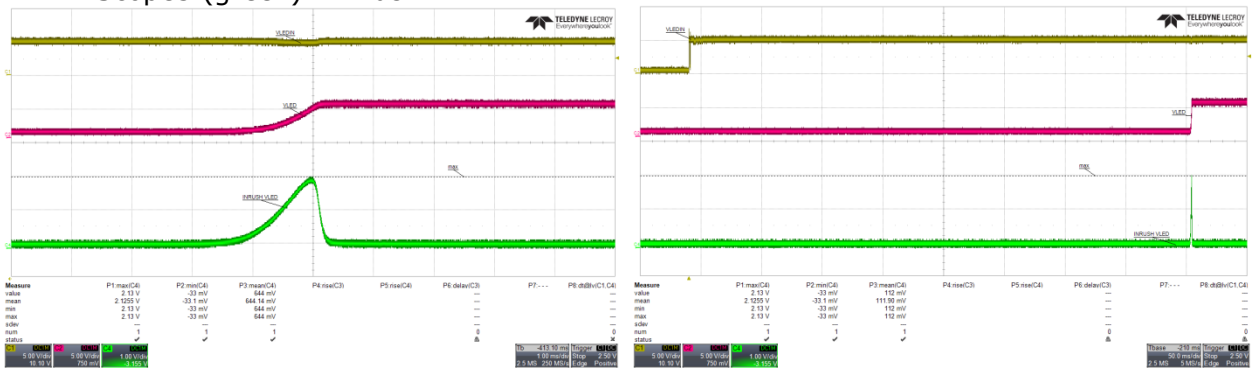
Nr.boards	Ipeak [A]
44	39
40	39
36	37,5
32	34,2
28	31,5
24	26,7
20	24,5
16	21

Table 9: Inrush current of LED modules (VCC+VLED) on HWS150A-5

2.7.1 Inrush currents I_{LED} oscillograms

Inrush current I_{LED} measuring points:

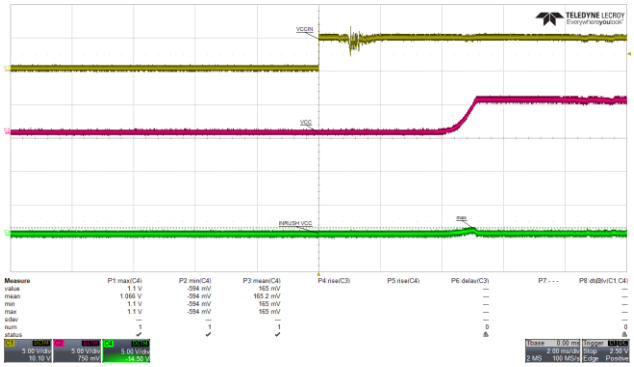
- Scope1 (yellow) : VLEDIN
- Scope2 (violet) : VLED
- Scope3 (green) : Inrush VLED



2.7.2 Inrush currents I_{VCC} oscillograms

Inrush current I_{VCC} measuring points:

- Scope1 (yellow) : VCCIN
- Scope2 (violet) : VCC
- Scope4 (green) : Inrush VCC



2.8 W-DOG functionality

LED module has also HW WDOG on board. When CLK, LAT or GCLK don’t toggle for prescribed period of time, WDOG triggers and disconnect VLED and disable D-FF, so we don’t get any data back anymore. Period for GCLK is not so strict, because this signal is present all the time. If it is not present LED drivers are automatically turned off, typically faster than in **100 ms**.

Sig-nal/pe-riod	t_{MIN} [ms]	t_{TYP} [ms]	t_{MAX} [ms]
LAT, CLK	150	250	280
GCLK		400	

Table 10: WDOG periods

2.9 Status register

On every LED module there is also additional LED driver (usually 9th or 25th) which does not drive 16 LEDs like other drivers, but it is used for status/control purposes.

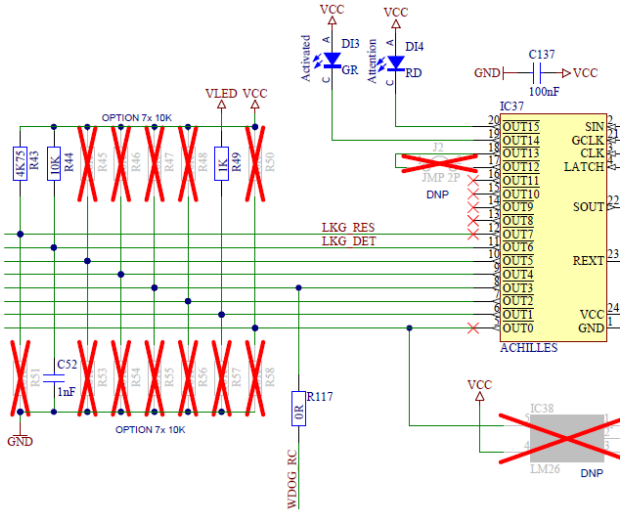


Figure 2: Schematics of status register

Pin name	Signal name	Description
OUT0		Thermostat input (by default not equipped)
OUT1	**VLED***	Detection if VLED is present
OUT2		Not used
OUT3	**WDOG_RC**	Disconnect VLED when output is active (FF)
OUT4-OUT5		Not used
OUT6	**LKG_DET**	Execute leakage detection (write FF)
OUT7	**LKG_RES**	Result of leakage detection
OUT8-OUT11		Not used
OUT12-OUT13		Predicted for external LED to be connected
OUT14	**Activated**	ON when initialised
OUT15	**Attention**	ON when there is a LED error on board.Blinking on LED modules which are reachable when there is a communication error

Table 11: Pin description of status register

***VLED detection:**
On OUT1 we perform LED short detection. If VLED is present, voltage VLED-0,25V is detected and short error detection returns 1. Software treat this as OK status. In case that VLED is not present, short error detection returns 0 and this is recognised as error status.

2.10 External leakage detection

Achilles LED drivers have implemented circuit for LED leakage detection, but it is not very reliable because forward voltage of LEDs varies from type to type and also with ambient temperature. Also VLED voltage is not always fixed 5,0 V but it may vary.

Out of that reason so called external leakage detection was implemented. Basic principle is, that we turn off all LEDs, then we turn off main switch (mosfet) for VLED and we turn on second switch (mosfet) to supply VLED via resistor. If there is a voltage drop on that resistor it means that somewhere leakage current is flowing to GND.

To prevent from false detection because of noise threshold is set to send error if current is higher than 25 µA.

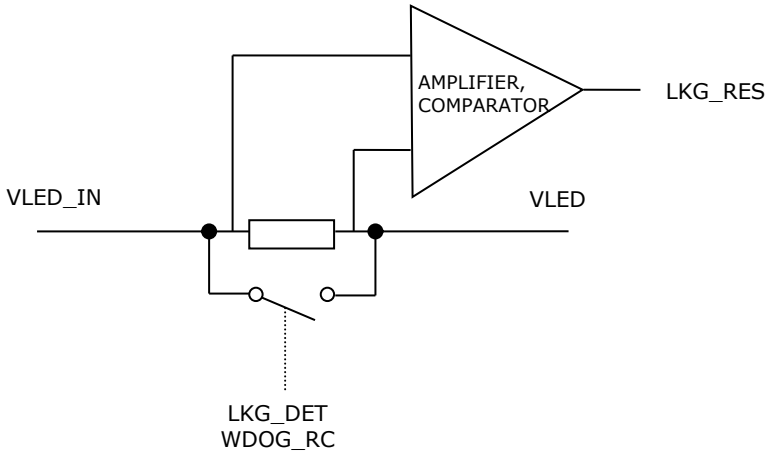


Figure 3: Principle operation of external leakage detection

Control signals LKG_DET and WDOG_RC are controlled via Achilles driver and are set to 0 when we enter 0xFF into output registers. When LKG_RES data is valid, we have to perform open detection. If there is leakage detected, we do not detect LED open error on LKG_RES pin.

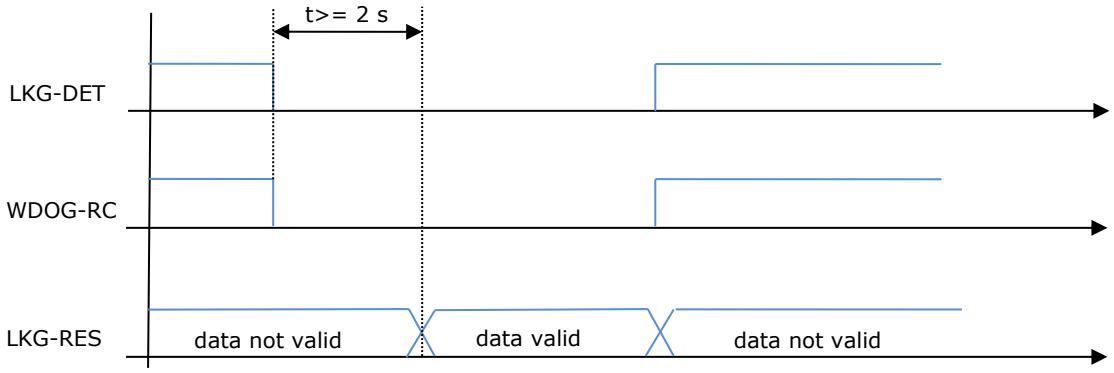


Figure 4: Timing diagram for external leakage detection

3 Description of Interfaces

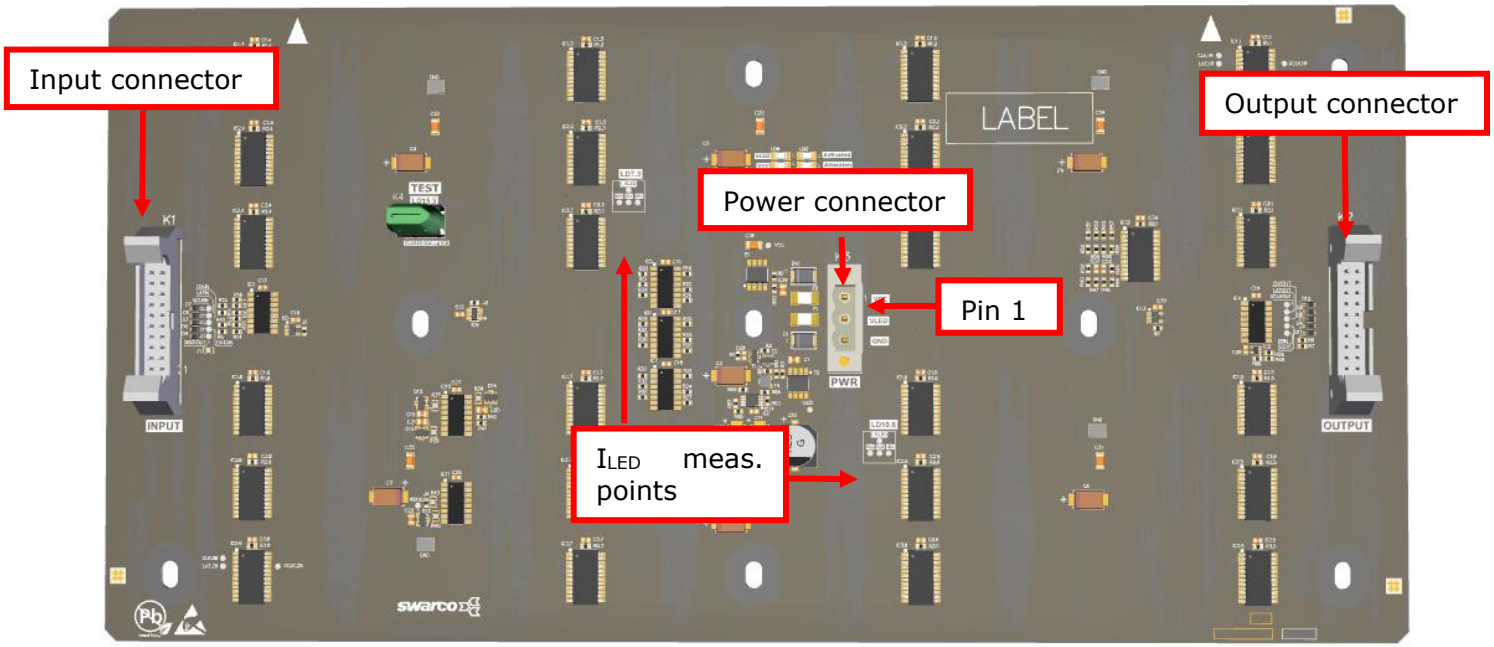


Figure 5: TOP view of 16x8 LED module

3.1 Detailed list of the interfaces with pin description

3.1.1 K1, K2 data connectors

Purpose: data connectors (K1 – input, K2 – output)
Type: THT 20p 2,54 mm pitch with latches
Voltage levels: Inputs and outputs have switching standard according to CMOS 5 V level (V_{OH}>3,5 V).

Board support standard THT connectors and press-fit connectors

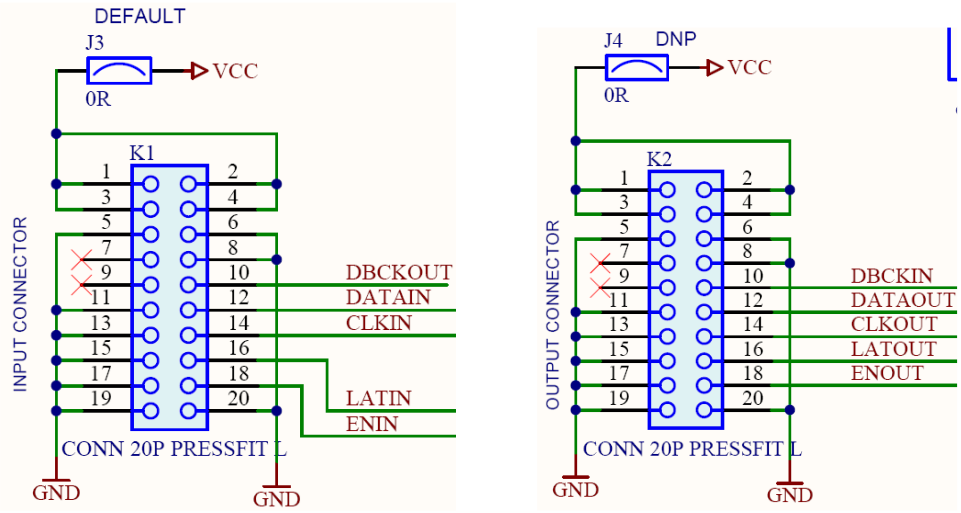


Figure 6: Pinning of the data connectors K1, K2

3.1.2 K3 power supply

Purpose: power supply connector
Type: 3p 5,08 mm pitch, cable size up to 2,5mm^2

Pin No.	Pin name	Value	Description
1	VCC	5 V DC	See table 1 for more details
2	VLED	5 V DC (up to 17 V)	See table 1 for more details
3	GND		Common ground

Table 12: Pinning of the power connector K3

3.2 LED indicator description

During normal operation four LED’s should be on (VLED, VCC, Activated and CLK running).

Name	Colour	Description
VLED	Green	ON when power supply is present
VCC	Green	ON when power supply is present
Activated **Attention**	Green Red	ON when initialised ON when there is a LED error on board. Blinking on LED modules which are reachable when there is a communication error
Line/com error	Red	ON when CLK signal is not present

Table 13: LED indicators

3.3 Test points

On board are test points, close to input and output connector:

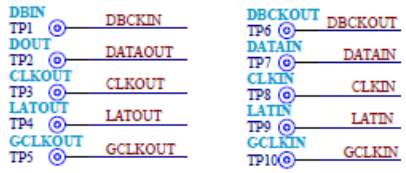


Figure 7: Basic test points

Beside that points there are additional tests points on all control signals.

Pads for LED current measurements are predicted on two places on PCB board:

Figure 8: LED current measurement

See also figure 5.

Pads for test socket are predicted. By adding debug board it is possible to measure some critical signals, currents, simulate LED errors,.. On FC.2 boards IDC connector (for example tag connect TC2050 IDC) can be used:

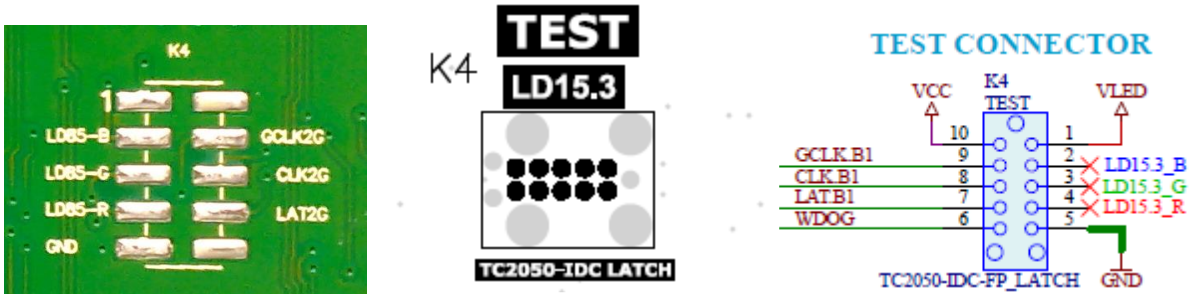


Figure 9: Test socket (left) and test socket on V18 boards (pictures on the right)

3.4 Troubleshooting

Basic cases are described in table below. For more details, check also oscillograms in chapter 7.

Problem	Solution
VLED LED is off	• Check the voltage on the power connector. If there is no voltage check the power supply and fuse on LED module. • Check if line comm error LED lit. If yes, then one of signals (CLK, LAT, GCLK) is missing
VCC LED is off	• Check the voltage on the power connector. If there is no voltage check the power supply. • If +5V are attached properly the fuse for the logics on board could be broken. Normally a communication error is reported.
“Attention LED” is on or “Activated LED” is off.	• DATA IN from this LED Board is defect. • DATA OUT from the LED Board before is defect. • Ribbon cable between the boards is defect. • VLED is missing
“CLK LED” not toggling	• Check the DATA ribbon cables in the board row • Switch the cables on the controller to find out if there is an error on the controller unit.

Table 14: Troubleshooting with indication LED’s of LED-Modules

4 Outline of the device and mounting

Outline dimensions of LED module depends of number of number of pixels in X and Y direction and of pixel pitch. General rule is that board is few mm smaller than *number_of_pixels_in_X_or_Y_direction * pixel_pitch*.

LED modules can be fixed with plastic or metal nuts. Number of fixation points differs in regard to size of the board.

5 Approvals

5.1 Temperature and humidity

- The unit shall operate over the external temperature range of -40°C to +85°C.
- All components are industrial grade type (-40°C to +85°C) or more.
- The unit is suitable for operating up to a relative humidity of 95% (non condensing).
- Requirements specified in EN / IEC 60068-2.

5.2 EMC

- The unit shall comply with EMC standards when properly installed into product. The corresponding standard for traffic applications is EN 50293.

5.3 LVD

- The unit complies with EN 60950-1.

5.4 Vibration

- The unit complies with EN 60068-2-64.

5.5 Rohs

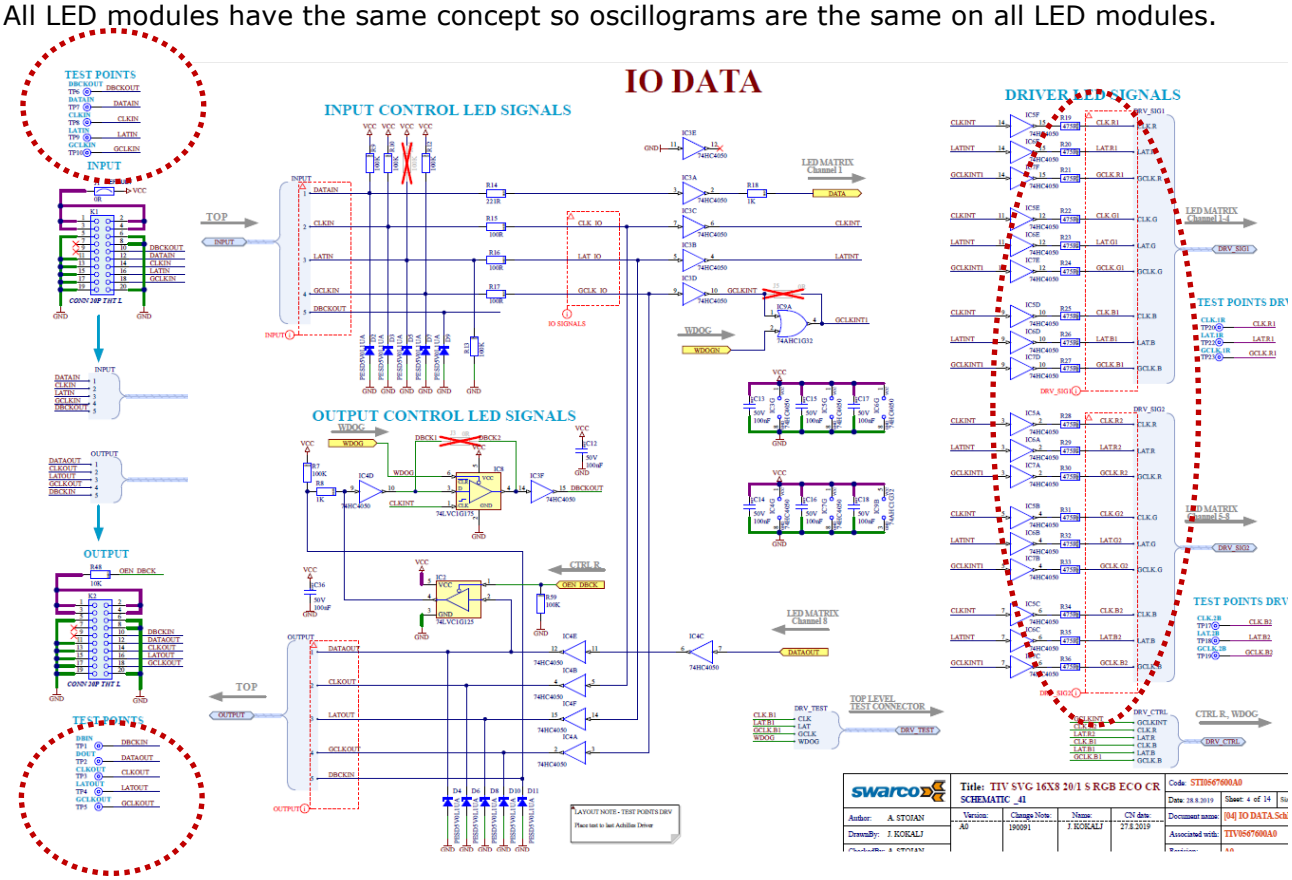
- All components are ROHS compliant.

5.6 UL marking

- PCB is UL recognized and critical components (such as connectors and fuses) are UL approved.

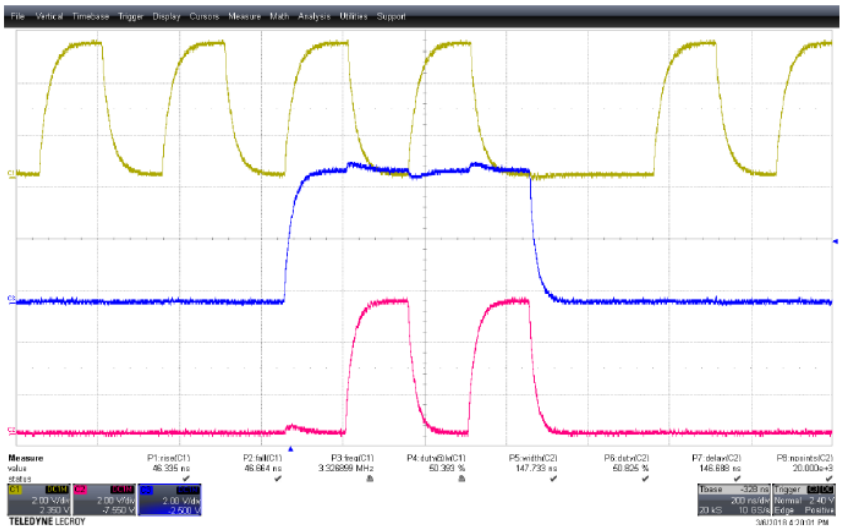
6 Oscillograms for troubleshooting

All LED modules have the same concept so oscillograms are the same on all LED modules.



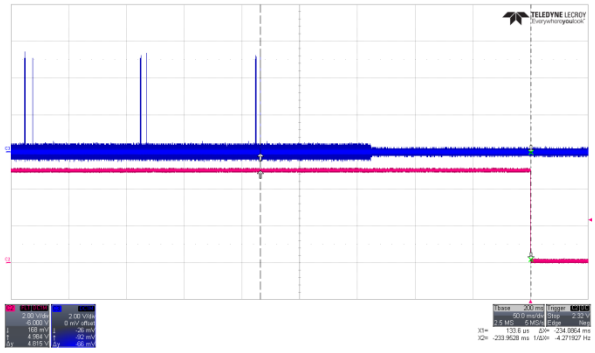
GCLK, CLK and LAT signals should look like this on appropriate test points or directly on Achilles drivers:

GCLK, **CLK**, **LAT** on IC1.1 at 3,325MHz:

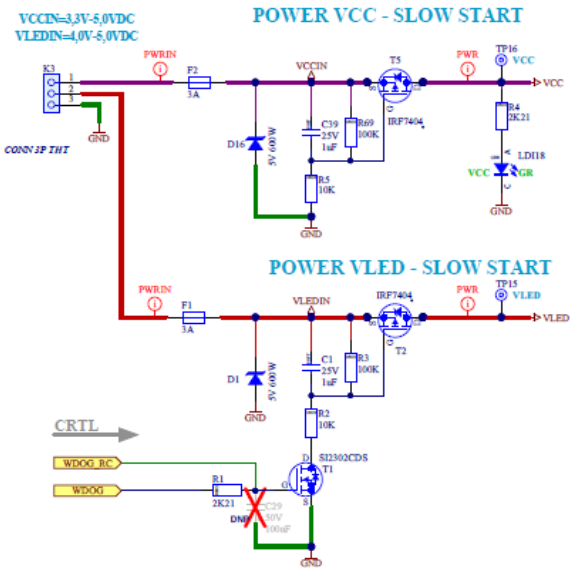


WDOG

Case when we disconnect data cable
Red- WDOG OUTPUT Q blue –*TP15* LAT



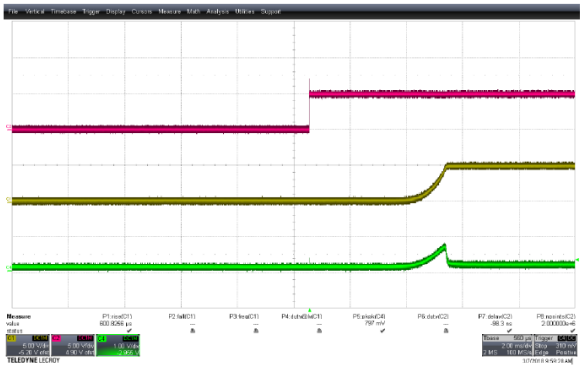
INPUT POWER CIRCUITRY



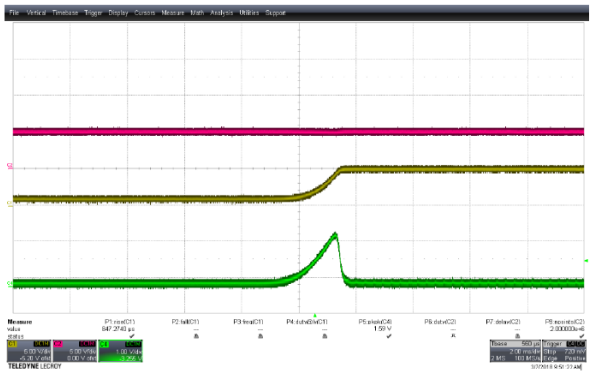
Yellow – VCCIN or VLEDIN
Pink – VCC or VLED
Green – Current on VCC or VLED

* 1V of voltage measured with current probe, corresponds to 1A of current

4.5.1 Inrush on VCC:



4.5.2 Inrush on VLED:



ADDENDUM ONE
NO QUESTIONS and ANSWERS RECEIVED
6890 OF

Date: 6-11-24

To: All Bidders

From: Brenda Sensibaugh, Procurement Contracts Officer
AS Materiel State Purchasing Bureau (SPB)

RE: Addendum for Invitation to Bid (ITB) Number 6890 OF for Dynamic Message Signs (DMS) to be opened on June 26, 2024, at 2:00 p.m. Central Time

Questions and Answers

No questions were received for ITB Number 6890 OF.

This Addendum will become part of the ITB and should be acknowledged with the ITB.

6-26-2024