Request for Proposal for
Tomball Independent School District
RFP 978-24 Traffic Signals and Related Equipment
Provide and Install Two Traffic Signal Systems at Two Locations within Tomball ISD

TABLE OF CONTENTS

Print Date: 8/23/2024 12:22 PM

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I. GENERAL INFORMATION

DATED: 08-23-2024

EQUIPMENT: Provide, Construct, and Install Traffic Signals and Related Equipment further defined in the RFP.

PROJECT NAME: Tomball ISD – RFP 978-24 Traffic Signals
This project is to provide and install Traffic Signals and all necessary equipment and work for a fully functional project at (2) separate locations with different completion dates.

PROJECT ADDRESS:
Locations listed in chronological order of intended completion. Refer to the probable Schedule of Events to due dates.

Location One: TS-01
At or about 11211 FM 2920, Tomball, Texas

Location Two: TS-02
At or about 17702 Mueschke Rd, Cypress, Texas

Addresses are all within Tomball ISD boundaries.

Tomball Independent School District is respectfully requesting qualified contractors to provide proposals for three separate traffic signals and related equipment at three separate locations. The locations are noted above, and individual project/locations are referred to in this document as TS-1, TS-2, and TS-3.

1. *Cost of Work – Total budgeted amount for BOTH locations is* *$450,000*
2. *Contingency – The total Owner Contingency for both locations is* *$ 75,000*
3. *Total Contract budget including contingencies for both locations is* *$525,000*

****Line 3 above does not include any alternate costs.*

The proposer shall answer all questions leaving no space blank where questions are asked for in this RFP. Use N/A where your response is not applicable. You must utilize the provided bid form. Additional information may be provided but it should be provided behind the required forms. All forms must but be signed for a proposal to be considered valid.

Tomball ISD has elected to group these projects into one agreement for convenience and coordination efficiency. Critical dates are listed below in this RFP. It is

perfectly acceptable to deliver the equipment ahead of schedule. If the proposer feels at the time of your proposal submission, that either of the delivery dates are not achievable, it is the proposer's responsibility to establish the date and time in which completion can be achieved. In NO WAY is it acceptable to deliver the equipment after the quoted delivery date except for situations where the delay is not due to the proposer's action or inaction. The basis of design for each location are included in the provided drawings as a part of this RFP. If you wish to propose any alternates, you must request a change during the bid process with qualifications for why the change is warranted. The same criteria for the basis of design must be met including quality, performance and overall physical characteristics that require no further rework or modification to adjacent work by others. Alternate manufacturers must maintain the same or improved timelines to be considered. All proposals shall be based on performance and design basis most directly competing with the stated basis of design model. Final determination of compliance and acceptance shall be at Tomball ISD's sole discretion. Variations should meet the standard being nominal in nature with minimal effect on output performance, life span of equipment, ease of installation and maintenance, energy usage and other similar criteria listed in the documents. However, there are no forgone conclusions.

Should you have additional questions, concerns or ideas regarding the RFP terms please contact:

Program Manager
Lockwood, Andrews & Newnam, Inc. (LAN)
Robert Wilbanks, AIA
rwwilbanks@lan-inc.com
832.570.7078

Should you have any questions regarding the design or basis of design, please contact the appropriate design engineer of record.

TS-01 – 11211 FM 2920
Quiddity
Tyler Cowser, P.E.
tcowser@quiddity.com
972.265.6039

TS-02 – 17702 Mueschke Rd.
Amani Engineering
Mahesh Dutta, P.E., CFM
mdutta@amaniengineering.com

Detailed questions shall be made via email to allow time for review and to qualify the responses. The Design Engineer will review questions comparatively against the

intended design performance criteria. In some cases, the Design Engineer may contact the proposer directly. Only responses provided as a final response and made in writing via Addendum shall be assumed to be correct. If the proposer does not receive the response in writing, the proposer shall identify any variation submitted by describing it per Section XII – Exceptions. In all cases the Program Manager shall be copied on all correspondence. Any questions regarding criteria acceptance should be directed to the Program Manager.

Please submit your proposal via email to:

Kasey Fields
Construction Specialist
Tomball ISD
kaseyfields@tomballisd.net

Proposals are due no later than dates provided below but improvement on these project delivery dates is a plus and will be considered when reviewing all proposals.

Tomball ISD reserves the right to cancel or modify this request at any time. Proposers understand they shall bear the entire cost of preparing their proposals. A final decision will be made by Tomball ISD based upon the entirety of all submission information received and any other sources they wish to consult.

II. SCHEDULE

The intent is to take delivery of the completed project on or before the dates as noted below.

1. **TS-01 –Tomball Innovation Center, FM 2920**
2. At or about 11211 FM 2920, Tomball, Texas
3. Proposed Completion Date: November 30, 2024
4.
5. **TS-02 – Tomball West Campus, Mueschke Rd**
6. At or about 17702 Mueschke Rd, Cypress, Texas
7. Proposed Completion Date: March 3, 2025

Delivery of the proposer's equipment shall be no later than is necessary to achieve the intended substantial completion dates. As part of this RFP, your projected dates are requested on the Bid Form.

An alternate is requested on the bid form, to provide rental equipment should the final equipment not be available at the proposed completion date. ***This alternate is for TS-01 only.***

Once a General Contractor has been selected, actual dates may be adjusted pending the final construction schedule, permit approvals and any necessary Owner approvals. Where these dates may be improved, please note those dates in your proposal on the bid form. If the improvements are based on a modified plan of work, please describe these constraints necessary to achieve the proposed improvement or delay. Selection criteria will consider delivery schedule and product availability. Earlier delivery is acceptable with notice or as accepted at bid time.

III. PROCESS OF SELECTION AND APPROVAL DATES

As a public entity, formal acceptance of any bid over a certain dollar amount must be presented and approved by the Tomball ISD Board of Trustees. Until this approval has taken place, a Purchase Order cannot be released. If the proposer has specific requirements prior to release of equipment for manufacture and/or order, those requirements shall be made on the bid form in the space allowed for special requirements of the vendor which includes any monetary requirements.

Scoring shall be based upon the following values and area of importance.

IV. PROBABLE SCHEDULE OF EVENTS

	Date	Time	Event
A.	August 23, 2024 August 30, 2024 August 23, 2024	N/A N/A N/A.	1st Advertisement Posted for this CSP. 2nd Advertisement Posted for this CSP. RFP Posted on TISD Website
B.	**September 3, 2024** ****This date is adjusted from the first advertisement on 08-23-2024 but correctly indicated in the 2nd advertisement on 08-30-2024**	1:30 P.M.	**Proposals Due with references-Submit in person to:** Attn: Mr. Zachery Boles, CFO 1110 Baker Drive Tomball, Texas 77375 **Or** **Via Email to**: **Kasey Fields** Tomball ISD kaseyfields@tomballisd.net
C.	September 4, 2024	N/A	Final Evaluations Complete – Recommendation to the BOT is written.
D.	September 10, 2024	5:30 P.M.	Regular BOT meeting – Presented for Approval
E.	September 13, 2024	12:00 P.M.	Intended Final Contract Agreement and General Conditions sent to Successful Bidder for Execution.
F.	September 13, 2024	12:00 P.M.	Intended Notice to Proceed.
G.	**November 30, 2024** **March 3, 2025**	**11:59 P.M.** **11:59 P.M.**	**TS-01 Substantial Completion Deadline – (FM 2920)** **TS-02 Substantial Completion Deadline – (Mueschke Rd)**

**Note-all times are Central Standard Time

Any Proposal received after the scheduled due date will not be considered and will be returned unopened. Unsigned Proposals and/or Proposals received via Facsimile or Email will not be considered. Pursuant to the provisions of the Texas Government Code §2269.253, the Owner's staff will publicly open and read aloud the names of the respondents and monetary offer stated in the Proposals. Within Forty-five (45) days following the date of the opening, the proposals will be evaluated and ranked in relation to the selection criteria set forth herein. Award will be made utilizing the Evaluation Criteria as required by Texas Government Code §2269.254 and as stated herein. Respondents must provide all requested information; and failure to comply with any portion of the solicitation will be reflected in the evaluation process. Proposals that have been opened may not be changed for the purpose of correcting an error in the price. Other than price, a proposer may have the right to change any other error or mistake in the proposal as may be permitted by applicable law and subject to the approval of the Owner, unless such change would be in contravention of statutory or common law requirements or unless such change would give an unfair advantage to the proposer making such change.

V. SCOPE OF WORK BY SITE

TS-01 – by Quiddity Engineering

1. *Scope of work (FM 2920) is to furnish and install traffic signals using 40' wood poles w/ Luminaire, VIVDS Detector and Pole Mounted Controller / Cabinet. Refer to the drawings for specifics of the project. This work shall be in accordance with TxDOT permit and notification requirements. See below.*

2. *The Permittee will contact the State's representative, TxDOT West Harris Maintenance Office (William Johns), Telephone – (713)934-5900, at least twenty-four (24) prior to beginning the work authorized by this permit.*

3. This permit is subject to a separate traffic control plan being approved by the Area Engineer. All work must follow the TxDOT Traffic Control Plan Standards. Latest Revision, or if approved, Typical Applications shown in the Texas Manual on Uniform Traffic Control Devices, Latest Revision, Chapter 6-H. The advanced warning signage shown on standards BC(1)-21 thru BC(12)-21 will be required. It is mutually agreed and understood that the implementation and maintenance of the traffic control plan shall be the responsibility of the Permittee. Contractor is required to supply all subcontractors with a copy of this permit and approved traffic control plan.
4. The contractor or sub-contractor is required to contact TxDOT Local Maintenance Supervisor a minimum of 72 hours prior to commencing any work.
    - Brazoria Maintenance Office – Permit Section 2: 979-864-8550
    - Galveston Maintenance Office – Permit Section 3: 409-978-2551
    - Fort Bend Maintenance Office – Permit Section 4: 281-238-7950
    - Montgomery Maintenance Office – Permit Section 5: 936-538-3350
    - Southeast Harris Maintenance Office – Permit Section 6: 281-464-5540
    - Waller Maintenance Office – Permit Section 7: 979-921-2400
    - West Harris Maintenance Office – Permit Section 8: 713-934-5900
    - Metro Houston Maintenance Office – Permit Section 9: 713-636-7400
    - North Harris Maintenance Office – Permit Section 10: 281-319-6450
5. Assist with CPE coordination. This process has been started already.
6. The design drawing package and specifications are attached, provided for your use. Note that the TxDOT and Harris County approvals relative to the project are approved.
7. Unique issues identified with this location is Construction of a wood pole traffic signal at the existing intersection of FM 2920 and TISD Driveway for the existing Tomball ISD District Facility and restriping of the exiting TWLTL to provide a westbound left turn lane and stop bars.

TS-02 – by Amani Engineering

8. Scope of work at Mueschke Rd and Destination Drive is to furnish and install traffic signal system, including but not limited to 30', 35' and 44' steel mast arms, and poles with LED luminaire and accuscan radar detectors, steel strain pole, meter pole, PED pole, ground mounted cabinet, conduit, cables, signal pole foundation, polymer concrete Type D pull boxes with lid and apron, polymer concrete ground box with lid

and apron, loop detectors associated fixtures, complete in place for the operation of traffic signals. Scope also includes traffic control during construction, permanent pavement markings and striping.

VI. SUBMISSION REQUIREMENTS

There are (2) separate REQUIRED responses. Refer to Section IV PROBABLE SCHEDULE OF EVENTS for dates and times.

1. Questions due via email.
2. Proposals are to be provided in one of two ways.
3. In a sealed envelope/package labeled as follows:

(Proposal Label for Hard Copy if Provided. NOT REQUIRED.)

PROPOSAL FOR
RFP #978-24 - Traffic Signals and Related Equipment
Attention: ZACHERY BOLES, CFO
310 S. CHERRY STREET
TOMBALL, TEXAS

Or

4. Via email to Kasey Fields. kaseyfields@tomballisd.net
   Please make the subject line in your email if utilized,
   RFP #978-24 - Traffic Signals and Related Equipment

VII. QUESTIONS

Questions concerning this RFP process and administration including the probable schedule of events and agreements, shall be directed to the owner's program manager, in writing, to the email address below.

Questions concerning the construction documents and specifications shall be addressed to the architect, in writing, to the email address below. Verbal questions and explanations, if any, are not permitted other than as described by this section.

Answers to questions will be issued in an addendum issued by the program manager and will include responses from the architect/engineer and will be posted on owner's website.

The owner's website shall be the only official location of plans, specifications, and addenda.

VIII. PROPOSAL INSTRUCTIONS

Instructions

1. Fill in all blanks on the Bid Form.
2. The district will provide Tax Exemption document to the successful proposer.
3. Price must be held for 45 days from submittal. If this impacts the first delivery, please note a time dependent date. A required date for issuance of a PO to the proposer cannot be prior to date noted in this RFP due to state purchasing rules and district policies.
4. By submitting the proposer is acknowledging and accepting all stated criteria.
5. On the bid form, provide date that submittals will be available based on the Notice to Proceed.
6. Assuming a (2) week approval process, on the bid form provide soonest dates possible for availability.
7. Substantial Completion date is defined as the date the equipment is installed and fully operational including any required Owner training.
8. Data Sheets for the units you are proposing which most closely matches the District's requested equipment, are to be submitted with the proposal.
9. For alternates submitted, which are not a part of the listed manufacturers, indicate on your data sheet where your product differs in any way from the requested product. It is very important for rating your proposal to make these indications.
10. Supplier agrees that the Warranty does NOT begin until equipment has been commissioned by a manufacturer qualified installer or Commissioning Agent. Tomball ISD will have a Commissioning Agent as a consultant.
11. Supplier agrees to transfer (1) year construction warranty under the General Contractor. Extended warranties will remain with the district.
12. It shall be understood that by submitting your proposal, everything noted within this document is accepted unless agreed upon prior to proposal submission in writing. Should you take any exception please provide those exceptions in Section XII. Documentation of an exception does not mean it is accepted. Discussions after bid date are not considered.
13. Assumed start date shall be the date of Notice to Proceed and any special descriptions within that notice.

IX. EXHIBIT A - PROPOSAL FORM

Company Information - (Please utilize this format.)

1. Name of Firm: _____
   a) Contact Address:
   _____
   b) Phone Number:
   _____
   c) Years in Business under the current name:
   _____

2. List at least (5) references for projects which most closely match this RFP requirement. References shall include name, contact phone number and email address.

   Reference No 1_____
   Reference No 2_____
   Reference No 3_____
   Reference No 4_____
   Reference No 5_____
   Proposed Project Manager: _____

   d) Years of Experience:
   _____
   e) Years of Experience in this role:
   _____

3. Proposed Superintendent: _____
   f) Years of Experience:
   _____
   g) Years of Experience in this role:
   _____

Addenda: *The undersigned acknowledges receipt of:*

Addenda 1 .....dated....._ _ /_ _/_ _ _ _

Addenda 2 .....dated....._ _ /_ _/_ _ _ _

Addenda 3 .....dated....._ _ /_ _/_ _ _ _

Base Cost of Work Proposed

Location Total Construction Cost and all Permitting Costs.

TS-01 FM 2920 *$*_____

Substantial Completion Date (If different from this RFP) _____

TS-02 Mueschke Rd *$*_____

Substantial Completion Date (If different from this RFP) _____

Owner's Contingency ($50,000) added to the total below.

Total Cost of the Project: *$*_____

*(Written in words)*_____

Alternate TS-01 FM 2920

Use of Contractor provided rental traffic operation equipment if it is not available to achieve full installation prior to the bid date. This cost includes the total value of rental for (6) months with the option to reduce or extend on a month to month basis and the cost to remove and install the final equipment when available in total with not additional costs to the Owner.

*Rental Cost Per Month $*_____*x (6) months = $*_____

*Remobilization and any necessary work to change out rental with permanent equipment including any additional costs for inspections. $*_____

Printed Name/Title:_____ Signature:_____

State whether firm is a: ❒ Corporation ❒ Partnership ❒ Individual

X. EXHIBIT C – RFP TERMS AND CONDITIONS

Acceptance of the following terms is understood by submission of a proposal. Additional project specific terms are also noted in the Agreement.

The Proposer agrees to hold the proposal open for acceptance by the Owner for 45 days.

The Owner maintains the right to reject any or all proposals, to waive informalities or minor irregularities in the proposal process and to accept the proposal which the Owner considers most advantageous. The Owner reserves the right to verify the accuracy and completeness of all responses by utilizing any information available to the Owner without regard to whether such information appears in the submission.

The submitted Proposal has been arrived at independently and is submitted without collusion with anyone to obtain information or gain any favoritism that would in any way limit competition or give an unfair advantage over respondents in the award of this proposal.

The Owner reserves the right to negotiate with any Respondent in a manner permitted by law.

The undersigned has reviewed the Contract Terms and exhibits as modified by Owner and agrees to those terms, subject to final approval by Owner.

By providing a response, each Applicant agrees to waive any claim it has or may have against the Owner, its Trustees, agents and employees, and any reference sources, arising out of or in connection with the administration, evaluation, or recommendation of any response; waiver of any requirements in the Request for Proposals; acceptance or rejection of any response and award of the Contract.

The cost of developing a response is the sole responsibility of the Applicant. The Owner will not provide reimbursement of such cost and will not be liable for any preparation cost for any reason.

The Owner reserves the right to divide the work in any manner that serves the best interest of and is the best value for the Owner. Further, it is expressly understood that the Owner will make their selection based on the entirety of each proposer in determining the best value for the Owner. Price shall not be the sole criterion for any decision.

Respondent has familiarized themselves with the scope of work in its entirety and fully acquaint themselves with the existing conditions there and has fully inform themselves as to the facilities involved, the difficulties and restrictions attending the performance of the contract. The Respondent should thoroughly examine and familiarize themselves with all drawings, images, technical specifications, and all other documents issued as a part of this Proposal request. The contractor by the execution of the contract

shall in no way be relieved of any obligation under it due to his failure to receive or examine any form or legal document or to visit the site or acquaint themselves with the conditions there existing. The Owner will be justified in rejecting any claim based on lack of inspection of the site prior to the proposal.

The unit price, if requested, for each of the items in the proposal shall include its pro rata share of overhead so that the sum of the products obtained by multiplying the quantity shown for each item by the unit price proposal represents the total proposal. Any proposal not conforming to this requirement may be rejected as informal. Special attention is drawn to this condition, as the unit prices will be used to determine the amount of any change orders resulting from an increase or decrease in quantities.

I _____ accept all terms noted above without.

Signature: _____ Title: _____

XI. EXHIBIT D - PURCHASE ORDER TERMS AND CONDITIONS

ACCEPTANCE *- This Purchase Order constitutes a binding contract between the Vendor and Tomball Independent School District (TISD), to furnish the goods or service(s) specified on the face of the Purchase Order. By acceptance of this Purchase Order, the Vendor agrees to furnish all goods or service(s) in accordance with the terms and conditions specified herein.*

AGREEMENT *- This Purchase Order represents the basis for the Vendor to deliver the required goods or service(s), and supersedes all prior offers, negotiations, exceptions, and understandings (whether done orally or in writing).*

ASSIGNMENT *- The rights and responsibilities of the Vendor to furnish the goods or service(s) specified herein will not be subcontracted, assigned, transferred, mortgaged, pledged, or disposed of, unless agreed to by TISD and the Vendor.*

CANCELLATION *- TISD reserves the right to cancel this Purchase Order at any time. If this Purchase Order is canceled pursuant to the Vendor's default, TISD may obtain similar goods or service(s) elsewhere and charge the Vendor for any damages incurred.*

CHANGES *- TISD reserves the right to make changes to this Purchase Order (e.g., increase/decrease quantities, change delivery address). Any changes to the Purchase Order will be communicated to the Vendor by the issuance of a Change Order.*

DELIVERY *- The Vendor shall deliver all goods Free On Board (F.O.B.) Destination, unless specified on Purchase Order.*

DISCOUNTS *- The Vendor shall indicate on the invoice any prompt payment discounts or trade discounts.*

INDEMNIFICATION *- The Vendor shall indemnify and hold harmless TISD (including the Board of Trustees and the employees of TISD) from all claims of liability to third parties (including but not limited to the injury or death of person(s), or the loss or damage to property) arising out of or in connection with the performance of the Vendor. The Vendor shall indemnify and hold harmless TISD (including the Board of Trustees and the employees of TISD) from all liabilities, cost, expenses, attorney fees, fines, penalties or damages for any or claimed infringement of any patents, trademarks, copyrights, or other corresponding right(s) which is related to any part of the goods or service(s) the Vendor is required to provide or perform. The Vendor's obligation to this clause shall survive acceptance and payment of the goods or service(s) by TISD.*

INSURANCE *- The Vendor shall be required to carry insurance protection sufficient to meet all the liabilities that are mentioned herein.*

INSPECTION *- Prior to acceptance and payment, TISD reserves the right to inspect all goods (in whole or in part) and service(s) furnished by the Vendor. Goods or*

service(s), which (in the opinion of TISD) fail to conform to the required specification(s) or standard(s), may be considered nonconforming.

***INTERPRETATION** - This Purchase Order shall be construed and interpreted solely in accordance with laws of the State of Texas. Venue of any suit, right or cause of action arising shall lie exclusively in Harris County, Texas.*

***NON-CONFORMANCE** - The Vendor assumes all liability for shipping goods that do not meet the specification(s) and standard(s) specified on the face of the Purchase Order. TISD reserves the right to accept or reject goods that are non-conforming. If TISD rejects the non-conforming goods, said goods shall be returned to the Vendor at the Vendor's expense. The Vendor shall use "best efforts" to replace any non-conforming good(s) at the Vendor's risk and expense.*

***PERFORMANCE** - By acceptance of this Purchase Order, the Vendor agrees to use "best efforts" to furnish the required goods or service(s).*

***PRICES** - The price(s) specified on the face of the Purchase Order shall remain firm until TISD has processed the Vendor's invoice, or until the item has been accepted by TISD (whichever is later).*

***PRODUCT RECALL** - The Vendor shall notify the Purchasing Agent of TISD immediately if a product recall is instituted on any item(s) the Vendor has delivered. This requirement shall survive payment and acceptance.*

***QUANTITIES** - Quantities in excess of the quantities specified on the face of the Purchase Order may be returned to the Vendor at the discretion of TISD. All risk and expense for the return of the good(s) shall be borne by the vendor.*

***QUALITY** - In the event no quality is specified on the face of the Purchase Order, the goods delivered and/or service(s) rendered hereunder shall be of the best quality. The Vendor shall ensure that all goods delivered to TISD will be new (i.e., previously unused and in its original packaging), and have not been remanufactured or refurbished. The Vendor also warrants that all services will conform to the standard(s) established herein.*

***SAFETY** - If applicable, the Vendor shall deliver Material Safety Data Sheets (MSDS) with the requested good(s).*

***TAXES** - The Vendor shall not include taxes on the invoice. **Tax Exempt # 1-74-6002408-0**.*

***TERMS** - Unless otherwise specified, payment terms are net thirty (30) days.*

***TITLE** - The title to any item delivered shall pass to TISD upon acceptance or payment (whichever is later).*

WARRANTY *- The Vendor warrants that all goods and service(s) furnished, shall be free from all defects, conform to all applicable specifications, and be suitable for its intended purpose(s).*

Neither acceptance of, nor payment for said goods and service(s) shall constitute a waiver or modification of any of the warranties of the Vendor, or the rights of TISD.

I _____ accept all terms noted above without exception unless noted in **Section XII.**

Signature: _____ Title: _____

The successful Proposer shall upon notice fill out all forms to become an Approved Vendor to Tomball ISD. This must be done prior to Tomball ISD issuing a Purchase Order.

This information can be found at: https://www.tomballisd.net/about-tisd/departments/finance/purchasing/bids-and-proposals

The Proposer is not required to register as a vendor as indicated on the website. This RFP submission is considered your intent.

XII. EXHIBIT E - DEVIATIONS & EXCEPTIONS

Please initial the applicable option accepted and provide signature at the bottom and title.

_____I have read and reviewed all RFP documents and take no exceptions to any portion of this RFP or any of the issued addenda.

Or

_____I take the following exceptions or am providing equipment with the following variations from the Design Documents. (Please identify specific exceptions. If in the agreement, list the specific paragraph and language along with your proposed modification.):

1. _____
   _____
2. _____
   _____

Add lines as needed.

_____I do not believe the schedules planned are attainable and propose the following as alternative Substantial Completion Dates

1. TS-01 FM 2920: _____
2. TS-02 Mueschke Rd: _____

Signature: _____ Title: _____

XIII. EXHIBIT F - AGREEMENT

1. AIA A104-2017 with Amendments. This document will be issued by addendum before the bid due date.

XIV. EXHIBIT G - PROOF OF DOCUMENTS

4. **Bonding:** This project will require a payment and performance bond. Provide proof of ability to bond this project by letter with submission.
5. Once selected and within three business days, Provide a bond or check for an amount equal to 10% of the cost of the equipment with your submission.
6. **Insurability:** Provide proof of insurability for values required below proof of bonding capacity.
7. Failure to provide either bond or insurance within the set time may result in the Owner ceasing negotiations if any and going to the next bidder.

Insurance and Bond Requirements

CONTRACTOR'S LIABILITY INSURANCE

The Contractor shall carry and maintain in force the insurance described below. Prior to execution of the Contract, the Contractor shall procure insurance coverage in the types and amounts as follows:

1. Workmen's Compensation	All liability arising out of Contractor's employment of workers and anyone for whom Contractor shall be liable for Worker's Compensation claims. Worker's Compensation is required and no "alternative" form of insurance shall be permitted. Waiver of Subrogation in favor of Owner and Program Manager required.
2. Employer's Liability	$1,000,000.00
3. Commercial General Liability	
a. Each Occurrence	$1,000,000.00
b. General Aggregate	$2,000,000.00 (A Designated Construction Project General Aggregate Limit shall be provided)
c. Personal & Advertising Injury	$1,000,000.00 (Each Person)
d. Products & Completed Operations	$1,000,000.00 (for one (1) year commencing with issuance of Final Certificate of Payment)
4. Property Damage	
a. Each Occurrence	$1,000,000.00
b. Aggregate	$2,000,000.00
c. Independent Contractors	$1,000,000.00 (Each Occurrence), $2,000,000.00 (Aggregate)
5. Commercial Automobile Liability	
a. Bodily Injury/Property Damage	$1,000,000.00 (Combined single limit)
6. Umbrella or Excess Liability	
a. Each Occurrence and Aggregate	(a) One times Contract amount for all Contracts with the following minimum and maximum: (i) $1,000,000.00 minimum limit (ii) $25,000,000.00 maximum limit (b) The Umbrella shall provide coverage over the workmen's compensation, comprehensive general liability, and comprehensive automobile liability.
7. All Risk Builder's Risk	All Risk Builder's Risk against the perils of fire, lightening, wind storm, hurricane, hail, explosion, riot, civil commotion, smoke, aircraft, land vehicles, vandalism, malicious mischief, and all other perils in the amount one hundred percent (100%) of the value of the improvements including transit and materials stored off site. Additionally, this coverage shall provide protection to the full replacement value for boiler and machinery equipment up to installation, during testing, and until acceptance by Owner.

1. The required insurance must be written by a company licensed to do business in Texas at the time the policy is issued. In addition, the company must be acceptable to the Owner. The Owner's Representative will contact the State Board of

Insurance to confirm that the issuing companies are admitted and authorized to issue such policies in the State of Texas.

2. The General Liability and Automobile so issued in the name of Contractor shall also name the Owner and Program Manager as additional insured. The coverage afforded to the additional insured under the policy or policies shall be primary insurance. It is the intent of the parties to this Agreement that the General Liability coverage required herein shall be primary to and shall seek no contribution from all insurance available to Owner, with Owner's insurance being excess, secondary, and non-contributing. The Commercial General Liability coverage provided by Contractor shall be endorsed to provide such primary and non-contributing liability. If the additional insured has other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis.
3. If the insurance is written with stipulated amounts deductible under the terms of the policy, the Contractor shall pay the difference attributable to deductions in any payment made by the insurance carrier on claims paid by this insurance to the extent Contractor the subject loss is due to the fault of Contractor. If the Owner is damaged by the failure of the Contractor to maintain such insurance and to so notify the Owner then the Contractor shall bear all reasonable costs properly attributable thereto.
4. The insurance required by this Exhibit A shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents. Nothing contained herein shall limit or waive Contractor's legal or contractual responsibilities to Owner or others.
5. Contractor shall have its insurance carrier(s) furnish to Owner insurance certificates in form satisfactory to Owner specifying the types and amounts of coverage in effect, the expiration dates of each policy, and a statement that no insurance will be canceled or materially changed while the Work is in progress without thirty (30) calendar day's prior written notice to Owner. Contractor shall permit Owner to examine the insurance policies, or at Owner's option, Contractor shall furnish Owner with copies, certified by the carrier(s), of insurance policies required in Exhibit A. If Contractor neglects or refuses to provide any insurance required herein, or if any insurance is canceled, Owner may, but shall not be obligated to, procure such insurance and the provisions of Section 7 hereof shall apply.
6. Contractor and its Subcontractors shall not commence the shipment of equipment or materials or commence the Work at the site until all of the insurance coverage required of Contractor and its Subcontractors are in force and the necessary certificates and statements pursuant to Section 5 hereof have been received by Owner and the Architect or Owner has issued a written notice to proceed.
7. As an alternative and at Owner's option and expense, Owner may elect to furnish or to arrange for any part or all of the insurance required by Exhibit A hereof. If Owner so elects, it shall notify, in writing, Contractor and issue a Change Order therefor, but no adjustment to the scheduled completion date or the Contract Sum shall be allowed.
8. A copy of a certificate of insurance, a certificate of authority to self-insure issued by the Texas Workers' Compensation Commission, or a coverage agreement (DWC-81, DWC-82, DWC-83, or DWC-84), showing statutory Workers' Compensation insurance coverage for the person's or entity's employees providing services on a Project is required for the duration of the Project.
    a. Duration of the Project includes the time from the beginning of the Work on the Project until the Contractor's/person's Work on the Project has been completed and accepted by the Owner.
    b. Persons providing services on the Project ("Subcontractor" in Texas Labor Code 406.096) include all persons or entities performing all or part of the services the Contractor has undertaken to perform on the Project, regardless of whether that person contracted directly with the Contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, contractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity that furnishes persons to provide services on the Project.
    c. Services include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a Project. Services do not include activities unrelated to the Project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.
    d. The Contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code Section 401.011(44) for all employees of the Contractor providing services on the Project for the duration of the Project.
    e. The Contractor must provide a certificate of coverage to the Owner prior to being awarded the contract.
    f. If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the Project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the Owner showing that coverage has been extended.

g. The Contractor shall obtain from each person providing services on a Project, and provide to the Owner:
    i. A certificate of coverage, prior to that person beginning Work on the Project, so the Owner will have on file certificates of coverage showing coverage for all persons providing services on the Project; and
    ii. No later than seven (7) days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project.

h. The Contractor shall retain all required certificates of coverage for the duration of the Project and for one (1) year thereafter.

i. The Contractor shall notify the Owner in writing by certified mail or personal delivery, within ten (10) days after the Contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project.

j. The Contractor shall post on each Project site a notice, in the text, form, and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the Project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

k. The Contractor shall contractually require each person with whom it contracts to provide services on a Project, to:
    i. Provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code 401.011(44) for all of its employees providing services on the Project for the duration of the Project;
    ii. Provide to the Contractor, prior to that person beginning Work on the Project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the Project for the duration of the Project;
    iii. Provide the Contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;
    iv. Obtain from each other person with whom it contracts, and provide to the Contractor:
        1. A certificate of coverage, prior to the other person beginning Work on the Project; and
        2. A new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;
        3. Retain all required certificates of coverage on file for the duration of the Project and for one (1) year thereafter;
        4. Notify the Owner in writing by certified mail or personal delivery, within ten (10) days after the person knew, or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project; and
        5. Contractually require each person with whom it contracts to perform as required by items 1-4, with the certificates of coverage to be provided to the person for whom they are providing services.

l. By signing this contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the Owner that all employees of the Contractor who will provide services on the Project will be covered by Workers' Compensation coverage for the duration of the Project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the Commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

m. The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor that entitles the Owner to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the Owner.

n. The coverage requirement recited above does not apply to sole proprietors, partners, and corporate officers who are excluded from coverage in an insurance policy or certificate of authority to self-insure that is delivered, issued for delivery, or renewed on or after January 1, 1996. 28 TAC 110.110(i).

9. The Owner and Contractor shall waive all rights against (1) each other and the Contractors, Subcontractors, agents and employees each of the other, and (2) the Architect and separate Contractors, if any, and their contractors, Subcontractors, agents and employees, for damages caused by fire or other perils to the extent covered by property insurance applicable to the Work. The foregoing waiver afforded the Architect, his agents and employees shall not extend to the liability

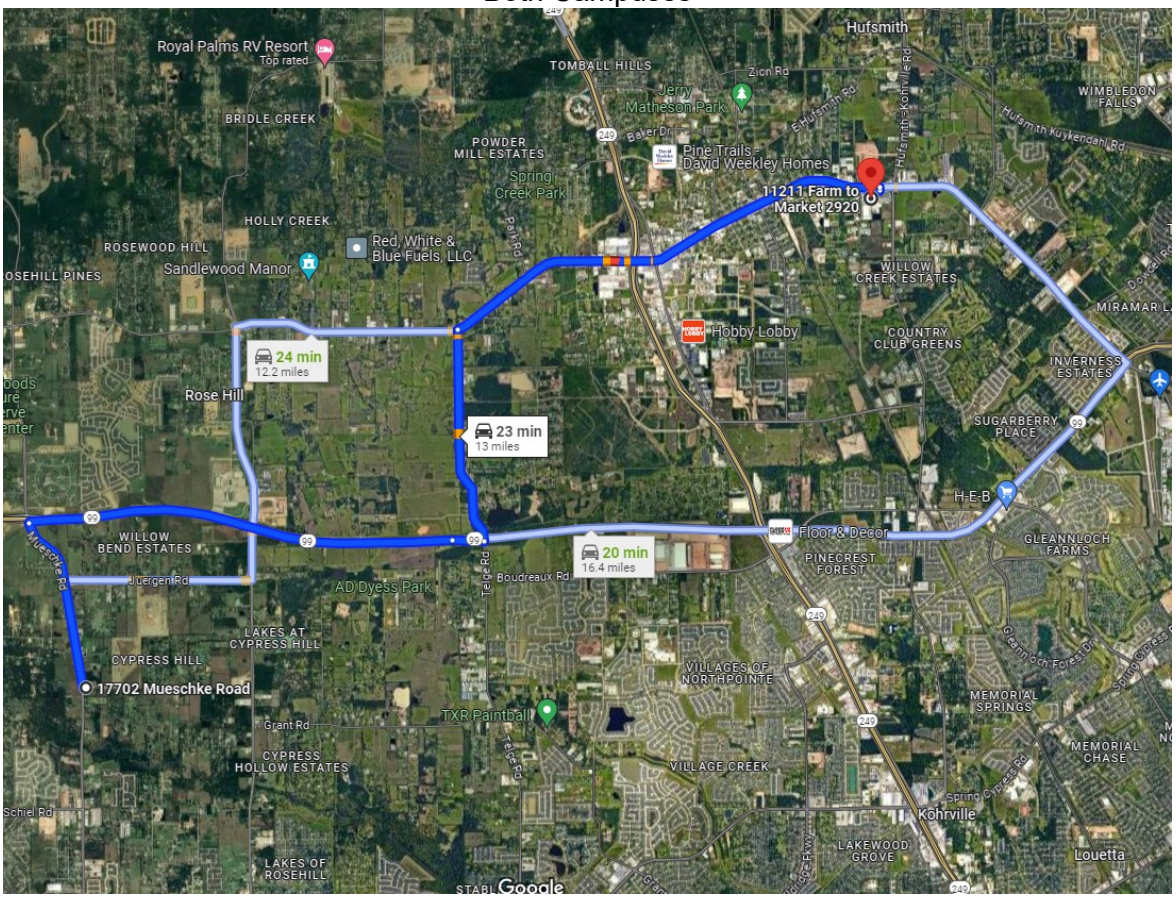
imposed by other portions of the Agreement. The Owner or the Contractor, as appropriate, shall require of the Architect, separate contractors, contractors, and Subcontractors by appropriate agreements, written where legally required for validity, similar waivers, each in favor of all other parties enumerated in this Exhibit A.

PERFORMANCE BOND AND PAYMENT BOND

1. The Contractor is required, as a condition precedent to the execution of the Contract, to execute a PERFORMANCE BOND in the form required by TEXAS STATUTES, in an amount equal to ONE HUNDRED PERCENT (100%) of the Contract Sum.
2. The Contractor is required, as a condition precedent to the execution of the Contract, to execute a PAYMENT BOND in the form required by TEXAS STATUTES, in an amount equal to ONE HUNDRED PERCENT (100%) of the Contract Sum as security for payment of all persons performing labor and furnishing materials in connection with this Contract. (Bonding Company is to furnish such forms). All bonds shall name the Owner as additional Obligee.
3. The Payment and Performance Bond shall meet requirements of Chapter 2253 of the Texas Governmental Code. All bonds shall be issued by a surety company licensed, listed, and authorized to issue bonds in the State of Texas by the Texas Department of Insurance. The surety company may be required by the Owner to have a rating of not less than "B" in the latest edition of Best's Insurance Reports, Property-Casualty. The surety company shall provide, if requested, information on bonding capacity, other projects under coverage and shall provide proof to establish adequate financial capacity for this Project.
    a. Should the bond amount be in excess of ten percent (10%) of the surety company's capital and surplus, the surety company issuing the bond shall certify that the surety company has acquired reinsurance, in a form and amount acceptable to the Owner, to reinsure the portion of the risk that exceeds ten percent (10%) of the surety company's capital and surplus with one or more reinsurers who are duly authorized and admitted to do business in Texas and that amount reinsured by an reinsurer does not exceed ten percent (10%) of the reinsurer's capital and surplus.
    b. The Sureties shall promptly file a signed copy of the Contract, Performance, and Payment Bonds with the Owner in full compliance with Chapter 2253 of the Texas Governmental Code or, in the case of a Construction Manager, as required by Article 8 of the A133-2009 as modified by the Parties.
4. All bonds will be reviewed by the Architect for compliance with the Contract Documents prior to execution of the contract. In the event that the Architect has any questions concerning the sufficiency of the bonds, the bonds will be referred to the Owner or the Owner's representative for review and decision.
5. All bonds shall be originals. The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the Power-of-Attorney. The name, address, and telephone number of a contact person for the bonding company shall be provided.
6. Upon the request in writing of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the contract, the Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.
7. Bonds shall be signed by an agent resident in the State of Texas and the date of the bond shall be the date of execution of the contract. If at any time during the continuance of the contract, the surety of the Contractor's bonds becomes insufficient, Owner shall have the right to require additional and sufficient sureties which the Contractor shall furnish to the satisfaction of the Owner within ten (10) business days after notice to do so. In default thereof, the Contractor may be suspended, and all payment or money due to the Contractor withheld.
8. By inclusion of this Section 8 in the Contract Documents, the surety which issues the bonds is hereby notified that the Owner, the Architect, and their agents and employees do not represent and will not be responsible for the surety's interests during the course of the Work. To protect its interests, the surety shall have the right to attend pay estimate meetings, review Applications for Payment when requested in writing by them, comment upon and make recommendations regarding payments, and inspect the Work in the presence of the Contractor and the Architect. By providing the bonds for the Work, the surety shall and hereby waives any cause of action against the Owner, the Architect, their agents and employees, for any loss suffered by the surety by reason of overpayment of any amounts to the Contractor, unless such is a direct result of a fraudulent or grossly negligent act committed by such party.

XV. SITE LOCATION MAP(s)

Both Campuses



Print Date: 8/23/2024 12:22 PM

Request for Proposal for
Tomball Independent School District
RFP 978-24 Traffic Signals and Related Equipment
Provide and Install Two Traffic Signal Systems at Two Locations within Tomball ISD

TS-01 Tomball Innovation Center 11211 F.M. 2920

Print Date: 8/23/2024 12:22 PM

Request for Proposal for
Tomball Independent School District
RFP 978-24 Traffic Signals and Related Equipment
Provide and Install Two Traffic Signal Systems at Two Locations within Tomball ISD

TS-02 Tomball West Campus – 17702 Mueschke Rd

Print Date: 8/23/2024 12:22 PM

XVI. Drawings for both locations attached.

INDEX TO SHEETS
SEE SHEET NO. 2

FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY
6	TEXAS				FM 2920
STATE DISTRICT	COUNTY	CONTROL	SECTION	JOB	SHEET NO.
HOU	HARRIS				1
LETTING DATE:					

TS-01 - FM 2920

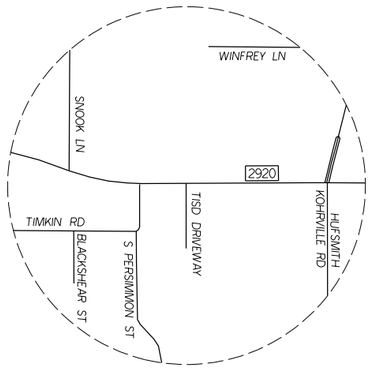
HARRIS COUNTY
FM 2920 AT TISD DRIVEWAY

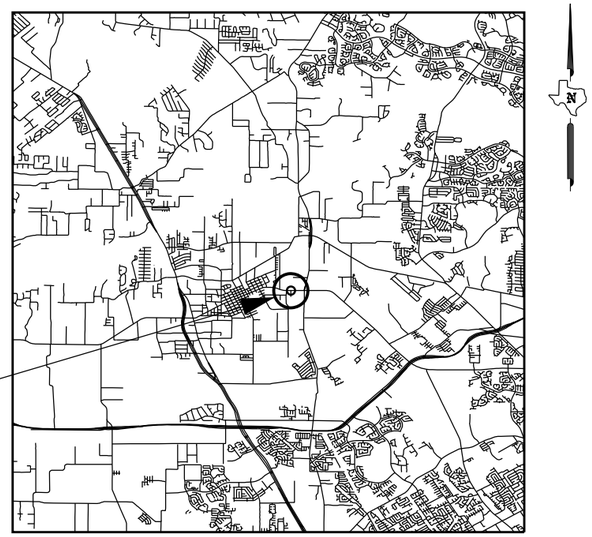
TDLR INSPECTION NOT REQUIRED

NO EXCEPTIONS
NO RAILROAD CROSSINGS
NO EQUATIONS

FOR THE CONSTRUCTION OF TRAFFIC SIGNAL WORK
CONSISTING OF INSTALLATION OF WOOD POLE SPAN WIRE SIGNAL
WITH SAFETY LIGHTING

REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH THE LATEST BC STANDARD SHEETS AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES."





HARRIS COUNTY
VICINITY MAP - N.T.S.

TOMBALL INDEPENDENT SCHOOL DISTRICT

QUIDDITY
Texas Board of Professional Engineers and Land Surveyors Reg. No. F-23290
2805 Dallas Parkway, Suite 600 • Plano, Texas 75093 • 972.488.3880

TEXAS DEPARTMENT OF TRANSPORTATION

STATE OF TEXAS
TYLER H. COWSER
147989
LICENSED
PROFESSIONAL ENGINEER
Tyler Cowser P.E.
3/8/2024

NOTES:

1. SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014, SHALL GOVERN ON THIS PROJECT.

2. FOR BARRICADES AND SIGNING AT INDIVIDUAL INTERSECTIONS UNDER SIGNAL CONSTRUCTION, REFER TO STANDARD SHEETS, WZ(BTS-1)-13 & WZ(BTS-2)-13.

SHEET NO. DESCRIPTION

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE (*) HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

STATE OF TEXAS
TYLER H. COWSER
147989
LICENSED PROFESSIONAL ENGINEER

Tyler Cowser P.E.
3/8/2024

QUIDDITY
Texas Board of Professional Engineers and Land Surveyors Reg. No. F-23290
6330 West Loop South, Suite 150 • Bellaire, TX 77401 • 713.777.5337

Texas Department of Transportation®

FM 2920 AT TISD DRIVEWAY

INDEX OF SHEETS

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
			2
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
			FM 2920

SUMMARY OF TRAFFIC SIGNAL QUANTITIES				
TXDOT SPECS		DESCRIPTION	UNIT	TOTAL
ITEM NO.	DESC. CODE			
500	6001	MOBILIZATION	LS	1
502	6001	BARRICADES, SIGNS, AND TRAFFIC HANDLING	MO	2
628	6145	ELC SRV TY D 120/240 060(NS)SS(E)SP(O)	EA	1
644	6076	REMOVE SM RD SN SUP&AM	EA	1
644	6078	REMOVE SM RD SN SUP&AM (SIGN ONLY)	EA	1
666	6036	REFL PAV MRK TY I (W) 8" (SLD)	LF	155
666	6048	REFL PAV MRK TY I (W) 24" (SLD)	LF	85
666	6054	REFL PAV MRK TY I (W) (ARROW)	EA	1
666	6078	REFL PAV MRK TY I (W) (WORD)	EA	1
666	6225	PAVEMENT SEALER 6"	LF	1125
666	6226	PAVEMENT SEALER 8"	LF	155
666	6230	PAVEMENT SEALER 24"	LF	85
666	6231	PAVEMENT SEALER (ARROW)	EA	1
666	6232	PAVEMENT SEALER (WORD)	EA	1
666	6321	REFL PAV MRK TY I (Y) 6" (SLD)	LF	1125
672	6007	REFL PAV MRKR TY I-C	EA	7
672	6009	REFL PAV MRKR TY II-A-A	EA	43
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	1135
677	6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	2
678	6002	PAV SURF PREP FOR MRK (6")	LF	275
678	6008	PAV SURF PREP FOR MRK (24")	LF	85
678	6009	PAV SURF PREP FOR MRK (ARROW)	EA	1
678	6016	PAV SURF PREP FOR MRK (WORD)	EA	1
681	6001	TEMP TRAF SIGNALS	EA	1
		** CONTROLLER, FULL-ACTUATED (POLE MOUNT W/ CABINET)	EA	1
		** POLE, 40' WOOD	EA	4
		** ROD 5/8" X 10' COPPER-CLAD GROUND (CONTROLLER ONLY)	EA	1
		** LED LUMINAIRE HEAD-EQUIVALENT TO 250W (HPS)	EA	2
		** MAST ARM, 8' LUMINAIRE	EA	2
		** SCREW ANCHOR, 8'-10"	EA	4
		** GUARD, GUY WIRE	LF	400
		** 4G LTE ENABLED CELLULAR MODEM W/ ANTENNA AND POWER SUPPLY	EA	1
		** DETECTOR UNIT (DUAL CHANNEL)	EA	1
		** DETECTOR CARD RACK (8 SLOT)	EA	1
		** 4G LTE CELLULAR MODEM	EA	1
		** "LEFT ON GREEN ARROW ONLY" (30"X36") (R10-5)	EA	1
		** STREET NAME SIGN, "FM 2920" (54"X18")	EA	1
		** WIRE, 5/16" GALV. GUY (HIGH STRENGTH)	LF	480
		** WIRE, 3/8" GALV. GUY (HIGH STRENGTH)	LF	480
		** WIRE, 1/4" GALV. GUY (HIGH STRENGTH)	LF	480
		** BACK PLATE W/REFL BRDR (3 SEC) (VENT) ALUM	EA	6
		** BACK PLATE W/REFL BRDR (4 SEC) (VENT) ALUM	EA	1
		** VEH SIG SEC (12 IN) LED (GRN)	EA	6
		** VEH SIG SEC (12 IN) LED (GRN ARW)	EA	1
		** VEH SIG SEC (12 IN) LED (YEL)	EA	6
		** VEH SIG SEC (12 IN) LED (YEL ARW)	EA	1
		** VEH SIG SEC (12 IN) LED (RED)	EA	6
		** VEH SIG SEC (12 IN) LED(RED ARW)	EA	2
		** TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	640
		** TRAY CABLE (4 CONDR) (12 AWG)	LF	430
		** ELEC CONDR (NO. 6) BARE	LF	50
		** ELEC CONDR (NO. 4) BARE	LF	50
		** ELEC CONDR (NO. 4) INSULATED	LF	100
		** CONDT (PVC) (SCH 80) (2")	LF	100
6185	6002	TMA (STATIONARY)	DAY	30
6306	6001	VIVDS PROSR SYS	EA	1
6306	6002	VIVDS CAM ASSY FXD LNS	EA	3
6306	6005	VIVDS CNTRL SOFTWARE	EA	1
6306	6007	VIVDS CABLING	LF	470

** MATERIAL SUBSIDIARY TO PERTINENT ITEM

STATE OF TEXAS
TYLER H. COWSER
147989
PROFESSIONAL ENGINEER
LICENSED
Tyler Cowser P.E.
3/8/2024

QUIDDITY
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Texas Department of Transportation®

FM 2920 AT TISD DRIVEWAY

SUMMARY OF TRAFFIC SIGNAL QUANTITIES

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
			3
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
			FM 2920

NOTES FOR TEMPORARY TRAFFIC SIGNAL(S):

1. INSTALL SIGNALS HORIZONTALLY ON SPAN WIRE, 18FT.-6IN, ABOVE THE ROADWAY.

2. FURNISH BLACK HOUSING FOR VEHICLE SIGNALS.
   FURNISH BLACK VEHICLE SIGNAL HEAD BACK PLATES WITH 2-INCH RETROREFLECTIVE YELLOW BORDERS.

3. FURNISH VEHICLE SIGNAL HEADS WITH LIGHT EMITTING DIODE(LED)SIGNAL LAMP UNITS.

4. USE TYPE B (HIGH INTENSITY PRISMATIC) OR TYPE D (DIAMOND GRADE) RETROREFLECTIVE SHEETING FOR SIGNS MOUNTED UNDER OR ADJACENT TO THE SIGNAL HEADS.

5. ROUTE CABLE FOR LUMINAIRES(#12/4C-TRAY CABLE)TO THE SERVICE ENCLOSURE. SEE ELECTRICAL DETAIL SHEETS.DO NOT PASS THE LUMINAIRE CONDUCTORS THROUGH THE SIGNAL CONTROLLER CABINET.

6. FURNISH AND INSTALL FULL-ACTUATED CONTROLLER WITH INTERNAL TIME BASE COORDINATION UNIT IN A BASE MOUNTED CABINET.

7. INSTALL A CLOSE NIPPLE WITH LOCK NUT AND BUSHING(SIZE AS REQUIRED) WHERE THE CABLE ENTERS THE UPPER PORTION OF THE SIGNAL POLE.

8. LOCATE CONTROLLER(S),WOOD POLES,DETECTORS,ETC.,AS APPROVED.

9. REPAIR OR REPLACE PAVEMENT AND SIDEWALKS DAMAGED BY THE CONTRACTOR'S FORCES DURING CONSTRUCTION AT NO COST TO THE DEPARTMENT.

10. REMOVE THE EXISTING STOP SIGN(S)AND THOSE ITEMS DEEMED SALVAGEABLE BY THE ENGINEER(TXDOT).STOCKPILE THOSE ITEMS ON THE RIGHT OF WAY. REMOVE AND DISPOSE OF OTHER ITEMS AT NO EXPENSE TO THE DEPARTMENT OR THE DISTRICT.

11. ASSUME OWNERSHIP OF THE REMOVED EXISTING SIGNS.

12. SEAL ENDS OF ALL CONDUITS WITH DUCT SEAL, EXPANDABLE FOAM, OR BY OTHER METHODS APPROVED BY THE ENGINEER. SEAL CONDUIT IMMEDIATELY AFTER COMPLETION OF CONDUCTOR INSTALLATION AND PULL TESTS. DO NOT USE DUCT TAPE AS A PERMANENT CONDUIT SEALANT. DO NOT USE SILICONE CAULK AS A CONDUIT SEALANT.

13. CAP SPARE CONDUITS INSTALLED IN POLE FOUNDATIONS AND GROUND BOXES USING APPROVED CAPPING DEVICES.

14. DO NOT PLACE SIGNAL HEADS OVER THE ROADWAY UNTIL ALL NECESSARY MATERIALS ARE ON HAND AS APPROVED.

15. INSTALL TWO SET SCREWS ON ALL VEHICLE SIGNAL HEAD MOUNTING HARDWARE FITTINGS.

16. INSTALL A 5/8-IN. (MINIMUM) EYE BOLT FOR THE POINT OF ATTACHMENT BELOW THE SERVICE ENTRANCE WEATHERHEAD FOR THE SERVICE DROP TO STEEL OR WOOD POLE.

17. AIM LUMINAIRE ARMS MOUNTED ON TRAFFIC SIGNAL POLES PERPENDICULAR TO THE CENTERLINE OF THE ROADWAY IT IS INTENDED TO COVER, TO DEVELOP THE PROPER ILLUMINATION PATTERN FOR THE INTERSECTION.

18. PROVIDE 250 WATT HPS EQUIVALENT LIGHT EMITTING DIODE(LED) LUMINAIRES OPERATING AT 240 VOLTS.

19. WRAP SIGNAL HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF INSTALLATION UNTIL PLACING INTO OPERATION.

20. GROUND ALL STEEL MAST ARM POLE ASSEMBLIES IN ACCORDANCE WITH THE REQUIREMENTS SHOWN ON THE LATEST TRAFFIC SIGNAL POLE FOUNDATION STANDARD.USE THE GROUNDING LUG ON THE POLE TO GROUND THE POLE TO THE GROUND CONDUCTORS FROM THE CONDUIT.

21. PLACE PAVEMENT MARKINGS AS SHOWN ON THE PLANS OR AS DIRECTED.

22. FURNISH NEW SOLID STATE TEMPORARY POLE MOUNTED CONTROLLER WITH AN INTERNAL TIME BASED COORDINATION UNIT. IN ADDITION TO ATTACHING THE CONTROLLER TO THE POLE, FUNISH AND INSTALL A STURDY PLATFORM TO STABILIZE THE CONTROLLER. SECURE THE ENGINEER'S APPROVAL OF THE CABINET PLATFORM BEFORE INSTALLATION.

23. FURNISH 3/8IN. GALVANIZED DOWN GUY(S) (HIGH STRENGTH) FOR WOOD POLES, FURNISH 8 FT.-10 IN. SCREW ANCHORS. FURNISH "SIDEWALK" DOWN-GUYS IF FIELD CONDITIONS DO NOT ALLOW FOR THE STANDARD DOWN-GUY ASSEMBLY.

24. AIM LUMINAIRE ARMS MOUNTED ON TRAFFIC SIGNAL POLES PERPENDICULAR TO THE CENTERLINE OF THE ROADWAY IT IS INTENDED TO COVER, TO DEVELOP THE PROPER ILLUMINATION PATTERN FOR THE INTERSECTION.

25. REFER TO TXDOTS WEBSITE FOR PREQUALIFIED PRODUCTS LIST REGARDING RADAR DETECTORS, VIVDS CAMERAS, WIRELESS MAGNETOMETERS, VEHICLE LED TRAFFIC SIGNAL LAMP UNIT, SYMBOLIC PEDESTRIAN SIGNAL HEAD, SYMBOLIC PEDESTRIAN SIGNAL LAMP, ACCESSIBLE PEDESTRIAN S*GNALS, SIGNAL CONTROLLERS, SIGNAL CABINETS, BUS INTERFACE UNITS, BATTERY BACKUP UNITS. CHECK WEBSITE PERIODICALLY FOR CURRENT UPDATES.

26. FURNISH VIDEO IMAGING VEHICLE DETECTION SYSTEM (VIVDS) CABLE RECOMENDED BY THE MANUFACTURER OR PURCHASE CABLE FROM THE SAME MANUFACTURER THAT SUPPLIED/PROVIDED THE VIVDS EQUIPMENT.

27. FOR VIVIDS CAMERA(S) MOUNTED TO LUMINAIRE ARMS, STRAP THE VIVDS CABLE TO THE LUMINAIRE ARMS WITH A METAL CABLE STRAP (ALUMINUM OR STAINLESS STEEL), 3/4-IN MINIMUM WIDTH AND TWO WRAPS AT 8 IN. MAXIMUM SPACING.

28. THE LOCATION OF THE VIVDS DETECTION ZONE IS APPROXIMATE. THE EXACT LOCATION WILL BE DETERMINED BY THE ENGINEER AND/OR DEPARTMENT TRAFFIC OPERATION SECTION.

29. ATTACH THE VIVDS COAX AND POWER CABLE TO A 5/16-IN. GALVANIZED GUY WIRE (HIGH STRENGTH) BETWEEN THE SIGNAL POLES ABOVE THE TRAFFIC SIGNAL CABLE.

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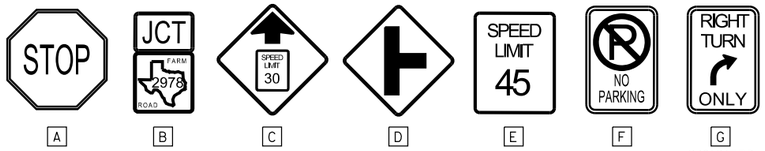
Texas Department of Transportation®

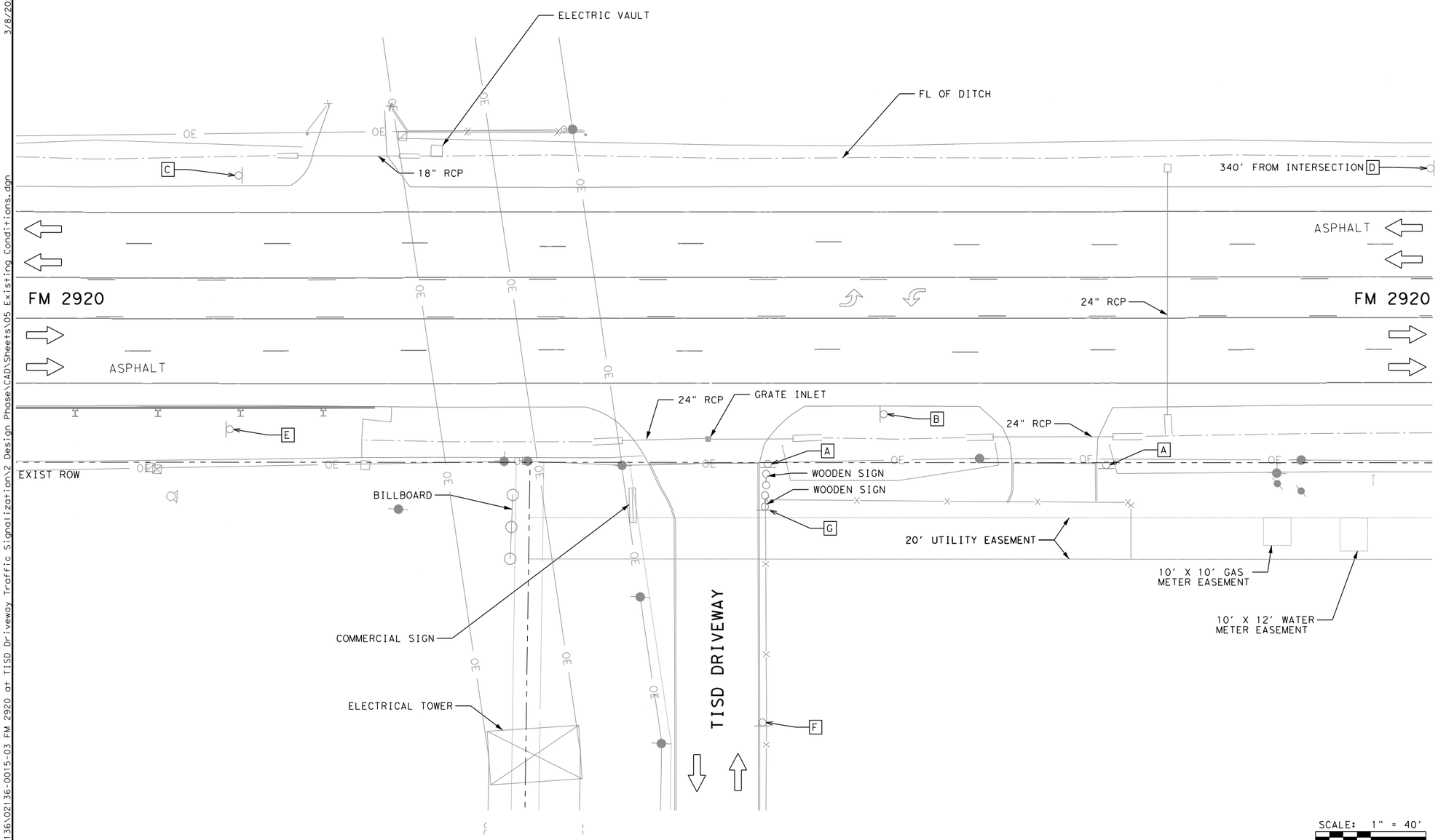
FM 2920 AT TISD DRIVEWAY
TRAFFIC SIGNAL PLAN LAYOUT NOTES

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
			4
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
			FM 2920

EXISTING SIGNS



A B C D E F G (MOUNTED ON WOODEN SIGN)



SCALE: 1" = 40'
0 20 40

LEGEND

- OE — OVERHEAD ELECTRIC
- FENCE
- RIGHT OF WAY
- FLOW LINE OF DITCH
- GROUND MOUNTED SIGN
- POWER POLE
- TELEPHONE PEDESTAL
- WATER METER
- GUARDRAIL
- TELEPHONE MARKER
- WATER VALVE
- FLUSH VALVE
- GROUND LIGHT
- DIRECTION OF FLOW

STATE OF TEXAS
TYLER H. COWSER
147989
PROFESSIONAL ENGINEER
LICENSED
Tyler Cowser P.E.
3/8/2024

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FM 2920 AT TISD DRIVEWAY

EXISTING LAYOUT

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
			5
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
			FM 2920

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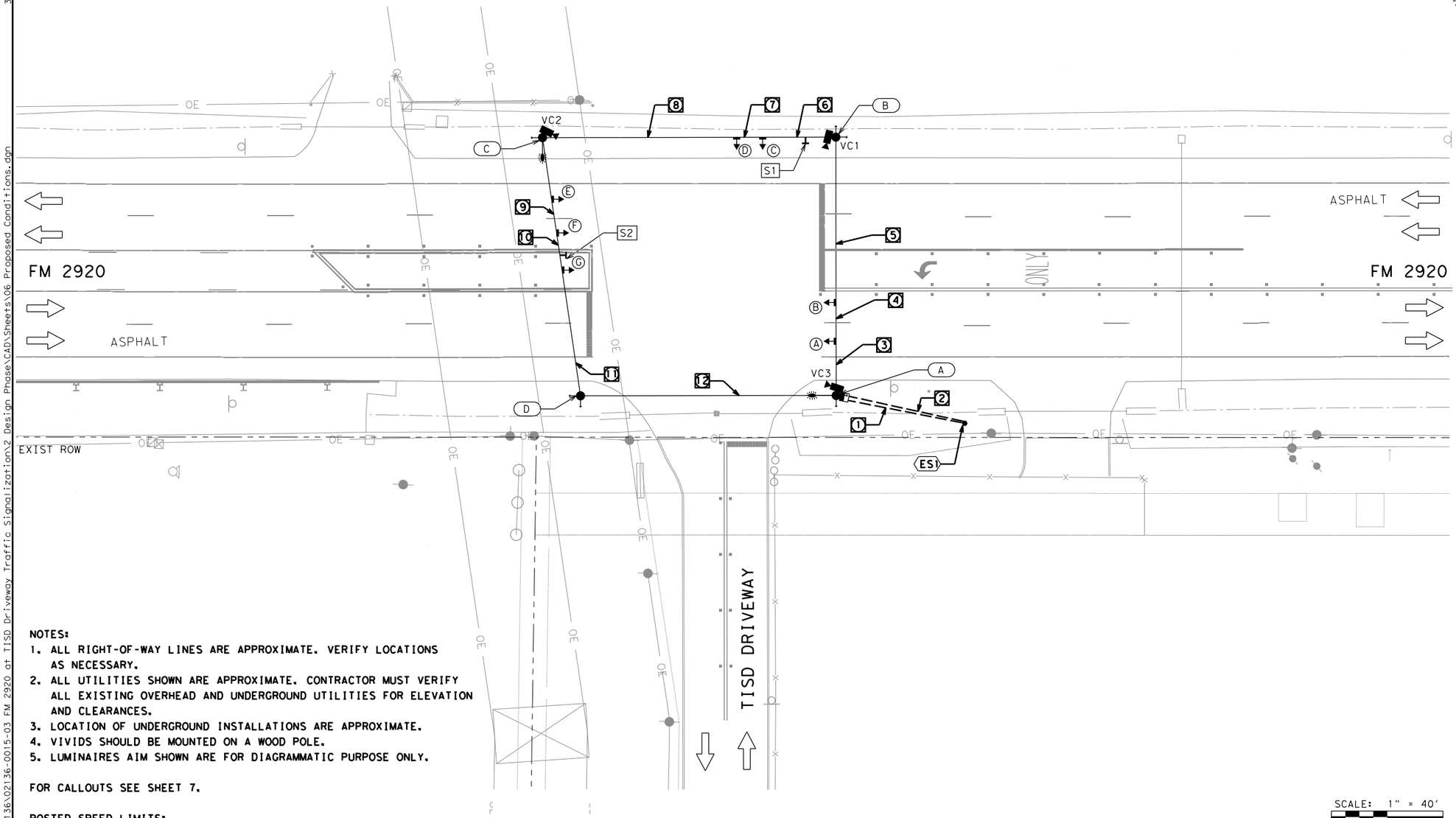

N

LEGEND

- PROPOSED TRAFFIC SIGNAL HEAD
- PROPOSED ROADWAY/STREET SIGN
- PROPOSED VIVDS DETECTOR
- PROPOSED FULL-ACTUATED POLE MOUNTED CONTROLLER W/CABINET, GPS MODULE
- PROPOSED CONDUIT (TRENCH)
- ES1 PROPOSED ELEC. SERV. POLE
- PROPOSED LUMINAIRE
- DIRECTION OF FLOW

NOTES:
1. ALL RIGHT-OF-WAY LINES ARE APPROXIMATE. VERIFY LOCATIONS AS NECESSARY.
2. ALL UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL EXISTING OVERHEAD AND UNDERGROUND UTILITIES FOR ELEVATION AND CLEARANCES.
3. LOCATION OF UNDERGROUND INSTALLATIONS ARE APPROXIMATE.
4. VIVIDS SHOULD BE MOUNTED ON A WOOD POLE.
5. LUMINAIRES AIM SHOWN ARE FOR DIAGRAMMATIC PURPOSE ONLY.

FOR CALLOUTS SEE SHEET 7.

POSTED SPEED LIMITS:
SPEED LIMIT: 45 MPH (FM 2920)

SCALE: 1" = 40'
0 20 40

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FM 2920 AT TISD DRIVEWAY

PROPOSED LAYOUT

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
			6
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
			FM 2920

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POLE DESCRIPTION

(A) PROPOSED 40' WOOD POLE W/ LUMINAIRE, VIVDS DETECTOR AND POLE MOUNTED CONTROLLER/CABINET

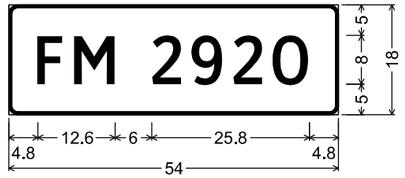
(B) PROPOSED 40' WOOD POLE W/ VIVDS DETECTOR

(C) PROPOSED 40' WOOD POLE W/ LUMINAIRE AND VIVDS DETECTOR

(D) PROPOSED 40' WOOD POLE

(ES1) PROP. SERVICE POLE TY D WITH METER AND (120/240 VOLT SERVICE). SERVICE ENCLOSURE AND SERVICE DISCONNECT.

PROPOSED SIGNS



1.5" Radius, 0.5" Border, White on Green;
"FM", ClearviewHwy-3-W;
"2920", ClearviewHwy-3-W;

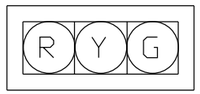
S1

R10-5

S2

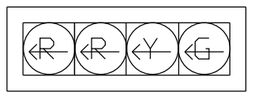
PROPOSED SIGNAL HEAD SCHEDULE

1W-3S (RYG)



SIGNAL# A, B, C, D, E, F

1W-4S (R R Y G)



SIGNAL# G

VIVDS DETECTOR CHART	
VC1	NORTHBOUND - TISD DRIVEWAY PRESENCE DETECTION
VC2	WESTBOUND - FM 2920 PRESENCE DETECTION
VC3	EASTBOUND - FM 2920 PRESENCE DETECTION

ELECTRICAL SERVICE DATA												
ELECTRICAL SERVICE NAME	POLE NO. CALLOUT	ELECTRICAL SERVICE DESCRIPTION (SEE ED (5, 6, 7, 8) - 14	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTOR NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	TWO-POLE CONTACTOR AMPS	PANEL BD./ LOAD CENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CIRCUIT AMPS	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
FM 2920 AT TISD DRIVEWAY	ES1	ELEC SERV TY D(120/240) 060 (NS)SS(E)SP(O)	1 - 1/4"	3 / #6	10	2P / 60	30	100	SIGNAL	40	1P / 50	<5.5
									LUMINAIRE	3	2P / 20	

CONDUIT AND CONDUCTOR RUNS														
RUN NO.	CONDUIT (618)		CONDUCTORS (620)						TRAY CABLE (621)		CABLE (684)		VIVDS (6306)	
	PVC		POWER		GROUND				LUMINAIRE		SIGNAL		DETECTOR	
	2" (SCHD 80)		#4 INSULATED		#4 BARE		#6 BARE		#12/4C TRAY CABLE		#12/7C		VIVDS CABLING	
	(SUBSIDIARY)		(SUBSIDIARY)		(SUBSIDIARY)		(SUBSIDIARY)		(SUBSIDIARY)		(SUBSIDIARY)		(6007)	
	NO.	TRENCH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
1	1	50	2	50	1	50								
2	1	50					1	50	2	50				
3									1	25	2	25	2	25
4									1	20	2	20	2	20
5									1	65	1	65	2	65
6									1	30	1	30	1	30
7									1	15	1	15	1	15
8									1	75			1	75
9											1	15		
10											1	15		
11											2	50		
12											2	95		
POLE A									2	40	4	30	3	30
POLE B													1	20
POLE C									1	20			1	20
POLE D														
TOTAL		100		100		50		50		430		640		470

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FM 2920 AT
TISD DRIVEWAY

PROPOSED LAYOUT

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
			7
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
			FM 2920

K:\02136\02136-0015-03 FM 2920 at TISD Driveway Traffic Signalization\2 Design Phase\CAD\Sheets\08 Pavement Markings.dgn 3/8/2024 3:02:43 PM

EXISTING SIGNS

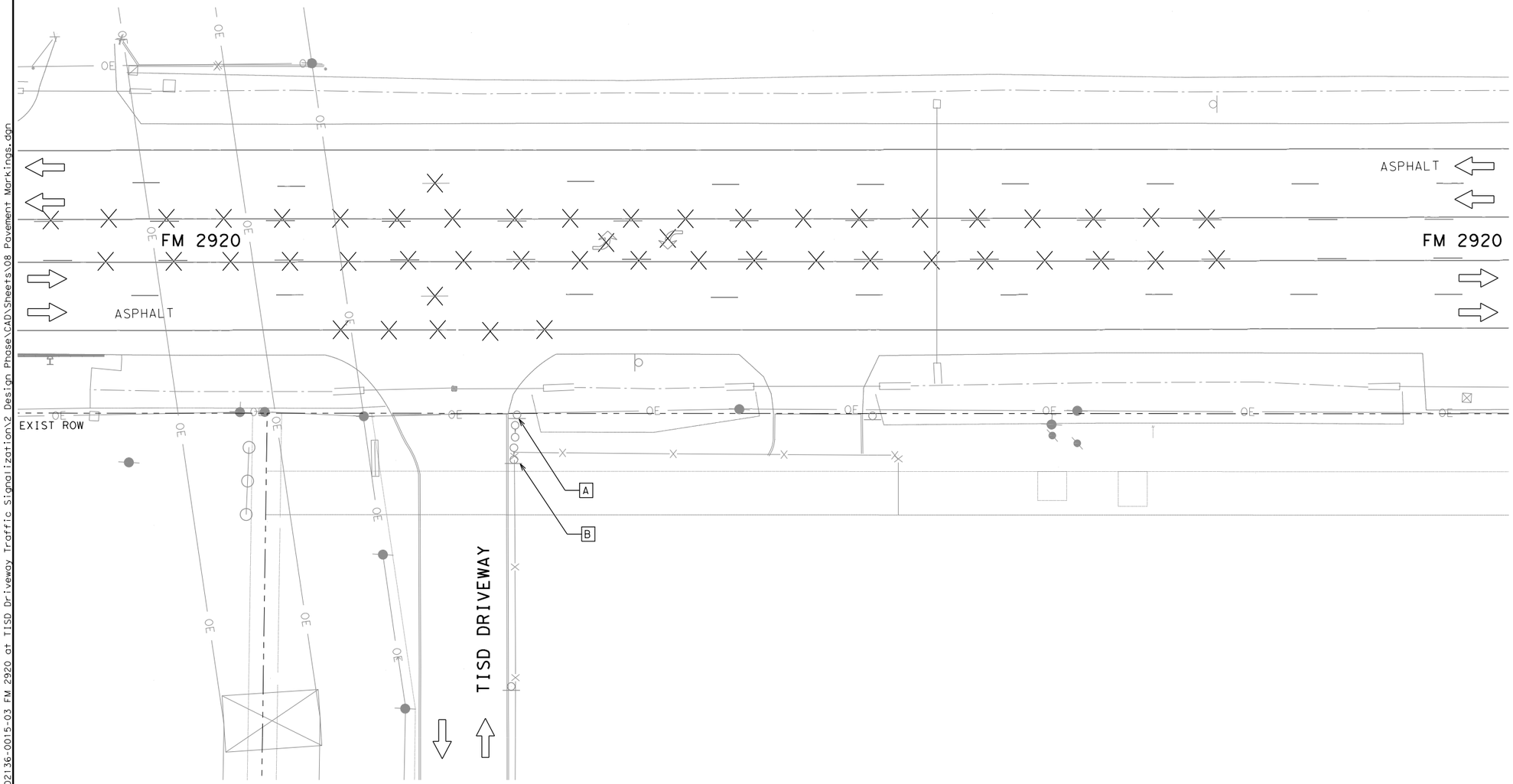
A
TO BE REMOVED

B
TO BE REMOVED
(SIGN ONLY)

N

LEGEND

- EXIST. PAVEMENT MARKING
- EXIST PAVEMENT MARKING (TO BE REMOVED)
- EXISTING SIGN/POLE



SCALE: 1" = 40'
0 20 40

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3/8/2024

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FM 2920 AT TISD DRIVEWAY

SIGNING AND PAVEMENT MARKINGS REMOVAL LAYOUT

FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
			8
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
			FM 2920

PROPOSED PAVEMENT MARKINGS

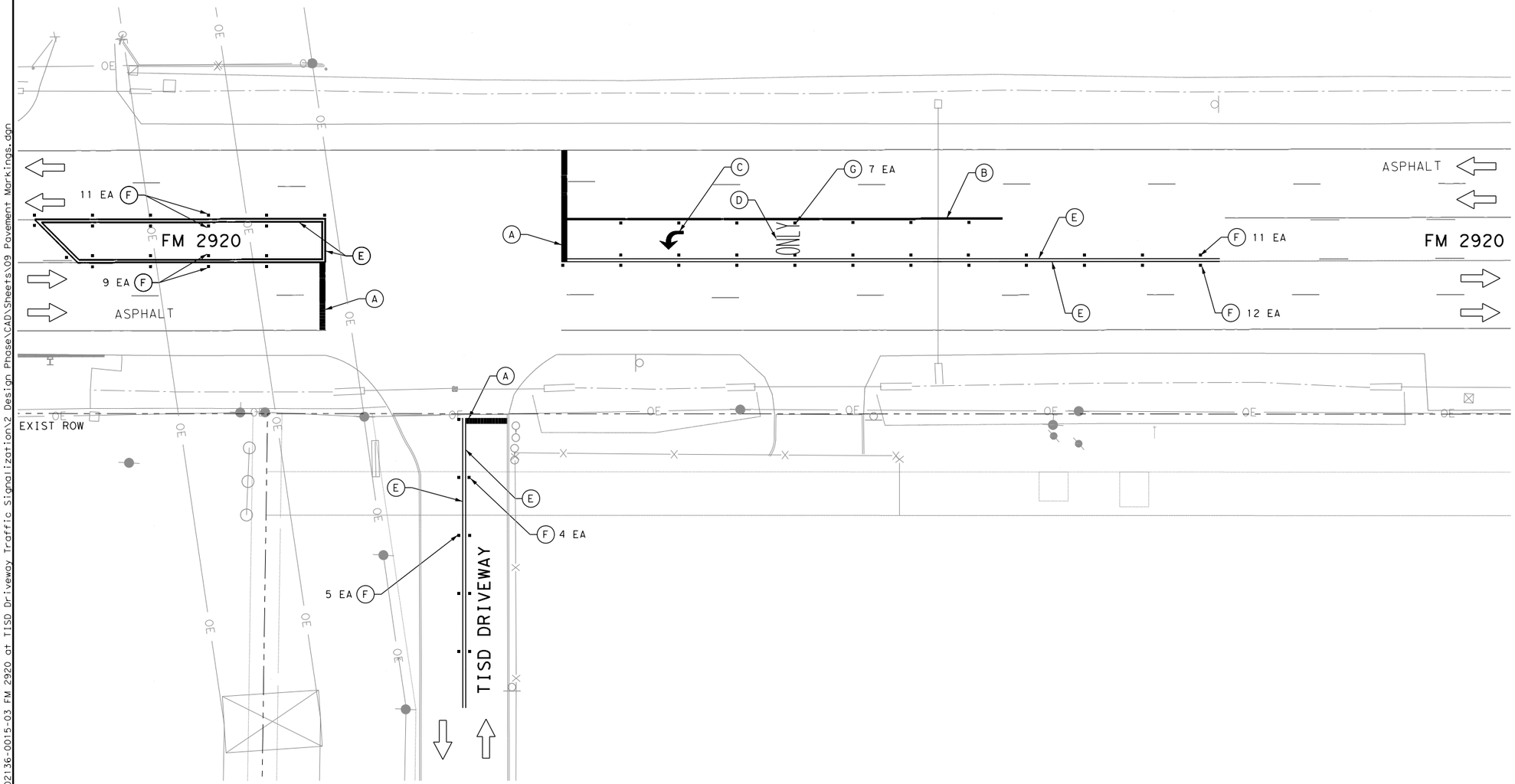
- (A) REFL PAV MRK TY I(W) 24" (SLD)
- (B) REFL PAV MRK TY I(W) 8" (SLD)
- (C) REFL PAV MRK TY I(W) (ARROW)
- (D) REFL PAV MRK TY I(W) (WORD)
- (E) RE PM W/RET REQ TY I(Y) 6" (SLD)
- (F) REFL PAV MRK TY II-A-A
- (G) REFL PAV MRK TY I-C

N

LEGEND

EXIST. PAVEMENT MARKING

PROP. PAVEMENT MARKING



SCALE: 1" = 40'

0 20 40

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TYLER H. COWSER
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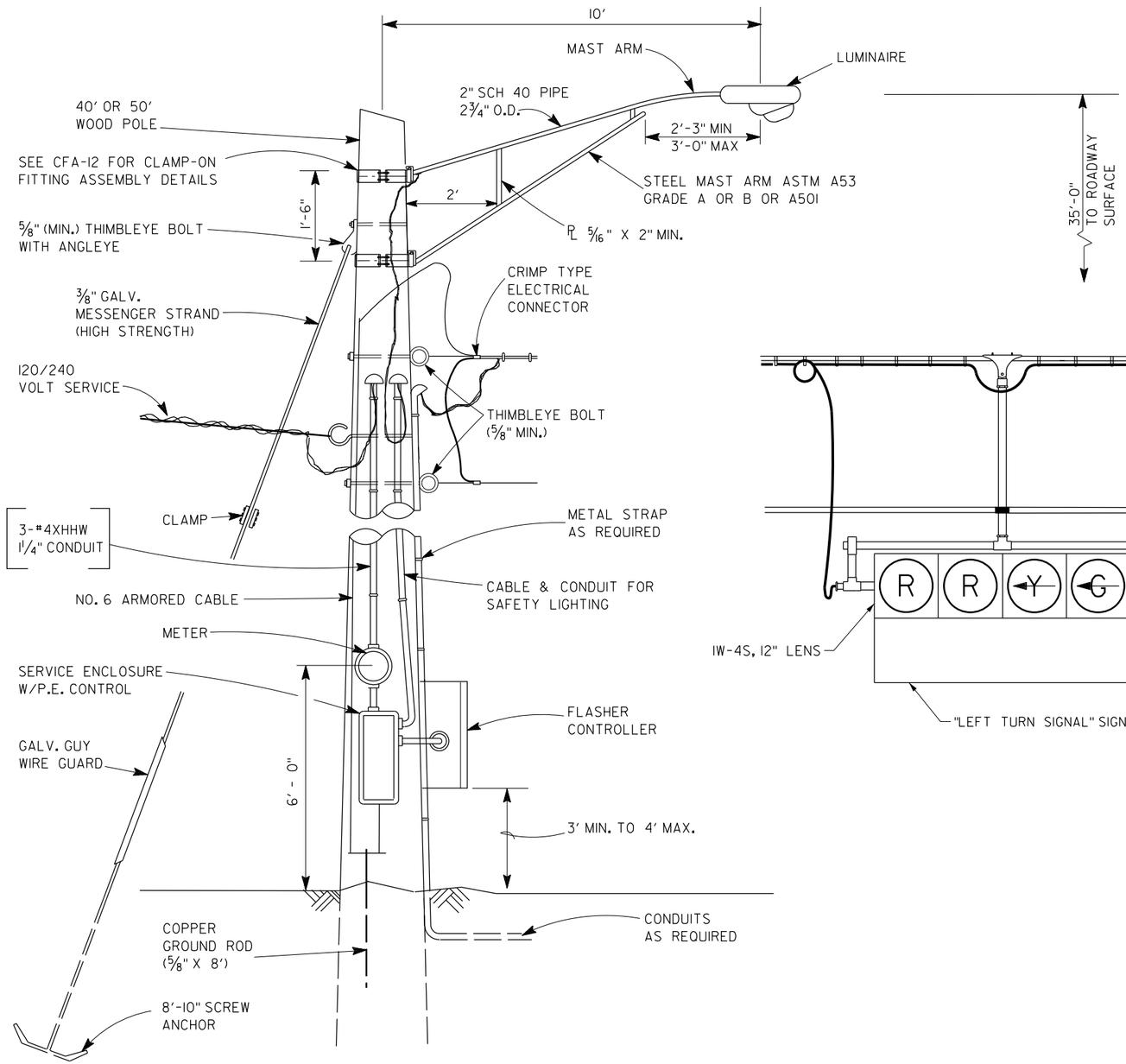
FM 2920 AT TISD DRIVEWAY

PROPOSED SIGNING AND PAVEMENT MARKINGS LAYOUT

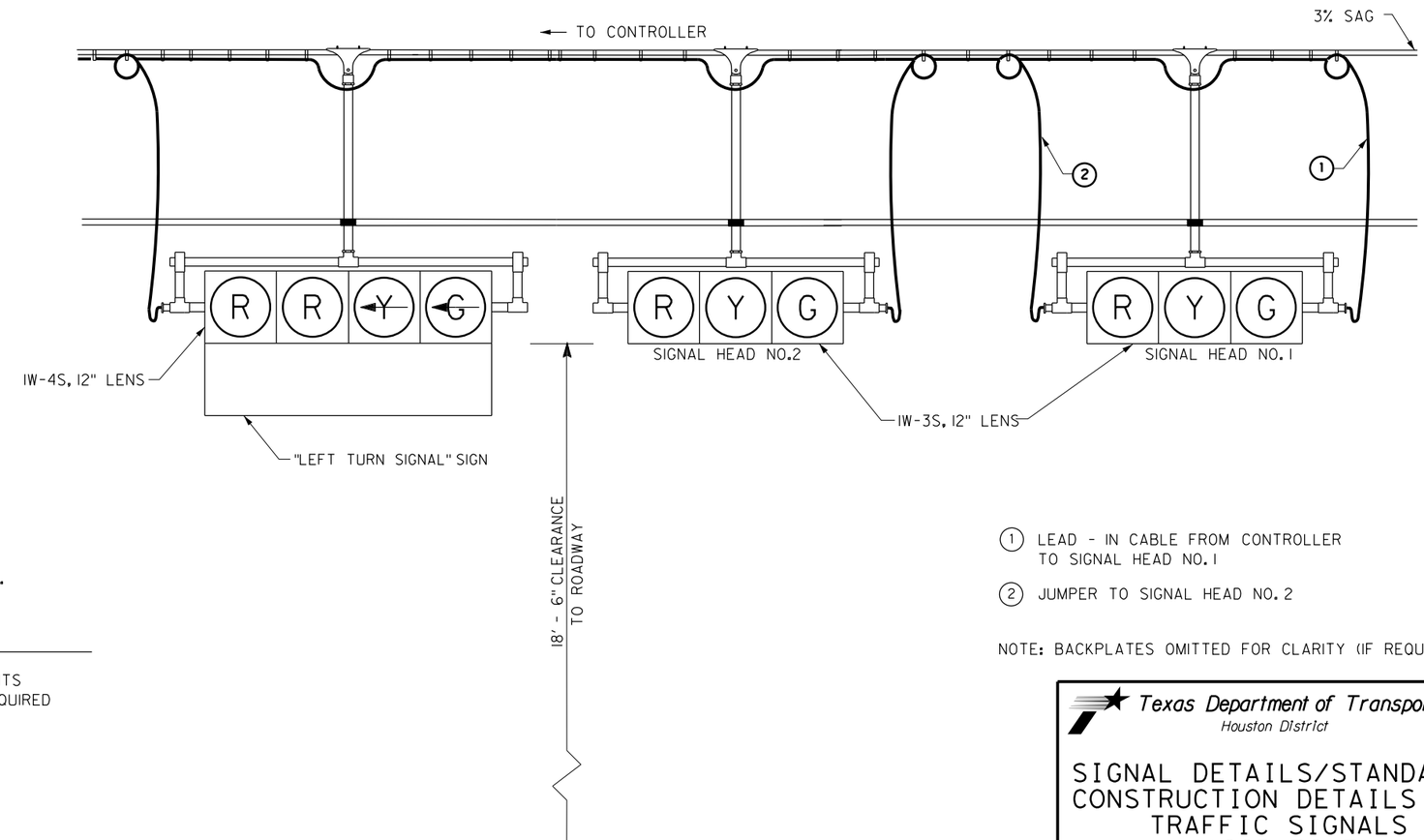
FHWA TEXAS DIVISION	FEDERAL AID PROJECT		SHEET NO.
			9
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
			FM 2920



NOTE: THE CONTRACTOR SHALL COIL ON THE SPAN WIRE A SUFFICIENT LENGTH OF SIGNAL CABLE FOR ADJUSTING SIGNAL HEADS DURING THE VARIOUS PHASES OF CONSTRUCTION.

NOTES:

1. WRAP SIGNAL HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF INSTALLATION UNTIL PLACING INTO OPERATION.
2. INSTALL GROUNDING BUSHINGS ON THE ENDS OF UNDERGROUND RIGID METAL CONDUITS. GROUND AND BOND CONDUITS, POLES, AND CONTROLLERS TO THE NEAREST GROUND ROD USING SOFT BARE NO. 6 COPPER WIRE.
3. FURNISH HIGH STRENGTH GALVANIZED SPAN WIRE.
4. FURNISH MINIMUM 2 SIGNAL HEADS PER APPROACH.
5. FURNISH LEFT TURN SIGNAL HEAD WHEN REQUIRED.
6. FOR TEMPORARY SIGNAL INSTALLATION, INSTALL A SEPARATE POWER SOURCE, IF REQUIRED.
7. FOR TEMPORARY SIGNAL INSTALLATION, INSTALL LUMINAIRES ON WOOD SIGNAL POLES, IF REQUIRED. CONSTRUCT STEEL UPSWEEP MAST ARM FOR WOOD POLE MOUNTING OF 2 IN. PIPE WITH SLIPFITTER MOUNTING OF THE LUMINAIRE.
8. FOR TEMPORARY SIGNAL INSTALLATION, COIL A SUFFICIENT LENGTH OF SIGNAL CABLE ON THE SPAN WIRE FOR ADJUSTING SIGNAL HEADS DURING THE VARIOUS PHASES OF CONSTRUCTION.



① LEAD - IN CABLE FROM CONTROLLER TO SIGNAL HEAD NO. 1

② JUMPER TO SIGNAL HEAD NO. 2

NOTE: BACKPLATES OMITTED FOR CLARITY (IF REQUIRED)

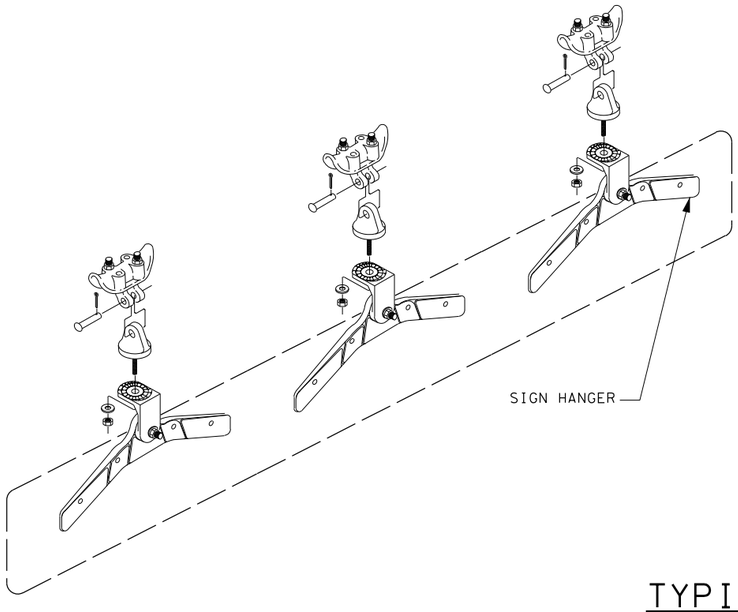
Texas Department of Transportation
Houston District

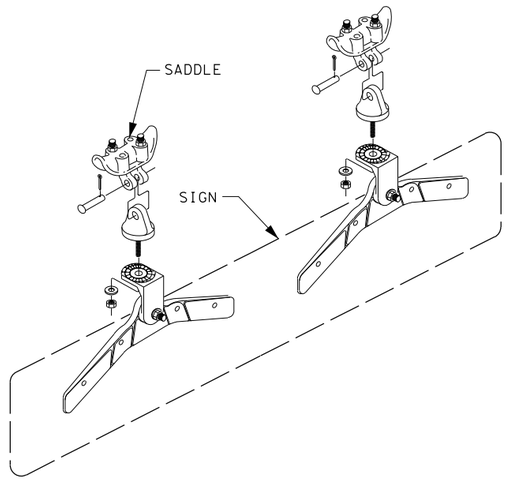
SIGNAL DETAILS/STANDARDS CONSTRUCTION DETAILS FOR TRAFFIC SIGNALS (WOOD POLE)

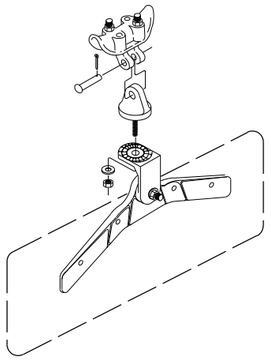
CD/TS/WP

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2008	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 03-07 05-08 8-12	HOU	6		10
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS				FM 2920

STD-M10

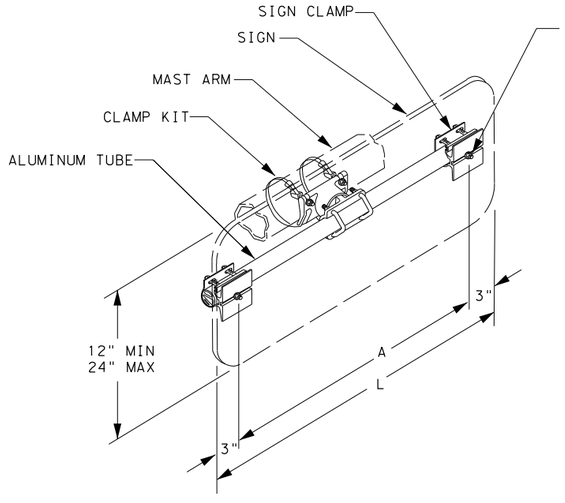


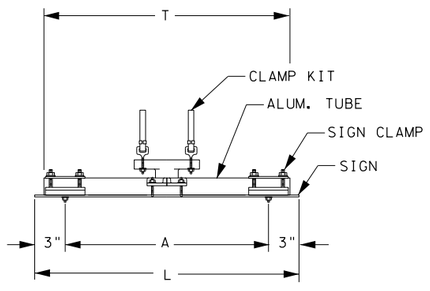


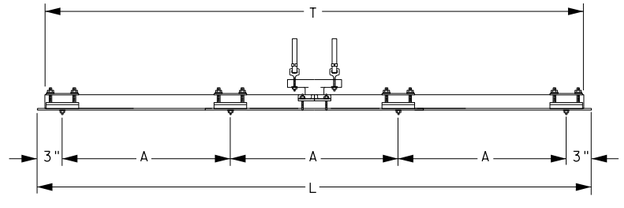


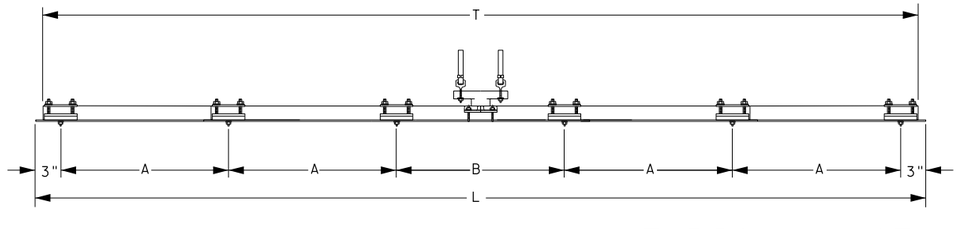
1. USE PELCO PARTS OR APPROVED EQUAL.
2. FURNISH HARDWARE FOR A COMPLETE INSTALLATION.
3. ATTACH THE 90 LB SPAN WIRE CLAMPS (SADDLES) TO TETHERS (SWAY CABLES).
4. FURNISH 1 ADJUSTABLE FREE SWINGING SIGN HANGER PER STREET NAME SIGN SMALLER THAN 3 FT. - 0 IN. SIGNS 3 FT - 0 IN. TO 6 FT.- 0 IN. REQUIRE 2 HANGERS. SIGNS LARGER THAN 6 FT. - 0 IN. REQUIRE 3 HANGERS.

TYPICAL SPAN WIRE SIGN HANGER DETAILS









SIGNS (1'-6" to 3'-0" Long)

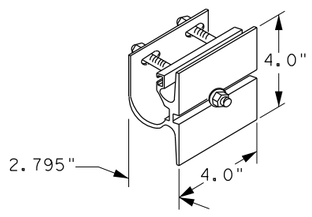
SIGN LENGTH (L)	TUBE LENGTH (T)	A
1'-6"	16"	12"
2'-0"	22"	18"
2'-6"	28"	24"
3'-0"	34"	30"

SIGNS (3'-6" to 8'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A
3'-6"	40"	12"
4'-0"	46"	14"
4'-6"	52"	16"
5'-0"	58"	18"
5'-6"	64"	20"
6'-0"	70"	22"
6'-6"	76"	24"
7'-0"	82"	26"
7'-6"	88"	28"
8'-0"	94"	30"

SIGNS (8'-6" to 10'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A	B
8'-6"	100"	19"	20"
9'-0"	106"	20"	22"
9'-6"	112"	21"	24"
10'-0"	118"	22"	26"



SIGN CLAMP DETAIL

GUSSETED TUBE CROSS SECTION

TYPICAL MAST ARM SIGN MOUNT DETAILS

Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS OVERHEAD STREET NAME SIGN MOUNTING DETAILS

OSNS/MD

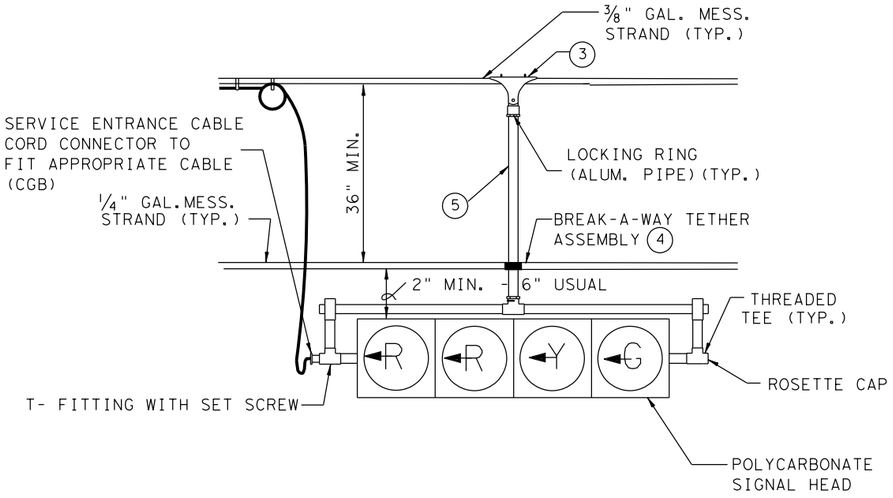
DN:	CK:	DW:	CK:

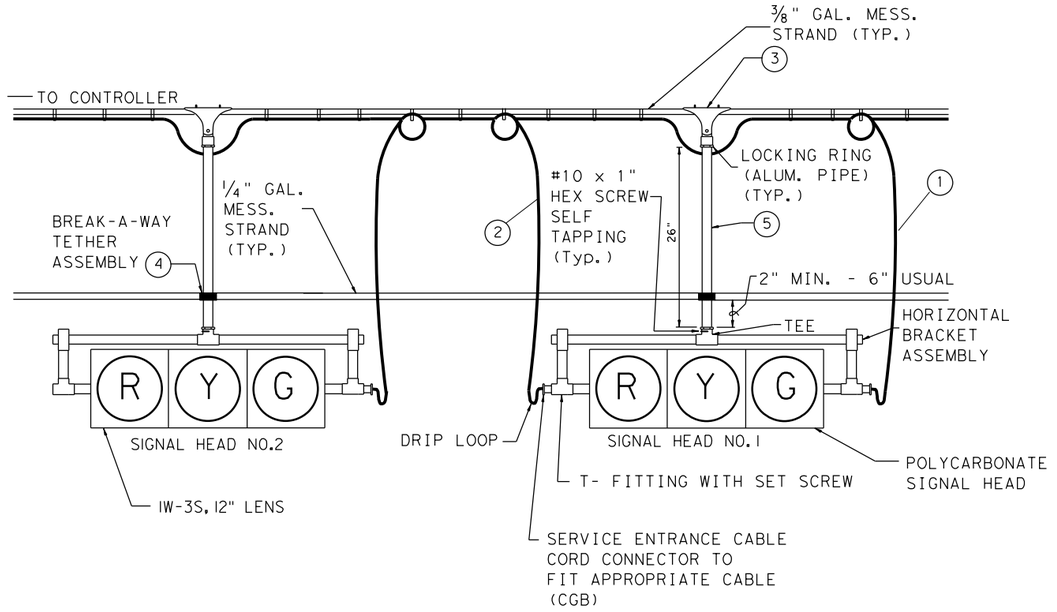
DIST	FED REG	PROJECT NO.	SHEET
HOU	6		11

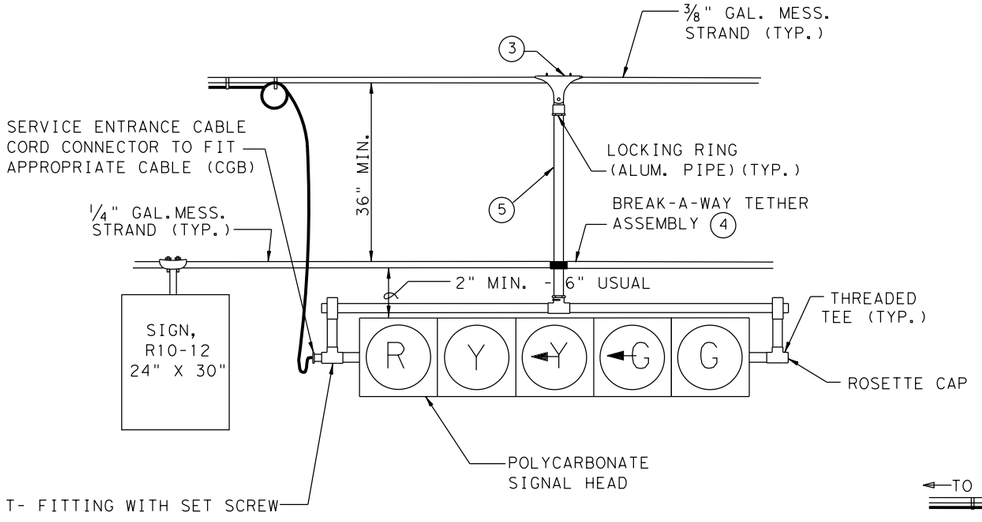
COUNTY	CONTROL	SECT	JOB	HIGHWAY
HARRIS				FM 2920

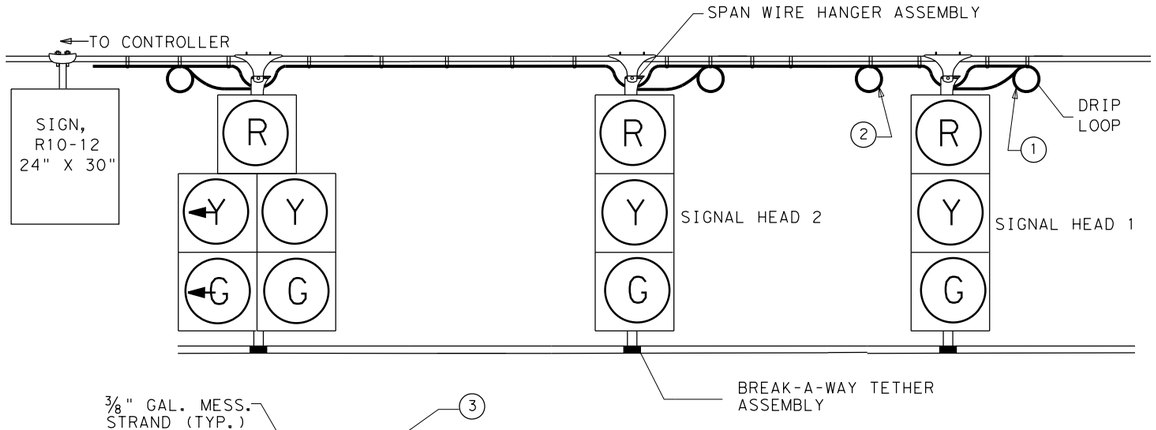
FILE: Overhead-Sign-mount-det-sp04.dgn

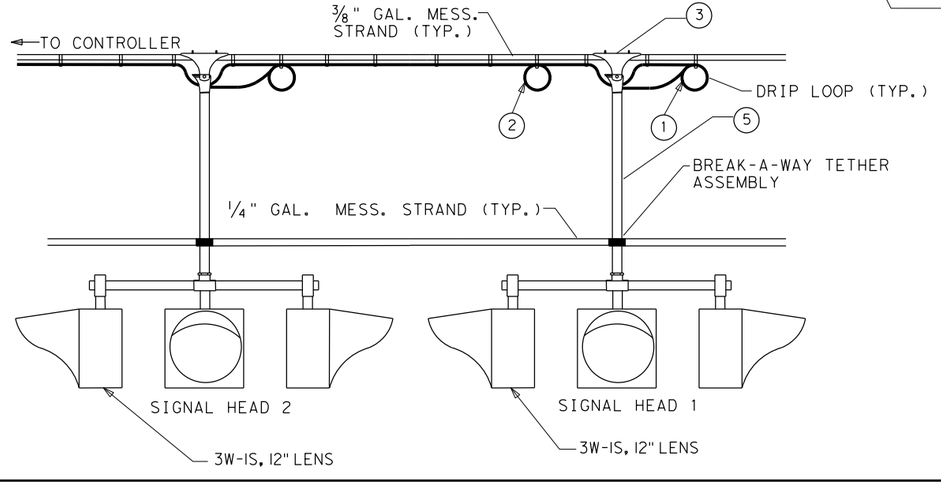
STD-M12











(1) LEAD - IN CABLE FROM CONTROLLER TO SIGNAL HEAD NO. 1

(2) JUMPER TO SIGNAL HEAD NO. 2

(3) CAST ALUMINUM SPAN WIRE CLAMP AND FEMALE CLEVIS ADAPTER (ALUMINUM PIPE) OR CAST ALUMINUM SPAN WIRE CLAMP TO ACCOMMODATE ADJUSTABLE HANGER BRACKET. SECURE CLEVIS PIN WITH A WASHER (BOTH ENDS) AND HUMP BACK COTTER PIN. DRILL CLEVIS PIN OPENINGS AND FIT WITH A SPLIT BUSHING. CLEVIS PIN, WASHER, COTTER PIN, AND SPLIT BUSHING TO BE STAINLESS STEEL.

(4) INSTALL TETHER CABLE ON BACK SIDE OF PIPE OR ADJUSTABLE BRACKET.

(5) 1 1/2" ALUM. PIPE (TYP.) OR ALUM. ADJUSTABLE HANGER BRACKET W/BREAKWAY TETHER ASSEMBLY

NOTE: BACKPLATES OMITTED FOR CLARITY

Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS
SIGNAL HEAD SPAN WIRE MOUNT DETAILS

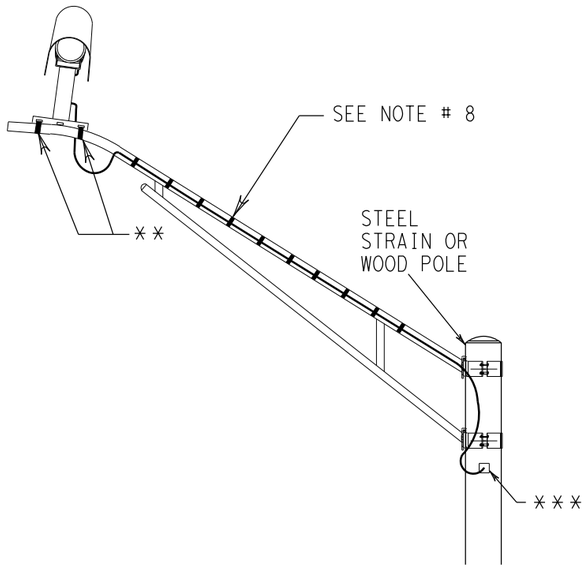
SHS/WMD

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2004	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 12-04 08-12 11-16	HOU	6		12
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS				FM 2920

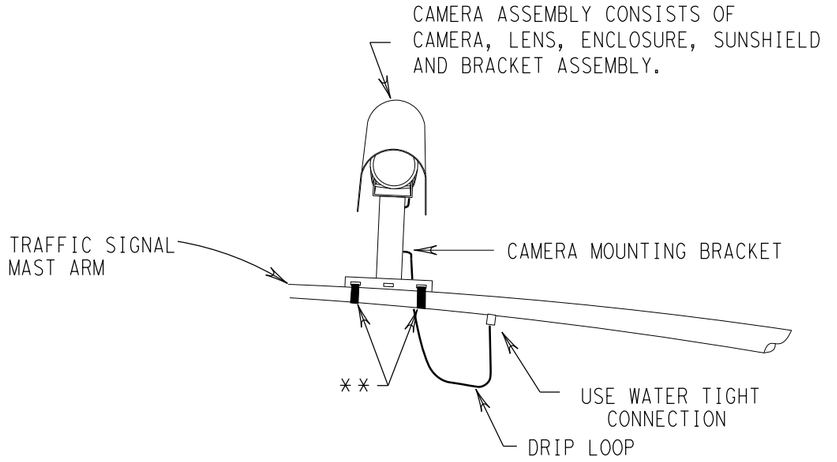
STD-M11

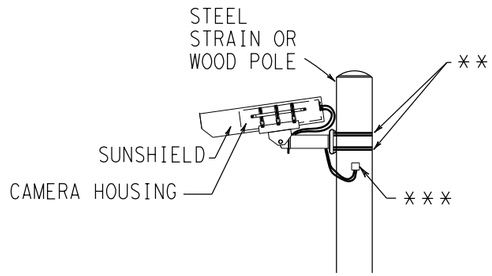
NOTES FOR VIDEO DETECTION:

1. INSTALL VIDEO DETECTION PROCESSOR UNIT INSIDE CONTROLLER CABINET.
2. INSTALL VIDEO DETECTION CAMERA & BRACKET AS DETAILED OR AS DIRECTED BY THE VIDEO DETECTION SUPPLIER.
3. MOUNT CAMERAS AS FAR OVER THE ROADWAY AS POSSIBLE.
4. USE ¾ IN. STAINLESS STEEL BANDING MATERIAL TO INSTALL CAMERA MOUNTS.
5. AIM CAMERA SO THAT HORIZON IS NOT VISIBLE IN THE FIELD OF VIEW.
6. INSTALL CAMERA ENCLOSURE ASSEMBLY SO THAT IT CAN ROTATE AFTER INSTALLATION TO PROVIDE PROPER ALIGNMENT.
7. PROVIDE WATER TIGHT CABLE ENTRY AND EXIT POINTS IN THE MAST ARM AND/OR POLES.
8. FOR VIVDS COAX AND POWER CABLES ATTACHED TO LUMINAIRE ARM, PROVIDE A METAL CABLE STRAP (ALUMINUM OR STAINLESS STEEL), 3/4-IN MINIMUM WIDTH AND TWO WRAPS AT 8 IN. MAXIMUM SPACING.

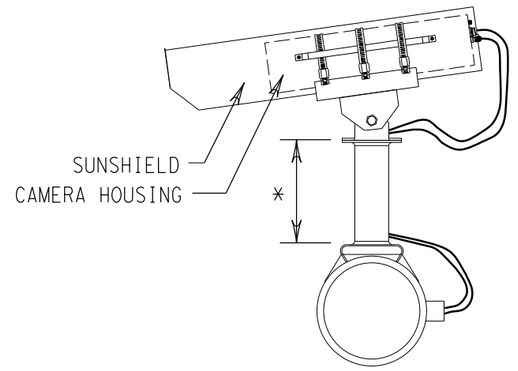


LUMINAIRE ARM MOUNT



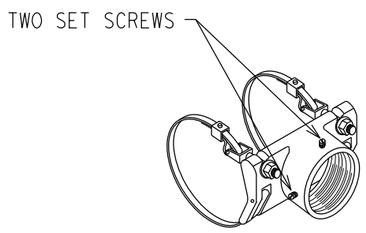


POLE MOUNT



SIDE VIEW

*	4 FT. PIPE EXTENSION WHEN MOUNTED ON TRAFFIC SIGNAL MAST ARM.
**	¾ IN. (MIN) STAINLESS STEEL BANDING 2 PLACES MIN.
***	ENTRY INTO STEEL POLE OR CONDUIT WEATHERHEAD ON WOOD POLE



BAND MOUNT BRACKET DETAIL

Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS VIVDS CAMERA MOUNTING DETAILS

VC/MD

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© TxDOT 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		13
02/2004 03/16/2006 09/2010	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS				FM 2920

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.

11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.

12. The Engineer has the final decision on the location of all traffic control devices.

13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY NOTES:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.

2. Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.

2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

SHEET 1 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

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REVISIONS 4-03 7-13				FM 2920
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5-10 5-21	HOU	HARRIS		14

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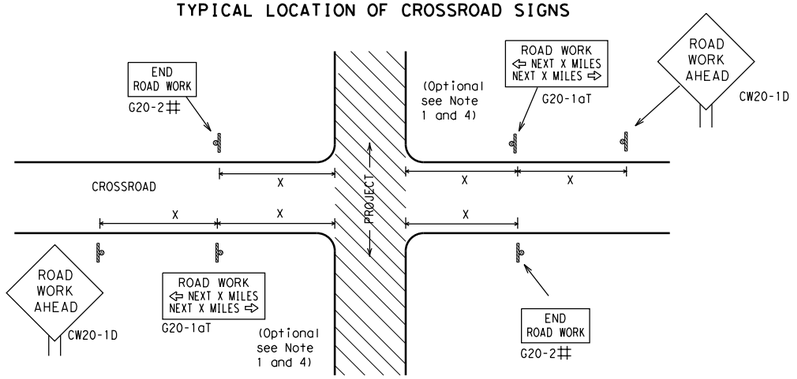
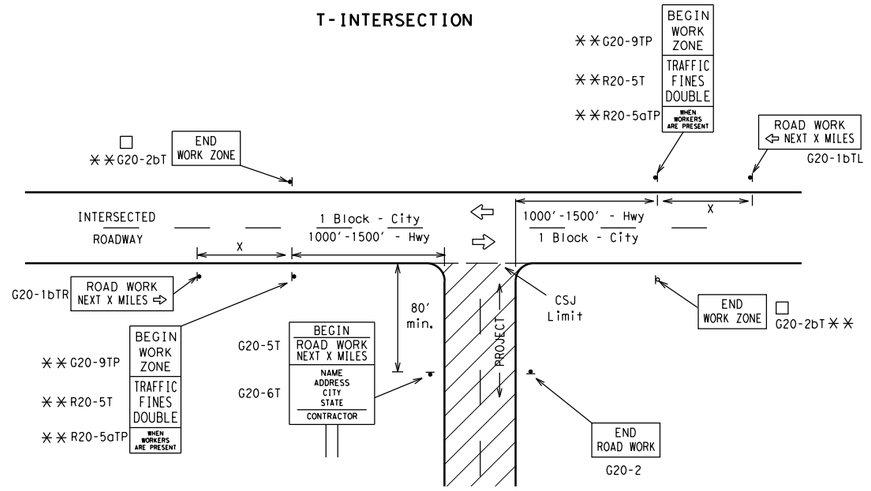
TYPICAL LOCATION OF CROSSROAD SIGNS



May be mounted on back of "ROAD WORK AHEAD"(CW20-1D) sign with approval of Engineer. (See note 2 below)

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume as per TMUTCD Part 5. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

1. The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
2. If construction closes the road at a T-intersection, the Contractor shall place the "CONTRACTOR NAME"(G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow(G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR)" signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING[1,5,6]

SIZE

Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING

Posted Speed	Sign △ Spacing "X"
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
✳	✳[3]

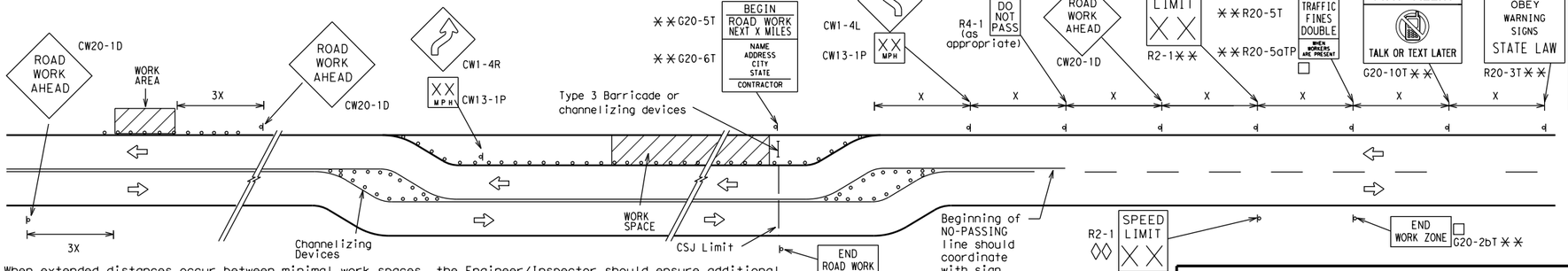
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

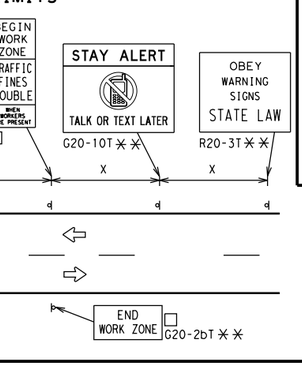
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer as per TMUTCD Part 5. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

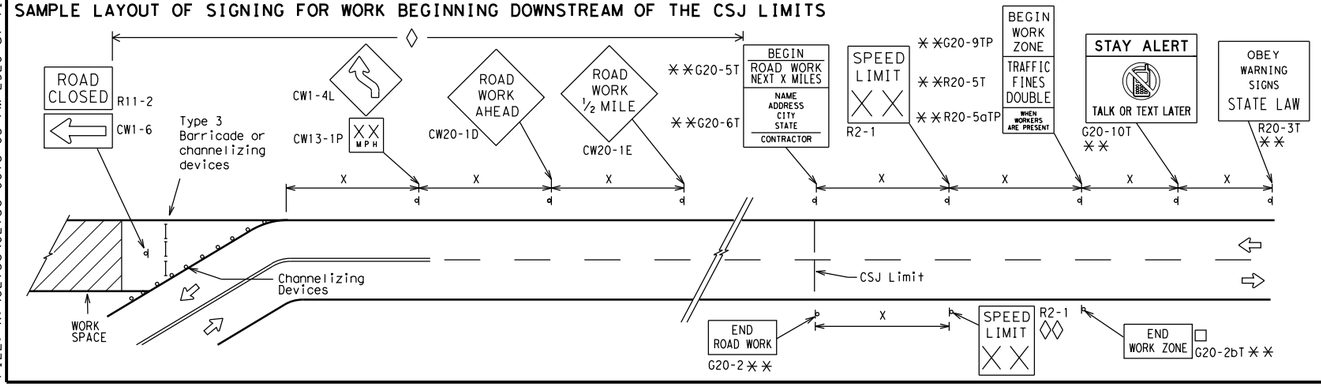


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

☐ The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

✳✳ CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.

◊ Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

◊◊ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

⟼	Type 3 Barricade
○ ○ ○	Channelizing Devices
▬	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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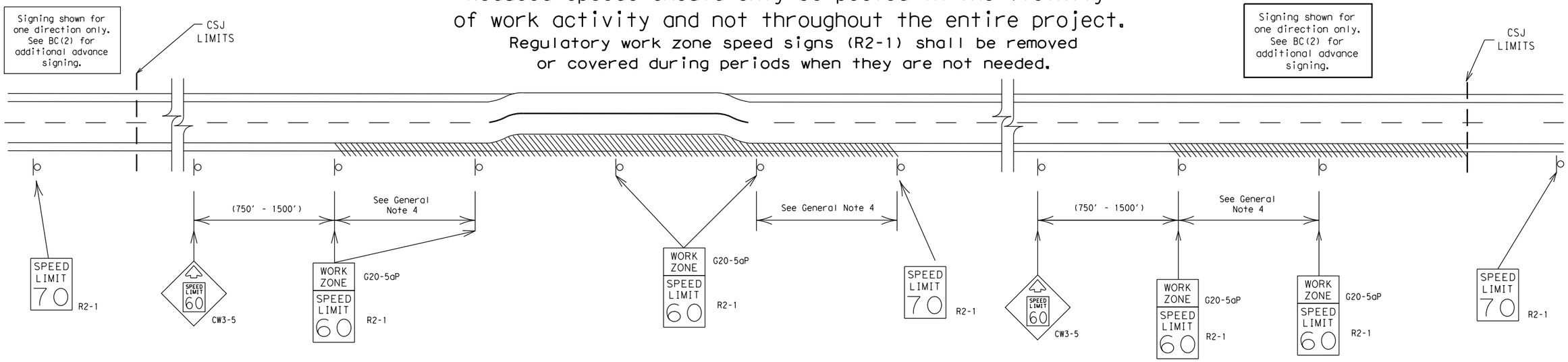
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the traveled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered.
(See Removing or Covering on BC(4)).

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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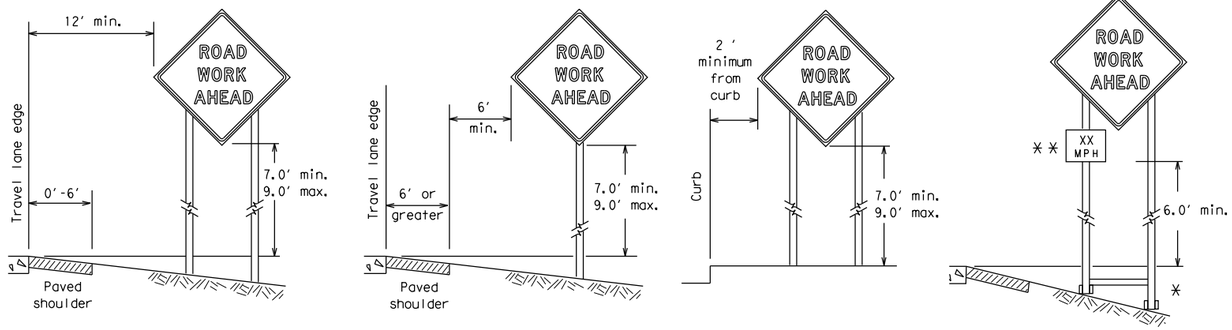
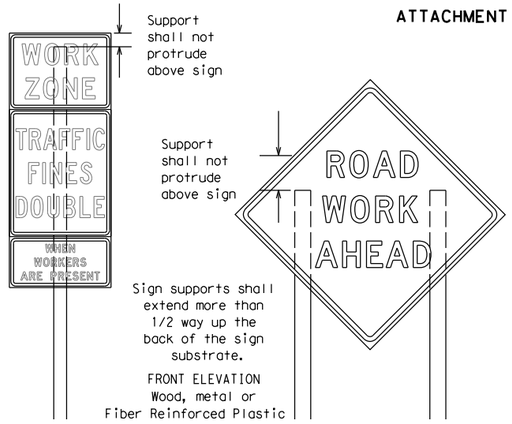
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

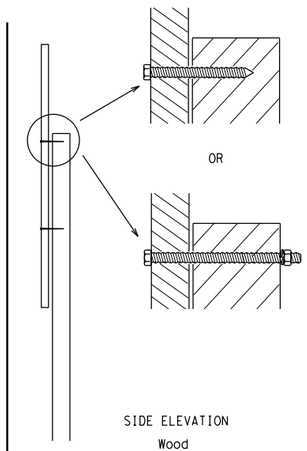


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS





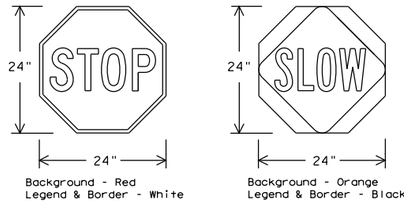
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
2. STOP/SLOW paddles shall be retroreflectorized when used at night.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC standard sheets, TLRS standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets.The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height,the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
   a. Long-term stationary - work that occupies a location more than 3 days.
   b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
   c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
   d. Short, duration - work that occupies a location up to 1 hour.
   e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to draw attention to warning signs. When used, the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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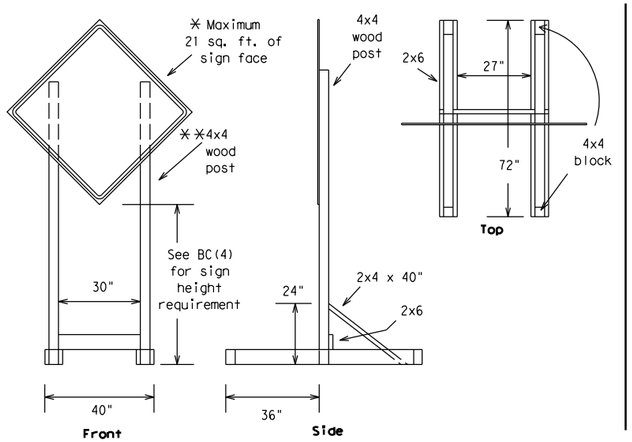
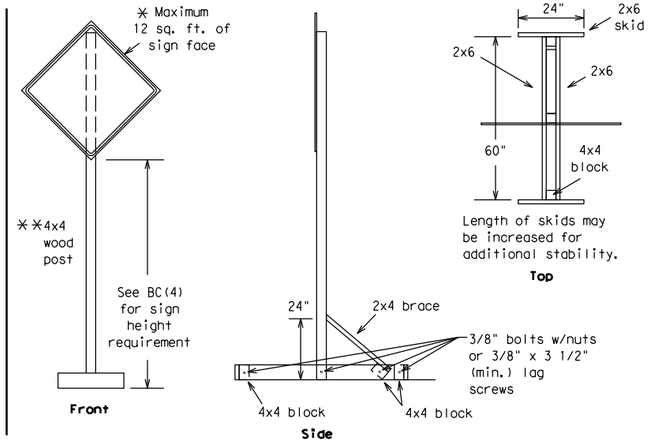
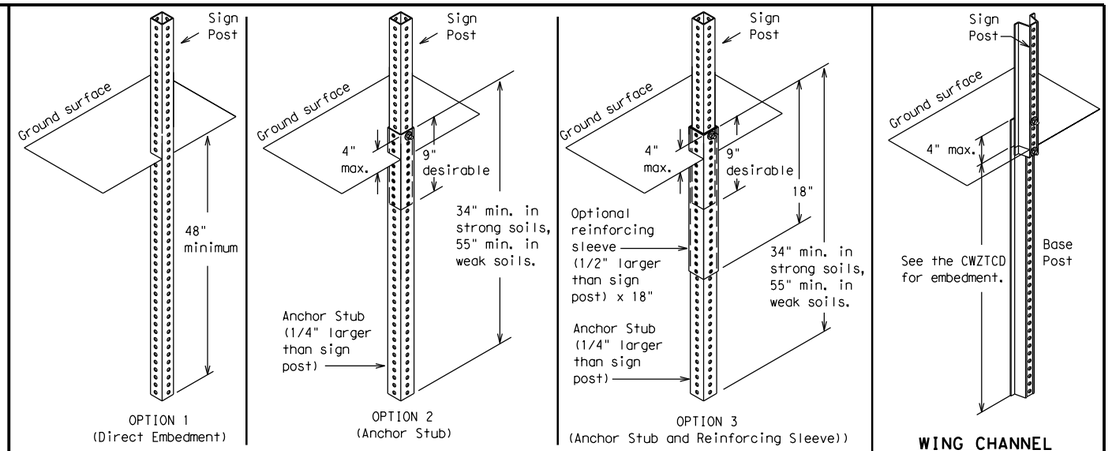




SKID MOUNTED WOOD SIGN SUPPORTS

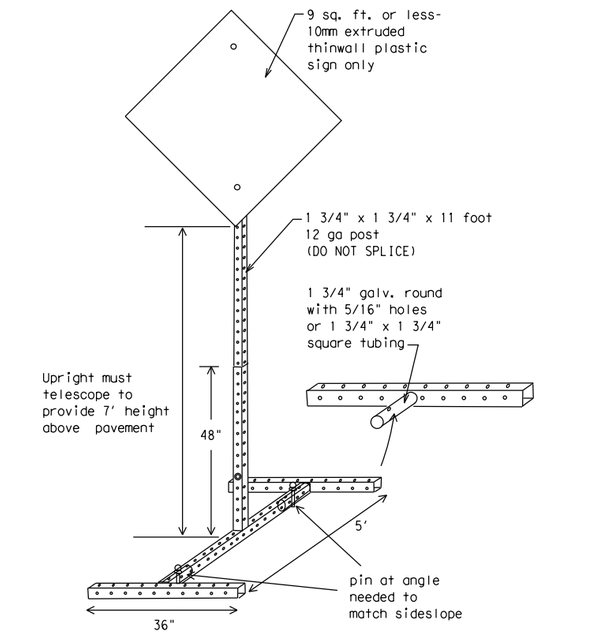
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

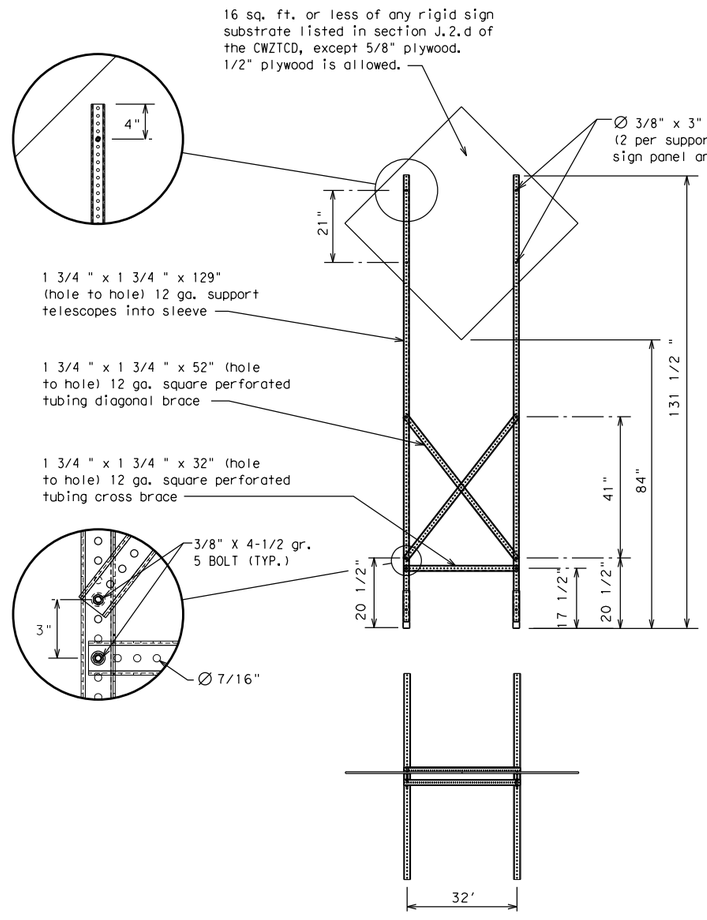


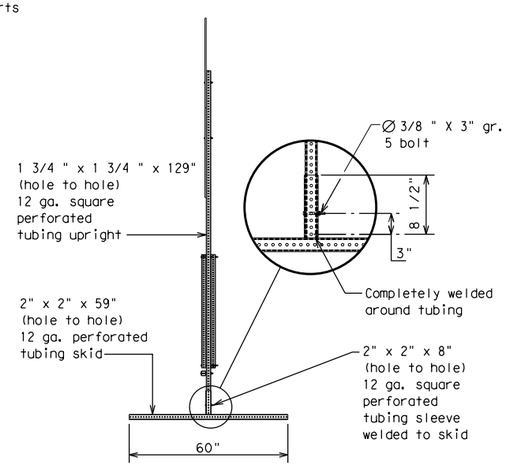
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support.
The maximum sign square footage shall adhere to the manufacturer's recommendation.
Two post installations can be used for larger signs.







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

GENERAL NOTES

1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

* See BC(4) for definition of "Work Duration."

** Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

□ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
3. Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

Roadway designation # IH-number, US-number, SH-number, FM-number

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

- FREEWAY CLOSED X MILE
- FRONTAGE ROAD CLOSED
- ROAD CLOSED AT SH XXX
- SHOULDER CLOSED XXX FT
- ROAD CLSD AT FM XXXX
- RIGHT LN CLOSED XXX FT
- RIGHT X LANES CLOSED
- RIGHT X LANES OPEN
- CENTER LANE CLOSED
- DAYTIME LANE CLOSURES
- NIGHT LANE CLOSURES
- I-XX SOUTH EXIT CLOSED
- VARIOUS LANES CLOSED
- EXIT XXX CLOSED X MILE
- EXIT CLOSED
- RIGHT LN TO BE CLOSED
- MALL DRIVEWAY CLOSED
- X LANES CLOSED TUE - FRI
- XXXXXXXX BLVD CLOSED

Other Condition List

- ROADWORK XXX FT
- ROAD REPAIRS XXXX FT
- FLAGGER XXXX FT
- LANE NARROWS XXXX FT
- RIGHT LN NARROWS XXXX FT
- TWO-WAY TRAFFIC XX MILE
- MERGING TRAFFIC XXXX FT
- CONST TRAFFIC XXX FT
- LOOSE GRAVEL XXXX FT
- UNEVEN LANES XXXX FT
- DETOUR X MILE
- ROUGH ROAD XXXX FT
- ROADWORK PAST SH XXXX
- ROADWORK NEXT FRI-SUN
- BUMP XXXX FT
- US XXX EXIT X MILES
- TRAFFIC SIGNAL XXXX FT
- LANES SHIFT *

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

- MERGE RIGHT
- FORM X LINES RIGHT
- DETOUR NEXT X EXITS
- USE XXXXX RD EXIT
- USE EXIT XXX
- USE EXIT I-XX NORTH
- STAY ON US XXX SOUTH
- USE I-XX E TO I-XX N
- TRUCKS USE US XXX N
- WATCH FOR TRUCKS
- WATCH FOR TRUCKS
- EXPECT DELAYS
- EXPECT DELAYS
- PREPARE TO STOP
- REDUCE SPEED XXX FT
- END SHOULDER USE
- USE OTHER ROUTES
- WATCH FOR WORKERS
- STAY IN LANE *

Location List

- AT FM XXXX
- BEFORE RAILROAD CROSSING
- NEXT X MILES
- PAST US XXX EXIT
- XXXXXXX TO XXXXXXX
- US XXX TO FM XXXX

Warning List

- SPEED LIMIT XX MPH
- MAXIMUM SPEED XX MPH
- MINIMUM SPEED XX MPH
- ADVISORY SPEED XX MPH
- RIGHT LANE EXIT
- USE CAUTION
- DRIVE SAFELY
- DRIVE WITH CARE

** Advance Notice List

- TUE-FRI XX AM- X PM
- APR XX-XX X PM-X AM
- BEGINS MONDAY
- BEGINS MAY XX
- MAY X-X XX PM - XX AM
- NEXT FRI-SUN
- XX AM TO XX PM
- NEXT TUE AUG XX
- TONIGHT XX PM- XX AM

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
4. Highway names and numbers replaced as appropriate.
5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
6. AHEAD may be used instead of distances if necessary.
7. FT and MI, MILE and MILES interchanged as appropriate.
8. AT, BEFORE and PAST interchanged as needed.
9. Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

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REVISIONS				FM 2920
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	HARRIS		19

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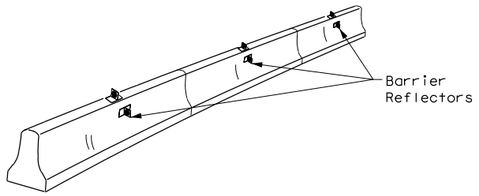
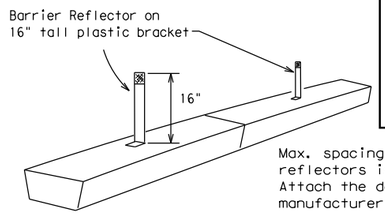
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



CONCRETE TRAFFIC BARRIER (CTB)

3. Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
4. Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional)while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
7. Maximum spacing of Barrier Reflectors is forty (40) feet.
8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
11. Single slope barriers shall be delineated as shown on the above detail.

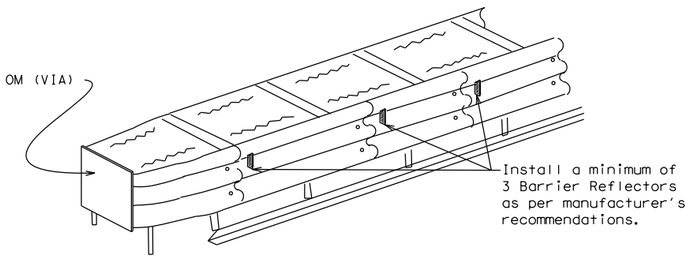


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

LOW PROFILE CONCRETE BARRIER (LPCB)

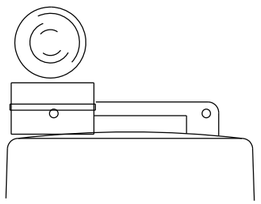


DELINEATION OF END TREATMENTS

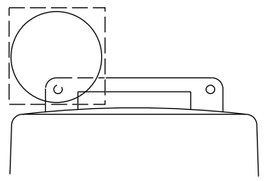
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the apppropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square.Must have a yellow reflective surface area of at least 30 square inches

WARNING LIGHTS

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
7. When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

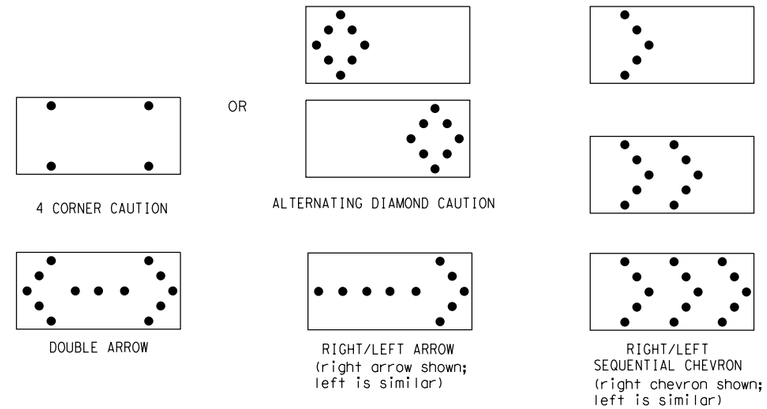
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
4. Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
6. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
7. The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

1. A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
2. The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
3. The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
5. Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
6. The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
7. When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
8. The warning reflector should be mounted on the side of the handle nearest approaching traffic.
9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

1. The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
2. Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
3. The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
4. The Flashing Arrow Board should be able to display the following symbols:



5. The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
6. The straight line caution display is NOT ALLOWED.
7. The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
8. Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
9. The sequential arrow display is NOT ALLOWED.
10. The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
13. A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

BC(7)-21

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GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections, one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
6. The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

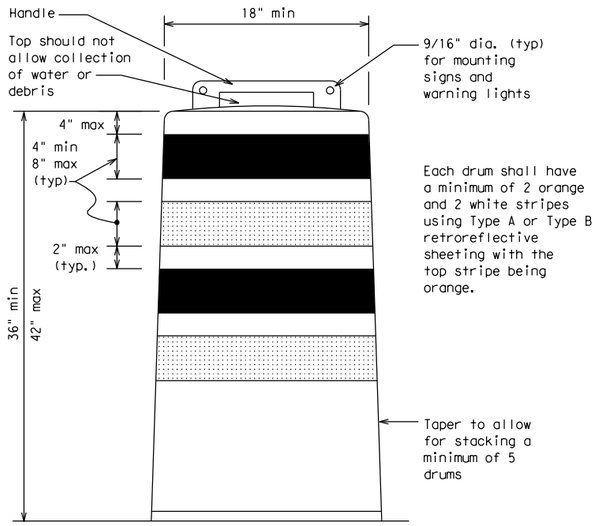
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
5. The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
7. Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

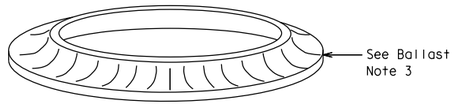
RETROREFLECTIVE SHEETING

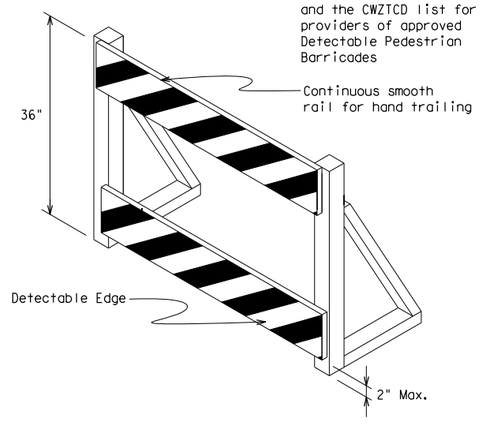
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
2. Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
3. Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
4. The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
5. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
6. Ballast shall not be placed on top of drums.
7. Adhesives may be used to secure base of drums to pavement.

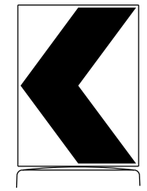




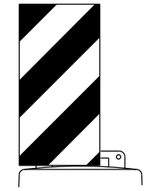


DETECTABLE PEDESTRIAN BARRICADES

1. When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
3. Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines (ADAAG)" and should not be used as a control for pedestrian movements.
5. Warning lights shall not be attached to detectable pedestrian barricades.
6. Detectable pedestrian barricades should use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24"
Vertical Panel
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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1. Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
2. Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
3. Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations, they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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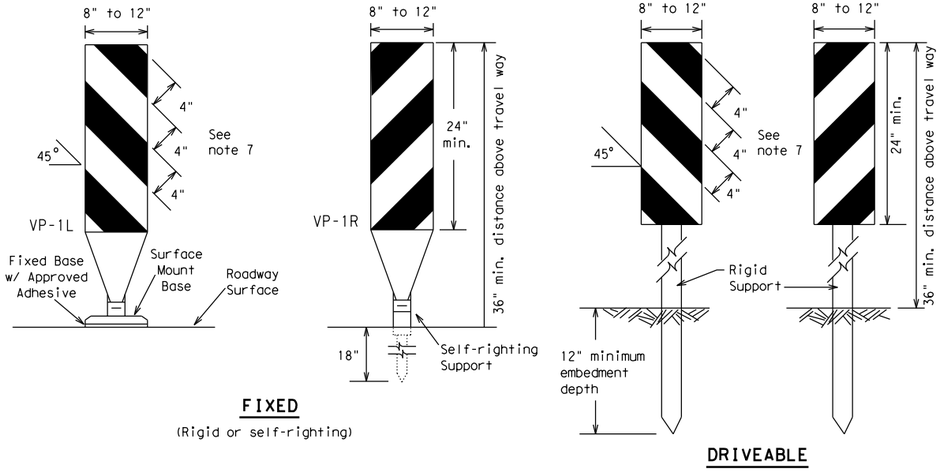
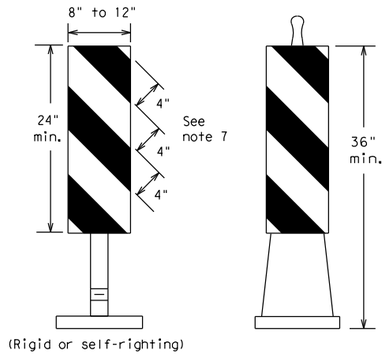


FIXED
(Rigid or self-righting)

DRIVEABLE

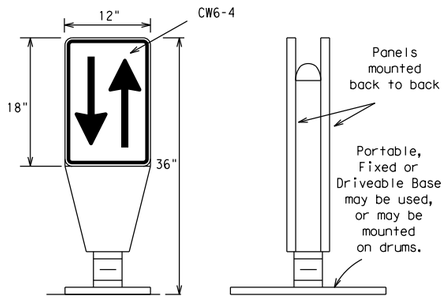


(Rigid or self-righting)

PORTABLE

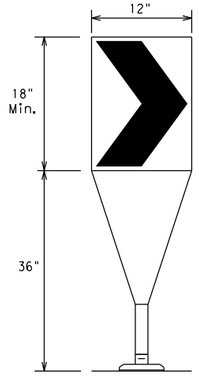
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



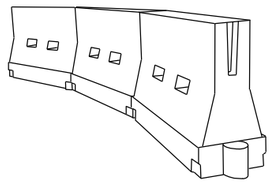
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways, self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10). Place reflective sheeting near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

Posted Speed	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

** Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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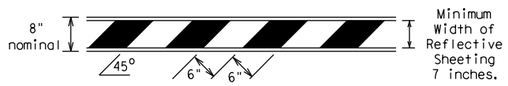
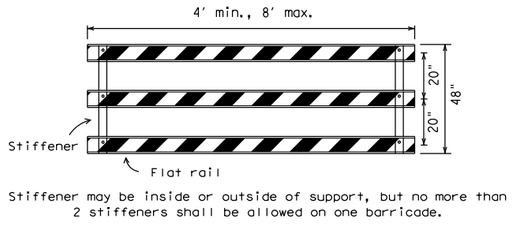
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road, striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



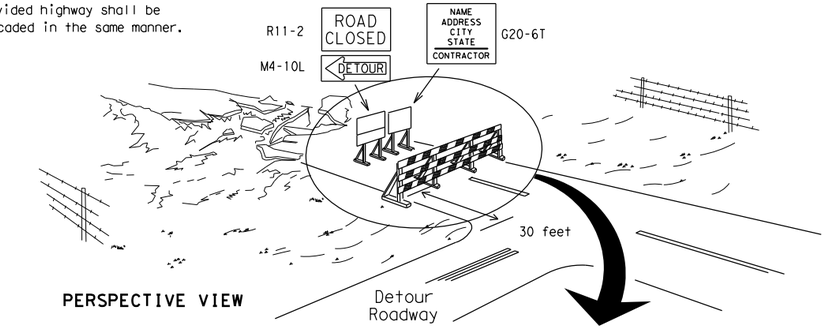
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

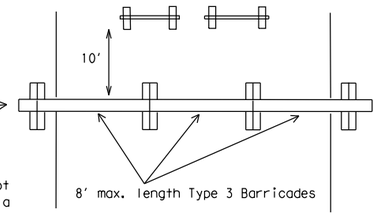
TYPICAL PANEL DETAIL
FOR SKID OR POST TYPE BARRICADES

Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

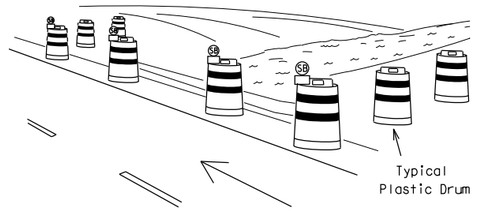
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

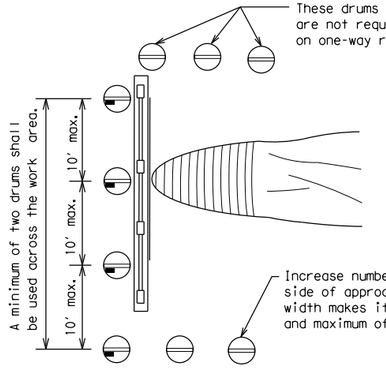
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

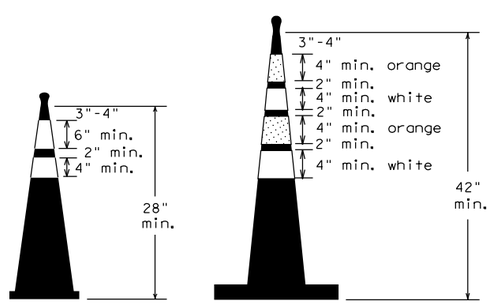
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



PLAN VIEW

LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

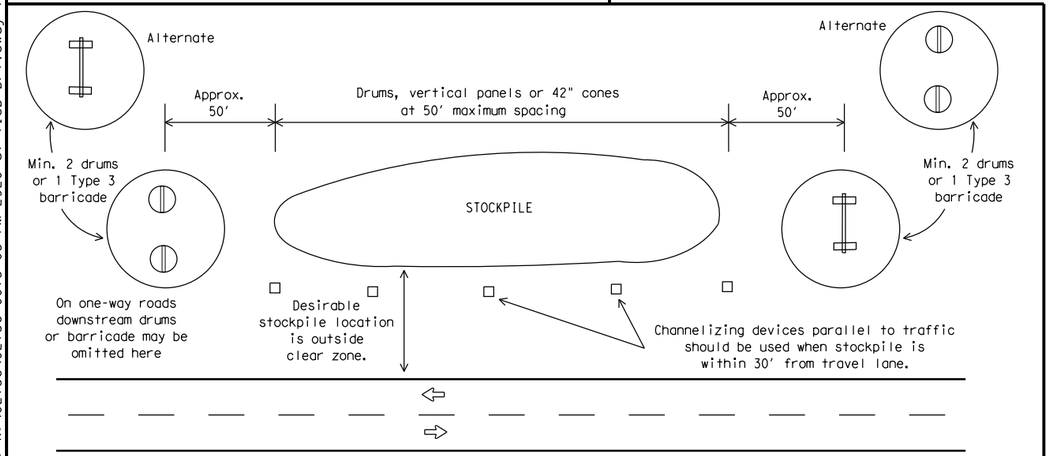
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.

42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A or Type B.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				FM 2920
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WORK ZONE PAVEMENT MARKINGS

GENERAL

1. The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
7. All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

1. Raised pavement markers are to be placed according to the patterns on BC(12).
2. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
2. Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

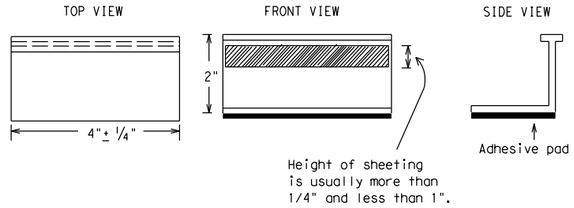
MAINTAINING WORK ZONE PAVEMENT MARKINGS

1. The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
2. Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
3. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
4. Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

1. Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
2. The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
10. Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
   A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
   B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
3. Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
YELLOW - (two amber reflective surfaces with yellow body).
WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 2-98 9-07 5-21				FM 2920
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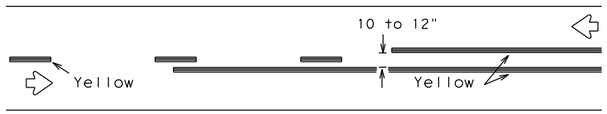
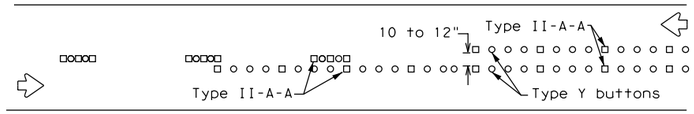
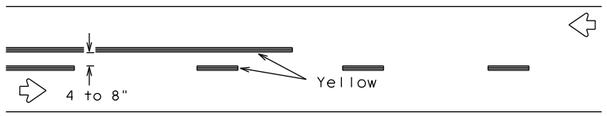
PAVEMENT MARKING PATTERNS



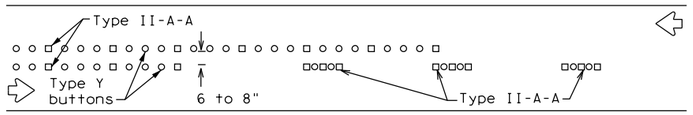
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



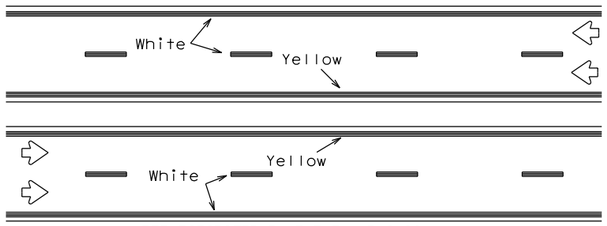
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



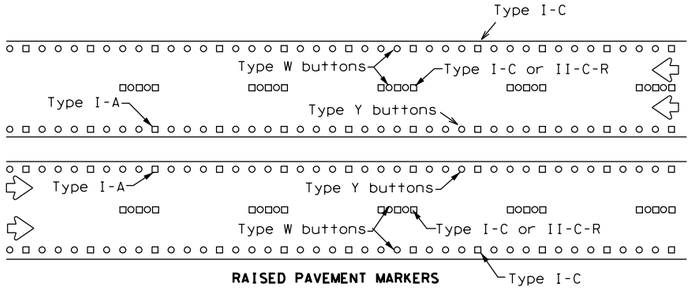
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



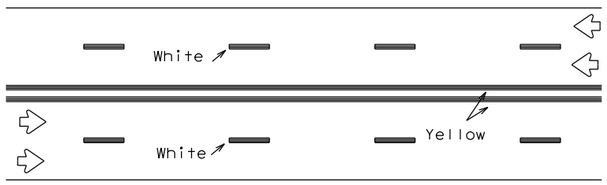
REFLECTORIZED PAVEMENT MARKINGS



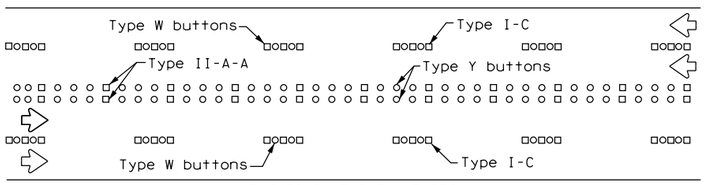
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



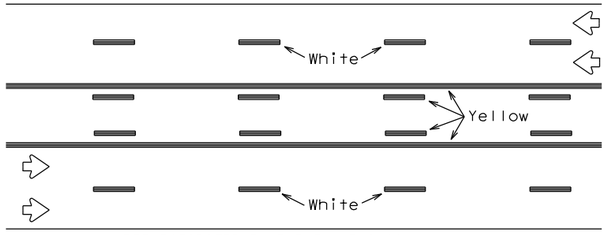
REFLECTORIZED PAVEMENT MARKINGS



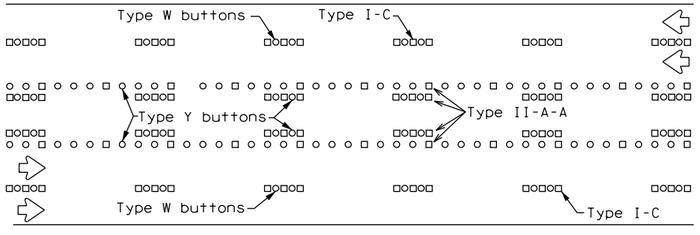
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

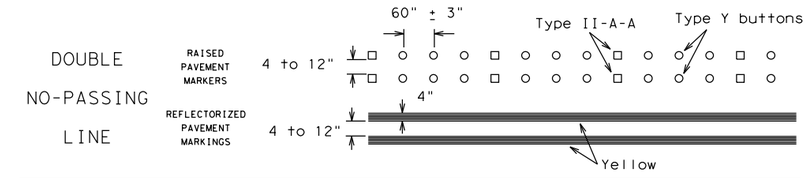
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

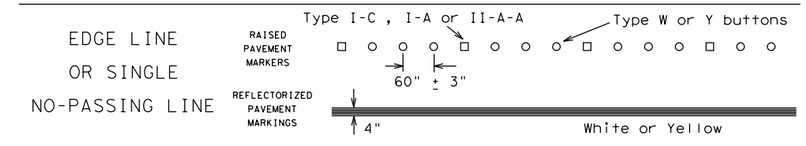
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

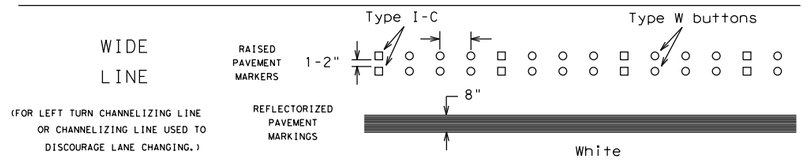


EDGE LINE OR SINGLE NO-PASSING LINE



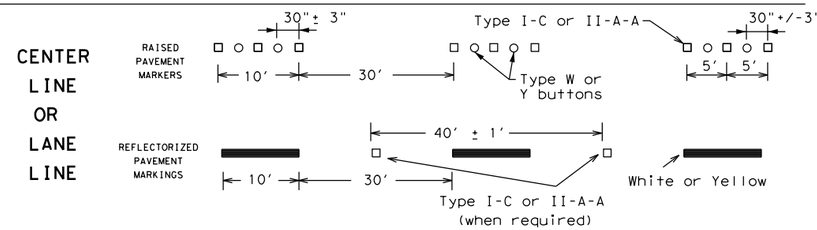
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

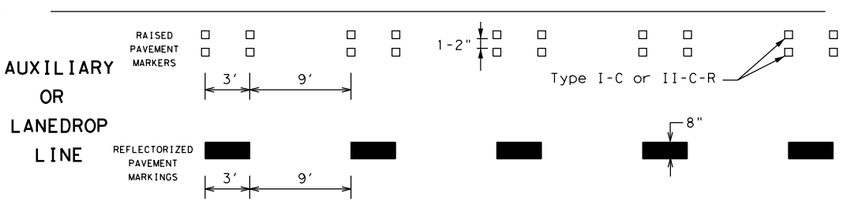


BROKEN LINES

CENTER LINE OR LANE LINE

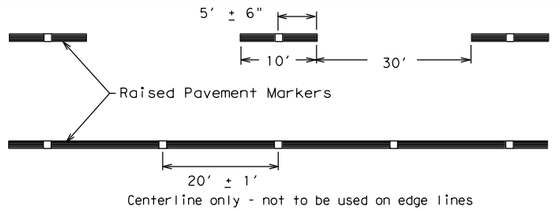


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

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	HOU	HARRIS		25

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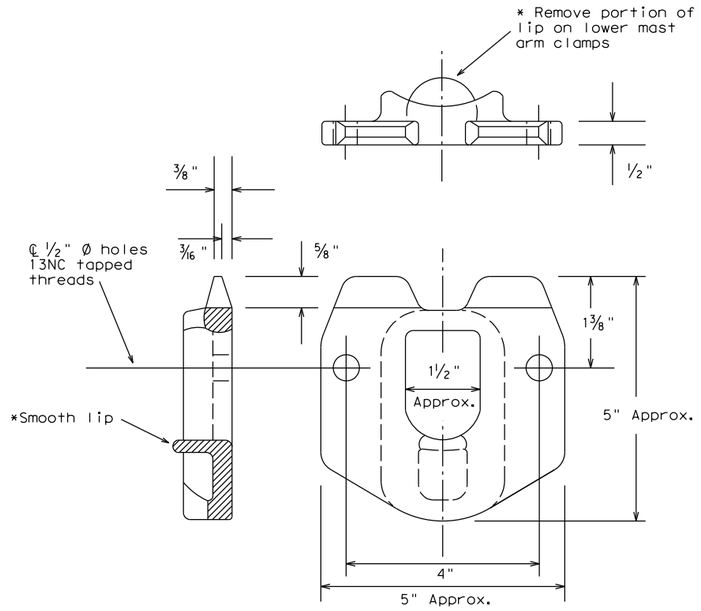
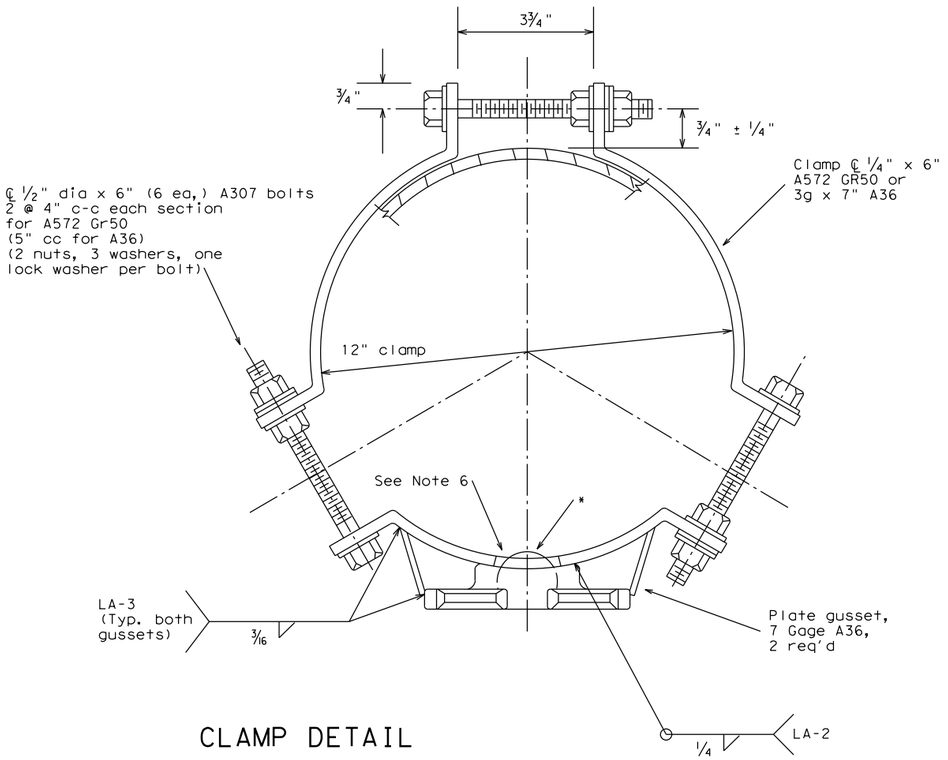


POLE SIMPLEX DETAILS



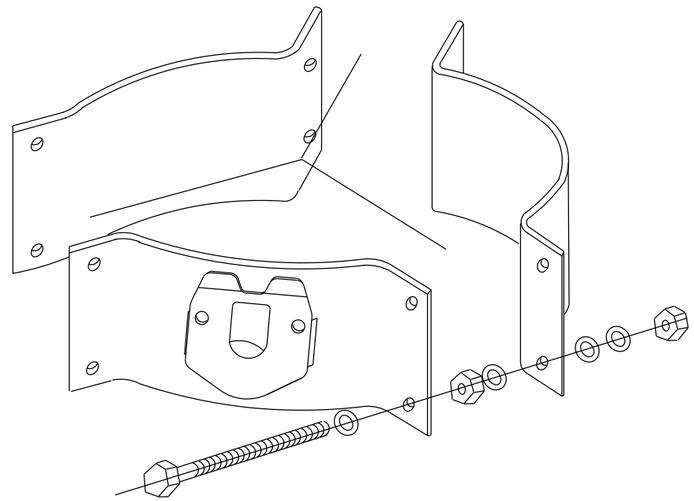
CLAMP DETAIL

OTHER MATERIALS:

1. Pole simplex shall be ASTM A27 GR65-35 or A148 GR80-50 or A576 GR1021. ASTM A576 must be suitable for forging and also meet minimum tensile of 65ksi, minimum yield of 35ksi, and a minimum elongation of 22 percent in 2 inches.
2. Welded tabs and backplates shall be ASTM A-36 steel or better.
3. Nylon insert locknuts shall conform to ASTM A563.

GENERAL NOTES:

1. Materials and fabrication shall be in accordance with Standard Sheet "MA-C" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
2. All parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing". The throat of the Simplex shall be made free of all rough or sharp edges resulting from the galvanizing process.
3. Each simplex fitting shall be supplied with 2 ASTM A325 bolts, 1/2in. X 1 1/2in. and 2 lock washers. The bolts and lock washers shall be secured to the clamp with the other hardware items. The Fabricator shall ship clamp assembly together in a single package, including all bolts, nuts, and washers required for the clamp and simplex fitting.
4. Design conforms to 1994 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" and interim revisions thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor. Clamps are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq.ft.,12 ft. maximum arm length.
5. Each assembly shall consist of one upper piece simplex fitting having a smooth lip and one lower piece simplex fitting with the lip removed.
6. Approximately 2 in. diameter hole in upper mast arm clamp.



PROJECTION

For 8.9 - 12 inch diameter Signal Poles
(Two req'd for each mast arm)

Texas Department of Transportation
Traffic Operations Division

CLAMP ON FITTING ASSEMBLY FOR LUMINAIRE MAST ARM

CFA-12

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REVISIONS	CONT	SECT	JOB	HIGHWAY
11-99 1-12				FM 2920
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		26

GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is $1/2$ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
CONDUITS & NOTES

ED(1)-14

FILE: ed1-14.dgn	DN:	CK:	DW:	CK:
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REVISIONS				FM 2920
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		27

71A

ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.

2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.

3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.

4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.

2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.

3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.

4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.

5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.

6. Support conductors in illumination poles with a J-hook at the top of the pole.

7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.

8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.

9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.

10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.

11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.

2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.

3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.

4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.

5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.

2. Do not place ground rods in the same drilled hole as a timber pole.

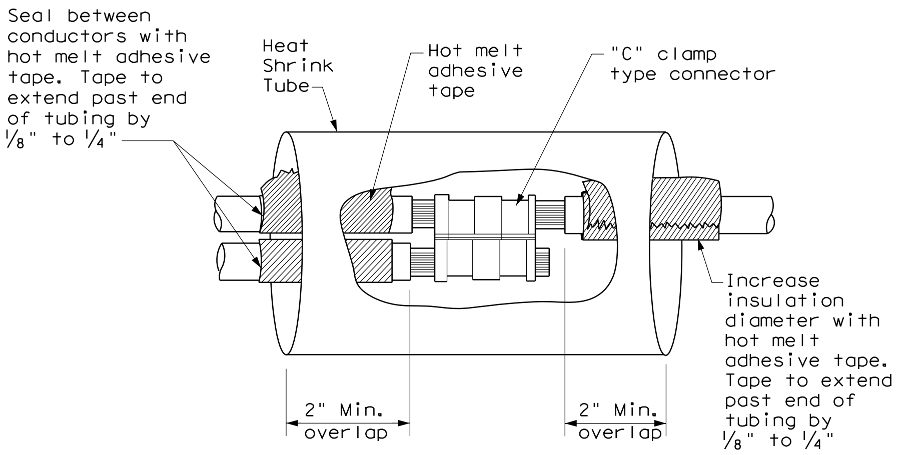
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

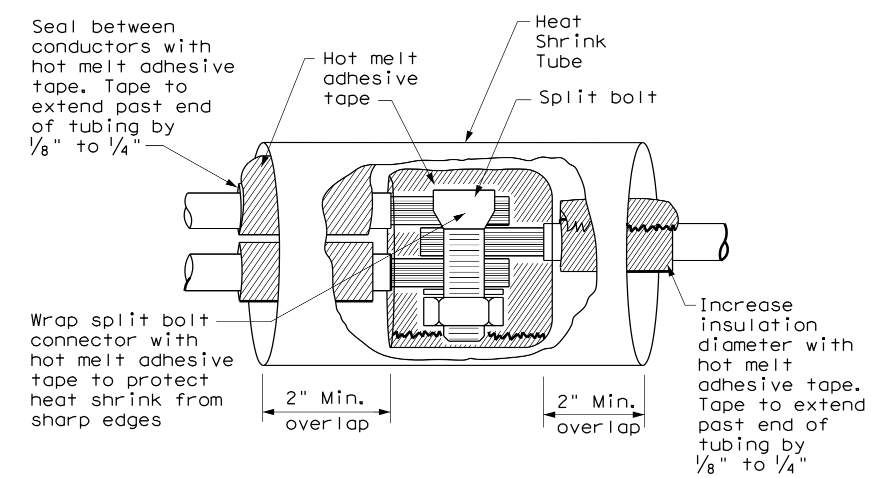
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.

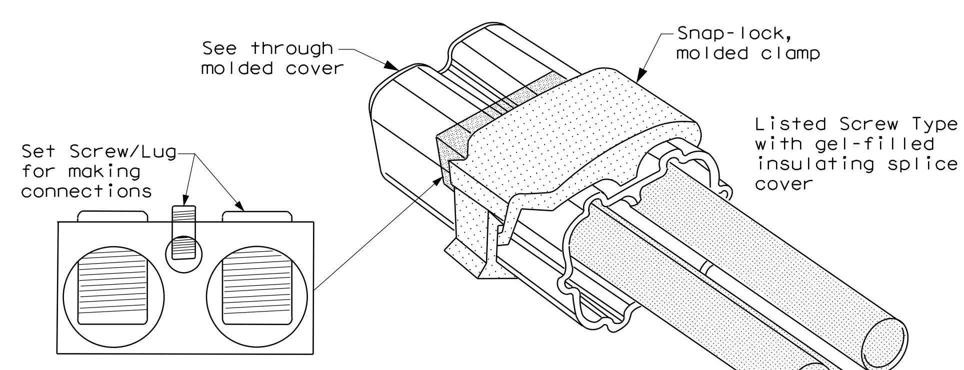
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation | Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

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	HOU	HARRIS		28

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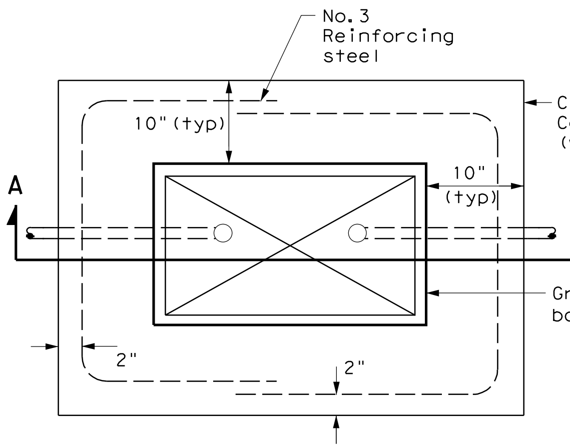
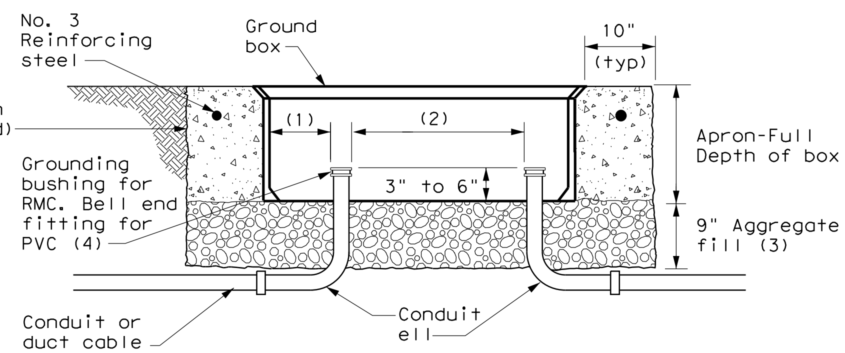


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."
2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.
3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.
4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

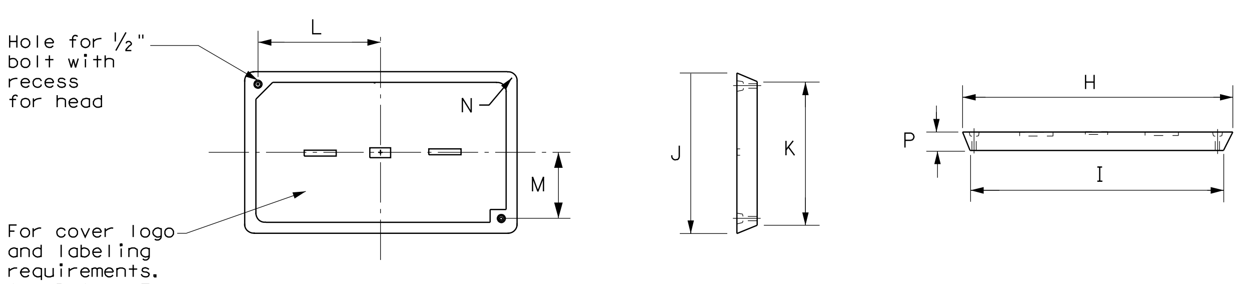
1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.
2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.
3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.
4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.
5. Temporarily seal all conduits in the ground box until conductors are installed.
6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.
7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.
8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.
9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.
10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.
11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

GROUND BOX DIMENSIONS

TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

GROUND BOX COVER DIMENSIONS

TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW END SIDE

GROUND BOX COVER

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS GROUND BOXES

ED(4)-14

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	HOU	HARRIS		29

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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

Schematic Type

Service Voltage V / V

Disconnect Amp Rating
000 indicates main lug only/
Typically Type T

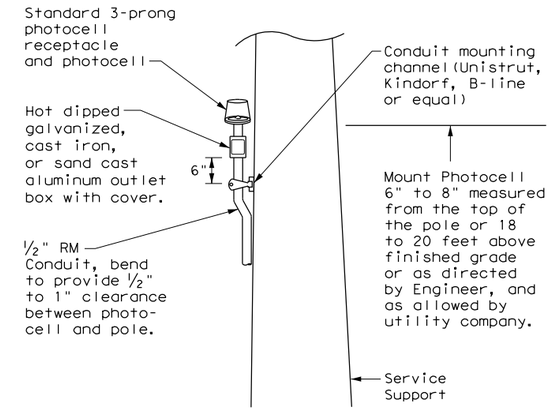
(SS)= Safety Switch Ahead of Meter-Check with Utility
(NS)= No safety Switch Ahead of Meter-Check with Utility

Enclosure Type
GS= Galvanized steel("off the shelf")
SS= Stainless steel(Custom Enclosure)See MPL
AL= Aluminum (Custom Enclosure)See MPL

Photocell Mounting Location
(E)= Inside Service/Enclosure Mounted
(T)= Top of pole
(L)= Luminaire mounted
(N)= None/No Photocell or Lighting Contactor Required

Service Support Type
GC= Granite concrete
OC= Other concrete
TP= Timber pole
SP= Steel pole
SF= Steel frame
OT= Pole by others or paid for separately
EX= Existing pole
TS= Service on traffic signal pole
PS= Pedestal Service

O= Overhead Service Feed from Utility
U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

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Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

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71E

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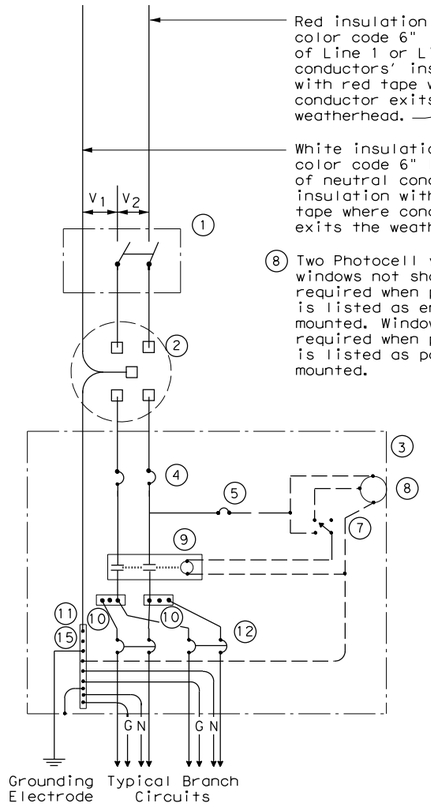
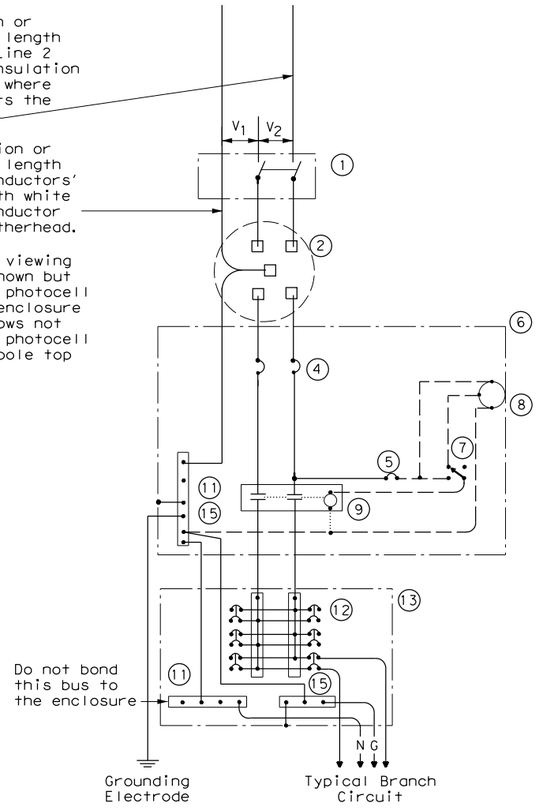
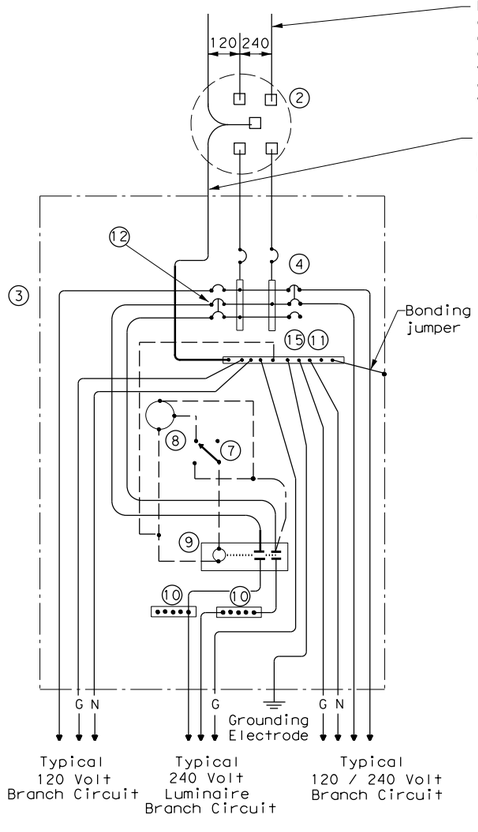


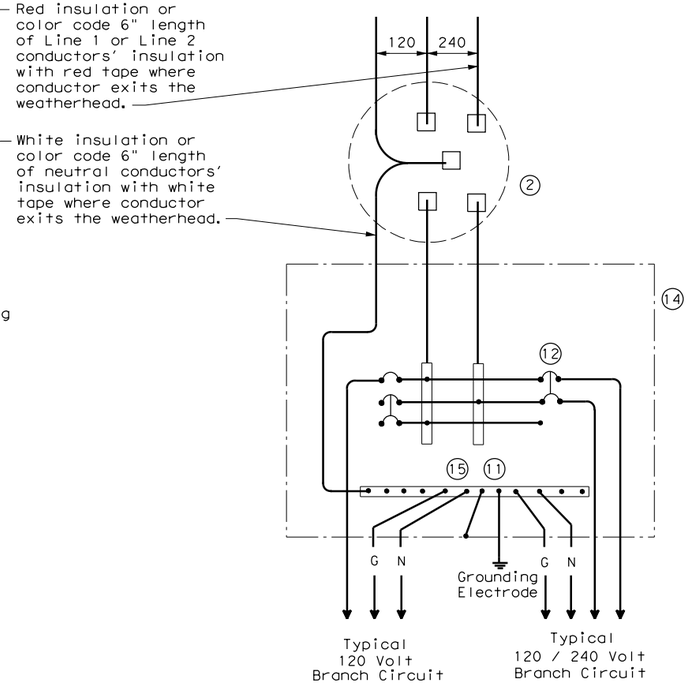
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

WIRING LEGEND	
———	Power Wiring
- - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

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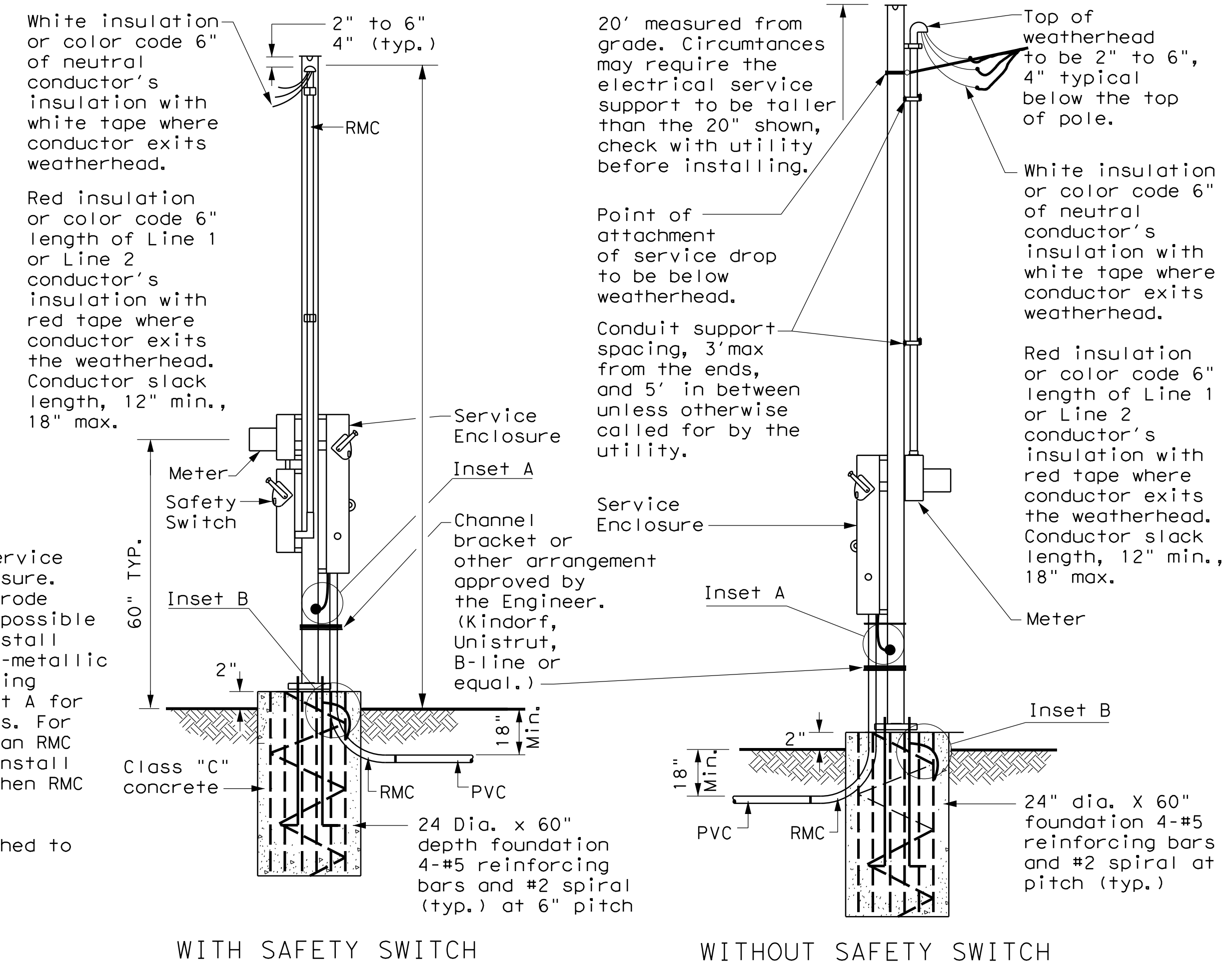
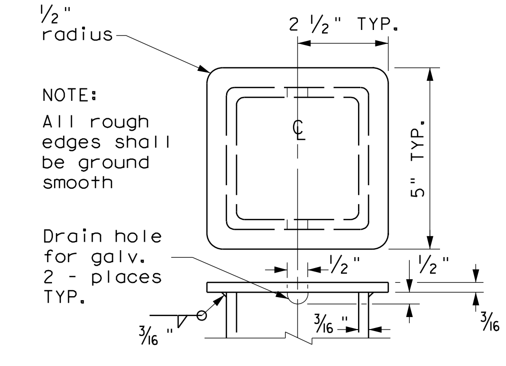
71F

SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

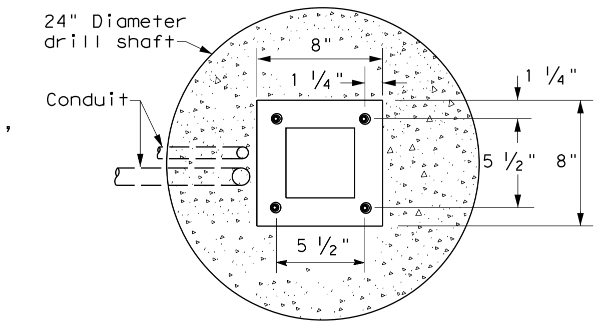
1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.
2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.
3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.
4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.
5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.
6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.
8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.
10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.
11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.



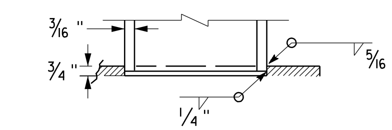
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

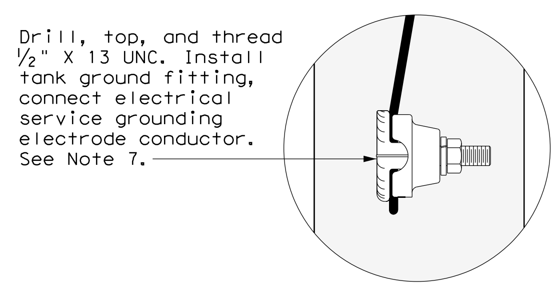


BASE PLATE DETAIL

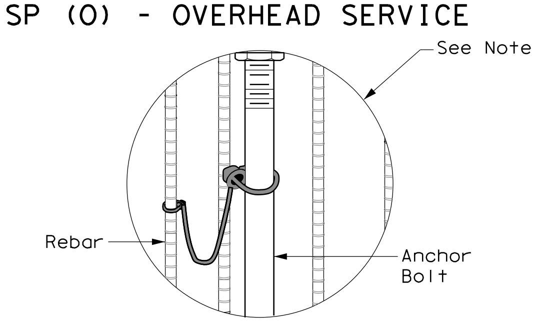


BOTTOM OF POLE

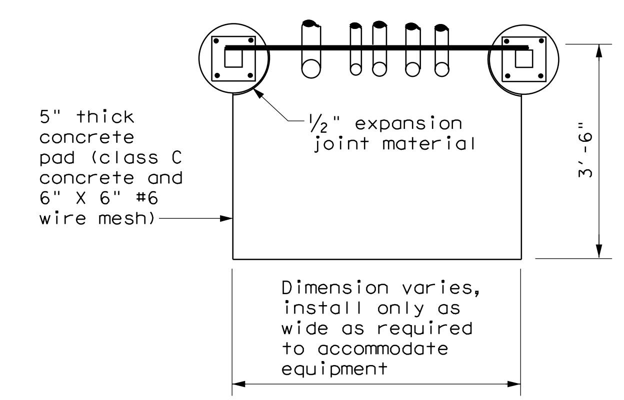
SERVICE SUPPORT TYPE SF & SP



INSET A

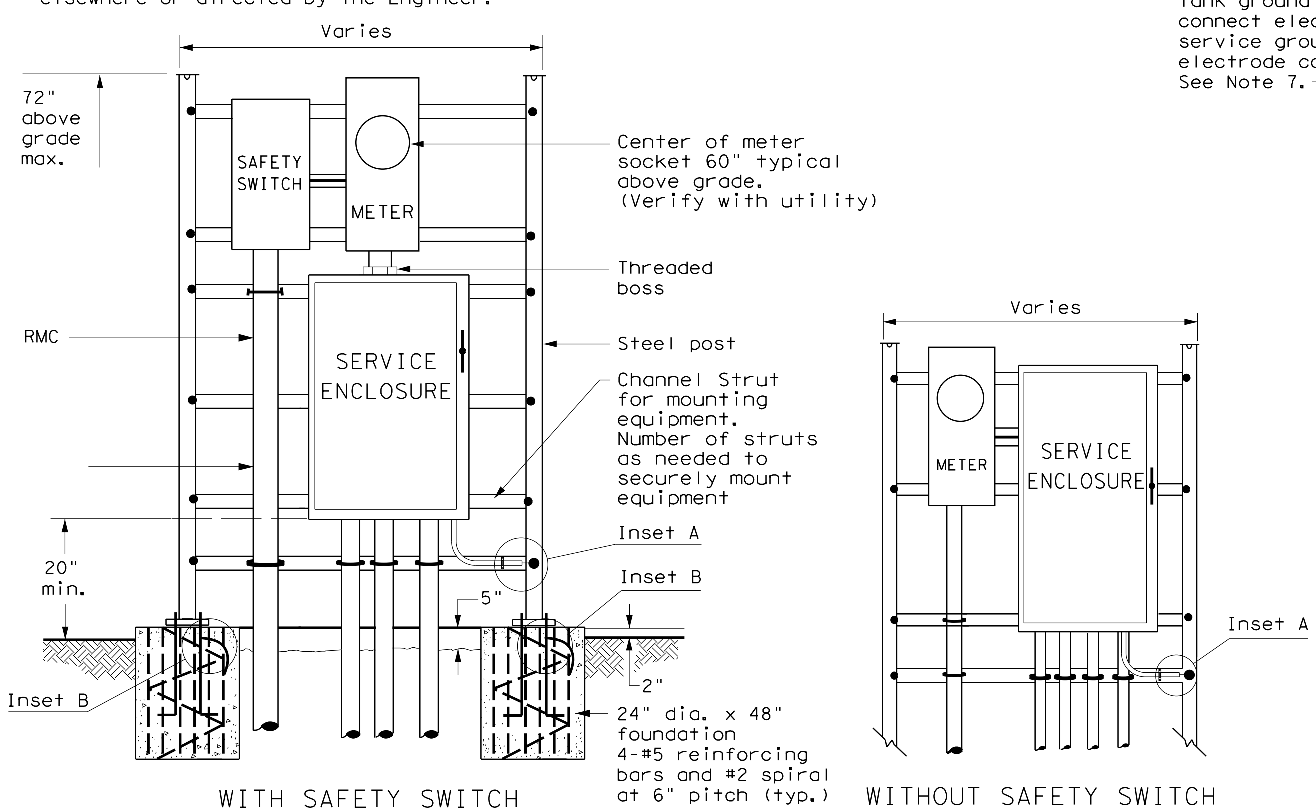


INSET B

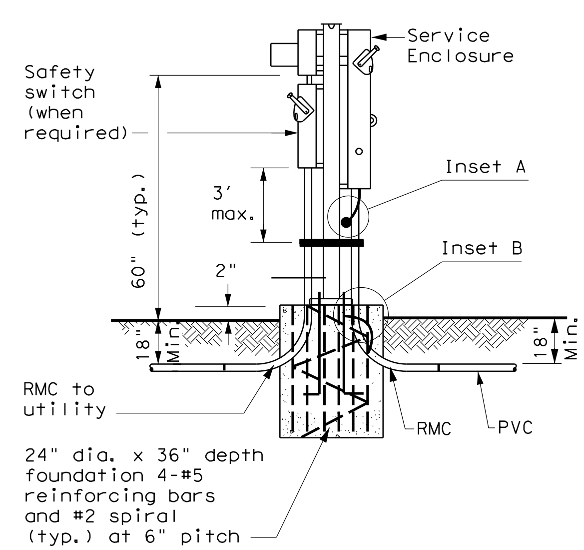


TOP VIEW

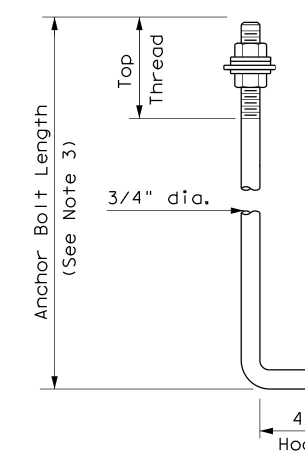
SERVICE SUPPORT TY SF (O) & SF (U)



SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE



HOOKED ANCHOR DETAIL

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ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

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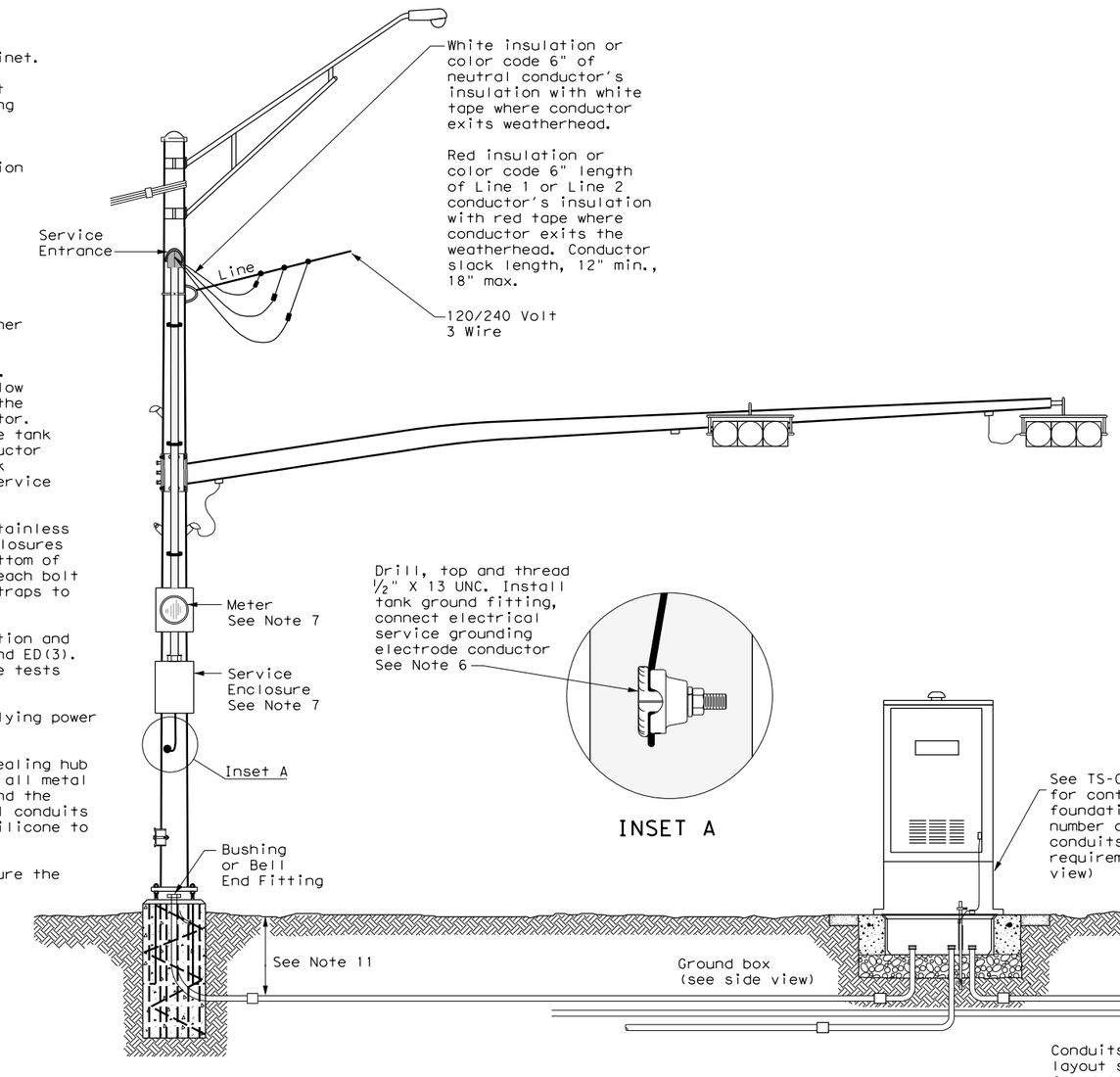
TRAFFIC SIGNAL NOTES

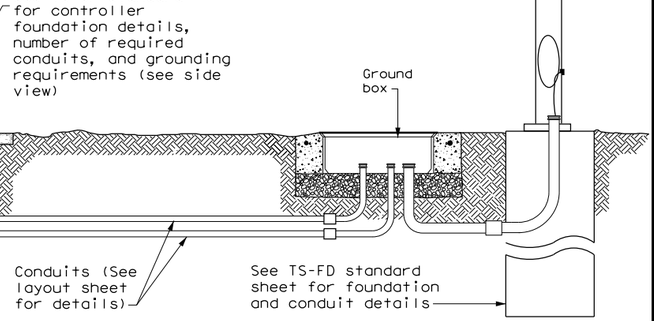
1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material and construction sections of Item 610, "Roadway Illumination Assemblies," except for performance testing of luminaires. Test installed roadway luminaires for proper operation as a part of the associated traffic signal system test.
4. If internally illuminated street name signs are approved for use, ground the fixture to the pole with a 12 AWG green XHHW conductor.
5. Bond anchor bolts to rebar cage in two locations using #3 bars or 6 AWG stranded copper conductors. Use listed mechanical connectors rated for embedment in concrete. See TXDOT standard TS-FD for further details.
6. Drill and tap signal poles for ½ in. X 13 UNC tank ground fitting. Provide and install tank ground fitting 4 in. to 6 in. directly below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Connect the electrical service grounding electrode conductor to the tank ground fitting. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. See Inset A detail for further information. Size service entrance conduit and branch circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signal pole with stainless steel bands. Ensure bands are a minimum width of ¾ in. Secure enclosures to bands using two-bolt brackets. Install brackets near top and bottom of each enclosure. Install properly sized stainless steel washers on each bolt in the enclosure. Band or drill and tap properly sized stand-off straps to signal pole for attaching conduit.
8. Conduct pull tests and insulation resistance tests on all illumination and power conductors as required in Item 620 "Electrical Conductors" and ED(3). To prevent electronics damage, do not conduct insulation resistance tests on traffic signal cables after termination.
9. Lock all enclosures and bolt down all ground box covers before applying power to the signal installation.
10. Terminate conduits entering the top of enclosures with a conduit-sealing hub or threaded boss such as meter hub. Install a grounding bushing on all metal conduits not connected to conduit-sealing hub or threaded boss. Bond the grounding bushing to the ground bus with a bonding jumper. Seal all conduits entering enclosures with duct seal or expanding foam. Do not use silicone to seal conduit ends.
11. For all conduits, ensure the burial depth is a minimum of 18". Ensure the minimum burial depth for conduit placed under a roadway is 24".



SIGNAL POLE WITH SERVICE

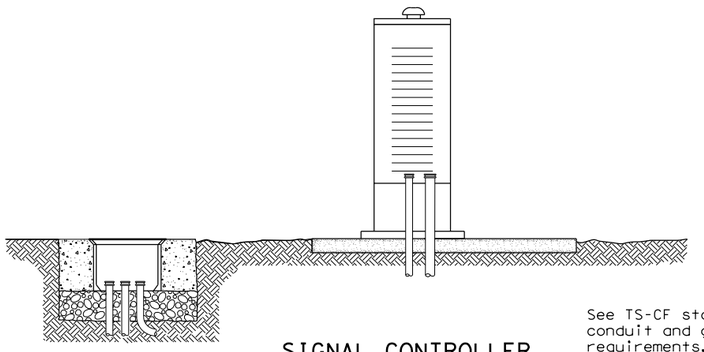
Type T electrical service mounted on signal pole shown as an example. See electrical details, layout sheets, and electrical service data chart for additional details.

INSET A



SIGNAL CONTROLLER FRONT VIEW

SIGNAL POLE



SIGNAL CONTROLLER SIDE VIEW

See TS-CF standard for conduit and grounding requirements. See layout sheets for ground box locations and any additional conduits that are required.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(8)-14

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71H

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DATE:
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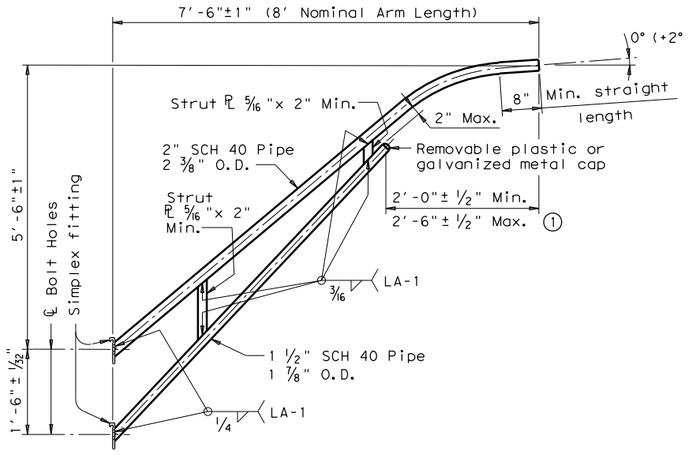
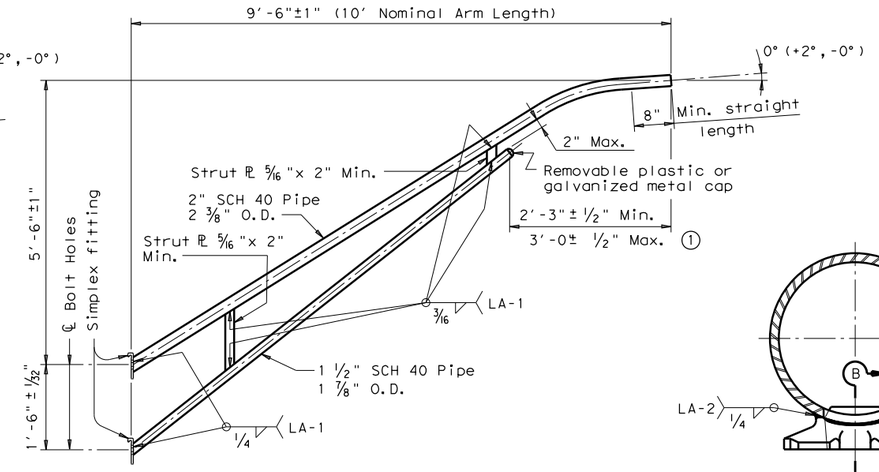
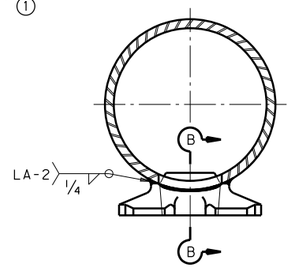
MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr.65-35 or A148 Gr.80-50, A576 Gr.1021 ③, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50 ④, or A1011 HSLAS-F Gr.50 ④
Arm Strut Plates ②	ASTM A36, A572 Gr.50 ④, or A588
Misc.	ASTM designations as noted



8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM



DIRECT ATTACHMENT DETAIL

① Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

② Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

③ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

④ ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

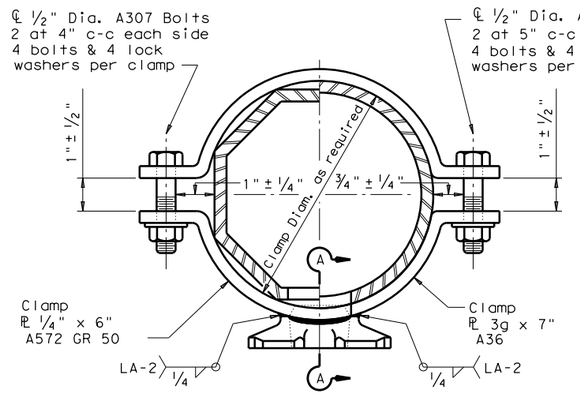
Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absense of specified Fabricaton tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

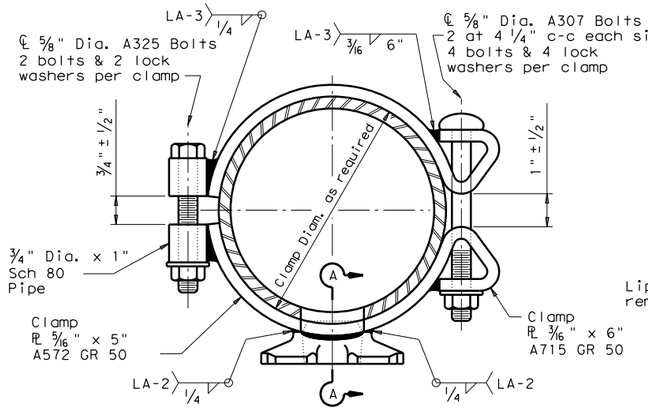
Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

If clamp assemblies are ordered without poles, the Fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.



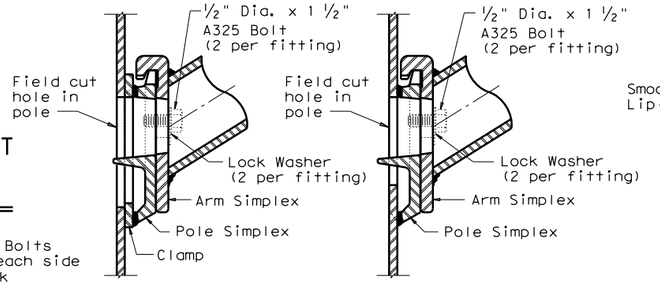
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



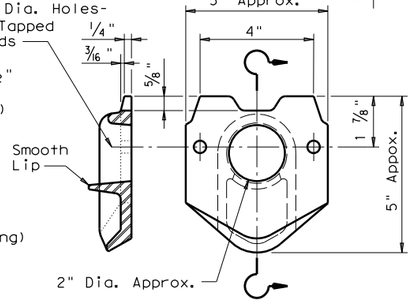
CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)

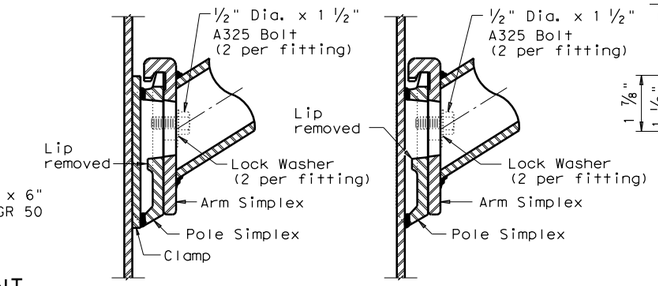


UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING



POLE SIMPLEX DETAIL

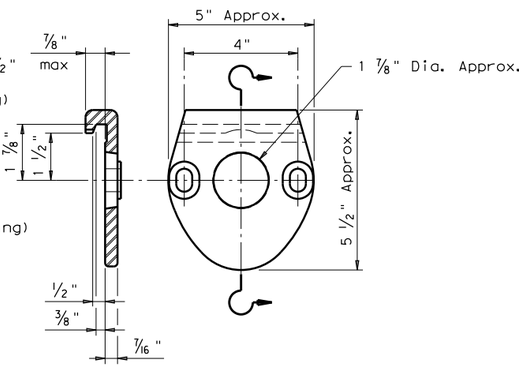


LOWER SIMPLEX FITTING

SECTON A-A

LOWER SIMPLEX FITTING

SECTON B-B



ARM SIMPLEX DETAIL

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES

ARM DETAILS

LUM-A-12

DN: LEH.	CK: JSY.	DW: LII.	CK: IEB.

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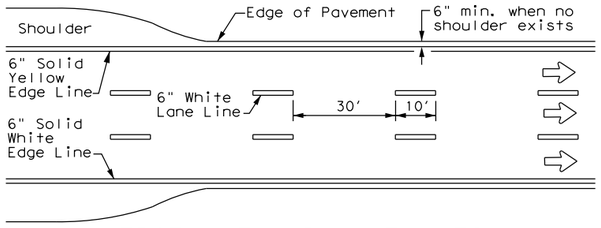
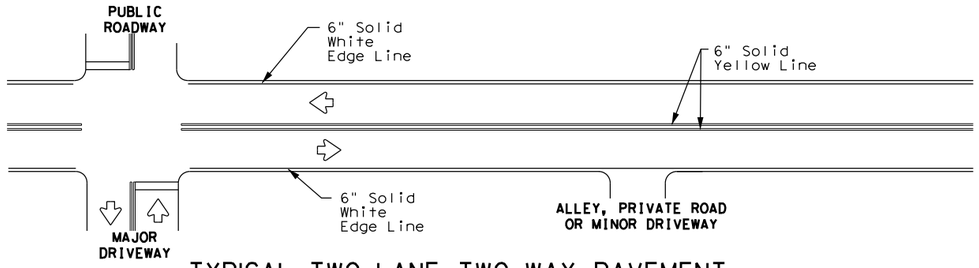
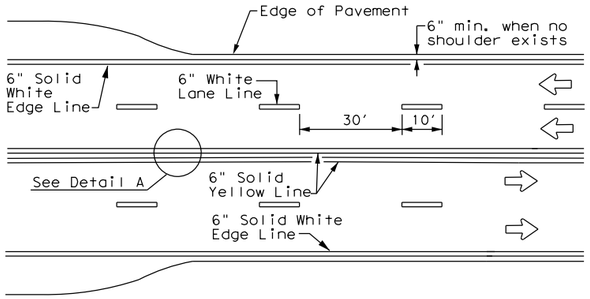


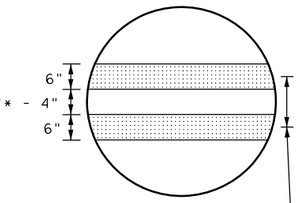
EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS

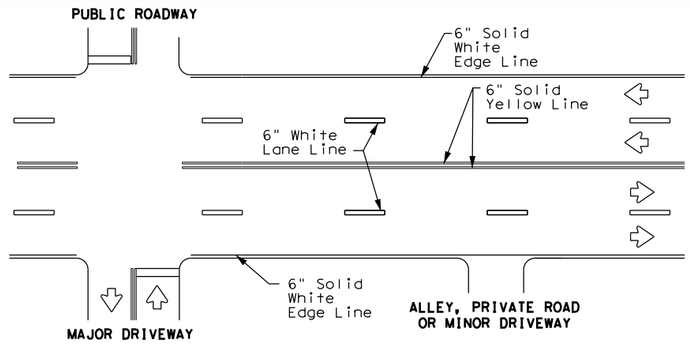


DETAIL "A"

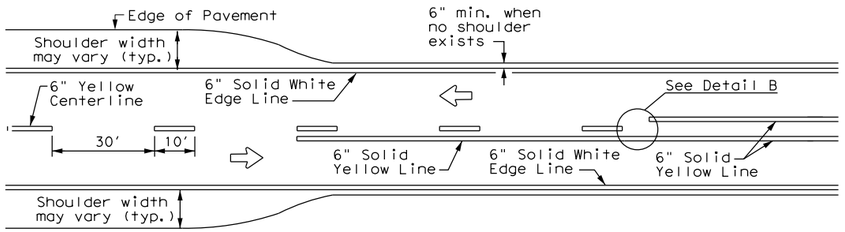
9"** min. - 10" typ.
(18" max. for traveled way greater than 48' only)

* 2" minimum for restripe projects when approved by the Engineer.

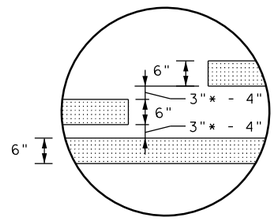
** 8" minimum for restripe projects when approved by the Engineer.



TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



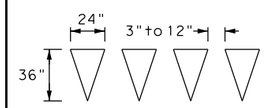
TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



18" min. - 20" max.
(16" minimum for restripe projects when approved by the Engineer.)

DETAIL "B"

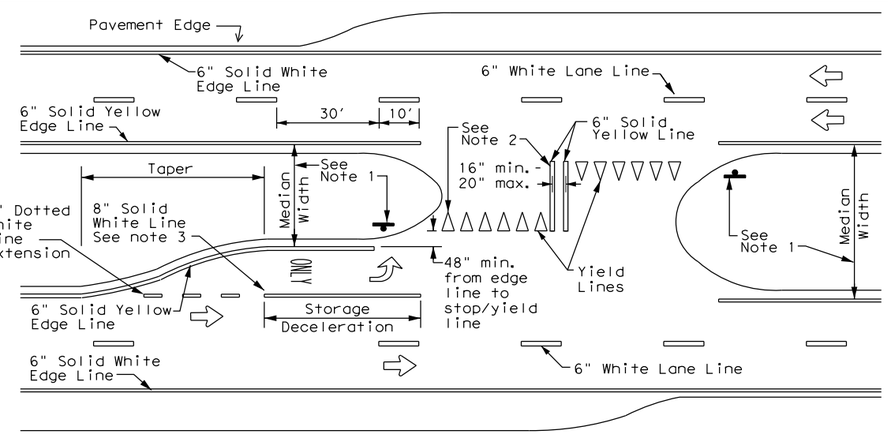
* 2" minimum for restripe projects when approved by the Engineer.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES

For posted speed on road being marked equal to or less than 40 MPH.



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

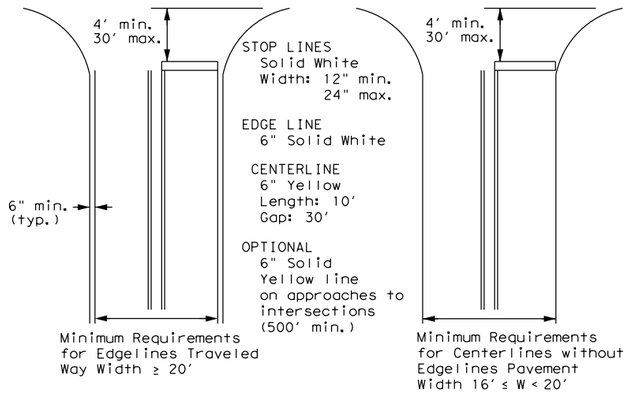
GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths
for Undivided Roadways

Texas Department of Transportation

Traffic Safety Division Standard

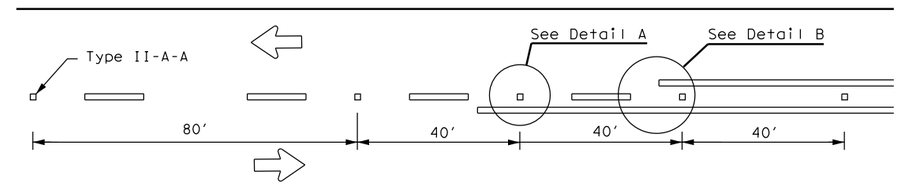
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

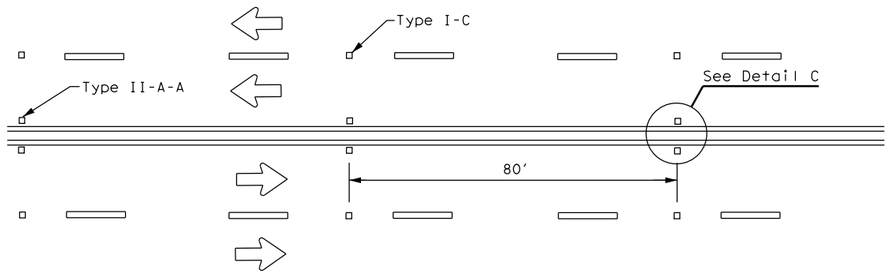
FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS				FM 2920
11-78 8-00 6-20	DIST	COUNTY		SHEET NO.
8-95 3-03 12-22	HOU	HARRIS		35
5-00 2-12				

22A

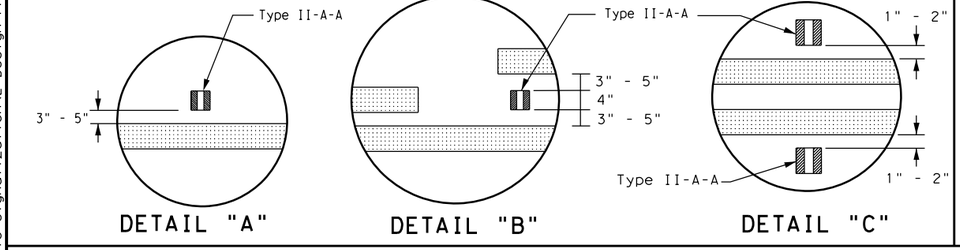
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

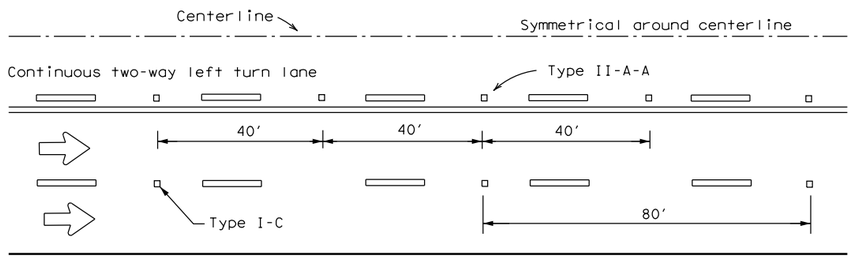


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

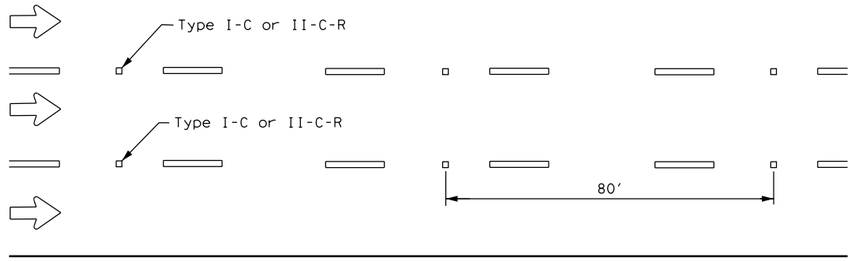


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



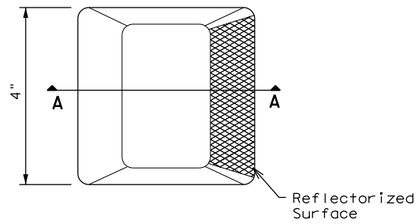
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

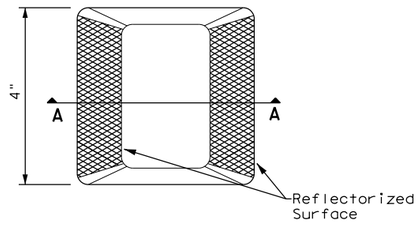
See Note 3.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

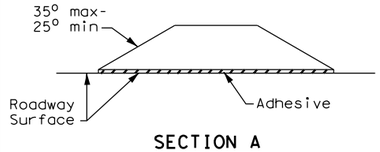
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

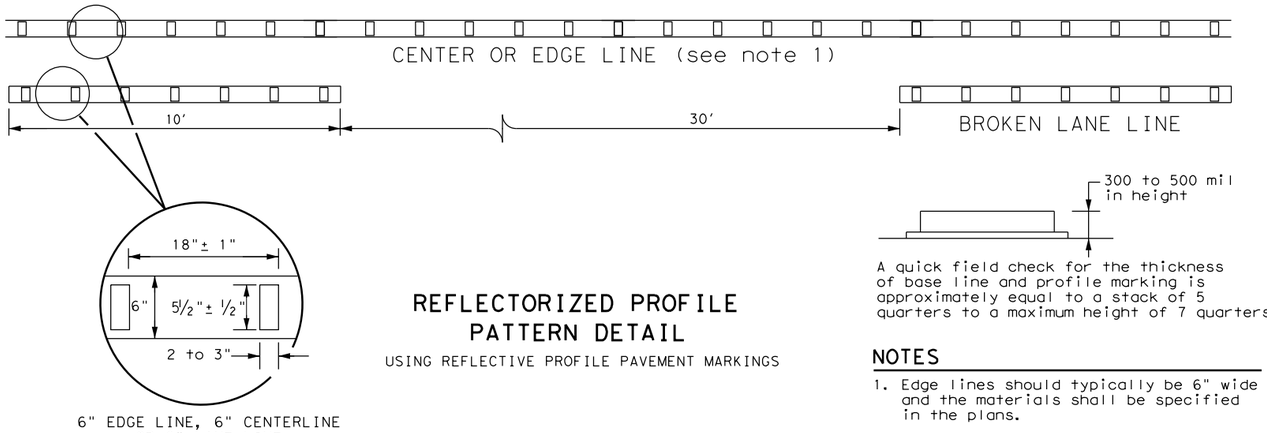


Type II (Top View)



SECTION A

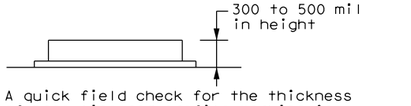
RAISED PAVEMENT MARKERS



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS				FM 2920
4-77 8-00 6-20				
4-92 2-10 12-22	DIST	COUNTY		SHEET NO.
5-00 2-12	HOU	HARRIS		36

22B

DATE: 3/8/2024 3:02:56 PM
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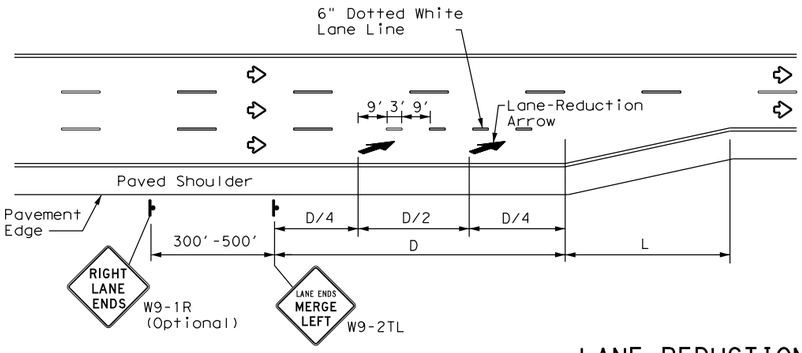
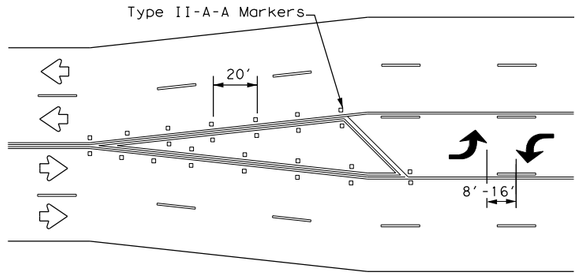


LANE REDUCTION

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional RIGHT LANE ENDS (W9-1R) sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

ADVANCED WARNING SIGN DISTANCE (D)		
Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	



A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

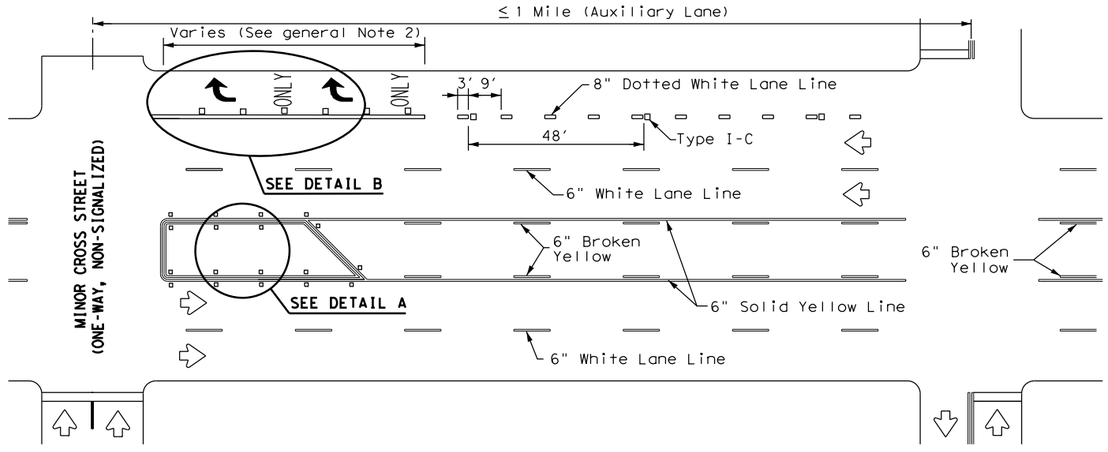
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

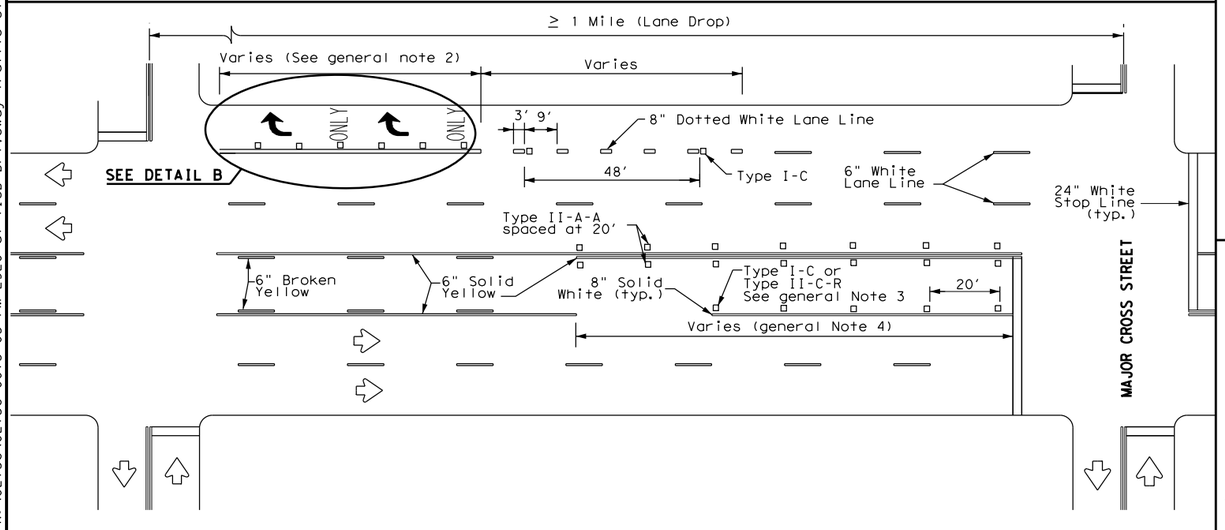
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

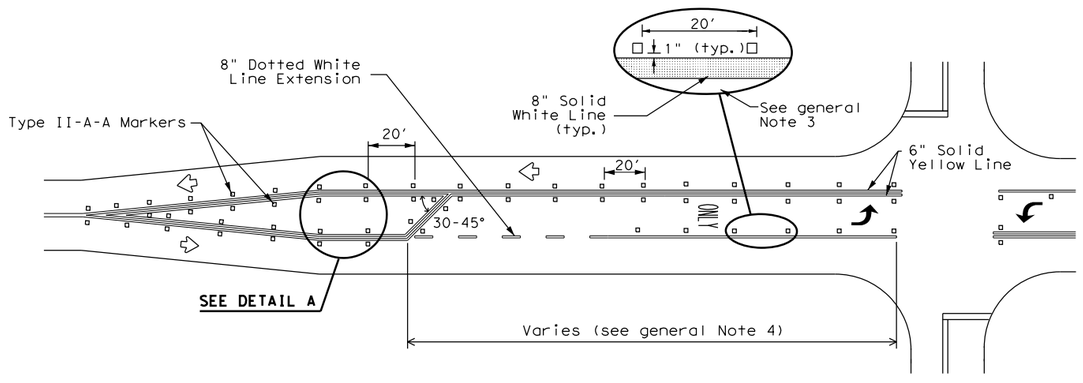
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



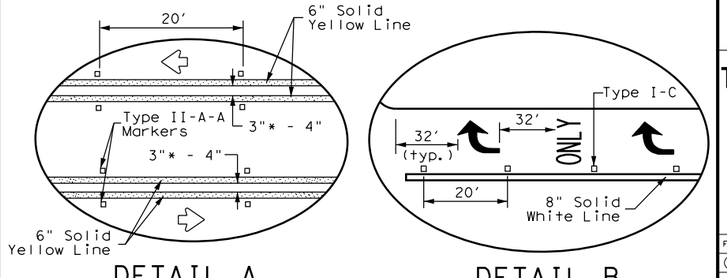
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



* 2" minimum allowed for restripe projects when approved by the Engineer.

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

PM(3)-22

FILE: pm3-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 3-03 6-20 5-00 2-10 12-22 8-00 2-12				FM 2920
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		37

22C

DATE: 3/8/2024 3:02:57 PM
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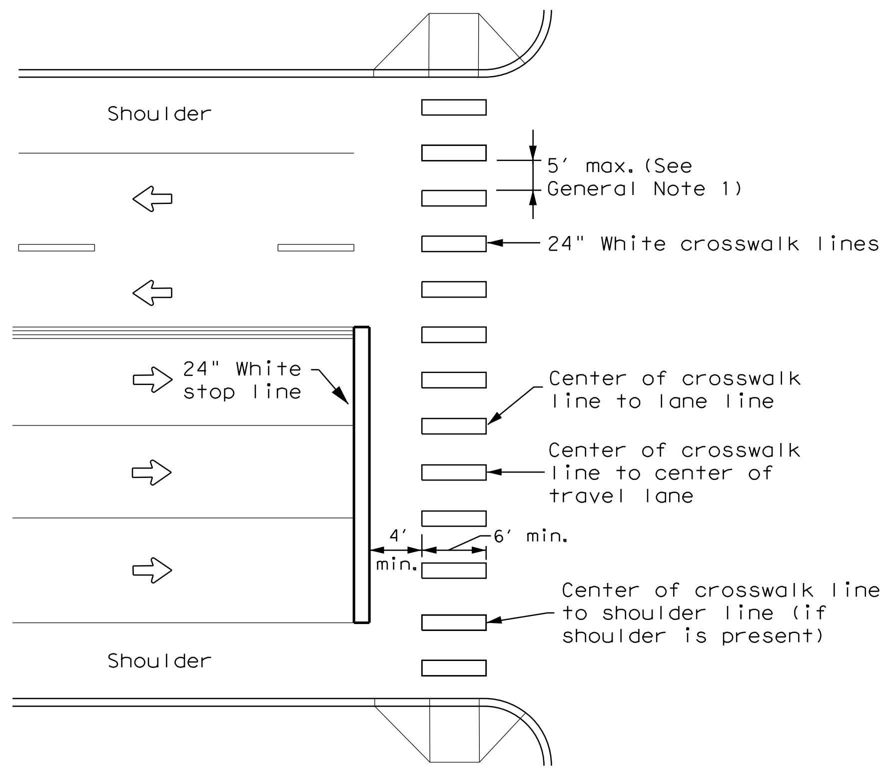
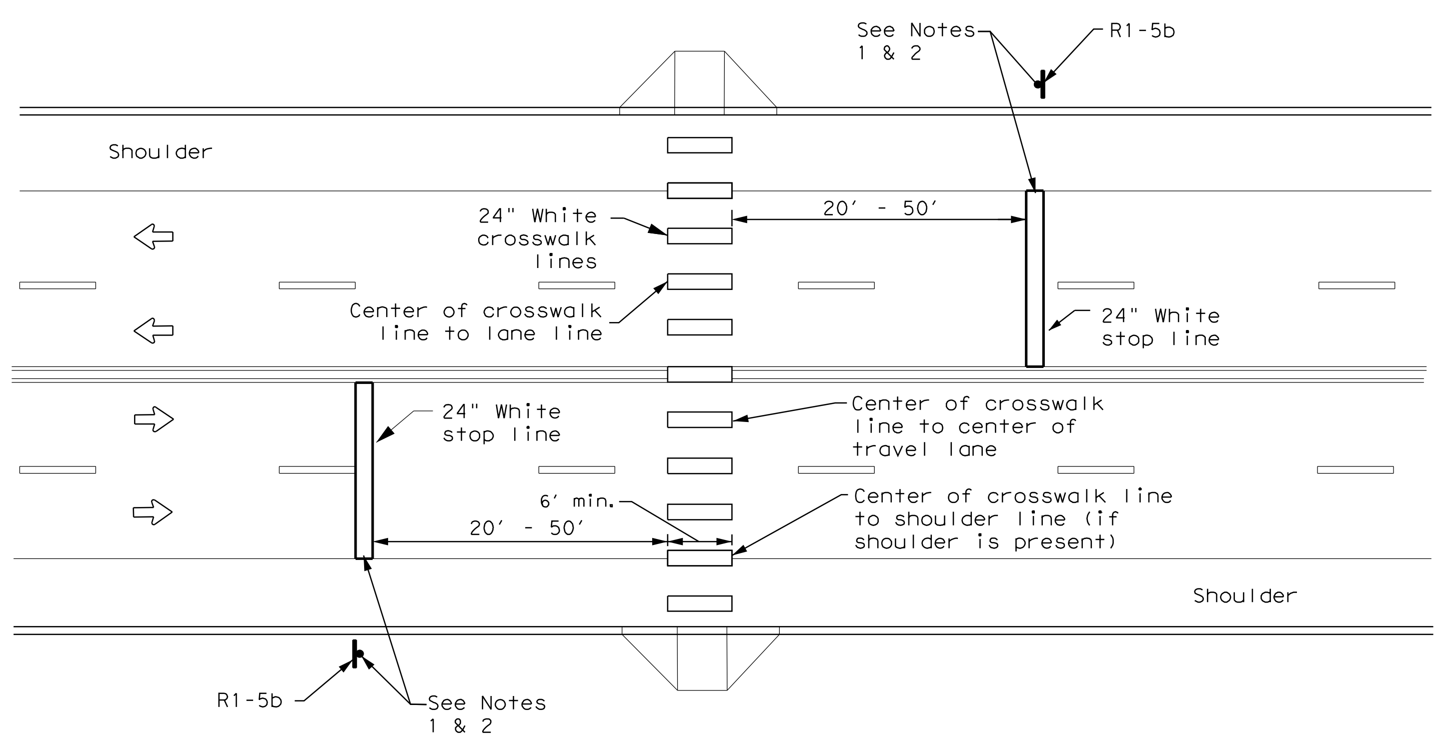


HIGH-VISIBILITY LONGITUDINAL CROSSWALK
AT CONTROLLED APPROACH



UNSIGNALIZED MIDBLOCK HIGH-VISIBILITY
LONGITUDINAL CROSSWALK

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6′ wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.

NOTES:

1. Use stop bars with Stop Here For Pedestrians (R1-5b) signs at unsignalized midblock cross walks.
2. Use stop bars with STOP HERE ON RED (R10-6 or R10-6a) signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

CROSSWALK PAVEMENT MARKINGS

PM(4)-22A

FILE: pm4-22a.dgn	DN:		CK:	DW:		CK:
©TxDOT December 2022	CONT	SECT	JOB		HIGHWAY	
REVISIONS 6-20 6-22 12-22					FM 2920	
	DIST	COUNTY			SHEET NO.	
	HOU	HARRIS			38	

22D

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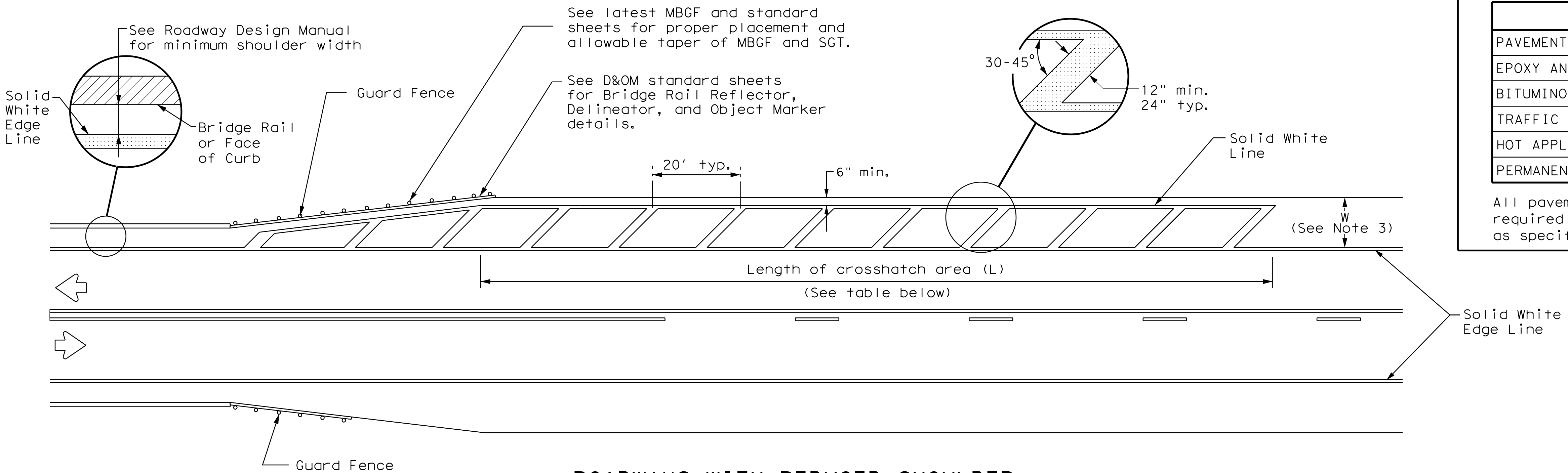

ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT

CROSSHATCH LENGTH (L)	
Posted Speed (MPH)	L (ft)
30	300 ft
35	
40	
45	
50	500 ft
55	
60	
65	
70	
75	

NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 4 inches from the bridge rail or face of curb or 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions.
2. No-passing zone on bridge approach is optional. If used, the no-passing zone shall be a minimum 500 feet long from the beginning of the bridge.
3. The crosshatching should be required if the shoulder width in advance of the bridge is 4 feet or wider and a reduction of at least 3 feet in shoulder width across the bridge occurs.
4. On divided highways, review both the right and left shoulder widths for the need for narrow bridge pavement markings.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.

Texas Department of Transportation

Traffic Safety Division Standard

PAVEMENT MARKINGS FOR ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT

PM(5)-22

FILE: pm5-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS				FM 2920
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		39

22E

DATE: 3/8/2024 3:02:58 PM
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ROADWAY ILLUMINATION ASSEMBLY NOTES

1. Details apply to roadway lighting installations bid or referenced under Item 610, "Roadway Illumination Assemblies." Provide, furnish, and install all other materials not shown on the plans which may be necessary for complete and proper construction. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the State such warranties or guarantees.

2. The locations of poles and fixtures may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.

3. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC),TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA),and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association, Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection.

4. Provide Roadway Illumination Light Fixtures as per TxDOT Departmental Material Specification (DMS) 11010, Item 610, and as shown on the Material Producers List (MPL) for Roadway Illumination and Electrical Supplies.

5. Fabricate steel roadway illumination poles in accordance with Roadway Illumination Poles (RIP) standards and Item 610. Poles fabricated according to RIP standards do not require shop drawing submittals.

   a. Alternate designs to RIP standards or the use of aluminum to fabricate poles will require the submission of shop drawings electronically. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" on the TxDOT web site.

   b. Limitations on use of the RIP standard: The RIP standard details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25′ above the elevation of the surrounding terrain, in accordance with the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," 6th Edition (2013) of the AASHTO Design Specifications. For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25′ above the surrounding terrain, provide poles meeting the following requirements:

      i. Submittals. Following the electronic shop drawing submittal process (see Guide to Electronic Shop Drawing Submittal on the TxDOT web site), submit to the Engineer for approval fabrication drawings and calculations for the poles, sealed by a Texas licensed professional engineer (P.E.).

      ii. Luminaire Structural Support Requirements. Provide light poles, arms, and anchor bolt assemblies with a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the 6th edition (2013) of the AASHTO Design Specifications. For transformer base poles, include transformer base and connecting hardware in calculations and shop drawing submittals. Structurally test all transformer bases to resist the theoretical plastic moment capacity of the pole. Submit certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished with the shop drawings. Show breakaway base model number, manufacturer's name, and logo on shop drawings. Include on manufacturer's shop drawings the ASTM designations for all materials to be used.

6. For both transformer and shoe-base type illumination poles, provide and install double-pole breakaway fuse holders as specified by DMS-11040. Breakaway fuse holders are listed on the MPL for Roadway Illumination and Electrical Supplies under Items 610 & 620. Provide 10 amp time delay fuses for breakaway connectors in light poles, or inside the light fixture for underpass luminaires. In each pole, connect luminaires to the breakaway connector with continuous stranded 12 AWG copper conductors as listed on the MPL. Bond all equipment grounding conductors together and to the ground lug in the transformer base or hand hole.

7. Tighten anchor bolts for shoe base, concrete traffic barrier base, and bridge mount roadway illumination poles, in accordance with Item 449.

8. Install T-Base with following procedure:

   a. Anchor Bolt Tightening.

      i. Coat the threads of the anchor bolts with electrically conductive lubricant.

      ii. Place the T-base over the anchor bolts. Foundation must be level and flat. The maximum permissible gap under any one corner of the t-base is 1/8" before nuts are tightened.

      iii. Coat the bearing surfaces of the nuts and washers with electrically conductive lubricant. Install (1) 1/2" hold down washer, (1) lock washer, and (1) nut on each anchor bolt. Turn the nuts onto the bolts so that each is hand-tight against the washer.

      iv. Using a torque wrench, tighten each nut to 150 ft-lb. Uniform contact is required between the foundation and the T-base in the corner regions of the T-base, and all corner gaps must be closed after applying torque. If a gap still exists after torquing to 150 ft-lbs, continue torquing each bolt incrementally until gap is closed or maximum allowable torque of 250 ft. pound is reached, whichever comes first. If 250 ft-lbs is not enough to close the gap the foundation must be leveled. Gaps along the straight sides of the T-bases and the foundation are permissible. Ensure that no high point of contact occurs between the straight sides of the T-base and the foundation.

      v. Check top of T-base for level. If not level then foundation must be leveled.

   b. Top Bolt Procedure

      i. Erect pole over T-base with crane. Coat bolts, nuts, washers, and lock washers with electrically conductive lubricant.

      ii. Install bolts and 1/2" connecting washers from the inside of the T-base, thread up through the pole base. Install flat washers, lock washers and nuts snug tight according to Item 447, "Structural Bolting."

      iii. Tighten each nut to 150 ft-lb. using a torque wrench.

   c. Level and Plumb

      i. Ensure pole is plumb and mast arm is perpendicular to the roadway according to plans to within 5 degrees.

9. Construct luminaire pole foundations in accordance with Item 416, "Drilled Shaft Foundations," and TxDOT standard sheet RID(2).

10. Provide and install underpass luminaires in accordance with Item 610, DMS-11010, and TxDOT standard sheet RID(3). Typical luminaire size for underpass luminaires is 150W HPS or 150W EQ LED.

11. Mount luminaires on arms level as shown by the luminaire level indicator.

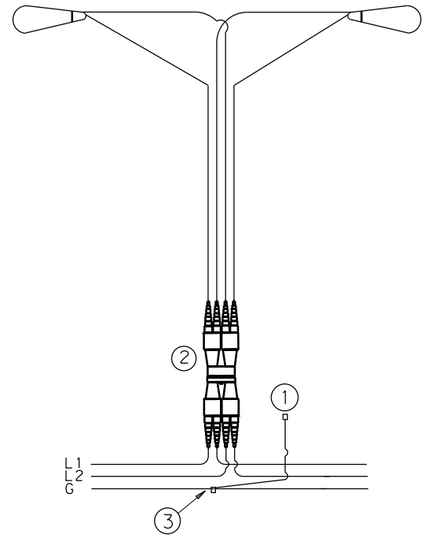
12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.

Wiring Diagram Notes:

(1) Use 1/2 in.-13 UNC threaded, copper or tin-plated copper, pole bonding connector, sized appropriately for conductors, bonded to T-base, or use ground lug in handhole as available.

(2) Use pre-qualified two-pole breakaway connectors for all luminaire pole installations. For luminaires fed by a circuit with a neutral conductor, use double pole breakaway connectors with the neutral side unfused and marked white.

(3) Split Bolt or other connector.



L1,L2 = Hot Conductors
G = Grounding Conductor

TYPICAL WIRING DIAGRAM

LUMINAIRES SERVED AT 480V ON 240/480 VOLT SERVICE OR LUMINAIRES SERVED AT 240V FOR 120/240 VOLT SERVICE.

Decorative LED Lighting Notes:

1. LED Drivers in Remote Outdoor enclosures (for drivers that do not include an enclosure as part of a factory assembly):

   a. Provide NEMA 3R outdoor enclosure or as approved.

   b. Install enclosure at least 12" above ground or other horizontal surface. Mount vertically or on ceiling, and avoid direct sun where possible.

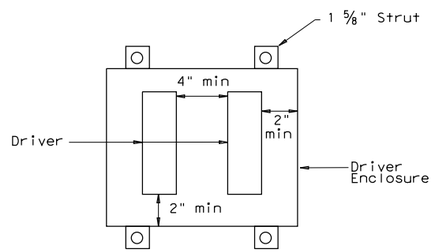
   c. Install drivers with at least 2 inches of space from enclosure walls.

   d. For multiple drivers in an enclosure, provide at least 4 inches side to side and 1 inch end to end from other drivers or electronic equipment

   e. For drivers mounted on back wall of enclosure, mount enclosure on 1 5/8" strut or other standoff to dissipate heat, or mount driver to side of the enclosure or to the metal cover.

   f. Provide remote drivers with a maximum of 100 watts

   g. Provide drivers with documentation of 100,000 hr lifetime at Tcase of 65C or higher.



Driver Spacing In Remote Enclosure

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ROADWAY ILLUMINATION DETAILS

RID(1)-20

FILE: rid1-20.dgn	DN:	CK:	DW:	CK:
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REVISIONS				FM 2920
7-17	DIST	COUNTY		SHEET NO.
12-20	HOU	HARRIS		40

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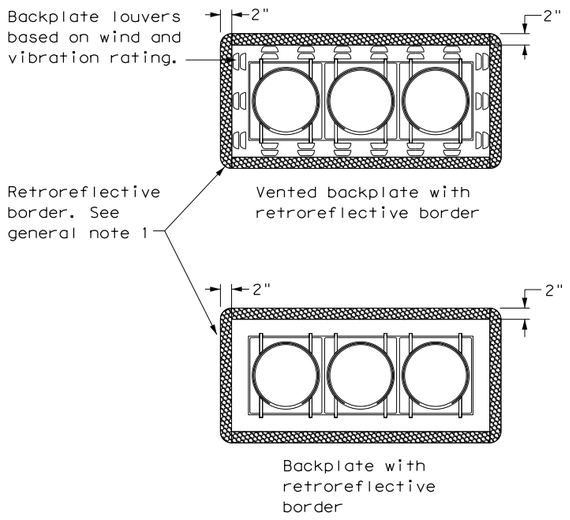
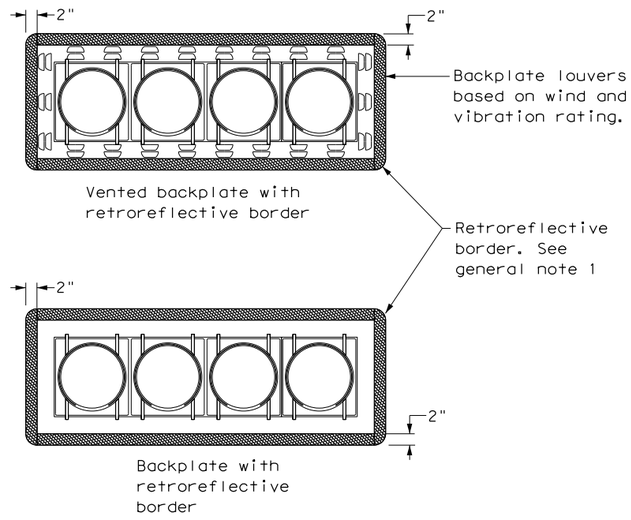


THREE-SECTION HEAD
HORIZONTAL OR VERTICAL



FOUR-SECTION HEAD
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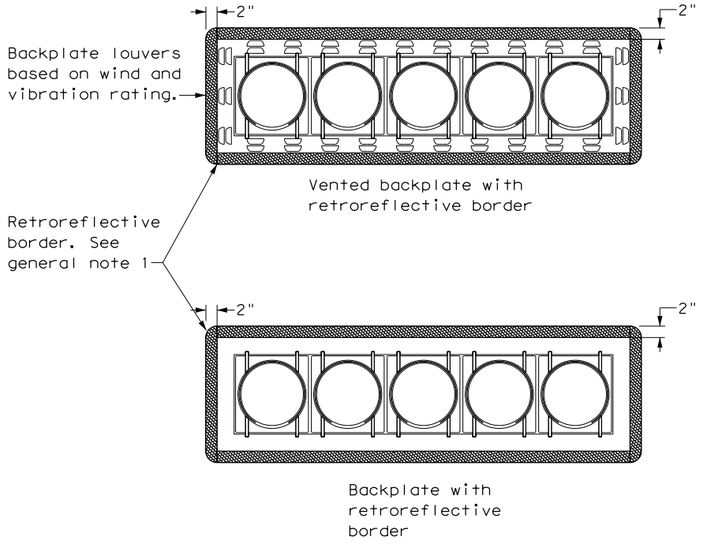
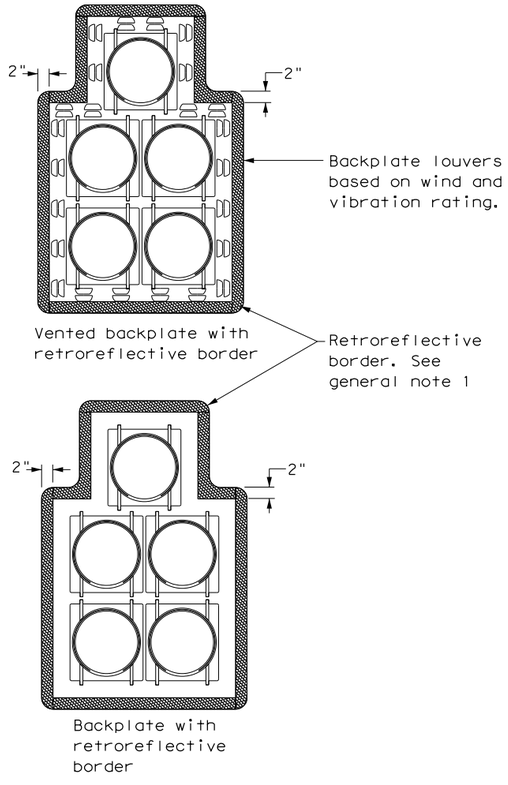
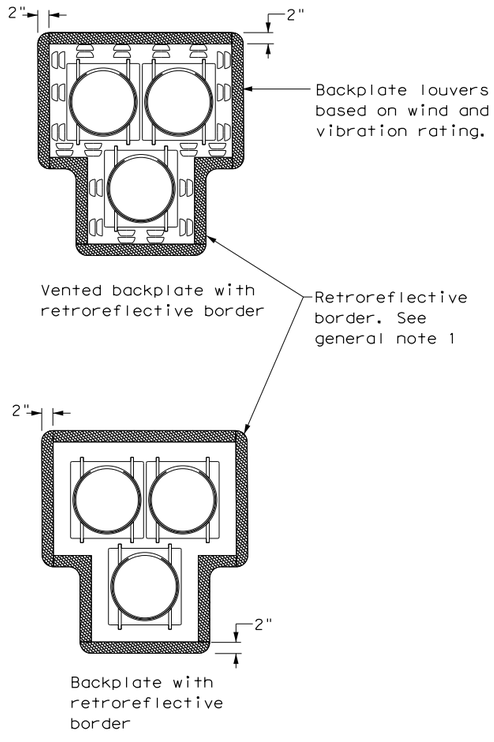


FIVE-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
CLUSTER



PEDESTRIAN HYBRID
BEACON

GENERAL NOTES:

1. Backplates are optional for traffic signals and pedestrian hybrid beacons. When backplates are used, a 2-inch wide fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 is required. Place on all approaches when used.
2. Signal head and backplate compatability must be verified by the contractor prior to installation.
3. When using backplates on signal heads, venting is preferred to reduce cyclic vibration stress.
4. When a vented backplate is used, the retroreflective border must not be placed over the louvers.
5. This standard sheet applies to all signal heads with backplates, including but not limited to:
   - Pole mounted
   - Overhead mounted
   - Span wire mounted
   - Mast arm mounted
   - Vertical signal heads
   - Horizontal signal heads
   - Clustered signal heads
   - Pedestrian hybrid beacons

Texas Department of Transportation

Traffic Safety Division Standard

TRAFFIC SIGNAL HEAD WITH BACKPLATE

TS-BP-20

FILE: ts-bp-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		41

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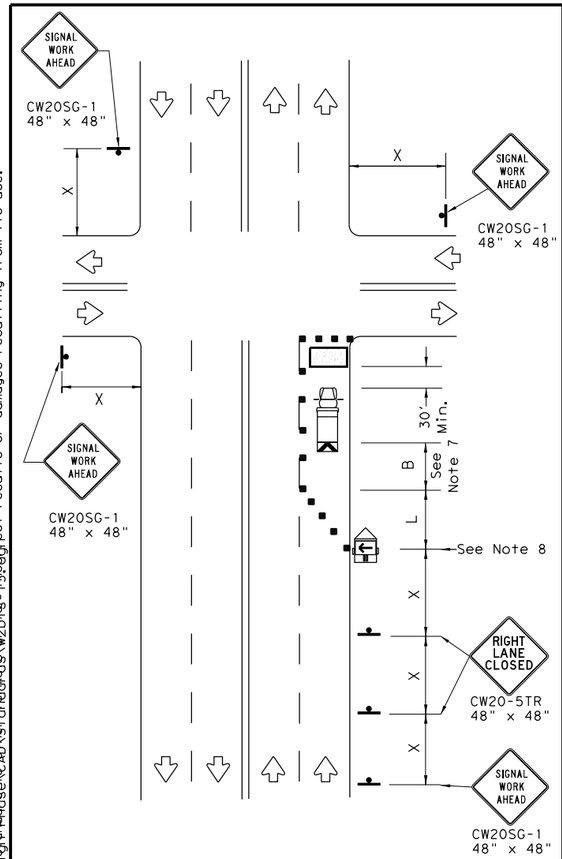
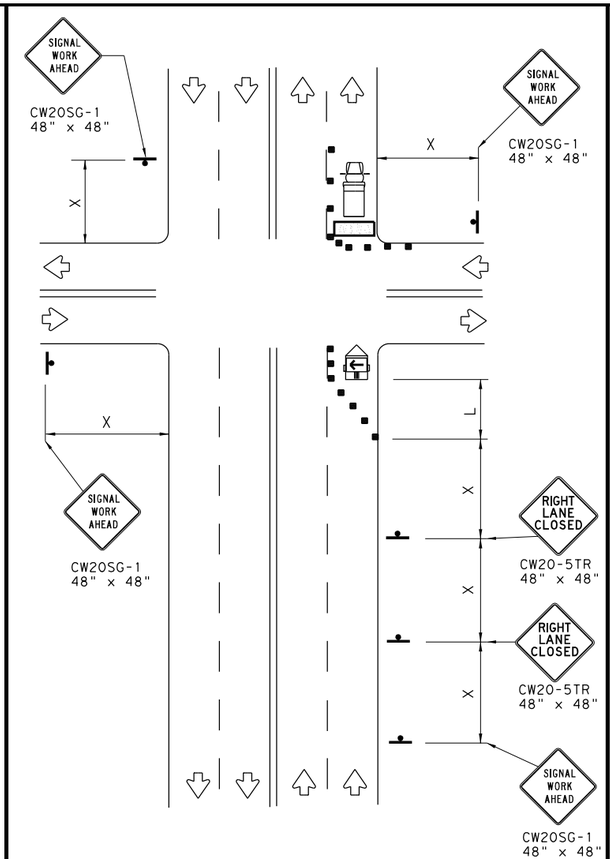


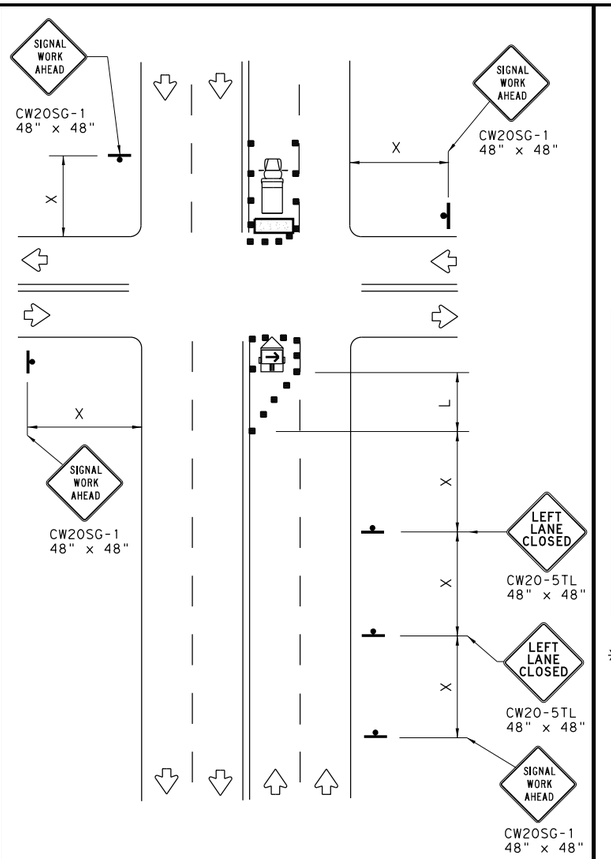
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



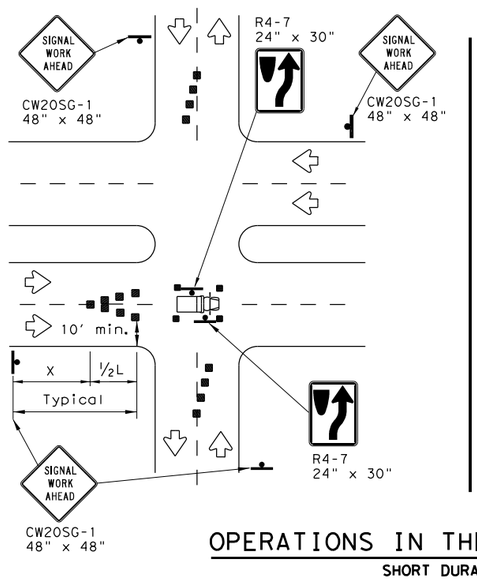
FAR SIDE RIGHT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



OPERATIONS IN THE INTERSECTION

SHORT DURATION

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.

GENERAL NOTES

1. The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
2. Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
3. Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
4. Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
5. High level warning devices (flag trees) may be used at corners of the vehicle.
6. When work operations are performed on existing signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1 and R1-3P) signs may be implemented when approved by the engineer.
7. For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the setup.
8. The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
9. Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

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©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
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4-98 3-03	HOU	HARRIS		42

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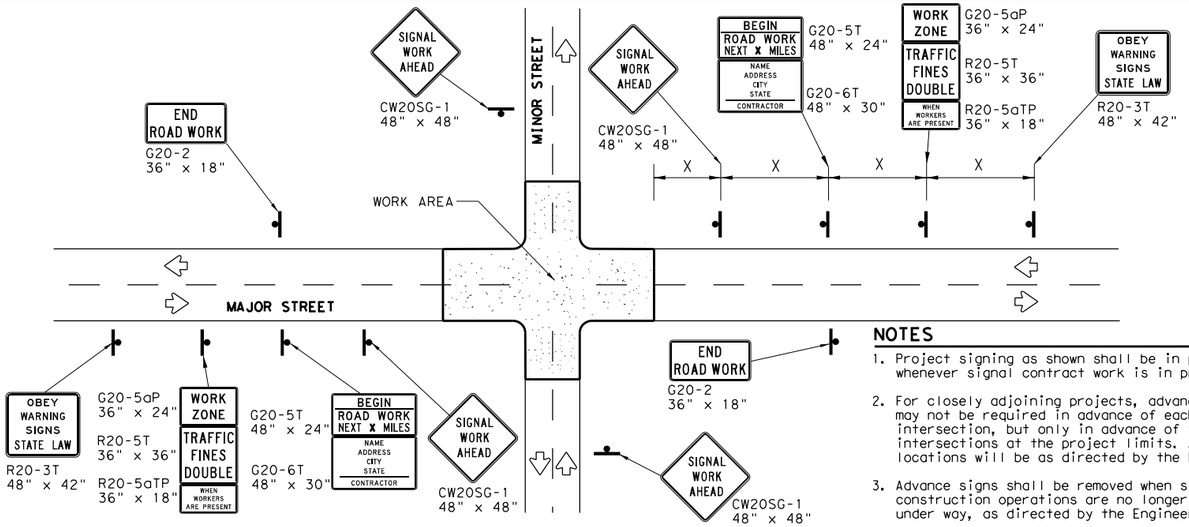


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

1. Project signing as shown shall be in place whenever signal contract work is in progress.
2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
4. Warning sign spacing shown is typical for both directions.
5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night without damaging the sign sheeting. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

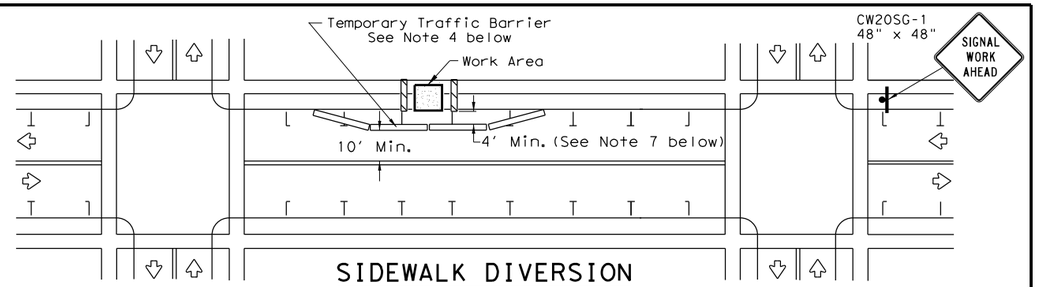
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber, such as tire inner tubes, shall not be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fastners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

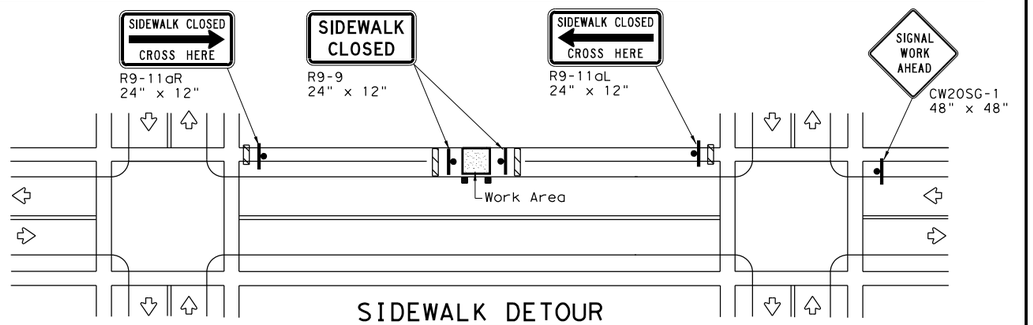
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL} SHEETING
WHITE	BACKGROUND	TYPE A SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

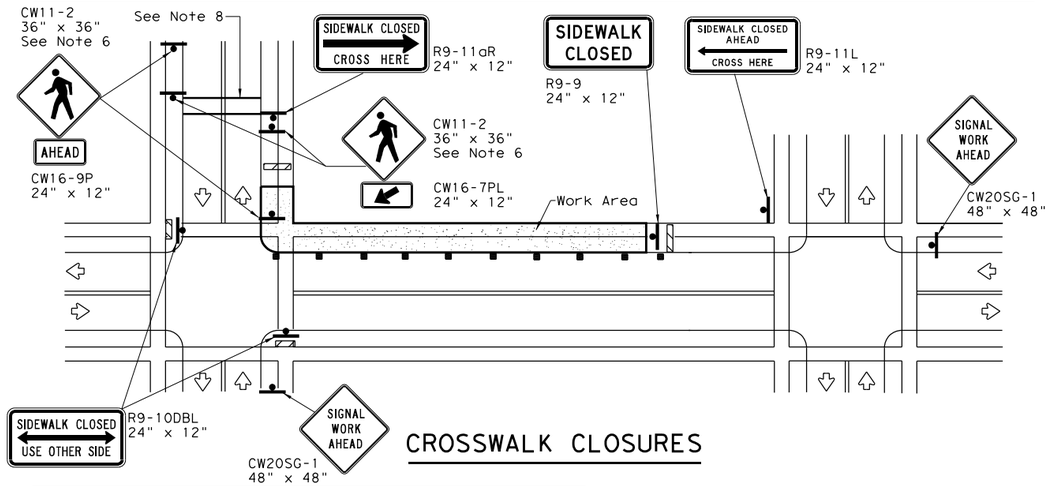
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

SHEET 2 OF 2

Texas Department of Transportation | Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS				FM 2920
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	HOU	HARRIS		43

115

SUMMARY OF TRAFFIC SIGNAL QUANTITIES							
TXDOT SPECS		DESCRIPTION	UNIT	TOTAL	COST PER UNIT (TXDOT 12MO AVG)	COST PER UNIT (RECOMMENDED)	TOTAL COST
ITEM NO.	DESC. CODE						
500	6001	MOBILIZATION	LS	1		$15,000.00	$15,000.00
502	6001	BARRICADES, SIGNS, AND TRAFFIC HANDLING	MO	2	$10,360.78	$10,500.00	$21,000.00
628	6145	ELC SRV TY D 120/240 060(NS)SS(E)SP(O)	EA	1	$7,585.90	$7,600.00	$7,600.00
644	6076	REMOVE SM RD SN SUP&AM	EA	1	$159.87	$160.00	$160.00
644	6078	REMOVE SM RD SN SUP&AM (SIGN ONLY)	EA	1	$121.17	$125.00	$125.00
666	6036	REFL PAV MRK TY I (W) 8" (SLD)	LF	155	$1.71	$1.75	$271.25
666	6048	REFL PAV MRK TY I (W) 24" (SLD)	LF	85	$10.65	$11.00	$935.00
666	6054	REFL PAV MRK TY I (W) (ARROW)	EA	1	$205.24	$210.00	$210.00
666	6078	REFL PAV MRK TY I (W) (WORD)	EA	1	$240.06	$240.00	$240.00
666	6225	PAVEMENT SEALER 6"	LF	1125	$0.63	$1.00	$1,125.00
666	6226	PAVEMENT SEALER 8"	LF	155	$0.73	$1.00	$155.00
666	6230	PAVEMENT SEALER 24"	LF	85	$2.82	$3.00	$255.00
666	6231	PAVEMENT SEALER (ARROW)	EA	1	$57.88	$60.00	$60.00
666	6232	PAVEMENT SEALER (WORD)	EA	1	$76.26	$80.00	$80.00
666	6321	REFL PAV MRK TY I (Y) 6" (SLD)	LF	1125	$1.21	$1.25	$1,406.25
672	6007	REFL PAV MRKR TY I-C	EA	7	$6.50	$6.50	$45.50
672	6009	REFL PAV MRKR TY II-A-A	EA	43	$7.86	$8.00	$344.00
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	1135	$1.08	$1.10	$1,248.50
677	6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	2	$85.31	$85.00	$170.00
678	6002	PAV SURF PREP FOR MRK (6")	LF	275	$0.41	$0.50	$137.50
678	6008	PAV SURF PREP FOR MRK (24")	LF	85	$2.26	$2.30	$195.50
678	6009	PAV SURF PREP FOR MRK (ARROW)	EA	1	$44.47	$45.00	$45.00
678	6016	PAV SURF PREP FOR MRK (WORD)	EA	1	$48.09	$50.00	$50.00
681	6001	TEMP TRAF SIGNALS	EA	1	$70,576.32	$71,000.00	$71,000.00
		** CONTROLLER, FULL-ACTUATED (POLE MOUNT W/ CABINET)	EA	1			
		** POLE, 40' WOOD	EA	4			
		** ROD 5/8" X 10' COPPER-CLAD GROUND (CONTROLLER ONLY)	EA	1			
		** LED LUMINAIRE HEAD-EQUIVALENT TO 250W (HPS)	EA	2			
		** MAST ARM, 8' LUMINAIRE	EA	2			
		** SCREW ANCHOR, 8'-10"	EA	4			
		** GUARD, GUY WIRE	LF	400			
		** 4G LTE ENABLED CELLULAR MODEM W/ ANTENNA AND POWER SUPPLY	EA	1			
		** DETECTOR UNIT (DUAL CHANNEL)	EA	1			
		** DETECTOR CARD RACK (8 SLOT)	EA	1			
		** 4G LTE CELLULAR MODEM	EA	1			
		** "LEFT ON GREEN ARROW ONLY" (30"X36") (R10-5)	EA	1			
		** STREET NAME SIGN, "FM 2920" (54"X18")	EA	1			
		** WIRE, 5/16" GALV. GUY (HIGH STRENGTH)	LF	480			
		** WIRE, 3/8" GALV. GUY (HIGH STRENGTH)	LF	480			
		** WIRE, 1/4" GALV. GUY (HIGH STRENGTH)	LF	480			
		** BACK PLATE W/REFL BRDR (3 SEC) (VENT) ALUM	EA	6			
		** BACK PLATE W/REFL BRDR (4 SEC) (VENT) ALUM	EA	1			
		** VEH SIG SEC (12 IN) LED (GRN)	EA	6			
		** VEH SIG SEC (12 IN) LED (GRN ARW)	EA	1			
		** VEH SIG SEC (12 IN) LED (YEL)	EA	6			
		** VEH SIG SEC (12 IN) LED (YEL ARW)	EA	1			
		** VEH SIG SEC (12 IN) LED (RED)	EA	6			
		** VEH SIG SEC (12 IN) LED(RED ARW)	EA	2			
		** TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	640			
		** TRAY CABLE (4 CONDR) (12 AWG)	LF	430			
		** ELEC CONDR (NO. 6) BARE	LF	50			
		** ELEC CONDR (NO.4) BARE	LF	50			
		** ELEC CONDR (NO.4) INSULATED	LF	100			
		** CONDT (PVC) (SCH 80) (2")	LF	100			
6185	6002	TMA (STATIONARY)	DAY	30	$303.85	$305.00	$9,150.00
6306	6001	VIVDS PROSR SYS	EA	1	$10,894.78	$11,000.00	$11,000.00
6306	6002	VIVDS CAM ASSY FXD LNS	EA	3	$5,107.13	$5,150.00	$15,450.00
6306	6005	VIVDS CNTRL SOFTWARE	EA	1	$1,539.68	$1,600.00	$1,600.00
6306	6007	VIVDS CABLING	LF	470	$3.29	$3.50	$1,645.00

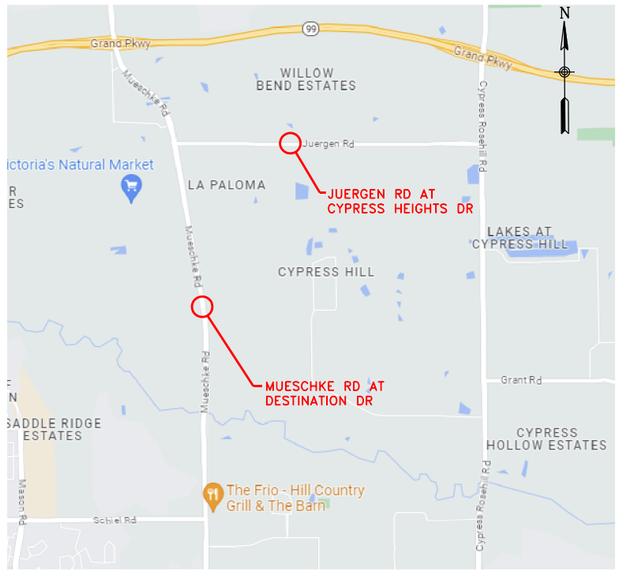
CONSTRUCTION PLANS FOR
TRAFFIC SIGNAL INSTALLATION AT:
MUESCHKE ROAD AT DESTINATION DRIVE &
JUERGEN ROAD AT CYPRESS HEIGHTS DRIVE

TS-02 - Mueschke Rd

WORK AT JUERGEN RD AT CYPRESS HEIGHTS DRIVE IS NOT PART OF THIS SCOPE OF WORK.

PREPARED FOR:

TOMBALL ISD
DESTINATION EXCELLENCE



NOVEMBER 2023

SHEET #	DESCRIPTION
1	TITLE SHEET AND INDEX
2A	EXPRESS REVIEW SHEET – HCED
2B	EXPRESS REVIEW SHEET – HCFCD
3	GENERAL NOTES FOR PRECINCT 3
4	GENERAL NOTES – PRIVATE UTILITIES
5	TRAFFIC SIGNAL BASIS OF ESTIMATE
6	EXISTING CONDITIONS – MUESCHKE RD AT DESTINATION DR
7	TRAFFIC SIGNAL LAYOUT – MUESCHKE RD AT DESTINATION DR
8	TRAFFIC SIGNAL LEGEND – MUESCHKE RD AT DESTINATION DR
9	TRAFFIC SIGNAL ELEVATIONS – MUESCHKE RD AT DESTINATION DR
10	SIGNING AND PAVEMENT MARKINGS – MUESCHKE RD AT DESTINATION DR
11	EXISTING CONDITIONS – JUERGEN RD AT CYPRESS HEIGHTS DR
12	TRAFFIC SIGNAL LAYOUT – JUERGEN RD AT CYPRESS HEIGHTS DR
13	TRAFFIC SIGNAL LEGEND – JUERGEN RD AT CYPRESS HEIGHTS DR
14	TRAFFIC SIGNAL ELEVATIONS – JUERGEN RD AT CYPRESS HEIGHTS DR
15	SIGNING AND PAVEMENT MARKINGS – JUERGEN RD AT CYPRESS HEIGHTS DR
16–38	STANDARD DETAIL DRAWINGS

VERIFICATION OF PRIVATE UTILITY LINES

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222

NOTICE:

For your safety, you are required by Texas Law to call 811 at lease 48 hours before you dig so that underground line can be marked. This Verification does not fulfill your obligation to call 811

Date

CenterPoint Energy/Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natudral gas lines correctly-not to be used for conflict verification.)
(gas service lines are not shown.)
Signature Valid for six months.

Date

CenterPoint Energy/UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature Valid for six months.

Date

Approved for AT&T TEXAS/SWBT underground conduit facilities only.
Signature valid for one year

UTILITY CONTACTS
CENTERPOINT ENERGY – ASHANA WEBSTER –
832-773-6080 – Ashana.Webster@centerpointenergy.com
AT&T – LAKEESHA UPCHURCH – 713-660-5328
COMCAST – MARGIE BLACKWELL – 281-624-3021

48 HOUR NOTICE:

CONTACT THE HARRIS COUNTY ENGINEERING DEPARTMENT - PERMIT OFFICE - 48 HOURS PRIOR TO THE START OF CONSTRUCTION OF UTILITIES OR PAVING WITHIN HARRIS COUNTY RIGHT-OF-WAY AT (713)-274-3931

CONSTRUCTION OF FACILITIES AND/OR PAVING WORK WITHIN PUBLIC RIGHT-OF-WAY

NOTIFICATIONS (PERMIT) ISSUED BY HARRIS COUNTY PUBLIC INFRASTRUCTURE DEPARTMENT - PERMITS OFFICE - IS REQUIRED FOR PROPOSED WORK WITHIN HARRIS COUNTY RIGHT-OF-WAY. THE PROJECT MUST BE APPROVED PRIOR TO OBTAINING THE REQUIRED NOTIFICATION. BE ADVISED THAT A NOTIFICATION MUST BE OBTAINED SEPARATELY FROM SITE DEVELOPMENT PERMIT PACKAGE. FOR ADDITIONAL INFORMATION, PLEASE VISIT HTTP://WWW.ENG.HCTX.NET/PERMITS/PUBLIC-REVIEW-CODE/PUBLIC-REVIEW/NOTIFICATION-OF-CONSTRUCTION-IN-THE-ROW OR CONTACT PUBLIC REVIEW INSPECTIONS DEPARTMENT @ (713)-274-3931

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
11/16/2023

SUBMITTED BY:

VOIGT ASSOCIATES, INC.
TBPE FIRM F-5333

ALL SHEETS DATED 11/16/23 FOR INTERIM REVIEW ONLY.
–DOCUMENT INCOMPLETE–
NOT INTENDED FOR PERMIT, BIDDING, OR CONSTRUCTION.

HARRIS COUNTY MAY HAVE EXISTING UNDERGROUND/OVERHEAD UTILITIES WITHIN THE PROPOSED PROJECT LIMITS. PLEASE CONTACT THE CALL CENTER AT (713) 881-3210, OR SUBMIT A WORK ORDER REQUEST THROUGH HTTP://WWW.ENG.HCTX.NET/SIGNALOUT TO OBTAIN FIELD LOCATES.

Approved: _____
HCPID – Permit Group
Flood Plain Management

1. PAVING

(FOR H.C. PUBLIC R.O.W. ONLY)

	DESIGN THICKNESS OF PAVING	STABILIZED SUBGRADE DEPTH	DESIGN STRENGTH OF CONCRETE	STEEL SPACING		REINFORCE STEEL SIZE
				LONG.	TRANS.	
CONCRETE	(IN.)	(IN.)	(PSI)	(IN.)	(IN.)	(#4 MIN.)

ASPHALT	DESIGN SURFACE COURSE THICKNESS	DESIGN SURFACE COURSE TYPE	DESIGN BASE COURSE THICKNESS	DESIGN BASE COURSE TYPE	STABILIZED SUBGRADE THICKNESS	STABILIZED SUBGRADE TYPE
	(IN.)	(MATERIAL)	(IN.)	(MATERIAL)	(IN.)	(MATERIAL)

DRIVEWAYS (in H.C. ROW only)

I. NUMBER OF DRIVEWAY APPROACHES PROPOSED INCLUDE WIDENING OR REPAVING EXISTING DRIVEWAYS AS WELL AS NEW DRIVEWAYS

DRWY	WIDTH	MATERIAL	CULVERT?	CULVERT LENGTH	NEAREST X-STREET	DIST. TO X-STREET
1						
2						
3						
4						
5						

II. HARRIS COUNTY STANDARD DRIVEWAY DETAIL APPEARS ON SHEET ____

FIRE APPARATUS ACCESS ROAD

☐ REQUIRED AND SHOWN ON SHEET(S) _____

☐ NOT REQUIRED DUE TO _____

CURBING

I. ISLANDS, MEDIANS AND ALL AREAS NOT TAKING DIRECT DRIVEWAY ACCESS REQUIRES STANDARD 6" CURBING

II. ☐ STANDARD 6" CURBING PROPOSED
☐ 4" x 12" CURBING PROPOSED EXCEPT AT MEDIANS AND ISLANDS

TRAFFIC CONSIDERATIONS

I. MEDIAN CUTS
☒ NO MEDIAN CUT OR RELOCATION IS PROPOSED
☐ MEDIAN MODIFICATIONS ARE SHOWN ON SHEET _____

II. LEFT / RIGHT TURN LANE
☒ NO LEFT / RIGHT TURN LANE IS PROPOSED
☐ LEFT / RIGHT TURN LANE IS SHOWN ON SHEET _____

III. TRAFFIC CONTROL PLAN
☐ NO WORK IN THE RIGHT OF WAY IS PROPOSED THAT WOULD INTERFERE WITH TRAFFIC FLOW
☒ TRAFFIC CONTROL SHOWN ON SHEET 34-36

IV. TRAFFIC SIGNAL
☐ NO TRAFFIC SIGNAL IS EXISTING / PROPOSED
☐ EXISTING TRAFFIC SIGNAL DEVICES (T.C. BOXES AND LOOPS) SHOWN ON SHEET _____
☒ PROPOSED TRAFFIC SIGNAL (BY OTHERS)

V. TRAFFIC IMPACT ANALYSIS
☐ NO TRAFFIC IMPACT ANALYSIS IS REQUIRED
☒ TRAFFIC IMPACT ANALYSIS HAS BEEN APPROVED ON DATE: 08/23
PLAN TITLE: TOMBALL ISD JUERGEN ROAD EDUCATIONAL COMPLEX
HCPID PROJECT NO.: _____

5. DESCRIPTION OF PROPERTY

I. LEGAL DESCRIPTION
A. ACREAGE: _____
B. ☐ SUBDIVISION: _____
☐ SURVEY & ABSTRACT: _____
C. ADJACENT ROADS: MUESCHKE ROAD AT DESTINATION DRIVE
JUERGEN ROAD AT CYPRESS HEIGHTS DRIVE

II. PLATTING
A. SUBDIVISION PLAT
☐ PROPOSED PLAT / REPLAT
☐ RECORDED PLAT / REPLAT
PLAT NAME: _____
B. STREETS PROPOSED
☒ PUBLIC
☐ PRIVATE
☐ PUBLIC & PRIVATE
☐ NONE

III. JURISDICTIONS
☐ CITY OF _____
☒ ETJ, CITY OF HOUSTON
☐ ETJ, CITY OF _____
☐ NO ETJ

IV. HCAD ACCOUNT NOS. (ALL) KEY MAP PAGE 326L

V. UNOBSTRUCTED VISIBILITY EASEMENT (U.V.E.)
☐ REQUIRED AND SHOWN ON SHEET(S) _____
☐ NOT REQUIRED

NOTE: ALL APPROVED, FINAL PLATS AND ASSOCIATED CPC101 FORMS MUST BE INCLUDED WITH PLAN SUBMITTAL.

☐ CONFORMING SUBDIVISION
☒ NON-CONFORMING SUBDIVISION
☐ PARTIALLY NON-CONFORMING SUBDIVISION

2. RESIDENTIAL / SUBDIVISION DRAINAGE

I. PROPOSED DRAINAGE SYSTEM TYPE
☐ STORM SEWER
☐ ROADSIDE DITCH
☐ LOW IMPACT DEVELOPMENT (LID)

II. DESIGN METHOD USED
☐ CITY OF HOUSTON ____ YEAR FREQUENCY
☐ OTHER: _____

III. DRAINAGE SYSTEM OUTFALLS DIRECTLY TO EXISTING
☐ DETENTION POND (APPROVED H.C. PRJ NO.): _____
DETENTION POND MAINTAINED BY: _____
☐ HCFCD DRAINAGE DITCH UNIT NO.: _____
☐ H.C. ROADSIDE DITCH (ROAD NAME): _____
☐ H.C. STORM SEWER (APPROVED H.C. PRJ NO.): _____

IV. H.C. OUTFALL CALCULATIONS
☐ ROADSIDE DITCH OUTFALL:
ALLOWABLE OUTFALL RATE: 0.0027 x _____ LF Frontage = _____ (CFS)
PROPOSED OUTFALL RATE: ____ (CFS), CALCULATIONS PROVIDED ON SHEET ___
☐ STORM SEWER OUTFALL
CAPACITY ALLOCATED TO TRACT FROM D. A. MAP: _____ (CFS)
FROM DRAINAGE AREA MAP DATED: _____
PREPARED BY: _____
APPROVED H.C. PROJECT NO.: _____
ACTUAL OUTFALL RATE: ____ (CFS), CALCULATIONS PROVIDED ON SHEET ___

V. DETENTION PROVIDED BY
☐ DETENTION BASIN IS PART THIS PLAN SET. SERVICE AREA MAP IS ON SHEET ___
☐ REGIONAL DETENTION BASIN SYSTEM (APPROVED H.C. PRJ NO.): _____

PROPOSED STORM SEWER IS SUBMERGED (AGREEMENT MUST BE PROVIDED).
STATIC W.S.E. @ OUTFALL IS _____

OFFSITE SHEET FLOW: (100 YEAR)

OFFSITE SHEET FLOW MAPPING, TOTAL DISCHARGE CALCULATIONS, AND DESIGN ACCOMODATIONS ARE SHOWN ON SHEET ____ OR, AS PRESENTED IN THE APPROVED DRAINAGE STUDY ENTITLED _____

TOTAL ACREAGE = ____
TOTAL DISCHARGE = ____

NOTE: ALL OFFSITE SHEET FLOW FROM ADJACENT PROPERTIES MUST BE IDENTIFIED AND PROPERLY ACCOUNTED FOR IN THE PROJECT. THE SIGNING ENGINEER HEREBY CERTIFIES THAT THESE AREAS HAVE BEEN ADDRESSED.

6. STORMWATER QUALITY

I. SWPPP: CONSTRUCTION MEASURES. (Complete for ALL projects)
☐ DISTURBS >1AC. SITE PLAN & DETAILS ON SHEET(S)_____
☒ DISTURBS <1AC. N/A

II. APPLICABILITY FOR PERMANENT FEATURES. (must be completed on all projects)
EXEMPT NEW DEVELOPMENT:
☐ PROJECT IS ON A PARCEL (A COMMON PLAN OF DEVELOPMENT) LESS THAN 5 ACRES. (must be verified with plat)
EXEMPT REDEVELOPMENT:
☒ PROJECT DOES NOT MEET THE DEFINITION OF SIGNIFICANT REDEVELOPMENT (Part A, Sec. 2.39 of Regulations of Harris County, Texas for Stormwater Quality Management)
EXEMPT GRANDFATHERED:
☐ PROJECT'S DRAINAGE TIES DIRECTLY INTO AN EXISTING DRAINAGE SYSTEM PRIOR TO OCTOBER 1, 2001.
(FOR VERIFICATION: PROVIDE ORIGINAL DRAINAGE AREA MAP INCLUDING CALCULATIONS)
GENERAL:
☒ PROJECT'S SWQ REQUIREMENTS FALL WITHIN THE JURISDICTION OF: HARRIS COUNTY
☐ STORMWATER QUALITY PERMIT REQUIREMENT IS COVERED BY AN EXISTING SWQMP WITHIN PROJECT TITLE: _____
HARRIS COUNTY PROJECT NO. _____ & SWQ PERMIT NO. _____
STORMWATER QUALITY MANAGEMENT PLAN:
☐ SITE PLAN ON SHEET(S) _____

III. PERMANENT SWQ FEATURES. (COMPLETE IF NOT EXEMPT)
☐ VEGETATIVE CONTROLS USED: (FILTER STRIP, GRASSY SWALE, URBAN FORESTRY) DETAILS AND CALCULATIONS APPEAR ON SHEET(S) _____
☐ POND STRUCTURE USED (WET, DRY, WETLANDS) DETAILS AND CALCULATIONS APPEAR ON SHEET(S) _____
☐ HYDRODYNAMIC TYPE SEPARATOR MODEL: _____
☐ OTHER(S): _____

3. COMMERCIAL / OTHER SITE DRAINAGE

I. PROPOSED DRAINAGE AREA
☒ NEW DEVELOPMENT AREA: _____
☐ RE-DEVELOPMENT AREA (NET NEW DEVELOPED AREA): _____
☐ LOW IMPACT DEVELOPMENT (LID)

II. DETENTION VOLUME
NEW AREA _____ X ____ * = _____ ACRE FEET
DETENTION REQUIRED
* ☐ .65 (CHANNEL)
* ☐ .75 (STM SWR)
* ☐ 1.00 (RD. DITCH)
* ☐ OTHER: ____
PROPOSED DETENTION VOLUME = _____ ACRE FEET
PROPOSED DETENTION VOLUME CALCULATIONS ARE SHOWN ON SHEET _____
DETENTION VOLUME PROVIDED BY EXISTING DETENTION POND
APPROVED H.C. PROJECT NO.: _____
DETENTION POND SERVICE AREA MAP IS PROVIDED ON SHEET ____

III. OUTFALL
OUTFALL TO ☐ H.C. ROADSIDE DITCH
☐ EXISTING H.C. STORM SEWER
☐ OTHER _____
☐ ROADSIDE DITCH OUTFALL:
ALLOWABLE OUTFALL RATE: 0.0027 x _____ LF Frontage = _____ (CFS)
PROPOSED OUTFALL RATE: ____ (CFS), CALCULATIONS PROVIDED ON SHEET ___
☐ STORM SEWER OUTFALL
CAPACITY ALLOCATED TO TRACT FROM D. A. MAP: _____ (CFS)
FROM DRAINAGE AREA MAP DATED: _____
PREPARED BY: _____
APPROVED H.C. PROJECT NO.: _____
ACTUAL OUTFALL RATE: ____ (CFS), CALCULATIONS PROVIDED ON SHEET ___

IV. PUMPED DETENTION FACILITIES
VOLUME THAT GRAVITY FLOWS: _____ ACRE FEET
VOLUME THAT IS PUMPED: _____ ACRE FEET
ENTRANCE VELOCITY INTO ROADSIDE DITCH OR STORM SEWER: _____
PUMP SPECIFICATIONS AND AUTOMATIC SHUTOFF PLAN FOR ROADSIDE DITCH & STORM SEWER OUTFALLS APPEAR ON SHEET _____

V. FLOW RESTRICTOR SIZE
OUTFALL PIPE SIZE: _____
RESTRICTOR PIPE SIZE: _____

NOTE: ALL ROADSIDE DITCH OUTFALLS REQUIRE EROSION CONTROL MEASURES. RIPRAP IS NOT ALLOWED AS AN EROSION CONTROL MEASURE IN HARRIS COUNTY ROW. ALL PUMPED DETENTION OUTFALLS TO ROADSIDE DITCHES REQUIRE MANHOLE W/ LEADS.

7. FLOOD PLAIN STATUS

I. GENERAL INFORMATION
FIRM PANEL(S) FOR PROPERTY: 48201C0215L
FIRM PANEL(S) DATE: 6/18/2007
STATUS OF PROPERTY ON MAP
☒ ENTIRELY LOCATED IN UNSHADED ZONE "X".
☐ LOCATED PARTIALLY OR ENTIRELY IN ANY "A" ZONE OR SHADED ZONE "X". DELINEATE FLOODPLAIN BOUNDARY ON CONSTRUCTION DRAWINGS
(DRAINAGE LAYOUT PG. NO._____) (1% BASE FLOOD LEVEL_____)
(0.2% BASE FLOOD LEVEL_____)
☐ SITE REMOVED FROM FLOODPLAIN BY LOMR, LOMR-F, LOMA
CASE NO._____ REVISED FLOODPLAIN IS SHOWN ON SHEET____

ELEVATION INFORMATION
BENCHMARK USED
☒ HARRIS COUNTY FLOODPLAIN REFERENCE MARK
☐ HARRIS-GALVESTON COASTAL SUBSIDENCE DISTRICT BENCHMARK (FOR COASTAL AREAS)
DESCRIPTION OF BENCHMARK INCLUDING ELEVATION, DATUM AND YEAR OF ADJUSTMENT (2001 ADJ.) RM 110985,110975,110970
From the intersection of US 290 and Mueschke Road, North along Mueschke 3.0 miles to bridge, and benchmark on the right side. ELEV=173.03

II. FLOOD PLAIN DETERMINATION BASED ON GROUND ELEVATION
☐ PROPERTY LIES ENTIRELY ABOVE THE BASE FLOOD LEVEL AND IN SHADED ZONE "X"
☐ PROPERTY LIES PARTIALLY OR ENTIRELY BELOW THE BASE FLOOD LEVEL

III. FLOODPLAIN STORAGE SUMMARY (APPLIES ONLY TO PORTION OF LAND LOCATED WITHIN FLOODPLAIN AS DELINEATED BY FIRM PANEL).
A. TOTAL VOLUME OF MATERIAL PROPOSED TO BE MOVED OR PLACED WITHIN THE FIRM DELINEATED FLOODPLAIN (SOIL, BASE, CONCRETE, ASPHALT, ETC.):
BELOW 0.2% BASE FLOOD ELEVATION _____ (2001 ADJ.) _____ CUBIC YARDS
B. TOTAL VOLUME OF MATERIAL PROPOSED TO BE REMOVED FROM THE FIRM DELINEATED FLOODPLAIN:
BELOW 0.2% BASE FLOOD ELEVATION _____ (2001 ADJ.) _____ CUBIC YARDS
C. FILL AREA & VOLUME CALCULATIONS ARE SHOWN ON SHEET _____

IV. ☐ LOMR REQUIRED ☐ CLOMR REQUIRED VERIFIED BY: _____

8. CURB RAMPS

A. ARE CURB RAMPS THAT CONNECT TO PUBLIC STREETS PROPOSED IN THIS SET OF PLANS? ☒ YES [ ] NO

9. LANDSCAPING

☐ REQUIRED AND SHOWN ON SHEET(S) _____
☒ NOT REQUIRED

4. WATER AND WASTEWATER

I. COMMERCIAL PROJECTS

DOES PROPERTY HAVE EXISTING AND/OR PROPOSED UTILITIES?
☐ YES ☐ NO

IF YES, CHECK THE BOX THAT APPLIES TO THIS PROJECT
☐ PUBLIC WATER & SANITARY
☐ PRIVATE WATER WELL & SEPTIC SYSTEM
☐ PUBLIC WATER & PRIVATE SEPTIC SYSTEM
☐ PRIVATE WATER WELL & PUBLIC SANITARY

NOTE: PUBLIC UTILITIES REQUIRE A LETTER FROM THE DISTRICT/ MUNICIPALITY AUTHORIZING SERVICE & CONNECTION. THIS IS REQUIRED FOR PLAN APPROVAL.

UTILITY DISTRICT/MUNICIPALITY NAME: _____

NOTE: SEPTIC SYSTEMS REQUIRE H.C. WASTE WATER REVIEW

H.C. SEPTIC PERMIT/REQUEST NO. _____

NOTE: ALL EXISTING AND PROPOSED UTILITIES MUST BE ACCURATELY SHOWN & LABELED ON THE SITE PLANS.

II. SUBDIVISION PROJECTS

☐ UTILITY DISTRICT/MUNICIPALITY NAME: _____
☐ PRIVATE WATER & WASTE WATER SYSTEMS
☐ PRIVATE WATER & INDIVIDUAL OSSF
☐ INDIVIDUAL WATER WELL & OSSF

NOTE: A COPY OF TCEQ APPROVAL FOR PRIVATE WATER & WASTE WATER SYSTEMS IS REQUIRED FOR PLAN APPROVAL.

*NOTE: DEDICATED UNDERGROUND FIRE LINES MUST BE SUBMITTED TO THE HARRIS COUNTY FIRE PROTECTION GROUP FOR REVIEW AND PERMITTING BY THE UNDERGROUND FIRE LINE CONTRACTOR. CIVIL REIVEW DOES **NOT** REVIEW OR APPROVE UNDERGROUND FIRE LINES FOR THE FIRE PROTECTION SYSTEMS.*

WASTEWATER TREATMENT PLANTS

H.C. WWTP REVIEW:

IS THIS PROPOSED PROJECT A NEW WWTP SITE OR A REHAB/EXPANSION OF AN EXISTING WWTP SITE? YES ☐ NO ☐

IF YES, IS A HARRIS COUNTY DOMESTIC WASTEWATER TREATMENT PLANT EXPRESS REVIEW SHEET ATTACHED AND COMPLETED ACCORDING TO INSTRUCTIONS? YES ☐ NO ☐

REFER TO:
WWW.ENG.HCTX.NET/PERMITS/WASTEWATER/REGULATIONS-STANDARDS-DETAILS FOR DOMESTIC WWTP ERS FORM

10. PERMITS REQUIRED

DOES THE PROPERTY HAVE ANY VIOLATIONS? IF SO PLEASE PROVIDE ALL VIOLATION NUMBERS. _____

☐ STORM WATER QUALITY
☐ SEPTIC (EXISTING) ☐ SEPTIC (PROPOSED)
☐ CIVIL SITE WORK (PHASE II PERMIT CLASS I (non-floodplain))
☐ CIVIL SITE WORK (PHASE II PERMIT CLASS II (floodplain))
☐ DRIVEWAY WITH CULVERT _____ CURB AND GUTTER _____
☐ BUILDING PERMITS (NO. OF BUILDINGS = _____) ☐ CRITICAL FACILITY
☐ SUBDIVISION INFRASTRUCTURE PHASE II (NO. OF LOTS = _____)
☐ NOTICE OF DETENTION AFFIDAVIT REQUIRED
☐ MUD MAINTENANCE AGREEMENT REQUIRED
NOTES: _____

WORK IN HARRIS COUNTY R.O.W.

☐ UTILITY WORK _____
☐ TURN LANE _____
☒ OTHER CONSTRUCTION **PROPOSED TRAFFIC SIGNAL, ADA RAMPS, ETC**

NOTES:
A PERMIT IS REQUIRED FOR EACH SCOPE OF WORK ON SITE.
A R.O.W. NOTIFICATION IS REQUIRED FOR EACH SCOPE OF WORK IN HC OR HCFCD ROW.
REFER TO www.eng.hctx.net/permits FOR EACH SCOPE OF WORK IN HC OR IN HCFCD ROW.

BENCHMARK REQUIREMENTS FOR PROPOSED BRIDGES AND OR NEW RESIDENTIAL SUBIDIVISIONS

When the County Engineer has determined that a new benchmark will be required to be established for the proposed project, the developer shall be required to install a benchmark per section 8.0, part 2 of the Harris County Infrastructure Regulations.

Is a new Benchmark required for this project? (*to be determined by Harris County*) [__] yes [__] no

If a new Benchmark is required, the proposed benchmark information is shown on sheets ____

FOR PROJECTS LOCATED IN ANY FLOODPLAIN

Development constructed or placed in accordance with these plans will comply with all provisions of the Regulations of Harris County, Texas for Floodplain Management.
No net fill is allowed in the flood plain and no fill is allowed in the floodway.
FOUNDATION NOTES: (*Applies to only buildings or building additions requiring a class II permit*)
All water heaters, furnaces, air conditioning units, electrical distribution panels, and any other mechanical or electrical equipment must be elevated in accordance with Section 4.05 of Harris County Floodplain regulations.
Any electrical circuit serving a light switch or outlet located below the base (100-year) flood elevation shall be dropped from above and be on a separate breaker.
All materials used below the (100-year) base flood elevation are on approved FEMA Technical Bulletin 2-08 as Class 5 water-resistant, and approved in accordance with FEMA Technical Bulletin 1-08 for foundation openings.
Critical facilities located in the 0.2% or 500yr floodplain or 1% or 100yr floodplain shall have the lowest floor elevated to 3 feet or more above the 0.2% flood elevation, or 24 inches above the crown of the adjacent road, which ever results in a higher elevation.
Floodproofing and sealing measures must be taken to ensure that toxic substances will not be displaced by or released into floodwaters.
Access routes elevated to or above the level of the base flood shall be provided to all critical facilities to the extent possible.
A completed as-built certificate must be submitted after the structure is complete and before it is occupied.
The County Engineer's Office will post a final inspection notice on the structure once all requirements have been met.
No fill may be used to elevate structures in the 1% or 100yr flood plain. Structures may be constructed on an open foundation, such as piers, or on continuous foundation walls with properly sized and located openings. All foundations are required to be designed by a registered professional engineer.
All structures shall be designed to withstand a three second gust basic wind speed of 120mph.
*Completed ***Elevation Certificates** to be submitted: one at permitting, a second after the slab is poured or sub-floor is installed and before the framing starts, and a third is required once construction is finished. *(PER CURRENT FIRM PANEL) to the Harris County Engineering Department, 10555 Northwest Freeway, Suite 120, Houston, TX 77092*

TRAFFIC SIGNAL FOR THE INTERSECTION OF MUESCHKE ROAD AT DESTINATION DRIVE

TRAFFIC SIGNAL FOR THE INTERSECTION OF JUERGEN ROAD AT CYPRESS HEIGHTS DRIVE

HARRIS COUNTY ENGINEERING DEPARTMENT - PERMIT OFFICE NOTE:

THE PERMIT MANAGER SIGNATURE REPRESENTS THE FOLLOWING:
- THE COMPLETION OF REVIEW OF THESE PLANS
- INTERPOSE NO OBJECTION TO THE PROPOSED DESIGN ON PRIVATE PROPERTY
- APPROVAL OF WORK IN HARRIS COUNTY MAINTAINED RIGHT OF WAY
- APPROVAL OF WORK IN PROPOSED HARRIS COUNTY RIGHT OF WAY THAT IS TO BE ACCEPTED BY THE COUNTY

HCED SIGNATURE BLOCK:

THE PROJECT WAS REVIEWED, HOWEVER, THIS DOES NOT MEAN THE ENTIRE PROJECT, INCLUDING ALL SUPPORTING DATA AND CALCULATIONS HAVE BEEN COMPLETELY CHECKED AND VERIFIED. THESE DRAWINGS ARE SIGNED, DATED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS, WHICH THEREFORE CONVEYS THE ENGINEER'S RESPONSIBILITY AND ACCOUNTABILITY. THIS DOES NOT RELIEVE ANY PARTY FROM COMPLYING WITH APPROPRIATE FEDERAL, STATE AND LOCAL ENVIRONMENTAL RULES, LAWS, AND REGULATIONS AND ANY OTHER LEGALLY ADOPTED REGULATION OR ORDINANCE RELATED TO LAND DEVELOPMENT. IF THE CITY SIGNATURES ARE REQUIRED BY ORDINANCE, COUNTY PERMITS WILL NOT BE ISSUED UNTIL SUCH SIGNATURES ARE OBTAINED. PLAN APPROVAL EXPIRATION TO BE IN ACCORDANCE WITH LOCAL GOVERNEMENT CODE CH. 245.

ENGINEER'S CERTIFICATION

I, ANTHONY VOIGT, A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THE INFORMATION PRESENTED ON THIS SHEET IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND THAT I AM NOT VIOLATING ANY PROVISION OF THE CURRENT TEXAS ENGINEERING PRACTICE ACT AND RULES CONCERNING THE PRACTICE OF ENGINEERING AND PROFESSIONAL ENGINEERING LICENSURE. I CERTIFY TO THE BEST OF MY KNOWLEDGE THAT THE PLANS IN THEIR ENTIRETY ARE DESIGNED PER THE HARRIS COUNTY ENGINEERING STANDARDS, REGULATIONS, AND GUIDELINES UNLESS PROVIDED A VARIANCE BY THE COUNTY ENGINEER OR HIS DESIGNEE. SHOULD IT BE DEEMED BY HCED STAFF, THAT THE PLANS DO NOT MEET THE COUNTY'S STANDARDS, REGULATIONS AND GUIDELINES AND DID NOT RECEIVE AN APPROVED VARIANCE, THE APPROVAL OF SAID PLANS BECOMES NULL AND VOID AND THE DESIGN PLANS MUST BE CORRECTED AT NO CHARGE TO THE COUNTY.

THE COMPLETED PROJECT CONSISTS OF DRAWING SHEETS 01 THRU 38 .

SIGNATURE _____ DATE 11/16/2023

SEAL: STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER

REVISIONS

NOTE: REVISION BLOCK IS TO BE USED ONLY FOR CHANGES MADE AFTER PLANS HAVE BEEN APPROVED BY HARRIS COUNTY. 11/16/2023

DATE	SHEET NO.	DESCRIPTION	P.E. INITIAL	H.C. APPROVED DATE

HC PROJECT NO. 2306280079 HCFCD PROJECT NO.

SHEET NUMBER 02A OF 38

HARRIS COUNTY
ENGINEERING DEPARTMENT
REVIEW SHEET

VERSION 20.0 MAY 27, 2020

1. PROPERTY DESCRIPTION

I. LOCATION INFORMATION

A. HARRIS COUNTY COMMISSIONER'S PRECINCT:
☐ 1 ☐ 2 ☐ 3 ☐ 4

B. KEY MAP: 326L

C. ADDRESS: MUESCHKE RD AT DESTINATION DR; JUERGEN RD AT CYPRESS HEIGHTS DR

II. LEGAL DESCRIPTION

A. ACREAGE: _____

B. ☐ SUBDIVISION: _____

☐ SURVEY & ABSTRACT: _____

C. ADJACENT ROADS: MUESCHKE RD & JUERGEN RD

III. PLATTING

A. SUBDIVISION PLAT
☐ PROPOSED PLAT / REPLAT
☐ RECORDED PLAT / REPLAT

PLAT NAME: _____

B. STREETS PROPOSED
☐ PUBLIC
☐ PRIVATE
☐ PUBLIC & PRIVATE
☐ NONE

IV. JURISDICTIONS

☐ CITY OF _____
☒ ETJ, CITY OF HOUSTON
☐ ETJ, CITY OF _____
☐ NO ETJ
☐ UTILITY DISTRICT (NAME)_____

V. HCAD ACCOUNT NOS. (ALL)

_____

2. SITE DETENTION DRAINAGE

I. PROPOSED DRAINAGE AREA

☐ NEW DEVELOPMENT AREA: _____
☐ RE-DEVELOPMENT AREA (AMOUNT INCREASED IMPERVIOUS AREA): _____
☐ LOW IMPACT DEVELOPMENT (LID)
METHOD/DESCRIPTION _____

II. METHODOLOGY

HCFCD PCPM DETENTION METHOD USED:
☐ METHOD 1 (LESS THAN 20 ACRES)
☐ METHOD 2 (20 ACRES TO 640 ACRES)
☐ METHOD 3 (GREATER THAN 640 ACRES)
☐ OTHER _____

III. DETENTION VOLUME & OUTFALL

OUTFALL TO:
☐ .65, H.C.F.C.D. CHANNEL, (H.C.F.C.D. UNIT NO.) _____
☐ .75, EXISTING STORM SEWER (OWNER & OPERATOR) _____
☐ 1.00, ROADSIDE DITCH, (OWNER & ROAD NAME) _____
☐ OTHER (OWNER & OPERATOR) _____

IV. STORMWATER DETENTION BASIN INFORMATION

A. HCFCD PCPM SUMMARY TABLE SEE SHEET _____ OF THESE PLANS.

DETENTION BASIN SERVICE AREA		acres	
STORM EVENT	50% EXCEEDANCE (2-YEAR)	10% EXCEEDANCE (10-YEAR)	1% EXCEEDANCE (100-YEAR)
MAXIMUM ALLOWABLE OUTFLOW (PRE-DEVELOPMENT PEAK FLOW)			
MAXIMUM OUTFLOW PROVIDED (PEAK FLOW FROM BASIN)			
LOWEST NATURAL/FINISHED GROUND OR FINISHED FLOOR ELEVATION ESTIMATE			
DESIGN WATER SURFACE ELEVATION			
MINIMUM STORAGE REQUIRED (ac-ft)			
DETENTION STORAGE PROVIDED (ac-ft)			
STORAGE RATE PROVIDED (ac-ft/ac)			
OUTFLOW VELOCITY INTO CHANNEL (ft/sec)			
DRAIN TIME - 1% ONLY (hours)			
EMERGENCY OVERFLOW (TYPE, SIZE, ELEVATION, ETC.)			

B. DETENTION BASIN TO BE MAINTAINED BY _____

C. DETENTION SERVICE AREA MAP ON SHEET _____

D. ADDITIONAL CRITERIA FOR PUMPED DETENTION BASINS
VOLUME OF PUMPED 1% EXCEEDANCE STORAGE VOLUME = _____ ACFT _____ % OF TOTAL VOLUME
MAXIMUM DESIGN OUTFLOW VELOCITY INTO HCFCD CHANNEL = _____ FT/SEC
DRAIN TIME FOR BASIN = _____ HOURS BASED ON _____HEAD CONDITIONS

V. DETENTION PROVIDED IN OTHER PLANS:

HCFCD PROJECT No. _____ DATE SIGNED BY HCFCD: _____
PLAN TITLE _____
DETENTION POND SERVICE AREA MAP IS PROVIDED ON SHEET _____
ENGINEERING FIRM _____
DETENTION BASIN MAINTAINED BY: _____

VI. FLOW RESTRICTOR SIZE

OUTFALL PIPE SIZE: _____
RESTRICTOR PIPE SIZE: _____
RESTRICTOR PLATE DIMENSION: _____

VII. DETENTION PROVIDED BY

☐ REGIONAL DETENTION BASIN SYSTEM (APPROVED H.C. PRJ NO.): _____

FOR PROJECTS LOCATED IN ANY FLOODPLAIN
Development constructed or placed in accordance with these plans will comply with all provisions of the designated Floodplain Administrator.
No net fill is allowed in the flood plain and no fill is allowed in the floodway.

3. SWQ DISCHARGE INTO FCD FACILITY

I. SWPPP: CONSTRUCTION MEASURES. (Must complete)

☐ DISTURBS >1AC. SITE PLAN & DETAILS ON SHEET(S) _____
☐ DISTURBS <1AC. N/A

*II. APPLICABILITY FOR PERMANENT FEATURES. (Must complete)

EXEMPT NEW DEVELOPMENT:
☐ PROJECT IS ON A PARCEL (A COMMON PLAN OF DEVELOPMENT) LESS THAN 5 ACRES. (Must be verified with plat)

EXEMPT REDEVELOPMENT:
☐ PROJECT DOES NOT MEET THE DEFINITION OF SIGNIFICANT REDEVELOPMENT (Part A,Sec. 2.39 of Regulations of Harris County, Texas for Stormwater Quality Management)

EXEMPT GRANDFATHERED:
☐ PROJECT'S DRAINAGE TIES DIRECTLY INTO AN EXISTING DRAINAGE SYSTEM PRIOR TO OCTOBER 1, 2001.
(FOR VERIFICATION: PROVIDE ORIGINAL DRAINAGE AREA MAP INCLUDING CALCULATIONS)

GENERAL:
☐ PROJECT'S SWQ REQUIREMENTS FALL WITHIN THE JURISDICTION OF: _____
☐ STORMWATER QUALITY PERMIT REQUIREMENT IS COVERED BY AN EXISTING SWQMP WITHIN PROJECT TITLE: _____
HARRIS COUNTY PROJECT No _____ & SWQ PERMIT No.

STORMWATER QUALITY MANAGEMENT PLAN:
☐ SITE PLAN ON SHEET(S)

III. PERMANENT SWQ FEATURES. (COMPLETE IF NOT EXEMPT)

☐ VEGETATIVE CONTROLS USED: (FILTER STRIP, GRASSY SWALE, URBAN FORESTRY DETAILS AND CALCULATIONS APPEAR ON SHEET(S) _____
☐ POND STRUCTURE USED (WET, DRY, WETLANDS) DETAILS AND CALCULATIONSAPPEAR ON SHEET(S)_____
☐ HYDRODYNAMIC TYPE SEPARATOR MODEL: _____
☐ OTHER(S): _____

4. FLOOD PLAIN STATUS

I. GENERAL INFORMATION

FIRM PANEL(S) FOR PROPERTY: 110980R
FIRM PANEL(S) DATE: 7/27/2014

STATUS OF PROPERTY ON MAP
☐ ENTIRELY LOCATED IN UNSHADED ZONE "X"
☐ LOCATED PARTIALLY OR ENTIRELY IN ANY "A" ZONE OR SHADED ZONE "X", DELINEATE FLOODPLAIN BOUNDARY ON CONSTRUCTION DRAWINGS (DRAINAGE LAYOUT PG. NO._____) (1% BASE FLOOD LEVEL_____)
(0.2% BASE FLOOD LEVEL_____)

☐ SITE REMOVED FROM FLOODPLAIN BY LOMR, LOMR-F, LOMA CASE NO._____ REVISED FLOODPLAIN IS SHOWN ON SHEET____

ELEVATION INFORMATION
BENCHMARK USED RM 110985,110975,110970
☐ HARRIS COUNTY FLOODPLAIN REFERENCE MARK
☐ HARRIS-GALVESTON COASTAL SUBSIDENCE DISTRICT BENCHMARK (FOR COASTAL AREAS)
DESCRIPTION OF BENCHMARK INCLUDING ELEVATION, DATUM AND YEAR OF ADJUSTMENT (2001 ADJ.) From the intersection of US 290 and Mueschke Road, North along Mueschke 3.0 miles to bridge, and benchmark on the right side. ELEV=173.03

II. FLOOD PLAIN DETERMINATION BASED ON GROUND ELEVATION

☐ PROPERTY LIES ENTIRELY ABOVE THE BASE FLOOD LEVEL AND IN SHADED ZONE "X"
☐ PROPERTY LIES PARTIALLY OR ENTIRELY BELOW THE BASE FLOOD LEVEL

III. FLOODPLAIN STORAGE SUMMARY

(APPLIES ONLY TO PORTION OF LAND LOCATED WITHIN FEMA REGULATORY FLOODPLAIN).

A. TOTAL VOLUME OF MATERIAL PROPOSED TO BE MOVED OR PLACED WITHIN THE FIRM DELINEATED FLOODPLAIN (FILL, BASE, CONCRETE, ASPHALT, ETC.): BELOW 0.2% BASE FLOOD ELEVATION (2001 ADJ.) _____ CUBIC YARDS _____

B. TOTAL VOLUME OF MATERIAL PROPOSED TO BE REMOVED FROM THE FIRM DELINEATED FLOODPLAIN: BELOW 0.2% BASE FLOOD ELEVATION (2001 ADJ.) _____ CUBIC YARDS _____ INCLUDING CALCULATIONS)

C. FILL AREA & VOLUME CALCULATIONS ARE SHOWN ON SHEET _____

5. WORK IN HCFCD RIGHT-OF-WAY

I. TYPE OF WORK TO BE PERFORMED IN HCFCD HCFCD ROW

A. BOND/NOTIFICATION INFORMATION
☐ HCFCD WATERSHED _____
☐ HCFCD UNIT No. _____
☐ NUMBER OF OUTFALLS _____
☐ UTILITY CROSSING
☐ ROADWAY BRIDGE/CULVERT CROSSING
☐ FILL ACTIVITY
☐ REHABILITATION OF CHANNEL
☐ MAINTENANCE
☐ TEMPORARY CROSSING
☐ TRAIL (LENGTH) _____
☐ OTHER _____
COST OF WORK IN HCFCD ROW _____

II. USACE ENVIRONMENTAL PERMIT

☐ US ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT NUMBER(S) _____
☐ US ARMY CORPS OF ENGINEERS INDIVIDUAL PERMITS
☐ OTHER
☐ NO PERMITS REQUIRED
EXPLAIN: _____

III. REFERENCE / BASIS OF DETERMINATION

☐ ENVIRONMENTAL CONSULTANT REPORT
BY _____
REPORT TITLE _____
REPORT DATE _____
☐ OTHER _____

NOTES:
I. – III. REQUIRED ON PROJECTS WITH WORK IN A HCFCD CHANNEL. PLEASE REFERENCE SECTION 17 OF THE FLOOD CONTROL DISTRICT POLICY, CRITERIA, AND PROCEDURE MANUAL FOR MORE INFORMATION.

IV. HCFCD STANDARD NOTES: SEE SHEET _____ OF THESE PLANS.

V. HCFCD STANDARD DETAILS: SEE SHEET _____ OF THESE PLANS.

VI. HCFCD ACCESS PLAN: SEE SHEET _____ OF THESE PLANS.

VII. REFER TO THE FOLLOWING PLAN SHEETS: _____
FOR EXISTING AND PROPOSED RIGHT(S) OF WAY INCLUDING DELINEATION AND RECORDING INFORMATION PER HCFCD POLICY, CRITERIA, & PROCEDURE MANUAL (i.e., DRAINAGE EASEMENT, FEE STRIP, ETC.) AND GRANTEE (e.g. COH, HCFCD, PUBLIC, TXDOT, ETC.)

6. REPORTS/AGREEMENTS

I. HCFCD ACCEPTED REPORTS (ALL)

STORMWATER DRAINAGE DESIGN REPORT
REPORT TITLE _____
HCFCD PROJECT #_____
ENGINEERING FIRM _____
REPORT ACCEPTANCE DATE _____

GEOTECHNICAL INVESTIGATION REPORT
REPORT TITLE _____
HCFCD PROJECT #_____
ENGINEERING FIRM _____
REPORT ACCEPTANCE DATE _____

HCFCD APPROVED VARIANCE
DESCRIPTION OF VARIANCE _____
DOCUMENT ID #_____
VARIANCE ACCEPTANCE DATE _____

II. AGREEMENT TYPE & No.:

☐ INTERLOCAL (ILA): _____
☐ HCFCD MAINTENANCE _____
☐ TURF ESTABLISHMENT _____
☐ OTHER _____

OFFSITE SHEET FLOW: (100 YEAR)

OFFSITE SHEET FLOW MAPPING, TOTAL DISCHARGE CALCULATIONS, AND DESIGN ACCOMODATIONS ARE SHOWN ON SHEET ____ OR, AS PRESENTED IN THE APPROVED DRAINAGE STUDY ENTITLED _____.

TOTAL ACREAGE =____
TOTAL DISCHARGE =____

NOTE: ALL OFFSITE SHEET FLOW FROM ADJACENT PROPERTIES MUST BE IDENTIFIED AND PROPERLY ACCOUNTED FOR IN THE PROJECT. THE SIGNING ENGINEER HEREBY CERTIFIES THAT THESE AREAS HAVE BEEN ADDRESSED.

HCFCD SIGNATURE BLOCK

PROJECT NAME: _____

ADDRESS: _____

WAS ACCEPTED BY HARRIS COUNTY FLOOD CONTROL DISTRICT FOR THE PURPOSES LISTED BELOW:

HARRIS COUNTY FLOOD CONTROL DISTRICT

INTERPOSE NO OBJECTION

BY _____
FOR ITEMS LOCATED OUTSIDE OF HCFCD RIGHT-OF-WAY

APPROVED:

BY _____
FOR ITEMS LOCATED WITHIN EXISTING HCFCD RIGHT-OF-WAY

APPROVED:

BY _____
FOR ITEMS LOCATED WITHIN PROPOSED HCFCD RIGHT-OF-WAY

NO REVIEW REQUIRED:

BY _____
FINAL PERMITTING BY OTHERS

ADDITIONAL COMMENTS:

_____

THE PROJECT WAS REVIEWED, HOWEVER, THIS DOES NOT MEAN THE ENTIRE PROJECT, INCLUDING ALL SUPPORTING DATA AND CALCULATIONS HAVE BEEN COMPLETELY CHECKED AND VERIFIED. THESE DRAWINGS ARE SIGNED, DATED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS, WHICH THEREFORE CONVEYS THE ENGINEER'S RESPONSIBILITY AND ACCOUNTABILITY. THIS DOES NOT RELIEVE ANY PARTY FROM COMPLYING WITH APPROPRIATE FEDERAL, STATE AND LOCAL ENVIRONMENTAL RULES, LAWS, AND REGULATIONS AND ANY OTHER LEGALLY ADOPTED REGULATION OR ORDINANCE RELATED TO LAND DEVELOPMENT. IF THE CITY SIGNATURES ARE REQUIRED BY ORDINANCE, COUNTY PERMITS WILL NOT BE ISSUED UNTIL SUCH SIGNATURES ARE OBTAINED. PLAN APPROVAL EXPIRATION TO BE IN ACCORDANCE WITH LOCAL GOVERNEMENT CODE CH. 245.

ENGINEER'S CERTIFICATION

I, ANTHONY VOIGT , A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THE INFORMATION PRESENTED ON THIS SHEET IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND THAT I AM NOT VIOLATING ANY PROVISION OF THE CURRENT TEXAS ENGINEERING PRACTICE ACT AND RULES CONCERNING THE PRACTICE OF ENGINEERING AND PROFESSIONAL ENGINEERING LICENSURE.

ANY VIOLATIONS WILL BE FORWARDED TO THE HARRIS COUNTY DISTRICT ATTORNEY'S OFFICE FOR PROSECUTION.

THE COMPLETED PROJECT CONSISTS OF DRAWING SHEETS 01 THRU 38.

SEAL

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
11/16/2023

SIGNATURE _____ DATE 11/16/2023

REVISIONS

NOTE: REVISION BLOCK IS TO BE USED ONLY FOR CHANGES MADE AFTER PLANS HAVE BEEN APPROVED BY HARRIS COUNTY FLOOD CONTROL.

DATE	SHEET NO.	DESCRIPTION	P.E. INITIAL	H.C.F.C.D APPROVED DATE

HARRIS COUNTY FLOOD CONTROL PROJECT NO.

SHEET NUMBER 02B OF 38

HARRIS COUNTY
FLOOD CONTROL DISTRICT
REVIEW SHEET

VERSION 1.0 OCTOBER 2019

GENERAL

1. THE CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS BEFORE BEGINNING CONSTRUCTION.

2. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING SECURITY TO PROTECT THE PROJECT SITE, CONTRACTOR PROPERTY, EQUIPMENT, AND WORK.

3. THE CONTRACTOR IS RESPONSIBLE FOR CLEANING STREETS OF CONSTRUCTION DIRT AND DEBRIS AT CLOSE OF EACH WORK DAY.

4. THE CONDITION OF THE ROAD AND/OR RIGHT-OF-WAY, UPON COMPLETION OF THE JOB SHALL BE AS GOOD AS OR BETTER THAN PRIOR TO STARTING WORK.

5. PRIOR TO CONSTRUCTION, THE CONTRACTOR, ALONG WITH CONCURRENCE FROM THE FIELD ENGINEER, SHALL DETERMINE HIS/HER LAY-DOWN AND/OR STAGING AREA LOCATIONS.

6. THE CONTRACTOR SHALL NOTIFY ALL PROPERTY OWNERS A MINIMUM OF 24 HOURS PRIOR TO BLOCKING DRIVEWAYS OR ENTERING UTILITY EASEMENTS.

7. TRAFFIC INGRESS AND EGRESS FOR DRIVEWAYS AND PEDESTRIAN ACCESS FACILITIES SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION.

8. THE CONTRACTOR SHALL REMOVE ANY FENCES, POSTS, MAILBOXES, PLANTERS, PERMANENT TRASH CONTAINERS, CULVERTS, ETC. OR SECTIONS THEREOF, THAT ENCROACH WITHIN THE COUNTY'S RIGHT-OF-WAY. NOTE: PRIOR TO CONSTRUCTION, THE PROPERTY OWNER WAS PAID TO RELOCATE OR REPLACE THESE ITEMS OUTSIDE OF THE COUNTY'S RIGHT-OF-WAY. IF THE OWNER HAS FAILED TO DO SO, THE CONTRACTOR WILL REPLACE THEM WITH THE MINIMUM LEVEL OF QUALITY NEEDED TO SECURE THE PROPERTY AND/OR MAINTAIN MAIL DELIVERY. IN THAT CASE, PAYMENT FOR THESE INSTALLATIONS WILL BE INCLUDED AS EXTRA WORK ITEMS OR AS OVERRUNS TO EXISTING PAY ITEMS.

   ANY DAMAGE CAUSED BY THE CONTRACTOR TO SUCH ITEMS LOCATED OUTSIDE OF THE COUNTY'S RIGHT-OF-WAY, SHALL BE REPLACED WITH LIKE-KIND OR BETTER AT THE CONTRACTOR'S EXPENSE.

   ALSO, IF THESE ITEMS ARE LOCATED WITHIN THE PROJECT RIGHT-OF-WAY AND ARE DESIGNATED TO REMAIN, ANY DAMAGE CAUSED BY THE CONTRACTOR TO SUCH ITEMS, SHALL BE REPLACED WITH LIKE-KIND OR BETTER AT THE CONTRACTOR'S EXPENSE.

   TREES, BUSHES, SHRUBBERY AND OTHER DAMAGED PLANTINGS DESIGNATED TO REMAIN SHALL BE REPLACED WITHIN 72 HOURS OF REMOVAL AND ARE TO BE THOROUGHLY WATERED-IN. NO SEPARATE PAY.

9. PAVED SURFACES, PAVEMENT MARKERS AND MARKINGS SHALL BE PROTECTED FROM DAMAGE BY TRACKED EQUIPMENT.

10. IRON RODS DISTURBED DURING CONSTRUCTION ARE TO BE REPLACED BY A REGISTERED PROFESSIONAL LAND SURVEYOR FOR THE ORIGINAL PROPERTY OWNER AT NO SEPARATE PAY.

11. CONSTRUCTION STAKING WILL BE PROVIDED BY THE CONTRACTOR. TWO COPIES OF STAKING NOTES TO BE PROVIDED TO THE ENGINEER PRIOR TO CONSTRUCTION.

12. THE COUNTY OR THE COUNTY'S SURVEYOR SHALL PROVIDE A BENCHMARK OR TEMPORARY BENCHMARK AND SURVEY CONTROLS.

13. THE CONTRACTOR SHALL MAINTAIN UPDATED RED-LINED RECORD DRAWINGS ON SITE FOR INSPECTION BY THE ENGINEER.

14. MOWING, MAINTENANCE, AND CLEAN-UP OF THE PROJECT SHALL MEET THE REQUIREMENT OF SPECIFICATION ITEM 560 (NO SEPARATE PAY). MOWING, MAINTENANCE, AND CLEAN-UP IS REQUIRED FOR THE PROJECT LIMITS AND DURATION, REGARDLESS OF THE CONTRACTOR'S SCOPE OF ACTIVITIES WITHIN THE PROJECT LIMITS.

15. THE REMOVAL OF ANY ABANDONED UTILITIES REQUIRED TO COMPLETE THE WORK SHALL BE INCIDENTAL AND NO SEPARATE PAYMENT SHALL BE MADE.

16. IT IS THE CONTRACTOR'S RESPONSIBILITY TO STOCKPILE NECESSARY MATERIAL ON-SITE OR AT A SECURED OFF-SITE LOCATION AT NO ADDITIONAL EXPENSE TO HARRIS COUNTY. ANY SUITABLE EXCAVATED MATERIAL ON THE PROJECT WHICH IS AVAILABLE AT THE TIME OF NEED; WHETHER FROM STORM SEWER, ROADWAY, AND/OR CHANNEL EXCAVATION, SHALL BE USED BEFORE BORROW IS BROUGHT ON-SITE.

17. MANHOLES, JUNCTION BOXES, INLETS, AND RISERS ARE TO BE PRE-CAST OR CAST IN PLACE.

TRAFFIC SIGNAL

1. ALL ITEMS RELATING TO THE CONSTRUCTION OF TRAFFIC SIGNAL INSTALLATIONS, EXCEPT FOR PUNCHLIST ITEMS, SHALL BE COMPLETED PRIOR TO THE ACTIVATION OF THE SIGNAL SYSTEM(S), UNLESS OTHERWISE REQUIRED BY THE CONTRACT.

2. THE CONTRACTOR SHALL MEET WITH THE HARRIS COUNTY TRAFFIC SIGNAL MAINTENANCE GROUPS FIELD INSPECTOR, HEREAFTER REFERRED TO AS THE TRAFFIC INSPECTOR, ONE-WEEK PRIOR TO THE DESIRED ACTIVATION OF ANY NEW TRAFFIC SIGNALS. THE CONTRACTOR SHALL OBTAIN VERBAL CONCURRENCE FROM THE TRAFFIC INSPECTOR THAT ADEQUATE PROGRESS HAS BEEN ACHIEVED AND THAT ADEQUATE PREPARATIONS ARE IN PLACE TO SCHEDULE A PRE-"TURN ON" WALK-THROUGH INSPECTION MEETING. IF IN THE OPINION OF THE TRAFFIC INSPECTOR, REQUIRED PROGRESS AND ADEQUATE PREPARATIONS ARE NOT COMPLETE, THE PRE-"TURN ON" WALK-THROUGH INSPECTION MEETING WILL BE POSTPONED TO ALLOW ADEQUATE TIME FOR INCOMPLETE CONSTRUCTION ITEMS AND PREPARATIONS TO BE COMPLETED. AFTER THE CONTRACTOR HAS COMPLETED ALL INCOMPLETE ITEMS AND PREPARATIONS, THE CONTRACTOR SHALL REQUEST THE TRAFFIC INSPECTOR REVIEW AND APPROVE ITEMS PREVIOUSLY IDENTIFIED. IF, IN THE OPINION OF THE TRAFFIC INSPECTOR, ALL ITEMS HAVE BEEN ADDRESSED SATISFACTORILY, THE DATE OF THE PRE-"TURN ON" WALK-THROUGH INSPECTION SHALL BE ESTABLISHED. TIME EXTENSIONS TO THE CONTRACT TIME WILL NOT BE GRANTED FOR DELAYS CAUSED BY INCOMPLETE CONSTRUCTION OR INADEQUATE CONTRACTOR PREPARATIONS REQUIRED TO COMPLETE TRAFFIC SIGNAL SYSTEM WITHIN THE TIMEFRAME SET FORTH IN THE CONTRACT.

3. PRIOR TO ACTIVATING A NEW TRAFFIC SIGNAL, THE CONTRACTOR SHALL REQUEST A PRE-"TURN ON" WALK-THROUGH INSPECTION MEETING, IN ACCORDANCE WITH ITEM 2. THE PURPOSE OF THE MEETING WILL BE TO ESTABLISH THAT THE TRAFFIC SIGNAL SYSTEM HAS BEEN CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT, AND IN A MANNER THAT DOES NOT ADVERSELY IMPACT PUBLIC SAFETY. THIS MEETING SHALL BE ATTENDED BY THE TRAFFIC INSPECTOR, THE ENGINEER OF RECORD, AND THE CONTRACTOR. AS A MINIMUM, ANY DEFICIENCIES THAT ADVERSELY IMPACT PUBLIC SAFETY WILL BE IDENTIFIED FOR CORRECTION PRIOR TO ESTABLISHING THE "TURN ON" DATE FOR THE TRAFFIC SIGNAL SYSTEM. ITEMS THAT HAVE AN IMPACT ON PUBLIC SAFETY INCLUDE, BUT ARE NOT LIMITED TO: PAVEMENT MARKINGS AND SIGNAGE, PROPER AND ACCEPTABLE BONDING OF EARTH GROUNDS, PROPERLY ALIGNED TRAFFIC SIGNALS, FULLY OPERATIONAL VEHICULAR AND PEDESTRIAN DETECTION, COMPLETED CABINET-TO-FIELD WIRING, AND PROPERLY TERMINATED ELECTRICAL SERVICE CONDUCTORS. FAILURE TO ADDRESS THE PUNCHLIST ITEMS IDENTIFIED AS BEING CRITICAL TO PUBLIC SAFETY PRIOR TO THE PRE-"TURN ON" WALK-THROUGH MEETING WILL RESULT IN THE TURN ON BEING POSTPONED TO ALLOW ADEQUATE TIME FOR THE INCOMPLETE ITEMS TO BE COMPLETED. AT SUCH TIME AS MEETING ATTENDEES AGREE THAT THE TRAFFIC SIGNAL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT, AND THAT THE TRAFFIC SIGNAL, AS IT EXISTS, IS NOT A THREAT TO PUBLIC SAFETY, A TURN ON DATE WILL BE ESTABLISHED.

4. THE CONTRACTOR SHALL HAVE 10 DAYS FROM THE DATE THE TRAFFIC SIGNAL SYSTEM IS TURNED ON TO COMPLETE ANY PUNCHLIST ITEMS IDENTIFIED AT THE PRE-"TURN ON" WALK-THROUGH MEETING OR AT THE TIME THE SIGNAL SYSTEM IS ACTIVATED THAT ARE NOT OTHERWISE ADDRESSED PRIOR TO ACTIVATION OF THE TRAFFIC SIGNAL SYSTEM.

5. THE CONTRACTOR'S ATTENTION IS DIRECTED TO STANDARD SPECIFICATION ITEM 1000, TRAFFIC SIGNAL INSTALLATION AND MODIFICATION, WHICH INCLUDES PROCEDURES AND REQUIREMENTS REGARDING ACTIVATION OF TRAFFIC SIGNAL CONTROL SYSTEMS. THE PROJECT MANUAL MAY INCLUDE SPECIAL SPECIFICATIONS AND/OR SPECIAL PROVISIONS RELATED TO PROPOSED TRAFFIC CONTROL SIGNAL SYSTEM INSTALLATION(S) AND MODIFICATION(S) REQUIRING THE CONTRACTOR'S ADHERENCE TO DEFINED CHECKLISTS, PROCEDURES AND/OR REPORTS AT NO ADDITIONAL COST TO THE COUNTY BEYOND THE ESTABLISHED BID ITEMS OF THE CONTRACT.

TRAFFIC CONTROL

1. THE CONTRACTOR SHALL PROVIDE AND INSTALL TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH PART VI OF THE MOST RECENT EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AND THE APPROVED TRAFFIC CONTROL PLAN.

2. THE CONTRACTOR SHALL MAINTAIN AT LEAST ONE LANE OF TRAFFIC IN EACH DIRECTION DURING WORKING HOURS EXCEPT DURING FLAGGING OPERATION OR PROVIDE DETOURS AROUND THE CONSTRUCTION SITE AND PROVIDE PUBLIC NOTIFICATION.

3. LANE CLOSURES SHALL BE DURING OFF-PEAK HOURS ONLY (MONDAY THROUGH FRIDAY 9 A.M. TO 4 P.M.) UNIFORMED PEACE OFFICERS OR FLAGGERS IN RADIO CONTACT ARE REQUIRED TO DIRECT TRAFFIC DURING LANE CLOSURES.

4. DETOURS REQUIRE PRIOR APPROVAL OF THE FIELD ENGINEER AND PRECINCT. DETOUR PLANS, IF ALLOWED, MUST INCLUDE APPROPRIATE DETOUR SIGNAGE, PUBLIC NOTICE VIA SIGNAGE TWO WEEKS IN ADVANCE STATING THE DATES OF THE AGREED UPON DATE OF CLOSURE AND DATE THE ROAD WILL RE-OPEN TO TRAFFIC. CONTRACTOR TO USE (WITH PRIOR APPROVAL OF THE FIELD ENGINEER) HIGH EARLY STRENGTH CONCRETE AND OTHER RELATED CONSTRUCTION METHODS TO MINIMIZE THE DURATION OF THE DETOUR AND TO ENSURE THAT THE ROADWAY IS OPEN ON, OR PRIOR TO, THE AGREED UPON DATE.

5. ONE DAY PRIOR TO THE IMPLEMENTATION OF A TRAFFIC CONTROL PLAN PHASE OR STEP, OR THE IMPLEMENTATION OF AN ADDITIONAL, REVISED, OR NEW TRAFFIC CONTROL ELEMENT, THE CONTRACTOR SHALL MEET WITH THE ENGINEER TO GIVE A DETAILED DESCRIPTION OF THE CONTRACTOR'S PLAN AND PREPARATIONS. THE CONTRACTOR SHALL OBTAIN WRITTEN CONCURRENCE FROM THE ENGINEER THAT ADEQUATE PROJECT PROGRESS HAS BEEN ACHIEVED AND THAT ADEQUATE PREPARATIONS ARE IN PLACE PRIOR TO SWITCHING TRAFFIC. IF, IN THE OPINION OF THE ENGINEER, REQUIRED PROGRESS AND ADEQUATE PREPARATIONS ARE NOT COMPLETE, THE CONTRACTOR SHALL NOT IMPLEMENT THE NEXT PHASE, STEP, OR ELEMENT OF TRAFFIC CONTROL UNTIL INCOMPLETE CONSTRUCTION ITEMS OR PREPARATIONS ARE COMPLETED. TIME EXTENSIONS WILL NOT BE GRANTED FOR DELAYS CAUSED BY THE INCOMPLETE CONSTRUCTION ITEMS OR INADEQUATE CONTRACTOR PREPARATIONS REQUIRED TO IMPLEMENT TRAFFIC CONTROL.

6. TRAFFIC CONTROL PER THE CONTRACT IS REQUIRED FOR THE ENTIRE DURATION OF THE PROJECT, INCLUDING THE PUNCHLIST PERIOD. PAYMENT FOR TRAFFIC CONTROL THAT IS PROPERLY INSTALLED FOR LESS THAN A FULL MONTH SHALL BE BASED ON A PERCENTAGE BASIS OF THE TIME INSTALLED. TRAFFIC CONTROL PAYMENTS TO THE CONTRACTOR SHALL END 10 DAYS AFTER SUBSTANTIAL COMPLETION, ALTHOUGH PROPER TRAFFIC CONTROL MUST BE MAINTAINED UNTIL PUNCHLIST COMPLETION.

7. THE PURPOSE OF THE CONSTRUCTION SEQUENCE AND TRAFFIC HANDLING OUTLINED HEREIN IS TO DOCUMENT A VIABLE TCP THAT CAN BE UTILIZED TO CONSTRUCT THE PROJECT. IT IS THE BASIS OF ESTIMATION FOR THE TRAFFIC CONTROL BID ITEMS, AND IS TO BE UTILIZED AND IMPLEMENTED, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

   IF THE CONTRACTOR CHOOSES TO USE A DIFFERENT TCP, HE/SHE SHALL PREPARE AND SUBMIT THE ALTERNATIVE TCP TO THE COUNTY FOR APPROVAL NO LESS THAN 10 WORKING DAYS PRIOR TO THE PROPOSED IMPLEMENTATION DATE. THE TCP SHALL BE DRAWN TO SCALE AND SIGNED & SEALED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS. UPON APPROVAL BY HARRIS COUNTY, THE ALTERNATIVE PLAN SHALL BECOME THE BASIS FOR A "CHANGE IN CONTRACT" TO REVISE THE TRAFFIC CONTROL BID ITEMS ACCORDINGLY AND BECOME PART OF THE CONTRACT DOCUMENTS.

PRECINCT 3 SPECIFIC NOTES

1. ALL TRAFFIC SIGNS (STOP SIGNS, SPEED LIMIT SIGNS, ETC.) THAT ARE REMOVED IN PRECINCT 3 SHALL BE DELIVERED AT NO EXTRA PAY TO THE SPRING SERVICE CENTER AT 4603 SPRING CYPRESS ROAD, SPRING, TEXAS 77388. CALL 713-274-3100 TO MAKE DELIVERY ARRANGEMENTS. ALL SIGNS MUST BE REMOVED FROM POLES AND RETURNED REASONABLY CLEAN.

2. TREE PRESERVATION - CONTRACTOR SHALL PROVIDE PRECINCT 3 WITH CLEAR ACCESS TO ANY TREE DESIGNATED FOR PRESERVATION. CONTRACTOR IS RESPONSIBLE FOR SUCH TREES. CONTRACTOR SHALL CONTACT PRECINCT 3 PARKS ADMINISTRATION OFFICE AT (713) 274-0930, TWO WEEKS PRIOR TO CONSTRUCTION FOR TREE AND LANDSCAPING RELOCATIONS.

3. PROVIDE PRECINCT 3 WITH A DRAWING OR DESCRIPTION FOR ANY PROPOSED "AS AUTHORIZED BY ENGINEER" OR "EXTRA WORK ITEMS" CONCERNING FENCE OR GATE CONSTRUCTION OR RELOCATION AND OBTAIN WRITTEN PRECINCT APPROVAL FOR THE WORK.

4. MANHOLES SHOULD BE FLUSH TO NO MORE THAN 3" ABOVE SURROUNDING GROUND IN NON-PAVED AREAS.

5. USE THE MAXIMUM ALLOWED SPACING BETWEEN RAIL POSTS WHERE THE COMBINATION OF TRAFFIC AND PEDESTRIAN RAIL IS SPECIFIED.

NO.	REVISIONS	DATE	NAME
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HARRIS COUNTY
ENGINEERING DEPARTMENT

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-423?8
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
SHEET DESCRIPTION:	GENERAL NOTES - PRECINCT 3
DRAWN BY: DWQ	DATE: 11/16/23
CK'D BY: DWQ	SCALE: NTS
	SHEET NO: 03 / 38

HCFCD NOTES

1. FENCES AND/OR OTHER ENCROACHMENTS IN THE HCFCD RIGHT-OF-WAY ARE NOT TO BE REMOVED UNLESS OTHERWISE STATED ON THE PLANS. IN CASES WHERE FENCE REMOVAL IS INDICATED ON THE PLANS, THE FENCE SHALL BE REMOVED AND PLACED NEATLY ON THE ADJACENT PROPERTY AT THE START OF CONSTRUCTION. WHERE THERE IS NOT ASEPARATE ITEM LISTED ON THE UNIT PRICE SCHEDULE, THE ENCROACHMENT REMOVAL IS INCIDENTAL TO SITEPREPARATION AND RESTORATION.

2. DO NOT ENTER PRIVATE PROPERTY WITHOUT PROPER WRITTEN AUTHORIZATION FROM THE OWNER. PROVIDE COPY OF WRITTEN PERMISSION TO HCFCD.

3. STRIP VEGETATION AND TOPSOIL AND STOCKPILE FOR REUSE ONSITE. MATERIAL FOUND UNACCEPTABLE BY THE ENGINEER WILL BE REMOVED AND PAID AS EXCAVATION AND OFFSITE DISPOSAL. NO SEPARATE MEASUREMENT AND PAYMENT WILL BE MADE FOR STRIPPING, STOCKPILING AND PLACING ON-SITE TOPSOIL. THE COST FOR THIS WORK WILL BE INCIDENTAL TO RELATED PAY ITEMS UNDER SPECIFICATION SECTION NUMBER 02315 LISTED ON THE UNIT PRICE SCHEDULE.

4. RIPRAP AND GRANULAR FILL MATERIAL REMOVED DURING EXCAVATION, MEETING SPECIFICATION SECTION NUMBER 02378, SHALL BE REUSED AS DIRECTED BY THE ENGINEER. REUSED MATERIAL WILL BE MEASURED AND PAID FOR AS EXCAVATION AND ON-SITE FILL UNDER SPECIFICATION NUMBER 02315. NO SEPARATE MEASUREMENT OR PAYMENT WILLBE MADE FOR PROCESSING, HANDLING, STOCKPILING, AND PLACING MATERIAL FOUND TO BE ACCEPTABLE FOR REUSE. UPON APPROVAL OF THE ENGINEER, DISPOSAL OF NONCONFORMING RIPRAP AND GRANULAR FILL MATERIAL WILL BE MEASURED AND PAID FOR AS REMOVE AND DISPOSE OF CONCRETE RUBBLE UNDER SPECIFICATION SECTION NUMBER 02120, MATERIAL DISPOSAL.

5. THE LOCATION AND GRADE OF THE BACKSLOPE INTERCEPTOR STRUCTURES AND SWALES MAY BE

6. ADJUSTED IN THE FIELD BY THE ENGINEER AT THE TIME OF CONSTRUCTION. UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER, THE BACKSLOPE INTERCEPTOR STRUCTURE SHALL BE SET AT A MAXIMUM DEPTH OF 2.5 FEET AND THE MINIMUM GRADE FOR BACKSLOPE SWALES SHALL BE 0.2%. ADJUST AND/OR EXTEND YARD DRAINS TO OUTFALL AT TOE OF CHANNEL PER STANDARD OUTFALL DETAILS. PAYMENT WILL BE INCIDENTAL TO SITE PREPARATION AND RESTORATION.

7. COMPLETED SECTIONS OF THE CHANNEL WILL BE TURNED OVER FOR VEGETATION ESTABLISHMENT IN MAXIMUM 1500 LINEAR FOOT SEGMENTS. CONTRACTOR MAY NOT DISTURB GREATER THAN 1500 LF OF CHANNEL AT A TIME.

8. CLEAR AND REMOVE ALL SILT FROM CULVERTS, PIPES AND UNDER BRIDGES TO THE PROPOSED DESIGN GRADES TO PROVIDE POSITIVE FLOW.

9. LENGTHS AND DIAMETERS REPRESENTED ON PLANS ARE APPROXIMATE. CONTRACTOR WILL BE RESPONSIBLE FOR FIELD VERIFICATION PRIOR TO ORDERING MATERIALS.

10. ACTIVITIES THAT DISTURB BIRD HABITAT, INCLUDING BUT NOT LIMITED TO CLEARING, GRUBBING, AND IMPACTS TO STRUCTURES WHERE MIGRATORY BIRDS AND BALD EAGLES MIGHT NEST, REQUIRE A NEST HABITAT SURVEY. DO NOT PROCEED UNTIL HARRIS COUNTY FLOOD CONTROL DISTRICT HAS CONDUCTED A NEST HABITAT SURVEY TO VERIFY ACTIVE MIGRATORY BIRD NESTS AND BALD EAGLE NESTS ARE NOT PRESENT. THE HARRIS COUNTY FLOOD CONTROL DISTRICT MUST PROVIDE WRITTEN AUTHORIZATION TO PROCEED.

11. WHEN BANK EROSION REPAIRS CALL FOR THE PLACEMENT OF 3"X5" GRANULAR FILL IN THE CHANNEL BOTTOM TO ESTABLISH A BASE FOR REBUILDING THE SLOPE. THE 3"X5" GRANULAR FILL SHALL BE LIMITED TO AN ELEVATION 6-INCHES ABOVE THE NORMAL WATER SURFACE ELEVATION LEVEL.

12. THE CONTRACT CONTAINS UNIT ITEMS FOR THE ESTABLISHMENT OF BEST MANAGEMENT PRACTICES FOR STORM WATER QUALITY PURPOSES. WHEN NOT CALLED FOR IN THE PROJECT PLANS, COORDINATE THE NEED AND LOCATION OF THESE UNIT ITEMS WITH THE DISTRICT REPRESENTATIVE ON SITE PRIOR TO PLACEMENT. THESE UNIT ITEMS INCLUDE, BUT ARE NOT LIMITED TO, REINFORCED SILT FENCE FOR MATERIAL STOCKPILES, ANCHORED SODDING FOR DISTURBED EARTHEN AREAS OR AROUND CONCRETE AND CONCRETE INTERCEPTOR, AND STABILIZED CONSTRUCTION ACCESS FOR PROJECT SITE INGRESS/EGRESS.

13. WHEN INCLUDED IN THE SCOPE OF WORK, THE PURPOSE OF DEEP PLOWING THE SLOPE OR BERM OF A CHANNEL IS TO BREAK UP THE DESICCATED SOILS AND TO ELIMINATE ANY VOIDS, OR RILLING CLOSE TO THE SURFACE OF THE SLOPE OR BERM. THE CONTRACTOR WILL DEEP PLOW THE SLOPE OR BERM TO A MINIMUM DEPTH OF 2 FEET IN AREAS CONTAINING VOIDS AND/OR RILLING. IN AREAS OF VOIDS ONLY, THE SURFACE FROM WHICH THE 2 FEET DEPTH IS MEASURED WILL BE THE LEVEL OF THE SURROUNDING UNDISTURBED SOIL. IN AREAS OF RILLING, THE RILLS WILL FIRST BE KNOCKED DOWN AND LEVELED OFF. THE 2 FEET DEPTH WILL THEN BE MEASURED FROM THIS NEW SURFACE. THE CONTRACTOR WILL DETERMINE THE MEANS AND METHODS FOR DEEP PLOWING.)

14. TREES AND PLANTS LOCATED WITHIN A DESIGNATED TREE PROTECTION ZONE (TPZ) SHALL BE PRESERVED. REFER TO SPECIFICATION SECTION 01566 – TREE AND PLANT PROTECTION, FOR DETAILED INFORMATION ON TREE AND PLANT PRESERVATION PRACTICES AND PROCEDURES INCLUDING, BUT NOT LIMITED TO, ROOT PRUNING, VEGETATION TRIMMING, FENCING AND OTHER PRESERVATION OPERATIONS.

15. IF APPLICABLE, CONTRACTOR SHALL AVOID ANY WETLAND AREAS BEYOND THE LIMITS OF EXCAVATION AND CLEARING. AS THE FIRST WORK ITEM CONTRACTOR WILL BE RESPONSIBLE FOR INSTALLING FENCING OR OTHER MATERIAL TO IDENTIFY AND PROTECT THE IDENTIFIED WETLAND AREAS, UNLESS WETLANDS HAVE BEEN IDENTIFIED AND FENCED BY HCFCD PRIOR TO CONSTRUCTION AND CONTRACTOR HAS WRITTEN EVIDENCE OF SUCH.

PRIVATE UTILITY NOTES

AT&T TEXAS / SWBT FACILITIES

1. THE LOCATIONS OF AT&T TEXAS/SWBT FACILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK. HE AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.

2. THE CONTRACTOR SHALL CALL 1-800-344-8377 A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE UNDERGROUND LINES FIELD LOCATED.

3. WHEN EXCAVATING WITHIN EIGHTEEN INCHES (18") OF THE INDICATED LOCATION OF AT&T TEXAS/SWBT FACILITIES, ALL EXCAVATIONS MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES. WHEN BORING, THE CONTRACTOR SHALL EXPOSE THE AT&T TEXAS/SWBT FACILITIES.

4. WHEN AT&T TEXAS/SWBT FACILITIES ARE EXPOSED, THE CONTRACTOR WILL PROVIDE SUPPORT TO PREVENT DAMAGE TO THE CONDUIT DUCTS OR CABLES. WHEN EXCAVATING NEAR TELEPHONE POLES THE CONTRACTOR SHALL BRACE THE POLE FOR SUPPORT.

5. THE PRESENCE OR ABSENCE OF AT&T TEXAS/SWBT UNDERGROUND CONDUIT FACILITIES OR BURIED CABLE FACILITIES SHOWN ON THESE PLANS DOES NOT MEAN THAT THERE ARE NO DIRECT BURIED CABLES OR OTHER CABLES IN THE AREA. FOLLOW THE DIRECT BURIED CABLE PROCEDURES TO LOCATE THE AT&T TEXAS/SWBT DIRECT BURIED CABLES AS INDICATED IN THE AT&T TEXAS RESEARCH AND SIGNATURE PROCESS FOR AT&T TEXAS/SWBT FACILITIES.

6. PLEASE CONTACT THE AT&T TEXAS DAMAGE PREVENTION MANAGER MR. ROOSEVELT LEE JR. AT (713)567-4552 OR EMAIL HIM AT RL7259@ATT.COM, IF THERE ARE QUESTIONS ABOUT BORING OR EXCAVATION NEAR OUR AT&T TEXAS/SWBT FACILITIES.

CAUTION: UNDERGROUND GAS FACILITIES

THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT 1-800-545-6005 OR 811 A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.

- WHEN CENTERPOINT ENERGY PIPE LINE MARKINGS ARE NOT VISIBLE, CALL (713) 207-5463 OR (713) 945-8037 (7:00 A.M. TO 4:30 P.M.) FOR STATUS OF LINE LOCATION REQUEST BEFORE EXCAVATION BEGINS.
- WHEN EXCAVATING WITHIN EIGHTEEN INCHES (18') OF THE INDICATED LOCATION OF CENTERPOINT ENERGY FACILITIES, ALL EXCAVATION MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES.
- WHEN CENTERPOINT ENERGY FACILITIES ARE EXPOSED, SUFFICIENT SUPPORT MUST BE PROVIDED TO THE FACILITIES TO PREVENT EXCESSIVE STRESS ON THE PIPING.
- FOR EMERGENCIES REGARDING GAS LINES CALL (713) 659-3552 OR (713) 207-4200.

THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

WARNING: OVERHEAD ELECTRICAL FACILITIES

OVERHEAD LINES MAY EXIST ON THE PROPERTY. THE LOCATION OF OVERHEAD LINES HAS NOT BEEN SHOWN ON THESE DRAWINGS AS THE LINES ARE CLEARLY VISIBLE, BUT YOU SHOULD LOCATE THEM PRIOR TO BEGINNING ANY CONSTRUCTION. TEXAS LAW, SECTION 752, HEALTH & SAFETY CODE FORBIDS ACTIVITIES THAT OCCUR IN CLOSE PROXIMITY TO HIGH VOLTAGE LINES, SPECIFICALLY:

- ANY ACTIVITY WHERE PERSON OR THINGS MAY COME WITHIN SIX(6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES; AND
- OPERATING A CRANE, DERRICK, POWER SHOVEL, DRILLING RIG, PILE DRIVER, HOISTING EQUIPMENT, OR SIMILAR APPARATUS WITHIN 10 FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES.

PARTIES RESPONSIBLE FOR THE WORK, INCLUDING CONTRACTORS ARE LEGALLY RESPONSIBLE FOR THE SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW. THIS LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE TURNED OFF OR REMOVED CALL CENTERPOINT ENERGY AT (713) 207-2222.

ACTIVITIES ON OR ACROSS CENTERPOINT ENERGY FEE OR EASEMENT PROPERTY

NO APPROVAL TO USE, CROSS OR OCCUPY CENTERPOINT FEE OR EASEMENT PROPERTY IS GIVEN. IF YOU NEED TO USE CENTERPOINT PROPERTY, PLEASE CONTACT OUR SURVEYING & RIGHT OF WAY DIVISION AT (713) 207-6348 OR (713) 207-5769.

48 HOUR NOTICE:

CONTRACTOR SHALL NOTIFY HARRIS COUNTY PRIOR TO COMMENCING CONSTRUCTION AND/OR BACKFILLING ANY UTILITIES. CONTRACTOR(S) TO CONTACT PUBLIC REVIEW DEPARTMENT @ (713-274-3931) OR (PUBLIC.REVIEW@HCPID.ORG).

NO.	REVISIONS	DATE	NAME
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HARRIS COUNTY ENGINEERING DEPARTMENT

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC. F-5333

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS

SHEET DESCRIPTION: GENERAL NOTES – PRIVATE UTILITIES

DRAWN BY:		DATE:
DWQ		11/16/23
CK'D BY:	SCALE:	SHEET NO:
DWQ	NTS	04 / 38

		Mueschke Rd at Destination Dr	Juergen Rd at Cypress Heights Dr		
Harris County Specification	Description	Quantity	Quantity	Total	Unit
677, 1000	Furnish and Install 1" Schedule 40 PVC Conduit	180	0	180	LF
677, 1000	Furnish and Install 2" Schedule 40 PVC Conduit	1300	50	1350	LF
677, 1000	Furnish and Install 3" Schedule 40 PVC Conduit	200	30	230	LF
677, 1000	Furnish and Install 4" Schedule 40 PVC Conduit	250	30	280	LF
680, 1000	Furnish and Install HC10034 (34') Steel Strain Pole	3	0	3	EA
680, 1000	Furnish and Install 44' Steel Mast Arm	2	0	2	EA
680, 1000	Furnish and Install 20' Steel Mast Arm	1	0	1	EA
680, 1000	Furnish and Install 30' Steel Mast Arm	1	0	1	EA
680, 1000	Furnish and Install 40' Wood Strain Pole	0	4	4	EA
680, 1000	Furnish and Install Meter Pole, Service Loop and Safety Switch [Type D(MOD 1) (120/240) 000 (NS) SS (N) SP (O)]	1	1	2	EA
680, 1000	Furnish and Install Meter Pole, Disconnect [Type D(MOD 2) (120/240) 070 (NS) SS (E) SP (O)]	1	1	2	EA
411, 1000, DWGS	Furnish and Install Reinforced Concrete Pole Foundation (Class B2), (TYPE 10036), Including Anchor Bolts	60	0	60	VF
1000, DWGS	Furnish and Install Polymer Concrete Pull Box (Type D) with Lid and Apron	18	0	18	EA
1000, DWGS	Furnish and Install Polymer Concrete Ground Box with Lid and Apron	1	1	2	EA
686, 1000	Furnish and Install 15' Luminaire Arm with LED Luminaire Fixture with Shorting Cap	2	2	4	EA
692, 699, 1000	Furnish and Install LED (AC Input Voltage) Single Section Symbolic Pedestrian (Countdown) Signal Assembly, All Hardware	4	2	6	EA
692, 1000	Furnish and Install Pedestrian Push Button Station (Right Arrow, Left Arrow, Double Arrow)	4	2	6	EA
689, 690, 1000	Furnish and Install 12", One Way, 3 Section LED (AC Input Voltage) Horizontal Signal Assembly, All Hardware	8	6	14	EA
689, 690, 1000	Furnish and Install 12", One Way, 4 Section LED (AC Input Voltage) Horizontal Signal Assembly, All Hardware	1	1	2	EA
1000, DWGS	Furnish and Install Accuscan 300 Detection Cameras	1	3	4	EA
624, 648, 1000	Furnish and Install Span Wire Mounted "Street Name Sign (VARIES X 18")	4	3	7	EA
1000, 1210, SS2071	Furnish and Install Harris County ATC Controller	1	1	2	EA
1000, 1210, SS2071	Furnish and Install Ground Mount ITS Controller Cabinet Assembly (HC)(Housing 3) with Side Mounted Battery Backup Syster	1	1	2	EA
660, 1000	Furnish and Install 4" Solid White - Type 1 Reflectorized Pavement Markings	80	0	80	LF
660, 1000	Furnish and Install 24" Solid White - Type 1 Reflectorized Pavement Markings	93	73	166	LF
679, 1000	Furnish and Install #4 AWG, XHHW (Stranded) Wire	140	100	240	LF
679, 1000	Furnish and Install #8 AWG, Bare Copper (Solid) Wire with Grounding Hardware	1200	1100	2300	LF
679, 1000	Furnish and Install 2/C #14 AWG (IMSA 20-1) (Stranded) Cable	1300	1100	2400	LF
679, 1000	Furnish and Install 2/C #14 AWG (IMSA 50-2) (Stranded) Cable	6500	0	6500	LF
679, 1000	Furnish and Install 4/C #14 AWG (IMSA 20-1) (Stranded)Cable	400	350	750	LF
679, 1000	Furnish and Install 7/C #14 AWG (IMSA 20-1) (Stranded) Cable	1400	1400	2800	LF
SS678	Furnish and Install 1/4" 7 Wire Strand (Siemens-Martin) Zinc Coated Steel Wire Strand with Hardware	0	900	900	LF
679, 1000	Furnish and Install 5/16" 7 Wire Strand (Siemens-Martin) Zinc Coated Steel Wire Strand with Hardware	0	1300	1300	LF
SS 6009	Furnish and Install and Integrate Wireless Router For Traffic Signals	1	1	2	EA
SS 6010	Furnish and Install Cellular LTE Antenna For Traffic Signals	1	1	2	EA
SS 6011	Furnish and Install and Integrate Field Hardened Ethernet Switch For Traffic Signals	1	1	2	EA
SS 6011	Furnish and Install Rack Mounting Bracket For Field Hardened Ethernet Switch For Traffic Signals	1	1	2	EA
55 9011, HC APPR	Furnish and Install CAT5E Patchcord With Boot	4	4	8	EA

NO.	REVISIONS	DATE	NAME
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HARRIS COUNTY
ENGINEERING DEPARTMENT

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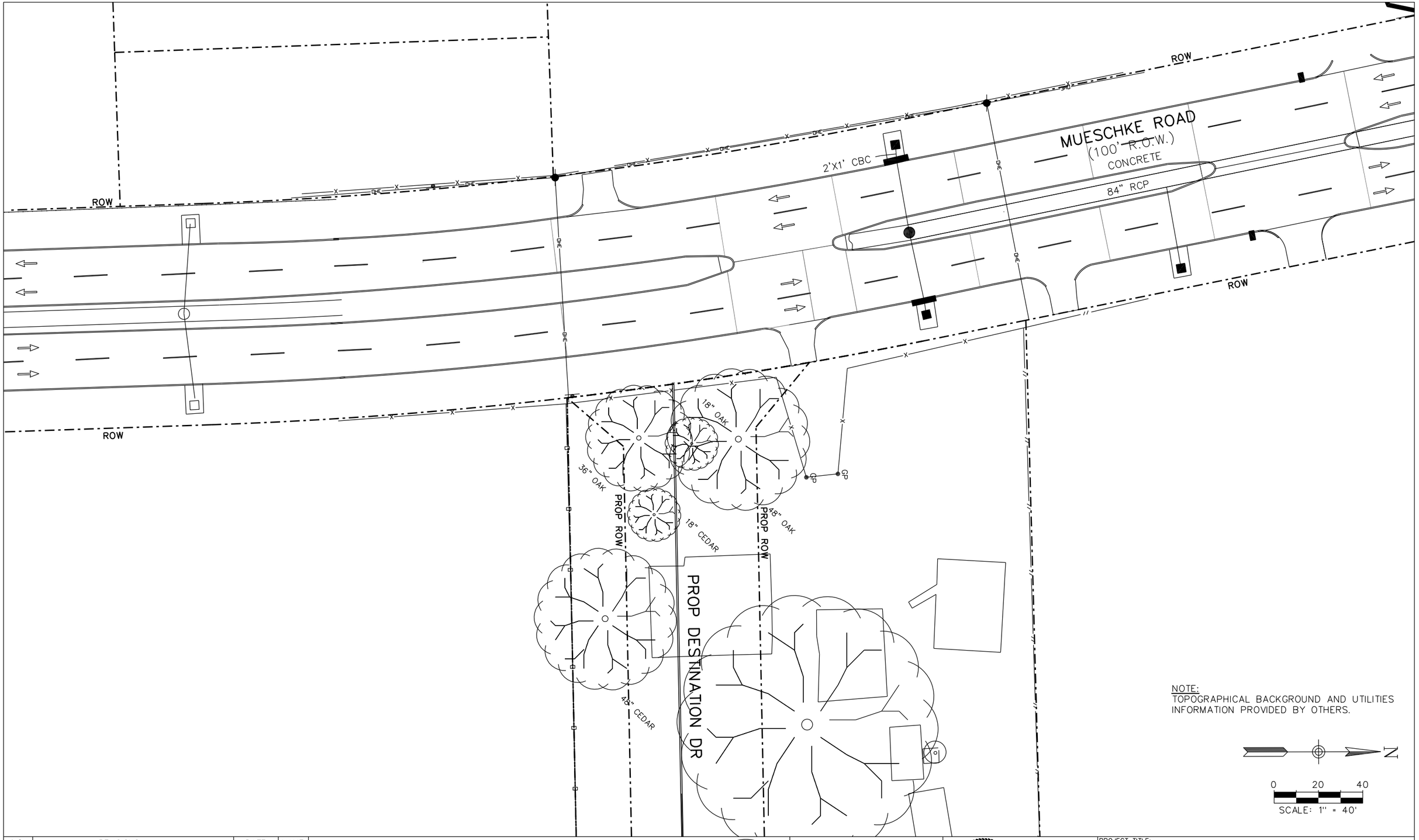
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100292-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS

SHEET DESCRIPTION: BASIS OF ESTIMATE

DRAWN BY: DWQ		DATE: 11/16/23
CK'D BY: DWQ	SCALE: NTS	SHEET NO: 05 / 38



NOTE:
TOPOGRAPHICAL BACKGROUND AND UTILITIES INFORMATION PROVIDED BY OTHERS.

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0 20 40

SCALE: 1" = 40'

NO.	REVISIONS	DATE	NAME
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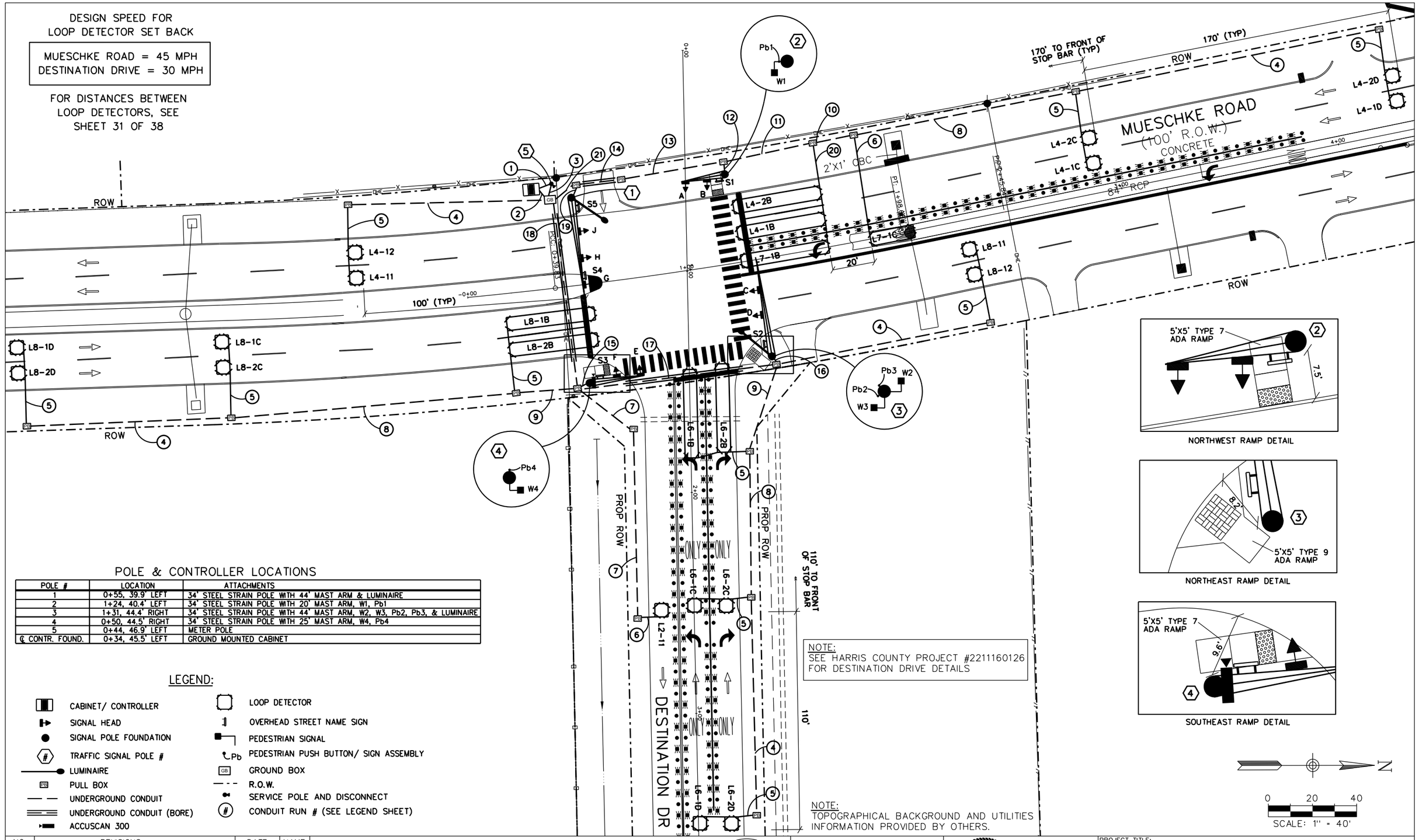
STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS	
	MUESCHKE RD AT DESTINATION DR	
SHEET DESCRIPTION:	EXISTING CONDITIONS	
DRAWN BY: DWQ	SHEET 1 OF 1	DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40'	SHEET NO: 06 / 38

DESIGN SPEED FOR
LOOP DETECTOR SET BACK

MUESCHKE ROAD = 45 MPH
DESTINATION DRIVE = 30 MPH

FOR DISTANCES BETWEEN
LOOP DETECTORS, SEE
SHEET 31 OF 38



NORTHWEST RAMP DETAIL

NORTHEAST RAMP DETAIL

SOUTHEAST RAMP DETAIL

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0 20 40

SCALE: 1" = 40'

POLE & CONTROLLER LOCATIONS

POLE #	LOCATION	ATTACHMENTS
1	0+55, 39.9' LEFT	34' STEEL STRAIN POLE WITH 44' MAST ARM & LUMINAIRE
2	1+24, 40.4' LEFT	34' STEEL STRAIN POLE WITH 20' MAST ARM, W1, Pb1
3	1+31, 44.4' RIGHT	34' STEEL STRAIN POLE WITH 44' MAST ARM, W2, W3, Pb2, Pb3, & LUMINAIRE
4	0+50, 44.5' RIGHT	34' STEEL STRAIN POLE WITH 25' MAST ARM, W4, Pb4
5	0+44, 46.9' LEFT	METER POLE
℄ CONTR. FOUND.	0+34, 45.5' LEFT	GROUND MOUNTED CABINET

LEGEND:

- CABINET/ CONTROLLER
- SIGNAL HEAD
- SIGNAL POLE FOUNDATION
- TRAFFIC SIGNAL POLE #
- LUMINAIRE
- PULL BOX
- UNDERGROUND CONDUIT
- UNDERGROUND CONDUIT (BORE)
- ACCUSCAN 300
- LOOP DETECTOR
- OVERHEAD STREET NAME SIGN
- PEDESTRIAN SIGNAL
- PEDESTRIAN PUSH BUTTON/ SIGN ASSEMBLY
- GROUND BOX
- R.O.W.
- SERVICE POLE AND DISCONNECT
- CONDUIT RUN # (SEE LEGEND SHEET)

NOTE:
SEE HARRIS COUNTY PROJECT #2211160126
FOR DESTINATION DRIVE DETAILS

NOTE:
TOPOGRAPHICAL BACKGROUND AND UTILITIES INFORMATION PROVIDED BY OTHERS.

NO.	REVISIONS	DATE	NAME
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HARRIS COUNTY
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STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	MUESCHKE RD AT DESTINATION DR
SHEET DESCRIPTION:	TRAFFIC SIGNAL LAYOUT
DRAWN BY: DWQ	SHEET 1 OF 1 — DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40' — SHEET NO: 07 / 38

NOTES TO CONTRACTOR:

1. LOCATION OF UTILITIES SHOWN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE-GROUND OR OVERHEAD.
2. CALL THE FOLLOWING NUMBERS FOR LOCATION OF UNDER-GROUND FACILITIES 72 HOURS PRIOR TO ANY EXCAVATION IN AREA:
   UTILITIES: (713) 223-4567 (HOUSTON)
   1-800-669-8344 (OUTSIDE HOUSTON)
   PIPELINES: 1-800-245-4545 AND 1-800-344-8377
3. ALL CONSTRUCTION SIGNS AND BARRICADES SHALL CONFORM TO THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.
4. ALL CONDUITS UNDER ROADWAYS AND DRIVEWAYS SHALL BE BORED AND JACKED. CONTRACTOR SHALL EXERCISE CAUTION WHEN BORING AND/OR EXCAVATING IN THE VICINITY OF UNDERGROUND UTILITIES.
5. NO LOOP DETECTOR SHALL BE CUT IN A PARALLEL EXPANSION JOINT. LOOPS CUT ACROSS EXPANSION JOINTS SHALL HAVE SLACK CABLE FOR EXPANSION.
6. CONTRACTOR SHALL RESTORE THE CONSTRUCTION AREA TO ORIGINAL CONDITION PRIOR TO FINAL INSPECTION.
7. EXACT LOCATION OF POLES, CONTROLLER, SIGNAL HEADS, PULL BOXES AND LOOP DETECTORS SHALL BE DETERMINED IN THE FIELD SUBJECT TO FINAL APPROVAL BY ENGINEER IN THE FIELD.
8. ALL CONDUITS UNDER PAVED SHOULDERS OR NATURAL GROUND SHALL BE TRENCHED AND BURIED. HOWEVER, THE CONTRACTOR SHALL BACKFILL, COMPACT AND RESTORE TRENCHED AREA TO ORIGINAL CONDITION AND MATCH EXISTING SURFACE CONDITION TO THE DENSITY OF ADJACENT AREA. EXISTING GRASS AREA SHOULD BE RE-SODDED.
9. REFER TO SIGNING AND PAVEMENT MARKING PLAN FOR ADDITIONAL INFORMATION PERTAINING TO CROSSWALK AND STOP LINE LOCATIONS.
10. CONTRACTOR SHALL RETURN ALL SALVAGEABLE ITEMS TO HARRIS COUNTY AS DIRECTED.

CONTROLLER

PROPOSED 2070LCS ADVANCED TRANSPORTATION CONTROLLER ASSEMBLY

Signal Phasing Diagram shall comply with Harris County Standard detection sequence and shall be determined during signal turn-on.

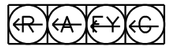
Phase 1 Westbound Left Turn	Phase 2 Eastbound Thru	Phase 3 Northbound Left Turn	Phase 4 Southbound Thru
Phase 5 Eastbound Left Turn	Phase 6 Westbound Thru	Phase 7 Southbound Left Turn	Phase 8 Northbound Thru

PROPOSED SIGNAL HEAD SCHEDULE

ONE-WAY
3-SECTION HORIZONTAL
12" LED SIGNAL HEAD

A, B, C, D,
E, F, H, J

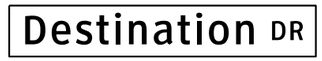
ONE-WAY
4-SECTION HORIZONTAL
12" LED SIGNAL HEAD
W/ FLASHING YELLOW ARROW



G

SIGN SCHEDULE

S1, S3
9.0' x 1.5'



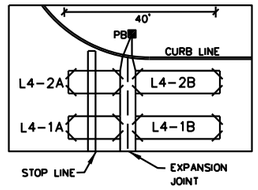
S2, S5
9.5' x 1.5'

S4
24" x 30"

LOOP DETECTOR CHART

LOOP	SIZE	SETTING	FUNCTION	LOOP	SIZE	SETTING	FUNCTION
L2-11	6'X6'	PULSE	SYSTEM DETECTOR	L6-1D	6'X6'	PULSE	CALL AND EXTEND ø6
L4-1B	6'X40'	PRESENCE	CALL AND EXTEND ø4	L6-2D	6'X6'	PULSE	CALL AND EXTEND ø6
L4-2B	6'X40'	PRESENCE	CALL AND EXTEND ø4	L7-1B	6'X40'	PRESENCE	CALL AND EXTEND ø7
L4-1C	6'X6'	PULSE	CALL AND EXTEND ø4	L7-1C	6'X20'	PRESENCE	CALL AND EXTEND ø7
L4-2C	6'X6'	PULSE	CALL AND EXTEND ø4	L8-1B	6'X40'	PRESENCE	CALL AND EXTEND ø8
L4-1D	6'X6'	PULSE	CALL AND EXTEND ø4	L8-2B	6'X40'	PRESENCE	CALL AND EXTEND ø8
L4-2D	6'X6'	PULSE	CALL AND EXTEND ø4	L8-1C	6'X6'	PULSE	CALL AND EXTEND ø8
L4-11	6'X6'	PULSE	SYSTEM DETECTOR	L8-2C	6'X6'	PULSE	CALL AND EXTEND ø8
L4-12	6'X6'	PULSE	SYSTEM DETECTOR	L8-1D	6'X6'	PULSE	CALL AND EXTEND ø8
L6-1B	6'X40'	PRESENCE	CALL AND EXTEND ø6	L8-2D	6'X6'	PULSE	CALL AND EXTEND ø8
L6-2B	6'X40'	PRESENCE	CALL AND EXTEND ø6	L8-11	6'X6'	PULSE	SYSTEM DETECTOR
L6-1C	6'X6'	PULSE	CALL AND EXTEND ø6	L8-12	6'X6'	PULSE	SYSTEM DETECTOR
L6-2C	6'X6'	PULSE	CALL AND EXTEND ø6				

DETAIL A



SEE "DETAIL A" IN CASE PRESENCE LOOPS CROSS CONC. EXPANSION JOINT

PROPOSED PEDESTRIAN SIGNAL UNITS

LED COUNTDOWN PEDESTRIAN SIGNAL HEADS

W1, W2
W3, W4

ACCESSIBLE PEDESTRIAN PUSH BUTTONS

R10-3eR

R10-3eL

Pb1, Pb3

Pb2, Pb4

ELECTRICAL CHART

ITEM	RUN NUMBER	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
LUMINAIRE & SIGN LIGHT	2/C #14 (IMSA 20-1)(STRANDED)			2													1	1		1		1
PUSH BUTTON	2/C #14 (IMSA 20-1)(STRANDED)		4										1	1	1	1	2	2	3			1
PED. SIGNAL	4/C #14 (IMSA 20-1)(STRANDED)		4										1	1	1	1	2	2	3			1
VEH. SIGNAL	7/C #14 (IMSA 20-1)(STRANDED)		9										2	2	2	2	2	2	4	3		5
GROUND BARE	#8 BARE COPPER		1	1									1	1	1	1	1	1	1	1		1
POWER	1/C-#4 AWG XHHW (STRANDED)	2																				
LOOP DETECTOR	2~#14 XHHW STRAND					2	1														3	
	2/C #14 (IMSA 50-2) (STRANDED)		23		2			1	4	6	5	8		8	8			8	15			8
CONDUIT	1 INCH PVC						1	1														
	2 INCH PVC	1		1	1	1			1				1			1	1			1	1	
	3 INCH PVC									1	1	1		1	1			1	1			1
	4 INCH PVC		1																			

ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE DESCRIPTION(SEE ELECTRICAL DETAILS - SERVICE SUPPORT SF & SP	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT		TWO-POLE CONTACTOR AMPS	PANELBD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
				SWITCH AMP/FUSES	CKT. BRK. POLE/AMP					
TY D (120/240)070(NS)SS(E)SP(O)	1 1/4"	3/#4	N/A	N/A	2P/70	20	70	TRAFFIC SIGNAL LIGHTING	1P/50 2P/20	<7.1

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
5			

HARRIS COUNTY
ENGINEERING DEPARTMENT

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
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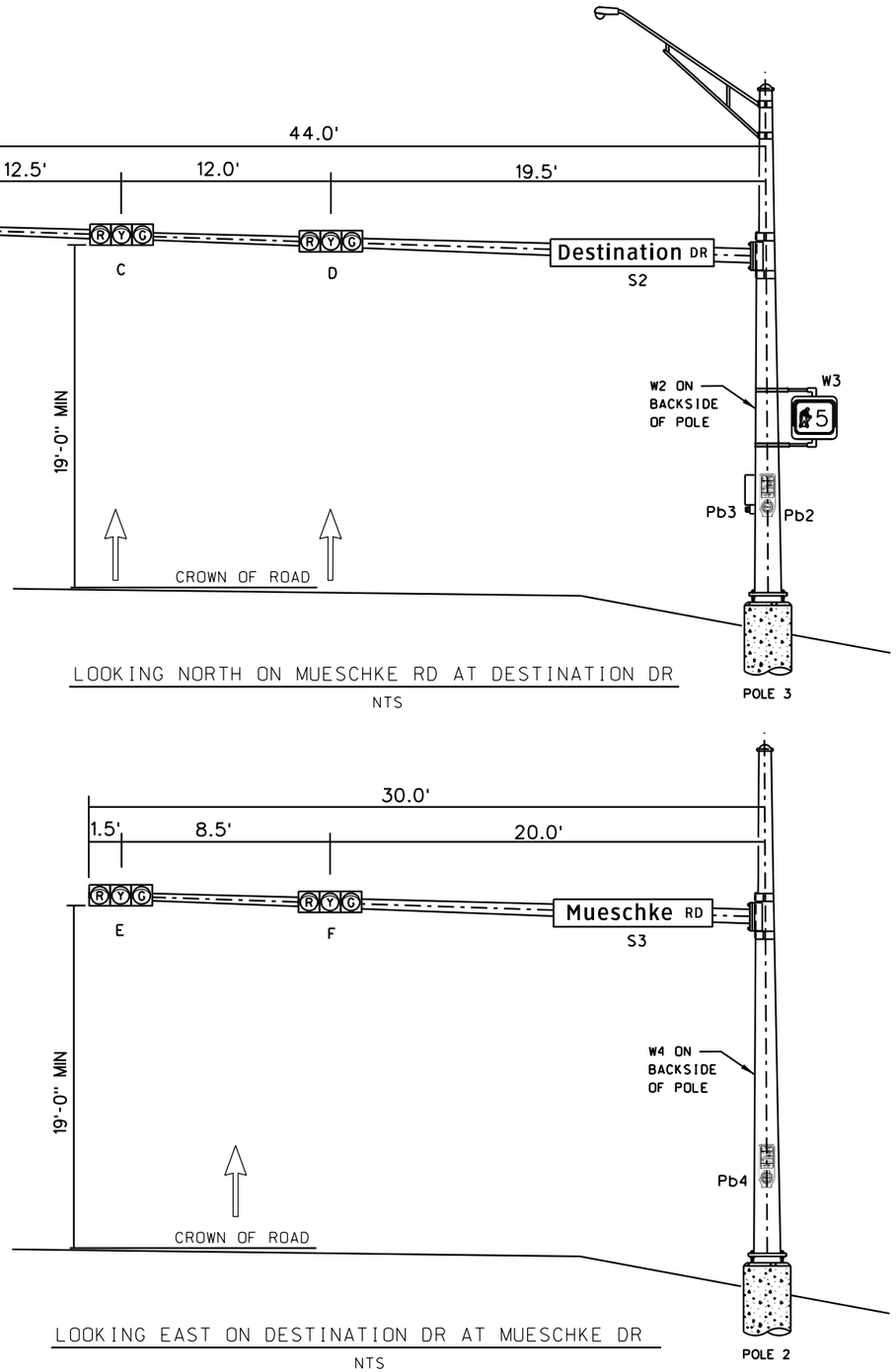
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100252-00

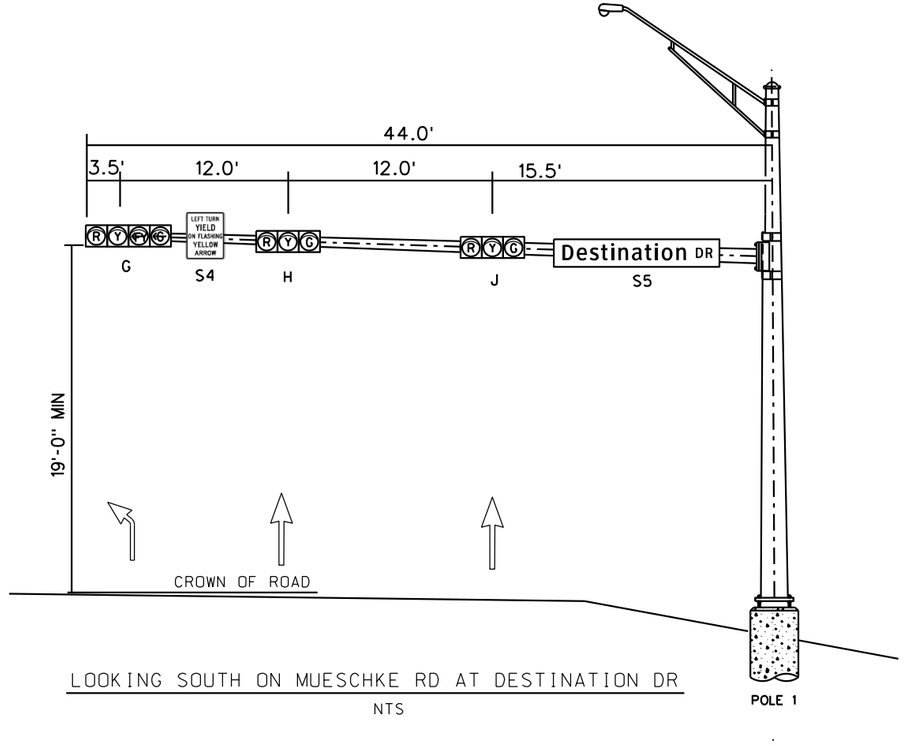
STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS
MUESCHKE RD AT DESTINATION DR
SHEET DESCRIPTION: TRAFFIC SIGNAL LEGEND
DRAWN BY: DWQ
CK'D BY: DWQ
SHEET 1 OF 1
SCALE: 1"=40'
DATE: 11/16/23
SHEET NO: 08 / 38



LOOKING NORTH ON MUESCHKE RD AT DESTINATION DR

NTS



LOOKING SOUTH ON MUESCHKE RD AT DESTINATION DR

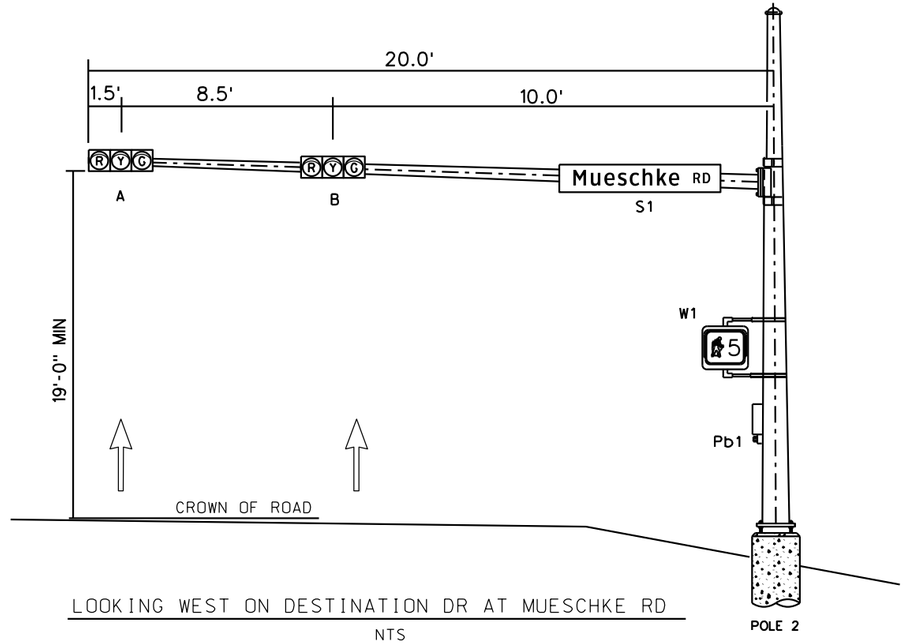
NTS

LOOKING EAST ON DESTINATION DR AT MUESCHKE DR

NTS

NOTES:

1. CENTER HEADS OVER THE LANES OR AS DIRECTED BY ENGINEER.DISTANCES SHOWN ALONG MAST ARMS ARE APPROXIMATE AND MUST BE ADJUSTED IN THE FIELD AS NEEDED.
2. FOUNDATIONS WILL BE ADJUSTED IN THE FIELD IN ORDER TO MEET CLEARANCES.
3. LOCATION OF MAST ARMS IS APPROXIMATE. ANY CHANGE WILL BE APPROVED BY THE ENGINEER.
4. MAST ARM ATTACHMENT HEIGHT WILL BE CALCULATED BY THE CONTRACTOR IN THE FIELD AND APPROVED BY THE ENGINEER.



LOOKING WEST ON DESTINATION DR AT MUESCHKE RD

NTS

NO.	REVISIONS	DATE	NAME
1			
2			
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HARRIS COUNTY
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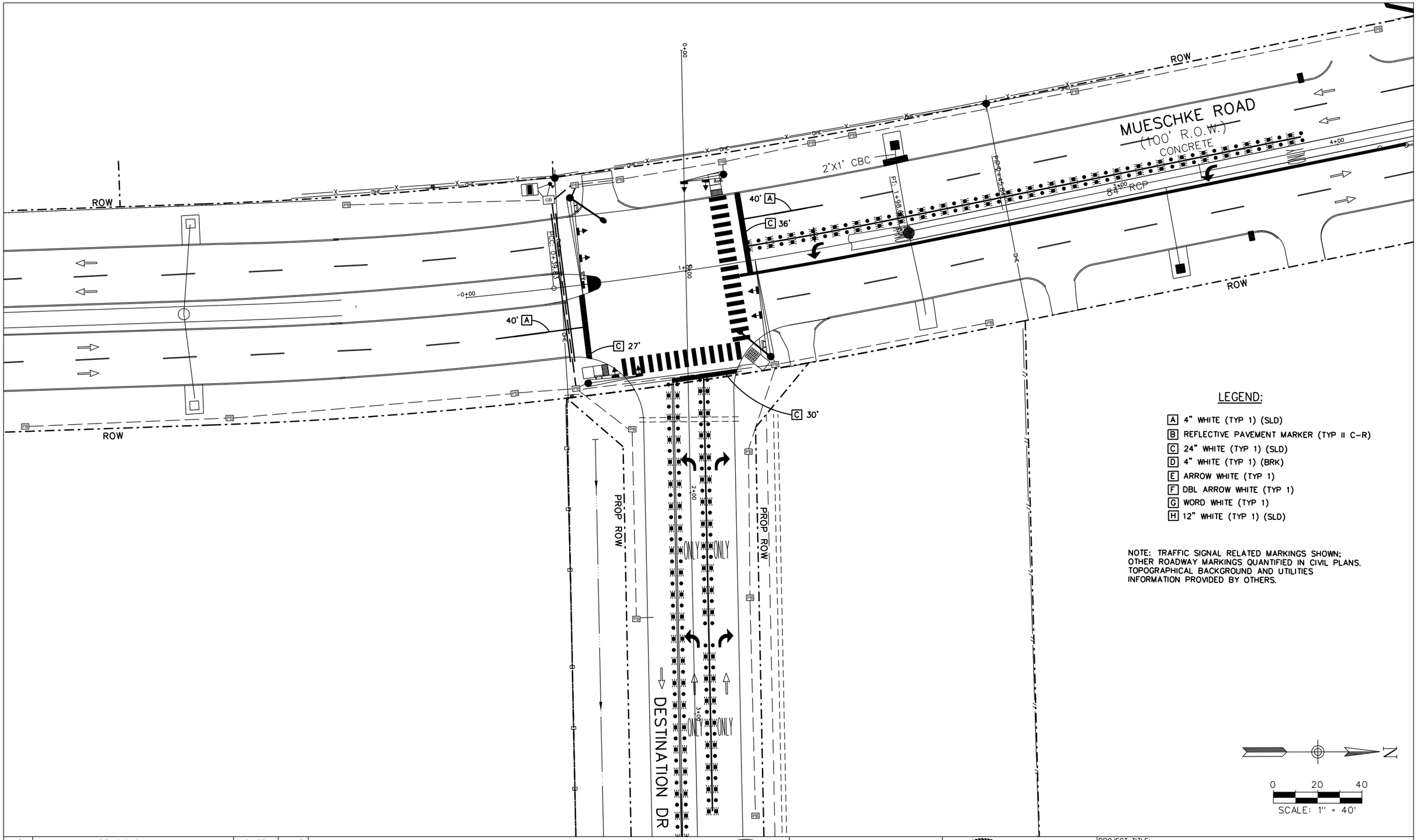
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
	MUESCHKE RD AT DESTINATION DR		
SHEET DESCRIPTION:	TRAFFIC SIGNAL ELEVATIONS		
DRAWN BY: DWQ	SHEET 1 OF 1	DATE: 11/16/23	
CK'D BY: DWQ	SCALE: NTS	SHEET NO: 09 / 38	



LEGEND:

- A 4" WHITE (TYP 1) (SLD)
- B REFLECTIVE PAVEMENT MARKER (TYP II C-R)
- C 24" WHITE (TYP 1) (SLD)
- D 4" WHITE (TYP 1) (BRK)
- E ARROW WHITE (TYP 1)
- F DBL ARROW WHITE (TYP 1)
- G WORD WHITE (TYP 1)
- H 12" WHITE (TYP 1) (SLD)

NOTE: TRAFFIC SIGNAL RELATED MARKINGS SHOWN; OTHER ROADWAY MARKINGS QUANTIFIED IN CIVIL PLANS. TOPOGRAPHICAL BACKGROUND AND UTILITIES INFORMATION PROVIDED BY OTHERS.

N

0 20 40

SCALE: 1" = 40'

NO.	REVISIONS	DATE	NAME
1			
2			
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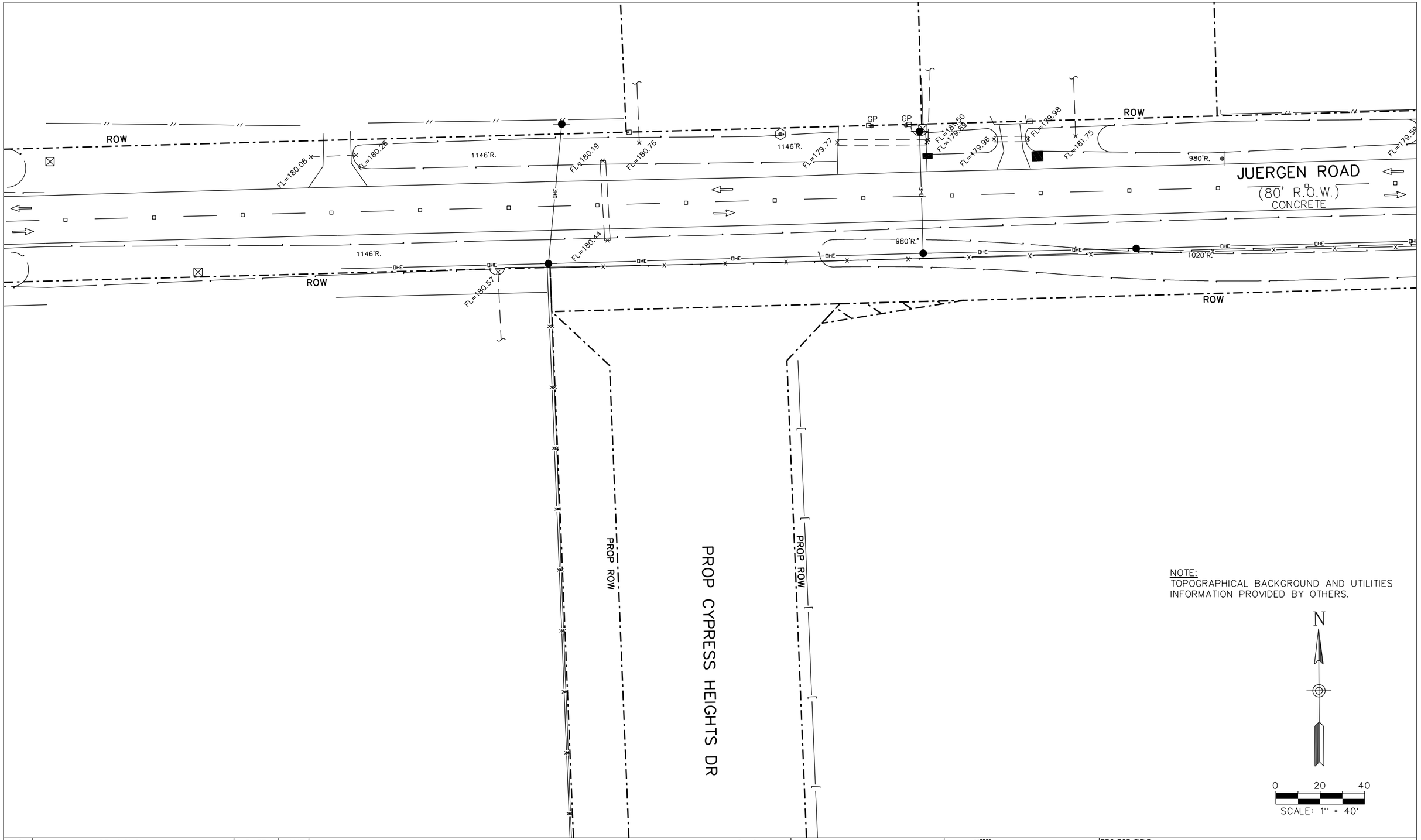
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	MUESCHKE RD AT DESTINATION DR
SHEET DESCRIPTION:	SIGNING AND PAVEMENT MARKINGS
DRAWN BY: DWQ	SHEET 1 OF 1 — DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40' — SHEET NO: 10 / 38



NOTE:
TOPOGRAPHICAL BACKGROUND AND UTILITIES INFORMATION PROVIDED BY OTHERS.

N

0 20 40

SCALE: 1" = 40'

NO.	REVISIONS	DATE	NAME
1			
2			
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TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
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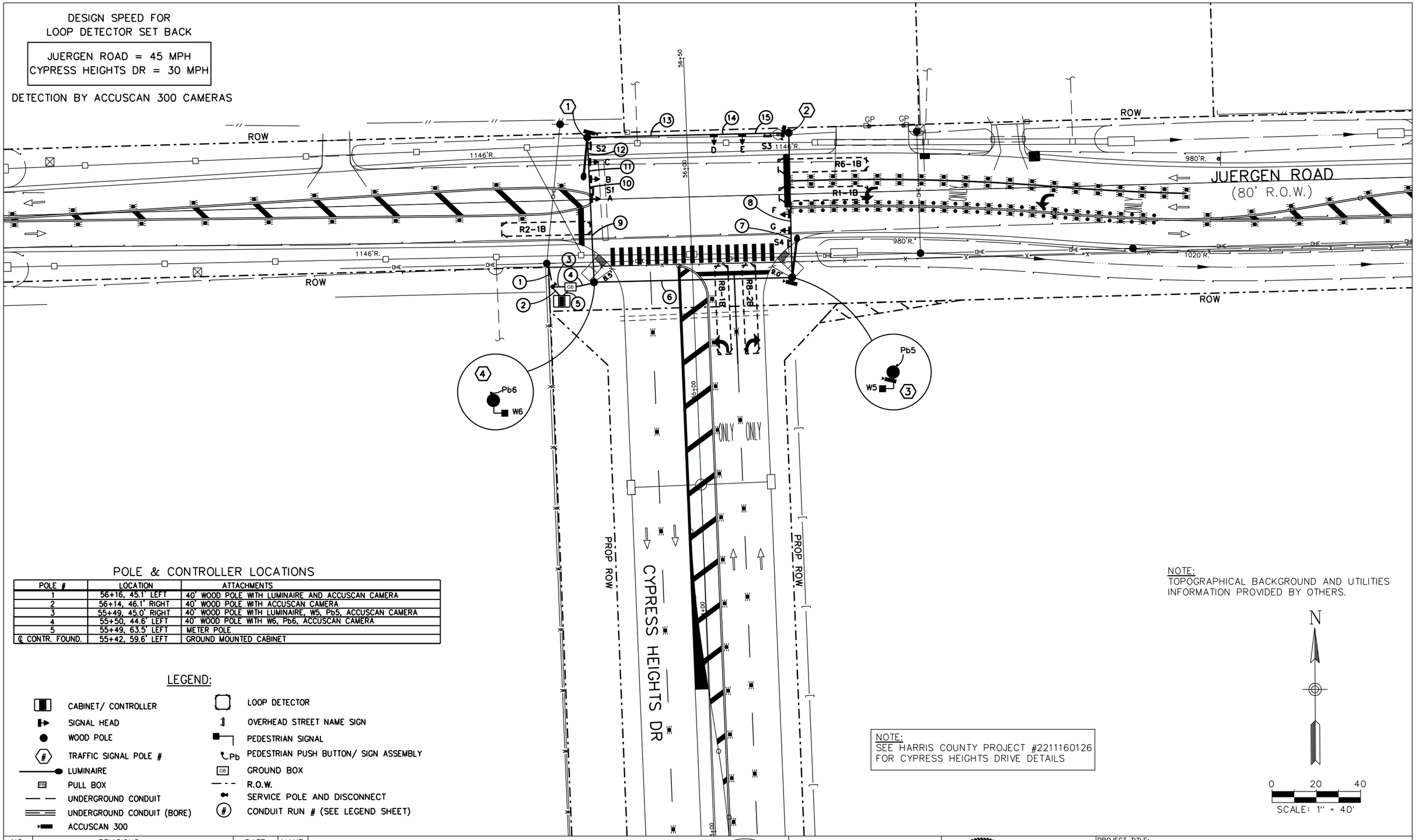
LICENSED PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS	
	JUERGEN RD AT CYPRESS HEIGHTS DR	
SHEET DESCRIPTION:	EXISTING CONDITIONS	
DRAWN BY: DWQ	SHEET 1 OF 1	DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40'	SHEET NO: 11 / 38

DESIGN SPEED FOR
LOOP DETECTOR SET BACK

JUERGEN ROAD = 45 MPH
CYPRESS HEIGHTS DR = 30 MPH

DETECTION BY ACCUSCAN 300 CAMERAS



POLE & CONTROLLER LOCATIONS

POLE #	LOCATION	ATTACHMENTS
1	56+16, 45.1' LEFT	40' WOOD POLE WITH LUMINAIRE AND ACCUSCAN CAMERA
2	56+14, 46.1' RIGHT	40' WOOD POLE WITH ACCUSCAN CAMERA
3	55+49, 45.0' RIGHT	40' WOOD POLE WITH LUMINAIRE, W5, Pb5, ACCUSCAN CAMERA
4	55+50, 44.6' LEFT	40' WOOD POLE WITH W6, Pb6, ACCUSCAN CAMERA
5	55+49, 63.5' LEFT	METER POLE
℄ CONTR. FOUND.	55+42, 59.6' LEFT	GROUND MOUNTED CABINET

LEGEND:

- CABINET/ CONTROLLER
- SIGNAL HEAD
- WOOD POLE
- TRAFFIC SIGNAL POLE #
- LUMINAIRE
- PULL BOX
- UNDERGROUND CONDUIT
- UNDERGROUND CONDUIT (BORE)
- ACCUSCAN 300
- LOOP DETECTOR
- OVERHEAD STREET NAME SIGN
- PEDESTRIAN SIGNAL
- PEDESTRIAN PUSH BUTTON/ SIGN ASSEMBLY
- GROUND BOX
- R.O.W.
- SERVICE POLE AND DISCONNECT
- CONDUIT RUN # (SEE LEGEND SHEET)

NOTE:
SEE HARRIS COUNTY PROJECT #2211160126
FOR CYPRESS HEIGHTS DRIVE DETAILS

NOTE:
TOPOGRAPHICAL BACKGROUND AND UTILITIES INFORMATION PROVIDED BY OTHERS.

N

0 20 40
SCALE: 1" = 40'

NO.	REVISIONS	DATE	NAME
1			
2			
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TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	JUERGEN RD AT CYPRESS HEIGHTS DR
SHEET DESCRIPTION:	TRAFFIC SIGNAL LAYOUT
DRAWN BY: DWQ	SHEET 1 OF 1
DATE: 11/16/23	
CK'D BY: DWQ	SCALE: 1"=40'
SHEET NO: 12 / 38	

NOTES TO CONTRACTOR:

1. LOCATION OF UTILITIES SHOWN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE-GROUND OR OVERHEAD.
2. CALL THE FOLLOWING NUMBERS FOR LOCATION OF UNDER-GROUND FACILITIES 72 HOURS PRIOR TO ANY EXCAVATION IN AREA:
   UTILITIES: (713) 223-4567 (HOUSTON)
   1-800-669-8344 (OUTSIDE HOUSTON)
   PIPELINES: 1-800-245-4545 AND 1-800-344-8377
3. ALL CONSTRUCTION SIGNS AND BARRICADES SHALL CONFORM TO THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.
4. ALL CONDUITS UNDER ROADWAYS AND DRIVEWAYS SHALL BE BORED AND JACKED. CONTRACTOR SHALL EXERCISE CAUTION WHEN BORING AND/OR EXCAVATING IN THE VICINITY OF UNDERGROUND UTILITIES.
5. NO LOOP DETECTOR SHALL BE CUT IN A PARALLEL EXPANSION JOINT. LOOPS CUT ACROSS EXPANSION JOINTS SHALL HAVE SLACK CABLE FOR EXPANSION.
6. CONTRACTOR SHALL RESTORE THE CONSTRUCTION AREA TO ORIGINAL CONDITION PRIOR TO FINAL INSPECTION.
7. EXACT LOCATION OF POLES, CONTROLLER, SIGNAL HEADS, PULL BOXES AND LOOP DETECTORS SHALL BE DETERMINED IN THE FIELD SUBJECT TO FINAL APPROVAL BY ENGINEER IN THE FIELD.
8. ALL CONDUITS UNDER PAVED SHOULDERS OR NATURAL GROUND SHALL BE TRENCHED AND BURIED. HOWEVER, THE CONTRACTOR SHALL BACKFILL, COMPACT AND RESTORE TRENCHED AREA TO ORIGINAL CONDITION AND MATCH EXISTING SURFACE CONDITION TO THE DENSITY OF ADJACENT AREA. EXISTING GRASS AREA SHOULD BE RE-SODDED.
9. REFER TO SIGNING AND PAVEMENT MARKING PLAN FOR ADDITIONAL INFORMATION PERTAINING TO CROSSWALK AND STOP LINE LOCATIONS.
10. CONTRACTOR SHALL RETURN ALL SALVAGEABLE ITEMS TO HARRIS COUNTY AS DIRECTED.

PROPOSED SIGNAL HEAD SCHEDULE

ONE-WAY
3-SECTION HORIZONTAL
12" LED SIGNAL HEAD

B, C, D,
E, F, G

ONE-WAY
4-SECTION HORIZONTAL
12" LED SIGNAL HEAD
W/ FLASHING YELLOW ARROW

A

SIGN SCHEDULE

S1
24" X 30"

S3
7.5' X 1.5'

S2, S4
11.0' X 1.5'

ACCUSCAN 300 DETECTOR CHART

LOOP	SIZE	SETTING	FUNCTION
R1-1B	6'X40'	PRESENCE	CALL AND EXTEND ø1
R2-1B	6'X40'	PRESENCE	CALL AND EXTEND ø2
R6-1B	6'X40'	PRESENCE	CALL AND EXTEND ø6
R8-1B	6'X40'	PRESENCE	CALL AND EXTEND ø8
R8-2B	6'X40'	PRESENCE	CALL AND EXTEND ø8

PROPOSED PEDESTRIAN SIGNAL UNITS

LED COUNTDOWN PEDESTRIAN SIGNAL HEADS

W5, W6

ACCESSIBLE PEDESTRIAN PUSH BUTTONS

R10-3eR

Pb5

R10-3eL

Pb6

CONTROLLER

PROPOSED 2070LCS ADVANCED TRANSPORTATION CONTROLLER ASSEMBLY

Signal Phasing Diagram shall comply with Harris County Standard detection sequence and shall be determined during signal turn-on.

Phase 1 Westbound Left Turn	Phase 2 Eastbound Thru	Phase 3 Northbound Left Turn	Phase 4 Southbound Thru
Phase 5 Eastbound Left Turn	Phase 6 Westbound Thru	Phase 7 Southbound Left Turn	Phase 8 Northbound Thru

ELECTRICAL CHART

ITEM	RUN NUMBER	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
LUMINAIRE & SIGN LIGHT	2/C #14 (IMSA 20-1)(STRANDED)			2	2		1			1	1	1	1			
PUSH BUTTON	2/C #14 (IMSA 20-1)(STRANDED)				2	2	1									
PED. SIGNAL	4/C #14 (IMSA 20-1)(STRANDED)				2	2	1									
VEH. SIGNAL	7/C #14 (IMSA 20-1)(STRANDED)				7	7	2	2	2	5	4	3	2	2	2	
GROUND BARE	#8 BARE COPPER			1	1	1	1	1	1	1	1	1	1	1	1	1
POWER	1/C-#4 AWG XHHW (STRANDED)	2	2													
LOOP DETECTOR	2~#14 XHHW STRAND															
	2/C #14 (IMSA 50-2) (STRANDED)															
ACCUSCAN DETECTOR	4/C #18 AWG				3	3	1			2	2	2	2	1	1	1
CONDUIT	1 INCH PVC															
	2 INCH PVC			1												
	3 INCH PVC	1	1													
	4 INCH PVC				1	1										

ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE DESCRIPTION(SEE ELECTRICAL DETAILS - SERVICE SUPPORT SF & SP	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT		TWO-POLE CONTACTOR AMPS	PANELBD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
				SWITCH AMP/FUSES	CKT. BRK. POLE/AMP					
TY D (120/240)070(NS)SS(E)SP(O)	1 1/4"	3/#4	N/A	N/A	2P/70	20	70	TRAFFIC SIGNAL LIGHTING	1P/50 2P/20	<7.1

NO.	REVISIONS	DATE	NAME
1			
2			
3			
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STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
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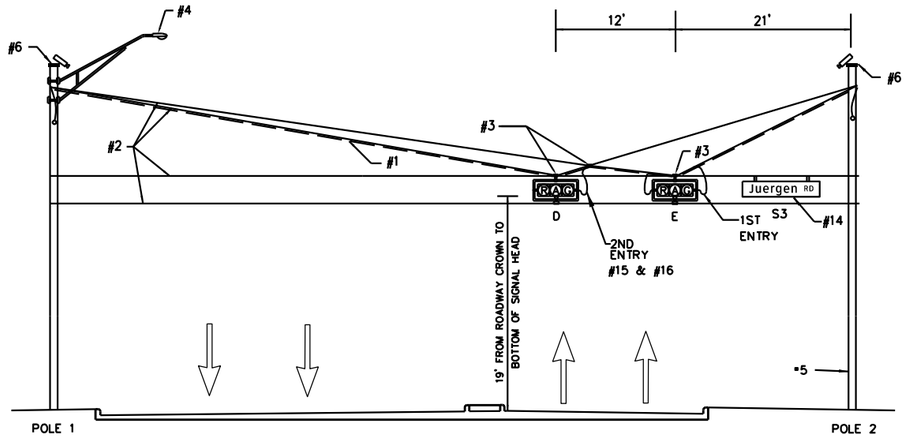
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

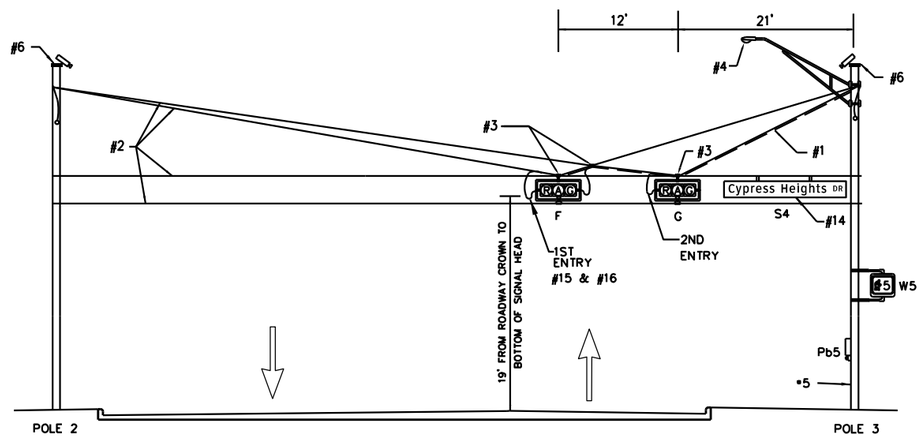
PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS
JUERGEN RD AT CYPRESS HEIGHTS DR
SHEET DESCRIPTION: TRAFFIC SIGNAL LEGEND

DRAWN BY: DWQ	SHEET 1 OF 1	DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40'	SHEET NO: 13 / 38



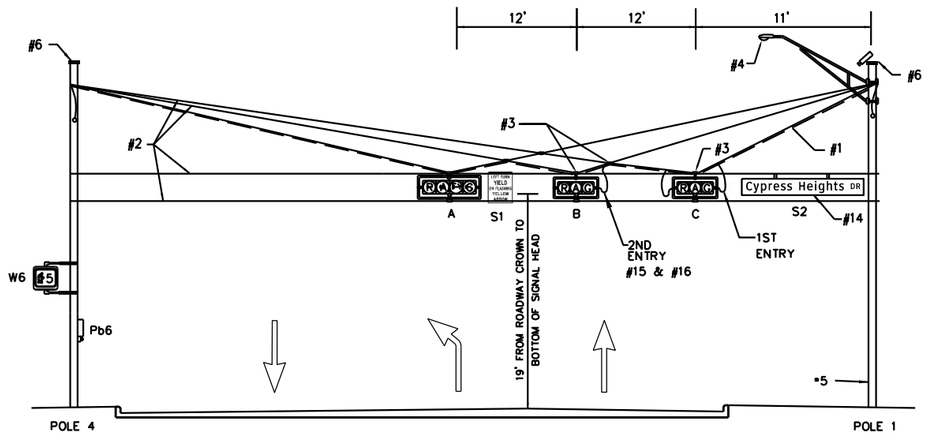
LOOKING NORTH ON CYPRESS HEIGHTS DR AT JUERGEN RD

NTS



LOOKING EAST ON JUERGEN RD AT CYPRESS HEIGHTS DR

NTS



LOOKING WEST ON JUERGEN RD AT CYPRESS HEIGHTS DR

NTS

SPECIAL NOTES:

•1. SIGNAL CABLE LASHED TO MESSENGER WIRE WITH STAINLESS STEEL SUPPORTS (2 EVERY 18" C-C), PANDUIT CATALOG • MLT 4H-LP OR APPROVED EQUAL.
•2. ONE (1) 5/16" - 7 WIRE STRAND (SIEMENS MARTIN) GALVANIZED STEEL CATENARY SYSTEM (ONE PER SIGNAL) AND TWO (2) - 1/4" 7 WIRE STRAND GALVANIZED STEEL CATENARY SYSTEM (HORIZONTAL).
•3. SADDLE TYPE CLAMP (TYPICAL FOR ALL SIGNAL CONNECTION AND MESSENGER CROSSINGS).
•4. LED LUMINAIRE ON 15' ARM.
•5. 40' WOOD POLE (TYPICAL ALL POLES).
•6. POLE CAP.
•7. ALL HARDWARE SHALL BE GALVANIZED PER THE APPROPRIATE HARRIS COUNTY SPECIFICATION.
•8. ALL POLES, CONTROLLER AND METER SHALL BE GROUNDED WITH •8 BARE SOLID COPPER WIRE CONNECTED TO 5/8" DIA. COPPER CLAD STEEL GROUND ROD BURIED 8' INTO THE GROUND.
•9. SEE TRAFFIC SIGNAL LAYOUT SHEETS FOR CONDUITS REQUIRED.
•10. SEE HARRIS COUNTY SPECIFICATIONS FOR ADDITIONAL INFORMATION ON WOOD POLE DETAILS.
•11. CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE ALL UTILITIES AND CULVERTS IN THE WAY OF CONSTRUCTION.
•12. PHOTOELECTRIC CELL FOR OPERATION OF LUMINAIRES AND LEFT TURN SIGN LIGHTS (ENCLOSURE MOUNTED).
•13. ALL PEDESTRIAN SIGNALS SHALL BE LED COUNTDOWN TYPE.
•14. STREET NAME SIGNS, SIGN CLAMPS SHALL BE SUBMITTED TO HARRIS COUNTY FOR APPROVAL.
•15. SIGNAL CABLES SHALL GO TO THE FURTHEST SIGNAL HEAD FROM THE CONTROLLER CABINET.
•16. SIGNAL CABLES SHALL ALWAYS ENTER THE RIGHT SIDE OF THE SIGNAL HEAD (ADJACENT TO THE GREEN INDICATION) AND EXIT THE LEFT SIDE (ADJACENT TO THE RED INDICATION) WHEN NECESSARY.

NO.	REVISIONS	DATE	NAME
1			
2			
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4			
5			

HARRIS COUNTY
ENGINEERING DEPARTMENT

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	JUERGEN RD AT CYPRESS HEIGHTS DR
SHEET DESCRIPTION:	TRAFFIC SIGNAL ELEVATIONS
DRAWN BY: DWQ	SHEET 1 OF 1 — DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40' — SHEET NO: 14 / 38

ROW

1146'R.

1146'R.

ROW

GP

GP

ROW

980'R.

JUERGEN ROAD
(80' R.O.W.)

24' C

C 17'

980'R.

1020'R.

GB

C 32'

ROW

ONLY ONLY

PROP ROW

CYPRESS HEIGHTS DR

PROP ROW

LEGEND:

- A 4" WHITE (TYP 1) (SLD)
- B REFLECTIVE PAVEMENT MARKER (TYP II C-R)
- C 24" WHITE (TYP 1) (SLD)
- D 4" WHITE (TYP 1) (BRK)
- E ARROW WHITE (TYP 1)
- F DBL ARROW WHITE (TYP 1)
- G WORD WHITE (TYP 1)
- H 12" WHITE (TYP 1) (SLD)

NOTE: TRAFFIC SIGNAL RELATED MARKINGS SHOWN; OTHER ROADWAY MARKINGS QUANTIFIED IN CIVIL PLANS. TOPOGRAPHICAL BACKGROUND AND UTILITIES INFORMATION PROVIDED BY OTHERS.

N

0 20 40

SCALE: 1" = 40'

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
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HARRIS COUNTY
ENGINEERING DEPARTMENT

Amani Engineering, Inc.
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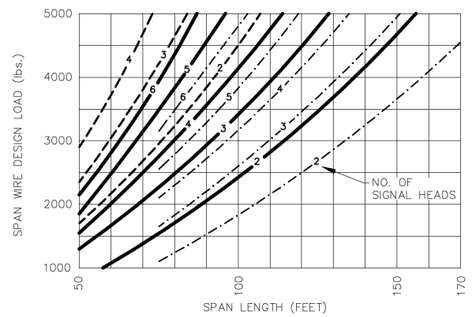
TBPE Firm Reg. No.: F-455?8
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	JUERGEN RD AT CYPRESS HEIGHTS DR
SHEET DESCRIPTION:	SIGNING AND PAVEMENT MARKINGS
DRAWN BY: DWQ	SHEET 1 OF 1 — DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40' — SHEET NO: 15 / 38



SAG = 4'–6" (30' POLE)
SAG = 8'–0" (30' OR 34' POLE)
SAG = 11'–6" (34' POLE)

SIGNAL HEAD TYPE	WT. PER HEAD	WIND AREA ◆
5–SECTION, 12" LENS	125 LBS.	9.6 SQ. FT.
3–SECTION, 12" LENS	75 LBS.	5.64 SQ. FT.

◆ EFFECTIVE PROJECTED DESIGN WIND AREA (ACTUAL AREA TIMES DRAG COEFFICIENT)

LOAD SPAN CHART – SIGNALS WITH 12–INCH LENS

LOAD SPAN CHART NOTES:

NUMBERS ON LOAD SPAN CHART INDICATE THE NUMBER OF SIGNAL HEADS ON THE SPAN. THE TOTAL SPAN WIRE DESIGN LOAD IS BASED ON ONE 5–SECTION HEAD AND ONE OR MORE ADDITIONAL 3–SECTION HEAD(S). DESIGN WIND PRESSURES ON CABLES ARE ASSUMED AS 1.6 LB/FT. WEIGHT OF SPAN WIRE CABLES (ONE PER SIGNAL HEAD) IS ASSUMED AS 0.65 LB/FT WHICH INCLUDES AN ALLOWANCE FOR CONDUCTOR CABLES AND MISCELLANEOUS HARDWARE. THE EFFECT OF THE SWAY CABLE ON LOAD DISTRIBUTION IS IGNORED AS IT IS ASSUMED TO BREAK AT DESIGN WIND CONDITIONS. WIND LOAD ON STREET NAME SIGNS SHOULD BE CONSIDERED FOR SPAN WIRE DESIGN LOAD. WHEN A POLE SUPPORTS 2 SPANS, THE SPAN WIRE DESIGN LOADS FOR BOTH SPANS SHOULD BE ADDED AS EXPLAINED BELOW TO DETERMINE THE DESIGN LOAD FOR THAT POLE.

DESIGN LOAD AND MOMENT CALCULATIONS:

WHEN A POLE SUPPORTS 2 SPANS, THE SPAN WIRE DESIGN LOADS FOR BOTH SPANS SHOULD BE ADDED, AS BELOW, TO DETERMINE THE DESIGN LOAD FOR THAT POLE.

Fx (lbs) = LOAD 2 + (LOAD 1 * COS(ANGLE BETWEEN SPANS))
Fy (lbs) = LOAD 1 * SIN(ANGLE BETWEEN SPANS)

DESIGN LOAD(lbs) = $\sqrt{Fx^2 + Fy^2}$

DESIGN MOMENT(K*FT) = ((POLE HT. – 0.953) * DESIGN LOAD) / 1000

IF DESIGN LOAD IS GREATER THAN THE MAX. PERMISSIBLE LOAD FROM TABLE BELOW, A SPECIAL FOUNDATION DESIGN MAY BE REQUIRED.

IF DESIGN MOMENT IS GREATER THAN THE MAX. ALLOWABLE MOMENT FROM THE FOUNDATION DESIGN TABLE ON THE STRAIN POLE FOUNDATION STANDARD DETAIL, A SPECIAL FOUNDATION MAYBE REQUIRED.

STRAIN POLE AND CLAMP–ON MAST ARM DESCRIPTION	POLE TYPE	FOUNDATION TYPE	MAX. PERMISSIBLE SPAN WIRE LOAD (lbs)
30' POLE WITH 20' CLAMP–ON MAST ARM & LUMINAIRE	HC10030	10030	4000
30' POLE WITH 25' CLAMP–ON MAST ARM & LUMINAIRE	HC10030	10030	3700
30' POLE WITH 30' CLAMP–ON MAST ARM & LUMINAIRE	HC10030	10030	3200
30' POLE WITH 35' CLAMP–ON MAST ARM & LUMINAIRE	HC10030	10030	2700
30' POLE WITH 40' CLAMP–ON MAST ARM & LUMINAIRE	HC10030	10030	2000
34' POLE WITH 20' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	4800
34' POLE WITH 25' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	4500
34' POLE WITH 30' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	4200
34' POLE WITH 35' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	3800
34' POLE WITH 40' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	3300
34' POLE WITH 42' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	3100
34' POLE WITH 44' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	2800

POLE TYPE	ROUND STRAIN POLE				OCTAGONAL STRAIN POLE			
	D_B	D_T	THK.	H	D_B	D_T	THK.	H
	IN.	IN.	IN.	FT.	IN.	IN.	IN.	FT.
HC10030	13.75	9.55	0.3125	30	13.75	9.55	0.3125	30
HC10034	15.5	10.74	0.3125	34	15.5	10.74	0.3125	34

D_B = POLE BASE O.D.
D_T = POLE TOP O.D.
H = HEIGHT

MAST ARM LENGTH	ROUND CLAMP–ON MAST ARM				OCTAGONAL CLAMP–ON MAST ARM			
	D_1	D_2 ◬	THK.(t)	RISE	D_1	D_2 ◬	THK.(t)	RISE
FT.	IN.	IN.	IN.	FT.	IN.	IN.	IN.	FT.
20	8.0"	5.3"	0.1793"	3'–10"	8.0"	5.3"	0.1793"	3'–10"
25	9.0"	5.6"	0.1793"	3'–10"	9.0"	5.6"	0.1793"	3'–10"
30	9.5"	5.4"	0.1793"	3'–10"	10.0"	5.4"	0.1793"	3'–10"
35	10.5"	5.7"	0.1793"	3'–10"	10.0"	5.7"	0.1793"	3'–10"
40	10.5"	5.0"	0.2391"	3'–10"	11.0"	5.0"	0.2391"	3'–10"
42	10.5"	4.7"	0.2391"	3'–10"	11.0"	4.7"	0.2391"	3'–10"
44	11.0"	4.9"	0.2391"	3'–10"	11.5"	4.9"	0.2391"	3'–10"

D_1 = POLE BASE O.D.
D_2 = POLE TOP O.D.
◬ D_2 MAY BE INCREASED BY UP TO 1.0" FOR OCTAGONAL ARMS

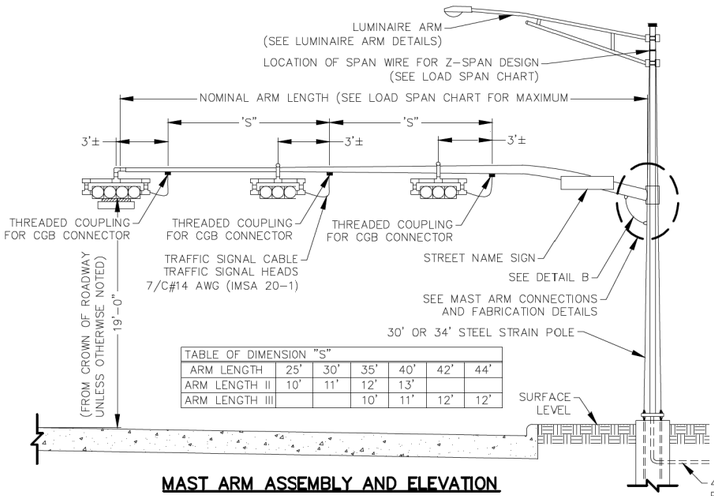
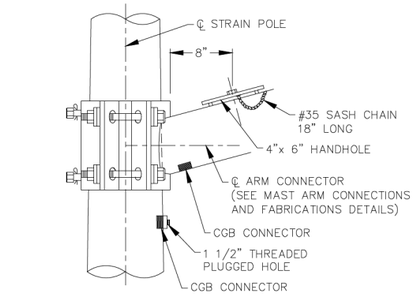
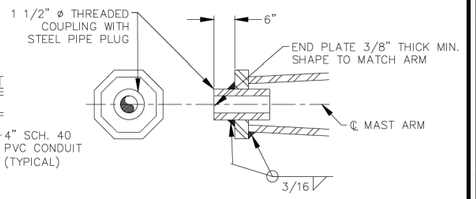


TABLE OF DIMENSION "S"						
ARM LENGTH	25'	30'	35'	40'	42'	44'
ARM LENGTH II	10'	11'	12'	13'		
ARM LENGTH III			10'	11'	12'	12'

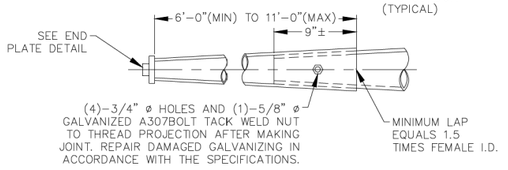
MAST ARM ASSEMBLY AND ELEVATION



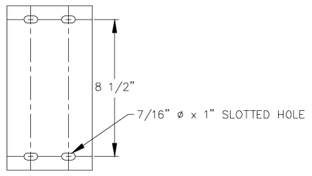
DETAIL B



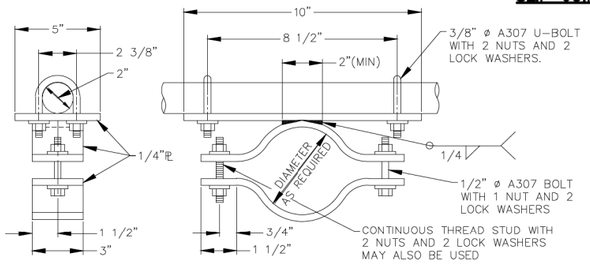
END PLATE DETAIL



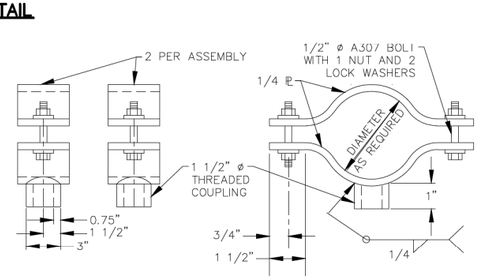
NOTE:
A SLIP JOINT IS PERMISSIBLE FOR MAST ARMS 40' AND GREATER IN LENGTH. THE SLIP JOINT SHALL BE MADE IN THE SHOP, BUT MAY BE MATCH MARKED AND SHIPPED DISASSEMBLED



SLIP JOINT DETAIL



BRACKET ASSEMBLY DETAIL – OPTION A



BRACKET ASSEMBLY DETAIL – OPTION B

GENERAL NOTES:

1.) DESIGN SHALL CONFORM TO 2001 OR LATEST ADDITION TO AASHTO STANDARD SPECIFICATIONS FOR THE STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS AND INTERIM SPECIFICATIONS DESIGN WIND SPEED EQUALS 100 MPH PLUS A 1.3 GUST FACTOR.
2.) STRAIN POLES ARE DESIGNED TO SUPPORT SPAN WIRE WITH ONE CLAMP–ON MAST ARM. THE SPECIFIED SIGNAL LOAD APPLIED AT THE END OF THE TRAFFIC SIGNAL ARM EQUALS 180 LBS. VERTICAL DEAD LOAD PLUS THE HORIZONTAL WIND LOAD ON AN EFFECTIVE PROJECTED AREA OF 32.4 SQ. FT. THE MAXIMUM PERMISSIBLE SPAN WIRE DESIGN LOADS TABULATED ARE CALCULATED AT A STRESS LOAD OF 1.40 TIMES THE BASIC ALLOWABLE STRESS. A SIMULTANEOUS WIND ON THE POLE, MAST ARM, AND LUMINAIRE IS ALSO INCLUDED. DESIGNS ARE BASED ON A SPAN WIRE AND ARM INCLUDED ANGLE OF 90 DEG. ANGLES OF LESS THAN 75 DEG. OR MORE THAN 105 DEG. WILL REQUIRE A SPECIAL DESIGN.
3.) FABRICATION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND THE WITH THE DETAILS AND DIMENSIONS. ALL WELDING SHALL CONFORM TO THE REQUIREMENTS OF THE SPECIFICATIONS OF THE AMERICAN WIELDING SOCIETY STRUCTURAL WELDING CODE AWS LATEST EDITION.
4.) SEE CLAMP–ON MAST ARM CONNECTIONS AND FABRICATION TOLERANCES DETAILS STANDARD SHEET FOR DETAILS OF CLAMP–ON MAST ARM CONNECTIONS AND FABRICATION TOLERANCES.
5.) SEE STRAIN POLE ASSEMBLY DETAILS STANDARD SHEET FOR DETAILS OF STRAIN POLE.
6.) SEE LUMINAIRE ARM DETAILS STANDARD SHEET FOR DETAILS OF LUMINAIRE ARM AND CONNECTION.
7.) SEE STRAIN POLE FOUNDATION DETAILS STANDARD SHEET FOR DETAILS OF ANCHOR BOLTS AND FOUNDATION.
8.) UNLESS OTHERWISE NOTED, ALL STEEL PARTS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 REQUIREMENTS WITH A MINIMUM OF 2 OUNCES PER SQUARE FOOT OF GALVANIZED COATING.
9.) ALL SMALL STEEL HARDWARE ITEMS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A153 REQUIREMENTS.
10.) SPECIAL DESIGNS REQUIRE SUBMISSION OF SHOP DRAWINGS IN ACCORDANCE WITH THE SPECIFICATION ITEM 680 "STEEL MAST ARM AND STEEL STRAIN POLE ASSEMBLIES".
11.) ALL BOLTS SHALL HAVE TWO FULL DIAMETER THREADS EXPOSED ABOVE THE NUT.
12.) CONTRACTOR SHALL INSTALL A CLOSE NIPPLE WITH LOCKNUTS AND METAL BUSHINGS (SIZE AS REQUIRED) TO PREVENT ABRASION WHERE CABLE(S) ENTER ANY PORTION OF THE STRAIN POLE.
13.) CLAMP–ON MAST ARM(S) AND STRAIN POLE(S) SHALL HAVE THE SAME GEOMETRIC SHAPE PER ASSEMBLY.

SHIPPING PARTS LIST

CLAMP–ON MAST ARM(S) – STRAIN POLE			
NOMINAL ARM LENGTH		SHIP EACH CLAMP–ON MAST ARM AND STRAIN POLE WITH THE FOLLOWING HARDWARE ATTACHED: HANDHOLE AT BASE, POLE CAP, ETC.	
Lc FT.	Lc FT.	DESCRIPTION	QUANTITY
20		20 – HC10030	1
		20 – HC10034	
25		25 – HC10030	1
		25 – HC10034	
30		30 – HC10030	
		30 – HC10034	
35		35 – HC10030	
		35 – HC10034	
40		40 – HC10030	
		40 – HC10034	
42		42 – HC10030	
		42 – HC10034	
44		44 – HC10030	
		44 – HC10034	2
20	20	20/20 – HC10030	
	20	20/20 – HC10034	
25	20	25/20 – HC10030	
	20	25/20 – HC10034	
	25	25/25 – HC10030	
	25	25/25 – HC10034	
30	20	30/20 – HC10030	
	20	30/20 – HC10034	
	25	30/25 – HC10030	
	25	30/25 – HC10034	
	30	30/30 – HC10030	
	30	30/30 – HC10034	
35	20	35/20 – HC10030	
	20	35/20 – HC10034	
	25	35/25 – HC10030	
	25	35/25 – HC10034	
	30	35/30 – HC10030	
	30	35/30 – HC10034	
	35	35/35 – HC10030	
	35	35/35 – HC10034	
40	20	40/20 – HC10030	
	20	40/20 – HC10034	
	25	40/25 – HC10030	
	25	40/25 – HC10034	
	30	40/30 – HC10030	
	30	40/30 – HC10034	
	35	40/35 – HC10030	
	35	40/35 – HC10034	
	40	40/40 – HC10034	
42	20	42/20 – HC10030	
	20	42/20 – HC10034	
	25	42/25 – HC10030	
	25	42/25 – HC10034	
	30	42/30 – HC10030	
	30	42/30 – HC10034	
	35	42/35 – HC10034	
	40	42/40 – HC10034	
	42	42/42 – HC10034	
44	20	44/20 – HC10030	
	20	44/20 – HC10034	
	25	44/25 – HC10034	
	30	44/30 – HC10034	
	35	44/35 – HC10034	
	40	44/40 – HC10034	
	42	44/42 – HC10034	
	44	44/44 – HC10034	

LUMINAIRE ARMS (1 PER POLE)	
NOMINAL ARM LENGTH	QUANTITY
15' ARM	2

ANCHOR BOLT ASSEMBLIES (1 PER POLE)*		
ANCHOR BOLT DIAMETER	BOLT HOLE DIAMETER	QUANTITY
2 ¼"	6'–3 ½"	4

* EACH ANCHOR BOLT ASSEMBLY CONSIST OF THE FOLLOWING:
TOP AND BOTTOM TEMPLATES, 4 ANCHOR BOLTS, 8 NUTS, 8 FLAT, WASHERS, 4 LOCK WASHERS AND 4 NUT ANCHOR DEVICES (TYPE 2) PER STANDARD DRAWING STRAIN POLE FOUNDATION DETAILS.
(TEMPLATES MAY BE REMOVED FOR SHIPMENT)

MATERIALS	
ROUND CLAMP–ON MAST ARM AND STRAIN POLE OR OCTAGONAL MAST ARM AND STRAIN POLE	ASTM A570 GR50 OR ASTM A572 GR50
PLATES (1)	ASTM A36 OR A572 GR50
STEEL CABLE	ASTM A475, 7 WIRE, UTILITIES GRADE

(1) EITHER OF THE MATERIALS LISTED FOR PLATES MAY BE USED WHERE THE DRAWINGS DO NOT SPECIFY A PARTICULAR ASTM DESIGNATION.

VIBRATION WARNING:

CLAMP–ON MAST ARMS STRUCTURES OF APPROXIMATELY 40 FEET OR LONGER ARE SUBJECT TO HARMONIC VERTICAL VIBRATIONS IN LIGHT WIND CONDITIONS DUE TO THE AEROELASTIC CHARACTERISTICS OF A FEW OF THE MYRIADS OF POSSIBLE COMBINATION OF THE FOLLOWING: SIGNAL NUMBERS, WEIGHTS AND POSITIONS; PRESENCE OF ADDITIONAL ATTACHMENTS TO THE ARM, SUCH AS SIGNS AND CAMERAS; ARM–WIND ORIENTATION; AND ARM–POLE STIFFNESS.
SUCH VIBRATIONS MAY CAUSE FATIGUE DAMAGE TO THE STRUCTURE AND MAY LEAD TO GALLOPING IN MODERATE WIND CONDITIONS WHICH MAY FURTHER DAMAGE THE STRUCTURE AND ALARM THE PUBLIC.
THE TRAFFIC SIGNAL CLAMP–ON MAST ARMS SHALL BE VISUALLY INSPECTED IN 5 TO 20 MPH WIND CONDITIONS AFTER INSTALLATION OF SIGNAL HEADS AND ANY ATTACHMENTS. IF VERTICAL MOVEMENTS WITH A TOTAL EXCURSION (MAXIMUM UPWARD EXCURSION TO MAXIMUM DOWNWARD EXCURSION) OF MORE THAN APPROXIMATELY 8" ARE OBSERVED AT THE ARM TIP, A DAMPING PLATE SHALL BE FITTED TO THE ARM.
THIS VISUAL INSPECTION SHALL BE REPEATED AFTER EACH MODIFICATION OF THE STRUCTURE THAT COULD AFFECT ITS AEROELASTIC RESPONSE. EXCESSIVE VIBRATIONS SHALL NOT BE ALLOWED TO CONTINUE FOR MORE THAN TWO DAYS.

CLAMP–ON MAST ARM(S) (TYPES) – STRAIN POLE						
NOMINAL ARM LENGTH (Lc)	TYPE I MAST ARM (1 SIGNAL)		TYPE II MAST ARM (2 SIGNAL)		TYPE I MAST ARM (1 SIGNAL)	
	SHIP EACH CLAMP–ON MAST ARM AND STRAN POLE WITH THE FOLLOWING HARDWARE ATTACHED: 1–CGB CONNECTOR 1–CLAMP WITH BOLTS AND WASHES		SHIP EACH CLAMP–ON MAST ARM AND STRAIN POLE WITH THE FOLLOWING HARDWARE ATTACHED: 1–SIGNAL BRACKET ASSEMBLIES, 2–CGB CONNECTOR, 1–CLAMP WITH BOLTS AND WASHES		SHIP EACH CLAMP–ON MAST ARM AND STRAIN POLE WITH THE FOLLOWING HARDWARE ATTACHED: 2–SIGNAL BRACKET ASSEMBLIES, 3–CGB CONNECTOR, 1–CLAMP WITH BOLTS AND WASHES	
FT.	DESCRIPTION	QUANTITY	DESCRIPTION	QUANTITY	DESCRIPTION	QUANTITY
	20 – HC10030					
	20 – HC10034	1				
	25 – HC10030		25 – HC10030			
	25 – HC10034		25 – HC10034	1		
			30 – HC10030			
			30 – HC10034			
			35 – HC10030		35 – HC10030	
			35 – HC10034		35 – HC10034	
					40 – HC10030	
					40 – HC10034	
					42 – HC10030	
					42 – HC10034	
					44 – HC10030	
					44 – HC10034	2

NOTE: ENGINEER SHALL COMPLETE SHIPPING PARTS LIST TABLES

NO.	REVISIONS	DATE	NAME
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△			
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△			

HARRIS COUNTY ENGINEERING DEPARTMENT

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TBPE Firm Reg. No.: F–438
TBPLS Firm Reg. No.: 100282–00

STATE OF TEXAS ANTHONY P. VOIGT 84845 LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F–5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD SDMA
SHEET DESCRIPTION: SINGLE AND DUAL MAST ARM ASSEMBLY		
DRAWN BY: BSH	DETAILS (100 MPH WIND ZONE)	DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 16 / 38

TABLE 1 – ROUND CLAMP–ON MAST ARM

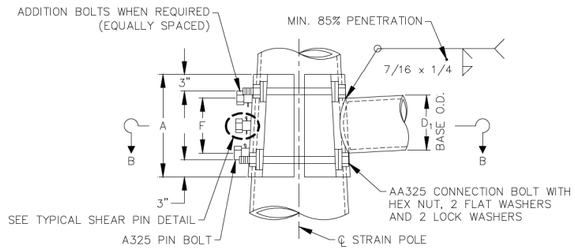
MAST ARM LENGTH	ROUND CLAMP–ON MAST ARM						CONN. BOLTS		PIN BOLTS	
	D_1	D_2 ⚠	THK.(t)	RISE UNDER LOAD	A	F	NO.	DIA.	NO.	DIA.
FT.	IN.	IN.	IN.	FT.	IN.	IN.	EA	IN.	EA	IN.
20	8.0"	5.3"	0.1793"	3'–10"	14"	8"	4	1"	2	7/8"
25	9.0"	5.6"	0.1793"	3'–10"	16"	10"	4	1"	2	7/8"
30	9.5"	5.4"	0.1793"	3'–10"	18"	10"	4	1 1/4"	3	7/8"
35	10.5"	5.7"	0.1793"	3'–10"	18"	10"	4	1 1/4"	3	7/8"
40	10.5"	5.0"	0.2391"	3'–10"	20"	14"	4	1 1/2"	4	7/8"
42	10.5"	4.7"	0.2391"	3'–10"	20"	14"	4	1 1/2"	4	7/8"
44	11.0"	4.9"	0.2391"	3'–10"	20"	14"	4	1 1/2"	4	7/8"

D_1 = POLE BASE O.D.
D_2 = POLE TOP O.D.
⚠ D_2 MAY BE INCREASED BY UP TO 1.0" FOR OCTAGONAL ARMS

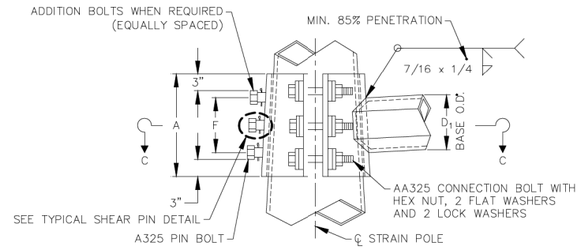
TABLE 2 – OCTAGONAL CLAMP–ON MAST ARM

MAST ARM LENGTH	OCTAGONAL CLAMP–ON MAST ARM							CONN. BOLTS		PIN BOLTS	
	D_1	D_2 ⚠	THK.(t)	RISE UNDER LOAD	A	F	T	NO.	DIA.	NO.	DIA.
FT.	IN.	IN.	IN.	FT.	IN.	IN.	IN.	EA	IN.	EA	IN.
20	8.0"	5.3"	0.1793"	3'–10"	14"	8"	3/4"	4	3/4"	2	5/8"
25	9.0"	5.6"	0.1793"	3'–10"	16"	10"	7/8"	4	1"	2	5/8"
30	10.0"	5.4"	0.1793"	3'–10"	18"	10"	1"	6	1"	3	5/8"
35	10.0"	5.7"	0.1793"	3'–10"	18"	10"	1"	6	1"	3	5/8"
40	11.0"	5.0"	0.2391"	3'–10"	20"	14"	1 1/8"	8	1"	4	5/8"
42	11.0"	4.7"	0.2391"	3'–10"	20"	14"	1 1/8"	8	1"	4	5/8"
44	11.5"	4.9"	0.2391"	3'–10"	20"	14"	1 1/8"	8	1"	4	5/8"

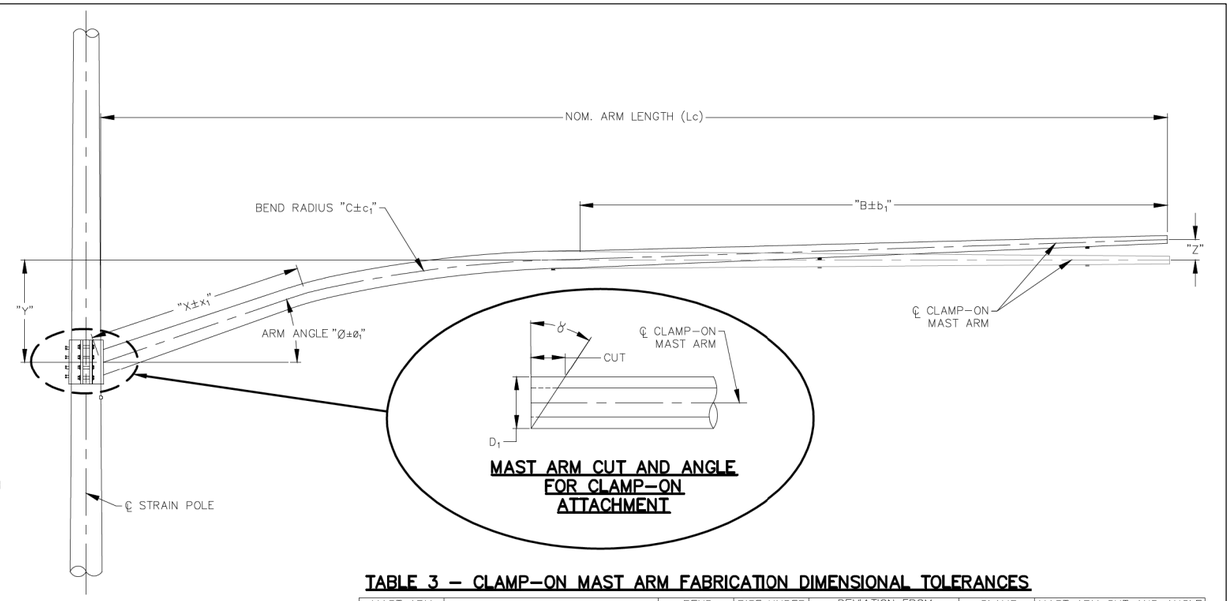
D_1 = POLE BASE O.D.
D_2 = POLE TOP O.D.
⚠ D_2 MAY BE INCREASED BY UP TO 1.0" FOR OCTAGONAL ARMS



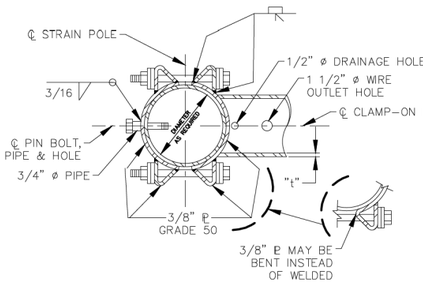
CLAMP–ON DETAIL 1 (ROUND MAST ARM)



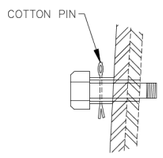
CLAMP–ON DETAIL 2 (OCTAGONAL MAST ARM)



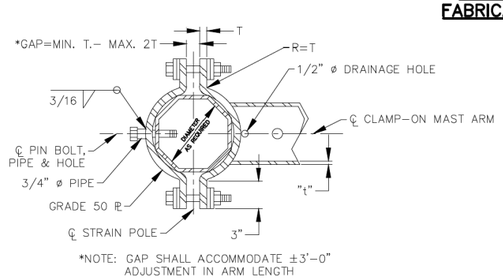
CLAMP–ON MAST ARM FABRICATION TOLERANCES



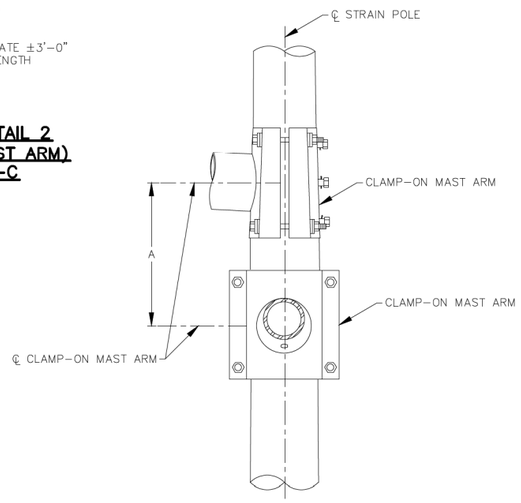
CLAMP–ON DETAIL 1 (ROUND MAST ARM) SECTION B–B



TYPICAL SHEAR PIN DETAIL



CLAMP–ON DETAIL 2 (OCTAGONAL MAST ARM) SECTION C–C



TYPICAL DUAL CLAMP–ON MAST ARM PLACEMENT

MATERIALS	
ROUND CLAMP–ON MAST ARM AND STRAIN POLE OR OCTAGONAL MAST ARM AND STRAIN POLE	ASTM A570 GR50 OR ASTM A572 GR50
PLATES (1)	ASTM A36 OR A572 GR50
CONNECTION BOLTS	ASTM A325 EXCEPT WHERE NOTED
PIN BOLTS	ASTM A325 EXCEPT WHERE NOTED
PIPE	ASTM A325
MISC. HARDWARE	ASTM A53 GR A OR B, OR A501
STEEL CABLE	ASTM A475, 7 WIRE, UTILITIES GRADE

(1) EITHER OF THE MATERIALS LISTED FOR PLATES MAY BE USED WHERE THE DRAWINGS DO NOT SPECIFY A PARTICULAR ASTM DESIGNATION.

TABLE 3 – CLAMP–ON MAST ARM FABRICATION DIMENSIONAL TOLERANCES

MAST ARM DESIGNATION (100 MPH)					BEND RADIUS		RISE UNDER LOAD	DEVIATION FROM HORIZONTAL (UNLOADED)		CLAMP ANGLE		MAST ARM CUT AND ANGLE FOR CLAMP ATTACHMENT			
	"X"	"X_1"	"B"	"b_1"	"C"	"C_1"	"Y"	"Z"	"ø"	"$ø_1$"	"$ø_1$"	Lc	CUT	γ	D_1
DESCRIPTION	FT.	FT.	FT.	FT.	FT.	FT.	FT.	IN.	DEG.	DEG.	DEG.	FT.	IN.	ANGLE	DIA.(IN.)
20–HC10030	4'–6"	±1.0'	10'–5⅞"	±1.0'	21.5'	±1.0'	3'–10"	3 ¼"±½"	±2.0°	29°	±1.0°	20	3 5⅛"	24°	8"
20–HC10034	4'–6"	±1.0'	10'–5⅞"	±1.0'	21.5'	±1.0'	3'–10"	3 ¼"±½"	±2.0°	29°	±1.0°	20	3 5⅛"	24°	8"
25–HC10030	3'–10"	±1.0'	10'–5⅞"	±1.0'	27.0'	±1.0'	3'–10"	3 ¼"±½"	±2.0°	24°	±1.0°	25	3 5⅛"	24°	9"
25–HC10034	3'–10"	±1.0'	10'–5⅞"	±1.0'	27.0'	±1.0'	3'–10"	3 ¼"±½"	±2.0°	24°	±1.0°	25	3 5⅛"	24°	9"
30–HC10030	5'–6"	±1.0'	15'–½"	±1.0'	27.0'	±1.0'	3'–10"	6 ¼"±½"	±2.0°	24°	±1.0°	30	4 9⅛"	25°	10"
30–HC10034	5'–6"	±1.0'	15'–½"	±1.0'	27.0'	±1.0'	3'–10"	6 ¼"±½"	±2.0°	24°	±1.0°	30	4 9⅛"	25°	10"
35–HC10030	5'–6"	±1.0'	20'	±2.0'	27.0'	±1.0'	3'–10"	8 ½"±¾"	±2.0°	24°	±1.0°	35	4 9⅛"	25°	10"
35–HC10034	5'–6"	±1.0'	20'	±2.0'	27.0'	±1.0'	3'–10"	8 ½"±¾"	±2.0°	24°	±1.0°	35	4 9⅛"	25°	10"
40–HC10030	9'–2"	±1.0'	19'–2 5⅛"	±2.0'	46.0'	±1.0'	3'–10"	4 1⅛"±¾"	±2.0°	15°	±1.0°	40	2 ¾"	8°	11"
40–HC10034	9'–2"	±1.0'	19'–2 5⅛"	±2.0'	46.0'	±1.0'	3'–10"	4 1⅛"±¾"	±2.0°	15°	±1.0°	40	2 ¾"	8°	11"
42–HC10030	9'–2"	±1.0'	24'–6"	±2.0'	46.0'	±1.0'	3'–10"	10 5⅝"±¾"	±2.0°	14.5°	±1.0°	42	3 1⅛"	15°	11"
42–HC10034	9'–2"	±1.0'	24'–6"	±2.0'	46.0'	±1.0'	3'–10"	10 5⅝"±¾"	±2.0°	14.5°	±1.0°	42	3 1⅛"	15°	11"
44–HC10030	9'–2"	±1.0'	24'–6"	±2.0'	46.0'	±1.0'	3'–10"	10 5⅞"±¾"	±2.0°	14.5°	±1.0°	44	3 1⅛"	15°	11.5"
44–HC10034	9'–2"	±1.0'	24'–6"	±2.0'	46.0'	±1.0'	3'–10"	10 5⅞"±¾"	±2.0°	14.5°	±1.0°	44	3 1⅛"	15°	11.5"

GENERAL NOTES:

1.) DESIGN SHALL CONFORM TO 2001 OR LATEST ADDITION TO AASHTO STANDARD SPECIFICATIONS FOR THE STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS AND INTERIM SPECIFICATIONS DESIGN WIND SPEED EQUALS 100 MPH PLUS A 1.3 GUST FACTOR.
2.) STRAIN POLES ARE DESIGNED TO SUPPORT SPAN WIRE WITH ONE CLAMP–ON MAST ARM. THE SPECIFIED SIGNAL LOAD APPLIED AT THE END OF THE TRAFFIC SIGNAL ARM EQUALS 180 LBS. VERTICAL DEAD LOAD PLUS THE HORIZONTAL WIND LOAD ON AN EFFECTIVE PROJECTED AREA OF 32.4 SQ. FT. THE MAXIMUM PERMISSIBLE SPAN WIRE DESIGN LOADS TABULATED ARE CALCULATED AT A STRESS LOAD OF 1.40 TIMES THE BASIC ALLOWABLE STRESS. A SIMULTANEOUS WIND ON THE POLE, MAST ARM, AND LUMINAIRE IS ALSO INCLUDED. DESIGNS ARE BASED ON A SPAN WIRE AND ARM INCLUDED ANGLE OF 90 DEG. ANGLES OF LESS THAN 75 DEG. OR MORE THAN 105 DEG. WILL REQUIRE A SPECIAL DESIGN.
3.) FABRICATION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND THE WITH THE DETAILS AND DIMENSIONS. ALL WELDING SHALL CONFORM TO THE REQUIREMENTS OF THE SPECIFICATIONS OF THE AMERICAN WIELDING SOCIETY STRUCTURAL WELDING CODE AWS LATEST EDITION.
4.) A MAXIMUM 1 1/2" WIDE VERTICAL SLOTTED HOLE MAY BE CUT IN THE FRONT CLAMP PLATE TO FACILITATE DRAINAGE DURING GALVANIZING. THE SLOT SHALL BE CENTERED BEHIND THE ARM AND SHALL BE NO LONGER THAN THE ARM DIAMETER MINUS 1".
5.) WHERE DUPLICATE PARTS OCCUR ON A DETAIL, WELDS SHOWN FOR ONE PART SHALL APPLY TO ALL SIMILAR PARTS ON THE DETAIL.
6.) PIN BOLTS ARE REQUIRED TO PREVENT ROTATION OF CLAMP–ON ARMS UNDER DESIGN WIND FORCES.
7.) PIN BOLTS SHALL BE A325 WITH THREADS EXCLUDED FROM THE SHEAR PLANE. PIN BOLT AND 3/4" ø PIPE SHALL HAVE 3/16" ø HOLES FOR A 1/8" ø GALVANIZED COTTER PIN. BACK CLAMP PLATE SHALL BE FURNISHED WITH A 3/4" ø HOLE FOR EACH PIN BOLT. AN 11/16" ø HOLE FOR EACH PIN BOLT SHALL BE DRILLED THROUGH THE POLE AFTER ARM ORIENTATIONS HAVE BEEN APPROVED BY THE ENGINEER. THE DRILLED HOLES SHALL BE PAINTED / SPRAYED WITH GALVANIZE PAINT.
8.) CLAMP–ON MAST ARM FABRICATIONS DIMENSIONAL TOLERANCES SHALL BE IN ACCORDANCE WITH TABLE 3.
9.) SEE SINGLE AND DUAL MAST ARM ASSEMBLIES DETAILS STANDARD SHEET FOR DETAILS OF CLAMP–ON MAST ARMS.
10.) SEE STRAIN POLE ASSEMBLY DETAILS STANDARD SHEET FOR DETAILS OF STRAIN POLE.
11.) SEE LUMINAIRE ARM DETAILS STANDARD SHEET FOR DETAILS OF LUMINAIRE ARM AND CONNECTION.
12.) SEE STRAIN POLE FOUNDATION DETAILS STANDARD SHEET FOR DETAILS OF ANCHOR BOLTS AND FOUNDATION.
13.) UNLESS OTHERWISE NOTED, ALL STEEL PARTS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 REQUIREMENTS WITH A MINIMUM OF 2 OUNCES PER SQUARE FOOT OF GALVANIZED COATING.
14.) ALL SMALL STEEL HARDWARE ITEMS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A153 REQUIREMENTS.
15.) SPECIAL DESIGNS REQUIRE SUBMISSION OF SHOP DRAWINGS IN ACCORDANCE WITH THE SPECIFICATION ITEM 680 "STEEL MAST ARM AND STEEL STRAIN POLE ASSEMBLIES".
16.) ALL BOLTS SHALL HAVE TWO FULL DIAMETER THREADS EXPOSED ABOVE THE NUT.
17.) CONTRACTOR SHALL INSTALL A CLOSE NIPPLE WITH LOCKNUTS AND METAL BUSHINGS (SIZE AS REQUIRED) TO PREVENT ABRASION WHERE CABLE(S) ENTER ANY PORTION OF THE STRAIN POLE.
18.) CLAMP–ON MAST ARM(S) AND STRAIN POLE(S) SHALL HAVE THE SAME GEOMETRIC SHAPES PER ASSEMBLY.

NO.	REVISIONS	DATE	NAME
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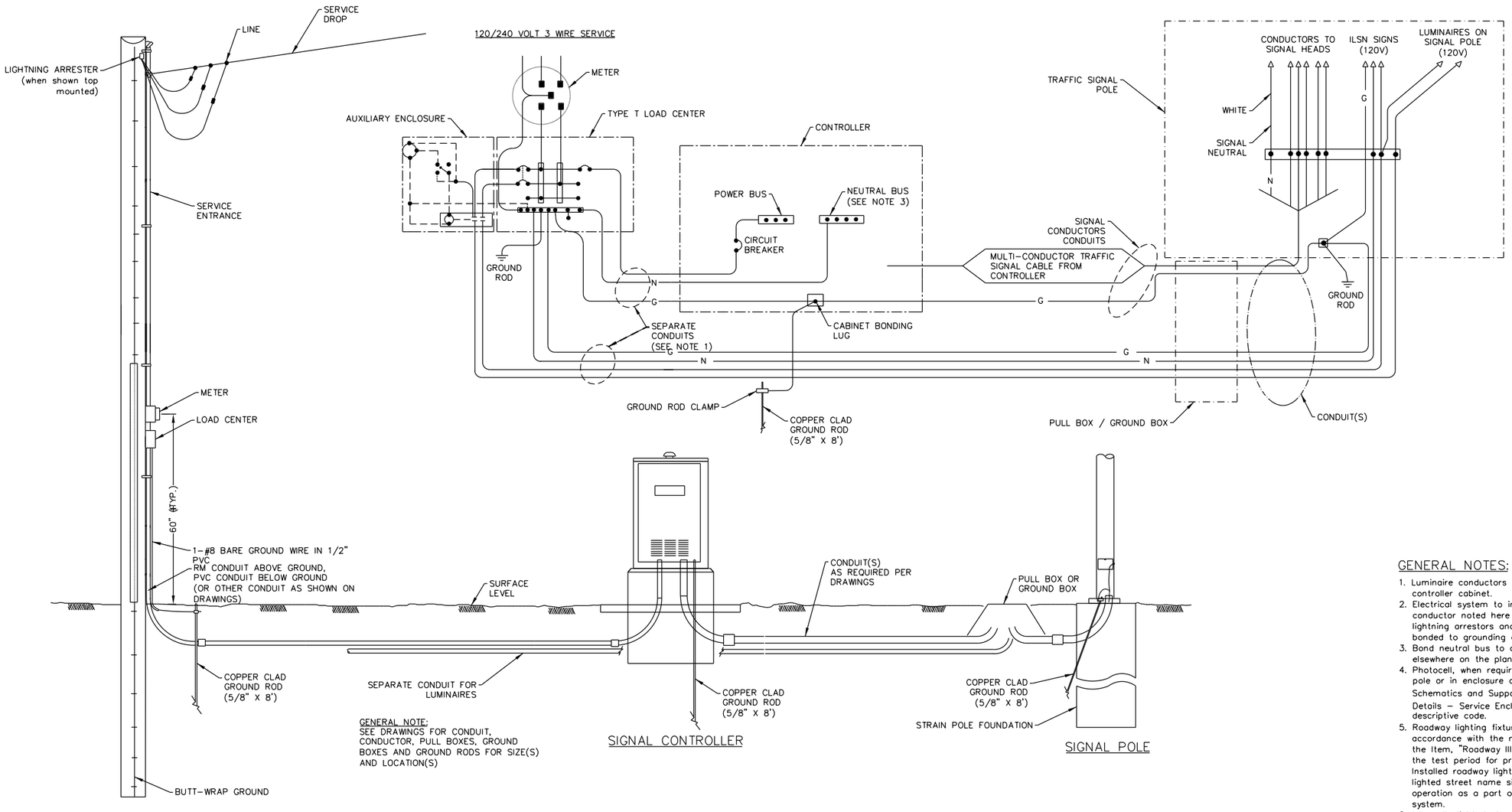
HARRIS COUNTY ENGINEERING DEPARTMENT

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270–5700 Fax (713) 271–3487
TBPE Firm Reg. No.: F-4578
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED — PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS			
STANDARD DETAILS			TRAFFIC STANDARD
SHEET DESCRIPTION: MAST ARM CONNECTIONS AND			MAC
DRAWN BY: BSH	FABRICATION DETAILS (100 WIND ZONE)		DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE		SHEET NO: 17 / 38



ELECTRICAL SERVICE

(TYPE T TIMBER POLE SHOWN AS EXAMPLE, SEE ELECTRICAL DETAILS, LAYOUT SHEETS, AND ELECTRICAL SERVICE DATA SHEET FOR SERVICE REQUIRED AND FOR DETAILS.)

UNLESS SHOWN ELSEWHERE IN THE PLANS, ELECTRICAL SERVICE DATA FOR TYPE D SHALL BE AS FOLLOWS:

ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE DESCRIPTION(SEE ELECTRICAL DETAILS – SERVICE SUPPORT SF & SP	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT		TWO-POLE CONTACTOR AMPS	PANELBD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
				SWITCH AMP/FUSES	CKT. BRK. POLE/AMP					
TY D (120/240)070(NS)SS(E)**(*)	1 1/4"	3/#4	N/A	N/A	2P/70	20	70	TRAFFIC SIGNAL LIGHTING	1P/50 2P/20	<7.1
TY D (MOD 1)(120/240)000(NS)SS(E)**(*)	1 1/4"	3/#4	70	NONE	NONE	N/A	N/A	N/A	N/A	<7.1
TY D (MOD 2)(120/240)070(NS)SS(E)**(*)	1 1/4"	3/#4	N/A	NONE	NONE	20	70	TRAFFIC SIGNAL LIGHTING	1P/50 2P/20	<7.1

* SEE DESCRIPTIVE CODE IN ESTIMATE FOR OVERHEAD OR UNDERGROUND SERVICE
** SEE DESCRIPTIVE CODE IN ESTIMATE FOR SERVICE SUPPORT TYPE

GENERAL NOTES:

1. Luminaire conductors shall not be looped through controller cabinet.
2. Electrical system to include an equipment grounding conductor noted here as "G". All exposed metal parts, lightning arrestors and surge protectors are to be bonded to grounding conductor.
3. Bond neutral bus to cabinet bonding lug when required elsewhere on the plans or when required by the Engineer.
4. Photocell, when required, shall be mounted at top of pole or in enclosure as shown on Electrical Details – Service Schematics and Support Type TP (overhead) and Electrical Details – Service Enclosure & Notes and as required by descriptive code.
5. Roadway lighting fixtures, when required, shall be in accordance with the material and construction methods of the Item, "Roadway Illumination Assemblies" except for the test period for proper operation of the luminaires, Installed roadway lighting luminaires and internally lighted street name signs shall be tested for proper operation as a part of the associated traffic signal system.
6. Internally lighted street name signs (ILSN), when required, shall be in accordance with the Item "Internally Lighted Street Name Signs". Because of the electrical isolation of ILSN hinges, a #12 green grounding conductor shall be run to the ILSN fixture.
7. Install ground rod at alternate location when directed by the Engineer. Maintain a minimum of 8 ft in contact with the earth.

NO.	REVISIONS	DATE	NAME
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TBPLS Firm Reg. No.: 100282-00

ANTHONY P. VOIGT 84845 LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS

STANDARD DETAILS

TRAFFIC STANDARD: ED-TS

SHEET DESCRIPTION: ELECTRICAL DETAILS: TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

DRAWN BY: BSH

DATE: 8/18/17

CK'D BY: BSH

SCALE: NONE

SHEET NO: 18 / 38

SERVICE ENCLOSURE NOTES:

VI. Service Assembly Enclosures. All service assemblies and enclosures shall be UL Listed for the intended purpose.

A. Shop built or shop assembled service assemblies (all types except Type T and Type D without lighting contactor) shall be built or assembled by a UL Listed Industrial Control Panel shop and shall have a unique serial numbered UL Label with the words "LISTED ENCLOSED INDUSTRIAL CONTROL PANEL". The same or an additional label shall have the name, location, and phone number of the shop, the UL file number of the shop, the shop order or drawing number, date of manufacture or assembly, and the line voltage. The enclosure shall also be labeled "SUITABLE ONLY FOR USE AS SERVICE EQUIPMENT".

B. Conduit entries into the top of all enclosures shall have threaded hubs.

C. All enclosures shall be permanently labeled on the front door "DANGER HIGH VOLTAGE" and the equipment supplied (i.e. LIGHTING, LANDSCAPING, SIGNALS, TRAFFIC MANAGEMENT). Unless otherwise approved by the Engineer, the labeling shall be minimum 1 inch letters and shall be applied by stenciled paint or stick-on decal.

D. Type GS enclosures for service types D, T, and the circuit breaker panelboard of service type C shall be made from pre-galvanized steel sheeting, hot dipped galvanized steel, or powder coat painted steel. Painted enclosures shall be painted inside and outside; galvanized enclosures may be painted. Unless otherwise approved by the engineer, painted enclosures shall be gray, beige, or white. Panelboard/loadcenter enclosures shall be UL type 3R, shall have a dead front trim, and shall have a door with provisions for padlocking. Auxiliary enclosures, when required for illumination or other control equipment, shall be UL type 12 as described in III.E. below for service types A and C.

E. Type GS enclosures for service types A and C shall meet the requirements of type GS in III.D. above for service types D and T except that the enclosure shall be a UL type 12 enclosure conforming to UL 50 and shall meet additional requirements of this paragraph. The enclosure door shall have a rolled lip around all sides of the enclosure opening, a continuous hinge, and a padlock handle. The door shall have a mechanically attached data pocket constructed of either thermoplastic or metal and measuring at least 12 inches by 12 inches. The main disconnect operator shall be flange-mounted, shall interlock the door when in the "on" position, and shall be pad lockable in both the "on" or the "off" positions. Enclosure shall include an equipment mounting panel installed inside the enclosure on collar studs or tapped bosses, and constructed of either 12-gauge steel or 0.10 inch thick aluminum. Enclosure shall be either hot dip galvanized, pre-galvanized sheeting or prime and painted. Paint shall be powder coat paint as show below. Color shall be white or gray. Condensation drainage shall be provided through 0.25 inch drain holes drilled in the bottom of the enclosure at two diagonal opposing corners. The contractor shall place in the service enclosure a laminated copy of the "as built" electrical plans showing the equipment supplied by that electrical service and all applicable wiring diagrams, layouts, and ED and RID standard sheets.

F. Type SS Stainless steel enclosure shall be meet all the requirements above for the respective type GS except that the enclosure shall be UL type 4X conforming to UL 50. Type GS circuit breaker panel housed in a stainless steel UL type 4X enclosure conforming to UL 50 shall be considered complying with the Type SS requirements for Service types D & T.

G. Type PS enclosure shall be as detailed and specified on ED(8).

VII. Powder Coat Paint. Powder coating shall be either a polyester thermosetting resin, a zinc rich primer with a TGIC (triglycidyl isocyanurate) powder overcoating, or a zinc-rich epoxy powder, applied by either electrostatic spray or fluidized bed immersion, high temperature oven cured, high density, low gloss, 4 mil thick (minimum), coating. Adhesion shall meet the 5A or 5B classifications of ASTM D3359. Finish shall be uniform in appearance and free of scratches.

VIII. Main Disconnect. Main disconnect device shall be either a fusible switch or a circuit breaker, as specified in the Electrical Service Data, shall be two pole, and rated for the voltage and amperage specified.

A. Switch shall be UL and NEMA Type HD (heavy duty) flange-mounted in the service assembly enclosure. Switch shall have clips for Class R fuses.

B. Circuit breaker shall be a UL Listed thermal-magnetic circuit breaker flange-mounted in the service assembly enclosure. Circuit breakers shall have a minimum interrupting rating of 14,000 Amps. Contractor shall verify that the available fault current is less than the circuit breaker amps interrupting capacity (AIC) rating and shall provide documentation from the Utility to the Engineer. Documentation shall be submitted at the same time as other electrical submittals. Circuit breaker shall be UL Listed to UL489.

IX. Lightning Arrester. Arresters shall be MOV-type secondary surge arresters rated 650 volts for 240/480 volt services or 175 volts for 120/240 volt services and shall meet ANSI, IEEE, UL, and NEMA standards. Mounting brackets shall be provided for mounting the arresters inside the service assembly enclosures, unless otherwise specified by the Engineer. Lightning arrester leads shall be run as straight and short as practical.

X. Control Circuit. Control circuit protection shall be either a 10 or 15 amp circuit breaker.

XI. Control Station ("H-O-A" Switch). Control station shall be a maintained-contact, three position selector switch in a UL type enclosure. Switch shall be rated 600 volts and shall be fitted with "Hand-Off-Auto" legend.

XII. Photo Electric Control. Photo electric control shall consist of a photocell, internal lightning arrester, and relay or bimetallic switch mounted inside a weatherproof enclosure with standard 3-prong twist lock photocell plug and receptacle. The enclosure shall be made of poly-acrylic with clear acrylic window. Enclosure chassis shall be molded phenolic plastic. The photocell shall have a polyethylene gasket, and shall have a hermetically sealed cadmium sulfide cell. The arrester shall have an enclosed type expulsion arrester rated 2.0 kV spark over with 10,000 amps follow-through. Relay or switch shall be time delay type with normally closed contacts. Photo electric control shall be rated 1800 VA, 105-285 volts.

Enclosure mounted photocells shall be the same as above except that the photocell shall be mounted inside the enclosure. The enclosure shall have two acrylic paned windows, or other material approved by the Engineer, one on each side of the enclosure. Each window shall be rectangular approximately 1 inch by 2 inch, round 2 inch diameter, or as otherwise approved by the Engineer. The photocell shall be mounted in a position to receive light from one window. Top of pole mounted photocells shall be mounted as shown on Electrical Details – Service Enclosure & Notes.

The Contractor shall be responsible for proper operation of the photo-electric control. The Contractor shall move and/or adjust or shield the photocell from stray or ambient nighttime light or shall make any other adjustments required for proper operation. The photocell shall face North when practicable. Unless otherwise shown on the plans, the photocell shall turn on the illumination system at 1.0 +(–) 0.5 footcandle and turn off the illumination system at 2 footcandle higher than turn on.

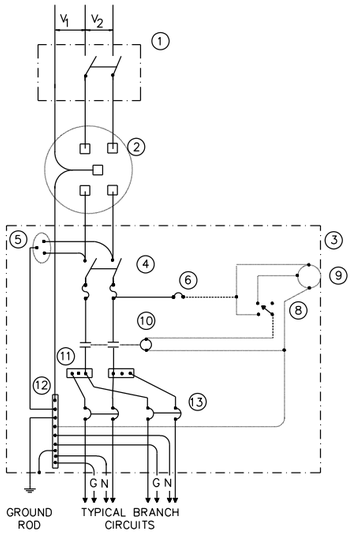
XIII. Lighting Contactor. Lighting contactor shall be a UL Listed lighting contactor, two-pole or multipole as required, electrically held type designed to control high pressure sodium lighting loads, with silver alloy double break contacts rated at 480 volts or 600 volts.

XIV. Power Distribution Terminal Blocks. Power distribution terminal blocks shall be rated for 600 volts and shall be used for line side connections to branch circuit breakers where more than one circuit breaker is required. Lugs on blocks shall be properly sized for conductors being used. Only one conductor shall be placed under each lug.

XV. Neutral/Ground Bus. Neutral/ground bus shall be a factory made bus permanently bonded to the enclosure with properly sized lugs for grounding and neutral conductors.

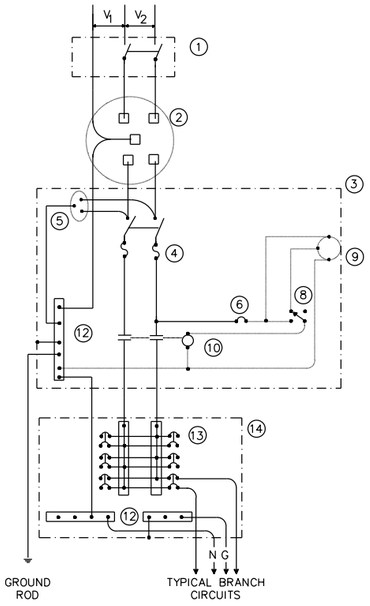
SCHEMATIC LEGEND

1 – Safety Switch (when required)
2 – Meter (when required)
3 – Service Assembly Enclosure
4 – Main Disconnect (Switch or Breaker, (See Electrical Service Data)
5 – Lightning Arrestor
6 – Circuit Breaker, 15A
7 – Auxiliary Enclosure
8 – Control Station ("H-O-A" Switch)
9 – Photo Electric Control (enclosure-mounted shown)
10 – Lighting Contactor
11 – Power Distribution Terminal Blocks
12 – Neutral/Ground Bus
13 – Branch Circuit Breaker (See Electrical Service Data)
14 – Circuit Breaker Panelboard (See Electrical Service Data)
15 – Load Center



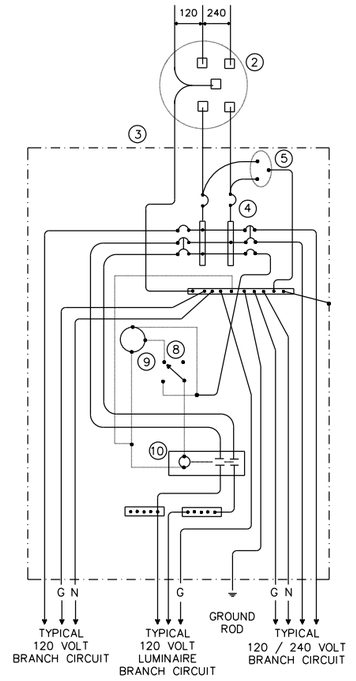
SCHEMATIC TYPE A
THREE WIRE

(MAXIMUM FEEDER CIRCUIT SIZE (HIGH MAST POLES): 100AMPS FOR TWO POLE 480V, 125 AMPS FOR ONE OR TWO POLE 120V OR 240V. MAXIMUM BRANCH CIRCUIT SIZE: 50AMPS)



SCHEMATIC TYPE C
THREE WIRE

(MAXIMUM FEEDER CIRCUIT SIZE (HIGH MAST POLES): 100AMPS FOR TWO POLE 480V, 125 AMPS FOR ONE OR TWO POLE 120V OR 240V. MAXIMUM BRANCH CIRCUIT SIZE: 50AMPS)



SCHEMATIC TYPE D
120/240 VOLTS – THREE WIRE

(INSTALL PHOTOCELL AND LIGHTING CONTACTOR WHEN SHOWN ON ELECTRICAL SERVICE DATA. SEE TYPE D SERVICE NOTES.)

TYPE D SERVICE NOTES:

Photocell and lighting contactor shall be located in the same UL type 3R enclosure. Photocells shall have a window on each side of enclosure to allow operation. Photocell/contactor and breaker area shall have separate dead front trim. Enclosure, except for RT and PS supports, shall not exceed 36 inches in height or 15 inches in width unless approved by the engineer.

NO.	REVISIONS	DATE	NAME
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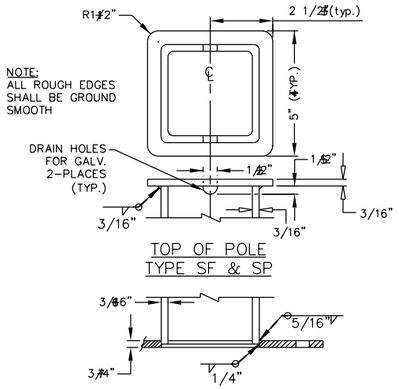
HARRIS COUNTY
ENGINEERING DEPARTMENT

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4324
TBPLS Firm Reg. No.: 100282-00

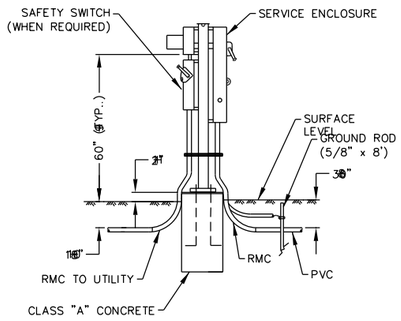
STATE OF TEXAS · ANTHONY P. VOIGT · 84545 · LICENSED · PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333
NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD: ED-SE
SHEET DESCRIPTION: ELECTRICAL DETAILS: SERVICE ENCLOSURE AND NOTES		DATE: 8/18/17
DRAWN BY: BSH	SCALE: NONE	SHEET NO: 19 / 38
CK'D BY: BSH		

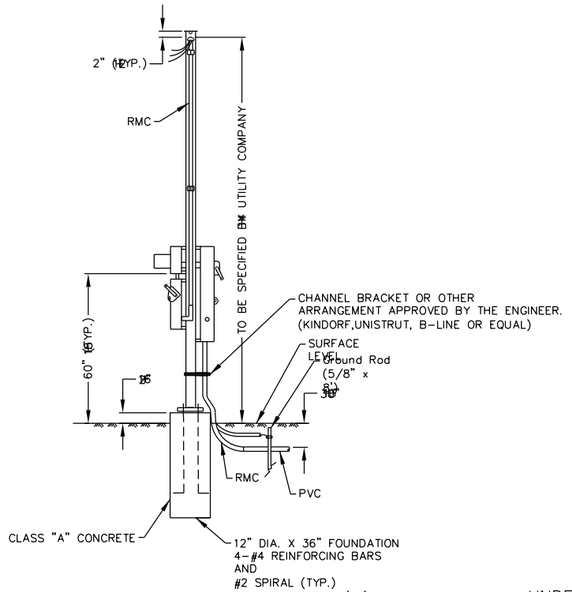


TOP OF POLE
TYPE SF & SP

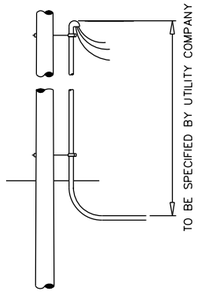
BOTTOM OF POLE
TYPE SF & SP



SERVICE SUPPORT TYPE SP (U)
UNDERGROUND SERVICE WITH
SAFETY SWITCH



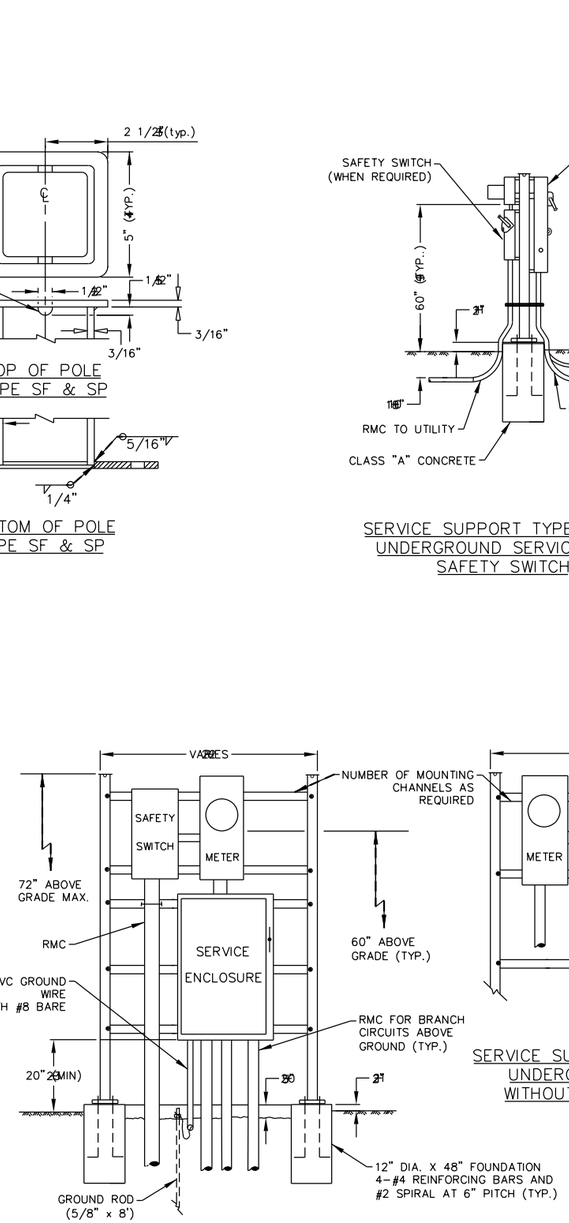
SERVICE SUPPORT TYPE SP (O)
OVERHEAD SERVICE WITH
SAFETY SWITCH



UNDERGROUND RISER
AT UTILITY POLE
(FOR UNDERGROUND SERVICE)

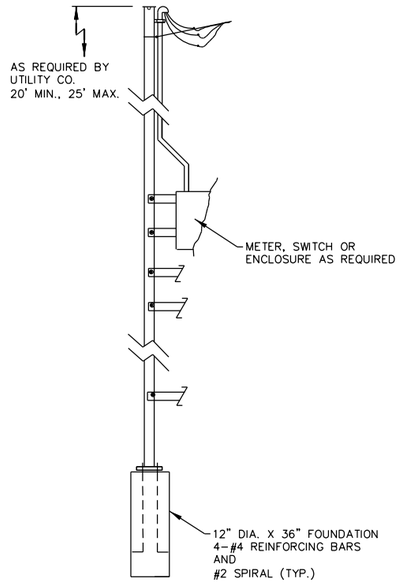
GENERAL NOTES:

1. Support type SP and SF: Fabricated from 4" x 4" x 3/16 " square structural tubing, ASTM A500 Grade A or G or equal. Base plate shall be 3/4 " plate, ASTM A36 or equal. All equipment and conduit shall be mounted on galvanized channel strut, 1 1/2 " x 1 5/8 " x 12 gauge galvanized steel channel (Unistrut, Kindorf, B-line or equal) clamped with channel hardware, bolted or welded to vertical member as approved by the Engineer.
2. Point end of all channels with zinc-rich paint.
3. All Steel Poles (SP and SF) shall be hot-dip galvanized after fabrication. Poles for overhead service shall be fitted with eyebolt or similar fitting, as approved by the utility company, for attachment of service drop to the pole.
4. All conduit and conductors attached to the electrical service and within 12 inches of the electrical service will not be paid for directly, but shall be subsidiary to the electrical service. All conduit and conductors from the utility company pole to the point 12 inches from the electrical service, including conduit and conductors required for the utility pole riser when furnished by the Contractor, will be paid for separately.
5. All mounting hardware and installation details of services shall be in accordance with utility company specifications.
6. Anchor bolts for underground service supports shall be 3/4 " x 18" x 4" (dia. x length x hook length). Anchor bolts for overhead services shall be 3/4 " x 56" x 4". Anchor bolts shall be provided with leveling nuts.
7. Conduit for grounding electrode conductor (ground rod wire) shall be 1/2 " PVC all other conduit on electrical services shall be rigid metal conduit. Service entrance conduit size shall be as shown elsewhere. Conduit for branch circuit entry to enclosure shall be the same size as that shown on the layout sheets for branch circuit conduit. Rigid metal conduit shall extend to the rigid metal elbow and then be coupled to the type conduit shown on the layout for that particular branch circuit. RMC shall have grounding bushings in enclosures.
8. If pole is painted, each separate painted piece shall have a bonding jumper attached to a drill and tapped hole.

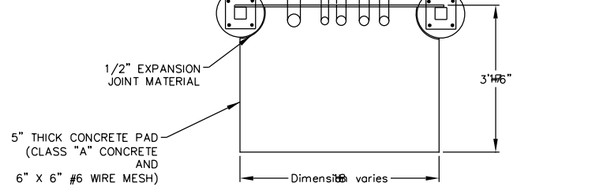


SERVICE SUPPORT TYPE SF (U)
UNDERGROUND SERVICE WITH
SAFETY SWITCH
(TYPICAL ARRANGEMENT)

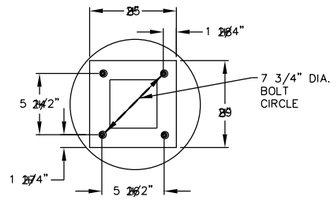
SERVICE SUPPORT TYPE SF (U)
UNDERGROUND SERVICE
WITHOUT SAFETY SWITCH



SERVICE SUPPORT TYPE SF (O)
OVERHEAD SERVICE



SERVICE SUPPORT TY SF (O) & SF (U)
TOP VIEW



BASE PLATE DETAIL

NO.	REVISIONS	DATE	NAME
1			
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TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS · ANTHONY P. VOIGT · 84845 · LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC.
F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD
SHEET DESCRIPTION: ELECTRICAL DETAILS: SERVICE SUPPORTS		ED-SFSP
DRAWN BY: BSH	TYPE SF AND SP	DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 20 / 38

ELECTRICAL SERVICE NOTES

All work, materials, services, and incidentals, whether or not specifically shown on the plans, which may be necessary for a complete and proper electrical service installation as specified in the plans to obtain electrical power (except extending primary lines to electrical service) shall be paid for, performed, furnished and installed by the Contractor. The Contractor shall contact the Utility for metering and shall comply with all Utility requirements.

Primary line extensions, when required, shall be paid for under Force Account work. The Contractor shall consult with the appropriate Utility to determine costs and requirements, and shall coordinate the Utility's work as approved by the Engineer. The contractor shall be reimbursed only the amount billed by the Utility. No additional amount for supervision of the Utility's work will be paid.

Materials shall be new and unused, and materials and installation shall comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards and shall be Underwriters Laboratories (UL) Listed. Electrical Service conduits, conductors, disconnects, contactors, circuit breaker panel sizes, and branch circuit breakers, shall be as shown in the Electrical Service Data elsewhere in the plans. Faulty fabrication or poor workmanship in any material, equipment, or installation shall be justification for rejection.

The Contractor shall submit for approval no less than five (5) copies of catalog cut sheets on electrical service materials. Submittals shall be legible and shall be marked to indicate which product on a cut-sheet is to be supplied. Where manufacturers provide warranties and guarantees as a customary trade practice, Contractor shall furnish to the County such warranties or guarantees.

I. Safety Switch. A safety switch, placed ahead of the meter, shall only be used when specified by the Utility and is shown on the Electrical Service Data. The switch shall be UL Listed, heavy duty type, 600 volt, unfused, with a UL type 3R enclosure and equipped with a solid neutral (s/n) assembly. The switch shall be padlockable in the "on" position.

II. Service Type. Electrical service types A, C, D, and T shall be as schematically detailed on ED(4). Other service types shall be as detailed elsewhere on the plans.

III. Branch Circuit Breakers. Circuit breakers shall be thermal magnetic and have a minimum interrupting capacity of 10,000 amps and a voltage rating compatible with their use. Circuit breakers shall be sized as shown on electrical service data table. Circuit breakers in panelboards and load centers shall be full size and designed exclusively for the panelboard or load center in use. Tandem and half-width breakers shall not be used. All circuit breakers shall be permanently and clearly marked identifying the circuit or device attached. Circuit breakers shall be UL Listed to UL489. Circuit breakers shall be switch duty.

IV. Circuit Breaker Panelboard. Panelboards shall be UL Listed and shall meet Federal Specification W-P-115b, Type 1, Class 1 requirements. Panelboards shall have copper busses, a minimum of 12 one-pole spaces, and shall be rated for service equipment. Enclosure shall meet UL type 3R classification. Panelboards shall have a threaded hub conduit entry for conduit entering the top of the enclosure. Circuit breakers shall be bolt-in type only.

V. Circuit Breaker Load Center. Load centers shall be UL Listed, and shall meet Federal Specification W-P-115c, Type 1, Class 2 requirements. Load centers shall have copper busses, a minimum of 4 one-pole spaces, and shall be rated for service equipment. Enclosure shall meet UL type 3R classification. Load centers shall have a threaded hub conduit entry for conduit entering the top of the enclosure. Circuit breakers shall be plug-in type only. Load centers for type T services shall accommodate a maximum of 6 one-pole breakers.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY D (120/240) 125 (NS) GS (E) PS (X)

Schematic Type

Service Voltage (V / V)

Main Disconnect Amp Rating
(000 indicates none)

SS= Safety switch ahead of meter
NS= No switch ahead of meter and/or no meter required

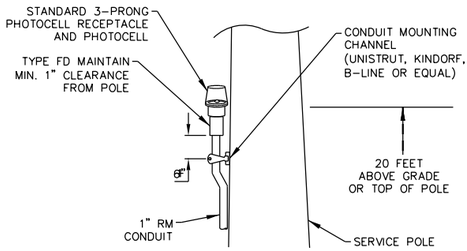
Enclosure Type
GS= Galvanized steel
SS= Stainless steel
PS= Pedestal Service

Photocell Location
T= Top of pole
E= Enclosure mounted
L= Luminaire mounted
N= None

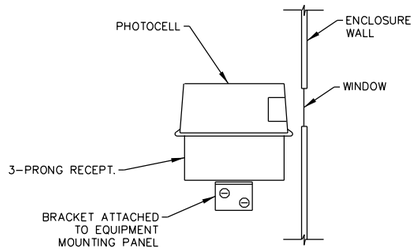
Service Support Type
GC= Granite concrete
OC= Other concrete
TP= Timber pole
SP= Steel pole
SF= Steel frame
OT= Pole by others or paid for separately
EX= Existing pole
TS= Switch gear to be placed on traffic signal pole
RT= Rectangular structural tubing
PS= Pedestal Service

O= Overhead service
U= Underground service

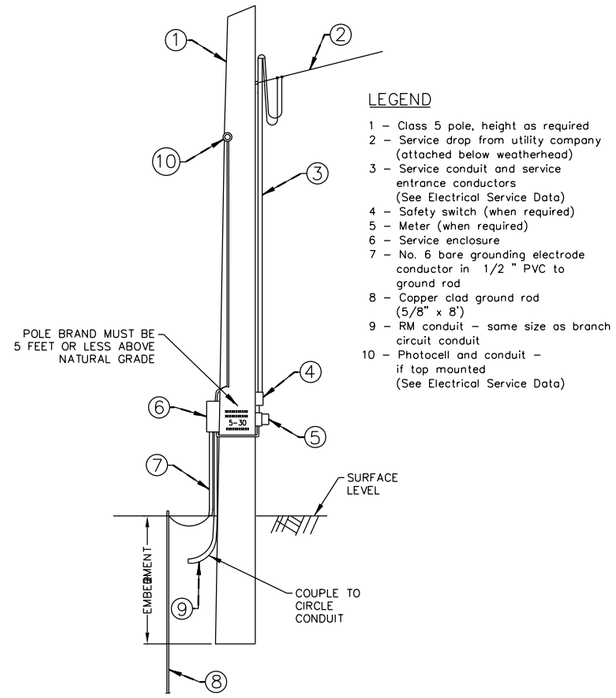
Example: ELEC SERV TY D(120/240)070(NS)GS(T)TP(O)



TOP MOUNTED PHOTOCELL



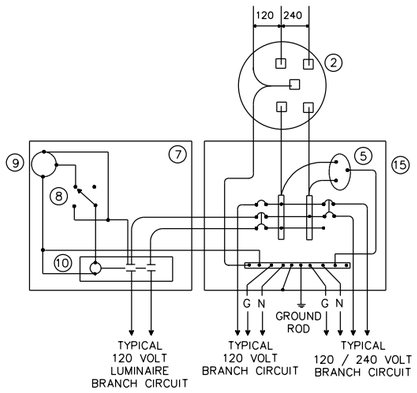
ENCLOSURE MOUNTED PHOTOCELL



LEGEND

1 – Class 5 pole, height as required
2 – Service drop from utility company (attached below weatherhead)
3 – Service conduit and service entrance conductors (See Electrical Service Data)
4 – Safety switch (when required)
5 – Meter (when required)
6 – Service enclosure
7 – No. 6 bare grounding electrode conductor in 1/2 " PVC to ground rod
8 – Copper clad ground rod (5/8" x 8')
9 – RM conduit – same size as branch circuit conduit
10 – Photocell and conduit – if top mounted (See Electrical Service Data)

SERVICE SUPPORT TYPE TP (O)
(TIMBER POLE, OVERHEAD SERVICE – TYPICAL ARRANGEMENT)



SERVICE SUPPORT TYPE T
120/240 VOLTS – THREE WIRE
(INSTALL PHOTOCELL AND LIGHTING CONTACTORS WHEN SHOWN ON ELECTRICAL SERVICE DATA)

SCHEMATIC LEGEND

1 – Safety Switch (when required)
2 – Meter (when required)
3 – Service Assembly Enclosure
4 – Main Disconnect (Switch or Breaker, See Electrical Service Data)
5 – Lightning Arrestor
6 – Circuit Breaker, 15A
7 – Auxiliary Enclosure
8 – Control Station ("H-O-A" Switch)
9 – Photo Electric Control (enclosure-mounted shown)
10 – Lighting Contactor
11 – Power Distribution Terminal Blocks
12 – Neutral/Ground Bus
13 – Branch Circuit Breaker (See Electrical Service Data)
14 – Circuit Breaker Panelboard (See Electrical Service Data)
15 – Load Center (See Electrical Service Data)

———— Power Wiring
———— Control Wiring
—N— Neutral Conductor (when required)
—G— Grounding Conductor

TIMBER POLE NOTES

1. Conduit and conductors attached to service pole and underground within 12 inches of service pole shall not be paid for directly but shall be subsidiary to the service pole.
2. Install photo electric control on north side of pole or in service enclosure as required. See Electrical Service Data.
3. Attach service enclosure with galvanized channel (Unistrut, Kindorf, or equal). Gain pole two places to provide flat surfaces. Paint ends of channel with zinc rich paint.
4. Embedment depth shall be as required in Item 627 Treated Timber Poles.
5. Poles trimmed for excess length shall be trimmed from the top end only.

NO.	REVISIONS	DATE	NAME
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STATE OF TEXAS · ANTHONY P. VOIGT · 84845 · LICENSED PROFESSIONAL ENGINEER

VOIGT ASSOCIATES, INC.
F-5333

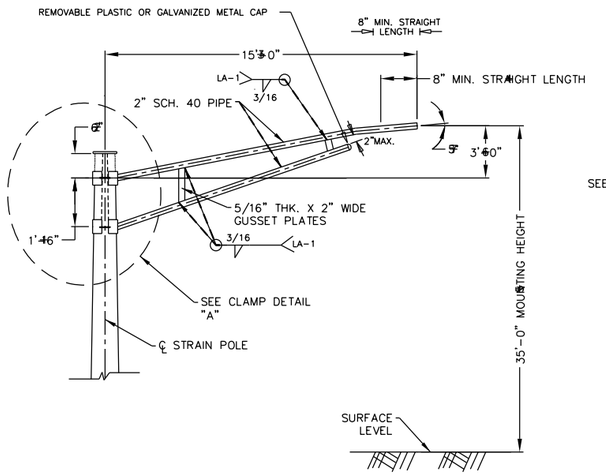
NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS

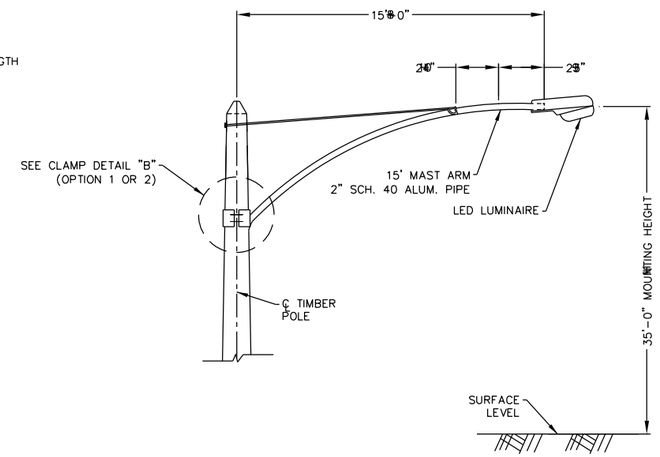
SHEET DESCRIPTION: STANDARD DETAILS
ELECTRICAL DETAILS: SERVICE SCHEMATICS AND SUPPORT TYPE TP (OVERHEAD)

TRAFFIC STANDARD: ED-TP

DRAWN BY: BSH
CK'D BY: BSH
SCALE: NONE
DATE: 8/18/17
SHEET NO: 21 / 38



TRUSS LUMINAIRE ARM



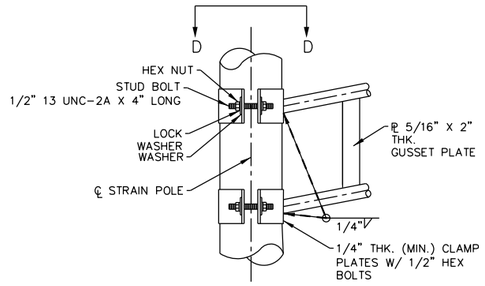
TENSION ROD LUMINAIRE ARM
(TIMBER POLE)

MATERIALS	
LUMINAIRE ARM	ASTM A53 GR A OR B OR A501 OR 595 (2) ALUMINUM 6061-T6
LUMINAIRE ARM PLATES (3)	ASTM A36 OR A572 GR50 (1) OR A595 GR A
MISCELLANEOUS	ASTM DESIGNATIONS AS NOTED

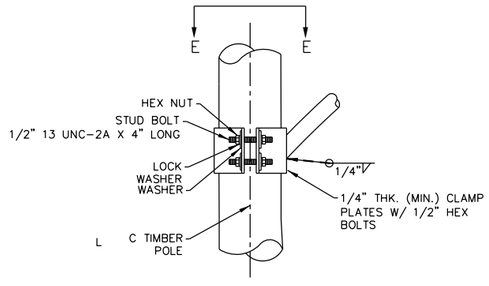
1.) IF A595 GR A MATERIAL IS USED, ARM NEED NOT BE COLD WORKED TO A595 REQUIREMENTS, BUT MATERIAL MUST HAVE 40 KSI MINIMUM YIELD PRIOR TO FABRICATION.
2.) EITHER OF THE MATERIALS LISTED FOR PLATES MAY BE USED WHERE THE DRAWINGS DO NOT SPECIFY A PARTICULAR ASTM DESIGNATION.
3.) ALL MATERIAL FOR TENSION ROD LUMINAIRE ARM EXCEPT BOLTS SHALL BE ALUMINUM 6061-T6.

GENERAL NOTES:

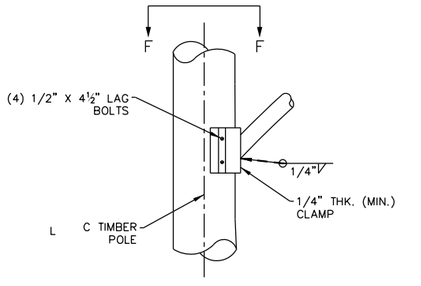
1.) DESIGN SHALL CONFORM TO HIGHWAY SIGNS, AASHTO STANDARD SPECIFICATIONS FOR STRUCTURE SUPPORTS FOR LUMINAIRES AND TRAFFIC SIGNALS, LATEST EDITION. DESIGN WIND SPEED EQUALS 90 MPH PLUS A 1.3 GUST FACTOR. ARMS ARE DESIGNED AREA TIMES DRAG COEFFICIENT) OF 1.5 SQ. FT.
2.) MATERIALS AND FABRICATION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND WITH THE DETAILS, DIMENSIONS, AND WELD PROCEDURES OF THE "AMERICAN NATIONAL STANDARD INSTITUTE/AMERICAN WELDING SOCIETY" ANSI/AWS D1.1, LATEST REVISION.
3.) WELD REFERENCES CALL FOR PREAPPROVED WELD PROCEDURES WHICH THE FABRICATOR MUST OBTAIN PRIOR TO FABRICATION. IN THE ABSENCE OF SPECIFIED FABRICATION TOLERANCES, DIMENSIONS SHALL BE WITHIN THE TOLERANCES GENERALLY OBTAINABLE IN NORMAL FABRICATION PRACTICE.
4.) UNLESS OTHERWISE NOTED, ALL PARTS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123.
5.) SUBMISSION OF SHOP DRAWINGS TO HARRIS COUNTY ENGINEER ON LUMINAIRE ARMS IS REQUIRED.



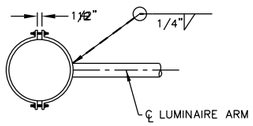
CLAMP DETAIL "A"



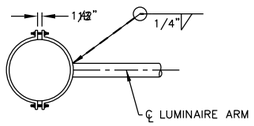
CLAMP DETAIL "B"
(OPTION 1)



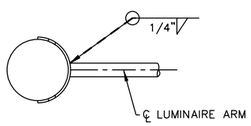
CLAMP DETAIL "B"
(OPTION 2)



SECTION D-D



SECTION E-E



SECTION F-F

NO.	REVISIONS	DATE	NAME
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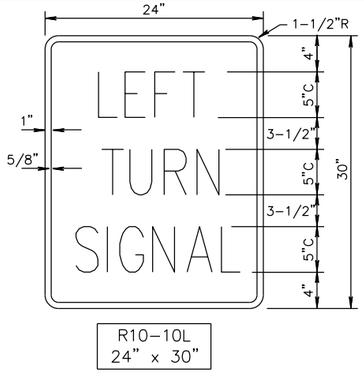
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

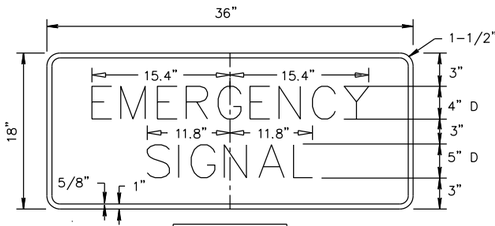
PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD
SHEET DESCRIPTION: LUMINAIRE ARM DETAILS		LUM-A
DRAWN BY: BSH	(100 MPH WIND ZONE)	DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 22 / 38



R10-10L
24" x 30"

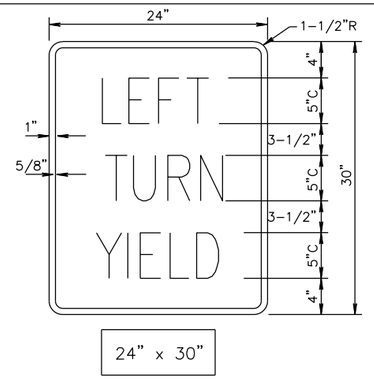
LETTERS – BLACK
BORDER – BLACK
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE

NOTE:
NOT FOR SPAN WIRE MOUNTING. ATTACH SIGN TO STAND ALONE POST OR SIGNAL POLE



36" x 18"

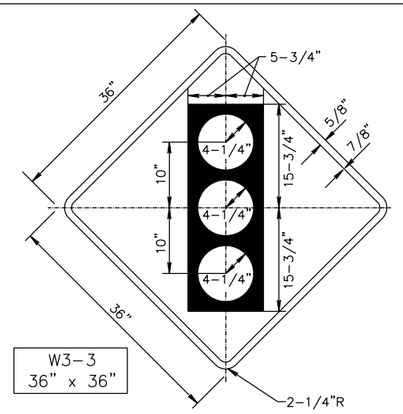
LETTERS – BLACK
BORDER – BLACK
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE



24" x 30"

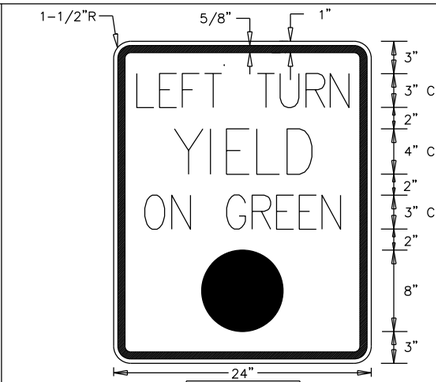
LETTERS – BLACK
BORDER – BLACK
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE

NOTE:
NOT FOR SPAN WIRE MOUNTING. ATTACH SIGN TO STAND ALONE POST OR SIGNAL POLE



W3-3
36" x 36"

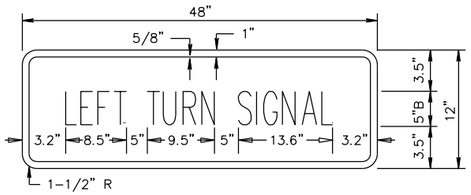
SYMBOL – BLACK
BORDER – BLACK
TOP CIRCLE – RED REFLECTIVE
BOTTOM CIRCLE – GREEN REFLECTIVE
BACKGROUND – YELLOW REFLECTIVE
SHEETING – VIP DIAMOND GRADE

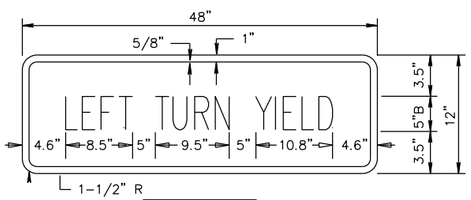


MR10-12
24" x 30"

LETTERS – BLACK
BORDER – BLACK
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE

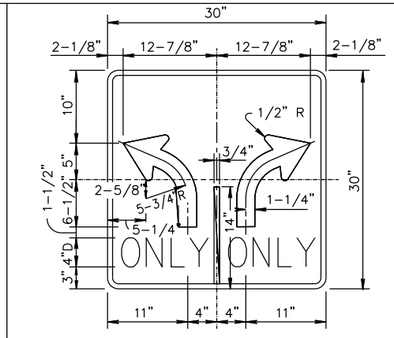
NOTE:
NOT FOR SPAN WIRE MOUNTING. ATTACH SIGN TO STAND ALONE POST OR SIGNAL POLE





48" x 12"

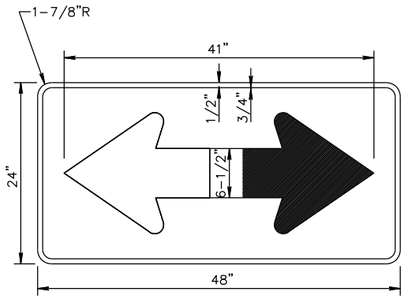
LETTERS – BLACK (SERIES B)
BORDER – BLACK
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE



R3-8 L(R)
30" x 30"

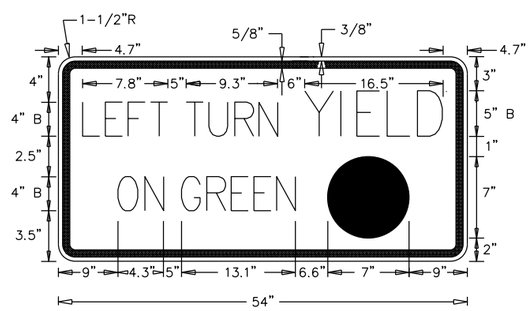
LETTERS – BLACK
BORDER – BLACK
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE

NOTE:
NOT FOR SPAN WIRE MOUNTING. ATTACH SIGN TO STAND ALONE POST OR SIGNAL POLE



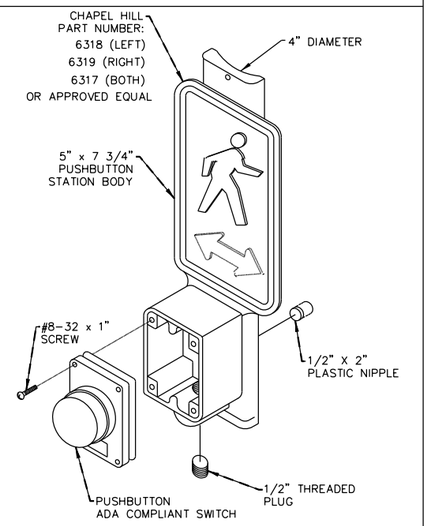
W1-7
48" x 24"

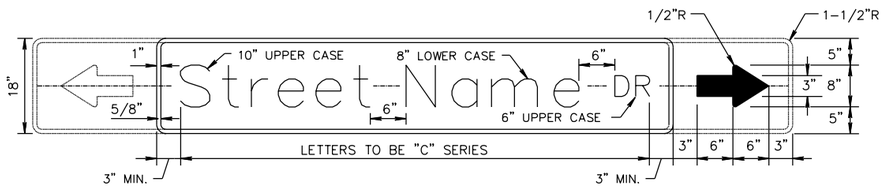
SYMBOL – BLACK
BORDER – BLACK
BACKGROUND – YELLOW REFLECTIVE
SHEETING – VIP DIAMOND GRADE



54" x 18"

LETTERS – BLACK (SERIES B)
BORDER – BLACK
CIRCLE – GREEN REFLECTIVE
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE





VARIES x 18"

LETTERS – WHITE REFLECTIVE
BORDER – WHITE REFLECTIVE
BACKGROUND – GREEN REFLECTIVE
(ALL MATERIAL SHALL BE DIAMOND GRADE VIP SHEETING)

GENERAL NOTES:

1.) CONTRACTOR SHALL USE CHAPEL HILL FREE SWINGING SIGN HANGER (PART NO. 7066) OR APPROVED EQUAL.
2.) CONTRACTOR SHALL FURNISH ALL HARDWARE FOR A COMPLETE INSTALLATION.
3.) ALL PARTS SHALL BE CAST ALUMINUM, WITH STAINLESS STEEL CLEVIS ADAPTER, BOLTS, WASHERS AND LOCKNUTS.
4.) ALL STREET NAME SIGNS SHALL HAVE VIP DIAMOND GRADE SHEETING.
5.) CONTRACTOR SHALL FURNISH ONE (1) SIGN HANGER PER STREET NAME SIGN SMALLER THAN 3'-0". SIGNS 3'-0"TO 6'-0" REQUIRE TWO (2) HANGERS. SIGNS LARGER THAN 6'-0" REQUIRE THREE (3) HANGERS.

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
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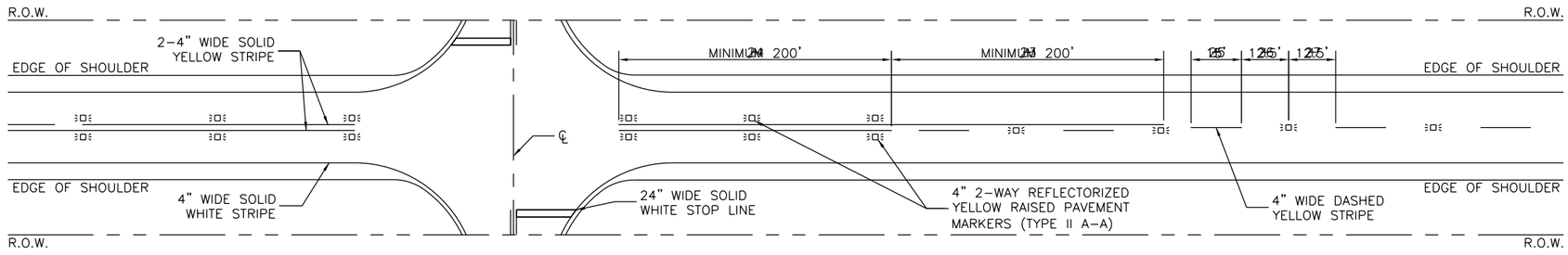
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC.
F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD
SHEET DESCRIPTION: TRAFFIC SIGNAL SIGN DETAILS		TSS
DRAWN BY: BSH		DATE: 12/14/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 23 / 38

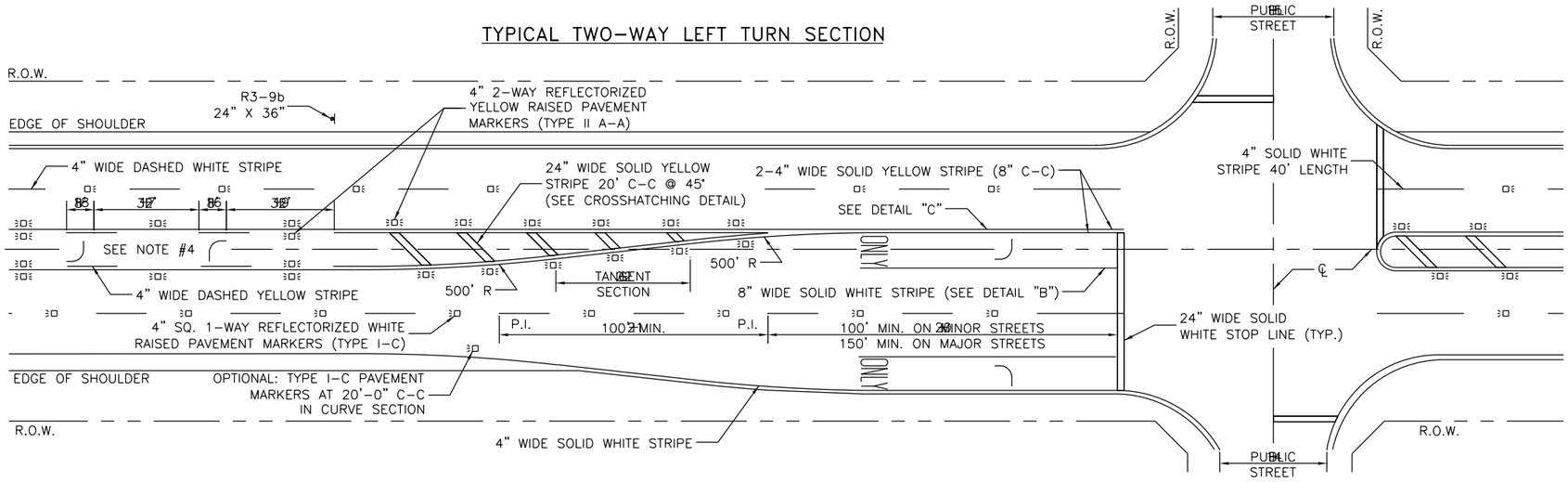


TYPICAL TWO LANE TWO–WAY ROAD

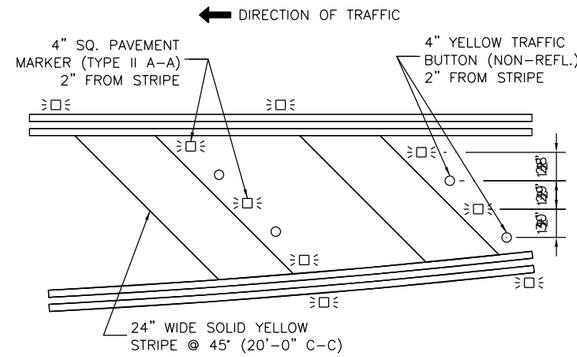
NOTES:

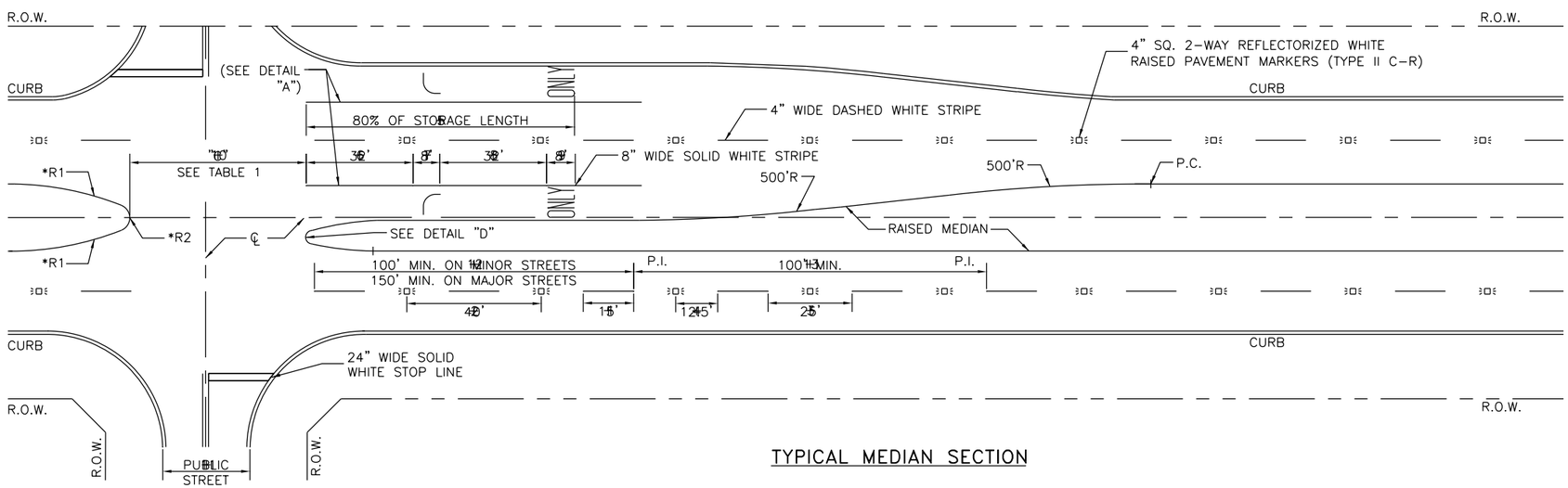
1. ALL PAVEMENT MARKINGS SHALL CONFORM TO THE LATEST EDITION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS (TMUTCD).
2. ALL TRAFFIC BUTTONS AND MARKERS SHALL BE INSTALLED ADJACENT TO STRIPES (APPROXIMATELY 2").
3. LEFT TURN STORAGE BAYS SHALL BE A MIN. OF 100' ON MINOR STREETS AND A MIN. 150' ON MAJOR STREETS.
4. REPEAT ARROWS AT APPROXIMATELY 1000' INTERVALS WITHIN TWO–WAY LEFT TURN SECTION.
5. WHEN PAVEMENT MARKINGS EXTEND INTO OR CONTINUE THROUGH AN INTERSECTION AREA, THEY SHALL BE THE SAME COLOR AND AT LEAST THE SAME WIDTH AS THE LINE MARKINGS THEY EXTEND.
6. WHEN CROSSWALK MARKINGS ARE USED WITHIN AN ESTABLISHED SCHOOL ZONE AREA, CONTINENTAL TYPE MARKINGS SHALL BE USED.
7. ADDITIONAL SET OF "WORD" AND "ARROW" PAVEMENT MARKINGS SHALL BE USED WHEN TURN LANE STORAGE LENGTH IS 160 FEET OR GREATER.

TYPICAL TWO–WAY LEFT TURN SECTION



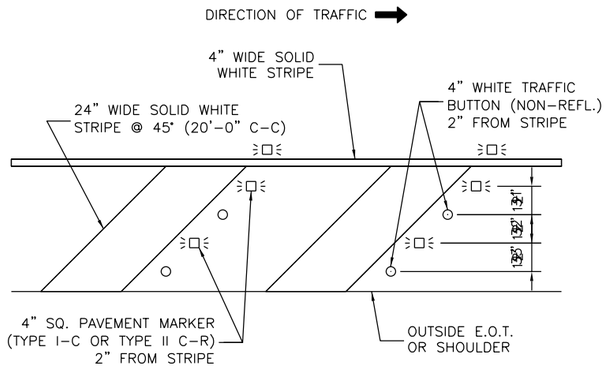
CROSSHATCHING DETAIL





TYPICAL MEDIAN SECTION

OUTSIDE EDGE CROSSHATCHING DETAIL



NO.	REVISIONS	DATE	NAME
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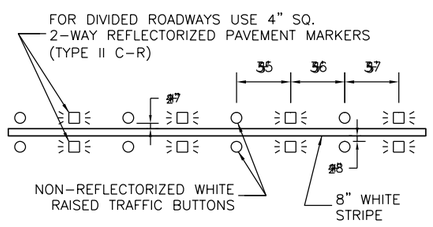
TBPLS Firm Reg. No.: 100282-00

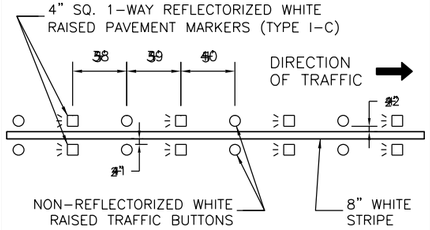
STATE OF TEXAS · ANTHONY P. VOIGT · 84845 · LICENSED PROFESSIONAL ENGINEER
NOVEMBER 20, 2023
VOIGT ASSOCIATES, INC. F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	STANDARD DETAILS
TRAFFIC STANDARD	PM
SHEET DESCRIPTION:	PAVEMENT MARKING DETAILS (1 OF 2)
DRAWN BY:	JDZ
DATE:	12/14/17
CK'D BY:	BSH
SCALE:	NONE
SHEET NO:	24 / 38

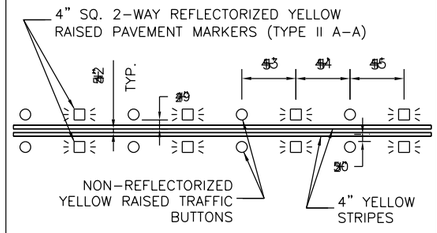
DETAIL "A"
(FOR DIVIDED ROADWAYS)



DETAIL "B"
(FOR UNDIVIDED ROADWAYS)

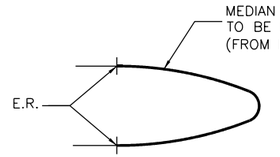


DETAIL "C"

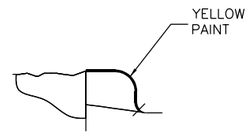


DETAIL "D"

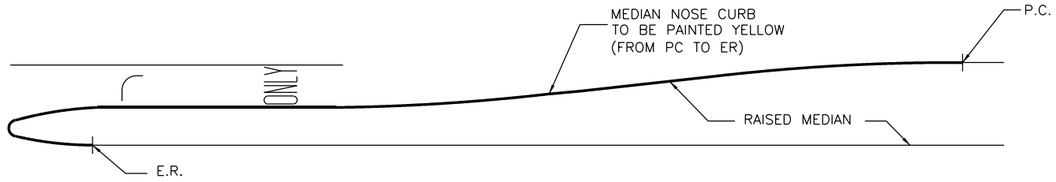
* PAINT FROM THE BACK OF CURB TO THE GUTTER LINE



TYPICAL MEDIAN NOSE



TYPICAL CURB SECTION



RAISED MEDIAN WITH TURN BAY

PAVEMENT MARKER LEGEND

SYMBOL	DESCRIPTION
≥□≤	4" x 4" REFLECTORIZED RAISED PAVEMENT MARKER
□≤	INDICATED DIRECTION OF TRAFFIC FLOW
○	NON-REFLECTIVE 4" DIA. RAISED TRAFFIC BUTTON

RADIUS DIMENSIONS

MEDIAN	*R1	*R2
≤10'	N/A	W/2
>10' ≤40'	90'	W/5
>40'	N/A	N/A

TABLE 1

TYPICAL MEDIAN OPENING "C"

MEDIAN INTERRUPTION	(1) NO LTB	(1) 1 LTB	(1) 2 LTB
PRIVATE DRIVE	45'	52.5'	60'
UNDIVIDED STREET <40'	45'	52.5' (2)	60'
44'	50'	55' (2)	60'
DIVIDED STREET	D+22'	D+22'	D+22'

NOTES:

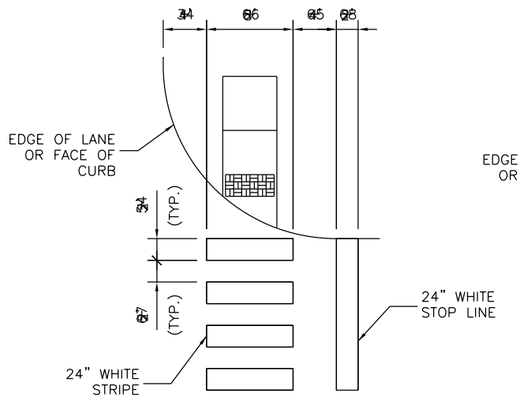
(1) LTB = LEFT TURN BAY

(2) DISTANCE FROM CENTERLINE OF OPENING TO MEDIAN NOSE WITH LEFT TURN LANE IS 30' FOR RIGHT ANGLE INTERSECTIONS, FOR INTERSECTIONS OTHER THAN 90°, APPLY DESIGN VEHICLE TURNING TEMPLATE TO DETERMINE DIMENSION TO MEDIAN NOSE CUT OFF.

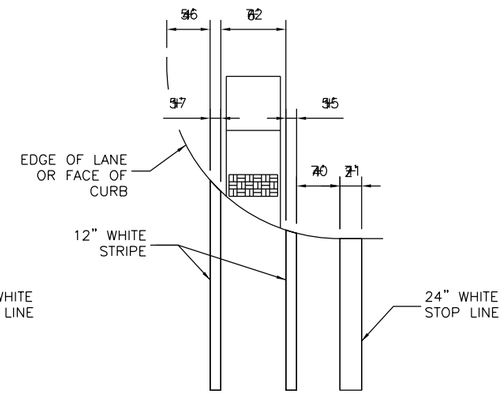
(3) D = WIDTH OF DIVIDED STREET

TYPICAL CROSSWALK PLACEMENT

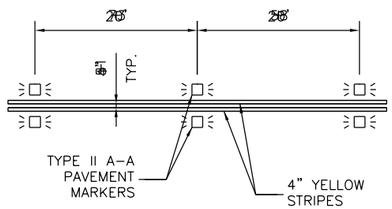
CONTINENTAL TYPE



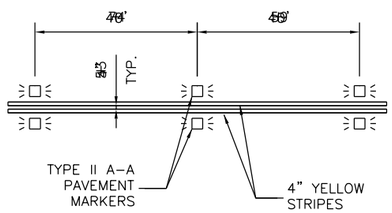
STANDARD TYPE



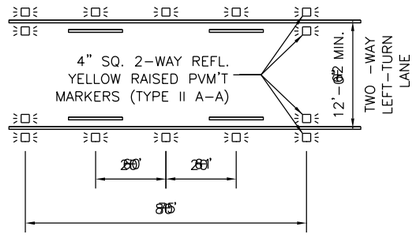
CENTER LINE DETAIL CURVE SECTION



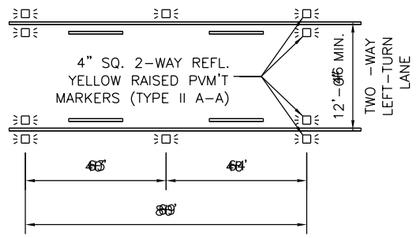
CENTER LINE DETAIL TANGENT SECTION



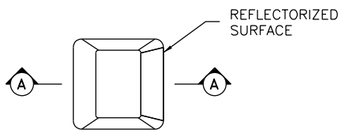
TWO-WAY LEFT TURN CURVE SECTION



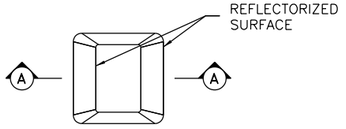
TWO-WAY LEFT TURN TANGENT SECTION



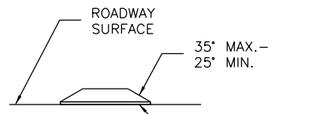
RAISED PAVEMENT MARKERS



TYPE I (TOP VIEW)



TYPE II (TOP VIEW)



SECTION A-A

NO.	REVISIONS	DATE	NAME
1			
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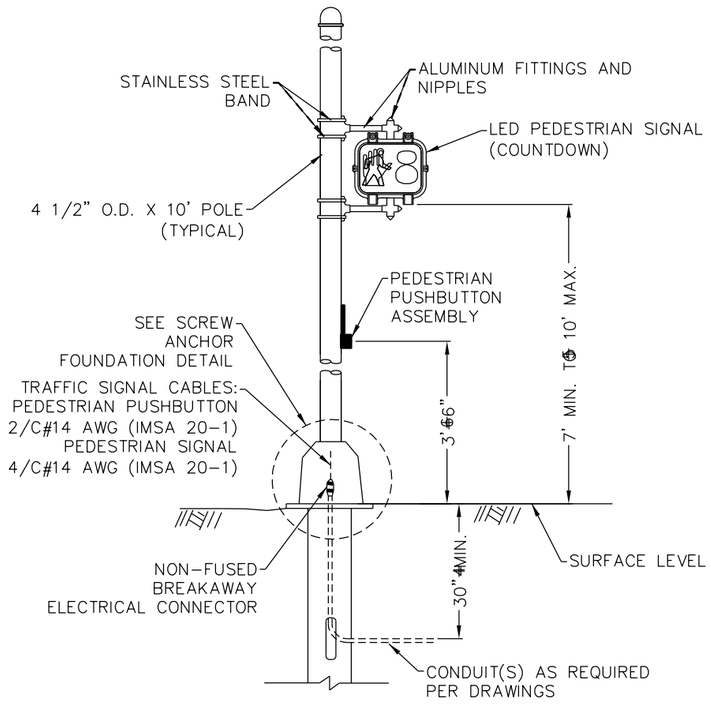
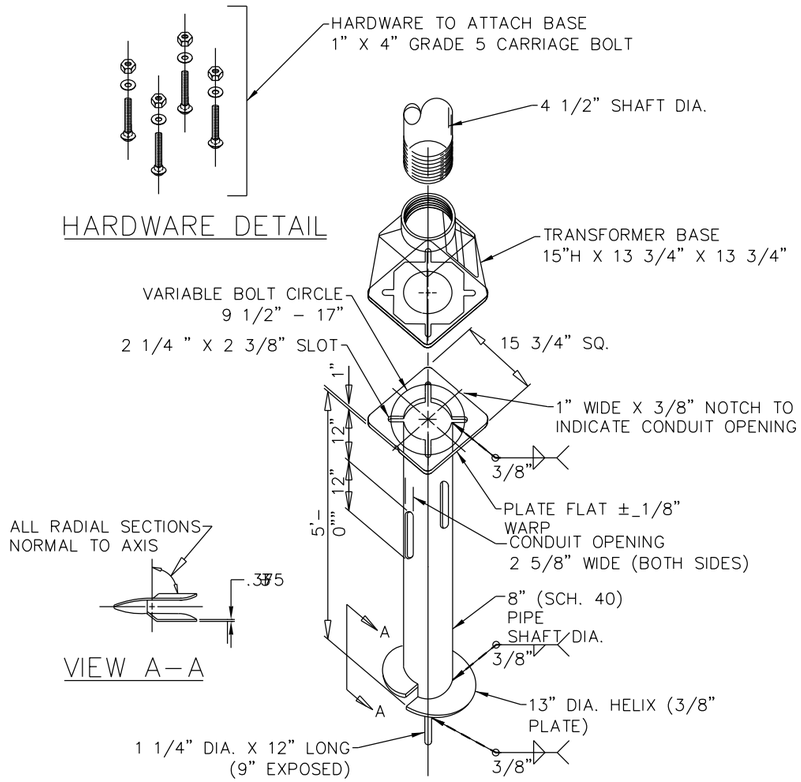
STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
NOVEMBER 20, 2023
VOIGT ASSOCIATES, INC. F-5333

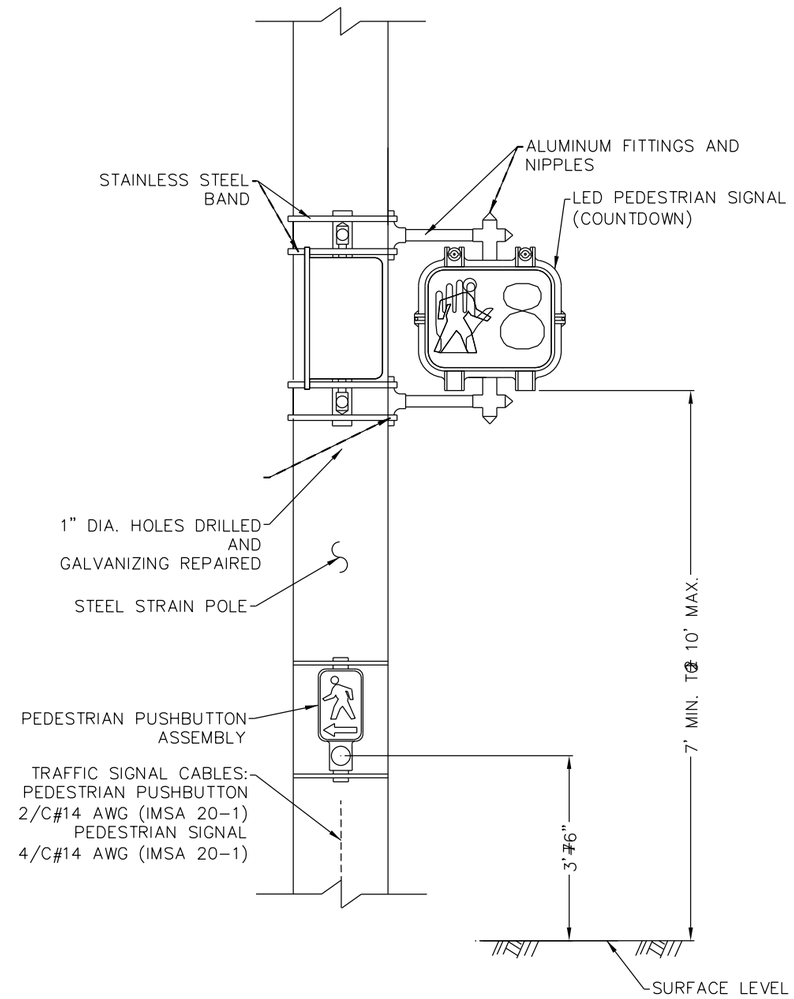
PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	STANDARD DETAILS
SHEET DESCRIPTION:	PAVEMENT MARKING DETAILS (2 OF 2)
TRAFFIC STANDARD	PM
DRAWN BY:	JDZ
DATE:	12/14/17
CK'D BY:	BSH
SCALE:	NONE
SHEET NO:	25 / 38



PEDESTRIAN SIGNAL INSTALLATION ON PEDESTRIAN POLE



SCREW ANCHOR FOUNDATION DETAIL



PEDESTRIAN SIGNAL INSTALLATION ON STEEL STRAIN POLE

NO.	REVISIONS	DATE	NAME
1			
2			
3			
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HARRIS COUNTY ENGINEERING DEPARTMENT

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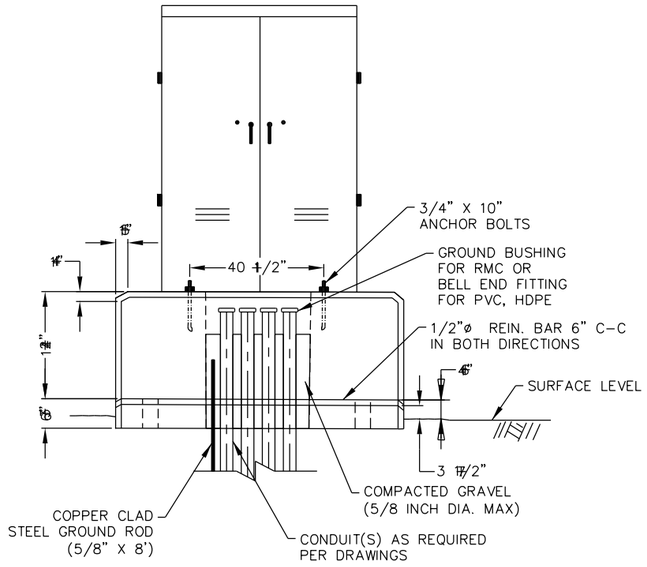
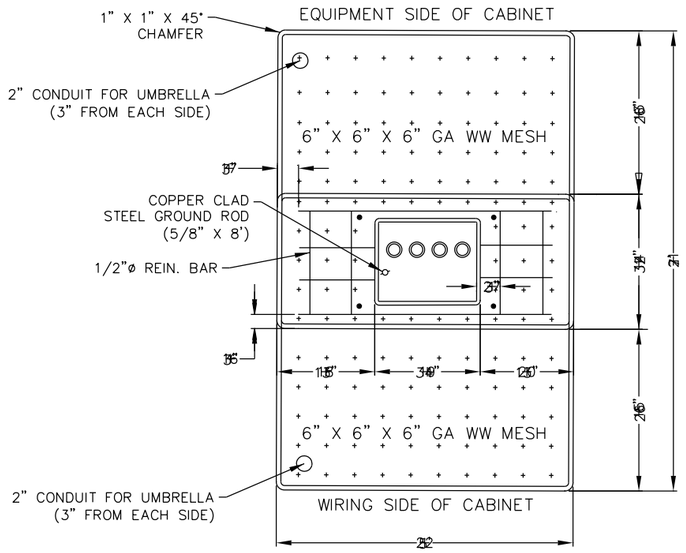
STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
NOVEMBER 20, 2023
VOIGT ASSOCIATES, INC. F-5333

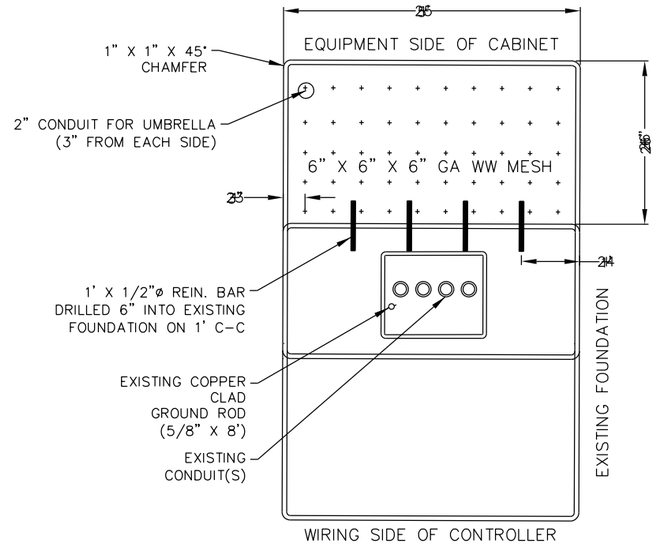
PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD
SHEET DESCRIPTION: PEDESTRIAN SIGNAL AND POLE INSTALLATION		PS&P
DRAWN BY: BSH	DETAILS	DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 26 / 38



FRONT VIEW

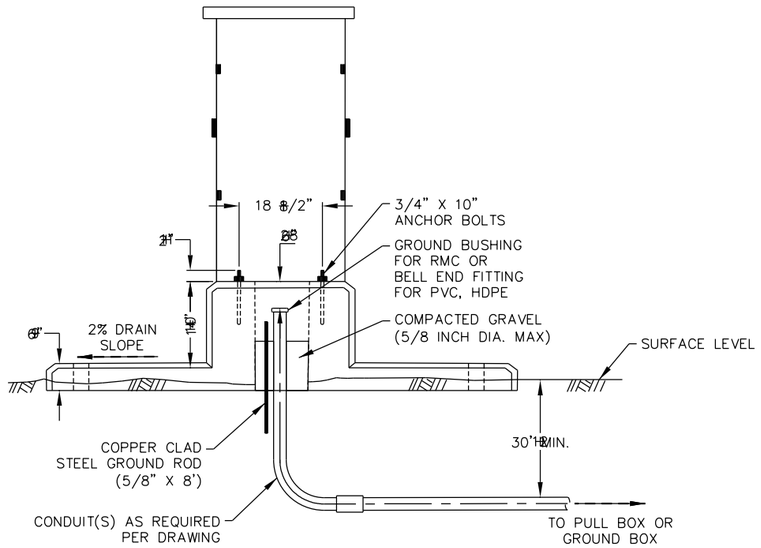


TOP VIEW
(LESS CABINET)



TOP VIEW
(LESS CABINET)

GROUND MOUNTED ITS (HOUSING 3) CABINET MODIFICATION TO EXISTING CABINET FOUNDATION



SIDE VIEW

CONTROLLER CABINET FOUNDATION NOTES:

1.) ALL CONCRETE TO BE CLASS B2 OR EQUIVALENT COMMERCIAL BAGGED CONCRETE MIX IN LIEU OF PLANT CONCRETE.
2.) CONDUIT WELL IN FOUNDATION TO HAVE GRAVEL DRAIN.
3.) THE CONTRACTOR SHALL SET THE TOP OF THE STEP OF THE CONTROLLER FOUNDATION NO LOWER THEN THE LEVEL OF THE PAVEMENT SURFACE. ANY NECESSARY ADJUSTMENT SHALL BE APPROVED BY THE ENGINEER.
4.) THE CONTRACTOR SHALL FURNISH ANY ADDITIONAL MATERIALS WHICH MAY BE NECESSARY TO LEVEL AND/OR STABILIZE FOUNDATION AT UNUSUAL LOCATIONS.
5.) THE CONTRACTOR SHALL CENTER THE CABINET ON THE FOUNDATION.
6.) THE FOUNDATION SHALL BE SUPPORTED BY UNDISTURBED SOIL OR BY SOIL THAT HAS BEEN COMPACTED TO 90% IN 6" LIFTS.

NO.	REVISIONS	DATE	NAME
1			
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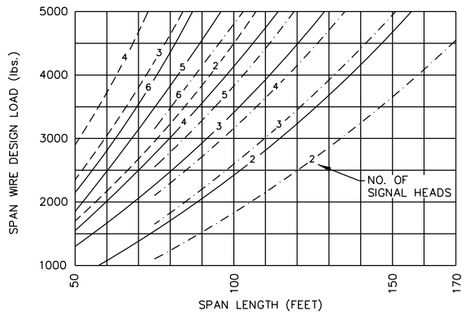
TBPLS Firm Reg. No.: 100252-00

STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD CCF
SHEET DESCRIPTION: CONTROLLER CABINET FOUNDATION		
DRAWN BY: BSH	DETAILS	DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 27 / 38



— — — — — SAG = 4'-6" (30' POLE)
——— SAG = 8'-0" (30' OR 34' POLE)
—·—·— SAG = 11'-6" (34' POLE)

SIGNAL HEAD TYPE	WT. PER HEAD	WIND AREA ◆
5-SECTION, 12" LENS	125 LBS.	9.6 SQ. FT.
3-SECTION, 12" LENS	75 LBS.	5.64 SQ. FT.

◆ EFFECTIVE PROJECTED DESIGN WIND AREA (ACTUAL AREA TIMES DRAG COEFFICIENT)

LOAD SPAN CHART – SIGNALS WITH 12-INCH LENS

LOAD SPAN CHART NOTES:

NUMBERS ON LOAD SPAN CHART INDICATE THE NUMBER OF SIGNAL HEADS ON THE SPAN. THE TOTAL SPAN WIRE DESIGN LOAD IS BASED ON ONE 5-SECTION HEAD AND ONE OR MORE ADDITIONAL 3-SECTION HEAD(S). DESIGN WIND PRESSURES ON CABLES ARE ASSUMED AS 1.6 LB/FT. WEIGHT OF SPAN WIRE CABLES (ONE PER SIGNAL HEAD) IS ASSUMED AS 0.65 LB/FT WHICH INCLUDES AN ALLOWANCE FOR CONDUCTOR CABLES AND MISCELLANEOUS HARDWARE. THE EFFECT OF THE SWAY CABLE ON LOAD DISTRIBUTION IS IGNORED AS IT IS ASSUMED TO BREAK AT DESIGN WIND CONDITIONS. WIND LOAD ON STREET NAME SIGNS SHOULD BE CONSIDERED FOR SPAN WIRE DESIGN LOAD. WHEN A POLE SUPPORTS 2 SPANS, THE SPAN WIRE DESIGN LOADS FOR BOTH SPANS SHOULD BE ADDED AS EXPLAINED BELOW TO DETERMINE THE DESIGN LOAD FOR THAT POLE.

DESIGN LOAD AND MOMENT CALCULATIONS:

WHEN A POLE SUPPORTS 2 SPANS, THE SPAN WIRE DESIGN LOADS FOR BOTH SPANS SHOULD BE ADDED, AS BELOW, TO DETERMINE THE DESIGN LOAD FOR THAT POLE.

Fx (lbs) = LOAD 2 + (LOAD 1 * COS(ANGLE BETWEEN SPANS))
Fy (lbs) = LOAD 1 * SIN(ANGLE BETWEEN SPANS)

DESIGN LOAD(lbs) = $\sqrt{Fx^2 + Fy^2}$

DESIGN MOMENT(K*FT) = ((POLE HT. – 0.953) * DESIGN LOAD) / 1000

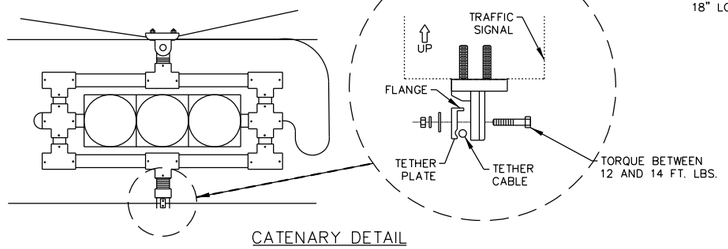
IF DESIGN LOAD IS GREATER THAN THE MAX. PERMISSIBLE LOAD FROM TABLE BELOW, A SPECIAL FOUNDATION DESIGN MAY BE REQUIRED.

IF DESIGN MOMENT IS GREATER THAN THE MAX. ALLOWABLE MOMENT FROM THE FOUNDATION DESIGN TABLE ON THE STRAIN POLE FOUNDATION STANDARD DETAIL, A SPECIAL FOUNDATION MAYBE REQUIRED.

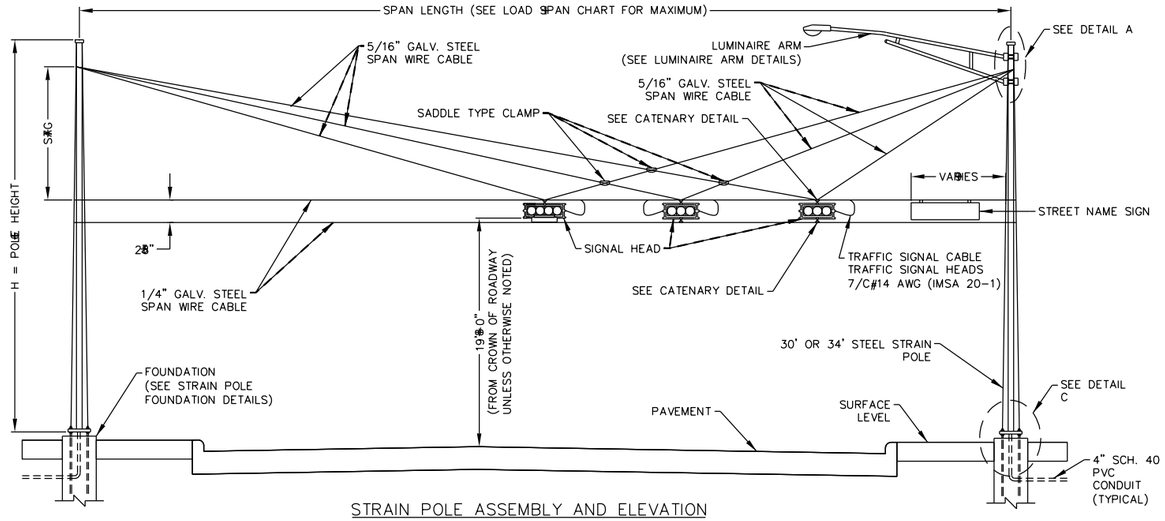
STRAIN POLE DESCRIPTION	POLE TYPE	FOUNDATION TYPE	MAX. PERMISSIBLE SPAN WIRE LOAD (lbs)
30' POLE	HC10030	10030	5800
30' POLE WITH LUMINAIRE	HC10030	10030	5500
34' POLE	HC10034	10036	6300
34' POLE WITH LUMINAIRE	HC10034	10036	6000

POLE TYPE	ROUND STRAIN POLE				OCTAGONAL STRAIN POLE			
	D_B	D_T	THK.	H	D_B	D_T	THK.	H
	IN.	IN.	IN.	FT.	IN.	IN.	IN.	FT.
HC10030	13.75	9.55	0.3125	30	13.75	9.55	0.3125	30
HC10034	15.5	10.74	0.3125	34	15.5	10.74	0.3125	34

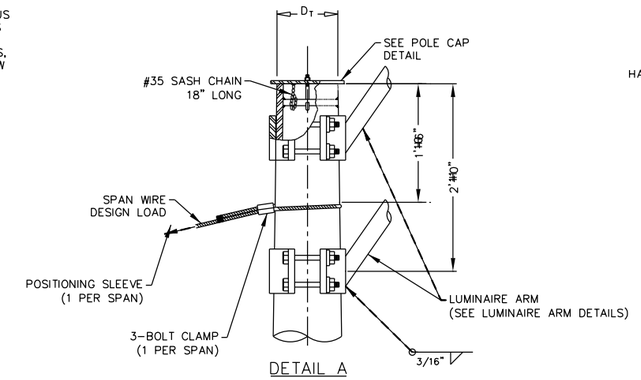
D_B = POLE BASE O.D.
D_T = POLE TOP O.D.
H = HEIGHT



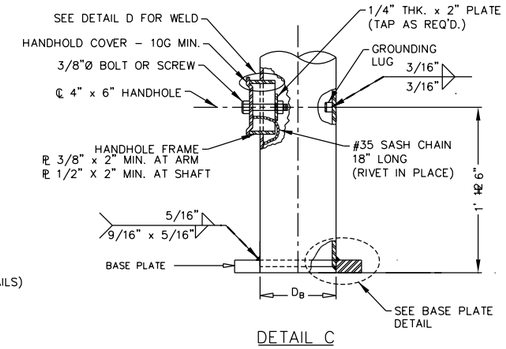
CATENARY DETAIL



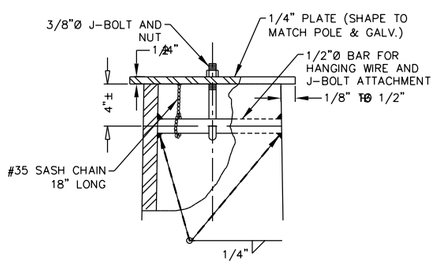
STRAIN POLE ASSEMBLY AND ELEVATION



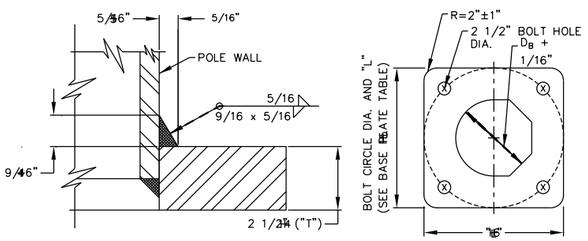
DETAIL A



DETAIL C



POLE CAP DETAIL



BASE PLATE TABLE				
FOUNDATION TYPE	ANCHOR BOLT DIAMETER	BOLT HOLE DIAMETER	BOLT CIRCLE DIAMETER	BASE ℘ DIMENSIONS "L" x "T"
10030	2 1/4"	2 1/2"	19"	19" 2 1/2"
10036	2 1/4"	2 1/2"	21"	21" 2 1/2"

BASE PLATE DETAIL

SHIPPING PARTS LIST

STRAIN POLE(S) (WITHOUT TRAFFIC SIGNAL ARM)						
POLE TYPE	STRAIN POLE(S) WITH LUMINAIRE			STRAIN POLE(S) WITHOUT LUMINAIRE		
	SHIP EACH STRAIN POLE WITH THE FOLLOWING HARDWARE ATTACHED: HANDHOLE AT BASE, POLE CAP, ETC.			SHIP EACH STRAIN POLE WITH THE FOLLOWING HARDWARE ATTACHED: HANDHOLD AT BASE, POLE CAP, ETC.		
	DESCRIPTION	DESIGNATION	QUANTITY	DESCRIPTION	DESIGNATION	QUANTITY
HC10030	30' STRAIN POLE	HC10030		30' STRAIN POLE	HC10030	
HC10034	34' STRAIN POLE	HC10034	2	34' STRAIN POLE	HC10034	2

LUMINAIRE ARMS	
ARM LENGTH	QUANTITY
15' ARM	2

ANCHOR BOLT ASSEMBLIES (1 PER POLE)*		
ANCHOR BOLT DIAMETER	BOLT HOLE DIAMETER	QUANTITY
2 1/4"	6'-3 1/2"	4

* EACH ANCHOR BOLT ASSEMBLY CONSIST OF THE FOLLOWING:
TOP AND BOTTOM TEMPLATES, 4 ANCHOR BOLTS, 8 NUTS, 8 FLAT, WASHERS, 4 LOCK WASHERS AND 4 NUT ANCHOR DEVICES (TYPE 2) PER STANDARD DRAWING STRAIN POLE FOUNDATION DETAILS.
(TEMPLATES MAY BE REMOVED FOR SHIPMENT)

MATERIALS	
ROUND STRAIN POLE OR OCTAGONAL STRAIN POLE	ASTM A570 GR50 OR ASTM A572 GR50
PLATES (1)	ASTM A36 OR A572 GR50
STEEL CABLE	ASTM A475, 7 WIRE, UTILITIES GRADE

(1) EITHER OF THE MATERIALS LISTED FOR PLATES MAY BE USED WHERE THE DRAWINGS DO NOT SPECIFY A PARTICULAR ASTM DESIGNATION.

NOTE: ENGINEER SHALL COMPLETE SHIPPING PARTS LIST TABLES

GENERAL NOTES:

1.) DESIGN SHALL CONFORM TO 2001 OR LATEST ADDITION TO AASHTO STANDARD SPECIFICATIONS FOR THE STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS AND INTERIM SPECIFICATIONS DESIGN WIND SPEED EQUALS 100 MPH PLUS A 1.3 GUST FACTOR.
2.) STRAIN POLES ARE DESIGNED TO SUPPORT SPAN WIRE WITH ONE CLAMP-ON MAST ARM. THE SPECIFIED SIGNAL LOAD APPLIED AT THE END OF THE TRAFFIC SIGNAL ARM EQUALS 180 LBS. VERTICAL DEAD LOAD PLUS THE HORIZONTAL WIND LOAD ON AN EFFECTIVE PROJECTED AREA OF 32.4 SQ. FT. THE MAXIMUM PERMISSIBLE SPAN WIRE DESIGN LOADS TABULATED ARE CALCULATED AT A STRESS LOAD OF 1.40 TIMES THE BASIC ALLOWABLE STRESS. A SIMULTANEOUS WIND ON THE POLE, MAST ARM, AND LUMINAIRE IS ALSO INCLUDED. DESIGNS ARE BASED ON A SPAN WIRE AND ARM INCLUDED ANGLE OF 90 DEG. ANGLES OF LESS THAN 75 DEG. OR MORE THAN 105 DEG. WILL REQUIRE A SPECIAL DESIGN.
3.) FABRICATION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND THE WITH THE DETAILS AND DIMENSIONS. ALL WELDING SHALL CONFORM TO THE REQUIREMENTS OF THE SPECIFICATIONS OF THE AMERICAN WIELDING SOCIETY STRUCTURAL WELDING CODE AWS LATEST EDITION.
4.) SEE SINGLE AND DUAL MAST ARM ASSEMBLIES DETAILS AND MAST ARM CONNECTIONS AND FABRICATIONS DETAILS STANDARD SHEETS FOR DETAILS OF CLAMP-ON MAST ARMS.
5.) SEE LUMINAIRE ARM DETAILS STANDARD SHEET FOR DETAILS OF LUMINAIRE ARM AND CONNECTION.
6.) SEE STRAIN POLE FOUNDATION DETAILS STANDARD SHEET FOR DETAILS OF ANCHOR BOLTS AND FOUNDATION.
7.) UNLESS OTHERWISE NOTED, ALL STEEL PARTS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 REQUIREMENTS WITH A MINIMUM OF 2 OUNCES PER SQUARE FOOT OF GALVANIZED COATING.
8.) ALL SMALL STEEL HARDWARE ITEMS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A153 REQUIREMENTS.
9.) SPECIAL DESIGNS REQUIRE SUBMISSION OF SHOP DRAWINGS IN ACCORDANCE WITH THE SPECIFICATION ITEM 680 "STEEL MAST ARM AND STEEL STRAIN POLE ASSEMBLIES".
10.) ALL BOLTS SHALL HAVE TWO FULL DIAMETER THREADS EXPOSED ABOVE THE NUT.
11.) CONTRACTOR SHALL INSTALL A CLOSE NIPPLE WITH LOCKNUTS AND METAL BUSHINGS (SIZE AS REQUIRED) TO PREVENT ABRASION WHERE CABLE(S) ENTER ANY PORTION OF THE STRAIN POLE.
12.) CONTRACTOR SHALL INSTALL AND/OR ADJUST CATENARY SYSTEM AND TRAFFIC SIGNAL HEADS. AND SHALL LEVEL ALL SIGNAL HEADS, PRIOR TO ATTACHING BOTTOM TETHER SPAN.

NO.	REVISIONS	DATE	NAME

HARRIS COUNTY ENGINEERING DEPARTMENT

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TBPE Firm Reg. No.: F-4578
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS · ANTHONY P. VOIGT · 84845 · LICENSED · PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

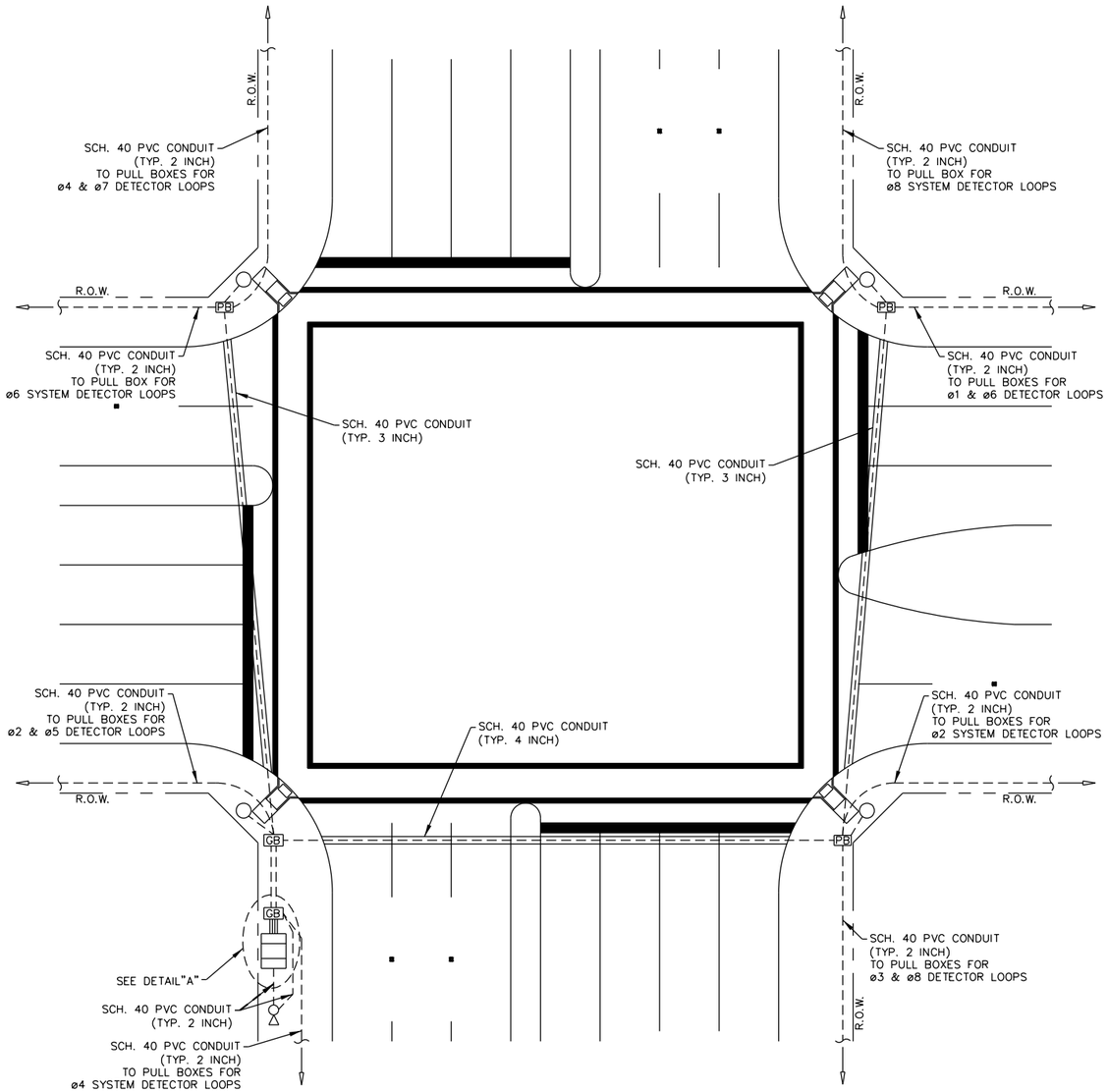
NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS			
STANDARD DETAILS			TRAFFIC STANDARD
SHEET DESCRIPTION: STRAIN POLE ASSEMBLY DETAILS			SP-100
DRAWN BY: BSH	(100 MPH WIND ZONE)		DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE		SHEET NO: 28 / 38

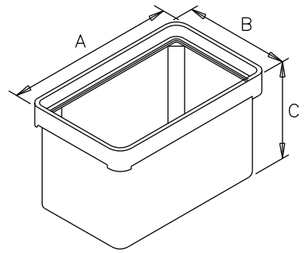
LEGEND:

- SIGNAL CONTROLLER
- SIGNAL POLE
- UNDERGROUND CONDUIT
- UNDERGROUND CONDUIT (BORE)
- PB PULL BOX
- GB GROUND BOX
- SERVICE POLE

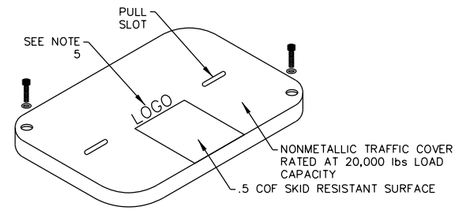
N



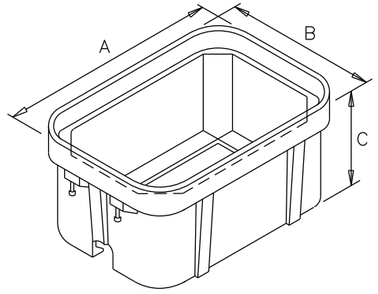
TYPICAL CONDUIT AND PULL BOX / GROUND BOX SYSTEM FOR SIGNALIZED MAJOR / MAJOR INTERSECTION



PULL BOX DETAIL



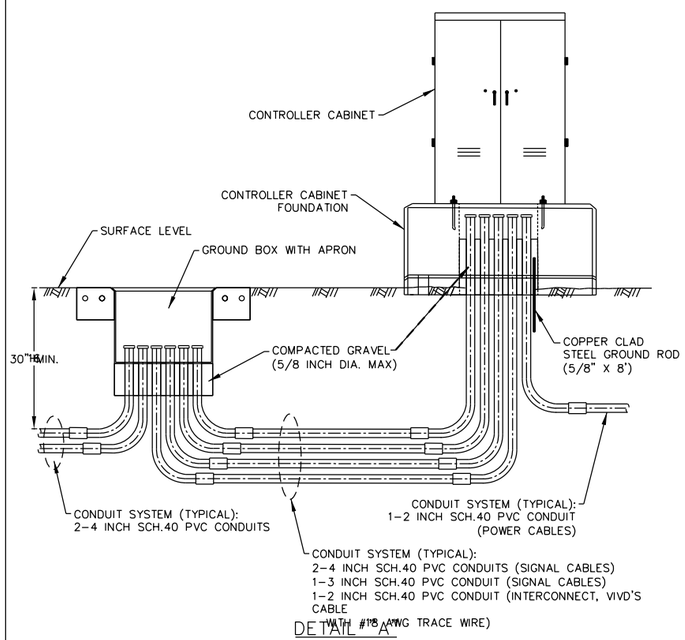
PULL BOX & GROUND BOX COVER DETAIL



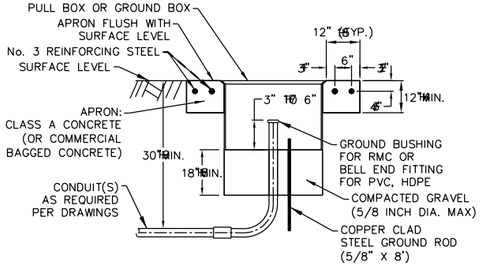
GROUND BOX DETAIL

TYPE	DIMENSIONS		
	A	B	C
PULL BOX (TYPE D)	32-1/4"±1"	19-1/4"±1"	22"±1"
GROUND BOX	37-5/8"±1"	26"±1"	30"±1"

PULL BOX & GROUND BOX DIMENSION DETAIL



DETAIL "A"



PULL BOX & GROUND BOX INSTALLATION DETAIL

GENERAL NOTES:

1.) ALL CONDUIT SPECIFIED IN PLANS SHALL BE INSTALLED AT A MINIMUM DEPTH OF 30 INCHES AND SHALL ENTER BOXES FROM THE BOTTOM.
2.) BOXES SHALL HAVE A CAPACITY LOADING OF 20,000 lbs OVER A 10 INCH BY 10 INCH AREA AND 600 lbs PER SQ. FOOT APPLIED OVER THE ENTIRE SIDE WALL.
3.) ALL BOXES AND COVERS SHALL BE PERMANENTLY MARKED BY EITHER IMPRESSION OR PERMANENT INK WITH MANUFACTURER'S MODEL NUMBER AND NAME/LOGO.
4.) BOX COVERS SHALL BE SECURED WITH TWO 1/2 INCH STAINLESS STEEL BOLTS. BOLTS SHALL BE WITHSTAND A MINIMUM OF 70 FT-lbs TORQUE AND A MINIMUM OF 750 lbs STRAIGHT PULL OUT STRENGTH. BOLT HOLES IN BOX SHALL BE ARRANGED TO DRAIN DIRT.
5.) BOX COVERS SHALL BE LEGIBLY IMPRINTED WITH THE WORDS "TRAFFIC SIGNAL - HCED" IN MINIMUM 1 INCH LETTERS.
6.) ALL BOXES SHALL BE INSTALLED WITH A 5/8 INCH (MIN.) BY 8 FOOT GROUNDING ROD AND ROD CLAMPS SHALL BE IN DIRECT CONTACT WITH THE SOIL.
7.) DETECTOR LOOP LEAD-IN CABLE FROM PULL BOX TO CONTROLLER CABINET SHALL BE 2/C #14 (IMSA 50-2).
8.) LEAVE A MINIMUM OF 10 FEET SLACK TRACE WIRE IN COMMUNICATION GROUND BOX AND CONTROLLER CABINET.

NO.	REVISIONS	DATE	NAME
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HARRIS COUNTY ENGINEERING DEPARTMENT

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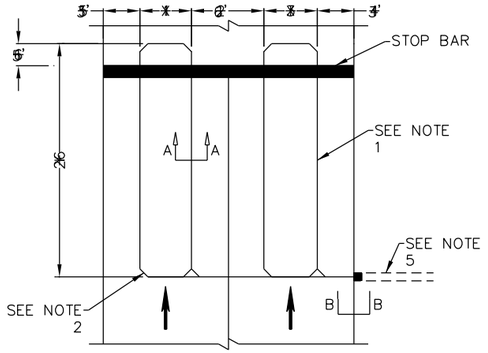
TBPE Firm Reg. No.: F-4526
TBPLS Firm Reg. No.: 100282-00

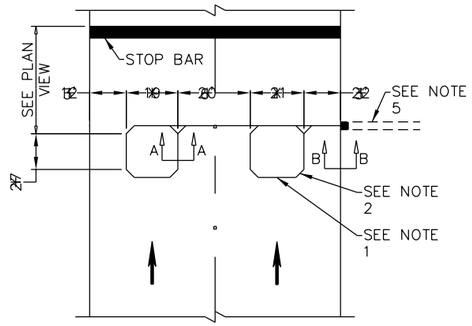
STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

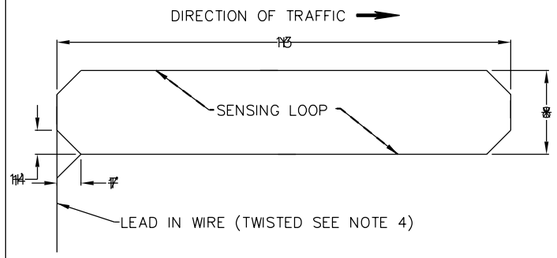
PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS			
STANDARD DETAILS			TRAFFIC STANDARD
SHEET DESCRIPTION: CONDUIT / PULL BOX / GROUND BOX			CPGT
DRAWN BY: BSH	TRAFFIC SIGNAL SYSTEM DETAILS		DATE: 3/21/19
CK'D BY: BSH	SCALE: NONE		SHEET NO: 29 / 38



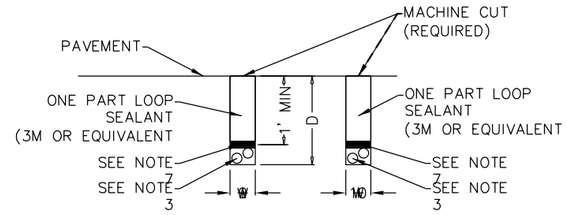
TYPICAL PRESENCE LOOP LAYOUT DETAIL



TYPICAL PULSE LOOP LAYOUT DETAIL



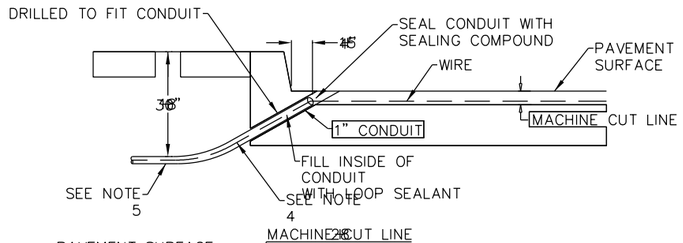
TYPICAL DIPOLE LOOP LAYOUT DETAIL

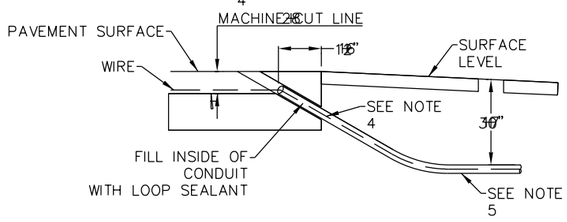


DIM.	CONC.	ASPHALT
D	*1-1/2"	* 2"
W	5/16"	5/16"

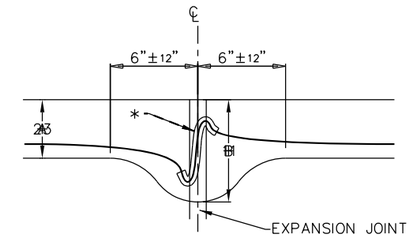
*MINIMUM 3" FOR LEAD LINE ON MULTIPLE LOOPS

SECTION A-A





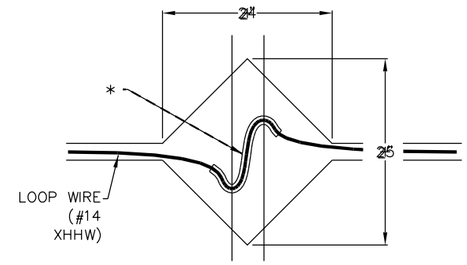
SECTION B-B



	A	B
SINGLE LOOP	1 1/2"	2 1/2"
MULTIPLE LOOPS	3"	4"

* WHEN USING A NON-HOT ASPHALT SEAL, A RUBBER OR PLASTIC SLEEVE IS REQUIRES WHEN CROSSING A EXPANSION JOINT

DETAIL "A"



* AREA REMOVED SHALL BE THE SAME DEPTH AS THE MACHINE CUT FOR THE LOOP WIRE. PROTECT LOOP WIRE WITH FIBERGLASS ROPE WHEN FILLING WITH HOT ASPHALT.

DETAIL "B"

GENERAL NOTES:

1.) MACHINE CUT PAVEMENT TO DEPTH AND WIDTH RECOMMENDED IN SECTION A-A ABOVE.
2.) CORNERS OF THE LOOP SHALL HAVE A ONE FOOT MACHINE CUT CHAMFER AT A 45° ANGLE.
3.) DETECTOR WIRES SHOULD BE WOUND FOR PROPER LOOP TUNING, SEE TABLE 3 ON STANDARD DETAIL FOR STANDARD INTERSECTION LOOP DETECTOR PLACEMENT AND SIZE DETAILS OR DIAMOND INTERSECTION LOOP PLACEMENT AND SIZE DETAILS (SHEET 2 OF 2), OR USE RECOMMENDATIONS OF MANUFACTURER. IT MAY BE NECESSARY TO ADD MORE TURNS TO INCREASE SENSITIVITY.
4.) THE LEAD IN WIRES ARE TO BE TWISTED A MINIMUM OF FIVE TIMES PER FOOT AND REMAIN UNDISTURBED AFTER THE LOOP HAS BEEN TUNED.
5.) MINIMUM 1" CONDUIT SHALL BE BURIED A MINIMUM 30" TO PULL BOX, CONTROLLER OR POLE AS SPECIFIED IN DRAWINGS.
6.) WHEN CUTTING IN ASPHALT, IF MACHINE CUT CLOSES DUE TO HIGH ATMOSPHERIC TEMPERATURE, CUTTING WILL BE HALTED UNTIL TEMPERATURE PERMITS.
7.) THE LOOP WIRE SHALL BE HELD IN PLACE WITH STRIPS OF RUBBER NEOPRENE FLEXIBLE TUBING OR POLYETHYLENE FOAM APPROXIMATELY ONE (1) INCH IN LENGTH EVERY TWO FEET. THESE STRIPS SHALL BE LEFT IN PLACE AND THE SLOT FILLED WITH ONE PART LOOP SEALANT (3M OR EQUIVALENT).
8.) DETECTOR LOOP LEAD-IN CABLE FROM PULL BOX TO CONTROLLER CABINET SHALL BE 2/C #14 (IMSA 50-2).
9.) LOCATION OF CONDUIT AND LOOP LEAD WIRES SUBJECT TO CHANGE.
10.) LOOP WIRES SHALL BE MINIMUM 14 GAUGE XHHW TYPE.
11.) NO EXPANSION JOINT SLOT SHALL BE USED IN LIEU OF SAWCUT SLOTS FOR VEHICLE DETECTOR WIRE PLACEMENT. LOOPS CUT ACROSS EXPANSION JOINTS SHALL HAVE SLACK CABLE FOR EXPANSION (SEE DETAIL "A" AND "B").
12.) THE SAWCUT SHALL BE CLEANED AND DRIED WITH AN AIR COMPRESSOR TO REMOVE ALL DEBRIS AND MOISTURE PRIOR TO INSTALLATION OF LOOP DETECTOR WIRE.
13.) ALL LOOPS SHALL BE TESTED WITH A MEGGER AT THE TIME OF INSTALLATION. INSULATION RESISTANCE MUST EXCEED 50MEG OHMS AND WIRE RESISTANCE MUST BE LESS THAN ONE MEG OHM.
14.) ALL CONNECTIONS SHALL BE SOLDERED. THE SOLDER JOINT SHALL BE SEALED WITH SCOTCHCAST A31 OR OTHER METHOD ACCEPTABLE TO THE ENGINEER.
15.) PRIOR APPROVAL MUST BE ATTAINED FROM HARRIS COUNTY BEFORE LOOP WIRES CAN CROSS AN EXPANSION JOINT.
16.) INSTALLATION OF THE LOOPS ARE TO BE MADE IN THE SHORTEST TIME PRACTICAL, NOT TO EXCEED FOUR HOURS AND SHALL BE SCHEDULED DURING THE OFF-PEAK HOURS TO MINIMIZE DELAY SCHEDULED DURING THE OFF-PEAK HOURS TO MINIMIZE DELAY IN VEHICULAR TRAFFIC.

NO.	REVISIONS	DATE	NAME
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TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS ANTHONY P. VOIGT 84845 LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD LDI
SHEET DESCRIPTION: LOOP DETECTOR INSTALLATION DETAILS		
DRAWN BY: BSH		DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 30 / 38

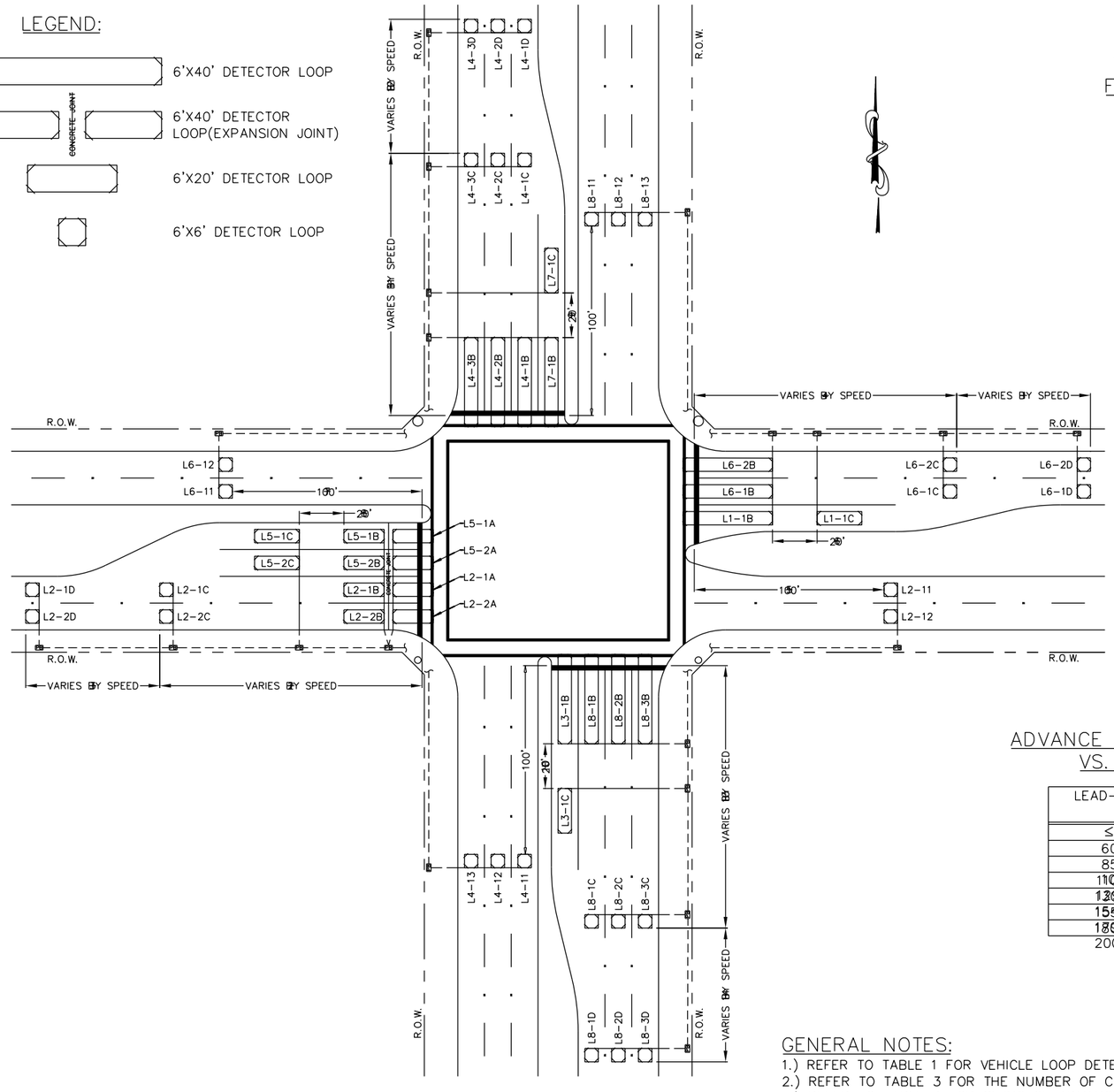
LEGEND:

6'X40' DETECTOR LOOP

6'X40' DETECTOR LOOP(EXPANSION JOINT)

6'X20' DETECTOR LOOP

6'X6' DETECTOR LOOP



VEHICLE LOOP DETECTOR SPACING FOR TRAFFIC SIGNAL INSTALLATIONS

DESIGN SPEED (MPH)	DISTANCE TO 1ST LOOP SET	DISTANCE TO 2ND LOOP SET
30	110'	220'
35	130'	260'
40	150'	300'
45	170'	340'
50	195'	390'
55	230'	460'
60	275'	550'
65	315'	630'
70	370'	740'
75	425'	850'

TABLE 1

RECOMMENDED NO. OF COILS (TURNS) FOR RECTANGULAR TYPE LOOPS

75 \ 6	8	10	12	14	16	18	20
100	1	1	1	1	1	1	1
75	1	1	1	1	1	1	1
50	2	2	2	2	2	2	2
45	2	2	2	2	2	2	2
40	2	2	2	2	2	2	2
35	2	2	2	2	2	2	2
30	2	2	2	2	2	2	2
25	2	2	2	2	2	2	2
20	2	2	2	2	2	2	2
15	2	2	2	2	2	2	2
10	2	2	2	2	2	2	2
8	2	2	2	2	2	2	2
6	3	3	3	3	2	2	2
4	4	3	3	3	3	3	2

75

6 8 10 12 14 16 18 20

6

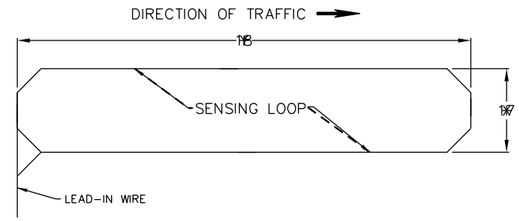
* RECOMMENDED NUMBER OF COILS (TURNS) FOR DIAMOND TYPE LOOPS = 4

TABLE 3

ADVANCE VEHICLE LOOP DETECTOR SIZE VS. LOOP LEAD-IN LENGTH

LEAD-IN LENGTH (FT)	LOOP SIZE (FT X FT)
≤ 550	6 x 6
600-849	6 x 10
850-1099	6 x 15
1100-1399	6 x 20
1400-1549	6 x 25
1550-1799	6 x 30
1800-2000	6 x 35

TABLE 4



TYPICAL DIPOLE LOOP LAYOUT DETAIL

GENERAL NOTES:

1.) REFER TO TABLE 1 FOR VEHICLE LOOP DETECTOR SPACING BASE ON THE POSTED SPEED LIMIT AND/OR 85th PERCENTILE SPEED.
2.) REFER TO TABLE 3 FOR THE NUMBER OF COILS (TURNS) BASED ON THE WIDTH AND LENGTH OF LOOP DETECTOR.
3.) REFER TO TABLE 4 FOR SIZING OF ADVANCE VEHICLE DETECTOR BASE ON LEAD-IN LENGTH FROM STOP BAR.
4.) FOR VEHICLE LOOP DETECTOR INSTALLATION REFER TO HARRIS COUNTY STANDARD DETAIL FOR "LOOP DETECTOR INSTALLATION DETAILS".

NO.	REVISIONS	DATE	NAME
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HARRIS COUNTY ENGINEERING DEPARTMENT

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS			
STANDARD DETAILS			TRAFFIC STANDARD
SHEET DESCRIPTION: STANDARD INTERSECTION LOOP DETECTOR			SILD
DRAWN BY: BSH	DETAILS		DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE		SHEET NO: 31 / 38

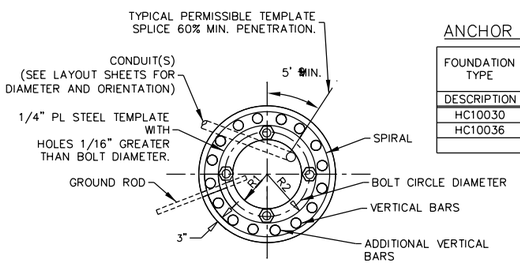
STRAIN POLE FOUNDATION DESIGN TABLE

FOUNDATION TYPE	DRILLED SHAFT DIAMETER	REINFORCING STEEL			DRILLED SHAFT DEPTH	ANCHOR BOLT DESIGN			FOUNDATION DESIGN LOAD			TYPICAL APPLICATION
		VERTICAL BARS	ADDITIONAL VERTICAL BARS	SPIRAL & PITCH		ANCHOR BOLT DIAMETER	Fy	BOLT CIRCLE DIAMETER	MOMENT	SHEAR	TORQUE	
DESCRIPTION	IN.				FT.	IN.	KSI	IN.	K-FT.	KIPS	K-FT.	
10030	30"	8-#9	8-#9x7'-6"	#3@9"	16'-0"	2 1/4"	55	19"	184	7	0	CLAMP-ON MAST ARM ASSEMBLY, 30' STRAIN POLE WITH OR WITHOUT LUMINAIRE
									103	5	93	
10036	36"	8-#10	8-#10x8'-0"	#3@9"	14'-0"	2 1/4"	55	21"	236	8	0	CLAMP-ON MAST ARM ASSEMBLY, 34' STRAIN POLE WITH OR WITHOUT LUMINAIRE
									133	5	104	

FOUNDATION SELECTION FOR STANDARD CLAMP-ON MAST ARM ASSEMBLIES

	FOUNDATION TYPE	HC10030	HC10036
100 MPH DESIGN WIND SPEED	MAXIMUM SINGLE CLAMP-ON MAST ARM LENGTH	44'	44'
	MAXIMUM DUAL CLAMP-ON MAST ARM LENGTH	35' x 35'	44' x 44'
		40' x 35'	
		42' x 30'	
		44' x 20'	

ANCHOR BOLT ASSEMBLY



TOP VIEW

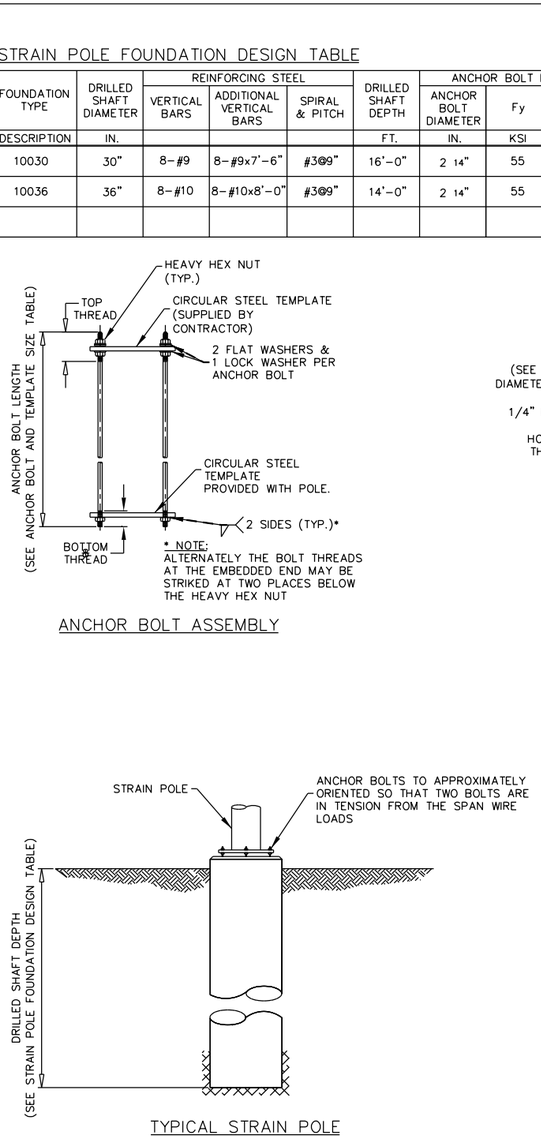
ANCHOR BOLT AND TEMPLATE SIZE TABLE

FOUNDATION TYPE	ANCHOR BOLT DIAMETER	*ANCHOR BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE DIAMETER	R1	R2
DESCRIPTION	IN.	FT.	IN.	IN.	IN.	IN.	IN.
HC10030	2 1/4"	6'-3 1/2"	9"	4"	19"	7 7/8"	11 1/8"
HC10036	2 1/4"	6'-3 1/2"	9"	4"	21"	8 7/8"	12 1/8"

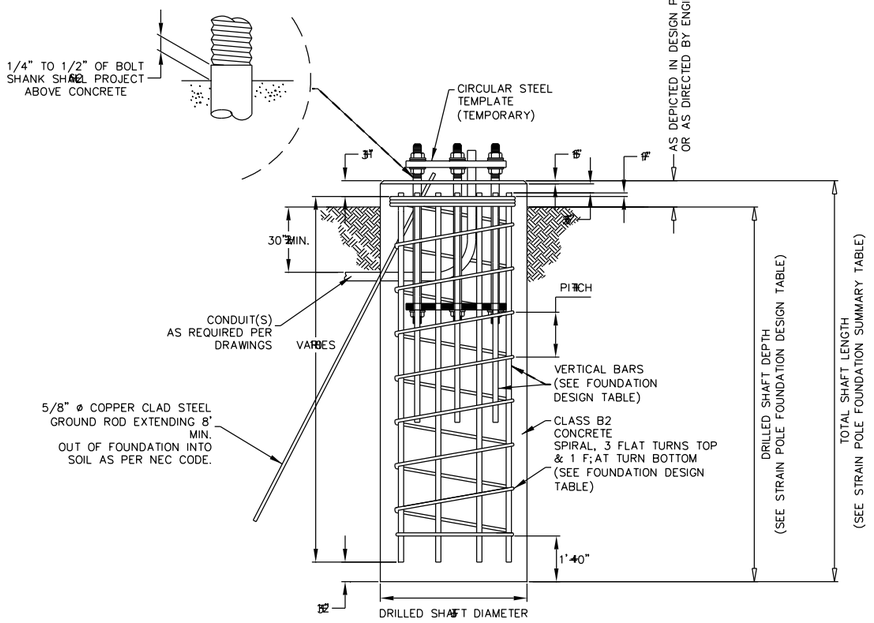
STRAIN POLE FOUNDATION SUMMARY TABLE

LOCATION IDENTIFICATION	FOUNDATION TYPE	NUMBER (EA)	DRILLED SHAFT LENGTH (FEET)		EXPOSED FOUNDATION (FEET)	TOTAL SHAFT LENGTH (FEET)
			HC10030	HC10036		
POLE 1 - MUESCHKE AT DESTINATION	10036	1		14.0	1.0	15.0
POLE 2 - MUESCHKE AT DESTINATION	10036	1		14.0	1.0	15.0
POLE 3 - MUESCHKE AT DESTINATION	10036	1		14.0	1.0	15.0
POLE 4 - MUESCHKE AT DESTINATION	10036	1		14.0	1.0	15.0
TOTAL DRILLED SHAFT LENGTHS						60.0

NOTE: ENGINEER SHALL COMPLETE STRAIN POLE FOUNDATION TABLE



TYPICAL STRAIN POLE FOUNDATION ASSEMBLY



STRAIN POLE FOUNDATION ELEVATION DETAILS

GENERAL NOTES:

1.) DESIGN SHALL CONFORM TO 2001 OR LATEST ADDITION TO AASHTO STANDARD SPECIFICATIONS FOR THE STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS AND INTERIM SPECIFICATIONS DESIGN WIND SPEED EQUALS 100 MPH PLUS A 1.3 GUST FACTOR.

2.) REINFORCING STEEL SHALL CONFORM TO THE PERTINENT HARRIS COUNTY STANDARD SPECIFICATION ITEM NUMBER 440 - REINFORCING STEEL.

3.) STRAIN POLE FOUNDATION SHALL BE INSTALLED WITH CLASS B2 CONCRETE.

4.) THREADS FOR ANCHOR BOLTS AND NUTS SHALL BE ROLLED OR CUT THREADS OF UNIFIED NATIONAL COARSE THREAD SERIES EXCEPT FOR A193B7 BOLTS WHICH SHALL HAVE 8 PITCH THREAD SERIES. BOLTS AND NUTS SHALL HAVE CLASS 2A AND 2B FIT TOLERANCES. GALVANIZED NUTS SHALL BE TAPPED AFTER GALVANIZING.

5.) THREADS FOR ANCHOR BOLTS SHALL BE COATED WITH PIPE JOINT COMPOUND PRIOR TO INSTALLATION OF UPPER NUTS WHEN ERECTING STRAIN POLE. AFTER STRAIN POLE IS PLUMBED AND IN PERMANENT ALIGNMENT, THE REMAINING EXPOSED THREADS OF PAINTED BOLTS SHALL BE CLEANED AND AN ADDITIONAL COATING OF ZINC-RICH PAINT SHALL BE APPLIED TO SEAL THE BOLT THREAD-NUT JOINT.

6.) ALL ANCHOR BOLTS SHALL CONFORM TO ASTM A193B7, A687 OR A36M55. ANCHOR BOLTS SHALL BE GALVANIZED THE ENTIRE LENGTH OF THE BOLT. NUTS FOR ANCHOR BOLTS SHALL CONFORM TO ASTM A563 GR A OR BETTER HEAVY HEX. EXPOSED NUTS AND WASHERS SHALL ALSO BE GALVANIZED. TEMPLATES AND EMBEDDED NUTS SHALL ALSO BE GALVANIZED.

7.) TOP OF STRAIN POLE FOUNDATION SHALL BE NO LOWER THAN THE PAVEMENT SURFACE ELEVATION. TYPICAL STRAIN POLE FOUNDATION SHOULD BE 6" ABOVE CROSS-SECTION CROWN OF MAJOR ROADWAY.

8.) ALL ANCHOR BOLTS SHALL HAVE A MINIMUM OF TWO FULL DIAMETER THREADS EXTENDED BEYOND THE NUTS.

9.) ANCHOR BOLT DESIGN DEVELOPS THE FOUNDATION CAPACITY GIVEN UNDER FOUNDATION DESIGN LOADS.

10.) STRAIN POLE FOUNDATION DESIGN LOADS ARE THE ALLOWABLE MOMENTS AND SHEARS AT THE BASE OF THE STRUCTURE.

11.) STRAIN POLE FOUNDATIONS MAY BE LISTED SEPARATELY OR GROUPED ACCORDING TO SIMILARITY OF LOCATION AND TYPE. QUANTITIES ARE FOR THE CONTRACTOR'S INFORMATION ONLY.

12.) STRAIN POLE FOUNDATION DESIGN IS BASED UPON UNDRAINED SHEAR STRENGTH OF 1500 PSF.

NO.	REVISIONS	DATE	NAME
1			
2			
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TBPLS Firm Reg. No.: 100252-00

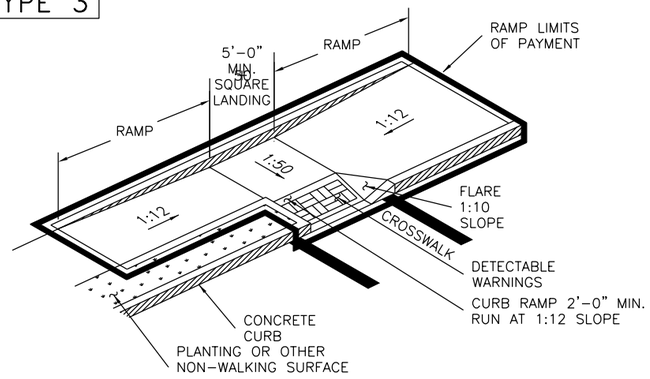
ANTHONY P. VOIGT 84845 LICENSED PROFESSIONAL ENGINEER STATE OF TEXAS

VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

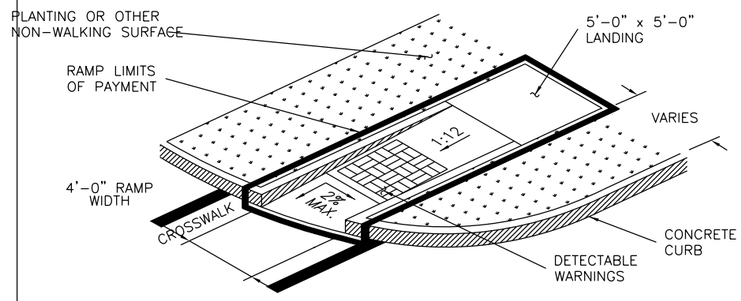
PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	STANDARD DETAILS
SHEET DESCRIPTION:	STRAIN POLE FOUNDATION DETAILS
TRAFFIC STANDARD	SPF
DRAWN BY: BSH	DATE: 7/19/22
CK'D BY: BSH	SCALE: NONE
SHEET NO:	32 / 38

TYPE 3



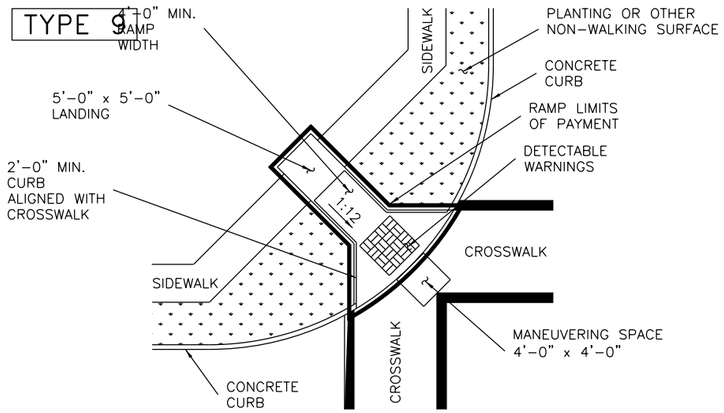
COMBINATION CURB RAMP
N.T.S.

TYPE 7



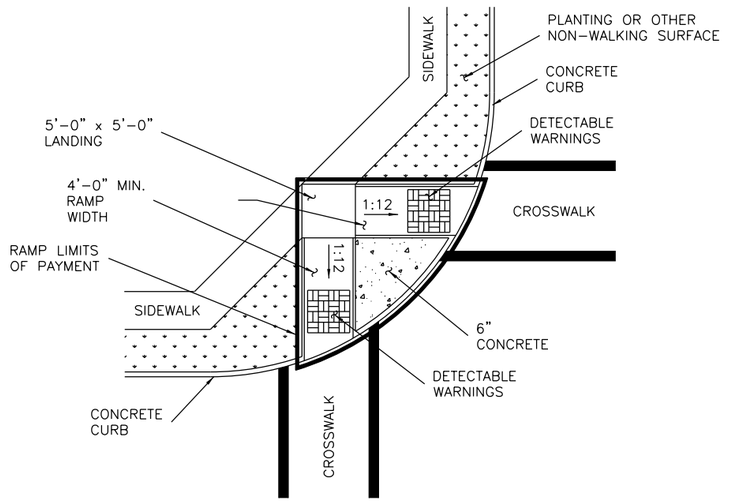
DIRECTIONAL CURB RAMP WITHIN RADIUS
N.T.S.

TYPE 9



DIAGONAL CURB RAMP (RETURNED CURB)
N.T.S.

TYPE 12

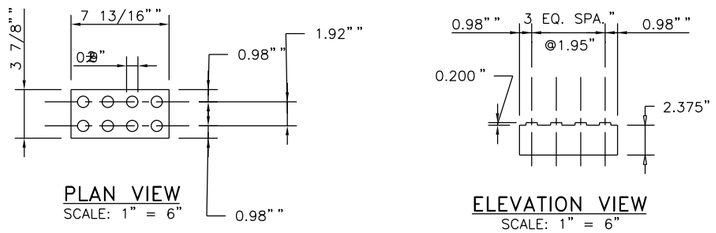


COMBINATION DIRECTIONAL CURB RAMP
N.T.S.

DETECTABLE WARNING GENERAL NOTES:

1. CONCRETE PAVER UNITS ARE REQUIRED FOR USE IN HARRIS COUNTY. ALTERNATIVE DETECTABLE WARNINGS THAT COMPLY WITH TAS AND TDLR GUIDELINES MAY BE SUBMITTED FOR CONSIDERATION TO HARRIS COUNTY PRIOR TO THE FINAL APPROVAL OF DESIGN DRAWINGS.
2. CONCRETE PAVER UNITS SHALL MEET ALL REQUIREMENTS OF ASTM C936, C33, AND SHALL BE LAID IN A TWO BY TWO UNIT BASKET WEAVE PATTERN, UNLESS OTHERWISE SHOWN IN THE PLANS.
3. CONCRETE PAVER UNITS SHALL BE BRICK RED AND HAVE A TRUNCATED DOME TOP SURFACE FOR DETECTABLE WARNING TO PEDESTRIANS.
4. CONCRETE PAVER UNITS SHALL BE SAW CUT ONLY AND ANY CUT UNIT SHALL BE NOT LESS THAN 25 PERCENT OF A FULL UNIT.
5. DETECTABLE WARNING SHALL BE A MINIMUM OF 24" IN DEPTH (IN THE DIRECTION OF PEDESTRIAN TRAVEL), AND EXTEND THE FULL WIDTH OF THE RAMP. (REFER TO TAS AND TDLR GUIDELINES)

TRUNCATED DOME PATTERN



PLAN VIEW
SCALE: 1" = 6"

ELEVATION VIEW
SCALE: 1" = 6"

CONCRETE PAVER WITH TRUNCATED DOME SURFACE

ACCESSIBLE CURB RAMPS AND LANDINGS GENERAL NOTES:

1. THE DESIGN AND CONSTRUCTION OF ALL ELEMENTS OF PEDESTRIAN FACILITIES SHALL MEET THE CRITERIA ESTABLISHED IN THE CURRENT EDITION OF THE TEXAS ACCESSIBILITY STANDARDS (TAS), AS PREPARED AND ADMINISTERED BY THE TEXAS DEPARTMENT OF LICENSING AND REGULATION (TDLR), UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
2. PEDESTRIAN FACILITIES AT SIGNALIZED INTERSECTION SHALL BE IN ACCORDANCE WITH APPLICABLE TRAFFIC SIGNAL DESIGN DRAWINGS.
3. ADJUSTMENT TO SIDEWALKS THAT CONNECT TO WHEELCHAIR RAMPS AND LANDINGS MAY BE NECESSARY TO MATCH BOTH THE GRADE AND THE WIDTH OF THE LANDING. THESE ADJUSTMENTS MAY NOT BE SHOWN ON THE DRAWINGS. WHEN DEEMED NECESSARY BY THE ENGINEER, FIELD ADJUSTMENT TO THE SIDEWALK SHALL BE MADE AS DIRECTED BY THE ENGINEER AND PAID FOR SEPARATELY, AS DIRECTED BY THE ENGINEER.
4. ALL ITEMS NECESSARY FOR THE CONSTRUCTION OF THE WHEELCHAIR RAMPS AND LANDINGS WITHIN THE "LIMITS OF PAYMENT" INDICATED ON APPROPRIATE WHEELCHAIR RAMP DETAILS AND DESIGN DRAWINGS (I.E., SAW CUT OF PAVEMENT. REMOVAL OF MATERIAL, EXCAVATION, DISPOSAL OF MATERIALS, ETC.) SHALL BE CONSIDERED INCIDENTAL TO THE COST OF THE WHEELCHAIR RAMP FOR PROJECTS THAT ARE DESIGNED AND/OR CONSTRUCTED USING HARRIS COUNTY RESOURCES.
5. FLATTER SLOPES THAT WILL STILL DRAIN PROPERLY MAY BE USED WHERE APPROPRIATE, SUBJECT TO THE REQUIREMENT OF NOTES 7, 8, AND 9.
6. RAMPS AND LANDINGS WITH DROP-OFFS GREATER THAT 6 INCHES IN HEIGHT SHALL HAVE CURB, RAILINGS, OR PROJECTING SURFACES. REFER TO TEXAS ACCESSIBILITY STANDARDS (TAS) AND THE ENGINEER.
7. ALL SLOPES SHOWN ARE MAXIMUM ALLOWABLE. THE CROSS SLOPE OF AN ACCESSIBLE ROUTE AND/OR LANDING MUST NOT EXCEED 1:50 (2%). ANY PART OF THE ACCESSIBLE ROUTE WITH A SLOPE GREATER THAN 1:20 (5%) SHALL BE CONSIDERED A RAMP.
8. IF A RAMP HAS A RISE GREATER THAT 6 INCHES, OR A HORIZONTAL PROJECTION GREATER THAT 72 INCHES, THEN IT SHALL HAVE HANDRAILS ON BOTH SIDES. THE ONLY EXCEPTIONS SHALL BE AT CURB RAMPS. HANDRAILS ARE NOT REQUIRED ON CURB RAMPS.
9. RAMP LENGTH OF GRADE OF APPROACH SIDEWALK SHALL BE SUBJECT TO ADJUSTMENT IN THE FIELD BY THE ENGINEER.
10. THE MAXIMUM ALLOWABLE CROSS SLOPE ON A SIDEWALK SHALL BE 2%.
11. THE MINIMUM THICKNESS FOR CURB RAMPS SHALL BE 4-1/2 INCHES.
12. CURB RAMPS WITH RETURN CURB MAY BE USED ONLY WHERE PEDESTRIANS WOULD NOT NORMALLY WALK ACROSS THE RAMP. OTHERWISE, FLARED SIDES SHALL BE PROVIDED.
13. CURB RAMPS AT MARKED CROSSINGS SHALL BE WHOLLY CONTAINED WITHIN THE MARKINGS. FLARED SIDES ASSOCIATED WITH CURB RAMPS ARE EXCLUDED FROM THIS REQUIREMENT.
14. A SMOOTH TRANSITION, IN ACCORDANCE WITH APPROPRIATE CONSTRUCTION DETAILS OR AS DIRECTED BY THE ENGINEER, AND SHALL BE PROVIDED WHERE CURB RAMPS CONNECT TO ADJACENT ROADWAY.
15. MANEUVERING SPACES AT THE BOTTOM OF THE CURB RAMPS SHALL BE A MINIMUM 4 FOOT X 4 FOOT CLEAR AREA, SHALL BE WHOLLY CONTAINED WITHIN THE CROSSWALK OUTSIDE OF THE PARALLEL VEHICULAR TRAVEL PATH.
16. A MINIMUM WIDTH OF 36 INCHES SHALL BE PROVIDED LANDINGS AROUND OBSTRUCTIONS (I.E., SIGN SUPPORTS, SIGNAL SUPPORTS, POLES, ETC.) LOCATED TO ADJACENT TO THE PEDESTRIAN ROUTE.
17. MINIMUM SIDEWALK WIDTH OF 4 FEET UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
18. CROSSWALKS WILL NOT BE REQUIRED AT UNSIGNALIZED INTERSECTIONS, UNLESS DIRECTED BY THE ENGINEER.
19. DETECTABLE WARNINGS ARE PLACED WHERE A PEDESTRIAN ACCESS ROUTE ENTERS THE ROADWAY, CROSSWALK, OR OTHER VEHICULAR AREA.
20. A MINIMUM OF 32 INCHES OF CLEARANCE IS REQUIRED FOR OBSTRUCTIONS LESS THAN 24 INCHES IN LENGTH, AND A MINIMUM OF 36 INCHES OF CLEARANCE IS REQUIRED FOR OBSTRUCTIONS GREATER THAN OR EQUAL TO 24 INCHES IN LENGTH.

NO.	REVISIONS	DATE	NAME
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HARRIS COUNTY
ENGINEERING DEPARTMENT

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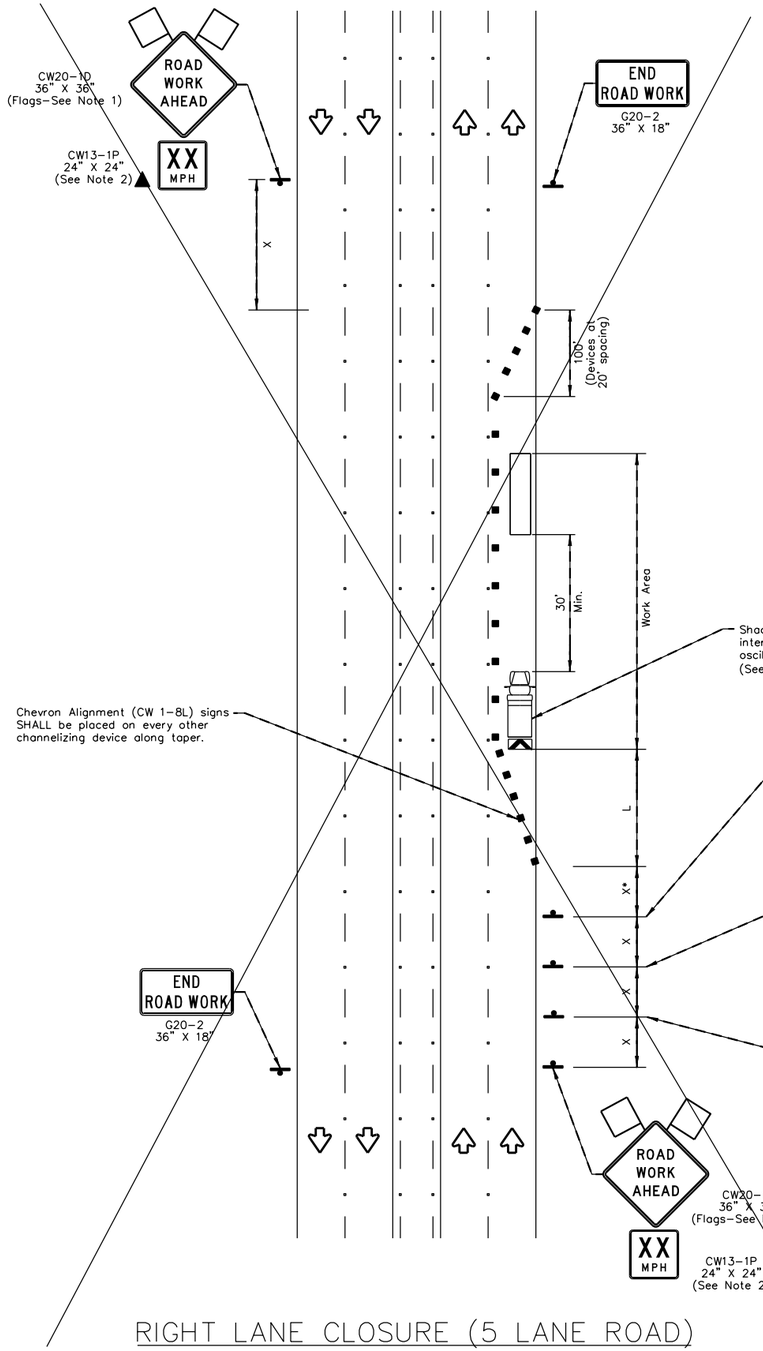
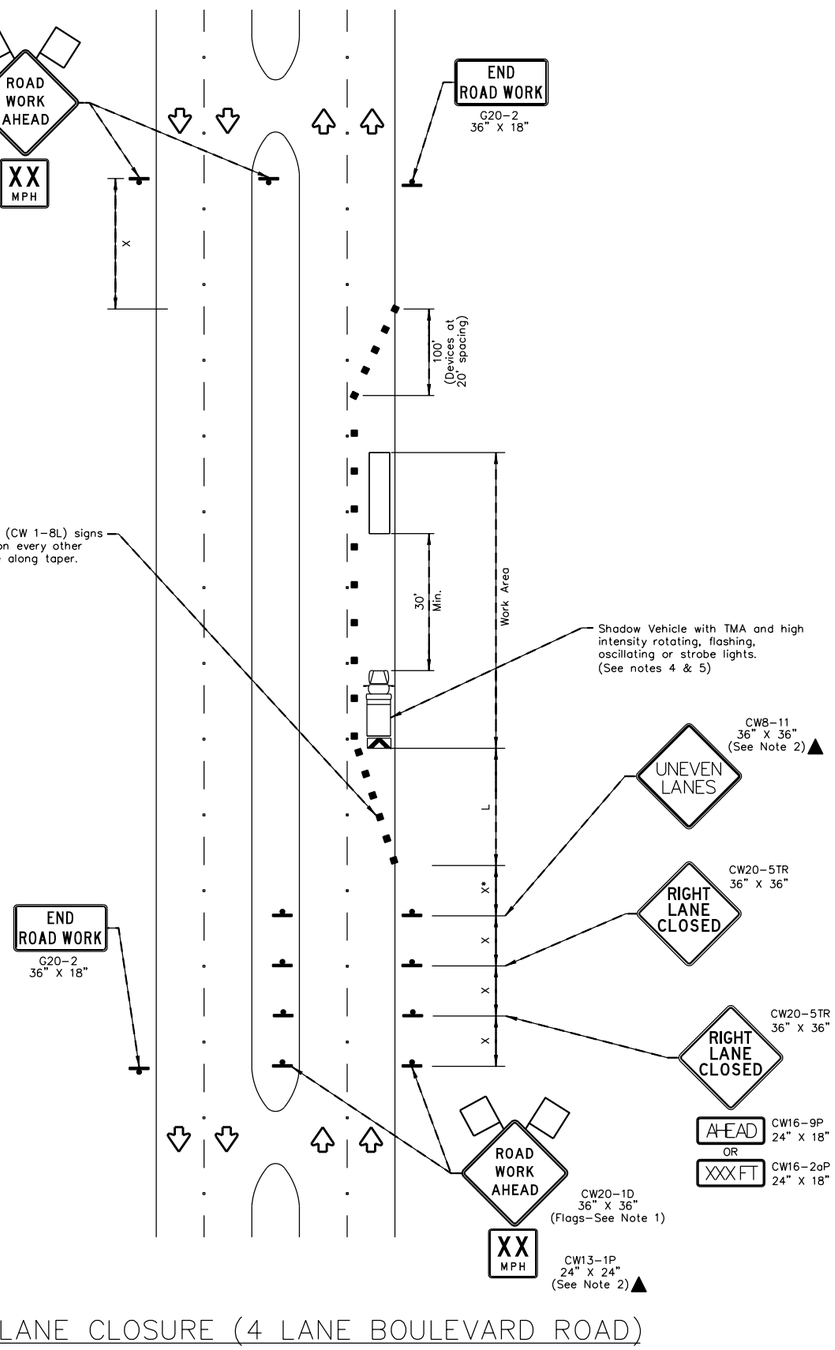
STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
NOVEMBER 20, 2023
VOIGT ASSOCIATES, INC. F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	STANDARD DETAILS
SHEET DESCRIPTION:	ADA RAMP DETAILS
CIVIL STANDARD	ADAR
DRAWN BY:	JDZ
DATE:	8/15/17
CK'D BY:	PDG
SCALE:	AS NOTED
SHEET NO:	33 / 38



RIGHT LANE CLOSURE (5 LANE ROAD)



RIGHT LANE CLOSURE (4 LANE BOULEVARD ROAD)

TRAFFIC CONTROL PLAN SECTION SHALL BE COMPLETED BY ENGINEER

ROADWAY	POSTED SPEED	TAPER LENGTH	SPACING CHANNELIZING DEVICES		SIGN SPACING	BUFFER SPACE
			TAPER	TANGENT		
MUESCHKE ROAD	45 MPH	540'	45'	90'	320'	195'
JUERGEN ROAD	45 MPH	540'	45'	90'	320'	195'

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

GENERAL NOTES

1. Flags attached to signs where shown are OPTIONAL.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol are OPTIONAL.
3. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
6. Contractor shall provide and install traffic control devices in conformance with part VI of Texas Manual on Uniform Traffic Control Devices (TMUTCD – Latest edition with revisions) during construction.
7. No lanes shall be blocked from 7am to 9am and 4pm to 6:30pm Monday thru Friday.
8. Off duty police officers/flaggers are required to direct traffic when applicable.
9. If project is within 400 feet from a signalized intersection, the Contractor shall contact Harris County Engineering Department, Traffic Signal Maintenance at (713) 881-3210 five (5) days prior to the start of construction.

NO.	REVISIONS	DATE	NAME
1			
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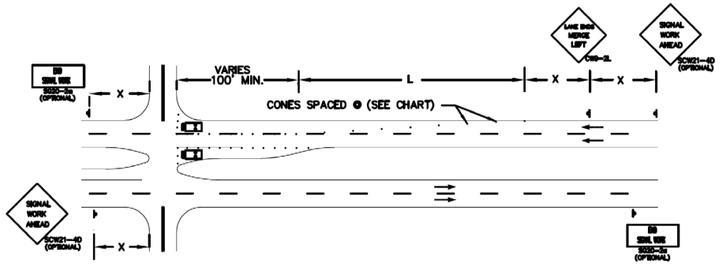
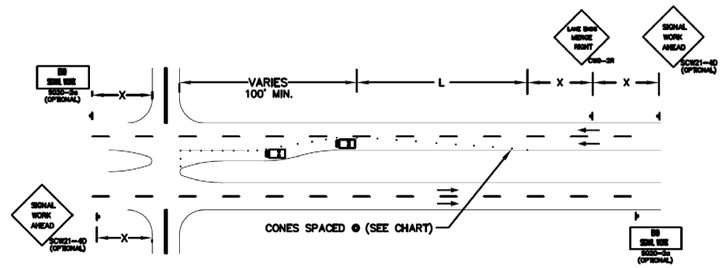
STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	STANDARD DETAILS
SHEET DESCRIPTION:	TRAFFIC CONTROL PLAN (RIGHT LANE CLOSURE)
TRAFFIC STANDARD	TCP-RL
DRAWN BY: BSH	DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE
SHEET NO:	34 / 38

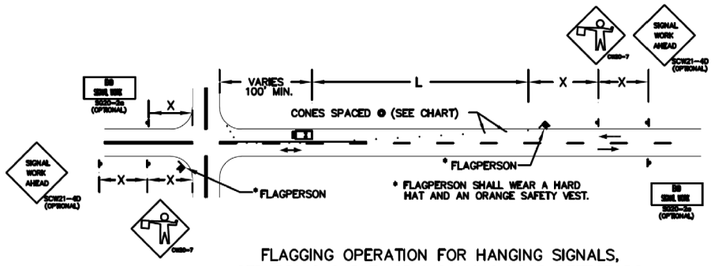


ONE LANE CLOSURE W/ LEFT TURN LANE CLOSED
FOR HANGING SIGNALS OR STRAPPING CABLE

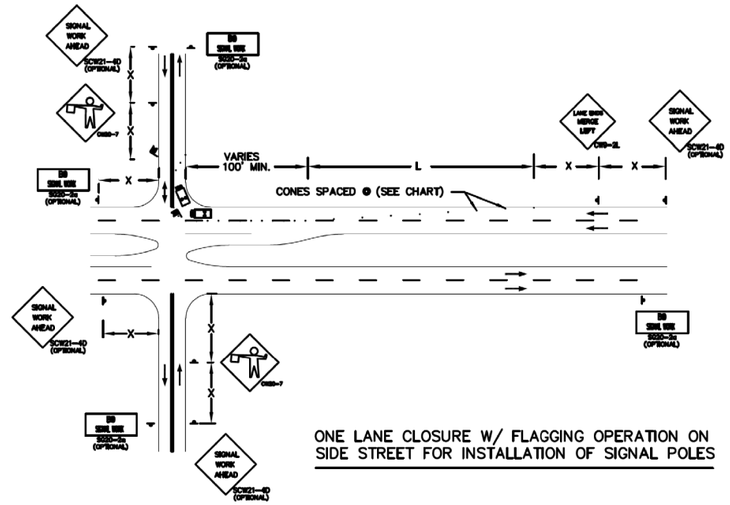


ONE LANE CLOSURE W/ LEFT TURN LANE CLOSED
FOR INSTALLATION OF LOOP DETECTORS

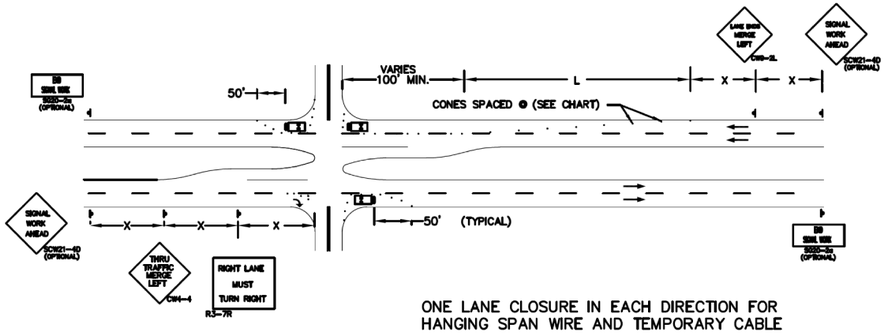
ONE LANE CLOSURE FOR INSTALLATION
OF CONDUIT OR LOOP DETECTORS



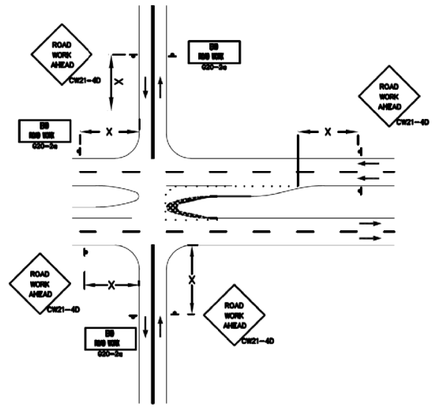
FLAGGING OPERATION FOR HANGING SIGNALS,
STRAPPING CABLE, OR INSALLING LOOP DETECTORS



ONE LANE CLOSURE W/ FLAGGING OPERATION ON
SIDE STREET FOR INSTALLATION OF SIGNAL POLES



ONE LANE CLOSURE IN EACH DIRECTION FOR
HANGING SPAN WIRE AND TEMPORARY CABLE



MEDIAN NOSE MODIFICATION

TYPICAL TRANSITION LENGTHS
AND
SUGGESTED MAXIMUM SPACING OF DEVICES

Posted * Speed	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Device On a Taper	On a Tangent
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'–75'
35		205'	225'	245'	35'	70'–90'
40		265'	295'	320'	40'	80'–100'
45	L=WS	450'	495'	540'	45'	90'–110'
50		500'	550'	600'	50'	100'–125'
55		550'	605'	660'	55'	110'–140'
60		600'	660'	720'	60'	120'–150'
65		650'	715'	780'	65'	130'–175'

* 85th Percentile Speed may be used on roads where traffic speeds normally exceed the posted speed limit.
** Taper lengths have been rounded off.

CONSTRUCTION WARNING
SIGN SPACING

Posted Speed or 85% Speed (MPH)	X Min. Distance (feet)
30 or less	120
35	160
40	240
45	320
50	400
55	500
65	750

X=SIGN SPACING
L=TAPER
HEAVY WORK VEHICLE

NOTES:

1. ALL TRAFFIC CONTROL DEVICES SHALL BE INSTALLED IN ACCORDANCE WITH THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST REVISION.
2. THE MINIMUM LANE WIDTH ALLOWED IS 10 FEET. THE MINIMUM BUFFER ZONE BETWEEN THE WORK ZONE AN ADJACENT TRAFFIC IS 2 FEET.
3. FLORESCENT ORANGE SHALL BE THE BACK GROUND COLOR ON ALL WORK ZONE SINGS.

NO.	REVISIONS	DATE	NAME
1			
2			
3			
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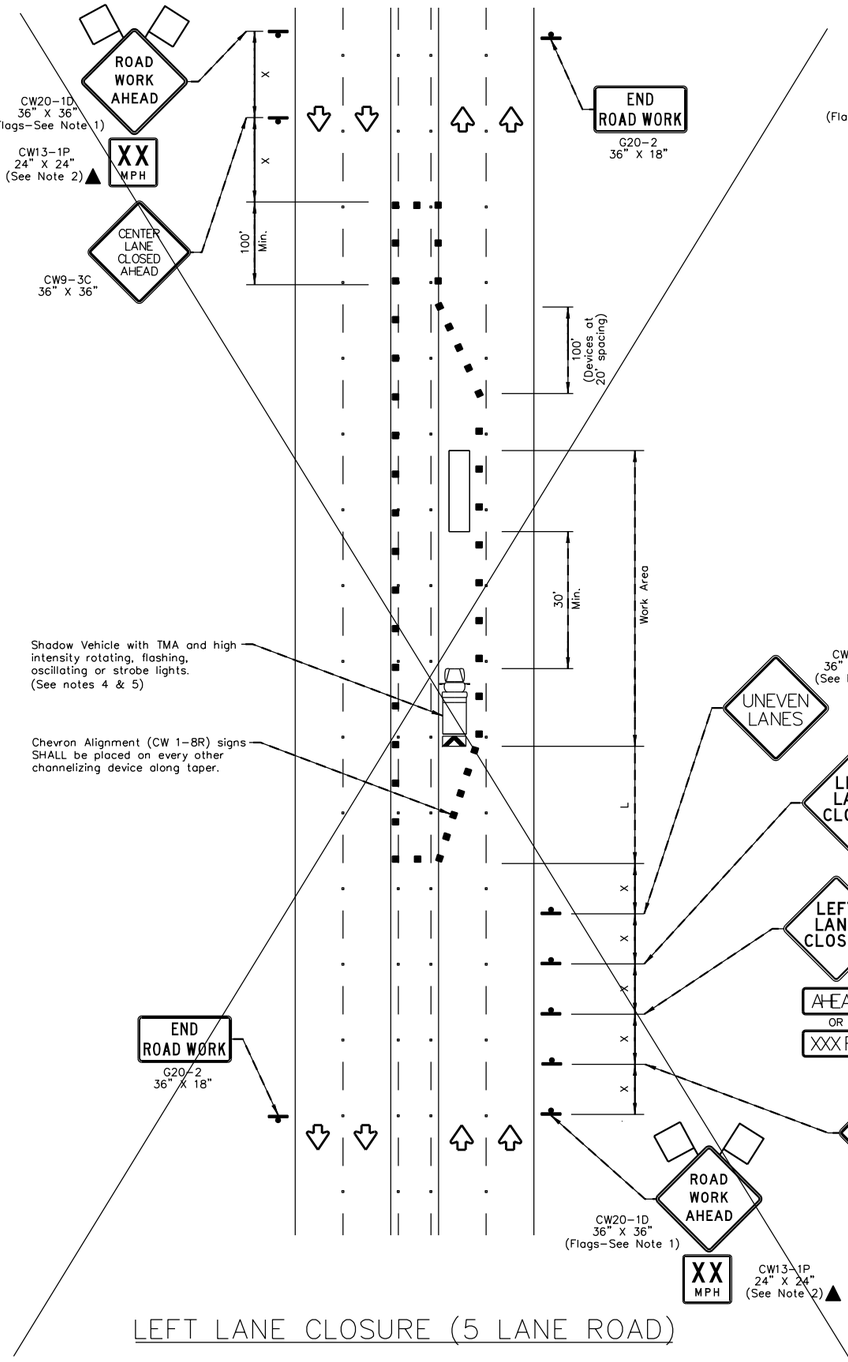
HARRIS COUNTY
ENGINEERING DEPARTMENT

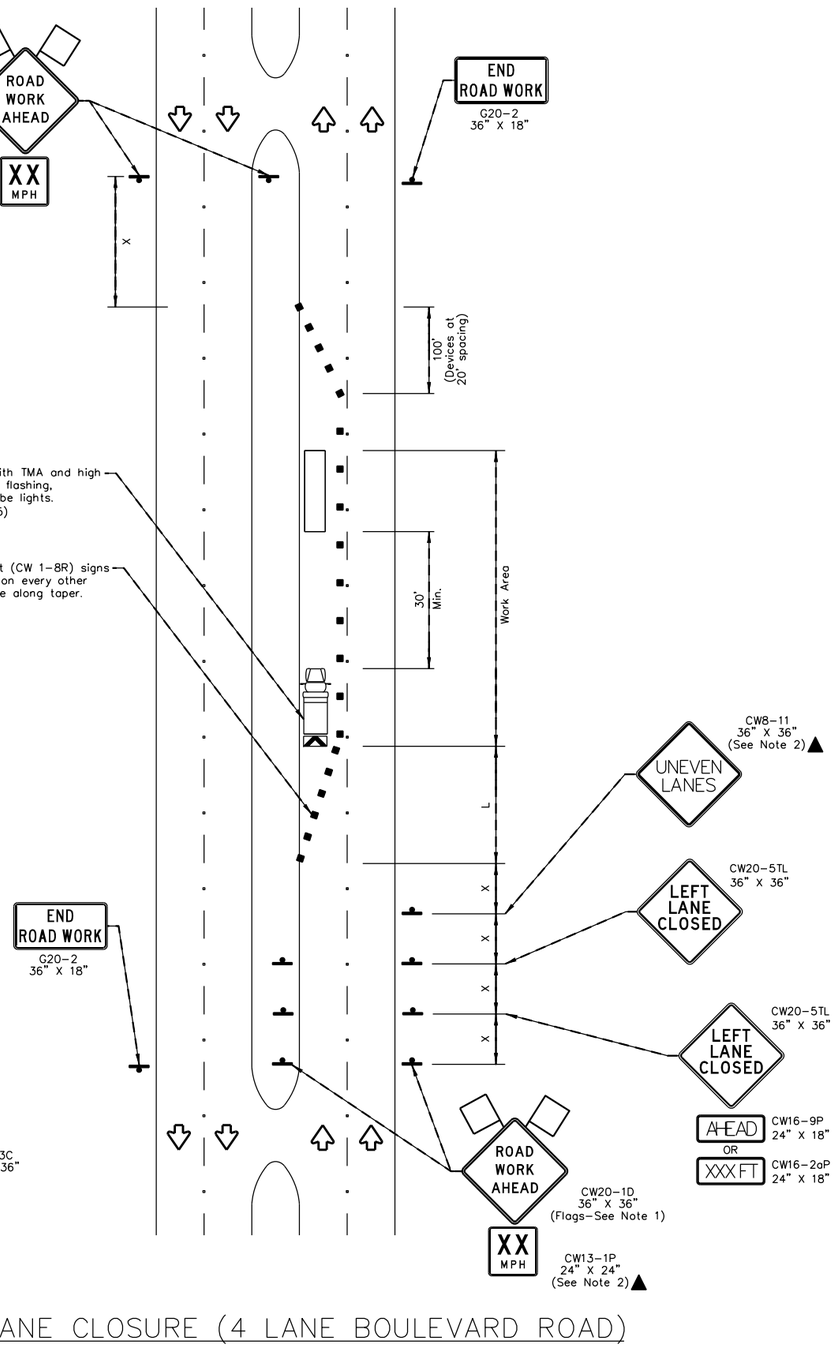
Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100252-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
NOVEMBER 20, 2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS
STANDARD DETAILS
TRAFFIC STANDARD
SHEET DESCRIPTION: TRAFFIC CONTROL PLAN
DRAWN BY: BSH
TRAFFIC SIGNAL INSTALLATION DETAILS
DATE: 8/18/17
CK'D BY: BSH
SCALE: NONE
SHEET NO: 35 / 38



LEFT LANE CLOSURE (5 LANE ROAD)



LEFT LANE CLOSURE (4 LANE BOULEVARD ROAD)

TRAFFIC CONTROL PLAN SECTION SHALL BE COMPLETED BY ENGINEER

ROADWAY	POSTED SPEED	TAPER LENGTH	SPACING CHANNELIZING DEVICES		SIGN SPACING	BUFFER SPACE
			TAPER	TANGENT		
MUESCHKE ROAD	45 MPH	540'	45'	90'	320'	195'
JUERGEN ROAD	45 MPH	540'	45'	90'	320'	195'

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

GENERAL NOTES

1. Flags attached to signs where shown are OPTIONAL.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol are OPTIONAL.
3. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
6. Contractor shall provide and install traffic control devices in conformance with part VI of Texas Manual on Uniform Traffic Control Devices (TMUTCD – Latest edition with revisions) during construction.
7. No lanes shall be blocked from 7am to 9am and 4pm to 6:30pm Monday thru Friday.
8. Off duty police officers/flaggers are required to direct traffic when applicable.
9. If project is within 400 feet from a signalized intersection, the Contractor shall contact Harris County Engineering Department, Traffic Signal Maintenance at (713) 881-3210 five (5) days prior to the start of construction.

NO.	REVISIONS	DATE	NAME
1			
2			
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HARRIS COUNTY ENGINEERING DEPARTMENT

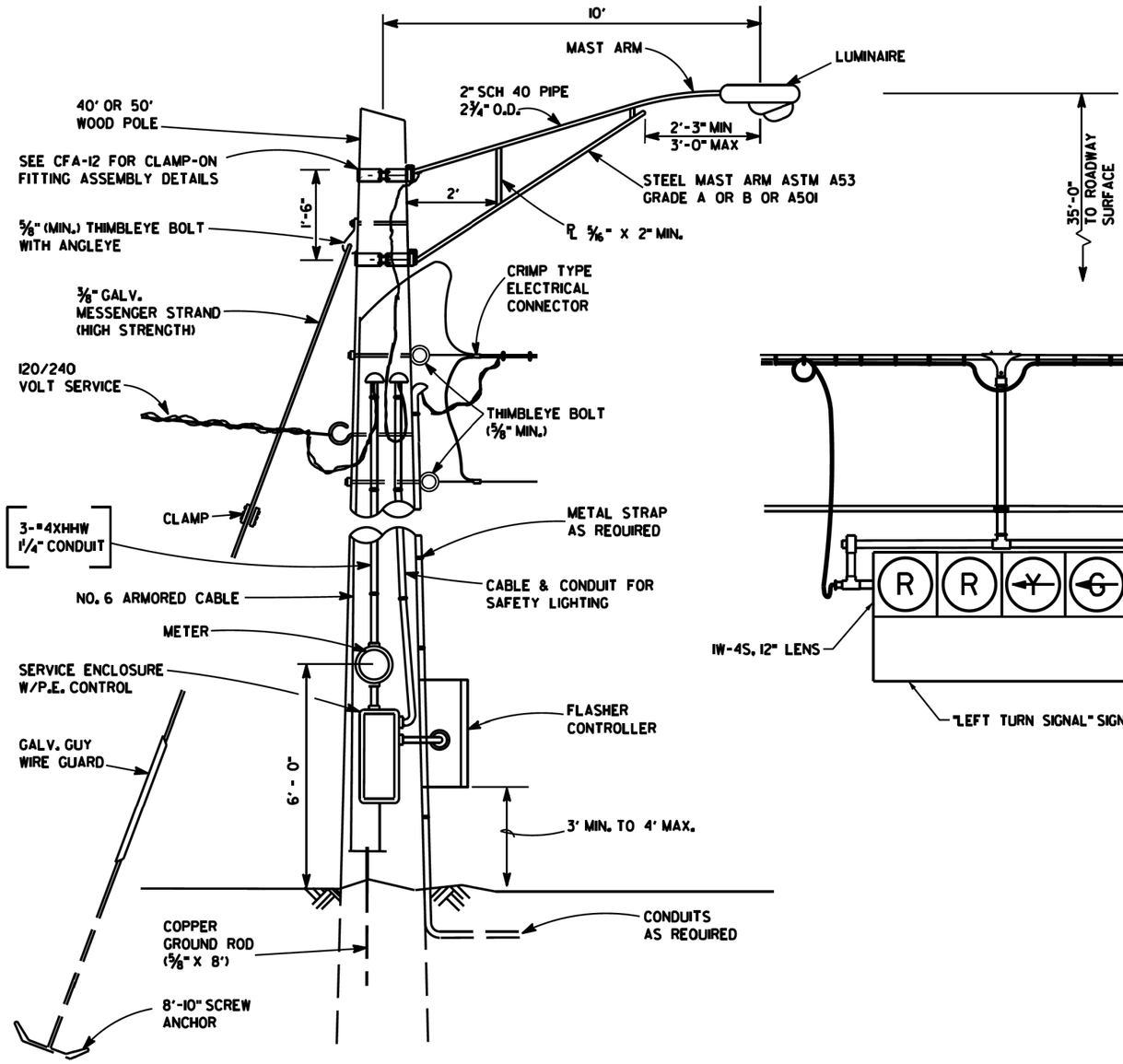
Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4578
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER

VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

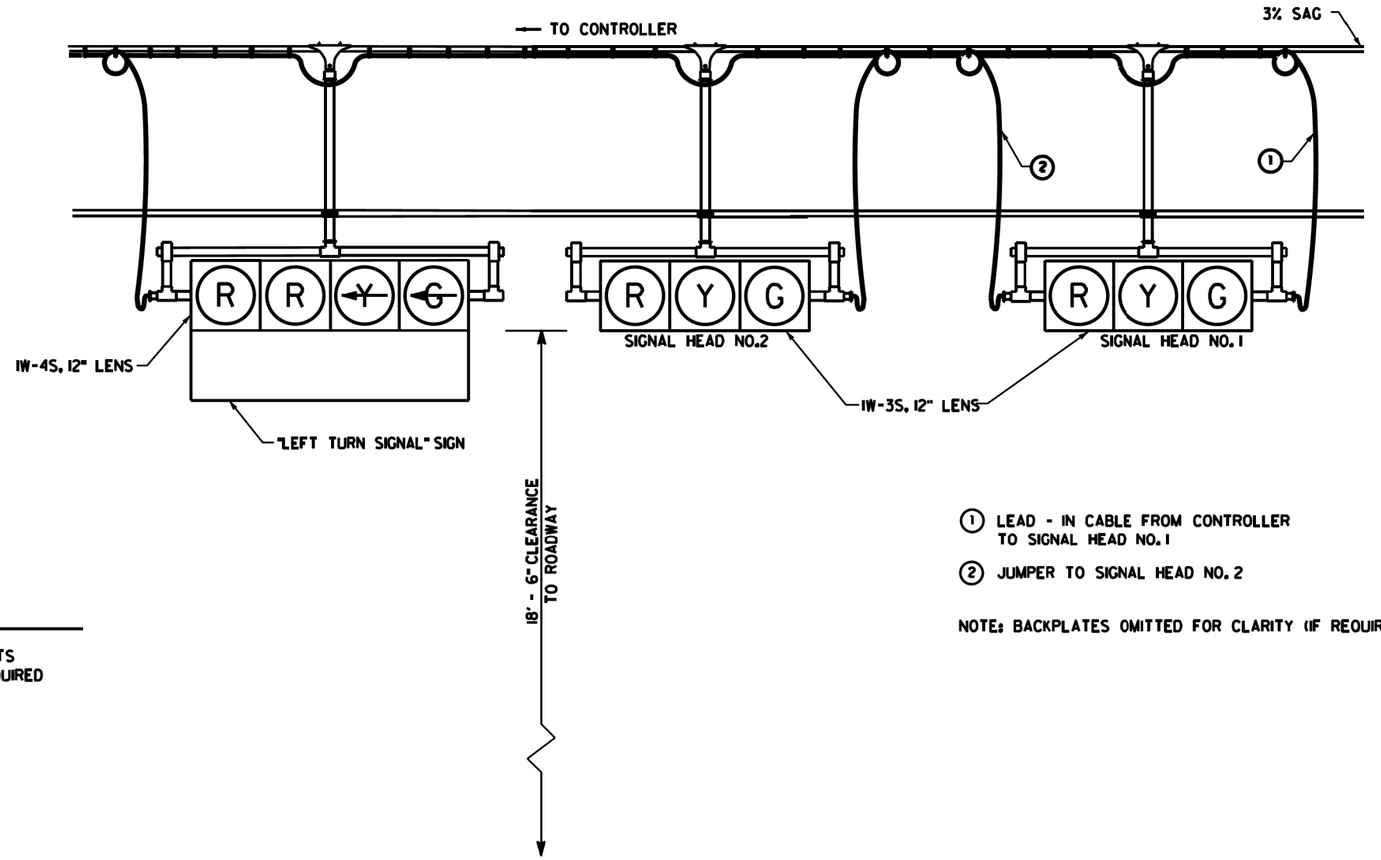
PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS			
STANDARD DETAILS			TRAFFIC STANDARD
SHEET DESCRIPTION: TRAFFIC CONTROL PLAN			TCP-LL
DRAWN BY: BSH	(LEFT LANE CLOSURE)		DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE		SHEET NO: 36 / 38



NOTE: THE CONTRACTOR SHALL COIL ON THE SPAN WIRE A SUFFICIENT LENGTH OF SIGNAL CABLE FOR ADJUSTING SIGNAL HEADS DURING THE VARIOUS PHASES OF CONSTRUCTION.

NOTES:

1. WRAP SIGNAL HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF INSTALLATION UNTIL PLACING INTO OPERATION.
2. INSTALL GROUNDING BUSHINGS ON THE ENDS OF UNDERGROUND RIGID METAL CONDUITS. GROUND AND BOND CONDUITS, POLES, AND CONTROLLERS TO THE NEAREST GROUND ROD USING SOFT BARE NO. 6 COPPER WIRE.
3. FURNISH HIGH STRENGTH GALVANIZED SPAN WIRE.
4. FURNISH MINIMUM 2 SIGNAL HEADS PER APPROACH.
5. FURNISH LEFT TURN SIGNAL HEAD WHEN REQUIRED.
6. FOR TEMPORARY SIGNAL INSTALLATION, INSTALL A SEPARATE POWER SOURCE, IF REQUIRED.
7. FOR TEMPORARY SIGNAL INSTALLATION, INSTALL LUMINAIRES ON WOOD SIGNAL POLES, IF REQUIRED. CONSTRUCT STEEL UPSWEEP MAST ARM FOR WOOD POLE MOUNTING OF 2 IN. PIPE WITH SLIPFITTER MOUNTING OF THE LUMINAIRE.
8. FOR TEMPORARY SIGNAL INSTALLATION, COIL A SUFFICIENT LENGTH OF SIGNAL CABLE ON THE SPAN WIRE FOR ADJUSTING SIGNAL HEADS DURING THE VARIOUS PHASES OF CONSTRUCTION.



1. LEAD - IN CABLE FROM CONTROLLER TO SIGNAL HEAD NO. 1
2. JUMPER TO SIGNAL HEAD NO. 2

NOTE: BACKPLATES OMITTED FOR CLARITY (IF REQUIRED)

NO.	REVISIONS	DATE	NAME
1			
2			
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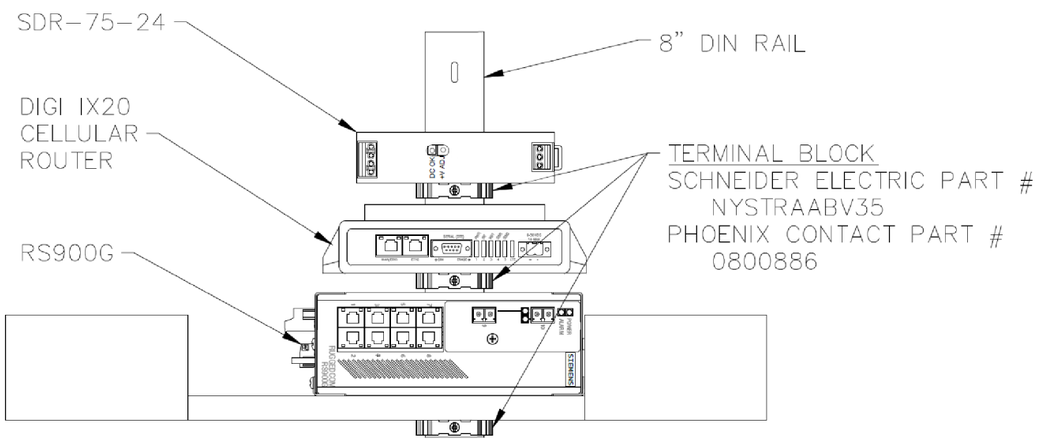
HARRIS COUNTY
ENGINEERING DEPARTMENT

HARRIS COUNTY 1836 TEXAS

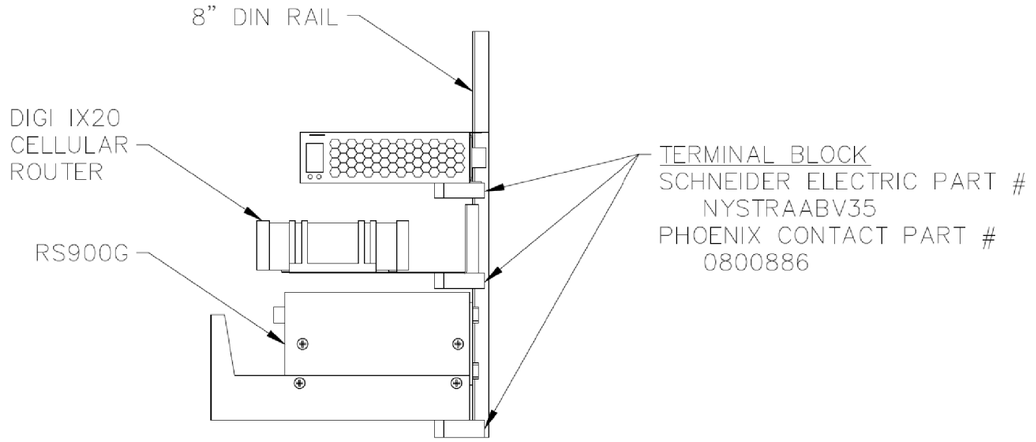
Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
NOVEMBER 20, 2023
VOIGT ASSOCIATES, INC.
F-5333

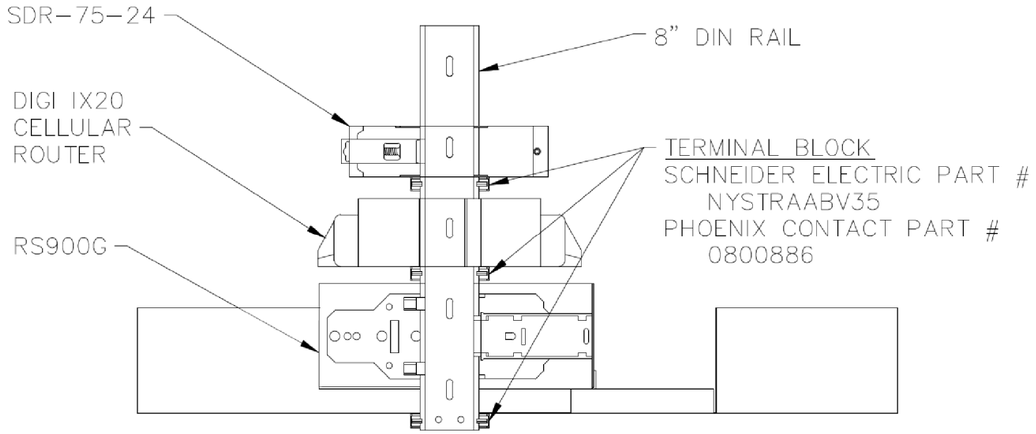
PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD
SHEET DESCRIPTION: CONSTRUCTION DETAILS FOR		CD/TS/WP
DRAWN BY:	TRAFFIC SIGNALS (WOOD POLE)	DATE: 8/18/17
CK'D BY:	SCALE: NONE	SHEET NO: 37 / 38



FRONT VIEW



SIDE VIEW



BACK VIEW

NO.	REVISIONS	DATE	NAME
1			
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HARRIS COUNTY
ENGINEERING DEPARTMENT

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TBPE Firm Reg. No.: F-4728
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC.
F-5333

NOVEMBER 20, 2023

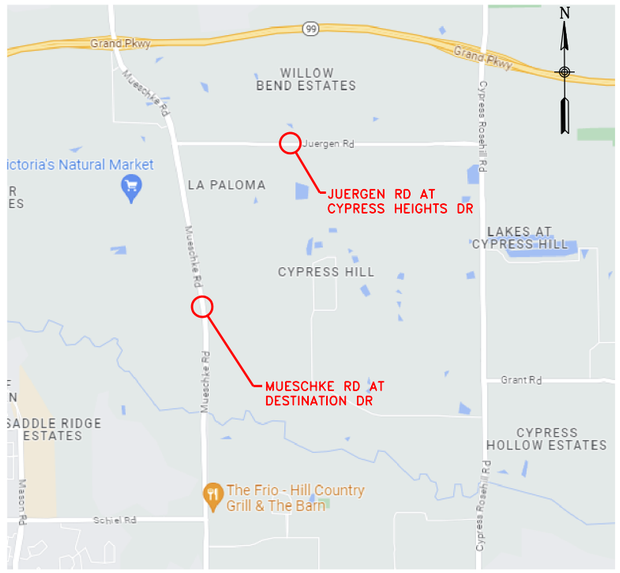
PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD
SHEET DESCRIPTION: SIGNAL MODEM ASSEMBLY		CD/TS/WP
DRAWN BY:		DATE: 8/18/17
CK'D BY:	SCALE: NONE	SHEET NO: 38 / 38

CONSTRUCTION PLANS FOR
TRAFFIC SIGNAL INSTALLATION AT:
MUESCHKE ROAD AT DESTINATION DRIVE &
JUERGEN ROAD AT CYPRESS HEIGHTS DRIVE

WORK AT JUERGEN RD AT CYPRESS HEIGHTS DRIVE IS NOT PART OF THIS SCOPE OF WORK.

PREPARED FOR:

TOMBALL ISD
DESTINATION EXCELLENCE



NOVEMBER 2023

SHEET #	DESCRIPTION
1	TITLE SHEET AND INDEX
2A	EXPRESS REVIEW SHEET – HCED
2B	EXPRESS REVIEW SHEET – HCFCD
3	GENERAL NOTES FOR PRECINCT 3
4	GENERAL NOTES – PRIVATE UTILITIES
5	TRAFFIC SIGNAL BASIS OF ESTIMATE
6	EXISTING CONDITIONS – MUESCHKE RD AT DESTINATION DR
7	TRAFFIC SIGNAL LAYOUT – MUESCHKE RD AT DESTINATION DR
8	TRAFFIC SIGNAL LEGEND – MUESCHKE RD AT DESTINATION DR
9	TRAFFIC SIGNAL ELEVATIONS – MUESCHKE RD AT DESTINATION DR
10	SIGNING AND PAVEMENT MARKINGS – MUESCHKE RD AT DESTINATION DR
11	EXISTING CONDITIONS – JUERGEN RD AT CYPRESS HEIGHTS DR
12	TRAFFIC SIGNAL LAYOUT – JUERGEN RD AT CYPRESS HEIGHTS DR
13	TRAFFIC SIGNAL LEGEND – JUERGEN RD AT CYPRESS HEIGHTS DR
14	TRAFFIC SIGNAL ELEVATIONS – JUERGEN RD AT CYPRESS HEIGHTS DR
15	SIGNING AND PAVEMENT MARKINGS – JUERGEN RD AT CYPRESS HEIGHTS DR
16–38	STANDARD DETAIL DRAWINGS

VERIFICATION OF PRIVATE UTILITY LINES

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222

NOTICE:
For your safety, you are required by Texas Law to call 811 at lease 48 hours before you dig so that underground line can be marked. This Verification does not fulfill your obligation to call 811

Date

CenterPoint Energy/Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natudral gas lines correctly-not to be used for conflict verification.)
(gas service lines are not shown.)
Signature Valid for six months.

Date

CenterPoint Energy/UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature Valid for six months.

Date

Approved for AT&T TEXAS/SWBT underground conduit facilities only.
Signature valid for one year

UTILITY CONTACTS
CENTERPOINT ENERGY – ASHANA WEBSTER –
832-773-6080 – Ashana.Webster@centerpointenergy.com
AT&T – LAKEESHA UPCHURCH – 713-660-5328
COMCAST – MARGIE BLACKWELL – 281-624-3021

48 HOUR NOTICE:

CONTACT THE HARRIS COUNTY ENGINEERING DEPARTMENT - PERMIT OFFICE - 48 HOURS PRIOR TO THE START OF CONSTRUCTION OF UTILITIES OR PAVING WITHIN HARRIS COUNTY RIGHT-OF-WAY AT (713)-274-3931

CONSTRUCTION OF FACILITIES AND/OR PAVING WORK WITHIN PUBLIC RIGHT-OF-WAY

NOTIFICATIONS (PERMIT) ISSUED BY HARRIS COUNTY PUBLIC INFRASTRUCTURE DEPARTMENT - PERMITS OFFICE - IS REQUIRED FOR PROPOSED WORK WITHIN HARRIS COUNTY RIGHT-OF-WAY. THE PROJECT MUST BE APPROVED PRIOR TO OBTAINING THE REQUIRED NOTIFICATION. BE ADVISED THAT A NOTIFICATION MUST BE OBTAINED SEPARATELY FROM SITE DEVELOPMENT PERMIT PACKAGE. FOR ADDITIONAL INFORMATION, PLEASE VISIT HTTP://WWW.ENG.HCTX.NET/PERMITS/PUBLIC-REVIEW-CODE/PUBLIC-REVIEW/NOTIFICATION-OF-CONSTRUCTION-IN-THE-ROW OR CONTACT PUBLIC REVIEW INSPECTIONS DEPARTMENT @ (713)-274-3931

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
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Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
11/16/2023

SUBMITTED BY:

VOIGT ASSOCIATES, INC.
TBPE FIRM F-5333

ALL SHEETS DATED 11/16/23 FOR INTERIM REVIEW ONLY.
–DOCUMENT INCOMPLETE–
NOT INTENDED FOR PERMIT, BIDDING, OR CONSTRUCTION.

HARRIS COUNTY MAY HAVE EXISTING UNDERGROUND/OVERHEAD UTILITIES WITHIN THE PROPOSED PROJECT LIMITS. PLEASE CONTACT THE CALL CENTER AT (713) 881-3210, OR SUBMIT A WORK ORDER REQUEST THROUGH HTTP://WWW.ENG.HCTX.NET/SIGNALOUT TO OBTAIN FIELD LOCATES.

Approved: _____
HCPID – Permit Group
Flood Plain Management

1. PAVING

(FOR H.C. PUBLIC R.O.W. ONLY)

	DESIGN THICKNESS OF PAVING	STABILIZED SUBGRADE DEPTH	DESIGN STRENGTH OF CONCRETE	STEEL SPACING		REINFORCE STEEL SIZE
				LONG.	TRANS.	
CONCRETE	(IN.)	(IN.)	(PSI)	(IN.)	(IN.)	(#4 MIN.)

ASPHALT	DESIGN SURFACE COURSE THICKNESS	DESIGN SURFACE COURSE TYPE	DESIGN BASE COURSE THICKNESS	DESIGN BASE COURSE TYPE	STABILIZED SUBGRADE THICKNESS	STABILIZED SUBGRADE TYPE
	(IN.)	(MATERIAL)	(IN.)	(MATERIAL)	(IN.)	(MATERIAL)

DRIVEWAYS (in H.C. ROW only)

I. NUMBER OF DRIVEWAY APPROACHES PROPOSED INCLUDE WIDENING OR REPAVING EXISTING DRIVEWAYS AS WELL AS NEW DRIVEWAYS

DRWY	WIDTH	MATERIAL	CULVERT?	CULVERT LENGTH	NEAREST X-STREET	DIST. TO X-STREET
1						
2						
3						
4						
5						

II. HARRIS COUNTY STANDARD DRIVEWAY DETAIL APPEARS ON SHEET ____

FIRE APPARATUS ACCESS ROAD

☐ REQUIRED AND SHOWN ON SHEET(S) _____

☐ NOT REQUIRED DUE TO _____

CURBING

I. ISLANDS, MEDIANS AND ALL AREAS NOT TAKING DIRECT DRIVEWAY ACCESS REQUIRES STANDARD 6" CURBING

II. ☐ STANDARD 6" CURBING PROPOSED
☐ 4" x 12" CURBING PROPOSED EXCEPT AT MEDIANS AND ISLANDS

TRAFFIC CONSIDERATIONS

I. MEDIAN CUTS
☒ NO MEDIAN CUT OR RELOCATION IS PROPOSED
☐ MEDIAN MODIFICATIONS ARE SHOWN ON SHEET _____

II. LEFT / RIGHT TURN LANE
☒ NO LEFT / RIGHT TURN LANE IS PROPOSED
☐ LEFT / RIGHT TURN LANE IS SHOWN ON SHEET _____

III. TRAFFIC CONTROL PLAN
☐ NO WORK IN THE RIGHT OF WAY IS PROPOSED THAT WOULD INTERFERE WITH TRAFFIC FLOW
☒ TRAFFIC CONTROL SHOWN ON SHEET 34-36

IV. TRAFFIC SIGNAL
☐ NO TRAFFIC SIGNAL IS EXISTING / PROPOSED
☐ EXISTING TRAFFIC SIGNAL DEVICES (T.C. BOXES AND LOOPS) SHOWN ON SHEET _____
☒ PROPOSED TRAFFIC SIGNAL (BY OTHERS)

V. TRAFFIC IMPACT ANALYSIS
☐ NO TRAFFIC IMPACT ANALYSIS IS REQUIRED
☒ TRAFFIC IMPACT ANALYSIS HAS BEEN APPROVED ON DATE: 08/23
PLAN TITLE: TOMBALL ISD JUERGEN ROAD EDUCATIONAL COMPLEX
HCPID PROJECT NO.: _____

5. DESCRIPTION OF PROPERTY

I. LEGAL DESCRIPTION
A. ACREAGE: _____
B. ☐ SUBDIVISION: _____
☐ SURVEY & ABSTRACT: _____
C. ADJACENT ROADS: MUESCHKE ROAD AT DESTINATION DRIVE
JUERGEN ROAD AT CYPRESS HEIGHTS DRIVE

II. PLATTING
A. SUBDIVISION PLAT
☐ PROPOSED PLAT / REPLAT
☐ RECORDED PLAT / REPLAT
PLAT NAME: _____
B. STREETS PROPOSED
☒ PUBLIC
☐ PRIVATE
☐ PUBLIC & PRIVATE
☐ NONE

III. JURISDICTIONS
☐ CITY OF _____
☒ ETJ, CITY OF HOUSTON
☐ ETJ, CITY OF _____
☐ NO ETJ

IV. HCAD ACCOUNT NOS. (ALL) KEY MAP PAGE 326L

V. UNOBSTRUCTED VISIBILITY EASEMENT (U.V.E.)
☐ REQUIRED AND SHOWN ON SHEET(S) _____
☐ NOT REQUIRED

NOTE: ALL APPROVED, FINAL PLATS AND ASSOCIATED CPC101 FORMS MUST BE INCLUDED WITH PLAN SUBMITTAL.

☐ CONFORMING SUBDIVISION
☒ NON-CONFORMING SUBDIVISION
☐ PARTIALLY NON-CONFORMING SUBDIVISION

2. RESIDENTIAL / SUBDIVISION DRAINAGE

I. PROPOSED DRAINAGE SYSTEM TYPE
☐ STORM SEWER
☐ ROADSIDE DITCH
☐ LOW IMPACT DEVELOPMENT (LID)

II. DESIGN METHOD USED
☐ CITY OF HOUSTON ____ YEAR FREQUENCY
☐ OTHER: _____

III. DRAINAGE SYSTEM OUTFALLS DIRECTLY TO EXISTING
☐ DETENTION POND (APPROVED H.C. PRJ NO.): _____
DETENTION POND MAINTAINED BY: _____
☐ HCFCD DRAINAGE DITCH UNIT NO.: _____
☐ H.C. ROADSIDE DITCH (ROAD NAME): _____
☐ H.C. STORM SEWER (APPROVED H.C. PRJ NO.): _____

IV. H.C. OUTFALL CALCULATIONS
☐ ROADSIDE DITCH OUTFALL:
ALLOWABLE OUTFALL RATE: 0.0027 x _____ LF Frontage = _____ (CFS)
PROPOSED OUTFALL RATE: ____ (CFS), CALCULATIONS PROVIDED ON SHEET ___
☐ STORM SEWER OUTFALL
CAPACITY ALLOCATED TO TRACT FROM D. A. MAP: _____ (CFS)
FROM DRAINAGE AREA MAP DATED: _____
PREPARED BY: _____
APPROVED H.C. PROJECT NO.: _____
ACTUAL OUTFALL RATE: ____ (CFS), CALCULATIONS PROVIDED ON SHEET ___

V. DETENTION PROVIDED BY
☐ DETENTION BASIN IS PART THIS PLAN SET. SERVICE AREA MAP IS ON SHEET ___
☐ REGIONAL DETENTION BASIN SYSTEM (APPROVED H.C. PRJ NO.): _____

PROPOSED STORM SEWER IS SUBMERGED (AGREEMENT MUST BE PROVIDED).
STATIC W.S.E. @ OUTFALL IS _____

OFFSITE SHEET FLOW: (100 YEAR)

OFFSITE SHEET FLOW MAPPING, TOTAL DISCHARGE CALCULATIONS, AND DESIGN ACCOMODATIONS ARE SHOWN ON SHEET ____ OR, AS PRESENTED IN THE APPROVED DRAINAGE STUDY ENTITLED _____

TOTAL ACREAGE = ____
TOTAL DISCHARGE = ____

NOTE: ALL OFFSITE SHEET FLOW FROM ADJACENT PROPERTIES MUST BE IDENTIFIED AND PROPERLY ACCOUNTED FOR IN THE PROJECT. THE SIGNING ENGINEER HEREBY CERTIFIES THAT THESE AREAS HAVE BEEN ADDRESSED.

6. STORMWATER QUALITY

I. SWPPP: CONSTRUCTION MEASURES. (Complete for ALL projects)
☐ DISTURBS >1AC. SITE PLAN & DETAILS ON SHEET(S)_____
☒ DISTURBS <1AC. N/A

II. APPLICABILITY FOR PERMANENT FEATURES. (must be completed on all projects)
EXEMPT NEW DEVELOPMENT:
☐ PROJECT IS ON A PARCEL (A COMMON PLAN OF DEVELOPMENT) LESS THAN 5 ACRES. (must be verified with plat)
EXEMPT REDEVELOPMENT:
☒ PROJECT DOES NOT MEET THE DEFINITION OF SIGNIFICANT REDEVELOPMENT (Part A, Sec. 2.39 of Regulations of Harris County, Texas for Stormwater Quality Management)
EXEMPT GRANDFATHERED:
☐ PROJECT'S DRAINAGE TIES DIRECTLY INTO AN EXISTING DRAINAGE SYSTEM PRIOR TO OCTOBER 1, 2001.
(FOR VERIFICATION: PROVIDE ORIGINAL DRAINAGE AREA MAP INCLUDING CALCULATIONS)
GENERAL:
☒ PROJECT'S SWQ REQUIREMENTS FALL WITHIN THE JURISDICTION OF: HARRIS COUNTY
☐ STORMWATER QUALITY PERMIT REQUIREMENT IS COVERED BY AN EXISTING SWQMP WITHIN PROJECT TITLE: _____
HARRIS COUNTY PROJECT NO. _____ & SWQ PERMIT NO. _____
STORMWATER QUALITY MANAGEMENT PLAN:
☐ SITE PLAN ON SHEET(S) _____

III. PERMANENT SWQ FEATURES. (COMPLETE IF NOT EXEMPT)
☐ VEGETATIVE CONTROLS USED: (FILTER STRIP, GRASSY SWALE, URBAN FORESTRY) DETAILS AND CALCULATIONS APPEAR ON SHEET(S) _____
☐ POND STRUCTURE USED (WET, DRY, WETLANDS) DETAILS AND CALCULATIONS APPEAR ON SHEET(S) _____
☐ HYDRODYNAMIC TYPE SEPARATOR MODEL: _____
☐ OTHER(S): _____

3. COMMERCIAL / OTHER SITE DRAINAGE

I. PROPOSED DRAINAGE AREA
☒ NEW DEVELOPMENT AREA: _____
☐ RE-DEVELOPMENT AREA (NET NEW DEVELOPED AREA): _____
☐ LOW IMPACT DEVELOPMENT (LID)

II. DETENTION VOLUME
NEW AREA _____ X ____ * = _____ ACRE FEET
DETENTION REQUIRED
* ☐ .65 (CHANNEL)
* ☐ .75 (STM SWR)
* ☐ 1.00 (RD. DITCH)
* ☐ OTHER: ____
PROPOSED DETENTION VOLUME = _____ ACRE FEET
PROPOSED DETENTION VOLUME CALCULATIONS ARE SHOWN ON SHEET _____
DETENTION VOLUME PROVIDED BY EXISTING DETENTION POND
APPROVED H.C. PROJECT NO.: _____
DETENTION POND SERVICE AREA MAP IS PROVIDED ON SHEET ____

III. OUTFALL
OUTFALL TO ☐ H.C. ROADSIDE DITCH
☐ EXISTING H.C. STORM SEWER
☐ OTHER _____
☐ ROADSIDE DITCH OUTFALL:
ALLOWABLE OUTFALL RATE: 0.0027 x _____ LF Frontage = _____ (CFS)
PROPOSED OUTFALL RATE: ____ (CFS), CALCULATIONS PROVIDED ON SHEET ___
☐ STORM SEWER OUTFALL
CAPACITY ALLOCATED TO TRACT FROM D. A. MAP: _____ (CFS)
FROM DRAINAGE AREA MAP DATED: _____
PREPARED BY: _____
APPROVED H.C. PROJECT NO.: _____
ACTUAL OUTFALL RATE: ____ (CFS), CALCULATIONS PROVIDED ON SHEET ___

IV. PUMPED DETENTION FACILITIES
VOLUME THAT GRAVITY FLOWS: _____ ACRE FEET
VOLUME THAT IS PUMPED: _____ ACRE FEET
ENTRANCE VELOCITY INTO ROADSIDE DITCH OR STORM SEWER: _____
PUMP SPECIFICATIONS AND AUTOMATIC SHUTOFF PLAN FOR ROADSIDE DITCH & STORM SEWER OUTFALLS APPEAR ON SHEET _____

V. FLOW RESTRICTOR SIZE
OUTFALL PIPE SIZE: _____
RESTRICTOR PIPE SIZE: _____

NOTE: ALL ROADSIDE DITCH OUTFALLS REQUIRE EROSION CONTROL MEASURES. RIPRAP IS NOT ALLOWED AS AN EROSION CONTROL MEASURE IN HARRIS COUNTY ROW. ALL PUMPED DETENTION OUTFALLS TO ROADSIDE DITCHES REQUIRE MANHOLE W/ LEADS.

7. FLOOD PLAIN STATUS

I. GENERAL INFORMATION
FIRM PANEL(S) FOR PROPERTY: 48201C0215L
FIRM PANEL(S) DATE: 6/18/2007
STATUS OF PROPERTY ON MAP
☒ ENTIRELY LOCATED IN UNSHADED ZONE "X".
☐ LOCATED PARTIALLY OR ENTIRELY IN ANY "A" ZONE OR SHADED ZONE "X". DELINEATE FLOODPLAIN BOUNDARY ON CONSTRUCTION DRAWINGS
(DRAINAGE LAYOUT PG. NO._____) (1% BASE FLOOD LEVEL_____)
(0.2% BASE FLOOD LEVEL_____)
☐ SITE REMOVED FROM FLOODPLAIN BY LOMR, LOMR-F, LOMA
CASE NO._____ REVISED FLOODPLAIN IS SHOWN ON SHEET____

ELEVATION INFORMATION
BENCHMARK USED
☒ HARRIS COUNTY FLOODPLAIN REFERENCE MARK
☐ HARRIS-GALVESTON COASTAL SUBSIDENCE DISTRICT BENCHMARK (FOR COASTAL AREAS)
DESCRIPTION OF BENCHMARK INCLUDING ELEVATION, DATUM AND YEAR OF ADJUSTMENT (2001 ADJ.) RM 110985,110975,110970
From the intersection of US 290 and Mueschke Road, North along Mueschke 3.0 miles to bridge, and benchmark on the right side. ELEV=173.03

II. FLOOD PLAIN DETERMINATION BASED ON GROUND ELEVATION
☐ PROPERTY LIES ENTIRELY ABOVE THE BASE FLOOD LEVEL AND IN SHADED ZONE "X"
☐ PROPERTY LIES PARTIALLY OR ENTIRELY BELOW THE BASE FLOOD LEVEL

III. FLOODPLAIN STORAGE SUMMARY (APPLIES ONLY TO PORTION OF LAND LOCATED WITHIN FLOODPLAIN AS DELINEATED BY FIRM PANEL).
A. TOTAL VOLUME OF MATERIAL PROPOSED TO BE MOVED OR PLACED WITHIN THE FIRM DELINEATED FLOODPLAIN (SOIL, BASE, CONCRETE, ASPHALT, ETC.):
BELOW 0.2% BASE FLOOD ELEVATION _____ (2001 ADJ.) _____ CUBIC YARDS
B. TOTAL VOLUME OF MATERIAL PROPOSED TO BE REMOVED FROM THE FIRM DELINEATED FLOODPLAIN:
BELOW 0.2% BASE FLOOD ELEVATION _____ (2001 ADJ.) _____ CUBIC YARDS
C. FILL AREA & VOLUME CALCULATIONS ARE SHOWN ON SHEET _____

IV. ☐ LOMR REQUIRED ☐ CLOMR REQUIRED VERIFIED BY: _____

8. CURB RAMPS

A. ARE CURB RAMPS THAT CONNECT TO PUBLIC STREETS PROPOSED IN THIS SET OF PLANS? ☒ YES [ ] NO

9. LANDSCAPING

☐ REQUIRED AND SHOWN ON SHEET(S) _____
☒ NOT REQUIRED

4. WATER AND WASTEWATER

I. COMMERCIAL PROJECTS

DOES PROPERTY HAVE EXISTING AND/OR PROPOSED UTILITIES?
☐ YES ☐ NO

IF YES, CHECK THE BOX THAT APPLIES TO THIS PROJECT
☐ PUBLIC WATER & SANITARY
☐ PRIVATE WATER WELL & SEPTIC SYSTEM
☐ PUBLIC WATER & PRIVATE SEPTIC SYSTEM
☐ PRIVATE WATER WELL & PUBLIC SANITARY

NOTE: PUBLIC UTILITIES REQUIRE A LETTER FROM THE DISTRICT/ MUNICIPALITY AUTHORIZING SERVICE & CONNECTION. THIS IS REQUIRED FOR PLAN APPROVAL.

UTILITY DISTRICT/MUNICIPALITY NAME: _____

NOTE: SEPTIC SYSTEMS REQUIRE H.C. WASTE WATER REVIEW

H.C. SEPTIC PERMIT/REQUEST NO. _____

NOTE: ALL EXISTING AND PROPOSED UTILITIES MUST BE ACCURATELY SHOWN & LABELED ON THE SITE PLANS.

II. SUBDIVISION PROJECTS

☐ UTILITY DISTRICT/MUNICIPALITY NAME: _____
☐ PRIVATE WATER & WASTE WATER SYSTEMS
☐ PRIVATE WATER & INDIVIDUAL OSSF
☐ INDIVIDUAL WATER WELL & OSSF

NOTE: A COPY OF TCEQ APPROVAL FOR PRIVATE WATER & WASTE WATER SYSTEMS IS REQUIRED FOR PLAN APPROVAL.

*NOTE: DEDICATED UNDERGROUND FIRE LINES MUST BE SUBMITTED TO THE HARRIS COUNTY FIRE PROTECTION GROUP FOR REVIEW AND PERMITTING BY THE UNDERGROUND FIRE LINE CONTRACTOR. CIVIL REIVEW DOES **NOT** REVIEW OR APPROVE UNDERGROUND FIRE LINES FOR THE FIRE PROTECTION SYSTEMS.*

WASTEWATER TREATMENT PLANTS

H.C. WWTP REVIEW:

IS THIS PROPOSED PROJECT A NEW WWTP SITE OR A REHAB/EXPANSION OF AN EXISTING WWTP SITE? YES ☐ NO ☐

IF YES, IS A HARRIS COUNTY DOMESTIC WASTEWATER TREATMENT PLANT EXPRESS REVIEW SHEET ATTACHED AND COMPLETED ACCORDING TO INSTRUCTIONS? YES ☐ NO ☐

REFER TO:
WWW.ENG.HCTX.NET/PERMITS/WASTEWATER/REGULATIONS-STANDARDS-DETAILS FOR DOMESTIC WWTP ERS FORM

10. PERMITS REQUIRED

DOES THE PROPERTY HAVE ANY VIOLATIONS? IF SO PLEASE PROVIDE ALL VIOLATION NUMBERS. _____

☐ STORM WATER QUALITY
☐ SEPTIC (EXISTING) ☐ SEPTIC (PROPOSED)
☐ CIVIL SITE WORK (PHASE II PERMIT CLASS I (non-floodplain))
☐ CIVIL SITE WORK (PHASE II PERMIT CLASS II (floodplain))
☐ DRIVEWAY WITH CULVERT _____ CURB AND GUTTER _____
☐ BUILDING PERMITS (NO. OF BUILDINGS = _____) ☐ CRITICAL FACILITY
☐ SUBDIVISION INFRASTRUCTURE PHASE II (NO. OF LOTS = _____)
☐ NOTICE OF DETENTION AFFIDAVIT REQUIRED
☐ MUD MAINTENANCE AGREEMENT REQUIRED
NOTES: _____

WORK IN HARRIS COUNTY R.O.W.

☐ UTILITY WORK _____
☐ TURN LANE _____
☒ OTHER CONSTRUCTION **PROPOSED TRAFFIC SIGNAL, ADA RAMPS, ETC**

NOTES:
A PERMIT IS REQUIRED FOR EACH SCOPE OF WORK ON SITE.
A R.O.W. NOTIFICATION IS REQUIRED FOR EACH SCOPE OF WORK IN HC OR HCFCD ROW.
REFER TO www.eng.hctx.net/permits FOR EACH SCOPE OF WORK IN HC OR IN HCFCD ROW.

BENCHMARK REQUIREMENTS FOR PROPOSED BRIDGES AND OR NEW RESIDENTIAL SUBIDIVISIONS

When the County Engineer has determined that a new benchmark will be required to be established for the proposed project, the developer shall be required to install a benchmark per section 8.0, part 2 of the Harris County Infrastructure Regulations.

Is a new Benchmark required for this project? (*to be determined by Harris County*) [__] yes [__] no

If a new Benchmark is required, the proposed benchmark information is shown on sheets ____

FOR PROJECTS LOCATED IN ANY FLOODPLAIN

Development constructed or placed in accordance with these plans will comply with all provisions of the Regulations of Harris County, Texas for Floodplain Management.
No net fill is allowed in the flood plain and no fill is allowed in the floodway.
FOUNDATION NOTES: (*Applies to only buildings or building additions requiring a class II permit*)
All water heaters, furnaces, air conditioning units, electrical distribution panels, and any other mechanical or electrical equipment must be elevated in accordance with Section 4.05 of Harris County Floodplain regulations.
Any electrical circuit serving a light switch or outlet located below the base (100-year) flood elevation shall be dropped from above and be on a separate breaker.
All materials used below the (100-year) base flood elevation are on approved FEMA Technical Bulletin 2-08 as Class 5 water-resistant, and approved in accordance with FEMA Technical Bulletin 1-08 for foundation openings.
Critical facilities located in the 0.2% or 500yr floodplain or 1% or 100yr floodplain shall have the lowest floor elevated to 3 feet or more above the 0.2% flood elevation, or 24 inches above the crown of the adjacent road, which ever results in a higher elevation.
Floodproofing and sealing measures must be taken to ensure that toxic substances will not be displaced by or released into floodwaters.
Access routes elevated to or above the level of the base flood shall be provided to all critical facilities to the extent possible.
A completed as-built certificate must be submitted after the structure is complete and before it is occupied.
The County Engineer's Office will post a final inspection notice on the structure once all requirements have been met.
No fill may be used to elevate structures in the 1% or 100yr flood plain. Structures may be constructed on an open foundation, such as piers, or on continuous foundation walls with properly sized and located openings. All foundations are required to be designed by a registered professional engineer.
All structures shall be designed to withstand a three second gust basic wind speed of 120mph.
*Completed ***Elevation Certificates** to be submitted: one at permitting, a second after the slab is poured or sub-floor is installed and before the framing starts, and a third is required once construction is finished. *(PER CURRENT FIRM PANEL) to the Harris County Engineering Department, 10555 Northwest Freeway, Suite 120, Houston, TX 77092*

TRAFFIC SIGNAL FOR THE INTERSECTION OF MUESCHKE ROAD AT DESTINATION DRIVE

TRAFFIC SIGNAL FOR THE INTERSECTION OF JUERGEN ROAD AT CYPRESS HEIGHTS DRIVE

HARRIS COUNTY ENGINEERING DEPARTMENT - PERMIT OFFICE NOTE:

THE PERMIT MANAGER SIGNATURE REPRESENTS THE FOLLOWING:
- THE COMPLETION OF REVIEW OF THESE PLANS
- INTERPOSE NO OBJECTION TO THE PROPOSED DESIGN ON PRIVATE PROPERTY
- APPROVAL OF WORK IN HARRIS COUNTY MAINTAINED RIGHT OF WAY
- APPROVAL OF WORK IN PROPOSED HARRIS COUNTY RIGHT OF WAY THAT IS TO BE ACCEPTED BY THE COUNTY

HCED SIGNATURE BLOCK:

THE PROJECT WAS REVIEWED, HOWEVER, THIS DOES NOT MEAN THE ENTIRE PROJECT, INCLUDING ALL SUPPORTING DATA AND CALCULATIONS HAVE BEEN COMPLETELY CHECKED AND VERIFIED. THESE DRAWINGS ARE SIGNED, DATED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS, WHICH THEREFORE CONVEYS THE ENGINEER'S RESPONSIBILITY AND ACCOUNTABILITY. THIS DOES NOT RELIEVE ANY PARTY FROM COMPLYING WITH APPROPRIATE FEDERAL, STATE AND LOCAL ENVIRONMENTAL RULES, LAWS, AND REGULATIONS AND ANY OTHER LEGALLY ADOPTED REGULATION OR ORDINANCE RELATED TO LAND DEVELOPMENT. IF THE CITY SIGNATURES ARE REQUIRED BY ORDINANCE, COUNTY PERMITS WILL NOT BE ISSUED UNTIL SUCH SIGNATURES ARE OBTAINED. PLAN APPROVAL EXPIRATION TO BE IN ACCORDANCE WITH LOCAL GOVERNEMENT CODE CH. 245.

ENGINEER'S CERTIFICATION

I, ANTHONY VOIGT, A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THE INFORMATION PRESENTED ON THIS SHEET IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND THAT I AM NOT VIOLATING ANY PROVISION OF THE CURRENT TEXAS ENGINEERING PRACTICE ACT AND RULES CONCERNING THE PRACTICE OF ENGINEERING AND PROFESSIONAL ENGINEERING LICENSURE. I CERTIFY TO THE BEST OF MY KNOWLEDGE THAT THE PLANS IN THEIR ENTIRETY ARE DESIGNED PER THE HARRIS COUNTY ENGINEERING STANDARDS, REGULATIONS, AND GUIDELINES UNLESS PROVIDED A VARIANCE BY THE COUNTY ENGINEER OR HIS DESIGNEE. SHOULD IT BE DEEMED BY HCED STAFF, THAT THE PLANS DO NOT MEET THE COUNTY'S STANDARDS, REGULATIONS AND GUIDELINES AND DID NOT RECEIVE AN APPROVED VARIANCE, THE APPROVAL OF SAID PLANS BECOMES NULL AND VOID AND THE DESIGN PLANS MUST BE CORRECTED AT NO CHARGE TO THE COUNTY.

THE COMPLETED PROJECT CONSISTS OF DRAWING SHEETS 01 THRU 38 .

SIGNATURE _____ DATE 11/16/2023

SEAL: STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER

REVISIONS

NOTE: REVISION BLOCK IS TO BE USED ONLY FOR CHANGES MADE AFTER PLANS HAVE BEEN APPROVED BY HARRIS COUNTY. 11/16/2023

DATE	SHEET NO.	DESCRIPTION	P.E. INITIAL	H.C. APPROVED DATE

HC PROJECT NO. 2306280079 HCFCD PROJECT NO.

SHEET NUMBER 02A OF 38

HARRIS COUNTY
ENGINEERING DEPARTMENT
REVIEW SHEET

VERSION 20.0 MAY 27, 2020

1. PROPERTY DESCRIPTION

I. LOCATION INFORMATION

A. HARRIS COUNTY COMMISSIONER'S PRECINCT:
☐ 1 ☐ 2 ☐ 3 ☐ 4

B. KEY MAP: 326L

C. ADDRESS: MUESCHKE RD AT DESTINATION DR; JUERGEN RD AT CYPRESS HEIGHTS DR

II. LEGAL DESCRIPTION

A. ACREAGE: _____

B. ☐ SUBDIVISION: _____

☐ SURVEY & ABSTRACT: _____

C. ADJACENT ROADS: MUESCHKE RD & JUERGEN RD

III. PLATTING

A. SUBDIVISION PLAT
☐ PROPOSED PLAT / REPLAT
☐ RECORDED PLAT / REPLAT

PLAT NAME: _____

B. STREETS PROPOSED
☐ PUBLIC
☐ PRIVATE
☐ PUBLIC & PRIVATE
☐ NONE

IV. JURISDICTIONS

☐ CITY OF _____
☒ ETJ, CITY OF HOUSTON
☐ ETJ, CITY OF _____
☐ NO ETJ
☐ UTILITY DISTRICT (NAME)_____

V. HCAD ACCOUNT NOS. (ALL)

_____

2. SITE DETENTION DRAINAGE

I. PROPOSED DRAINAGE AREA

☐ NEW DEVELOPMENT AREA: _____
☐ RE-DEVELOPMENT AREA (AMOUNT INCREASED IMPERVIOUS AREA): _____
☐ LOW IMPACT DEVELOPMENT (LID)
METHOD/DESCRIPTION _____

II. METHODOLOGY

HCFCD PCPM DETENTION METHOD USED:
☐ METHOD 1 (LESS THAN 20 ACRES)
☐ METHOD 2 (20 ACRES TO 640 ACRES)
☐ METHOD 3 (GREATER THAN 640 ACRES)
☐ OTHER _____

III. DETENTION VOLUME & OUTFALL

OUTFALL TO:
☐ .65, H.C.F.C.D. CHANNEL, (H.C.F.C.D. UNIT NO.) _____
☐ .75, EXISTING STORM SEWER (OWNER & OPERATOR) _____
☐ 1.00, ROADSIDE DITCH, (OWNER & ROAD NAME) _____
☐ OTHER (OWNER & OPERATOR) _____

IV. STORMWATER DETENTION BASIN INFORMATION

A. HCFCD PCPM SUMMARY TABLE SEE SHEET _____ OF THESE PLANS.

DETENTION BASIN SERVICE AREA		acres	
STORM EVENT	50% EXCEEDANCE (2-YEAR)	10% EXCEEDANCE (10-YEAR)	1% EXCEEDANCE (100-YEAR)
MAXIMUM ALLOWABLE OUTFLOW (PRE-DEVELOPMENT PEAK FLOW)			
MAXIMUM OUTFLOW PROVIDED (PEAK FLOW FROM BASIN)			
LOWEST NATURAL/FINISHED GROUND OR FINISHED FLOOR ELEVATION ESTIMATE			
DESIGN WATER SURFACE ELEVATION			
MINIMUM STORAGE REQUIRED (ac-ft)			
DETENTION STORAGE PROVIDED (ac-ft)			
STORAGE RATE PROVIDED (ac-ft/ac)			
OUTFLOW VELOCITY INTO CHANNEL (ft/sec)			
DRAIN TIME - 1% ONLY (hours)			
EMERGENCY OVERFLOW (TYPE, SIZE, ELEVATION, ETC.)			

B. DETENTION BASIN TO BE MAINTAINED BY _____

C. DETENTION SERVICE AREA MAP ON SHEET _____

D. ADDITIONAL CRITERIA FOR PUMPED DETENTION BASINS
VOLUME OF PUMPED 1% EXCEEDANCE STORAGE VOLUME = _____ ACFT _____ % OF TOTAL VOLUME
MAXIMUM DESIGN OUTFLOW VELOCITY INTO HCFCD CHANNEL = _____ FT/SEC
DRAIN TIME FOR BASIN = _____ HOURS BASED ON _____HEAD CONDITIONS

V. DETENTION PROVIDED IN OTHER PLANS:

HCFCD PROJECT No. _____ DATE SIGNED BY HCFCD: _____
PLAN TITLE _____
DETENTION POND SERVICE AREA MAP IS PROVIDED ON SHEET _____
ENGINEERING FIRM _____
DETENTION BASIN MAINTAINED BY: _____

VI. FLOW RESTRICTOR SIZE

OUTFALL PIPE SIZE: _____
RESTRICTOR PIPE SIZE: _____
RESTRICTOR PLATE DIMENSION: _____

VII. DETENTION PROVIDED BY

☐ REGIONAL DETENTION BASIN SYSTEM (APPROVED H.C. PRJ NO.): _____

FOR PROJECTS LOCATED IN ANY FLOODPLAIN
Development constructed or placed in accordance with these plans will comply with all provisions of the designated Floodplain Administrator.
No net fill is allowed in the flood plain and no fill is allowed in the floodway.

3. SWQ DISCHARGE INTO FCD FACILITY

I. SWPPP: CONSTRUCTION MEASURES. (Must complete)

☐ DISTURBS >1AC. SITE PLAN & DETAILS ON SHEET(S) _____
☐ DISTURBS <1AC. N/A

*II. APPLICABILITY FOR PERMANENT FEATURES. (Must complete)

EXEMPT NEW DEVELOPMENT:
☐ PROJECT IS ON A PARCEL (A COMMON PLAN OF DEVELOPMENT) LESS THAN 5 ACRES. (Must be verified with plat)

EXEMPT REDEVELOPMENT:
☐ PROJECT DOES NOT MEET THE DEFINITION OF SIGNIFICANT REDEVELOPMENT (Part A,Sec. 2.39 of Regulations of Harris County, Texas for Stormwater Quality Management)

EXEMPT GRANDFATHERED:
☐ PROJECT'S DRAINAGE TIES DIRECTLY INTO AN EXISTING DRAINAGE SYSTEM PRIOR TO OCTOBER 1, 2001.
(FOR VERIFICATION: PROVIDE ORIGINAL DRAINAGE AREA MAP INCLUDING CALCULATIONS)

GENERAL:
☐ PROJECT'S SWQ REQUIREMENTS FALL WITHIN THE JURISDICTION OF: _____
☐ STORMWATER QUALITY PERMIT REQUIREMENT IS COVERED BY AN EXISTING SWQMP WITHIN PROJECT TITLE: _____
HARRIS COUNTY PROJECT No _____ & SWQ PERMIT No.

STORMWATER QUALITY MANAGEMENT PLAN:
☐ SITE PLAN ON SHEET(S)

III. PERMANENT SWQ FEATURES. (COMPLETE IF NOT EXEMPT)

☐ VEGETATIVE CONTROLS USED: (FILTER STRIP, GRASSY SWALE, URBAN FORESTRY DETAILS AND CALCULATIONS APPEAR ON SHEET(S) _____
☐ POND STRUCTURE USED (WET, DRY, WETLANDS) DETAILS AND CALCULATIONSAPPEAR ON SHEET(S)_____
☐ HYDRODYNAMIC TYPE SEPARATOR MODEL: _____
☐ OTHER(S): _____

4. FLOOD PLAIN STATUS

I. GENERAL INFORMATION

FIRM PANEL(S) FOR PROPERTY: 110980R
FIRM PANEL(S) DATE: 7/27/2014

STATUS OF PROPERTY ON MAP
☐ ENTIRELY LOCATED IN UNSHADED ZONE "X"
☐ LOCATED PARTIALLY OR ENTIRELY IN ANY "A" ZONE OR SHADED ZONE "X", DELINEATE FLOODPLAIN BOUNDARY ON CONSTRUCTION DRAWINGS (DRAINAGE LAYOUT PG. NO._____) (1% BASE FLOOD LEVEL_____)
(0.2% BASE FLOOD LEVEL_____)

☐ SITE REMOVED FROM FLOODPLAIN BY LOMR, LOMR-F, LOMA CASE NO._____ REVISED FLOODPLAIN IS SHOWN ON SHEET____

ELEVATION INFORMATION
BENCHMARK USED RM 110985,110975,110970
☐ HARRIS COUNTY FLOODPLAIN REFERENCE MARK
☐ HARRIS-GALVESTON COASTAL SUBSIDENCE DISTRICT BENCHMARK (FOR COASTAL AREAS)
DESCRIPTION OF BENCHMARK INCLUDING ELEVATION, DATUM AND YEAR OF ADJUSTMENT (2001 ADJ.) From the intersection of US 290 and Mueschke Road, North along Mueschke 3.0 miles to bridge, and benchmark on the right side. ELEV=173.03

II. FLOOD PLAIN DETERMINATION BASED ON GROUND ELEVATION

☐ PROPERTY LIES ENTIRELY ABOVE THE BASE FLOOD LEVEL AND IN SHADED ZONE "X"
☐ PROPERTY LIES PARTIALLY OR ENTIRELY BELOW THE BASE FLOOD LEVEL

III. FLOODPLAIN STORAGE SUMMARY

(APPLIES ONLY TO PORTION OF LAND LOCATED WITHIN FEMA REGULATORY FLOODPLAIN).

A. TOTAL VOLUME OF MATERIAL PROPOSED TO BE MOVED OR PLACED WITHIN THE FIRM DELINEATED FLOODPLAIN (FILL, BASE, CONCRETE, ASPHALT, ETC.): BELOW 0.2% BASE FLOOD ELEVATION (2001 ADJ.) _____ CUBIC YARDS _____

B. TOTAL VOLUME OF MATERIAL PROPOSED TO BE REMOVED FROM THE FIRM DELINEATED FLOODPLAIN: BELOW 0.2% BASE FLOOD ELEVATION (2001 ADJ.) _____ CUBIC YARDS _____ INCLUDING CALCULATIONS)

C. FILL AREA & VOLUME CALCULATIONS ARE SHOWN ON SHEET _____

5. WORK IN HCFCD RIGHT-OF-WAY

I. TYPE OF WORK TO BE PERFORMED IN HCFCD HCFCD ROW

A. BOND/NOTIFICATION INFORMATION
☐ HCFCD WATERSHED _____
☐ HCFCD UNIT No. _____
☐ NUMBER OF OUTFALLS _____
☐ UTILITY CROSSING
☐ ROADWAY BRIDGE/CULVERT CROSSING
☐ FILL ACTIVITY
☐ REHABILITATION OF CHANNEL
☐ MAINTENANCE
☐ TEMPORARY CROSSING
☐ TRAIL (LENGTH) _____
☐ OTHER _____
COST OF WORK IN HCFCD ROW _____

II. USACE ENVIRONMENTAL PERMIT

☐ US ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT NUMBER(S) _____
☐ US ARMY CORPS OF ENGINEERS INDIVIDUAL PERMITS
☐ OTHER
☐ NO PERMITS REQUIRED
EXPLAIN: _____

III. REFERENCE / BASIS OF DETERMINATION

☐ ENVIRONMENTAL CONSULTANT REPORT
BY _____
REPORT TITLE _____
REPORT DATE _____
☐ OTHER _____

NOTES:
I. – III. REQUIRED ON PROJECTS WITH WORK IN A HCFCD CHANNEL. PLEASE REFERENCE SECTION 17 OF THE FLOOD CONTROL DISTRICT POLICY, CRITERIA, AND PROCEDURE MANUAL FOR MORE INFORMATION.

IV. HCFCD STANDARD NOTES: SEE SHEET _____ OF THESE PLANS.

V. HCFCD STANDARD DETAILS: SEE SHEET _____ OF THESE PLANS.

VI. HCFCD ACCESS PLAN: SEE SHEET _____ OF THESE PLANS.

VII. REFER TO THE FOLLOWING PLAN SHEETS: _____
FOR EXISTING AND PROPOSED RIGHT(S) OF WAY INCLUDING DELINEATION AND RECORDING INFORMATION PER HCFCD POLICY, CRITERIA, & PROCEDURE MANUAL (i.e., DRAINAGE EASEMENT, FEE STRIP, ETC.) AND GRANTEE (e.g. COH, HCFCD, PUBLIC, TXDOT, ETC.)

6. REPORTS/AGREEMENTS

I. HCFCD ACCEPTED REPORTS (ALL)

STORMWATER DRAINAGE DESIGN REPORT
REPORT TITLE _____
HCFCD PROJECT #_____
ENGINEERING FIRM _____
REPORT ACCEPTANCE DATE _____

GEOTECHNICAL INVESTIGATION REPORT
REPORT TITLE _____
HCFCD PROJECT #_____
ENGINEERING FIRM _____
REPORT ACCEPTANCE DATE _____

HCFCD APPROVED VARIANCE
DESCRIPTION OF VARIANCE _____
DOCUMENT ID #_____
VARIANCE ACCEPTANCE DATE _____

II. AGREEMENT TYPE & No.:

☐ INTERLOCAL (ILA): _____
☐ HCFCD MAINTENANCE _____
☐ TURF ESTABLISHMENT _____
☐ OTHER _____

OFFSITE SHEET FLOW: (100 YEAR)

OFFSITE SHEET FLOW MAPPING, TOTAL DISCHARGE CALCULATIONS, AND DESIGN ACCOMODATIONS ARE SHOWN ON SHEET ____ OR, AS PRESENTED IN THE APPROVED DRAINAGE STUDY ENTITLED _____.

TOTAL ACREAGE =____
TOTAL DISCHARGE =____

NOTE: ALL OFFSITE SHEET FLOW FROM ADJACENT PROPERTIES MUST BE IDENTIFIED AND PROPERLY ACCOUNTED FOR IN THE PROJECT. THE SIGNING ENGINEER HEREBY CERTIFIES THAT THESE AREAS HAVE BEEN ADDRESSED.

HCFCD SIGNATURE BLOCK

PROJECT NAME: _____

ADDRESS: _____

WAS ACCEPTED BY HARRIS COUNTY FLOOD CONTROL DISTRICT FOR THE PURPOSES LISTED BELOW:

HARRIS COUNTY FLOOD CONTROL DISTRICT

INTERPOSE NO OBJECTION

BY _____
FOR ITEMS LOCATED OUTSIDE OF HCFCD RIGHT-OF-WAY

APPROVED:

BY _____
FOR ITEMS LOCATED WITHIN EXISTING HCFCD RIGHT-OF-WAY

APPROVED:

BY _____
FOR ITEMS LOCATED WITHIN PROPOSED HCFCD RIGHT-OF-WAY

NO REVIEW REQUIRED:

BY _____
FINAL PERMITTING BY OTHERS

ADDITIONAL COMMENTS:

_____

THE PROJECT WAS REVIEWED, HOWEVER, THIS DOES NOT MEAN THE ENTIRE PROJECT, INCLUDING ALL SUPPORTING DATA AND CALCULATIONS HAVE BEEN COMPLETELY CHECKED AND VERIFIED. THESE DRAWINGS ARE SIGNED, DATED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS, WHICH THEREFORE CONVEYS THE ENGINEER'S RESPONSIBILITY AND ACCOUNTABILITY. THIS DOES NOT RELIEVE ANY PARTY FROM COMPLYING WITH APPROPRIATE FEDERAL, STATE AND LOCAL ENVIRONMENTAL RULES, LAWS, AND REGULATIONS AND ANY OTHER LEGALLY ADOPTED REGULATION OR ORDINANCE RELATED TO LAND DEVELOPMENT. IF THE CITY SIGNATURES ARE REQUIRED BY ORDINANCE, COUNTY PERMITS WILL NOT BE ISSUED UNTIL SUCH SIGNATURES ARE OBTAINED. PLAN APPROVAL EXPIRATION TO BE IN ACCORDANCE WITH LOCAL GOVERNEMENT CODE CH. 245.

ENGINEER'S CERTIFICATION

I, ANTHONY VOIGT , A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THE INFORMATION PRESENTED ON THIS SHEET IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND THAT I AM NOT VIOLATING ANY PROVISION OF THE CURRENT TEXAS ENGINEERING PRACTICE ACT AND RULES CONCERNING THE PRACTICE OF ENGINEERING AND PROFESSIONAL ENGINEERING LICENSURE.

ANY VIOLATIONS WILL BE FORWARDED TO THE HARRIS COUNTY DISTRICT ATTORNEY'S OFFICE FOR PROSECUTION.

THE COMPLETED PROJECT CONSISTS OF DRAWING SHEETS 01 THRU 38.

SEAL

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
11/16/2023

SIGNATURE _____ DATE 11/16/2023

REVISIONS

NOTE: REVISION BLOCK IS TO BE USED ONLY FOR CHANGES MADE AFTER PLANS HAVE BEEN APPROVED BY HARRIS COUNTY FLOOD CONTROL.

DATE	SHEET NO.	DESCRIPTION	P.E. INITIAL	H.C.F.C.D APPROVED DATE

HARRIS COUNTY FLOOD CONTROL PROJECT NO.

SHEET NUMBER 02B OF 38

HARRIS COUNTY
FLOOD CONTROL DISTRICT
REVIEW SHEET

VERSION 1.0 OCTOBER 2019

GENERAL

1. THE CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS BEFORE BEGINNING CONSTRUCTION.

2. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING SECURITY TO PROTECT THE PROJECT SITE, CONTRACTOR PROPERTY, EQUIPMENT, AND WORK.

3. THE CONTRACTOR IS RESPONSIBLE FOR CLEANING STREETS OF CONSTRUCTION DIRT AND DEBRIS AT CLOSE OF EACH WORK DAY.

4. THE CONDITION OF THE ROAD AND/OR RIGHT-OF-WAY, UPON COMPLETION OF THE JOB SHALL BE AS GOOD AS OR BETTER THAN PRIOR TO STARTING WORK.

5. PRIOR TO CONSTRUCTION, THE CONTRACTOR, ALONG WITH CONCURRENCE FROM THE FIELD ENGINEER, SHALL DETERMINE HIS/HER LAY-DOWN AND/OR STAGING AREA LOCATIONS.

6. THE CONTRACTOR SHALL NOTIFY ALL PROPERTY OWNERS A MINIMUM OF 24 HOURS PRIOR TO BLOCKING DRIVEWAYS OR ENTERING UTILITY EASEMENTS.

7. TRAFFIC INGRESS AND EGRESS FOR DRIVEWAYS AND PEDESTRIAN ACCESS FACILITIES SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION.

8. THE CONTRACTOR SHALL REMOVE ANY FENCES, POSTS, MAILBOXES, PLANTERS, PERMANENT TRASH CONTAINERS, CULVERTS, ETC. OR SECTIONS THEREOF, THAT ENCROACH WITHIN THE COUNTY'S RIGHT-OF-WAY. NOTE: PRIOR TO CONSTRUCTION, THE PROPERTY OWNER WAS PAID TO RELOCATE OR REPLACE THESE ITEMS OUTSIDE OF THE COUNTY'S RIGHT-OF-WAY. IF THE OWNER HAS FAILED TO DO SO, THE CONTRACTOR WILL REPLACE THEM WITH THE MINIMUM LEVEL OF QUALITY NEEDED TO SECURE THE PROPERTY AND/OR MAINTAIN MAIL DELIVERY. IN THAT CASE, PAYMENT FOR THESE INSTALLATIONS WILL BE INCLUDED AS EXTRA WORK ITEMS OR AS OVERRUNS TO EXISTING PAY ITEMS.

   ANY DAMAGE CAUSED BY THE CONTRACTOR TO SUCH ITEMS LOCATED OUTSIDE OF THE COUNTY'S RIGHT-OF-WAY, SHALL BE REPLACED WITH LIKE-KIND OR BETTER AT THE CONTRACTOR'S EXPENSE.

   ALSO, IF THESE ITEMS ARE LOCATED WITHIN THE PROJECT RIGHT-OF-WAY AND ARE DESIGNATED TO REMAIN, ANY DAMAGE CAUSED BY THE CONTRACTOR TO SUCH ITEMS, SHALL BE REPLACED WITH LIKE-KIND OR BETTER AT THE CONTRACTOR'S EXPENSE.

   TREES, BUSHES, SHRUBBERY AND OTHER DAMAGED PLANTINGS DESIGNATED TO REMAIN SHALL BE REPLACED WITHIN 72 HOURS OF REMOVAL AND ARE TO BE THOROUGHLY WATERED-IN. NO SEPARATE PAY.

9. PAVED SURFACES, PAVEMENT MARKERS AND MARKINGS SHALL BE PROTECTED FROM DAMAGE BY TRACKED EQUIPMENT.

10. IRON RODS DISTURBED DURING CONSTRUCTION ARE TO BE REPLACED BY A REGISTERED PROFESSIONAL LAND SURVEYOR FOR THE ORIGINAL PROPERTY OWNER AT NO SEPARATE PAY.

11. CONSTRUCTION STAKING WILL BE PROVIDED BY THE CONTRACTOR. TWO COPIES OF STAKING NOTES TO BE PROVIDED TO THE ENGINEER PRIOR TO CONSTRUCTION.

12. THE COUNTY OR THE COUNTY'S SURVEYOR SHALL PROVIDE A BENCHMARK OR TEMPORARY BENCHMARK AND SURVEY CONTROLS.

13. THE CONTRACTOR SHALL MAINTAIN UPDATED RED-LINED RECORD DRAWINGS ON SITE FOR INSPECTION BY THE ENGINEER.

14. MOWING, MAINTENANCE, AND CLEAN-UP OF THE PROJECT SHALL MEET THE REQUIREMENT OF SPECIFICATION ITEM 560 (NO SEPARATE PAY). MOWING, MAINTENANCE, AND CLEAN-UP IS REQUIRED FOR THE PROJECT LIMITS AND DURATION, REGARDLESS OF THE CONTRACTOR'S SCOPE OF ACTIVITIES WITHIN THE PROJECT LIMITS.

15. THE REMOVAL OF ANY ABANDONED UTILITIES REQUIRED TO COMPLETE THE WORK SHALL BE INCIDENTAL AND NO SEPARATE PAYMENT SHALL BE MADE.

16. IT IS THE CONTRACTOR'S RESPONSIBILITY TO STOCKPILE NECESSARY MATERIAL ON-SITE OR AT A SECURED OFF-SITE LOCATION AT NO ADDITIONAL EXPENSE TO HARRIS COUNTY. ANY SUITABLE EXCAVATED MATERIAL ON THE PROJECT WHICH IS AVAILABLE AT THE TIME OF NEED; WHETHER FROM STORM SEWER, ROADWAY, AND/OR CHANNEL EXCAVATION, SHALL BE USED BEFORE BORROW IS BROUGHT ON-SITE.

17. MANHOLES, JUNCTION BOXES, INLETS, AND RISERS ARE TO BE PRE-CAST OR CAST IN PLACE.

TRAFFIC SIGNAL

1. ALL ITEMS RELATING TO THE CONSTRUCTION OF TRAFFIC SIGNAL INSTALLATIONS, EXCEPT FOR PUNCHLIST ITEMS, SHALL BE COMPLETED PRIOR TO THE ACTIVATION OF THE SIGNAL SYSTEM(S), UNLESS OTHERWISE REQUIRED BY THE CONTRACT.

2. THE CONTRACTOR SHALL MEET WITH THE HARRIS COUNTY TRAFFIC SIGNAL MAINTENANCE GROUPS FIELD INSPECTOR, HEREAFTER REFERRED TO AS THE TRAFFIC INSPECTOR, ONE-WEEK PRIOR TO THE DESIRED ACTIVATION OF ANY NEW TRAFFIC SIGNALS. THE CONTRACTOR SHALL OBTAIN VERBAL CONCURRENCE FROM THE TRAFFIC INSPECTOR THAT ADEQUATE PROGRESS HAS BEEN ACHIEVED AND THAT ADEQUATE PREPARATIONS ARE IN PLACE TO SCHEDULE A PRE-"TURN ON" WALK-THROUGH INSPECTION MEETING. IF IN THE OPINION OF THE TRAFFIC INSPECTOR, REQUIRED PROGRESS AND ADEQUATE PREPARATIONS ARE NOT COMPLETE, THE PRE-"TURN ON" WALK-THROUGH INSPECTION MEETING WILL BE POSTPONED TO ALLOW ADEQUATE TIME FOR INCOMPLETE CONSTRUCTION ITEMS AND PREPARATIONS TO BE COMPLETED. AFTER THE CONTRACTOR HAS COMPLETED ALL INCOMPLETE ITEMS AND PREPARATIONS, THE CONTRACTOR SHALL REQUEST THE TRAFFIC INSPECTOR REVIEW AND APPROVE ITEMS PREVIOUSLY IDENTIFIED. IF, IN THE OPINION OF THE TRAFFIC INSPECTOR, ALL ITEMS HAVE BEEN ADDRESSED SATISFACTORILY, THE DATE OF THE PRE-"TURN ON" WALK-THROUGH INSPECTION SHALL BE ESTABLISHED. TIME EXTENSIONS TO THE CONTRACT TIME WILL NOT BE GRANTED FOR DELAYS CAUSED BY INCOMPLETE CONSTRUCTION OR INADEQUATE CONTRACTOR PREPARATIONS REQUIRED TO COMPLETE TRAFFIC SIGNAL SYSTEM WITHIN THE TIMEFRAME SET FORTH IN THE CONTRACT.

3. PRIOR TO ACTIVATING A NEW TRAFFIC SIGNAL, THE CONTRACTOR SHALL REQUEST A PRE-"TURN ON" WALK-THROUGH INSPECTION MEETING, IN ACCORDANCE WITH ITEM 2. THE PURPOSE OF THE MEETING WILL BE TO ESTABLISH THAT THE TRAFFIC SIGNAL SYSTEM HAS BEEN CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT, AND IN A MANNER THAT DOES NOT ADVERSELY IMPACT PUBLIC SAFETY. THIS MEETING SHALL BE ATTENDED BY THE TRAFFIC INSPECTOR, THE ENGINEER OF RECORD, AND THE CONTRACTOR. AS A MINIMUM, ANY DEFICIENCIES THAT ADVERSELY IMPACT PUBLIC SAFETY WILL BE IDENTIFIED FOR CORRECTION PRIOR TO ESTABLISHING THE "TURN ON" DATE FOR THE TRAFFIC SIGNAL SYSTEM. ITEMS THAT HAVE AN IMPACT ON PUBLIC SAFETY INCLUDE, BUT ARE NOT LIMITED TO: PAVEMENT MARKINGS AND SIGNAGE, PROPER AND ACCEPTABLE BONDING OF EARTH GROUNDS, PROPERLY ALIGNED TRAFFIC SIGNALS, FULLY OPERATIONAL VEHICULAR AND PEDESTRIAN DETECTION, COMPLETED CABINET-TO-FIELD WIRING, AND PROPERLY TERMINATED ELECTRICAL SERVICE CONDUCTORS. FAILURE TO ADDRESS THE PUNCHLIST ITEMS IDENTIFIED AS BEING CRITICAL TO PUBLIC SAFETY PRIOR TO THE PRE-"TURN ON" WALK-THROUGH MEETING WILL RESULT IN THE TURN ON BEING POSTPONED TO ALLOW ADEQUATE TIME FOR THE INCOMPLETE ITEMS TO BE COMPLETED. AT SUCH TIME AS MEETING ATTENDEES AGREE THAT THE TRAFFIC SIGNAL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT, AND THAT THE TRAFFIC SIGNAL, AS IT EXISTS, IS NOT A THREAT TO PUBLIC SAFETY, A TURN ON DATE WILL BE ESTABLISHED.

4. THE CONTRACTOR SHALL HAVE 10 DAYS FROM THE DATE THE TRAFFIC SIGNAL SYSTEM IS TURNED ON TO COMPLETE ANY PUNCHLIST ITEMS IDENTIFIED AT THE PRE-"TURN ON" WALK-THROUGH MEETING OR AT THE TIME THE SIGNAL SYSTEM IS ACTIVATED THAT ARE NOT OTHERWISE ADDRESSED PRIOR TO ACTIVATION OF THE TRAFFIC SIGNAL SYSTEM.

5. THE CONTRACTOR'S ATTENTION IS DIRECTED TO STANDARD SPECIFICATION ITEM 1000, TRAFFIC SIGNAL INSTALLATION AND MODIFICATION, WHICH INCLUDES PROCEDURES AND REQUIREMENTS REGARDING ACTIVATION OF TRAFFIC SIGNAL CONTROL SYSTEMS. THE PROJECT MANUAL MAY INCLUDE SPECIAL SPECIFICATIONS AND/OR SPECIAL PROVISIONS RELATED TO PROPOSED TRAFFIC CONTROL SIGNAL SYSTEM INSTALLATION(S) AND MODIFICATION(S) REQUIRING THE CONTRACTOR'S ADHERENCE TO DEFINED CHECKLISTS, PROCEDURES AND/OR REPORTS AT NO ADDITIONAL COST TO THE COUNTY BEYOND THE ESTABLISHED BID ITEMS OF THE CONTRACT.

TRAFFIC CONTROL

1. THE CONTRACTOR SHALL PROVIDE AND INSTALL TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH PART VI OF THE MOST RECENT EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AND THE APPROVED TRAFFIC CONTROL PLAN.

2. THE CONTRACTOR SHALL MAINTAIN AT LEAST ONE LANE OF TRAFFIC IN EACH DIRECTION DURING WORKING HOURS EXCEPT DURING FLAGGING OPERATION OR PROVIDE DETOURS AROUND THE CONSTRUCTION SITE AND PROVIDE PUBLIC NOTIFICATION.

3. LANE CLOSURES SHALL BE DURING OFF-PEAK HOURS ONLY (MONDAY THROUGH FRIDAY 9 A.M. TO 4 P.M.) UNIFORMED PEACE OFFICERS OR FLAGGERS IN RADIO CONTACT ARE REQUIRED TO DIRECT TRAFFIC DURING LANE CLOSURES.

4. DETOURS REQUIRE PRIOR APPROVAL OF THE FIELD ENGINEER AND PRECINCT. DETOUR PLANS, IF ALLOWED, MUST INCLUDE APPROPRIATE DETOUR SIGNAGE, PUBLIC NOTICE VIA SIGNAGE TWO WEEKS IN ADVANCE STATING THE DATES OF THE AGREED UPON DATE OF CLOSURE AND DATE THE ROAD WILL RE-OPEN TO TRAFFIC. CONTRACTOR TO USE (WITH PRIOR APPROVAL OF THE FIELD ENGINEER) HIGH EARLY STRENGTH CONCRETE AND OTHER RELATED CONSTRUCTION METHODS TO MINIMIZE THE DURATION OF THE DETOUR AND TO ENSURE THAT THE ROADWAY IS OPEN ON, OR PRIOR TO, THE AGREED UPON DATE.

5. ONE DAY PRIOR TO THE IMPLEMENTATION OF A TRAFFIC CONTROL PLAN PHASE OR STEP, OR THE IMPLEMENTATION OF AN ADDITIONAL, REVISED, OR NEW TRAFFIC CONTROL ELEMENT, THE CONTRACTOR SHALL MEET WITH THE ENGINEER TO GIVE A DETAILED DESCRIPTION OF THE CONTRACTOR'S PLAN AND PREPARATIONS. THE CONTRACTOR SHALL OBTAIN WRITTEN CONCURRENCE FROM THE ENGINEER THAT ADEQUATE PROJECT PROGRESS HAS BEEN ACHIEVED AND THAT ADEQUATE PREPARATIONS ARE IN PLACE PRIOR TO SWITCHING TRAFFIC. IF, IN THE OPINION OF THE ENGINEER, REQUIRED PROGRESS AND ADEQUATE PREPARATIONS ARE NOT COMPLETE, THE CONTRACTOR SHALL NOT IMPLEMENT THE NEXT PHASE, STEP, OR ELEMENT OF TRAFFIC CONTROL UNTIL INCOMPLETE CONSTRUCTION ITEMS OR PREPARATIONS ARE COMPLETED. TIME EXTENSIONS WILL NOT BE GRANTED FOR DELAYS CAUSED BY THE INCOMPLETE CONSTRUCTION ITEMS OR INADEQUATE CONTRACTOR PREPARATIONS REQUIRED TO IMPLEMENT TRAFFIC CONTROL.

6. TRAFFIC CONTROL PER THE CONTRACT IS REQUIRED FOR THE ENTIRE DURATION OF THE PROJECT, INCLUDING THE PUNCHLIST PERIOD. PAYMENT FOR TRAFFIC CONTROL THAT IS PROPERLY INSTALLED FOR LESS THAN A FULL MONTH SHALL BE BASED ON A PERCENTAGE BASIS OF THE TIME INSTALLED. TRAFFIC CONTROL PAYMENTS TO THE CONTRACTOR SHALL END 10 DAYS AFTER SUBSTANTIAL COMPLETION, ALTHOUGH PROPER TRAFFIC CONTROL MUST BE MAINTAINED UNTIL PUNCHLIST COMPLETION.

7. THE PURPOSE OF THE CONSTRUCTION SEQUENCE AND TRAFFIC HANDLING OUTLINED HEREIN IS TO DOCUMENT A VIABLE TCP THAT CAN BE UTILIZED TO CONSTRUCT THE PROJECT. IT IS THE BASIS OF ESTIMATION FOR THE TRAFFIC CONTROL BID ITEMS, AND IS TO BE UTILIZED AND IMPLEMENTED, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

   IF THE CONTRACTOR CHOOSES TO USE A DIFFERENT TCP, HE/SHE SHALL PREPARE AND SUBMIT THE ALTERNATIVE TCP TO THE COUNTY FOR APPROVAL NO LESS THAN 10 WORKING DAYS PRIOR TO THE PROPOSED IMPLEMENTATION DATE. THE TCP SHALL BE DRAWN TO SCALE AND SIGNED & SEALED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS. UPON APPROVAL BY HARRIS COUNTY, THE ALTERNATIVE PLAN SHALL BECOME THE BASIS FOR A "CHANGE IN CONTRACT" TO REVISE THE TRAFFIC CONTROL BID ITEMS ACCORDINGLY AND BECOME PART OF THE CONTRACT DOCUMENTS.

PRECINCT 3 SPECIFIC NOTES

1. ALL TRAFFIC SIGNS (STOP SIGNS, SPEED LIMIT SIGNS, ETC.) THAT ARE REMOVED IN PRECINCT 3 SHALL BE DELIVERED AT NO EXTRA PAY TO THE SPRING SERVICE CENTER AT 4603 SPRING CYPRESS ROAD, SPRING, TEXAS 77388. CALL 713-274-3100 TO MAKE DELIVERY ARRANGEMENTS. ALL SIGNS MUST BE REMOVED FROM POLES AND RETURNED REASONABLY CLEAN.

2. TREE PRESERVATION - CONTRACTOR SHALL PROVIDE PRECINCT 3 WITH CLEAR ACCESS TO ANY TREE DESIGNATED FOR PRESERVATION. CONTRACTOR IS RESPONSIBLE FOR SUCH TREES. CONTRACTOR SHALL CONTACT PRECINCT 3 PARKS ADMINISTRATION OFFICE AT (713) 274-0930, TWO WEEKS PRIOR TO CONSTRUCTION FOR TREE AND LANDSCAPING RELOCATIONS.

3. PROVIDE PRECINCT 3 WITH A DRAWING OR DESCRIPTION FOR ANY PROPOSED "AS AUTHORIZED BY ENGINEER" OR "EXTRA WORK ITEMS" CONCERNING FENCE OR GATE CONSTRUCTION OR RELOCATION AND OBTAIN WRITTEN PRECINCT APPROVAL FOR THE WORK.

4. MANHOLES SHOULD BE FLUSH TO NO MORE THAN 3" ABOVE SURROUNDING GROUND IN NON-PAVED AREAS.

5. USE THE MAXIMUM ALLOWED SPACING BETWEEN RAIL POSTS WHERE THE COMBINATION OF TRAFFIC AND PEDESTRIAN RAIL IS SPECIFIED.

NO.	REVISIONS	DATE	NAME
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HARRIS COUNTY
ENGINEERING DEPARTMENT

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-423?8
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
SHEET DESCRIPTION:	GENERAL NOTES - PRECINCT 3
DRAWN BY: DWQ	DATE: 11/16/23
CK'D BY: DWQ	SCALE: NTS
	SHEET NO: 03 / 38

HCFCD NOTES

1. FENCES AND/OR OTHER ENCROACHMENTS IN THE HCFCD RIGHT-OF-WAY ARE NOT TO BE REMOVED UNLESS OTHERWISE STATED ON THE PLANS. IN CASES WHERE FENCE REMOVAL IS INDICATED ON THE PLANS, THE FENCE SHALL BE REMOVED AND PLACED NEATLY ON THE ADJACENT PROPERTY AT THE START OF CONSTRUCTION. WHERE THERE IS NOT ASEPARATE ITEM LISTED ON THE UNIT PRICE SCHEDULE, THE ENCROACHMENT REMOVAL IS INCIDENTAL TO SITEPREPARATION AND RESTORATION.

2. DO NOT ENTER PRIVATE PROPERTY WITHOUT PROPER WRITTEN AUTHORIZATION FROM THE OWNER. PROVIDE COPY OF WRITTEN PERMISSION TO HCFCD.

3. STRIP VEGETATION AND TOPSOIL AND STOCKPILE FOR REUSE ONSITE. MATERIAL FOUND UNACCEPTABLE BY THE ENGINEER WILL BE REMOVED AND PAID AS EXCAVATION AND OFFSITE DISPOSAL. NO SEPARATE MEASUREMENT AND PAYMENT WILL BE MADE FOR STRIPPING, STOCKPILING AND PLACING ON-SITE TOPSOIL. THE COST FOR THIS WORK WILL BE INCIDENTAL TO RELATED PAY ITEMS UNDER SPECIFICATION SECTION NUMBER 02315 LISTED ON THE UNIT PRICE SCHEDULE.

4. RIPRAP AND GRANULAR FILL MATERIAL REMOVED DURING EXCAVATION, MEETING SPECIFICATION SECTION NUMBER 02378, SHALL BE REUSED AS DIRECTED BY THE ENGINEER. REUSED MATERIAL WILL BE MEASURED AND PAID FOR AS EXCAVATION AND ON-SITE FILL UNDER SPECIFICATION NUMBER 02315. NO SEPARATE MEASUREMENT OR PAYMENT WILLBE MADE FOR PROCESSING, HANDLING, STOCKPILING, AND PLACING MATERIAL FOUND TO BE ACCEPTABLE FOR REUSE. UPON APPROVAL OF THE ENGINEER, DISPOSAL OF NONCONFORMING RIPRAP AND GRANULAR FILL MATERIAL WILL BE MEASURED AND PAID FOR AS REMOVE AND DISPOSE OF CONCRETE RUBBLE UNDER SPECIFICATION SECTION NUMBER 02120, MATERIAL DISPOSAL.

5. THE LOCATION AND GRADE OF THE BACKSLOPE INTERCEPTOR STRUCTURES AND SWALES MAY BE

6. ADJUSTED IN THE FIELD BY THE ENGINEER AT THE TIME OF CONSTRUCTION. UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER, THE BACKSLOPE INTERCEPTOR STRUCTURE SHALL BE SET AT A MAXIMUM DEPTH OF 2.5 FEET AND THE MINIMUM GRADE FOR BACKSLOPE SWALES SHALL BE 0.2%. ADJUST AND/OR EXTEND YARD DRAINS TO OUTFALL AT TOE OF CHANNEL PER STANDARD OUTFALL DETAILS. PAYMENT WILL BE INCIDENTAL TO SITE PREPARATION AND RESTORATION.

7. COMPLETED SECTIONS OF THE CHANNEL WILL BE TURNED OVER FOR VEGETATION ESTABLISHMENT IN MAXIMUM 1500 LINEAR FOOT SEGMENTS. CONTRACTOR MAY NOT DISTURB GREATER THAN 1500 LF OF CHANNEL AT A TIME.

8. CLEAR AND REMOVE ALL SILT FROM CULVERTS, PIPES AND UNDER BRIDGES TO THE PROPOSED DESIGN GRADES TO PROVIDE POSITIVE FLOW.

9. LENGTHS AND DIAMETERS REPRESENTED ON PLANS ARE APPROXIMATE. CONTRACTOR WILL BE RESPONSIBLE FOR FIELD VERIFICATION PRIOR TO ORDERING MATERIALS.

10. ACTIVITIES THAT DISTURB BIRD HABITAT, INCLUDING BUT NOT LIMITED TO CLEARING, GRUBBING, AND IMPACTS TO STRUCTURES WHERE MIGRATORY BIRDS AND BALD EAGLES MIGHT NEST, REQUIRE A NEST HABITAT SURVEY. DO NOT PROCEED UNTIL HARRIS COUNTY FLOOD CONTROL DISTRICT HAS CONDUCTED A NEST HABITAT SURVEY TO VERIFY ACTIVE MIGRATORY BIRD NESTS AND BALD EAGLE NESTS ARE NOT PRESENT. THE HARRIS COUNTY FLOOD CONTROL DISTRICT MUST PROVIDE WRITTEN AUTHORIZATION TO PROCEED.

11. WHEN BANK EROSION REPAIRS CALL FOR THE PLACEMENT OF 3"X5" GRANULAR FILL IN THE CHANNEL BOTTOM TO ESTABLISH A BASE FOR REBUILDING THE SLOPE. THE 3"X5" GRANULAR FILL SHALL BE LIMITED TO AN ELEVATION 6-INCHES ABOVE THE NORMAL WATER SURFACE ELEVATION LEVEL.

12. THE CONTRACT CONTAINS UNIT ITEMS FOR THE ESTABLISHMENT OF BEST MANAGEMENT PRACTICES FOR STORM WATER QUALITY PURPOSES. WHEN NOT CALLED FOR IN THE PROJECT PLANS, COORDINATE THE NEED AND LOCATION OF THESE UNIT ITEMS WITH THE DISTRICT REPRESENTATIVE ON SITE PRIOR TO PLACEMENT. THESE UNIT ITEMS INCLUDE, BUT ARE NOT LIMITED TO, REINFORCED SILT FENCE FOR MATERIAL STOCKPILES, ANCHORED SODDING FOR DISTURBED EARTHEN AREAS OR AROUND CONCRETE AND CONCRETE INTERCEPTOR, AND STABILIZED CONSTRUCTION ACCESS FOR PROJECT SITE INGRESS/EGRESS.

13. WHEN INCLUDED IN THE SCOPE OF WORK, THE PURPOSE OF DEEP PLOWING THE SLOPE OR BERM OF A CHANNEL IS TO BREAK UP THE DESICCATED SOILS AND TO ELIMINATE ANY VOIDS, OR RILLING CLOSE TO THE SURFACE OF THE SLOPE OR BERM. THE CONTRACTOR WILL DEEP PLOW THE SLOPE OR BERM TO A MINIMUM DEPTH OF 2 FEET IN AREAS CONTAINING VOIDS AND/OR RILLING. IN AREAS OF VOIDS ONLY, THE SURFACE FROM WHICH THE 2 FEET DEPTH IS MEASURED WILL BE THE LEVEL OF THE SURROUNDING UNDISTURBED SOIL. IN AREAS OF RILLING, THE RILLS WILL FIRST BE KNOCKED DOWN AND LEVELED OFF. THE 2 FEET DEPTH WILL THEN BE MEASURED FROM THIS NEW SURFACE. THE CONTRACTOR WILL DETERMINE THE MEANS AND METHODS FOR DEEP PLOWING.)

14. TREES AND PLANTS LOCATED WITHIN A DESIGNATED TREE PROTECTION ZONE (TPZ) SHALL BE PRESERVED. REFER TO SPECIFICATION SECTION 01566 – TREE AND PLANT PROTECTION, FOR DETAILED INFORMATION ON TREE AND PLANT PRESERVATION PRACTICES AND PROCEDURES INCLUDING, BUT NOT LIMITED TO, ROOT PRUNING, VEGETATION TRIMMING, FENCING AND OTHER PRESERVATION OPERATIONS.

15. IF APPLICABLE, CONTRACTOR SHALL AVOID ANY WETLAND AREAS BEYOND THE LIMITS OF EXCAVATION AND CLEARING. AS THE FIRST WORK ITEM CONTRACTOR WILL BE RESPONSIBLE FOR INSTALLING FENCING OR OTHER MATERIAL TO IDENTIFY AND PROTECT THE IDENTIFIED WETLAND AREAS, UNLESS WETLANDS HAVE BEEN IDENTIFIED AND FENCED BY HCFCD PRIOR TO CONSTRUCTION AND CONTRACTOR HAS WRITTEN EVIDENCE OF SUCH.

PRIVATE UTILITY NOTES

AT&T TEXAS / SWBT FACILITIES

1. THE LOCATIONS OF AT&T TEXAS/SWBT FACILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK. HE AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.

2. THE CONTRACTOR SHALL CALL 1-800-344-8377 A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE UNDERGROUND LINES FIELD LOCATED.

3. WHEN EXCAVATING WITHIN EIGHTEEN INCHES (18") OF THE INDICATED LOCATION OF AT&T TEXAS/SWBT FACILITIES, ALL EXCAVATIONS MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES. WHEN BORING, THE CONTRACTOR SHALL EXPOSE THE AT&T TEXAS/SWBT FACILITIES.

4. WHEN AT&T TEXAS/SWBT FACILITIES ARE EXPOSED, THE CONTRACTOR WILL PROVIDE SUPPORT TO PREVENT DAMAGE TO THE CONDUIT DUCTS OR CABLES. WHEN EXCAVATING NEAR TELEPHONE POLES THE CONTRACTOR SHALL BRACE THE POLE FOR SUPPORT.

5. THE PRESENCE OR ABSENCE OF AT&T TEXAS/SWBT UNDERGROUND CONDUIT FACILITIES OR BURIED CABLE FACILITIES SHOWN ON THESE PLANS DOES NOT MEAN THAT THERE ARE NO DIRECT BURIED CABLES OR OTHER CABLES IN THE AREA. FOLLOW THE DIRECT BURIED CABLE PROCEDURES TO LOCATE THE AT&T TEXAS/SWBT DIRECT BURIED CABLES AS INDICATED IN THE AT&T TEXAS RESEARCH AND SIGNATURE PROCESS FOR AT&T TEXAS/SWBT FACILITIES.

6. PLEASE CONTACT THE AT&T TEXAS DAMAGE PREVENTION MANAGER MR. ROOSEVELT LEE JR. AT (713)567-4552 OR EMAIL HIM AT RL7259@ATT.COM, IF THERE ARE QUESTIONS ABOUT BORING OR EXCAVATION NEAR OUR AT&T TEXAS/SWBT FACILITIES.

CAUTION: UNDERGROUND GAS FACILITIES

THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT 1-800-545-6005 OR 811 A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.

- WHEN CENTERPOINT ENERGY PIPE LINE MARKINGS ARE NOT VISIBLE, CALL (713) 207-5463 OR (713) 945-8037 (7:00 A.M. TO 4:30 P.M.) FOR STATUS OF LINE LOCATION REQUEST BEFORE EXCAVATION BEGINS.
- WHEN EXCAVATING WITHIN EIGHTEEN INCHES (18') OF THE INDICATED LOCATION OF CENTERPOINT ENERGY FACILITIES, ALL EXCAVATION MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES.
- WHEN CENTERPOINT ENERGY FACILITIES ARE EXPOSED, SUFFICIENT SUPPORT MUST BE PROVIDED TO THE FACILITIES TO PREVENT EXCESSIVE STRESS ON THE PIPING.
- FOR EMERGENCIES REGARDING GAS LINES CALL (713) 659-3552 OR (713) 207-4200.

THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

WARNING: OVERHEAD ELECTRICAL FACILITIES

OVERHEAD LINES MAY EXIST ON THE PROPERTY. THE LOCATION OF OVERHEAD LINES HAS NOT BEEN SHOWN ON THESE DRAWINGS AS THE LINES ARE CLEARLY VISIBLE, BUT YOU SHOULD LOCATE THEM PRIOR TO BEGINNING ANY CONSTRUCTION. TEXAS LAW, SECTION 752, HEALTH & SAFETY CODE FORBIDS ACTIVITIES THAT OCCUR IN CLOSE PROXIMITY TO HIGH VOLTAGE LINES, SPECIFICALLY:

- ANY ACTIVITY WHERE PERSON OR THINGS MAY COME WITHIN SIX(6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES; AND
- OPERATING A CRANE, DERRICK, POWER SHOVEL, DRILLING RIG, PILE DRIVER, HOISTING EQUIPMENT, OR SIMILAR APPARATUS WITHIN 10 FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES.

PARTIES RESPONSIBLE FOR THE WORK, INCLUDING CONTRACTORS ARE LEGALLY RESPONSIBLE FOR THE SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW. THIS LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE TURNED OFF OR REMOVED CALL CENTERPOINT ENERGY AT (713) 207-2222.

ACTIVITIES ON OR ACROSS CENTERPOINT ENERGY FEE OR EASEMENT PROPERTY

NO APPROVAL TO USE, CROSS OR OCCUPY CENTERPOINT FEE OR EASEMENT PROPERTY IS GIVEN. IF YOU NEED TO USE CENTERPOINT PROPERTY, PLEASE CONTACT OUR SURVEYING & RIGHT OF WAY DIVISION AT (713) 207-6348 OR (713) 207-5769.

48 HOUR NOTICE:

CONTRACTOR SHALL NOTIFY HARRIS COUNTY PRIOR TO COMMENCING CONSTRUCTION AND/OR BACKFILLING ANY UTILITIES. CONTRACTOR(S) TO CONTACT PUBLIC REVIEW DEPARTMENT @ (713-274-3931) OR (PUBLIC.REVIEW@HCPID.ORG).

NO.	REVISIONS	DATE	NAME
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HARRIS COUNTY ENGINEERING DEPARTMENT

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC. F-5333

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS

SHEET DESCRIPTION: GENERAL NOTES – PRIVATE UTILITIES

DRAWN BY:		DATE:
DWQ		11/16/23
CK'D BY:	SCALE:	SHEET NO:
DWQ	NTS	04 / 38

		Mueschke Rd at Destination Dr	Juergen Rd at Cypress Heights Dr		
Harris County Specification	Description	Quantity	Quantity	Total	Unit
677, 1000	Furnish and Install 1" Schedule 40 PVC Conduit	180	0	180	LF
677, 1000	Furnish and Install 2" Schedule 40 PVC Conduit	1300	50	1350	LF
677, 1000	Furnish and Install 3" Schedule 40 PVC Conduit	200	30	230	LF
677, 1000	Furnish and Install 4" Schedule 40 PVC Conduit	250	30	280	LF
680, 1000	Furnish and Install HC10034 (34') Steel Strain Pole	3	0	3	EA
680, 1000	Furnish and Install 44' Steel Mast Arm	2	0	2	EA
680, 1000	Furnish and Install 20' Steel Mast Arm	1	0	1	EA
680, 1000	Furnish and Install 30' Steel Mast Arm	1	0	1	EA
680, 1000	Furnish and Install 40' Wood Strain Pole	0	4	4	EA
680, 1000	Furnish and Install Meter Pole, Service Loop and Safety Switch [Type D(MOD 1) (120/240) 000 (NS) SS (N) SP (O)]	1	1	2	EA
680, 1000	Furnish and Install Meter Pole, Disconnect [Type D(MOD 2) (120/240) 070 (NS) SS (E) SP (O)]	1	1	2	EA
411, 1000, DWGS	Furnish and Install Reinforced Concrete Pole Foundation (Class B2), (TYPE 10036), Including Anchor Bolts	60	0	60	VF
1000, DWGS	Furnish and Install Polymer Concrete Pull Box (Type D) with Lid and Apron	18	0	18	EA
1000, DWGS	Furnish and Install Polymer Concrete Ground Box with Lid and Apron	1	1	2	EA
686, 1000	Furnish and Install 15' Luminaire Arm with LED Luminaire Fixture with Shorting Cap	2	2	4	EA
692, 699, 1000	Furnish and Install LED (AC Input Voltage) Single Section Symbolic Pedestrian (Countdown) Signal Assembly, All Hardware	4	2	6	EA
692, 1000	Furnish and Install Pedestrian Push Button Station (Right Arrow, Left Arrow, Double Arrow)	4	2	6	EA
689, 690, 1000	Furnish and Install 12", One Way, 3 Section LED (AC Input Voltage) Horizontal Signal Assembly, All Hardware	8	6	14	EA
689, 690, 1000	Furnish and Install 12", One Way, 4 Section LED (AC Input Voltage) Horizontal Signal Assembly, All Hardware	1	1	2	EA
1000, DWGS	Furnish and Install Accuscan 300 Detection Cameras	1	3	4	EA
624, 648, 1000	Furnish and Install Span Wire Mounted "Street Name Sign (VARIES X 18")	4	3	7	EA
1000, 1210, SS2071	Furnish and Install Harris County ATC Controller	1	1	2	EA
1000, 1210, SS2071	Furnish and Install Ground Mount ITS Controller Cabinet Assembly (HC)(Housing 3) with Side Mounted Battery Backup Syster	1	1	2	EA
660, 1000	Furnish and Install 4" Solid White - Type 1 Reflectorized Pavement Markings	80	0	80	LF
660, 1000	Furnish and Install 24" Solid White - Type 1 Reflectorized Pavement Markings	93	73	166	LF
679, 1000	Furnish and Install #4 AWG, XHHW (Stranded) Wire	140	100	240	LF
679, 1000	Furnish and Install #8 AWG, Bare Copper (Solid) Wire with Grounding Hardware	1200	1100	2300	LF
679, 1000	Furnish and Install 2/C #14 AWG (IMSA 20-1) (Stranded) Cable	1300	1100	2400	LF
679, 1000	Furnish and Install 2/C #14 AWG (IMSA 50-2) (Stranded) Cable	6500	0	6500	LF
679, 1000	Furnish and Install 4/C #14 AWG (IMSA 20-1) (Stranded)Cable	400	350	750	LF
679, 1000	Furnish and Install 7/C #14 AWG (IMSA 20-1) (Stranded) Cable	1400	1400	2800	LF
SS678	Furnish and Install 1/4" 7 Wire Strand (Siemens-Martin) Zinc Coated Steel Wire Strand with Hardware	0	900	900	LF
679, 1000	Furnish and Install 5/16" 7 Wire Strand (Siemens-Martin) Zinc Coated Steel Wire Strand with Hardware	0	1300	1300	LF
SS 6009	Furnish and Install and Integrate Wireless Router For Traffic Signals	1	1	2	EA
SS 6010	Furnish and Install Cellular LTE Antenna For Traffic Signals	1	1	2	EA
SS 6011	Furnish and Install and Integrate Field Hardened Ethernet Switch For Traffic Signals	1	1	2	EA
SS 6011	Furnish and Install Rack Mounting Bracket For Field Hardened Ethernet Switch For Traffic Signals	1	1	2	EA
55 9011, HC APPR	Furnish and Install CAT5E Patchcord With Boot	4	4	8	EA

NO.	REVISIONS	DATE	NAME
1			
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HARRIS COUNTY
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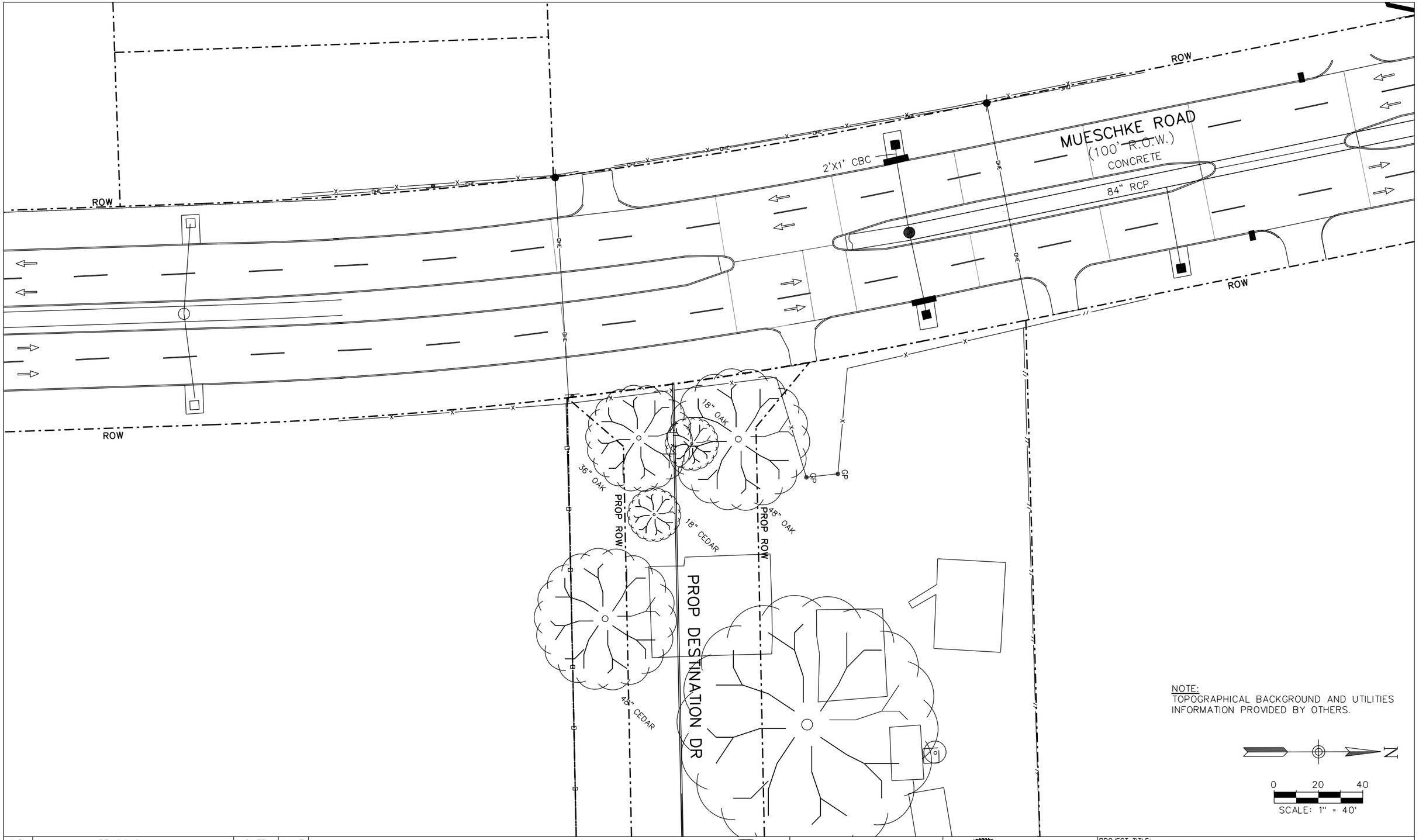
TBPLS Firm Reg. No.: 100292-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS

SHEET DESCRIPTION: BASIS OF ESTIMATE

DRAWN BY: DWQ		DATE: 11/16/23
CK'D BY: DWQ	SCALE: NTS	SHEET NO: 05 / 38



NOTE:
TOPOGRAPHICAL BACKGROUND AND UTILITIES INFORMATION PROVIDED BY OTHERS.

N

0 20 40

SCALE: 1" = 40'

NO.	REVISIONS	DATE	NAME
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STATE OF TEXAS
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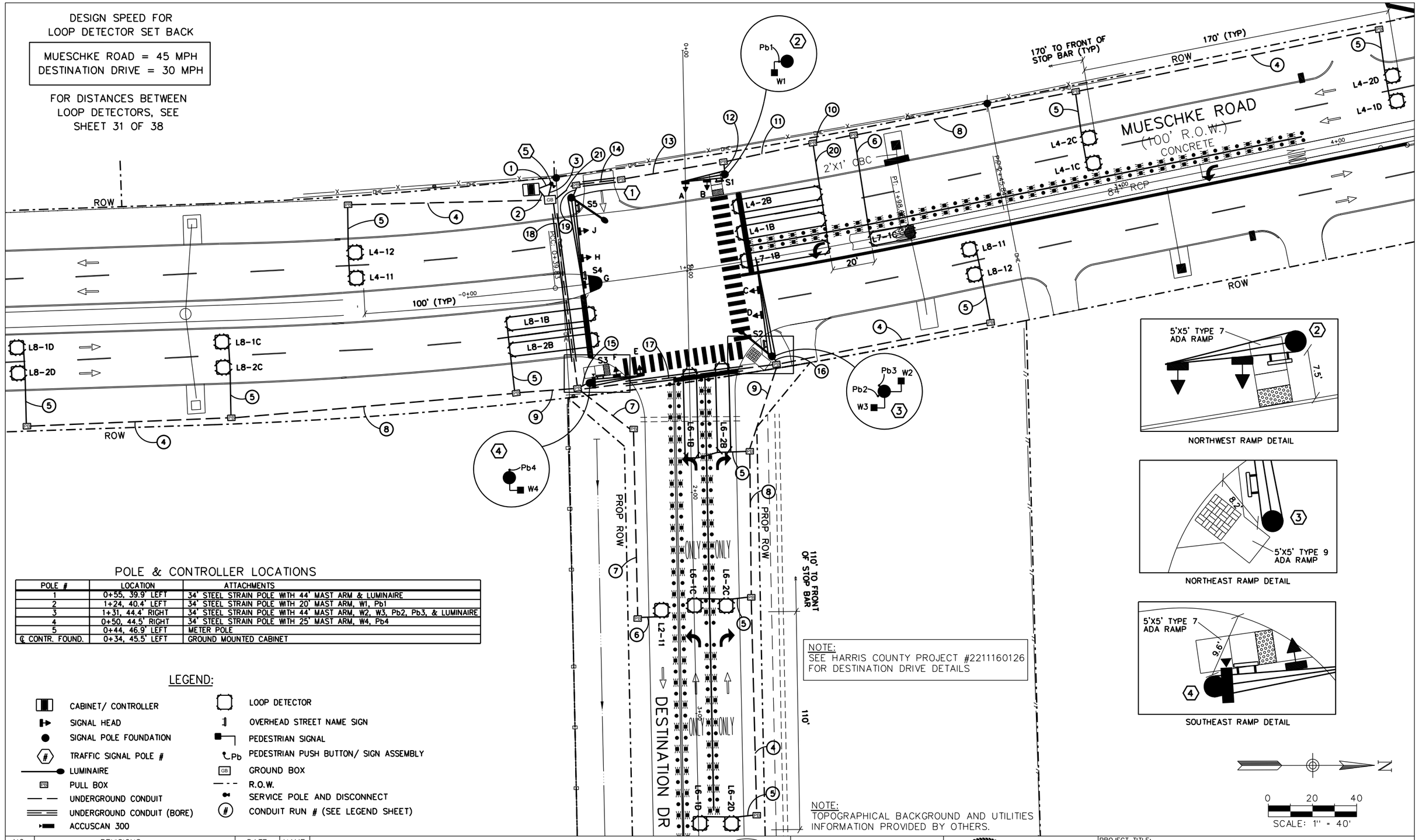
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS	
	MUESCHKE RD AT DESTINATION DR	
SHEET DESCRIPTION:	EXISTING CONDITIONS	
DRAWN BY: DWQ	SHEET 1 OF 1	DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40'	SHEET NO: 06 / 38

DESIGN SPEED FOR
LOOP DETECTOR SET BACK

MUESCHKE ROAD = 45 MPH
DESTINATION DRIVE = 30 MPH

FOR DISTANCES BETWEEN
LOOP DETECTORS, SEE
SHEET 31 OF 38



NORTHWEST RAMP DETAIL

NORTHEAST RAMP DETAIL

SOUTHEAST RAMP DETAIL

N

0 20 40

SCALE: 1" = 40'

POLE & CONTROLLER LOCATIONS

POLE #	LOCATION	ATTACHMENTS
1	0+55, 39.9' LEFT	34' STEEL STRAIN POLE WITH 44' MAST ARM & LUMINAIRE
2	1+24, 40.4' LEFT	34' STEEL STRAIN POLE WITH 20' MAST ARM, W1, Pb1
3	1+31, 44.4' RIGHT	34' STEEL STRAIN POLE WITH 44' MAST ARM, W2, W3, Pb2, Pb3, & LUMINAIRE
4	0+50, 44.5' RIGHT	34' STEEL STRAIN POLE WITH 25' MAST ARM, W4, Pb4
5	0+44, 46.9' LEFT	METER POLE
℄ CONTR. FOUND.	0+34, 45.5' LEFT	GROUND MOUNTED CABINET

LEGEND:

- CABINET/ CONTROLLER
- SIGNAL HEAD
- SIGNAL POLE FOUNDATION
- TRAFFIC SIGNAL POLE #
- LUMINAIRE
- PULL BOX
- UNDERGROUND CONDUIT
- UNDERGROUND CONDUIT (BORE)
- ACCUSCAN 300
- LOOP DETECTOR
- OVERHEAD STREET NAME SIGN
- PEDESTRIAN SIGNAL
- PEDESTRIAN PUSH BUTTON/ SIGN ASSEMBLY
- GROUND BOX
- R.O.W.
- SERVICE POLE AND DISCONNECT
- CONDUIT RUN # (SEE LEGEND SHEET)

NOTE:
SEE HARRIS COUNTY PROJECT #2211160126
FOR DESTINATION DRIVE DETAILS

NOTE:
TOPOGRAPHICAL BACKGROUND AND UTILITIES INFORMATION PROVIDED BY OTHERS.

NO.	REVISIONS	DATE	NAME
1			
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11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	MUESCHKE RD AT DESTINATION DR
SHEET DESCRIPTION:	TRAFFIC SIGNAL LAYOUT
DRAWN BY: DWQ	SHEET 1 OF 1 — DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40' — SHEET NO: 07 / 38

NOTES TO CONTRACTOR:

1. LOCATION OF UTILITIES SHOWN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE-GROUND OR OVERHEAD.
2. CALL THE FOLLOWING NUMBERS FOR LOCATION OF UNDER-GROUND FACILITIES 72 HOURS PRIOR TO ANY EXCAVATION IN AREA:
   UTILITIES: (713) 223-4567 (HOUSTON)
   1-800-669-8344 (OUTSIDE HOUSTON)
   PIPELINES: 1-800-245-4545 AND 1-800-344-8377
3. ALL CONSTRUCTION SIGNS AND BARRICADES SHALL CONFORM TO THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.
4. ALL CONDUITS UNDER ROADWAYS AND DRIVEWAYS SHALL BE BORED AND JACKED. CONTRACTOR SHALL EXERCISE CAUTION WHEN BORING AND/OR EXCAVATING IN THE VICINITY OF UNDERGROUND UTILITIES.
5. NO LOOP DETECTOR SHALL BE CUT IN A PARALLEL EXPANSION JOINT. LOOPS CUT ACROSS EXPANSION JOINTS SHALL HAVE SLACK CABLE FOR EXPANSION.
6. CONTRACTOR SHALL RESTORE THE CONSTRUCTION AREA TO ORIGINAL CONDITION PRIOR TO FINAL INSPECTION.
7. EXACT LOCATION OF POLES, CONTROLLER, SIGNAL HEADS, PULL BOXES AND LOOP DETECTORS SHALL BE DETERMINED IN THE FIELD SUBJECT TO FINAL APPROVAL BY ENGINEER IN THE FIELD.
8. ALL CONDUITS UNDER PAVED SHOULDERS OR NATURAL GROUND SHALL BE TRENCHED AND BURIED. HOWEVER, THE CONTRACTOR SHALL BACKFILL, COMPACT AND RESTORE TRENCHED AREA TO ORIGINAL CONDITION AND MATCH EXISTING SURFACE CONDITION TO THE DENSITY OF ADJACENT AREA. EXISTING GRASS AREA SHOULD BE RE-SODDED.
9. REFER TO SIGNING AND PAVEMENT MARKING PLAN FOR ADDITIONAL INFORMATION PERTAINING TO CROSSWALK AND STOP LINE LOCATIONS.
10. CONTRACTOR SHALL RETURN ALL SALVAGEABLE ITEMS TO HARRIS COUNTY AS DIRECTED.

CONTROLLER

PROPOSED 2070LCS ADVANCED TRANSPORTATION CONTROLLER ASSEMBLY

Signal Phasing Diagram shall comply with Harris County Standard detection sequence and shall be determined during signal turn-on.

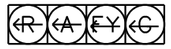
Phase 1 Westbound Left Turn	Phase 2 Eastbound Thru	Phase 3 Northbound Left Turn	Phase 4 Southbound Thru
Phase 5 Eastbound Left Turn	Phase 6 Westbound Thru	Phase 7 Southbound Left Turn	Phase 8 Northbound Thru

PROPOSED SIGNAL HEAD SCHEDULE

ONE-WAY
3-SECTION HORIZONTAL
12" LED SIGNAL HEAD

A, B, C, D,
E, F, H, J

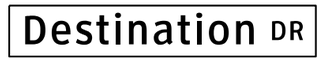
ONE-WAY
4-SECTION HORIZONTAL
12" LED SIGNAL HEAD
W/ FLASHING YELLOW ARROW



G

SIGN SCHEDULE

S1, S3
9.0' x 1.5'



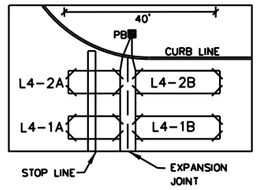
S2, S5
9.5' x 1.5'

S4
24" x 30"

LOOP DETECTOR CHART

LOOP	SIZE	SETTING	FUNCTION	LOOP	SIZE	SETTING	FUNCTION
L2-11	6'X6'	PULSE	SYSTEM DETECTOR	L6-1D	6'X6'	PULSE	CALL AND EXTEND ø6
L4-1B	6'X40'	PRESENCE	CALL AND EXTEND ø4	L6-2D	6'X6'	PULSE	CALL AND EXTEND ø6
L4-2B	6'X40'	PRESENCE	CALL AND EXTEND ø4	L7-1B	6'X40'	PRESENCE	CALL AND EXTEND ø7
L4-1C	6'X6'	PULSE	CALL AND EXTEND ø4	L7-1C	6'X20'	PRESENCE	CALL AND EXTEND ø7
L4-2C	6'X6'	PULSE	CALL AND EXTEND ø4	L8-1B	6'X40'	PRESENCE	CALL AND EXTEND ø8
L4-1D	6'X6'	PULSE	CALL AND EXTEND ø4	L8-2B	6'X40'	PRESENCE	CALL AND EXTEND ø8
L4-2D	6'X6'	PULSE	CALL AND EXTEND ø4	L8-1C	6'X6'	PULSE	CALL AND EXTEND ø8
L4-11	6'X6'	PULSE	SYSTEM DETECTOR	L8-2C	6'X6'	PULSE	CALL AND EXTEND ø8
L4-12	6'X6'	PULSE	SYSTEM DETECTOR	L8-1D	6'X6'	PULSE	CALL AND EXTEND ø8
L6-1B	6'X40'	PRESENCE	CALL AND EXTEND ø6	L8-2D	6'X6'	PULSE	CALL AND EXTEND ø8
L6-2B	6'X40'	PRESENCE	CALL AND EXTEND ø6	L8-11	6'X6'	PULSE	SYSTEM DETECTOR
L6-1C	6'X6'	PULSE	CALL AND EXTEND ø6	L8-12	6'X6'	PULSE	SYSTEM DETECTOR
L6-2C	6'X6'	PULSE	CALL AND EXTEND ø6				

DETAIL A



SEE "DETAIL A" IN CASE PRESENCE LOOPS CROSS CONC. EXPANSION JOINT

PROPOSED PEDESTRIAN SIGNAL UNITS

LED COUNTDOWN PEDESTRIAN SIGNAL HEADS

W1, W2
W3, W4

ACCESSIBLE PEDESTRIAN PUSH BUTTONS

R10-3eR

R10-3eL

Pb1, Pb3

Pb2, Pb4

ELECTRICAL CHART

ITEM	RUN NUMBER	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑
LUMINAIRE & SIGN LIGHT	2/C #14 (IMSA 20-1)(STRANDED)			2													1	1		1		1
PUSH BUTTON	2/C #14 (IMSA 20-1)(STRANDED)		4										1	1	1	1	2	2	3			1
PED. SIGNAL	4/C #14 (IMSA 20-1)(STRANDED)		4										1	1	1	1	2	2	3			1
VEH. SIGNAL	7/C #14 (IMSA 20-1)(STRANDED)		9										2	2	2	2	2	2	4	3		5
GROUND BARE	#8 BARE COPPER		1	1									1	1	1	1	1	1	1	1		1
POWER	1/C-#4 AWG XHHW (STRANDED)	2																				
LOOP DETECTOR	2~#14 XHHW STRAND					2	1														3	
	2/C #14 (IMSA 50-2) (STRANDED)		23		2			1	4	6	5	8		8	8			8	15			8
CONDUIT	1 INCH PVC						1	1														
	2 INCH PVC	1		1	1	1			1				1			1	1			1	1	
	3 INCH PVC									1	1	1		1	1			1	1			1
	4 INCH PVC		1																			

ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE DESCRIPTION(SEE ELECTRICAL DETAILS - SERVICE SUPPORT SF & SP	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT		TWO-POLE CONTACTOR AMPS	PANELBD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
				SWITCH AMP/FUSES	CKT. BRK. POLE/AMP					
TY D (120/240)070(NS)SS(E)SP(O)	1 1/4"	3/#4	N/A	N/A	2P/70	20	70	TRAFFIC SIGNAL LIGHTING	1P/50 2P/20	<7.1

NO.	REVISIONS	DATE	NAME
1			
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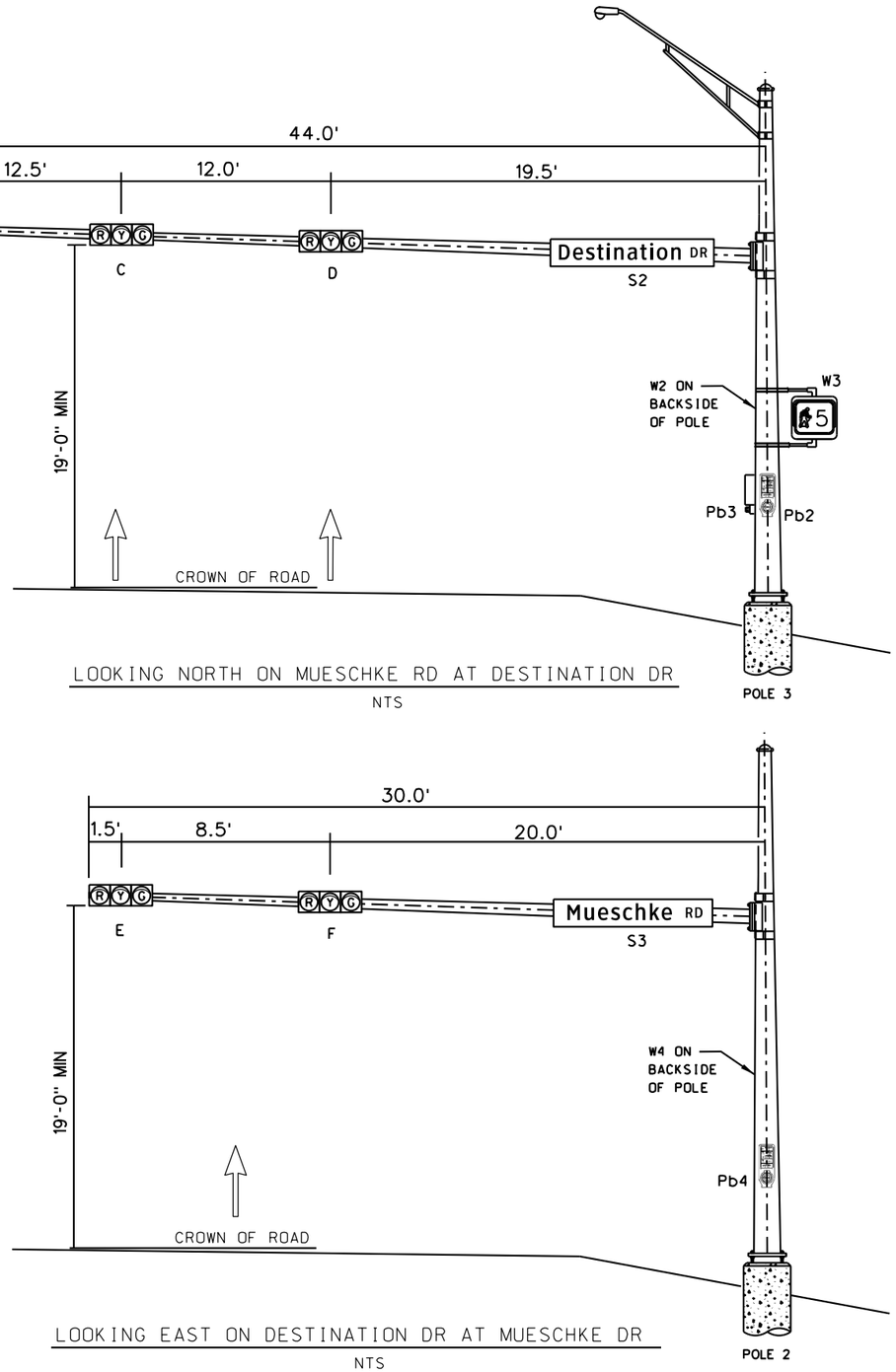
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100252-00

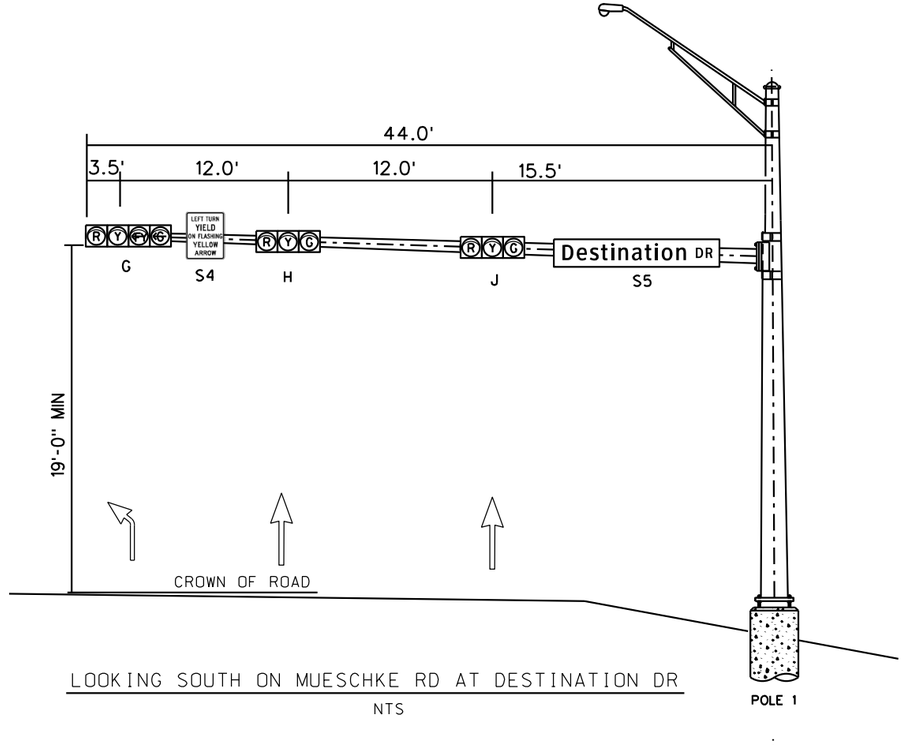
STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS
MUESCHKE RD AT DESTINATION DR
SHEET DESCRIPTION: TRAFFIC SIGNAL LEGEND
DRAWN BY: DWQ
CK'D BY: DWQ
SHEET 1 OF 1
SCALE: 1"=40'
DATE: 11/16/23
SHEET NO: 08 / 38



LOOKING NORTH ON MUESCHKE RD AT DESTINATION DR

NTS



LOOKING SOUTH ON MUESCHKE RD AT DESTINATION DR

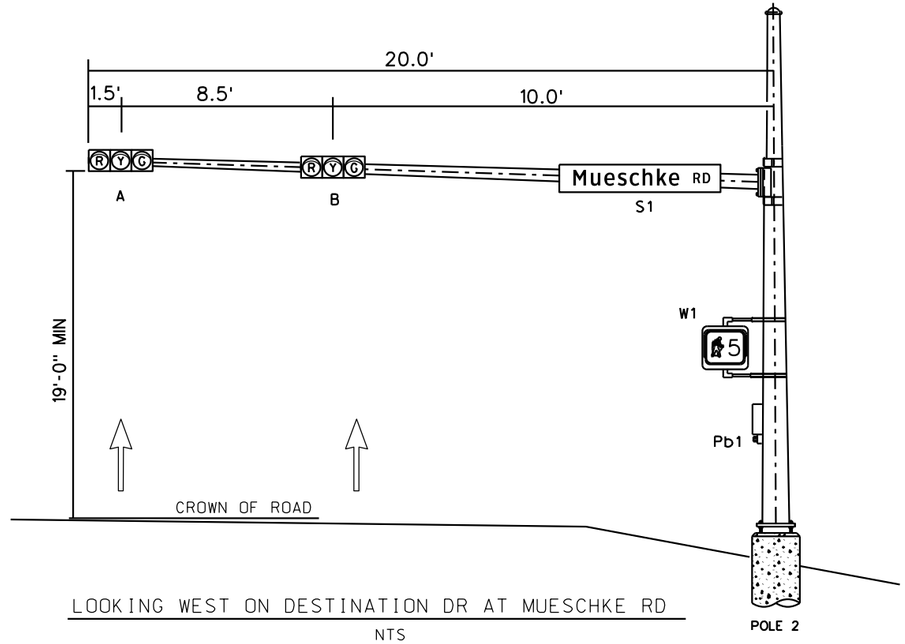
NTS

LOOKING EAST ON DESTINATION DR AT MUESCHKE DR

NTS

NOTES:

1. CENTER HEADS OVER THE LANES OR AS DIRECTED BY ENGINEER.DISTANCES SHOWN ALONG MAST ARMS ARE APPROXIMATE AND MUST BE ADJUSTED IN THE FIELD AS NEEDED.
2. FOUNDATIONS WILL BE ADJUSTED IN THE FIELD IN ORDER TO MEET CLEARANCES.
3. LOCATION OF MAST ARMS IS APPROXIMATE. ANY CHANGE WILL BE APPROVED BY THE ENGINEER.
4. MAST ARM ATTACHMENT HEIGHT WILL BE CALCULATED BY THE CONTRACTOR IN THE FIELD AND APPROVED BY THE ENGINEER.



LOOKING WEST ON DESTINATION DR AT MUESCHKE RD

NTS

NO.	REVISIONS	DATE	NAME
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STATE OF TEXAS
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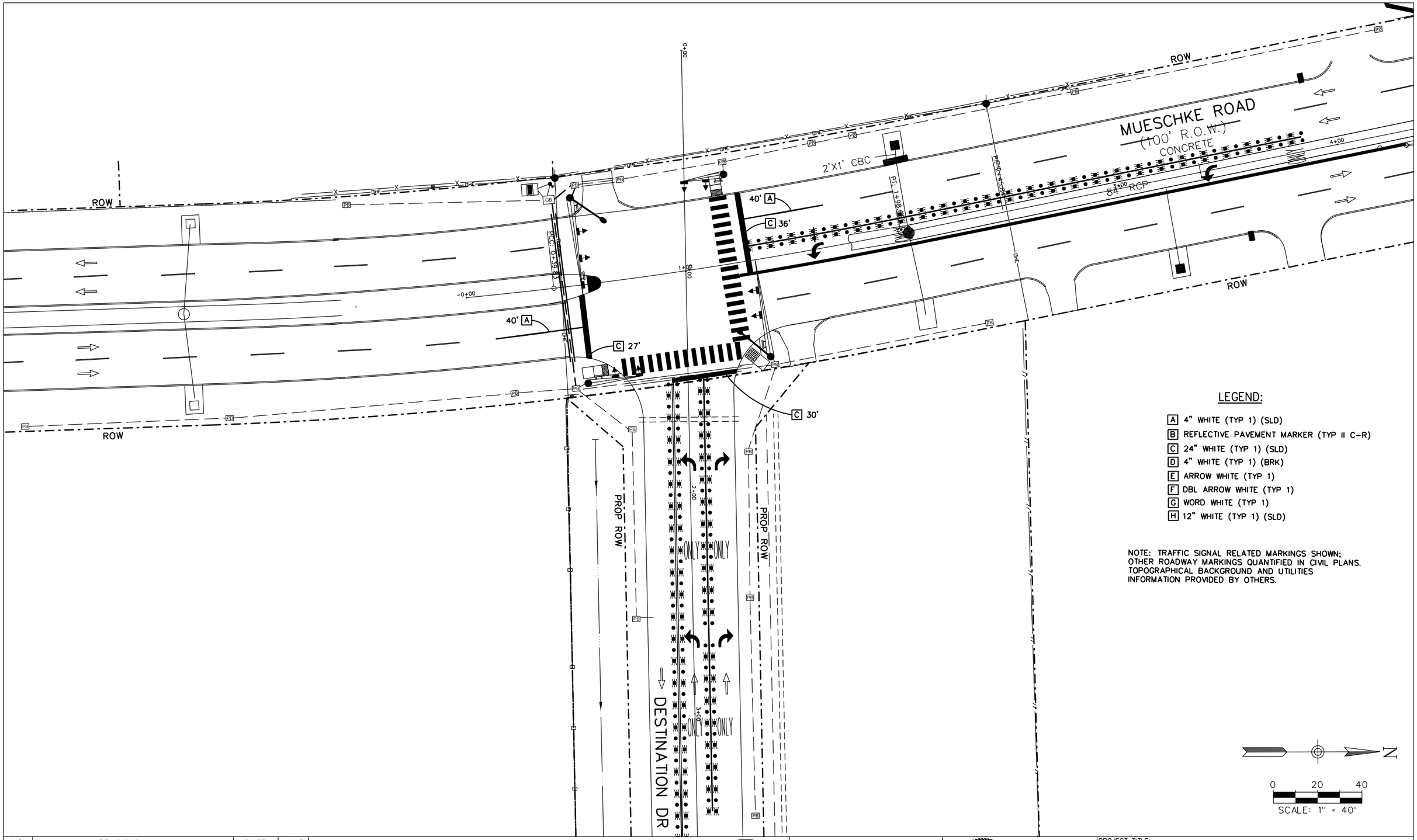
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
	MUESCHKE RD AT DESTINATION DR		
SHEET DESCRIPTION:	TRAFFIC SIGNAL ELEVATIONS		
DRAWN BY: DWQ	SHEET 1 OF 1	DATE: 11/16/23	
CK'D BY: DWQ	SCALE: NTS	SHEET NO: 09 / 38	



LEGEND:

- A 4" WHITE (TYP 1) (SLD)
- B REFLECTIVE PAVEMENT MARKER (TYP II C-R)
- C 24" WHITE (TYP 1) (SLD)
- D 4" WHITE (TYP 1) (BRK)
- E ARROW WHITE (TYP 1)
- F DBL ARROW WHITE (TYP 1)
- G WORD WHITE (TYP 1)
- H 12" WHITE (TYP 1) (SLD)

NOTE: TRAFFIC SIGNAL RELATED MARKINGS SHOWN; OTHER ROADWAY MARKINGS QUANTIFIED IN CIVIL PLANS. TOPOGRAPHICAL BACKGROUND AND UTILITIES INFORMATION PROVIDED BY OTHERS.

N

0 20 40

SCALE: 1" = 40'

NO.	REVISIONS	DATE	NAME
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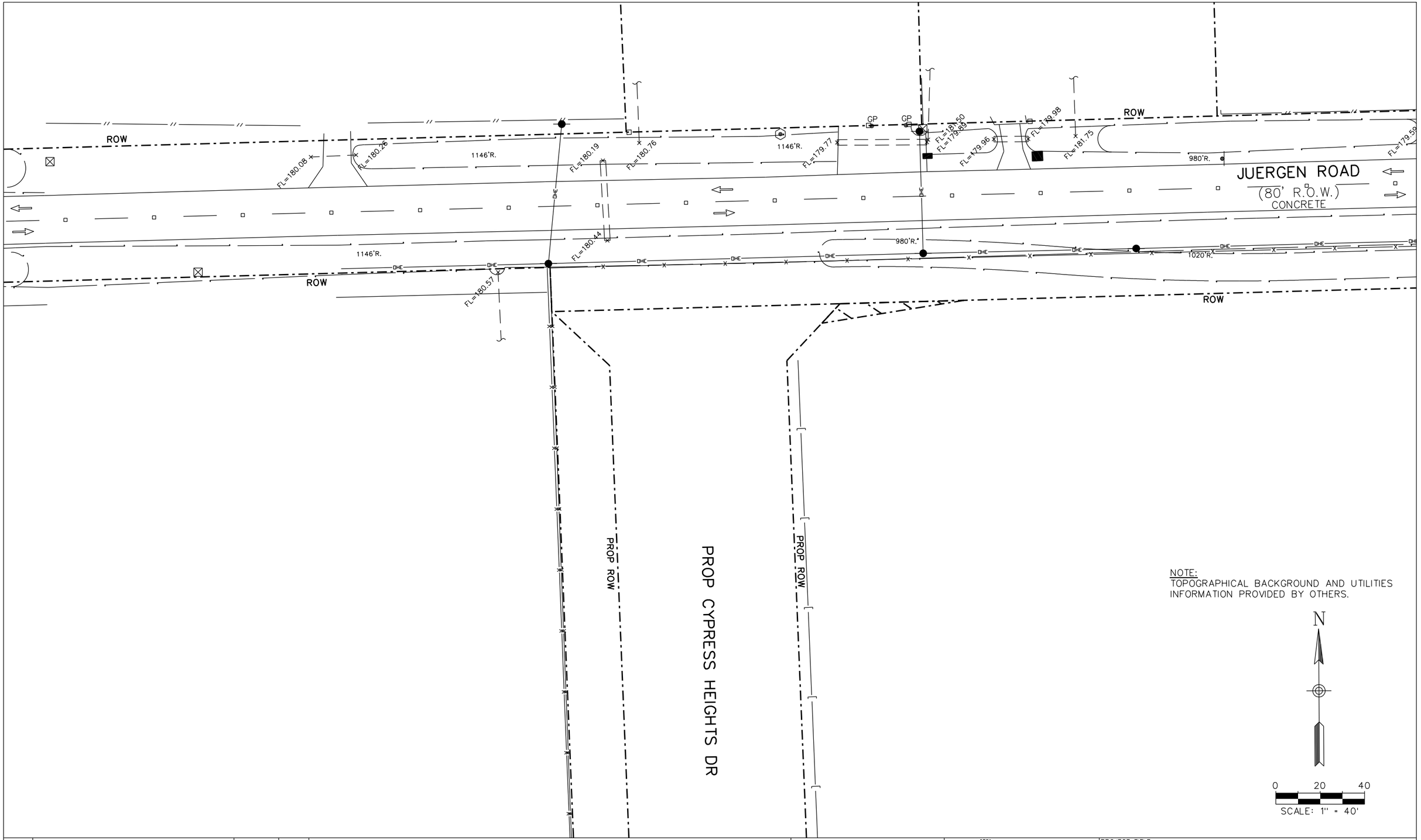
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	MUESCHKE RD AT DESTINATION DR
SHEET DESCRIPTION:	SIGNING AND PAVEMENT MARKINGS
DRAWN BY: DWQ	SHEET 1 OF 1 — DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40' — SHEET NO: 10 / 38



NOTE:
TOPOGRAPHICAL BACKGROUND AND UTILITIES INFORMATION PROVIDED BY OTHERS.

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0 20 40

SCALE: 1" = 40'

NO.	REVISIONS	DATE	NAME
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TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
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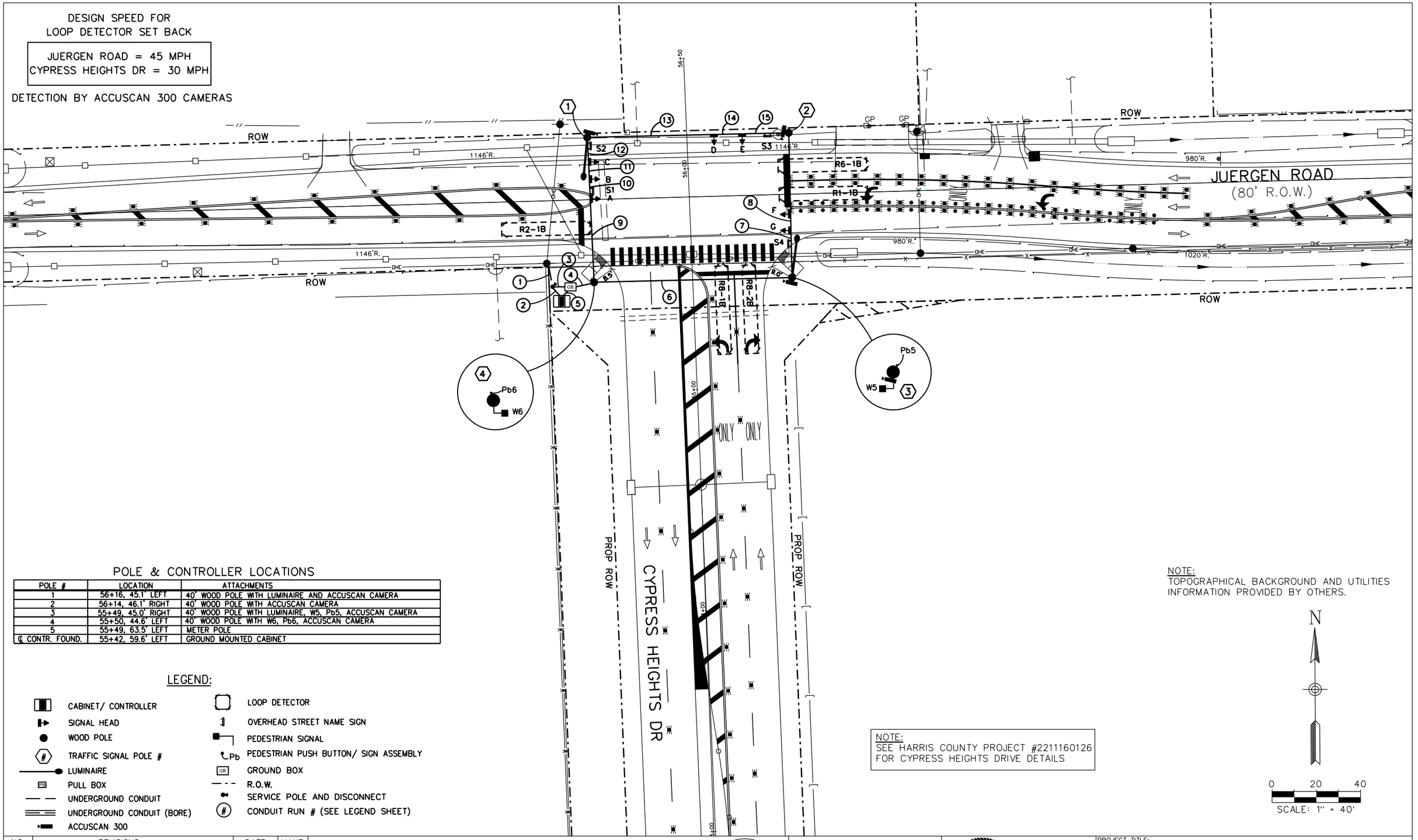
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS	
	JUERGEN RD AT CYPRESS HEIGHTS DR	
SHEET DESCRIPTION:	EXISTING CONDITIONS	
DRAWN BY: DWQ	SHEET 1 OF 1	DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40'	SHEET NO: 11 / 38

DESIGN SPEED FOR
LOOP DETECTOR SET BACK

JUERGEN ROAD = 45 MPH
CYPRESS HEIGHTS DR = 30 MPH

DETECTION BY ACCUSCAN 300 CAMERAS



POLE & CONTROLLER LOCATIONS

POLE #	LOCATION	ATTACHMENTS
1	56+16, 45.1' LEFT	40' WOOD POLE WITH LUMINAIRE AND ACCUSCAN CAMERA
2	56+14, 46.1' RIGHT	40' WOOD POLE WITH ACCUSCAN CAMERA
3	55+49, 45.0' RIGHT	40' WOOD POLE WITH LUMINAIRE, W5, Pb5, ACCUSCAN CAMERA
4	55+50, 44.6' LEFT	40' WOOD POLE WITH W6, Pb6, ACCUSCAN CAMERA
5	55+49, 63.5' LEFT	METER POLE
℄ CONTR. FOUND.	55+42, 59.6' LEFT	GROUND MOUNTED CABINET

LEGEND:

- CABINET/ CONTROLLER
- SIGNAL HEAD
- WOOD POLE
- TRAFFIC SIGNAL POLE #
- LUMINAIRE
- PULL BOX
- UNDERGROUND CONDUIT
- UNDERGROUND CONDUIT (BORE)
- ACCUSCAN 300
- LOOP DETECTOR
- OVERHEAD STREET NAME SIGN
- PEDESTRIAN SIGNAL
- PEDESTRIAN PUSH BUTTON/ SIGN ASSEMBLY
- GROUND BOX
- R.O.W.
- SERVICE POLE AND DISCONNECT
- CONDUIT RUN # (SEE LEGEND SHEET)

NOTE:
SEE HARRIS COUNTY PROJECT #2211160126
FOR CYPRESS HEIGHTS DRIVE DETAILS

NOTE:
TOPOGRAPHICAL BACKGROUND AND UTILITIES INFORMATION PROVIDED BY OTHERS.

N

0 20 40
SCALE: 1" = 40'

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
5			

HARRIS COUNTY
ENGINEERING DEPARTMENT

Amani Engineering, Inc.
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TBPE Firm Reg. No.: F-4578
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	JUERGEN RD AT CYPRESS HEIGHTS DR
SHEET DESCRIPTION:	TRAFFIC SIGNAL LAYOUT
DRAWN BY: DWQ	SHEET 1 OF 1
DATE: 11/16/23	
CK'D BY: DWQ	SCALE: 1"=40'
SHEET NO: 12 / 38	

NOTES TO CONTRACTOR:

1. LOCATION OF UTILITIES SHOWN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE-GROUND OR OVERHEAD.
2. CALL THE FOLLOWING NUMBERS FOR LOCATION OF UNDER-GROUND FACILITIES 72 HOURS PRIOR TO ANY EXCAVATION IN AREA:
   UTILITIES: (713) 223-4567 (HOUSTON)
   1-800-669-8344 (OUTSIDE HOUSTON)
   PIPELINES: 1-800-245-4545 AND 1-800-344-8377
3. ALL CONSTRUCTION SIGNS AND BARRICADES SHALL CONFORM TO THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.
4. ALL CONDUITS UNDER ROADWAYS AND DRIVEWAYS SHALL BE BORED AND JACKED. CONTRACTOR SHALL EXERCISE CAUTION WHEN BORING AND/OR EXCAVATING IN THE VICINITY OF UNDERGROUND UTILITIES.
5. NO LOOP DETECTOR SHALL BE CUT IN A PARALLEL EXPANSION JOINT. LOOPS CUT ACROSS EXPANSION JOINTS SHALL HAVE SLACK CABLE FOR EXPANSION.
6. CONTRACTOR SHALL RESTORE THE CONSTRUCTION AREA TO ORIGINAL CONDITION PRIOR TO FINAL INSPECTION.
7. EXACT LOCATION OF POLES, CONTROLLER, SIGNAL HEADS, PULL BOXES AND LOOP DETECTORS SHALL BE DETERMINED IN THE FIELD SUBJECT TO FINAL APPROVAL BY ENGINEER IN THE FIELD.
8. ALL CONDUITS UNDER PAVED SHOULDERS OR NATURAL GROUND SHALL BE TRENCHED AND BURIED. HOWEVER, THE CONTRACTOR SHALL BACKFILL, COMPACT AND RESTORE TRENCHED AREA TO ORIGINAL CONDITION AND MATCH EXISTING SURFACE CONDITION TO THE DENSITY OF ADJACENT AREA. EXISTING GRASS AREA SHOULD BE RE-SODDED.
9. REFER TO SIGNING AND PAVEMENT MARKING PLAN FOR ADDITIONAL INFORMATION PERTAINING TO CROSSWALK AND STOP LINE LOCATIONS.
10. CONTRACTOR SHALL RETURN ALL SALVAGEABLE ITEMS TO HARRIS COUNTY AS DIRECTED.

PROPOSED SIGNAL HEAD SCHEDULE

ONE-WAY
3-SECTION HORIZONTAL
12" LED SIGNAL HEAD

B, C, D,
E, F, G

ONE-WAY
4-SECTION HORIZONTAL
12" LED SIGNAL HEAD
W/ FLASHING YELLOW ARROW

A

SIGN SCHEDULE

S1
24" X 30"

S3
7.5' X 1.5'

S2, S4
11.0' X 1.5'

ACCUSCAN 300 DETECTOR CHART

LOOP	SIZE	SETTING	FUNCTION
R1-1B	6'X40'	PRESENCE	CALL AND EXTEND ø1
R2-1B	6'X40'	PRESENCE	CALL AND EXTEND ø2
R6-1B	6'X40'	PRESENCE	CALL AND EXTEND ø6
R8-1B	6'X40'	PRESENCE	CALL AND EXTEND ø8
R8-2B	6'X40'	PRESENCE	CALL AND EXTEND ø8

PROPOSED PEDESTRIAN SIGNAL UNITS

LED COUNTDOWN PEDESTRIAN SIGNAL HEADS

W5, W6

ACCESSIBLE PEDESTRIAN PUSH BUTTONS

R10-3eR

Pb5

R10-3eL

Pb6

CONTROLLER

PROPOSED 2070LCS ADVANCED TRANSPORTATION CONTROLLER ASSEMBLY

Signal Phasing Diagram shall comply with Harris County Standard detection sequence and shall be determined during signal turn-on.

Phase 1 Westbound Left Turn	Phase 2 Eastbound Thru	Phase 3 Northbound Left Turn	Phase 4 Southbound Thru
Phase 5 Eastbound Left Turn	Phase 6 Westbound Thru	Phase 7 Southbound Left Turn	Phase 8 Northbound Thru

ELECTRICAL CHART

ITEM	RUN NUMBER	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
LUMINAIRE & SIGN LIGHT	2/C #14 (IMSA 20-1)(STRANDED)			2	2		1			1	1	1	1			
PUSH BUTTON	2/C #14 (IMSA 20-1)(STRANDED)				2	2	1									
PED. SIGNAL	4/C #14 (IMSA 20-1)(STRANDED)				2	2	1									
VEH. SIGNAL	7/C #14 (IMSA 20-1)(STRANDED)				7	7	2	2	2	5	4	3	2	2	2	
GROUND BARE	#8 BARE COPPER			1	1	1	1	1	1	1	1	1	1	1	1	1
POWER	1/C-#4 AWG XHHW (STRANDED)	2	2													
LOOP DETECTOR	2~#14 XHHW STRAND															
	2/C #14 (IMSA 50-2) (STRANDED)															
ACCUSCAN DETECTOR	4/C #18 AWG				3	3	1			2	2	2	2	1	1	1
CONDUIT	1 INCH PVC															
	2 INCH PVC			1												
	3 INCH PVC	1	1													
	4 INCH PVC				1	1										

ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE DESCRIPTION(SEE ELECTRICAL DETAILS - SERVICE SUPPORT SF & SP	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT		TWO-POLE CONTACTOR AMPS	PANELBD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
				SWITCH AMP/FUSES	CKT. BRK. POLE/AMP					
TY D (120/240)070(NS)SS(E)SP(O)	1 1/4"	3/#4	N/A	N/A	2P/70	20	70	TRAFFIC SIGNAL LIGHTING	1P/50 2P/20	<7.1

NO.	REVISIONS	DATE	NAME
1			
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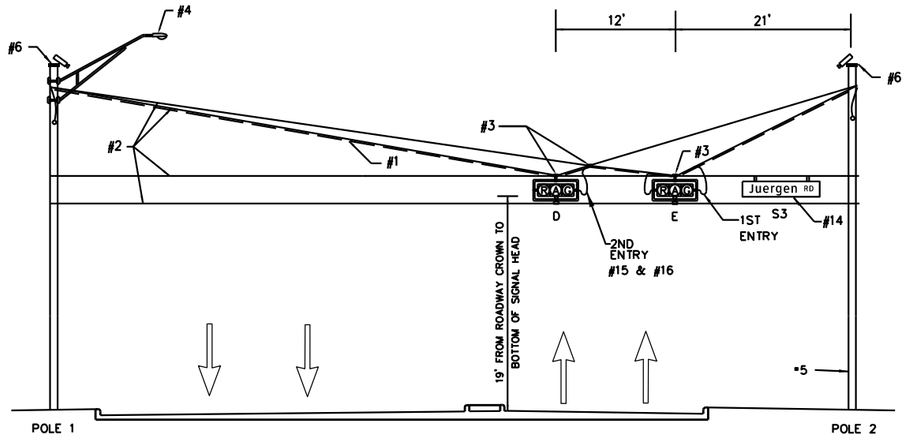
STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

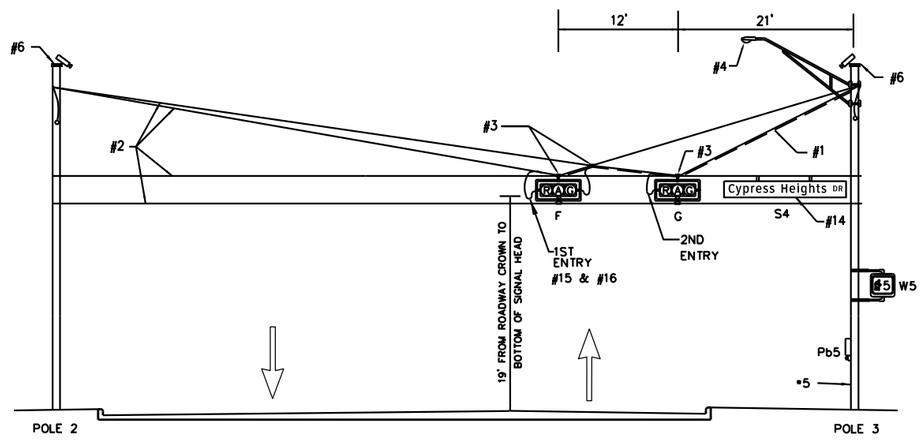
PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS
JUERGEN RD AT CYPRESS HEIGHTS DR
SHEET DESCRIPTION: TRAFFIC SIGNAL LEGEND

DRAWN BY: DWQ	SHEET 1 OF 1	DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40'	SHEET NO: 13 / 38



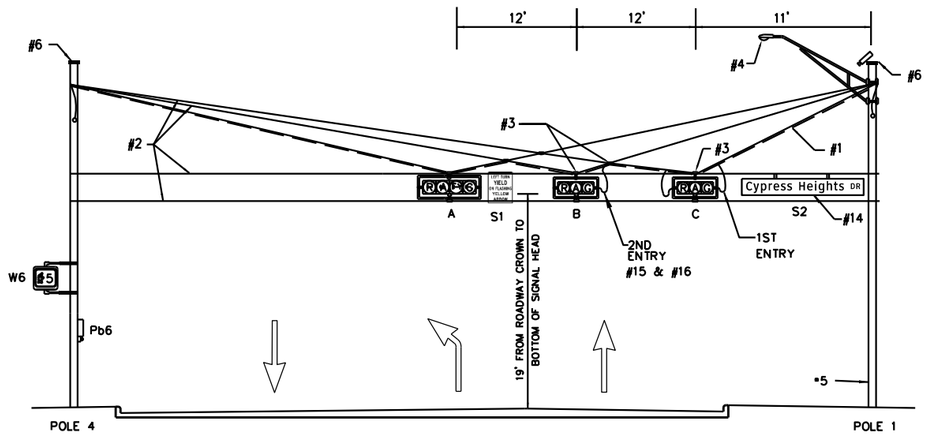
LOOKING NORTH ON CYPRESS HEIGHTS DR AT JUERGEN RD

NTS



LOOKING EAST ON JUERGEN RD AT CYPRESS HEIGHTS DR

NTS



LOOKING WEST ON JUERGEN RD AT CYPRESS HEIGHTS DR

NTS

SPECIAL NOTES:

•1. SIGNAL CABLE LASHED TO MESSENGER WIRE WITH STAINLESS STEEL SUPPORTS (2 EVERY 18" C-C), PANDUIT CATALOG • MLT 4H-LP OR APPROVED EQUAL.
•2. ONE (1) 5/16" - 7 WIRE STRAND (SIEMENS MARTIN) GALVANIZED STEEL CATENARY SYSTEM (ONE PER SIGNAL) AND TWO (2) - 1/4" 7 WIRE STRAND GALVANIZED STEEL CATENARY SYSTEM (HORIZONTAL).
•3. SADDLE TYPE CLAMP (TYPICAL FOR ALL SIGNAL CONNECTION AND MESSENGER CROSSINGS).
•4. LED LUMINAIRE ON 15' ARM.
•5. 40' WOOD POLE (TYPICAL ALL POLES).
•6. POLE CAP.
•7. ALL HARDWARE SHALL BE GALVANIZED PER THE APPROPRIATE HARRIS COUNTY SPECIFICATION.
•8. ALL POLES, CONTROLLER AND METER SHALL BE GROUNDED WITH •8 BARE SOLID COPPER WIRE CONNECTED TO 5/8" DIA. COPPER CLAD STEEL GROUND ROD BURIED 8' INTO THE GROUND.
•9. SEE TRAFFIC SIGNAL LAYOUT SHEETS FOR CONDUITS REQUIRED.
•10. SEE HARRIS COUNTY SPECIFICATIONS FOR ADDITIONAL INFORMATION ON WOOD POLE DETAILS.
•11. CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE ALL UTILITIES AND CULVERTS IN THE WAY OF CONSTRUCTION.
•12. PHOTOELECTRIC CELL FOR OPERATION OF LUMINAIRES AND LEFT TURN SIGN LIGHTS (ENCLOSURE MOUNTED).
•13. ALL PEDESTRIAN SIGNALS SHALL BE LED COUNTDOWN TYPE.
•14. STREET NAME SIGNS, SIGN CLAMPS SHALL BE SUBMITTED TO HARRIS COUNTY FOR APPROVAL.
•15. SIGNAL CABLES SHALL GO TO THE FURTHEST SIGNAL HEAD FROM THE CONTROLLER CABINET.
•16. SIGNAL CABLES SHALL ALWAYS ENTER THE RIGHT SIDE OF THE SIGNAL HEAD (ADJACENT TO THE GREEN INDICATION) AND EXIT THE LEFT SIDE (ADJACENT TO THE RED INDICATION) WHEN NECESSARY.

NO.	REVISIONS	DATE	NAME
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STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	JUERGEN RD AT CYPRESS HEIGHTS DR
SHEET DESCRIPTION:	TRAFFIC SIGNAL ELEVATIONS
DRAWN BY: DWQ	SHEET 1 OF 1 — DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40' — SHEET NO: 14 / 38

ROW

1146'R.

1146'R.

ROW

GP

GP

ROW

980'R.

JUERGEN ROAD
(80' R.O.W.)

24' C

C 17'

980'R.

1020'R.

GB

C 32'

ROW

ONLY ONLY

PROP ROW

CYPRESS HEIGHTS DR

PROP ROW

LEGEND:

- A 4" WHITE (TYP 1) (SLD)
- B REFLECTIVE PAVEMENT MARKER (TYP II C-R)
- C 24" WHITE (TYP 1) (SLD)
- D 4" WHITE (TYP 1) (BRK)
- E ARROW WHITE (TYP 1)
- F DBL ARROW WHITE (TYP 1)
- G WORD WHITE (TYP 1)
- H 12" WHITE (TYP 1) (SLD)

NOTE: TRAFFIC SIGNAL RELATED MARKINGS SHOWN; OTHER ROADWAY MARKINGS QUANTIFIED IN CIVIL PLANS. TOPOGRAPHICAL BACKGROUND AND UTILITIES INFORMATION PROVIDED BY OTHERS.

N

0 20 40

SCALE: 1" = 40'

NO.	REVISIONS	DATE	NAME
1			
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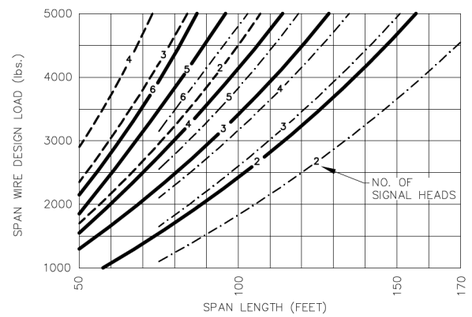
TBPE Firm Reg. No.: F-455?8
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED PROFESSIONAL ENGINEER
11/16/2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	JUERGEN RD AT CYPRESS HEIGHTS DR
SHEET DESCRIPTION:	SIGNING AND PAVEMENT MARKINGS
DRAWN BY: DWQ	SHEET 1 OF 1 — DATE: 11/16/23
CK'D BY: DWQ	SCALE: 1"=40' — SHEET NO: 15 / 38



SAG = 4'–6" (30' POLE)
SAG = 8'–0" (30' OR 34' POLE)
SAG = 11'–6" (34' POLE)

SIGNAL HEAD TYPE	WT. PER HEAD	WIND AREA ◆
5–SECTION, 12" LENS	125 LBS.	9.6 SQ. FT.
3–SECTION, 12" LENS	75 LBS.	5.64 SQ. FT.

◆ EFFECTIVE PROJECTED DESIGN WIND AREA (ACTUAL AREA TIMES DRAG COEFFICIENT)

LOAD SPAN CHART – SIGNALS WITH 12–INCH LENS

LOAD SPAN CHART NOTES:

NUMBERS ON LOAD SPAN CHART INDICATE THE NUMBER OF SIGNAL HEADS ON THE SPAN. THE TOTAL SPAN WIRE DESIGN LOAD IS BASED ON ONE 5–SECTION HEAD AND ONE OR MORE ADDITIONAL 3–SECTION HEAD(S). DESIGN WIND PRESSURES ON CABLES ARE ASSUMED AS 1.6 LB/FT. WEIGHT OF SPAN WIRE CABLES (ONE PER SIGNAL HEAD) IS ASSUMED AS 0.65 LB/FT WHICH INCLUDES AN ALLOWANCE FOR CONDUCTOR CABLES AND MISCELLANEOUS HARDWARE. THE EFFECT OF THE SWAY CABLE ON LOAD DISTRIBUTION IS IGNORED AS IT IS ASSUMED TO BREAK AT DESIGN WIND CONDITIONS. WIND LOAD ON STREET NAME SIGNS SHOULD BE CONSIDERED FOR SPAN WIRE DESIGN LOAD. WHEN A POLE SUPPORTS 2 SPANS, THE SPAN WIRE DESIGN LOADS FOR BOTH SPANS SHOULD BE ADDED AS EXPLAINED BELOW TO DETERMINE THE DESIGN LOAD FOR THAT POLE.

DESIGN LOAD AND MOMENT CALCULATIONS:

WHEN A POLE SUPPORTS 2 SPANS, THE SPAN WIRE DESIGN LOADS FOR BOTH SPANS SHOULD BE ADDED, AS BELOW, TO DETERMINE THE DESIGN LOAD FOR THAT POLE.

Fx (lbs) = LOAD 2 + (LOAD 1 * COS(ANGLE BETWEEN SPANS))
Fy (lbs) = LOAD 1 * SIN(ANGLE BETWEEN SPANS)

DESIGN LOAD(lbs) = $\sqrt{Fx^2 + Fy^2}$

DESIGN MOMENT(K*FT) = ((POLE HT. – 0.953) * DESIGN LOAD) / 1000

IF DESIGN LOAD IS GREATER THAN THE MAX. PERMISSIBLE LOAD FROM TABLE BELOW, A SPECIAL FOUNDATION DESIGN MAY BE REQUIRED.

IF DESIGN MOMENT IS GREATER THAN THE MAX. ALLOWABLE MOMENT FROM THE FOUNDATION DESIGN TABLE ON THE STRAIN POLE FOUNDATION STANDARD DETAIL, A SPECIAL FOUNDATION MAYBE REQUIRED.

STRAIN POLE AND CLAMP–ON MAST ARM DESCRIPTION	POLE TYPE	FOUNDATION TYPE	MAX. PERMISSIBLE SPAN WIRE LOAD (lbs)
30' POLE WITH 20' CLAMP–ON MAST ARM & LUMINAIRE	HC10030	10030	4000
30' POLE WITH 25' CLAMP–ON MAST ARM & LUMINAIRE	HC10030	10030	3700
30' POLE WITH 30' CLAMP–ON MAST ARM & LUMINAIRE	HC10030	10030	3200
30' POLE WITH 35' CLAMP–ON MAST ARM & LUMINAIRE	HC10030	10030	2700
30' POLE WITH 40' CLAMP–ON MAST ARM & LUMINAIRE	HC10030	10030	2000
34' POLE WITH 20' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	4800
34' POLE WITH 25' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	4500
34' POLE WITH 30' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	4200
34' POLE WITH 35' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	3800
34' POLE WITH 40' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	3300
34' POLE WITH 42' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	3100
34' POLE WITH 44' CLAMP–ON MAST ARM & LUMINAIRE	HC10034	10036	2800

POLE TYPE	ROUND STRAIN POLE				OCTAGONAL STRAIN POLE			
	D_B	D_T	THK.	H	D_B	D_T	THK.	H
	IN.	IN.	IN.	FT.	IN.	IN.	IN.	FT.
HC10030	13.75	9.55	0.3125	30	13.75	9.55	0.3125	30
HC10034	15.5	10.74	0.3125	34	15.5	10.74	0.3125	34

D_B = POLE BASE O.D.
D_T = POLE TOP O.D.
H = HEIGHT

MAST ARM LENGTH	ROUND CLAMP–ON MAST ARM				OCTAGONAL CLAMP–ON MAST ARM			
	D_1	D_2 ◬	THK.(t)	RISE	D_1	D_2 ◬	THK.(t)	RISE
FT.	IN.	IN.	IN.	FT.	IN.	IN.	IN.	FT.
20	8.0"	5.3"	0.1793"	3'–10"	8.0"	5.3"	0.1793"	3'–10"
25	9.0"	5.6"	0.1793"	3'–10"	9.0"	5.6"	0.1793"	3'–10"
30	9.5"	5.4"	0.1793"	3'–10"	10.0"	5.4"	0.1793"	3'–10"
35	10.5"	5.7"	0.1793"	3'–10"	10.0"	5.7"	0.1793"	3'–10"
40	10.5"	5.0"	0.2391"	3'–10"	11.0"	5.0"	0.2391"	3'–10"
42	10.5"	4.7"	0.2391"	3'–10"	11.0"	4.7"	0.2391"	3'–10"
44	11.0"	4.9"	0.2391"	3'–10"	11.5"	4.9"	0.2391"	3'–10"

D_1 = POLE BASE O.D.
D_2 = POLE TOP O.D.
◬ D_2 MAY BE INCREASED BY UP TO 1.0" FOR OCTAGONAL ARMS

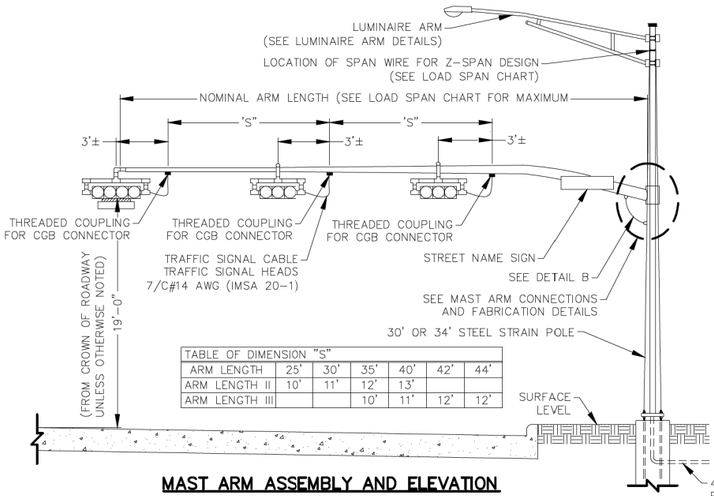
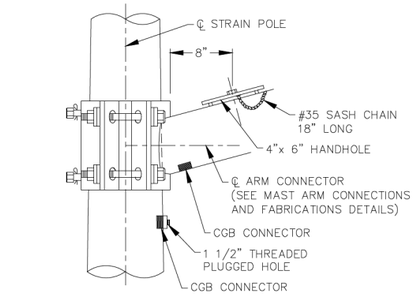
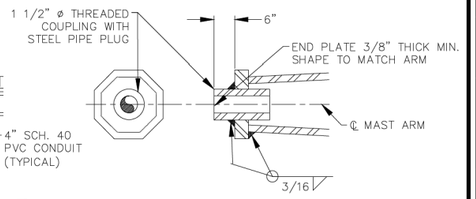


TABLE OF DIMENSION "S"						
ARM LENGTH	25'	30'	35'	40'	42'	44'
ARM LENGTH II	10'	11'	12'	13'		
ARM LENGTH III			10'	11'	12'	12'

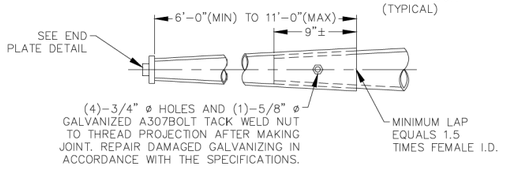
MAST ARM ASSEMBLY AND ELEVATION



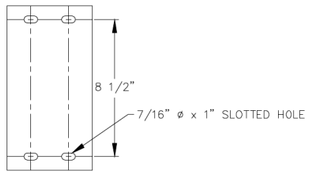
DETAIL B



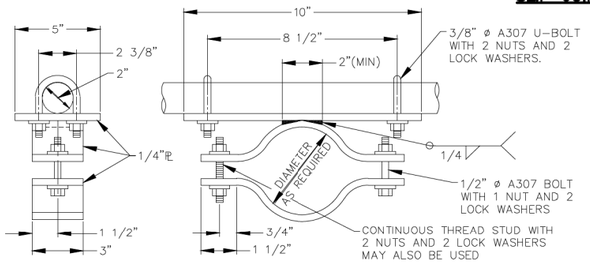
END PLATE DETAIL



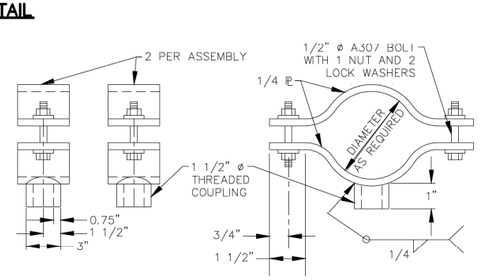
NOTE:
A SLIP JOINT IS PERMISSIBLE FOR MAST ARMS 40' AND GREATER IN LENGTH. THE SLIP JOINT SHALL BE MADE IN THE SHOP, BUT MAY BE MATCH MARKED AND SHIPPED DISASSEMBLED



SLIP JOINT DETAIL



BRACKET ASSEMBLY DETAIL – OPTION A



BRACKET ASSEMBLY DETAIL – OPTION B

GENERAL NOTES:

1.) DESIGN SHALL CONFORM TO 2001 OR LATEST ADDITION TO AASHTO STANDARD SPECIFICATIONS FOR THE STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS AND INTERIM SPECIFICATIONS DESIGN WIND SPEED EQUALS 100 MPH PLUS A 1.3 GUST FACTOR.
2.) STRAIN POLES ARE DESIGNED TO SUPPORT SPAN WIRE WITH ONE CLAMP–ON MAST ARM. THE SPECIFIED SIGNAL LOAD APPLIED AT THE END OF THE TRAFFIC SIGNAL ARM EQUALS 180 LBS. VERTICAL DEAD LOAD PLUS THE HORIZONTAL WIND LOAD ON AN EFFECTIVE PROJECTED AREA OF 32.4 SQ. FT. THE MAXIMUM PERMISSIBLE SPAN WIRE DESIGN LOADS TABULATED ARE CALCULATED AT A STRESS LOAD OF 1.40 TIMES THE BASIC ALLOWABLE STRESS. A SIMULTANEOUS WIND ON THE POLE, MAST ARM, AND LUMINAIRE IS ALSO INCLUDED. DESIGNS ARE BASED ON A SPAN WIRE AND ARM INCLUDED ANGLE OF 90 DEG. ANGLES OF LESS THAN 75 DEG. OR MORE THAN 105 DEG. WILL REQUIRE A SPECIAL DESIGN.
3.) FABRICATION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND THE WITH THE DETAILS AND DIMENSIONS. ALL WELDING SHALL CONFORM TO THE REQUIREMENTS OF THE SPECIFICATIONS OF THE AMERICAN WIELDING SOCIETY STRUCTURAL WELDING CODE AWS LATEST EDITION.
4.) SEE CLAMP–ON MAST ARM CONNECTIONS AND FABRICATION TOLERANCES DETAILS STANDARD SHEET FOR DETAILS OF CLAMP–ON MAST ARM CONNECTIONS AND FABRICATION TOLERANCES.
5.) SEE STRAIN POLE ASSEMBLY DETAILS STANDARD SHEET FOR DETAILS OF STRAIN POLE.
6.) SEE LUMINAIRE ARM DETAILS STANDARD SHEET FOR DETAILS OF LUMINAIRE ARM AND CONNECTION.
7.) SEE STRAIN POLE FOUNDATION DETAILS STANDARD SHEET FOR DETAILS OF ANCHOR BOLTS AND FOUNDATION.
8.) UNLESS OTHERWISE NOTED, ALL STEEL PARTS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 REQUIREMENTS WITH A MINIMUM OF 2 OUNCES PER SQUARE FOOT OF GALVANIZED COATING.
9.) ALL SMALL STEEL HARDWARE ITEMS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A153 REQUIREMENTS.
10.) SPECIAL DESIGNS REQUIRE SUBMISSION OF SHOP DRAWINGS IN ACCORDANCE WITH THE SPECIFICATION ITEM 680 "STEEL MAST ARM AND STEEL STRAIN POLE ASSEMBLIES".
11.) ALL BOLTS SHALL HAVE TWO FULL DIAMETER THREADS EXPOSED ABOVE THE NUT.
12.) CONTRACTOR SHALL INSTALL A CLOSE NIPPLE WITH LOCKNUTS AND METAL BUSHINGS (SIZE AS REQUIRED) TO PREVENT ABRASION WHERE CABLE(S) ENTER ANY PORTION OF THE STRAIN POLE.
13.) CLAMP–ON MAST ARM(S) AND STRAIN POLE(S) SHALL HAVE THE SAME GEOMETRIC SHAPE PER ASSEMBLY.

SHIPPING PARTS LIST

CLAMP–ON MAST ARM(S) – STRAIN POLE			
NOMINAL ARM LENGTH		SHIP EACH CLAMP–ON MAST ARM AND STRAIN POLE WITH THE FOLLOWING HARDWARE ATTACHED: HANDHOLE AT BASE, POLE CAP, ETC.	
Lc FT.	Lc FT.	DESCRIPTION	QUANTITY
20		20 – HC10030	1
		20 – HC10034	
25		25 – HC10030	1
		25 – HC10034	
30		30 – HC10030	
		30 – HC10034	
35		35 – HC10030	
		35 – HC10034	
40		40 – HC10030	
		40 – HC10034	
42		42 – HC10030	
		42 – HC10034	
44		44 – HC10030	
		44 – HC10034	2
20	20	20/20 – HC10030	
	20	20/20 – HC10034	
25	20	25/20 – HC10030	
	20	25/20 – HC10034	
	25	25/25 – HC10030	
	25	25/25 – HC10034	
30	20	30/20 – HC10030	
	20	30/20 – HC10034	
	25	30/25 – HC10030	
	25	30/25 – HC10034	
	30	30/30 – HC10030	
	30	30/30 – HC10034	
35	20	35/20 – HC10030	
	20	35/20 – HC10034	
	25	35/25 – HC10030	
	25	35/25 – HC10034	
	30	35/30 – HC10030	
	30	35/30 – HC10034	
	35	35/35 – HC10030	
	35	35/35 – HC10034	
40	20	40/20 – HC10030	
	20	40/20 – HC10034	
	25	40/25 – HC10030	
	25	40/25 – HC10034	
	30	40/30 – HC10030	
	30	40/30 – HC10034	
	35	40/35 – HC10030	
	35	40/35 – HC10034	
	40	40/40 – HC10034	
42	20	42/20 – HC10030	
	20	42/20 – HC10034	
	25	42/25 – HC10030	
	25	42/25 – HC10034	
	30	42/30 – HC10030	
	30	42/30 – HC10034	
	35	42/35 – HC10034	
	40	42/40 – HC10034	
	42	42/42 – HC10034	
44	20	44/20 – HC10030	
	20	44/20 – HC10034	
	25	44/25 – HC10034	
	30	44/30 – HC10034	
	35	44/35 – HC10034	
	40	44/40 – HC10034	
	42	44/42 – HC10034	
	44	44/44 – HC10034	

LUMINAIRE ARMS (1 PER POLE)	
NOMINAL ARM LENGTH	QUANTITY
15' ARM	2

ANCHOR BOLT ASSEMBLIES (1 PER POLE)*		
ANCHOR BOLT DIAMETER	BOLT HOLE DIAMETER	QUANTITY
2 ¼"	6'–3 ½"	4

* EACH ANCHOR BOLT ASSEMBLY CONSIST OF THE FOLLOWING:
TOP AND BOTTOM TEMPLATES, 4 ANCHOR BOLTS, 8 NUTS, 8 FLAT, WASHERS, 4 LOCK WASHERS AND 4 NUT ANCHOR DEVICES (TYPE 2) PER STANDARD DRAWING STRAIN POLE FOUNDATION DETAILS.
(TEMPLATES MAY BE REMOVED FOR SHIPMENT)

MATERIALS	
ROUND CLAMP–ON MAST ARM AND STRAIN POLE OR OCTAGONAL MAST ARM AND STRAIN POLE	ASTM A570 GR50 OR ASTM A572 GR50
PLATES (1)	ASTM A36 OR A572 GR50
STEEL CABLE	ASTM A475, 7 WIRE, UTILITIES GRADE

(1) EITHER OF THE MATERIALS LISTED FOR PLATES MAY BE USED WHERE THE DRAWINGS DO NOT SPECIFY A PARTICULAR ASTM DESIGNATION.

VIBRATION WARNING:

CLAMP–ON MAST ARMS STRUCTURES OF APPROXIMATELY 40 FEET OR LONGER ARE SUBJECT TO HARMONIC VERTICAL VIBRATIONS IN LIGHT WIND CONDITIONS DUE TO THE AEROELASTIC CHARACTERISTICS OF A FEW OF THE MYRIADS OF POSSIBLE COMBINATION OF THE FOLLOWING: SIGNAL NUMBERS, WEIGHTS AND POSITIONS; PRESENCE OF ADDITIONAL ATTACHMENTS TO THE ARM, SUCH AS SIGNS AND CAMERAS; ARM–WIND ORIENTATION; AND ARM–POLE STIFFNESS.
SUCH VIBRATIONS MAY CAUSE FATIGUE DAMAGE TO THE STRUCTURE AND MAY LEAD TO GALLOPING IN MODERATE WIND CONDITIONS WHICH MAY FURTHER DAMAGE THE STRUCTURE AND ALARM THE PUBLIC.
THE TRAFFIC SIGNAL CLAMP–ON MAST ARMS SHALL BE VISUALLY INSPECTED IN 5 TO 20 MPH WIND CONDITIONS AFTER INSTALLATION OF SIGNAL HEADS AND ANY ATTACHMENTS. IF VERTICAL MOVEMENTS WITH A TOTAL EXCURSION (MAXIMUM UPWARD EXCURSION TO MAXIMUM DOWNWARD EXCURSION) OF MORE THAN APPROXIMATELY 8" ARE OBSERVED AT THE ARM TIP, A DAMPING PLATE SHALL BE FITTED TO THE ARM.
THIS VISUAL INSPECTION SHALL BE REPEATED AFTER EACH MODIFICATION OF THE STRUCTURE THAT COULD AFFECT ITS AEROELASTIC RESPONSE. EXCESSIVE VIBRATIONS SHALL NOT BE ALLOWED TO CONTINUE FOR MORE THAN TWO DAYS.

CLAMP–ON MAST ARM(S) (TYPES) – STRAIN POLE						
NOMINAL ARM LENGTH (Lc)	TYPE I MAST ARM (1 SIGNAL)		TYPE II MAST ARM (2 SIGNAL)		TYPE I MAST ARM (1 SIGNAL)	
	SHIP EACH CLAMP–ON MAST ARM AND STRAN POLE WITH THE FOLLOWING HARDWARE ATTACHED: 1–CGB CONNECTOR 1–CLAMP WITH BOLTS AND WASHES		SHIP EACH CLAMP–ON MAST ARM AND STRAIN POLE WITH THE FOLLOWING HARDWARE ATTACHED: 1–SIGNAL BRACKET ASSEMBLIES, 2–CGB CONNECTOR, 1–CLAMP WITH BOLTS AND WASHES		SHIP EACH CLAMP–ON MAST ARM AND STRAIN POLE WITH THE FOLLOWING HARDWARE ATTACHED: 2–SIGNAL BRACKET ASSEMBLIES, 3–CGB CONNECTOR, 1–CLAMP WITH BOLTS AND WASHES	
FT.	DESCRIPTION	QUANTITY	DESCRIPTION	QUANTITY	DESCRIPTION	QUANTITY
	20 – HC10030					
	20 – HC10034	1				
	25 – HC10030		25 – HC10030			
	25 – HC10034		25 – HC10034	1		
			30 – HC10030			
			30 – HC10034			
			35 – HC10030		35 – HC10030	
			35 – HC10034		35 – HC10034	
					40 – HC10030	
					40 – HC10034	
					42 – HC10030	
					42 – HC10034	
					44 – HC10030	
					44 – HC10034	2

NOTE: ENGINEER SHALL COMPLETE SHIPPING PARTS LIST TABLES

NO.	REVISIONS	DATE	NAME
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△			

HARRIS COUNTY ENGINEERING DEPARTMENT

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270–5700 Fax (713) 271–3487
TBPE Firm Reg. No.: F–438
TBPLS Firm Reg. No.: 100282–00

STATE OF TEXAS ANTHONY P. VOIGT 84845 LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F–5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD SDMA
SHEET DESCRIPTION: SINGLE AND DUAL MAST ARM ASSEMBLY		
DRAWN BY: BSH	DETAILS (100 MPH WIND ZONE)	DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 16 / 38

TABLE 1 – ROUND CLAMP–ON MAST ARM

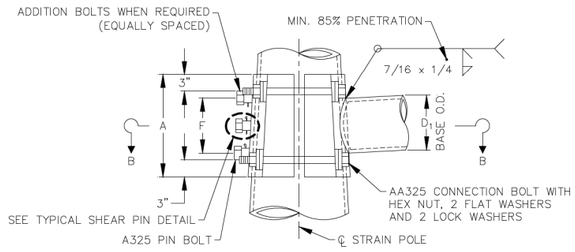
MAST ARM LENGTH	ROUND CLAMP–ON MAST ARM						CONN. BOLTS		PIN BOLTS	
	D_1	D_2 ⚠	THK.(t)	RISE UNDER LOAD	A	F	NO.	DIA.	NO.	DIA.
FT.	IN.	IN.	IN.	FT.	IN.	IN.	EA	IN.	EA	IN.
20	8.0"	5.3"	0.1793"	3'–10"	14"	8"	4	1"	2	7/8"
25	9.0"	5.6"	0.1793"	3'–10"	16"	10"	4	1"	2	7/8"
30	9.5"	5.4"	0.1793"	3'–10"	18"	10"	4	1 1/4"	3	7/8"
35	10.5"	5.7"	0.1793"	3'–10"	18"	10"	4	1 1/4"	3	7/8"
40	10.5"	5.0"	0.2391"	3'–10"	20"	14"	4	1 1/2"	4	7/8"
42	10.5"	4.7"	0.2391"	3'–10"	20"	14"	4	1 1/2"	4	7/8"
44	11.0"	4.9"	0.2391"	3'–10"	20"	14"	4	1 1/2"	4	7/8"

D_1 = POLE BASE O.D.
D_2 = POLE TOP O.D.
⚠ D_2 MAY BE INCREASED BY UP TO 1.0" FOR OCTAGONAL ARMS

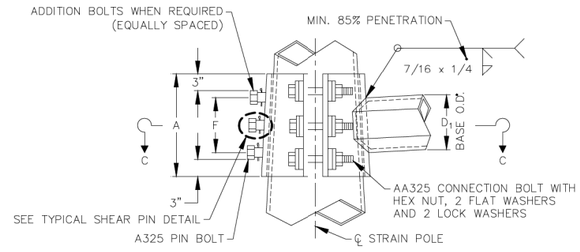
TABLE 2 – OCTAGONAL CLAMP–ON MAST ARM

MAST ARM LENGTH	OCTAGONAL CLAMP–ON MAST ARM							CONN. BOLTS		PIN BOLTS	
	D_1	D_2 ⚠	THK.(t)	RISE UNDER LOAD	A	F	T	NO.	DIA.	NO.	DIA.
FT.	IN.	IN.	IN.	FT.	IN.	IN.	IN.	EA	IN.	EA	IN.
20	8.0"	5.3"	0.1793"	3'–10"	14"	8"	3/4"	4	3/4"	2	5/8"
25	9.0"	5.6"	0.1793"	3'–10"	16"	10"	7/8"	4	1"	2	5/8"
30	10.0"	5.4"	0.1793"	3'–10"	18"	10"	1"	6	1"	3	5/8"
35	10.0"	5.7"	0.1793"	3'–10"	18"	10"	1"	6	1"	3	5/8"
40	11.0"	5.0"	0.2391"	3'–10"	20"	14"	1 1/8"	8	1"	4	5/8"
42	11.0"	4.7"	0.2391"	3'–10"	20"	14"	1 1/8"	8	1"	4	5/8"
44	11.5"	4.9"	0.2391"	3'–10"	20"	14"	1 1/8"	8	1"	4	5/8"

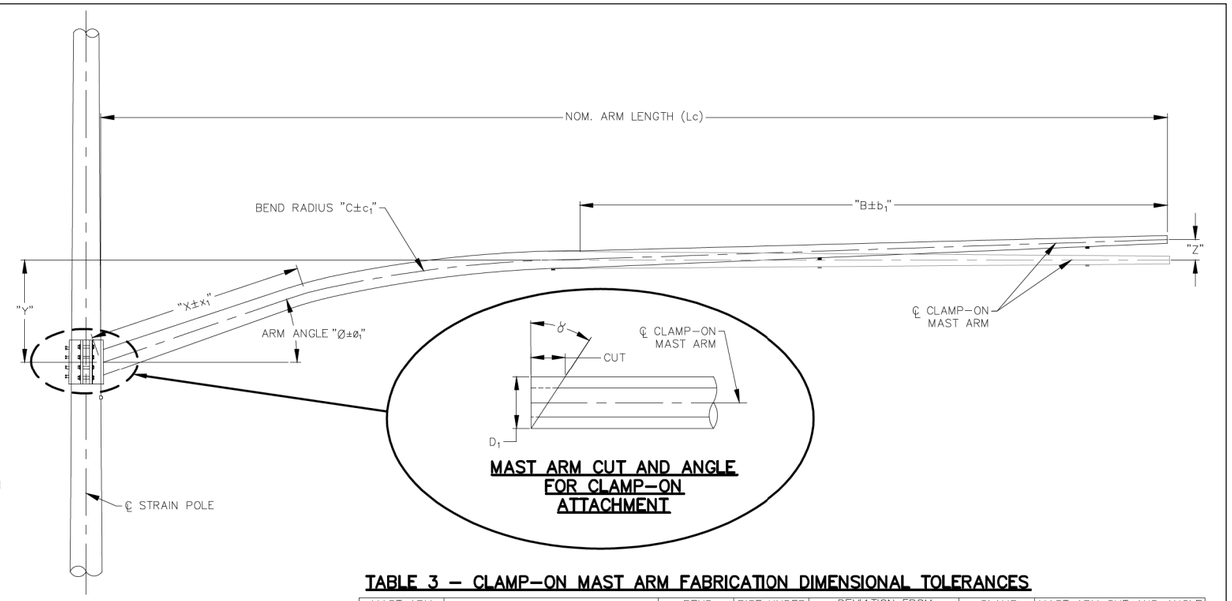
D_1 = POLE BASE O.D.
D_2 = POLE TOP O.D.
⚠ D_2 MAY BE INCREASED BY UP TO 1.0" FOR OCTAGONAL ARMS



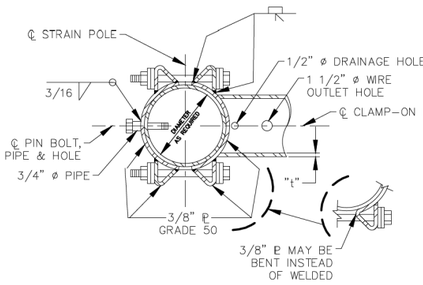
CLAMP–ON DETAIL 1 (ROUND MAST ARM)



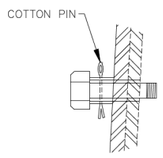
CLAMP–ON DETAIL 2 (OCTAGONAL MAST ARM)



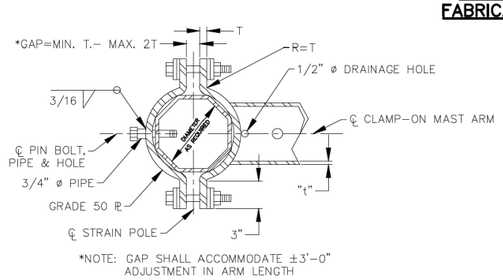
CLAMP–ON MAST ARM FABRICATION TOLERANCES



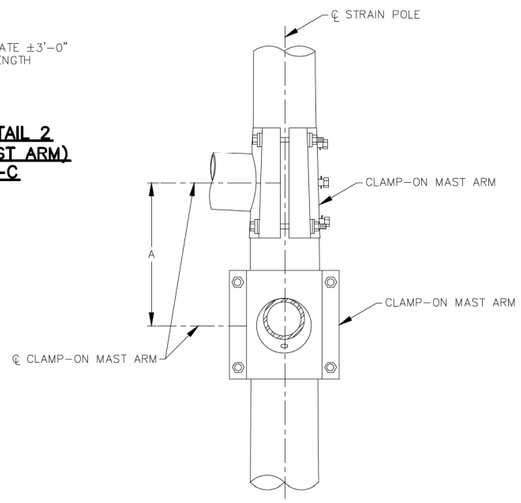
CLAMP–ON DETAIL 1 (ROUND MAST ARM) SECTION B–B



TYPICAL SHEAR PIN DETAIL



CLAMP–ON DETAIL 2 (OCTAGONAL MAST ARM) SECTION C–C



TYPICAL DUAL CLAMP–ON MAST ARM PLACEMENT

MATERIALS	
ROUND CLAMP–ON MAST ARM AND STRAIN POLE OR OCTAGONAL MAST ARM AND STRAIN POLE	ASTM A570 GR50 OR ASTM A572 GR50
PLATES (1)	ASTM A36 OR A572 GR50
CONNECTION BOLTS	ASTM A325 EXCEPT WHERE NOTED
PIN BOLTS	ASTM A325 EXCEPT WHERE NOTED
PIPE	ASTM A325
MISC. HARDWARE	ASTM A53 GR A OR B, OR A501
STEEL CABLE	ASTM A475, 7 WIRE, UTILITIES GRADE

(1) EITHER OF THE MATERIALS LISTED FOR PLATES MAY BE USED WHERE THE DRAWINGS DO NOT SPECIFY A PARTICULAR ASTM DESIGNATION.

TABLE 3 – CLAMP–ON MAST ARM FABRICATION DIMENSIONAL TOLERANCES

MAST ARM DESIGNATION (100 MPH)					BEND RADIUS		RISE UNDER LOAD	DEVIATION FROM HORIZONTAL (UNLOADED)		CLAMP ANGLE		MAST ARM CUT AND ANGLE FOR CLAMP ATTACHMENT			
	"X"	"X_1"	"B"	"b_1"	"C"	"C_1"	"Y"	"Z"	"ø"	"$ø_1$"	"$ø_1$"	Lc	CUT	γ	D_1
DESCRIPTION	FT.	FT.	FT.	FT.	FT.	FT.	FT.	IN.	DEG.	DEG.	DEG.	FT.	IN.	ANGLE	DIA.(IN.)
20–HC10030	4'–6"	±1.0'	10'–5⅞"	±1.0'	21.5'	±1.0'	3'–10"	3 ¼"±½"	±2.0°	29°	±1.0°	20	3 5⅛"	24°	8"
20–HC10034	4'–6"	±1.0'	10'–5⅞"	±1.0'	21.5'	±1.0'	3'–10"	3 ¼"±½"	±2.0°	29°	±1.0°	20	3 5⅛"	24°	8"
25–HC10030	3'–10"	±1.0'	10'–5⅞"	±1.0'	27.0'	±1.0'	3'–10"	3 ¼"±½"	±2.0°	24°	±1.0°	25	3 5⅛"	24°	9"
25–HC10034	3'–10"	±1.0'	10'–5⅞"	±1.0'	27.0'	±1.0'	3'–10"	3 ¼"±½"	±2.0°	24°	±1.0°	25	3 5⅛"	24°	9"
30–HC10030	5'–6"	±1.0'	15'–½"	±1.0'	27.0'	±1.0'	3'–10"	6 ¼"±½"	±2.0°	24°	±1.0°	30	4 9⅛"	25°	10"
30–HC10034	5'–6"	±1.0'	15'–½"	±1.0'	27.0'	±1.0'	3'–10"	6 ¼"±½"	±2.0°	24°	±1.0°	30	4 9⅛"	25°	10"
35–HC10030	5'–6"	±1.0'	20'	±2.0'	27.0'	±1.0'	3'–10"	8 ½"±¾"	±2.0°	24°	±1.0°	35	4 9⅛"	25°	10"
35–HC10034	5'–6"	±1.0'	20'	±2.0'	27.0'	±1.0'	3'–10"	8 ½"±¾"	±2.0°	24°	±1.0°	35	4 9⅛"	25°	10"
40–HC10030	9'–2"	±1.0'	19'–2 5⅛"	±2.0'	46.0'	±1.0'	3'–10"	4 1⅛"±¾"	±2.0°	15°	±1.0°	40	2 ¾"	8°	11"
40–HC10034	9'–2"	±1.0'	19'–2 5⅛"	±2.0'	46.0'	±1.0'	3'–10"	4 1⅛"±¾"	±2.0°	15°	±1.0°	40	2 ¾"	8°	11"
42–HC10030	9'–2"	±1.0'	24'–6"	±2.0'	46.0'	±1.0'	3'–10"	10 5⅝"±¾"	±2.0°	14.5°	±1.0°	42	3 1⅛"	15°	11"
42–HC10034	9'–2"	±1.0'	24'–6"	±2.0'	46.0'	±1.0'	3'–10"	10 5⅝"±¾"	±2.0°	14.5°	±1.0°	42	3 1⅛"	15°	11"
44–HC10030	9'–2"	±1.0'	24'–6"	±2.0'	46.0'	±1.0'	3'–10"	10 5⅞"±¾"	±2.0°	14.5°	±1.0°	44	3 1⅛"	15°	11.5"
44–HC10034	9'–2"	±1.0'	24'–6"	±2.0'	46.0'	±1.0'	3'–10"	10 5⅞"±¾"	±2.0°	14.5°	±1.0°	44	3 1⅛"	15°	11.5"

GENERAL NOTES:

1.) DESIGN SHALL CONFORM TO 2001 OR LATEST ADDITION TO AASHTO STANDARD SPECIFICATIONS FOR THE STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS AND INTERIM SPECIFICATIONS DESIGN WIND SPEED EQUALS 100 MPH PLUS A 1.3 GUST FACTOR.
2.) STRAIN POLES ARE DESIGNED TO SUPPORT SPAN WIRE WITH ONE CLAMP–ON MAST ARM. THE SPECIFIED SIGNAL LOAD APPLIED AT THE END OF THE TRAFFIC SIGNAL ARM EQUALS 180 LBS. VERTICAL DEAD LOAD PLUS THE HORIZONTAL WIND LOAD ON AN EFFECTIVE PROJECTED AREA OF 32.4 SQ. FT. THE MAXIMUM PERMISSIBLE SPAN WIRE DESIGN LOADS TABULATED ARE CALCULATED AT A STRESS LOAD OF 1.40 TIMES THE BASIC ALLOWABLE STRESS. A SIMULTANEOUS WIND ON THE POLE, MAST ARM, AND LUMINAIRE IS ALSO INCLUDED. DESIGNS ARE BASED ON A SPAN WIRE AND ARM INCLUDED ANGLE OF 90 DEG. ANGLES OF LESS THAN 75 DEG. OR MORE THAN 105 DEG. WILL REQUIRE A SPECIAL DESIGN.
3.) FABRICATION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND THE WITH THE DETAILS AND DIMENSIONS. ALL WELDING SHALL CONFORM TO THE REQUIREMENTS OF THE SPECIFICATIONS OF THE AMERICAN WIELDING SOCIETY STRUCTURAL WELDING CODE AWS LATEST EDITION.
4.) A MAXIMUM 1 1/2" WIDE VERTICAL SLOTTED HOLE MAY BE CUT IN THE FRONT CLAMP PLATE TO FACILITATE DRAINAGE DURING GALVANIZING. THE SLOT SHALL BE CENTERED BEHIND THE ARM AND SHALL BE NO LONGER THAN THE ARM DIAMETER MINUS 1".
5.) WHERE DUPLICATE PARTS OCCUR ON A DETAIL, WELDS SHOWN FOR ONE PART SHALL APPLY TO ALL SIMILAR PARTS ON THE DETAIL.
6.) PIN BOLTS ARE REQUIRED TO PREVENT ROTATION OF CLAMP–ON ARMS UNDER DESIGN WIND FORCES.
7.) PIN BOLTS SHALL BE A325 WITH THREADS EXCLUDED FROM THE SHEAR PLANE. PIN BOLT AND 3/4" ø PIPE SHALL HAVE 3/16" ø HOLES FOR A 1/8" ø GALVANIZED COTTER PIN. BACK CLAMP PLATE SHALL BE FURNISHED WITH A 3/4" ø HOLE FOR EACH PIN BOLT. AN 11/16" ø HOLE FOR EACH PIN BOLT SHALL BE DRILLED THROUGH THE POLE AFTER ARM ORIENTATIONS HAVE BEEN APPROVED BY THE ENGINEER. THE DRILLED HOLES SHALL BE PAINTED / SPRAYED WITH GALVANIZE PAINT.
8.) CLAMP–ON MAST ARM FABRICATIONS DIMENSIONAL TOLERANCES SHALL BE IN ACCORDANCE WITH TABLE 3.
9.) SEE SINGLE AND DUAL MAST ARM ASSEMBLIES DETAILS STANDARD SHEET FOR DETAILS OF CLAMP–ON MAST ARMS.
10.) SEE STRAIN POLE ASSEMBLY DETAILS STANDARD SHEET FOR DETAILS OF STRAIN POLE.
11.) SEE LUMINAIRE ARM DETAILS STANDARD SHEET FOR DETAILS OF LUMINAIRE ARM AND CONNECTION.
12.) SEE STRAIN POLE FOUNDATION DETAILS STANDARD SHEET FOR DETAILS OF ANCHOR BOLTS AND FOUNDATION.
13.) UNLESS OTHERWISE NOTED, ALL STEEL PARTS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 REQUIREMENTS WITH A MINIMUM OF 2 OUNCES PER SQUARE FOOT OF GALVANIZED COATING.
14.) ALL SMALL STEEL HARDWARE ITEMS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A153 REQUIREMENTS.
15.) SPECIAL DESIGNS REQUIRE SUBMISSION OF SHOP DRAWINGS IN ACCORDANCE WITH THE SPECIFICATION ITEM 680 "STEEL MAST ARM AND STEEL STRAIN POLE ASSEMBLIES".
16.) ALL BOLTS SHALL HAVE TWO FULL DIAMETER THREADS EXPOSED ABOVE THE NUT.
17.) CONTRACTOR SHALL INSTALL A CLOSE NIPPLE WITH LOCKNUTS AND METAL BUSHINGS (SIZE AS REQUIRED) TO PREVENT ABRASION WHERE CABLE(S) ENTER ANY PORTION OF THE STRAIN POLE.
18.) CLAMP–ON MAST ARM(S) AND STRAIN POLE(S) SHALL HAVE THE SAME GEOMETRIC SHAPES PER ASSEMBLY.

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
5			

HARRIS COUNTY ENGINEERING DEPARTMENT

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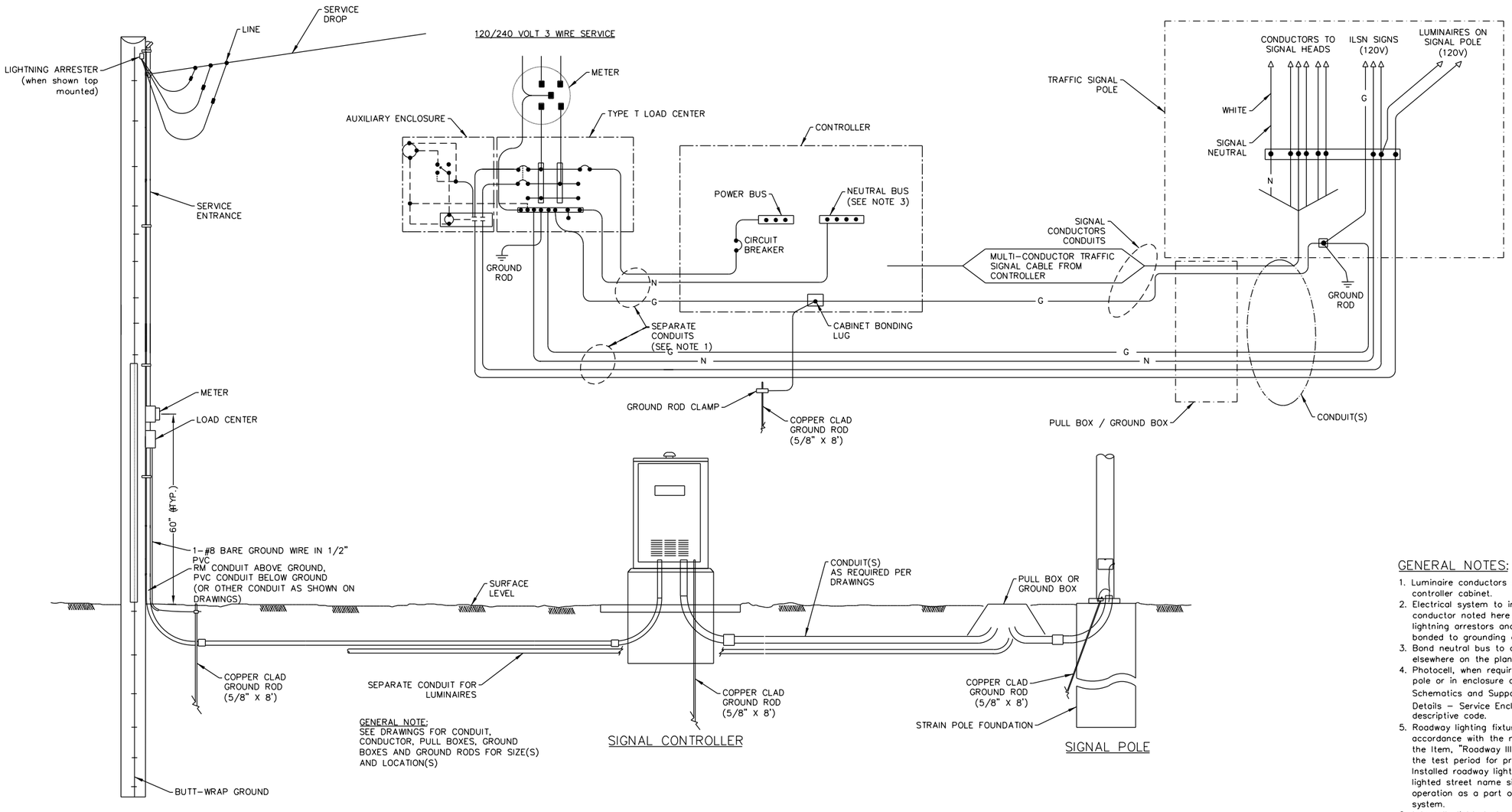
STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED — PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS			
STANDARD DETAILS			TRAFFIC STANDARD
SHEET DESCRIPTION: MAST ARM CONNECTIONS AND			MAC
DRAWN BY: BSH	FABRICATION DETAILS (100 WIND ZONE)		DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE		SHEET NO: 17 / 38



ELECTRICAL SERVICE

(TYPE T TIMBER POLE SHOWN AS EXAMPLE, SEE ELECTRICAL DETAILS, LAYOUT SHEETS, AND ELECTRICAL SERVICE DATA SHEET FOR SERVICE REQUIRED AND FOR DETAILS.)

UNLESS SHOWN ELSEWHERE IN THE PLANS, ELECTRICAL SERVICE DATA FOR TYPE D SHALL BE AS FOLLOWS:

ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE DESCRIPTION(SEE ELECTRICAL DETAILS – SERVICE SUPPORT SF & SP	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT		TWO-POLE CONTACTOR AMPS	PANELBD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
				SWITCH AMP/FUSES	CKT. BRK. POLE/AMP					
TY D (120/240)070(NS)SS(E)**(*)	1 1/4"	3/#4	N/A	N/A	2P/70	20	70	TRAFFIC SIGNAL LIGHTING	1P/50 2P/20	<7.1
TY D (MOD 1)(120/240)000(NS)SS(E)**(*)	1 1/4"	3/#4	70	NONE	NONE	N/A	N/A	N/A	N/A	<7.1
TY D (MOD 2)(120/240)070(NS)SS(E)**(*)	1 1/4"	3/#4	N/A	NONE	NONE	20	70	TRAFFIC SIGNAL LIGHTING	1P/50 2P/20	<7.1

* SEE DESCRIPTIVE CODE IN ESTIMATE FOR OVERHEAD OR UNDERGROUND SERVICE
** SEE DESCRIPTIVE CODE IN ESTIMATE FOR SERVICE SUPPORT TYPE

GENERAL NOTES:

1. Luminaire conductors shall not be looped through controller cabinet.
2. Electrical system to include an equipment grounding conductor noted here as "G". All exposed metal parts, lightning arrestors and surge protectors are to be bonded to grounding conductor.
3. Bond neutral bus to cabinet bonding lug when required elsewhere on the plans or when required by the Engineer.
4. Photocell, when required, shall be mounted at top of pole or in enclosure as shown on Electrical Details – Service Schematics and Support Type TP (overhead) and Electrical Details – Service Enclosure & Notes and as required by descriptive code.
5. Roadway lighting fixtures, when required, shall be in accordance with the material and construction methods of the Item, "Roadway Illumination Assemblies" except for the test period for proper operation of the luminaires, Installed roadway lighting luminaires and internally lighted street name signs shall be tested for proper operation as a part of the associated traffic signal system.
6. Internally lighted street name signs (ILSN), when required, shall be in accordance with the Item "Internally Lighted Street Name Signs". Because of the electrical isolation of ILSN hinges, a #12 green grounding conductor shall be run to the ILSN fixture.
7. Install ground rod at alternate location when directed by the Engineer. Maintain a minimum of 8 ft in contact with the earth.

NO.	REVISIONS	DATE	NAME
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ANTHONY P. VOIGT 84845 LICENSED PROFESSIONAL ENGINEER
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NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS

STANDARD DETAILS

TRAFFIC STANDARD: ED-TS

SHEET DESCRIPTION: ELECTRICAL DETAILS: TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

DRAWN BY: BSH

DATE: 8/18/17

CK'D BY: BSH

SCALE: NONE

SHEET NO: 18 / 38

SERVICE ENCLOSURE NOTES:

VI. Service Assembly Enclosures. All service assemblies and enclosures shall be UL Listed for the intended purpose.

A. Shop built or shop assembled service assemblies (all types except Type T and Type D without lighting contactor) shall be built or assembled by a UL Listed Industrial Control Panel shop and shall have a unique serial numbered UL Label with the words "LISTED ENCLOSED INDUSTRIAL CONTROL PANEL". The same or an additional label shall have the name, location, and phone number of the shop, the UL file number of the shop, the shop order or drawing number, date of manufacture or assembly, and the line voltage. The enclosure shall also be labeled "SUITABLE ONLY FOR USE AS SERVICE EQUIPMENT".

B. Conduit entries into the top of all enclosures shall have threaded hubs.

C. All enclosures shall be permanently labeled on the front door "DANGER HIGH VOLTAGE" and the equipment supplied (i.e. LIGHTING, LANDSCAPING, SIGNALS, TRAFFIC MANAGEMENT). Unless otherwise approved by the Engineer, the labeling shall be minimum 1 inch letters and shall be applied by stenciled paint or stick-on decal.

D. Type GS enclosures for service types D, T, and the circuit breaker panelboard of service type C shall be made from pre-galvanized steel sheeting, hot dipped galvanized steel, or powder coat painted steel. Painted enclosures shall be painted inside and outside; galvanized enclosures may be painted. Unless otherwise approved by the engineer, painted enclosures shall be gray, beige, or white. Panelboard/loadcenter enclosures shall be UL type 3R, shall have a dead front trim, and shall have a door with provisions for padlocking. Auxiliary enclosures, when required for illumination or other control equipment, shall be UL type 12 as described in III.E. below for service types A and C.

E. Type GS enclosures for service types A and C shall meet the requirements of type GS in III.D. above for service types D and T except that the enclosure shall be a UL type 12 enclosure conforming to UL 50 and shall meet additional requirements of this paragraph. The enclosure door shall have a rolled lip around all sides of the enclosure opening, a continuous hinge, and a padlock handle. The door shall have a mechanically attached data pocket constructed of either thermoplastic or metal and measuring at least 12 inches by 12 inches. The main disconnect operator shall be flange-mounted, shall interlock the door when in the "on" position, and shall be pad lockable in both the "on" or the "off" positions. Enclosure shall include an equipment mounting panel installed inside the enclosure on collar studs or tapped bosses, and constructed of either 12-gauge steel or 0.10 inch thick aluminum. Enclosure shall be either hot dip galvanized, pre-galvanized sheeting or prime and painted. Paint shall be powder coat paint as show below. Color shall be white or gray. Condensation drainage shall be provided through 0.25 inch drain holes drilled in the bottom of the enclosure at two diagonal opposing corners. The contractor shall place in the service enclosure a laminated copy of the "as built" electrical plans showing the equipment supplied by that electrical service and all applicable wiring diagrams, layouts, and ED and RID standard sheets.

F. Type SS Stainless steel enclosure shall be meet all the requirements above for the respective type GS except that the enclosure shall be UL type 4X conforming to UL 50. Type GS circuit breaker panel housed in a stainless steel UL type 4X enclosure conforming to UL 50 shall be considered complying with the Type SS requirements for Service types D & T.

G. Type PS enclosure shall be as detailed and specified on ED(8).

VII. Powder Coat Paint. Powder coating shall be either a polyester thermosetting resin, a zinc rich primer with a TGIC (triglycidyl isocyanurate) powder overcoating, or a zinc-rich epoxy powder, applied by either electrostatic spray or fluidized bed immersion, high temperature oven cured, high density, low gloss, 4 mil thick (minimum), coating. Adhesion shall meet the 5A or 5B classifications of ASTM D3359. Finish shall be uniform in appearance and free of scratches.

VIII. Main Disconnect. Main disconnect device shall be either a fusible switch or a circuit breaker, as specified in the Electrical Service Data, shall be two pole, and rated for the voltage and amperage specified.

A. Switch shall be UL and NEMA Type HD (heavy duty) flange-mounted in the service assembly enclosure. Switch shall have clips for Class R fuses.

B. Circuit breaker shall be a UL Listed thermal-magnetic circuit breaker flange-mounted in the service assembly enclosure. Circuit breakers shall have a minimum interrupting rating of 14,000 Amps. Contractor shall verify that the available fault current is less than the circuit breaker amps interrupting capacity (AIC) rating and shall provide documentation from the Utility to the Engineer. Documentation shall be submitted at the same time as other electrical submittals. Circuit breaker shall be UL Listed to UL489.

IX. Lightning Arrester. Arresters shall be MOV-type secondary surge arresters rated 650 volts for 240/480 volt services or 175 volts for 120/240 volt services and shall meet ANSI, IEEE, UL, and NEMA standards. Mounting brackets shall be provided for mounting the arresters inside the service assembly enclosures, unless otherwise specified by the Engineer. Lightning arrester leads shall be run as straight and short as practical.

X. Control Circuit. Control circuit protection shall be either a 10 or 15 amp circuit breaker.

XI. Control Station ("H-O-A" Switch). Control station shall be a maintained-contact, three position selector switch in a UL type enclosure. Switch shall be rated 600 volts and shall be fitted with "Hand-Off-Auto" legend.

XII. Photo Electric Control. Photo electric control shall consist of a photocell, internal lightning arrester, and relay or bimetallic switch mounted inside a weatherproof enclosure with standard 3-prong twist lock photocell plug and receptacle. The enclosure shall be made of poly-acrylic with clear acrylic window. Enclosure chassis shall be molded phenolic plastic. The photocell shall have a polyethylene gasket, and shall have a hermetically sealed cadmium sulfide cell. The arrester shall have an enclosed type expulsion arrester rated 2.0 kV spark over with 10,000 amps follow-through. Relay or switch shall be time delay type with normally closed contacts. Photo electric control shall be rated 1800 VA, 105-285 volts.

Enclosure mounted photocells shall be the same as above except that the photocell shall be mounted inside the enclosure. The enclosure shall have two acrylic paned windows, or other material approved by the Engineer, one on each side of the enclosure. Each window shall be rectangular approximately 1 inch by 2 inch, round 2 inch diameter, or as otherwise approved by the Engineer. The photocell shall be mounted in a position to receive light from one window. Top of pole mounted photocells shall be mounted as shown on Electrical Details – Service Enclosure & Notes.

The Contractor shall be responsible for proper operation of the photo-electric control. The Contractor shall move and/or adjust or shield the photocell from stray or ambient nighttime light or shall make any other adjustments required for proper operation. The photocell shall face North when practicable. Unless otherwise shown on the plans, the photocell shall turn on the illumination system at 1.0 +(–) 0.5 footcandle and turn off the illumination system at 2 footcandle higher than turn on.

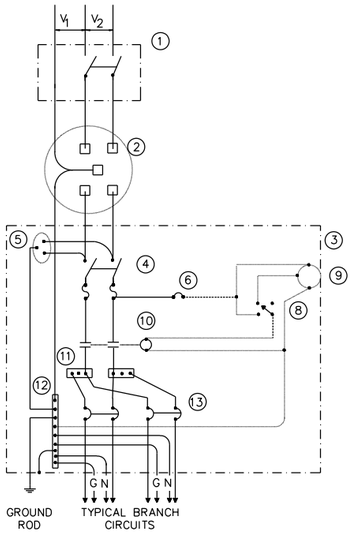
XIII. Lighting Contactor. Lighting contactor shall be a UL Listed lighting contactor, two-pole or multipole as required, electrically held type designed to control high pressure sodium lighting loads, with silver alloy double break contacts rated at 480 volts or 600 volts.

XIV. Power Distribution Terminal Blocks. Power distribution terminal blocks shall be rated for 600 volts and shall be used for line side connections to branch circuit breakers where more than one circuit breaker is required. Lugs on blocks shall be properly sized for conductors being used. Only one conductor shall be placed under each lug.

XV. Neutral/Ground Bus. Neutral/ground bus shall be a factory made bus permanently bonded to the enclosure with properly sized lugs for grounding and neutral conductors.

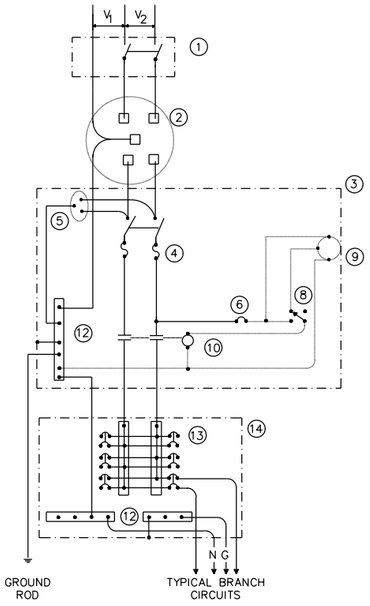
SCHEMATIC LEGEND

1 – Safety Switch (when required)
2 – Meter (when required)
3 – Service Assembly Enclosure
4 – Main Disconnect (Switch or Breaker, (See Electrical Service Data)
5 – Lightning Arrestor
6 – Circuit Breaker, 15A
7 – Auxiliary Enclosure
8 – Control Station ("H-O-A" Switch)
9 – Photo Electric Control (enclosure-mounted shown)
10 – Lighting Contactor
11 – Power Distribution Terminal Blocks
12 – Neutral/Ground Bus
13 – Branch Circuit Breaker (See Electrical Service Data)
14 – Circuit Breaker Panelboard (See Electrical Service Data)
15 – Load Center



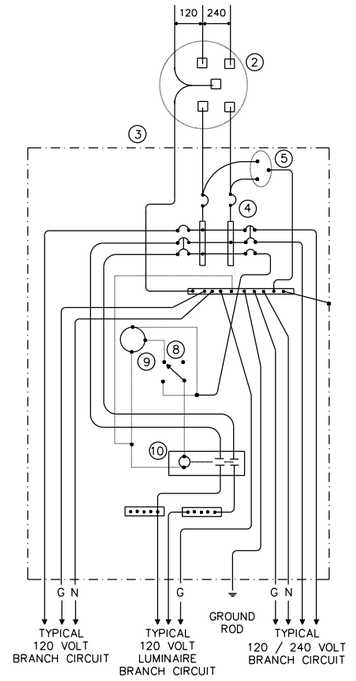
SCHEMATIC TYPE A
THREE WIRE

(MAXIMUM FEEDER CIRCUIT SIZE (HIGH MAST POLES): 100AMPS FOR TWO POLE 480V, 125 AMPS FOR ONE OR TWO POLE 120V OR 240V. MAXIMUM BRANCH CIRCUIT SIZE: 50AMPS)



SCHEMATIC TYPE C
THREE WIRE

(MAXIMUM FEEDER CIRCUIT SIZE (HIGH MAST POLES): 100AMPS FOR TWO POLE 480V, 125 AMPS FOR ONE OR TWO POLE 120V OR 240V. MAXIMUM BRANCH CIRCUIT SIZE: 50AMPS)



SCHEMATIC TYPE D
120/240 VOLTS – THREE WIRE

(INSTALL PHOTOCELL AND LIGHTING CONTACTOR WHEN SHOWN ON ELECTRICAL SERVICE DATA. SEE TYPE D SERVICE NOTES.)

TYPE D SERVICE NOTES:

Photocell and lighting contactor shall be located in the same UL type 3R enclosure. Photocells shall have a window on each side of enclosure to allow operation. Photocell/contactor and breaker area shall have separate dead front trim. Enclosure, except for RT and PS supports, shall not exceed 36 inches in height or 15 inches in width unless approved by the engineer.

NO.	REVISIONS	DATE	NAME
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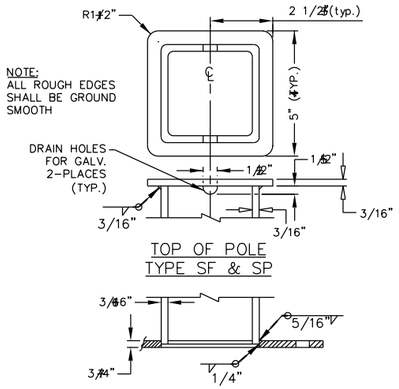
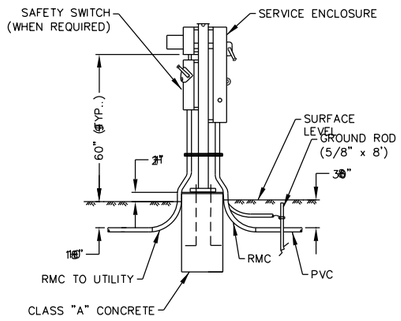
VOIGT ASSOCIATES, INC. F-5333
NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD: ED-SE
SHEET DESCRIPTION: ELECTRICAL DETAILS: SERVICE ENCLOSURE AND NOTES		DATE: 8/18/17
DRAWN BY: BSH	SCALE: NONE	SHEET NO: 19 / 38
CK'D BY: BSH		

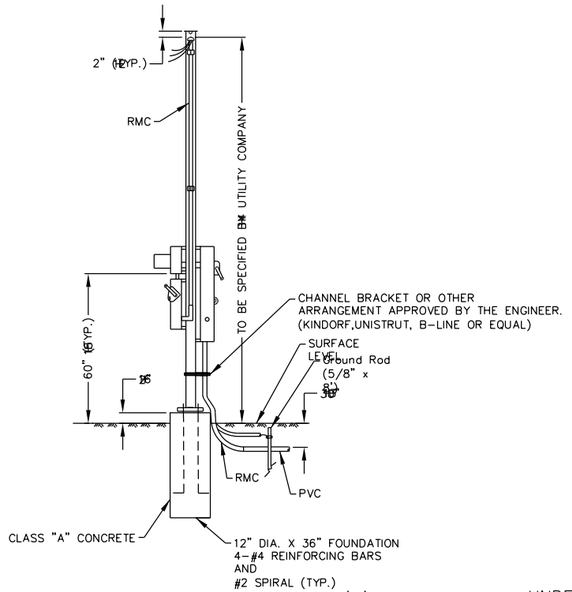


TOP OF POLE
TYPE SF & SP

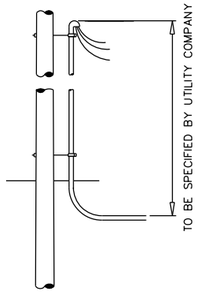
BOTTOM OF POLE
TYPE SF & SP



SERVICE SUPPORT TYPE SP (U)
UNDERGROUND SERVICE WITH
SAFETY SWITCH



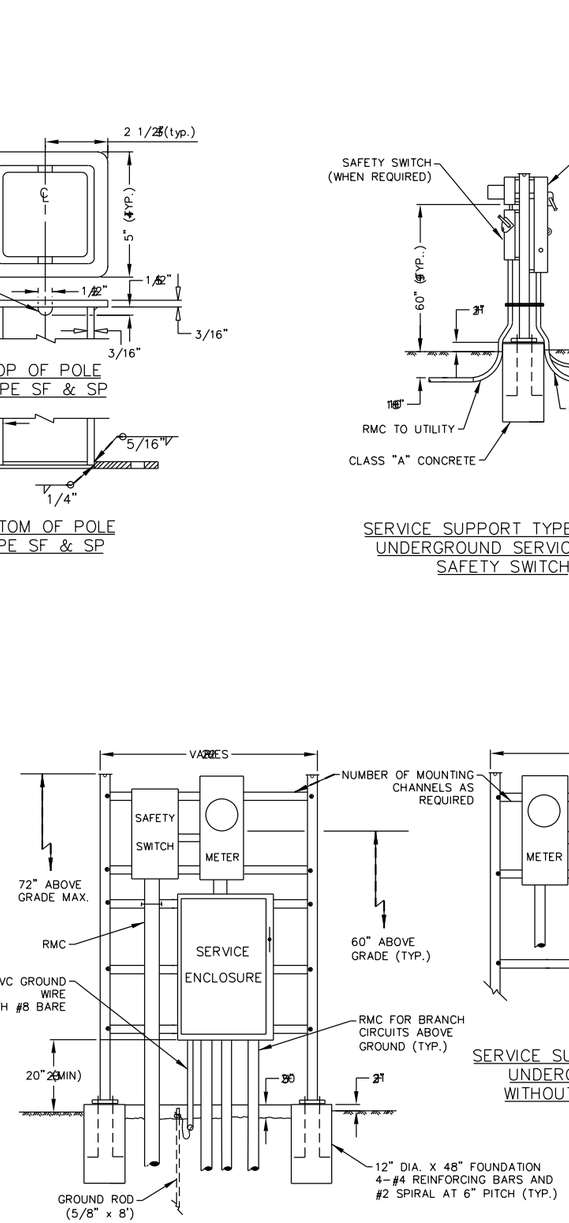
SERVICE SUPPORT TYPE SP (O)
OVERHEAD SERVICE WITH
SAFETY SWITCH



UNDERGROUND RISER
AT UTILITY POLE
(FOR UNDERGROUND SERVICE)

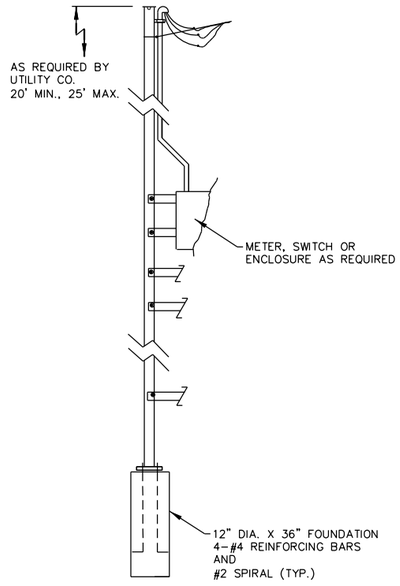
GENERAL NOTES:

1. Support type SP and SF: Fabricated from 4" x 4" x 3/16 " square structural tubing, ASTM A500 Grade A or G or equal. Base plate shall be 3/4 " plate, ASTM A36 or equal. All equipment and conduit shall be mounted on galvanized channel strut, 1 1/2 " x 1 5/8 " x 12 gauge galvanized steel channel (Unistrut, Kindorf, B-line or equal) clamped with channel hardware, bolted or welded to vertical member as approved by the Engineer.
2. Point end of all channels with zinc-rich paint.
3. All Steel Poles (SP and SF) shall be hot-dip galvanized after fabrication. Poles for overhead service shall be fitted with eyebolt or similar fitting, as approved by the utility company, for attachment of service drop to the pole.
4. All conduit and conductors attached to the electrical service and within 12 inches of the electrical service will not be paid for directly, but shall be subsidiary to the electrical service. All conduit and conductors from the utility company pole to the point 12 inches from the electrical service, including conduit and conductors required for the utility pole riser when furnished by the Contractor, will be paid for separately.
5. All mounting hardware and installation details of services shall be in accordance with utility company specifications.
6. Anchor bolts for underground service supports shall be 3/4 " x 18" x 4" (dia. x length x hook length). Anchor bolts for overhead services shall be 3/4 " x 56" x 4". Anchor bolts shall be provided with leveling nuts.
7. Conduit for grounding electrode conductor (ground rod wire) shall be 1/2 " PVC all other conduit on electrical services shall be rigid metal conduit. Service entrance conduit size shall be as shown elsewhere. Conduit for branch circuit entry to enclosure shall be the same size as that shown on the layout sheets for branch circuit conduit. Rigid metal conduit shall extend to the rigid metal elbow and then be coupled to the type conduit shown on the layout for that particular branch circuit. RMC shall have grounding bushings in enclosures.
8. If pole is painted, each separate painted piece shall have a bonding jumper attached to a drill and tapped hole.

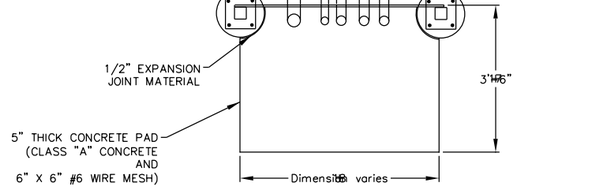


SERVICE SUPPORT TYPE SF (U)
UNDERGROUND SERVICE WITH
SAFETY SWITCH
(TYPICAL ARRANGEMENT)

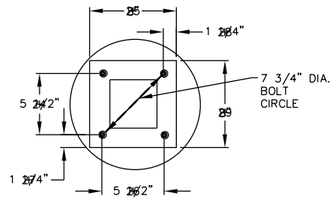
SERVICE SUPPORT TYPE SF (U)
UNDERGROUND SERVICE
WITHOUT SAFETY SWITCH



SERVICE SUPPORT TYPE SF (O)
OVERHEAD SERVICE



SERVICE SUPPORT TY SF (O) & SF (U)
TOP VIEW



BASE PLATE DETAIL

NO.	REVISIONS	DATE	NAME
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VOIGT ASSOCIATES, INC.
F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD
SHEET DESCRIPTION: ELECTRICAL DETAILS: SERVICE SUPPORTS		ED-SFSP
DRAWN BY: BSH	TYPE SF AND SP	DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 20 / 38

ELECTRICAL SERVICE NOTES

All work, materials, services, and incidentals, whether or not specifically shown on the plans, which may be necessary for a complete and proper electrical service installation as specified in the plans to obtain electrical power (except extending primary lines to electrical service) shall be paid for, performed, furnished and installed by the Contractor. The Contractor shall contact the Utility for metering and shall comply with all Utility requirements.

Primary line extensions, when required, shall be paid for under Force Account work. The Contractor shall consult with the appropriate Utility to determine costs and requirements, and shall coordinate the Utility's work as approved by the Engineer. The contractor shall be reimbursed only the amount billed by the Utility. No additional amount for supervision of the Utility's work will be paid.

Materials shall be new and unused, and materials and installation shall comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards and shall be Underwriters Laboratories (UL) Listed. Electrical Service conduits, conductors, disconnects, contactors, circuit breaker panel sizes, and branch circuit breakers, shall be as shown in the Electrical Service Data elsewhere in the plans. Faulty fabrication or poor workmanship in any material, equipment, or installation shall be justification for rejection.

The Contractor shall submit for approval no less than five (5) copies of catalog cut sheets on electrical service materials. Submittals shall be legible and shall be marked to indicate which product on a cut-sheet is to be supplied. Where manufacturers provide warranties and guarantees as a customary trade practice, Contractor shall furnish to the County such warranties or guarantees.

I. Safety Switch. A safety switch, placed ahead of the meter, shall only be used when specified by the Utility and is shown on the Electrical Service Data. The switch shall be UL Listed, heavy duty type, 600 volt, unfused, with a UL type 3R enclosure and equipped with a solid neutral (s/n) assembly. The switch shall be padlockable in the "on" position.

II. Service Type. Electrical service types A, C, D, and T shall be as schematically detailed on ED(4). Other service types shall be as detailed elsewhere on the plans.

III. Branch Circuit Breakers. Circuit breakers shall be thermal magnetic and have a minimum interrupting capacity of 10,000 amps and a voltage rating compatible with their use. Circuit breakers shall be sized as shown on electrical service data table. Circuit breakers in panelboards and load centers shall be full size and designed exclusively for the panelboard or load center in use. Tandem and half-width breakers shall not be used. All circuit breakers shall be permanently and clearly marked identifying the circuit or device attached. Circuit breakers shall be UL Listed to UL489. Circuit breakers shall be switch duty.

IV. Circuit Breaker Panelboard. Panelboards shall be UL Listed and shall meet Federal Specification W-P-115b, Type 1, Class 1 requirements. Panelboards shall have copper busses, a minimum of 12 one-pole spaces, and shall be rated for service equipment. Enclosure shall meet UL type 3R classification. Panelboards shall have a threaded hub conduit entry for conduit entering the top of the enclosure. Circuit breakers shall be bolt-in type only.

V. Circuit Breaker Load Center. Load centers shall be UL Listed, and shall meet Federal Specification W-P-115c, Type 1, Class 2 requirements. Load centers shall have copper busses, a minimum of 4 one-pole spaces, and shall be rated for service equipment. Enclosure shall meet UL type 3R classification. Load centers shall have a threaded hub conduit entry for conduit entering the top of the enclosure. Circuit breakers shall be plug-in type only. Load centers for type T services shall accommodate a maximum of 6 one-pole breakers.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY D (120/240) 125 (NS) GS (E) PS (X)

Schematic Type

Service Voltage (V / V)

Main Disconnect Amp Rating
(000 indicates none)

SS= Safety switch ahead of meter
NS= No switch ahead of meter and/or no meter required

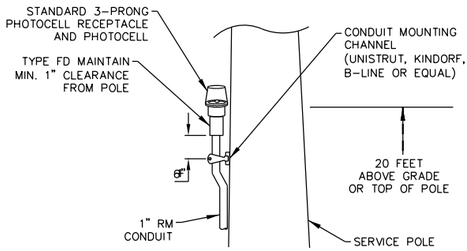
Enclosure Type
GS= Galvanized steel
SS= Stainless steel
PS= Pedestal Service

Photocell Location
T= Top of pole
E= Enclosure mounted
L= Luminaire mounted
N= None

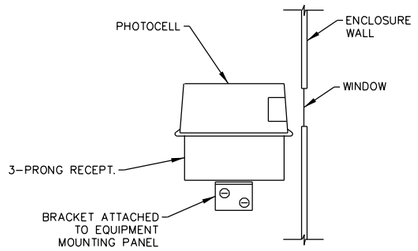
Service Support Type
GC= Granite concrete
OC= Other concrete
TP= Timber pole
SP= Steel pole
SF= Steel frame
OT= Pole by others or paid for separately
EX= Existing pole
TS= Switch gear to be placed on traffic signal pole
RT= Rectangular structural tubing
PS= Pedestal Service

O= Overhead service
U= Underground service

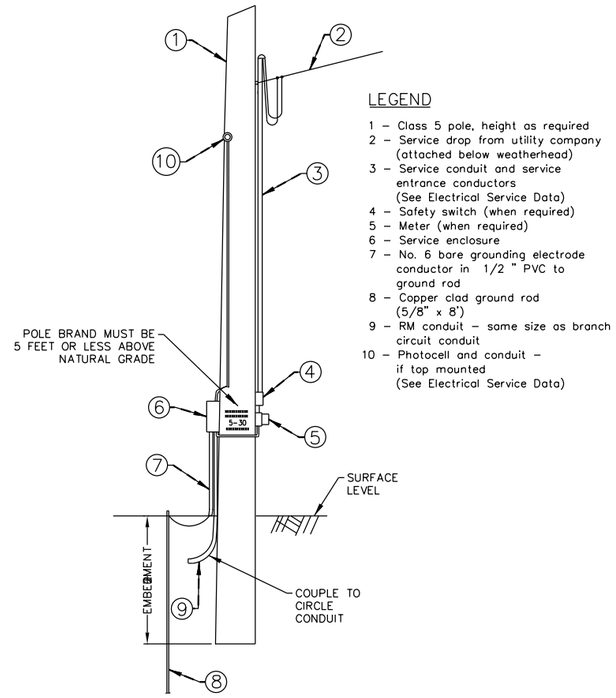
Example: ELEC SERV TY D(120/240)070(NS)GS(T)TP(O)



TOP MOUNTED PHOTOCELL



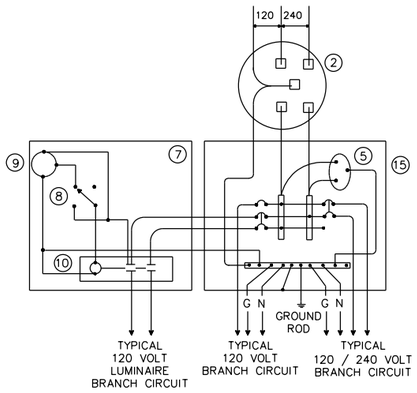
ENCLOSURE MOUNTED PHOTOCELL



LEGEND

1 – Class 5 pole, height as required
2 – Service drop from utility company (attached below weatherhead)
3 – Service conduit and service entrance conductors (See Electrical Service Data)
4 – Safety switch (when required)
5 – Meter (when required)
6 – Service enclosure
7 – No. 6 bare grounding electrode conductor in 1/2 " PVC to ground rod
8 – Copper clad ground rod (5/8" x 8')
9 – RM conduit – same size as branch circuit conduit
10 – Photocell and conduit – if top mounted (See Electrical Service Data)

SERVICE SUPPORT TYPE TP (O)
(TIMBER POLE, OVERHEAD SERVICE – TYPICAL ARRANGEMENT)



SERVICE SUPPORT TYPE T
120/240 VOLTS – THREE WIRE
(INSTALL PHOTOCELL AND LIGHTING CONTACTORS WHEN SHOWN ON ELECTRICAL SERVICE DATA)

SCHEMATIC LEGEND

1 – Safety Switch (when required)
2 – Meter (when required)
3 – Service Assembly Enclosure
4 – Main Disconnect (Switch or Breaker, See Electrical Service Data)
5 – Lightning Arrestor
6 – Circuit Breaker, 15A
7 – Auxiliary Enclosure
8 – Control Station ("H-O-A" Switch)
9 – Photo Electric Control (enclosure-mounted shown)
10 – Lighting Contactor
11 – Power Distribution Terminal Blocks
12 – Neutral/Ground Bus
13 – Branch Circuit Breaker (See Electrical Service Data)
14 – Circuit Breaker Panelboard (See Electrical Service Data)
15 – Load Center (See Electrical Service Data)

———— Power Wiring
———— Control Wiring
—N— Neutral Conductor (when required)
—G— Grounding Conductor

TIMBER POLE NOTES

1. Conduit and conductors attached to service pole and underground within 12 inches of service pole shall not be paid for directly but shall be subsidiary to the service pole.
2. Install photo electric control on north side of pole or in service enclosure as required. See Electrical Service Data.
3. Attach service enclosure with galvanized channel (Unistrut, Kindorf, or equal). Gain pole two places to provide flat surfaces. Paint ends of channel with zinc rich paint.
4. Embedment depth shall be as required in Item 627 Treated Timber Poles.
5. Poles trimmed for excess length shall be trimmed from the top end only.

NO.	REVISIONS	DATE	NAME
1			
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TBPE Firm Reg. No.: F-4578
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS · ANTHONY P. VOIGT · 84845 · LICENSED PROFESSIONAL ENGINEER

VOIGT ASSOCIATES, INC.
F-5333

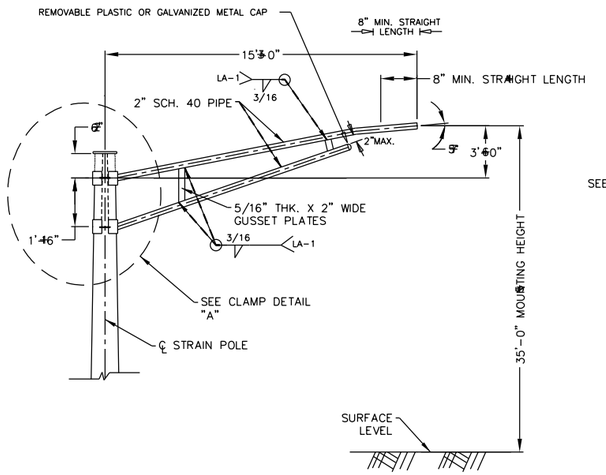
NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS

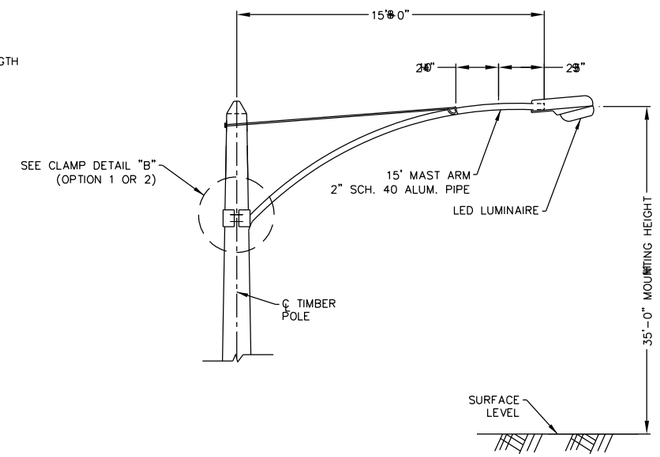
SHEET DESCRIPTION: STANDARD DETAILS
ELECTRICAL DETAILS: SERVICE SCHEMATICS AND SUPPORT TYPE TP (OVERHEAD)

TRAFFIC STANDARD: ED-TP

DRAWN BY: BSH
CK'D BY: BSH
SCALE: NONE
DATE: 8/18/17
SHEET NO: 21 / 38



TRUSS LUMINAIRE ARM



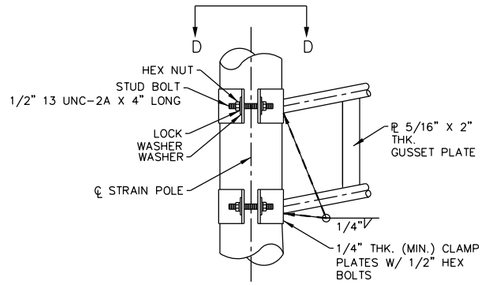
TENSION ROD LUMINAIRE ARM
(TIMBER POLE)

MATERIALS	
LUMINAIRE ARM	ASTM A53 GR A OR B OR A501 OR 595 (2) ALUMINUM 6061-T6
LUMINAIRE ARM PLATES (3)	ASTM A36 OR A572 GR50 (1) OR A595 GR A
MISCELLANEOUS	ASTM DESIGNATIONS AS NOTED

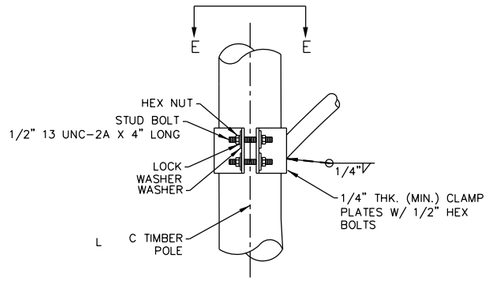
1.) IF A595 GR A MATERIAL IS USED, ARM NEED NOT BE COLD WORKED TO A595 REQUIREMENTS, BUT MATERIAL MUST HAVE 40 KSI MINIMUM YIELD PRIOR TO FABRICATION.
2.) EITHER OF THE MATERIALS LISTED FOR PLATES MAY BE USED WHERE THE DRAWINGS DO NOT SPECIFY A PARTICULAR ASTM DESIGNATION.
3.) ALL MATERIAL FOR TENSION ROD LUMINAIRE ARM EXCEPT BOLTS SHALL BE ALUMINUM 6061-T6.

GENERAL NOTES:

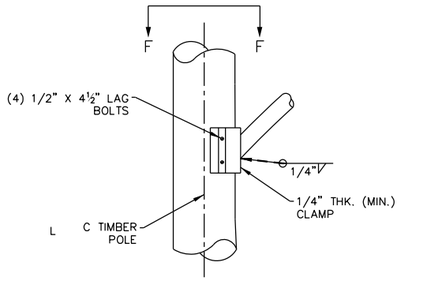
1.) DESIGN SHALL CONFORM TO HIGHWAY SIGNS, AASHTO STANDARD SPECIFICATIONS FOR STRUCTURE SUPPORTS FOR LUMINAIRES AND TRAFFIC SIGNALS, LATEST EDITION. DESIGN WIND SPEED EQUALS 90 MPH PLUS A 1.3 GUST FACTOR. ARMS ARE DESIGNED AREA TIMES DRAG COEFFICIENT) OF 1.5 SQ. FT.
2.) MATERIALS AND FABRICATION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND WITH THE DETAILS, DIMENSIONS, AND WELD PROCEDURES OF THE "AMERICAN NATIONAL STANDARD INSTITUTE/AMERICAN WELDING SOCIETY" ANSI/AWS D1.1, LATEST REVISION.
3.) WELD REFERENCES CALL FOR PREAPPROVED WELD PROCEDURES WHICH THE FABRICATOR MUST OBTAIN PRIOR TO FABRICATION. IN THE ABSENCE OF SPECIFIED FABRICATION TOLERANCES, DIMENSIONS SHALL BE WITHIN THE TOLERANCES GENERALLY OBTAINABLE IN NORMAL FABRICATION PRACTICE.
4.) UNLESS OTHERWISE NOTED, ALL PARTS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123.
5.) SUBMISSION OF SHOP DRAWINGS TO HARRIS COUNTY ENGINEER ON LUMINAIRE ARMS IS REQUIRED.



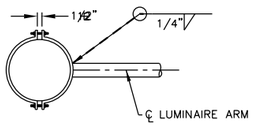
CLAMP DETAIL "A"



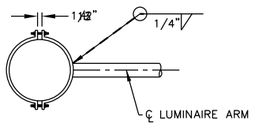
CLAMP DETAIL "B"
(OPTION 1)



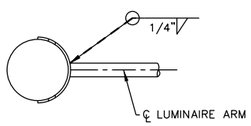
CLAMP DETAIL "B"
(OPTION 2)



SECTION D-D



SECTION E-E



SECTION F-F

NO.	REVISIONS	DATE	NAME
1			
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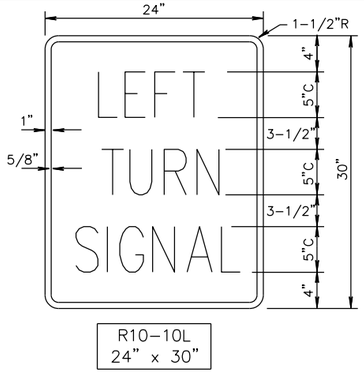
STATE OF TEXAS · ANTHONY P. VOIGT · 84845 · LICENSED · PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

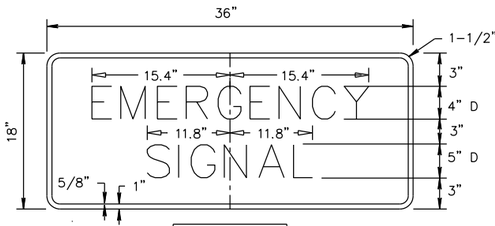
PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD
SHEET DESCRIPTION: LUMINAIRE ARM DETAILS		LUM-A
DRAWN BY: BSH	(100 MPH WIND ZONE)	DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 22 / 38



R10-10L
24" x 30"

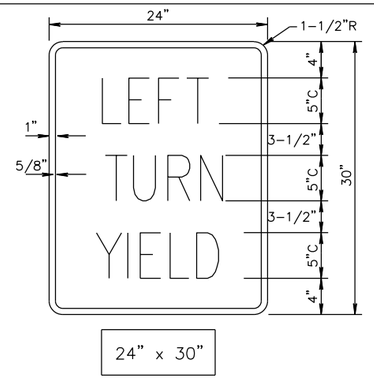
LETTERS – BLACK
BORDER – BLACK
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE

NOTE:
NOT FOR SPAN WIRE MOUNTING. ATTACH SIGN TO STAND ALONE POST OR SIGNAL POLE



36" x 18"

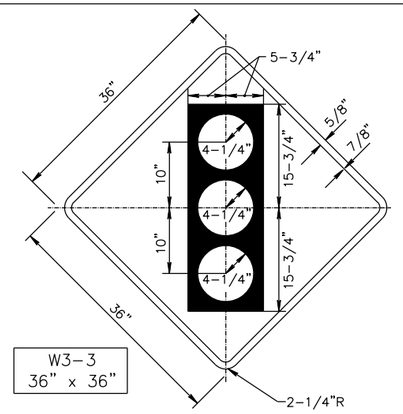
LETTERS – BLACK
BORDER – BLACK
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE



24" x 30"

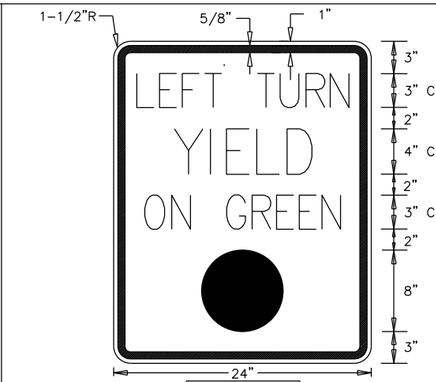
LETTERS – BLACK
BORDER – BLACK
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE

NOTE:
NOT FOR SPAN WIRE MOUNTING. ATTACH SIGN TO STAND ALONE POST OR SIGNAL POLE



W3-3
36" x 36"

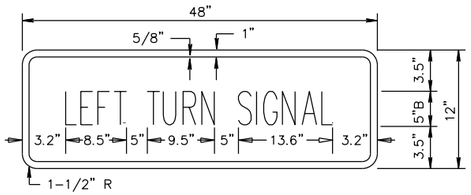
SYMBOL – BLACK
BORDER – BLACK
TOP CIRCLE – RED REFLECTIVE
BOTTOM CIRCLE – GREEN REFLECTIVE
BACKGROUND – YELLOW REFLECTIVE
SHEETING – VIP DIAMOND GRADE

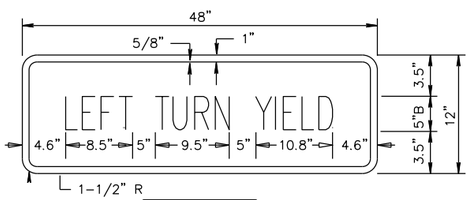


MR10-12
24" x 30"

LETTERS – BLACK
BORDER – BLACK
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE

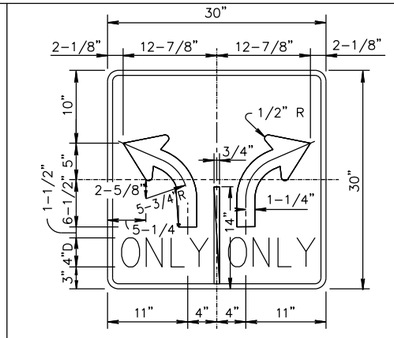
NOTE:
NOT FOR SPAN WIRE MOUNTING. ATTACH SIGN TO STAND ALONE POST OR SIGNAL POLE





48" x 12"

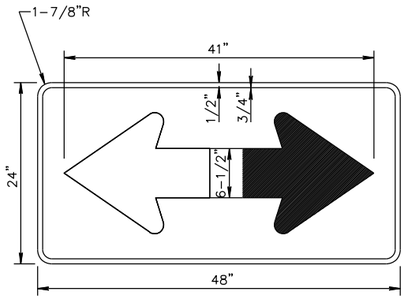
LETTERS – BLACK (SERIES B)
BORDER – BLACK
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE



R3-8 L(R)
30" x 30"

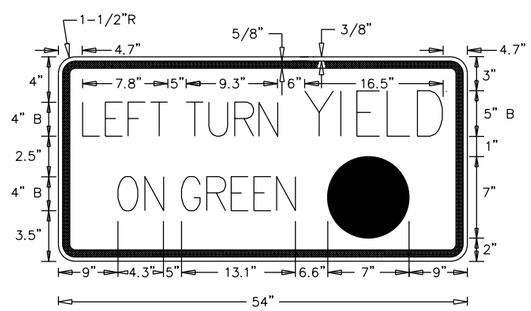
LETTERS – BLACK
BORDER – BLACK
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE

NOTE:
NOT FOR SPAN WIRE MOUNTING. ATTACH SIGN TO STAND ALONE POST OR SIGNAL POLE



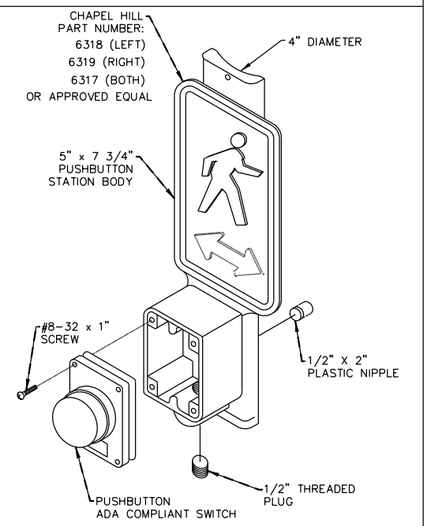
W1-7
48" x 24"

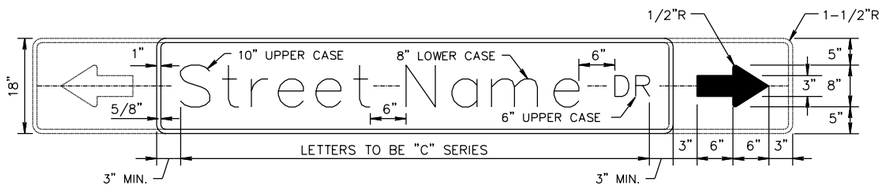
SYMBOL – BLACK
BORDER – BLACK
BACKGROUND – YELLOW REFLECTIVE
SHEETING – VIP DIAMOND GRADE



54" x 18"

LETTERS – BLACK (SERIES B)
BORDER – BLACK
CIRCLE – GREEN REFLECTIVE
BACKGROUND – WHITE REFLECTIVE
SHEETING – VIP DIAMOND GRADE





VARIES x 18"

LETTERS – WHITE REFLECTIVE
BORDER – WHITE REFLECTIVE
BACKGROUND – GREEN REFLECTIVE
(ALL MATERIAL SHALL BE DIAMOND GRADE VIP SHEETING)

GENERAL NOTES:

1.) CONTRACTOR SHALL USE CHAPEL HILL FREE SWINGING SIGN HANGER (PART NO. 7066) OR APPROVED EQUAL.
2.) CONTRACTOR SHALL FURNISH ALL HARDWARE FOR A COMPLETE INSTALLATION.
3.) ALL PARTS SHALL BE CAST ALUMINUM, WITH STAINLESS STEEL CLEVIS ADAPTER, BOLTS, WASHERS AND LOCKNUTS.
4.) ALL STREET NAME SIGNS SHALL HAVE VIP DIAMOND GRADE SHEETING.
5.) CONTRACTOR SHALL FURNISH ONE (1) SIGN HANGER PER STREET NAME SIGN SMALLER THAN 3'-0". SIGNS 3'-0"TO 6'-0" REQUIRE TWO (2) HANGERS. SIGNS LARGER THAN 6'-0" REQUIRE THREE (3) HANGERS.

NO.	REVISIONS	DATE	NAME
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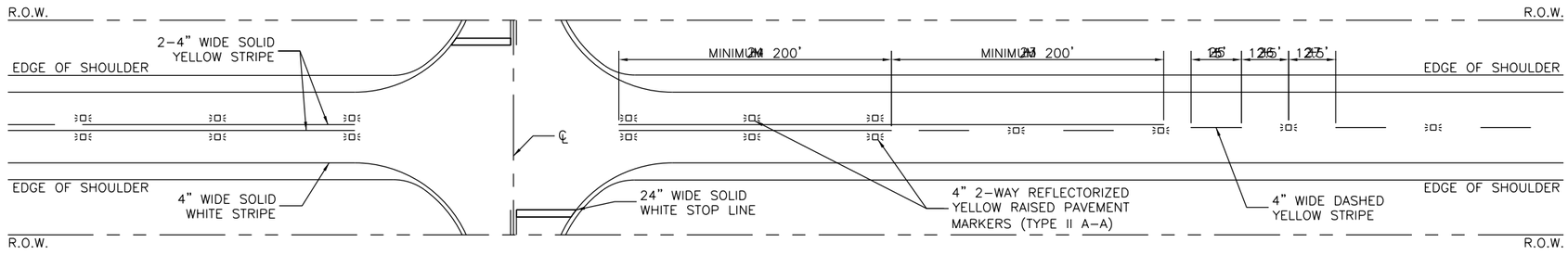
STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC.
F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD
SHEET DESCRIPTION: TRAFFIC SIGNAL SIGN DETAILS		TSS
DRAWN BY: BSH		DATE: 12/14/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 23 / 38

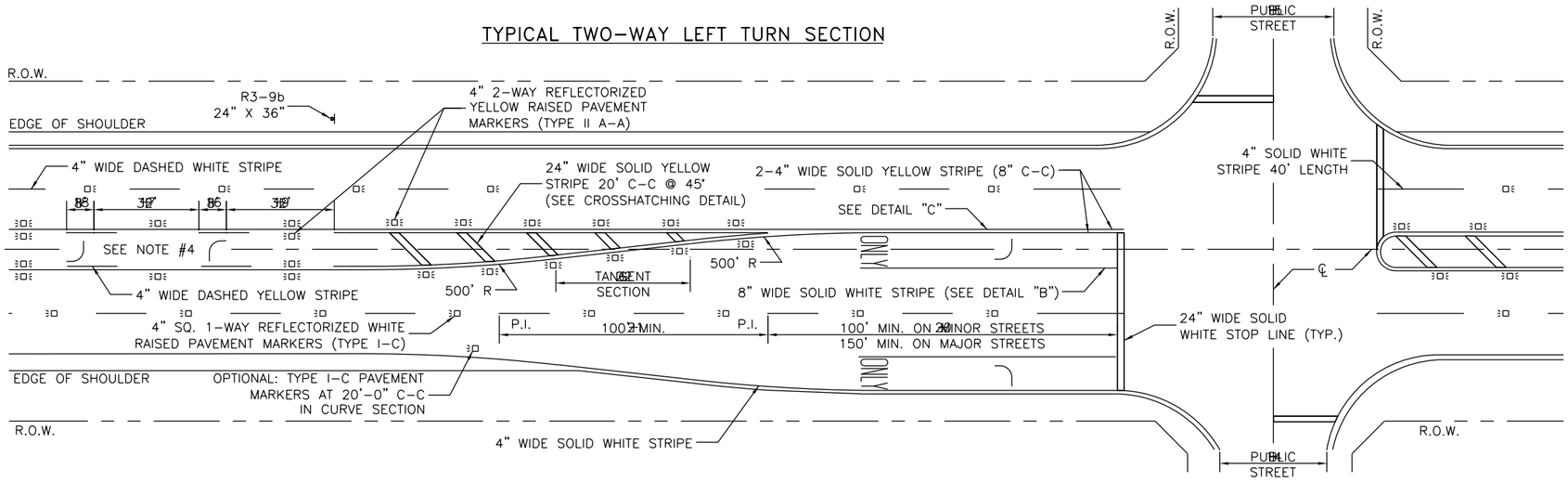


TYPICAL TWO LANE TWO–WAY ROAD

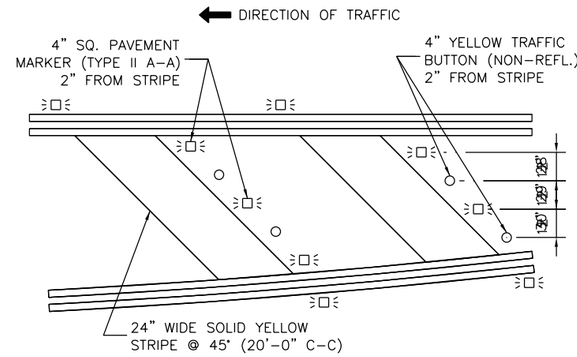
NOTES:

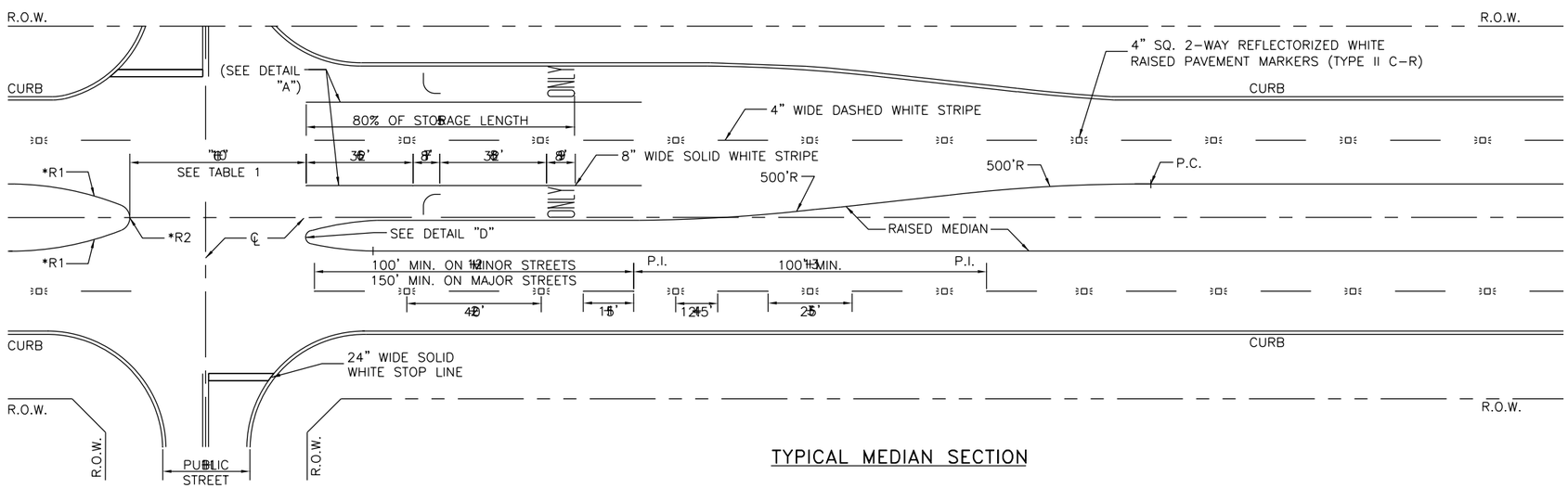
1. ALL PAVEMENT MARKINGS SHALL CONFORM TO THE LATEST EDITION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS (TMUTCD).
2. ALL TRAFFIC BUTTONS AND MARKERS SHALL BE INSTALLED ADJACENT TO STRIPES (APPROXIMATELY 2").
3. LEFT TURN STORAGE BAYS SHALL BE A MIN. OF 100' ON MINOR STREETS AND A MIN. 150' ON MAJOR STREETS.
4. REPEAT ARROWS AT APPROXIMATELY 1000' INTERVALS WITHIN TWO–WAY LEFT TURN SECTION.
5. WHEN PAVEMENT MARKINGS EXTEND INTO OR CONTINUE THROUGH AN INTERSECTION AREA, THEY SHALL BE THE SAME COLOR AND AT LEAST THE SAME WIDTH AS THE LINE MARKINGS THEY EXTEND.
6. WHEN CROSSWALK MARKINGS ARE USED WITHIN AN ESTABLISHED SCHOOL ZONE AREA, CONTINENTAL TYPE MARKINGS SHALL BE USED.
7. ADDITIONAL SET OF "WORD" AND "ARROW" PAVEMENT MARKINGS SHALL BE USED WHEN TURN LANE STORAGE LENGTH IS 160 FEET OR GREATER.

TYPICAL TWO–WAY LEFT TURN SECTION



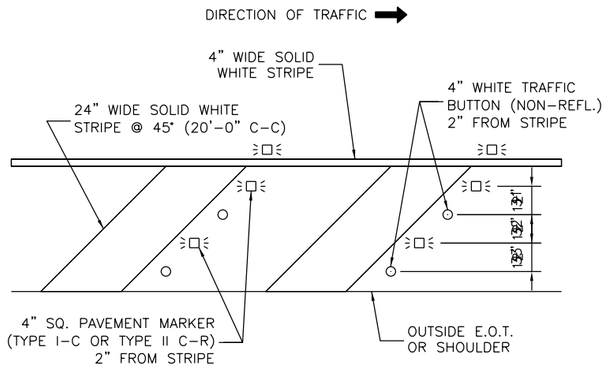
CROSSHATCHING DETAIL





TYPICAL MEDIAN SECTION

OUTSIDE EDGE CROSSHATCHING DETAIL



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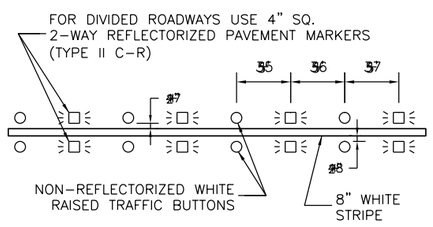
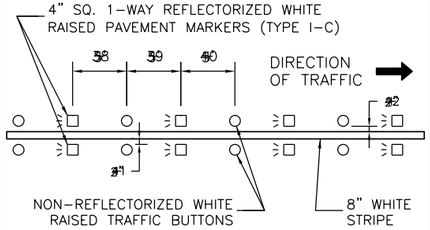
NOVEMBER 20, 2023
VOIGT ASSOCIATES, INC. F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	STANDARD DETAILS
TRAFFIC STANDARD	PM
SHEET DESCRIPTION:	PAVEMENT MARKING DETAILS (1 OF 2)
DRAWN BY:	JDZ
DATE:	12/14/17
CK'D BY:	BSH
SCALE:	NONE
SHEET NO:	24 / 38

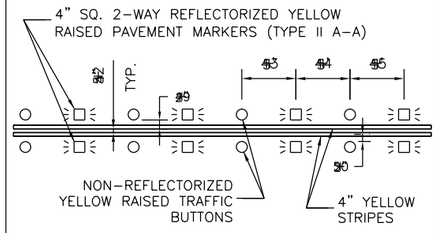
DETAIL "A"
(FOR DIVIDED ROADWAYS)



DETAIL "B"
(FOR UNDIVIDED ROADWAYS)

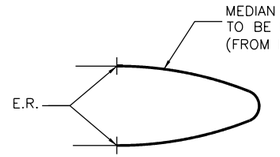


DETAIL "C"

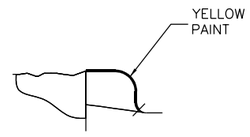


DETAIL "D"

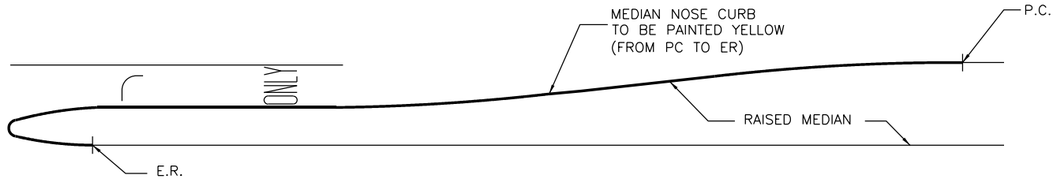
* PAINT FROM THE BACK OF CURB TO THE GUTTER LINE



TYPICAL MEDIAN NOSE



TYPICAL CURB SECTION



RAISED MEDIAN WITH TURN BAY

PAVEMENT MARKER LEGEND

SYMBOL	DESCRIPTION
≥□≤	4" x 4" REFLECTORIZED RAISED PAVEMENT MARKER
□≤	INDICATED DIRECTION OF TRAFFIC FLOW
○	NON-REFLECTIVE 4" DIA. RAISED TRAFFIC BUTTON

RADIUS DIMENSIONS

MEDIAN	*R1	*R2
≤10'	N/A	W/2
>10' ≤40'	90'	W/5
>40'	N/A	N/A

TABLE 1

TYPICAL MEDIAN OPENING "C"

MEDIAN INTERRUPTION	(1) NO LTB	(1) 1 LTB	(1) 2 LTB
PRIVATE DRIVE	45'	52.5'	60'
UNDIVIDED STREET <40'	45'	52.5' (2)	60'
44'	50'	55' (2)	60'
DIVIDED STREET	D+22'	D+22'	D+22'

NOTES:

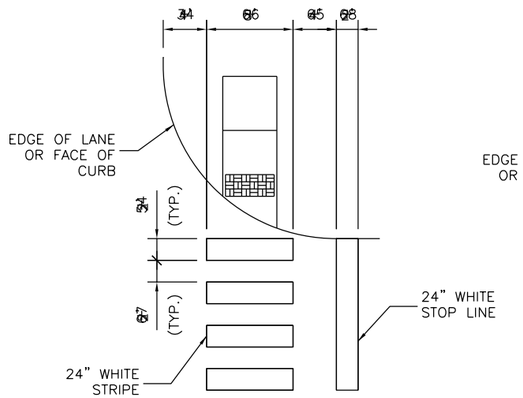
(1) LTB = LEFT TURN BAY

(2) DISTANCE FROM CENTERLINE OF OPENING TO MEDIAN NOSE WITH LEFT TURN LANE IS 30' FOR RIGHT ANGLE INTERSECTIONS, FOR INTERSECTIONS OTHER THAN 90°, APPLY DESIGN VEHICLE TURNING TEMPLATE TO DETERMINE DIMENSION TO MEDIAN NOSE CUT OFF.

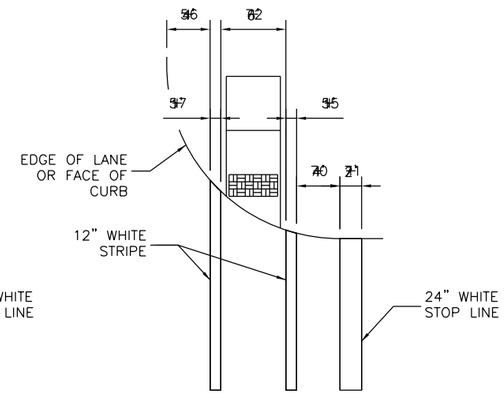
(3) D = WIDTH OF DIVIDED STREET

TYPICAL CROSSWALK PLACEMENT

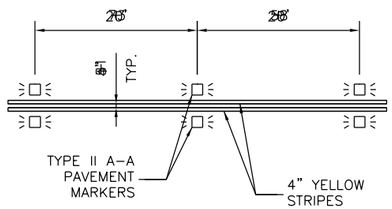
CONTINENTAL TYPE



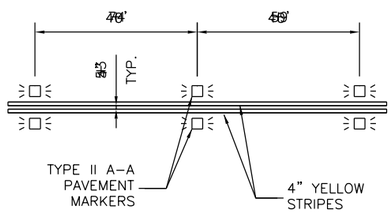
STANDARD TYPE



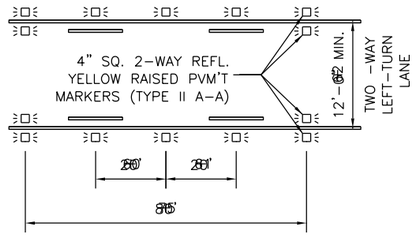
CENTER LINE DETAIL CURVE SECTION



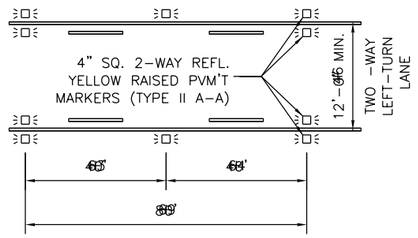
CENTER LINE DETAIL TANGENT SECTION



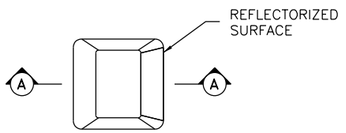
TWO-WAY LEFT TURN CURVE SECTION



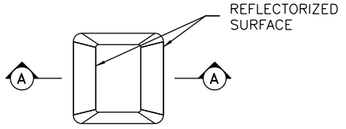
TWO-WAY LEFT TURN TANGENT SECTION



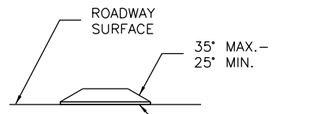
RAISED PAVEMENT MARKERS



TYPE I (TOP VIEW)



TYPE II (TOP VIEW)



SECTION A-A

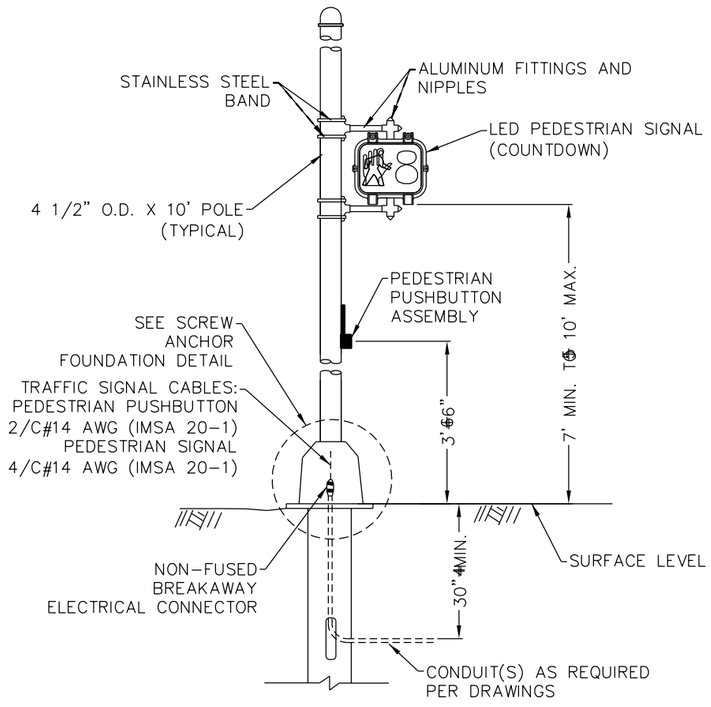
NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
5			

HARRIS COUNTY
ENGINEERING DEPARTMENT

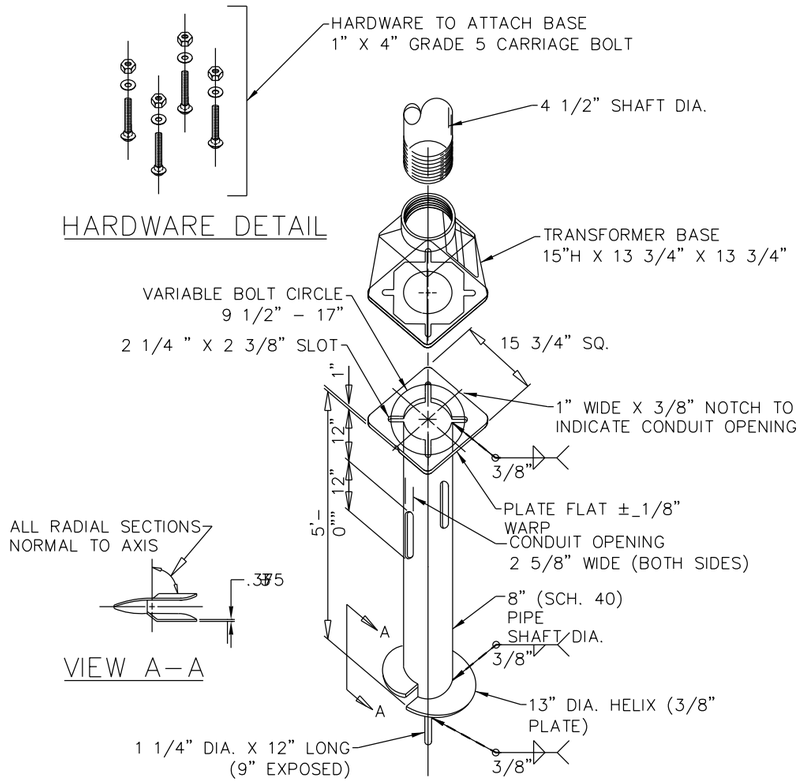
Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4578
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
NOVEMBER 20, 2023
VOIGT ASSOCIATES, INC. F-5333

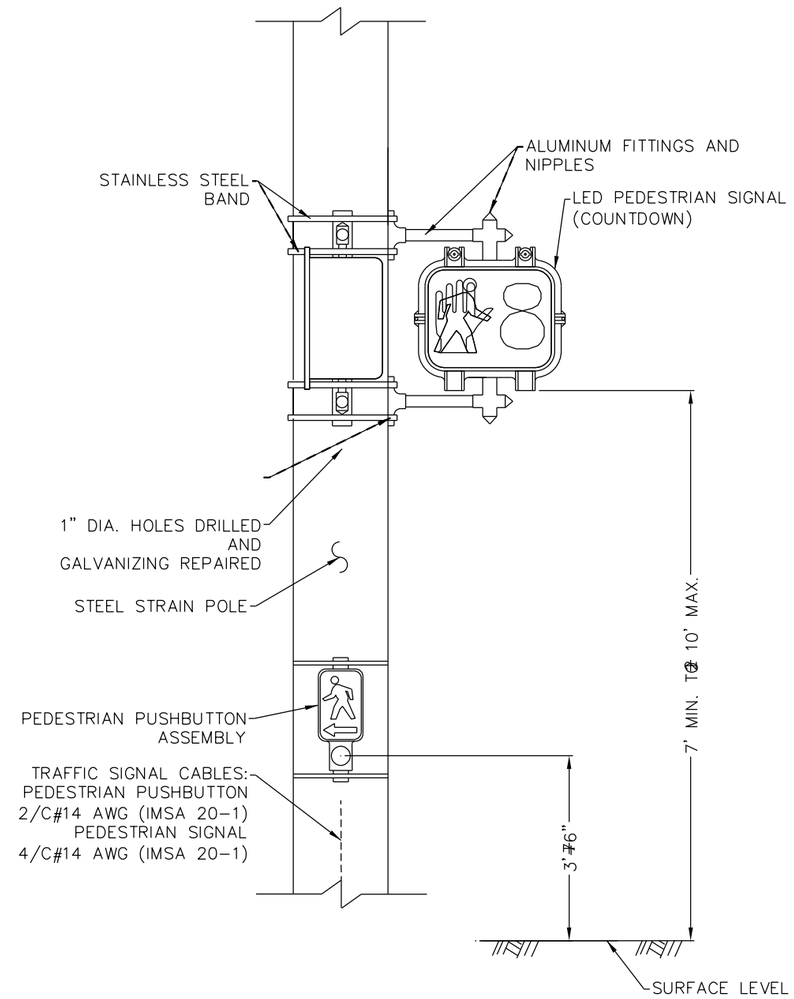
PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	STANDARD DETAILS
SHEET DESCRIPTION:	PAVEMENT MARKING DETAILS (2 OF 2)
TRAFFIC STANDARD	PM
DRAWN BY:	JDZ
DATE:	12/14/17
CK'D BY:	BSH
SCALE:	NONE
SHEET NO:	25 / 38



PEDESTRIAN SIGNAL INSTALLATION ON PEDESTRIAN POLE



SCREW ANCHOR FOUNDATION DETAIL



PEDESTRIAN SIGNAL INSTALLATION ON STEEL STRAIN POLE

NO.	REVISIONS	DATE	NAME
1			
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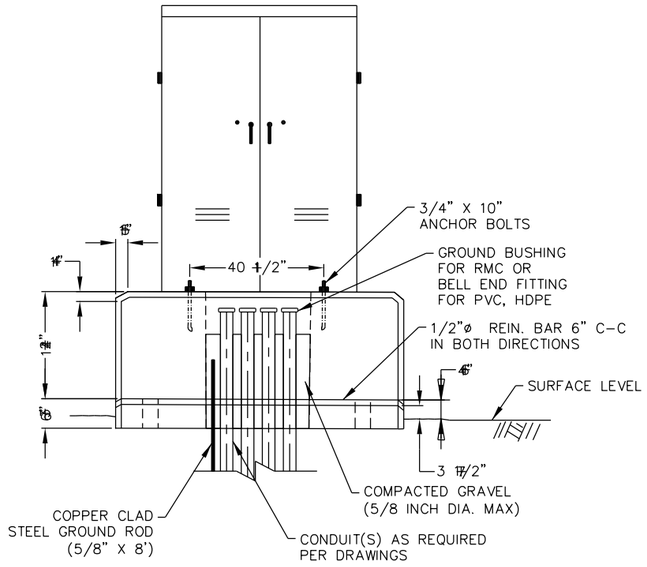
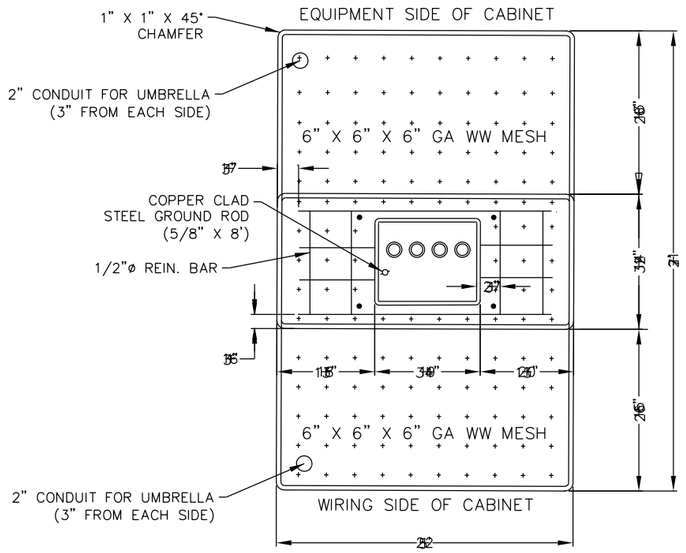
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
NOVEMBER 20, 2023
VOIGT ASSOCIATES, INC. F-5333

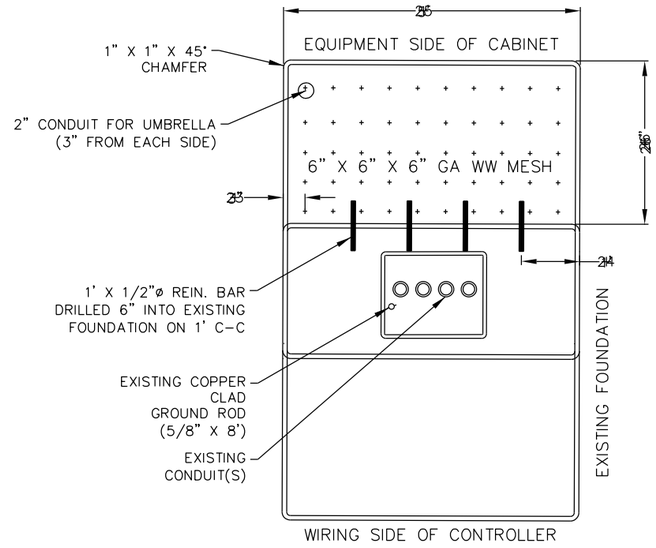
PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD
SHEET DESCRIPTION: PEDESTRIAN SIGNAL AND POLE INSTALLATION		PS&P
DRAWN BY: BSH	DETAILS	DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 26 / 38



FRONT VIEW

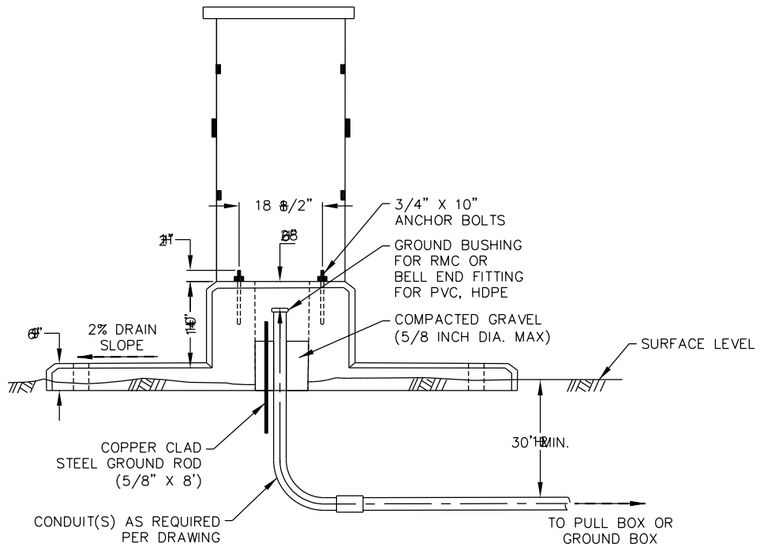


TOP VIEW
(LESS CABINET)



TOP VIEW
(LESS CABINET)

GROUND MOUNTED ITS (HOUSING 3) CABINET MODIFICATION TO EXISTING CABINET FOUNDATION



SIDE VIEW

CONTROLLER CABINET FOUNDATION NOTES:

1.) ALL CONCRETE TO BE CLASS B2 OR EQUIVALENT COMMERCIAL BAGGED CONCRETE MIX IN LIEU OF PLANT CONCRETE.
2.) CONDUIT WELL IN FOUNDATION TO HAVE GRAVEL DRAIN.
3.) THE CONTRACTOR SHALL SET THE TOP OF THE STEP OF THE CONTROLLER FOUNDATION NO LOWER THEN THE LEVEL OF THE PAVEMENT SURFACE. ANY NECESSARY ADJUSTMENT SHALL BE APPROVED BY THE ENGINEER.
4.) THE CONTRACTOR SHALL FURNISH ANY ADDITIONAL MATERIALS WHICH MAY BE NECESSARY TO LEVEL AND/OR STABILIZE FOUNDATION AT UNUSUAL LOCATIONS.
5.) THE CONTRACTOR SHALL CENTER THE CABINET ON THE FOUNDATION.
6.) THE FOUNDATION SHALL BE SUPPORTED BY UNDISTURBED SOIL OR BY SOIL THAT HAS BEEN COMPACTED TO 90% IN 6" LIFTS.

NO.	REVISIONS	DATE	NAME
1			
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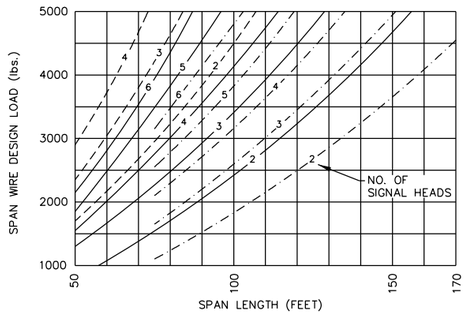
TBPLS Firm Reg. No.: 100252-00

STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD CCF
SHEET DESCRIPTION: CONTROLLER CABINET FOUNDATION		
DRAWN BY: BSH	DETAILS	DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 27 / 38



— — — — — SAG = 4'-6" (30' POLE)
——— SAG = 8'-0" (30' OR 34' POLE)
—·—·— SAG = 11'-6" (34' POLE)

SIGNAL HEAD TYPE	WT. PER HEAD	WIND AREA ◆
5-SECTION, 12" LENS	125 LBS.	9.6 SQ. FT.
3-SECTION, 12" LENS	75 LBS.	5.64 SQ. FT.

◆ EFFECTIVE PROJECTED DESIGN WIND AREA (ACTUAL AREA TIMES DRAG COEFFICIENT)

LOAD SPAN CHART – SIGNALS WITH 12-INCH LENS

LOAD SPAN CHART NOTES:

NUMBERS ON LOAD SPAN CHART INDICATE THE NUMBER OF SIGNAL HEADS ON THE SPAN. THE TOTAL SPAN WIRE DESIGN LOAD IS BASED ON ONE 5-SECTION HEAD AND ONE OR MORE ADDITIONAL 3-SECTION HEAD(S). DESIGN WIND PRESSURES ON CABLES ARE ASSUMED AS 1.6 LB/FT. WEIGHT OF SPAN WIRE CABLES (ONE PER SIGNAL HEAD) IS ASSUMED AS 0.65 LB/FT WHICH INCLUDES AN ALLOWANCE FOR CONDUCTOR CABLES AND MISCELLANEOUS HARDWARE. THE EFFECT OF THE SWAY CABLE ON LOAD DISTRIBUTION IS IGNORED AS IT IS ASSUMED TO BREAK AT DESIGN WIND CONDITIONS. WIND LOAD ON STREET NAME SIGNS SHOULD BE CONSIDERED FOR SPAN WIRE DESIGN LOAD. WHEN A POLE SUPPORTS 2 SPANS, THE SPAN WIRE DESIGN LOADS FOR BOTH SPANS SHOULD BE ADDED AS EXPLAINED BELOW TO DETERMINE THE DESIGN LOAD FOR THAT POLE.

DESIGN LOAD AND MOMENT CALCULATIONS:

WHEN A POLE SUPPORTS 2 SPANS, THE SPAN WIRE DESIGN LOADS FOR BOTH SPANS SHOULD BE ADDED, AS BELOW, TO DETERMINE THE DESIGN LOAD FOR THAT POLE.

Fx (lbs) = LOAD 2 + (LOAD 1 * COS(ANGLE BETWEEN SPANS))
Fy (lbs) = LOAD 1 * SIN(ANGLE BETWEEN SPANS)

DESIGN LOAD(lbs) = $\sqrt{Fx^2 + Fy^2}$

DESIGN MOMENT(K*FT) = ((POLE HT. – 0.953) * DESIGN LOAD) / 1000

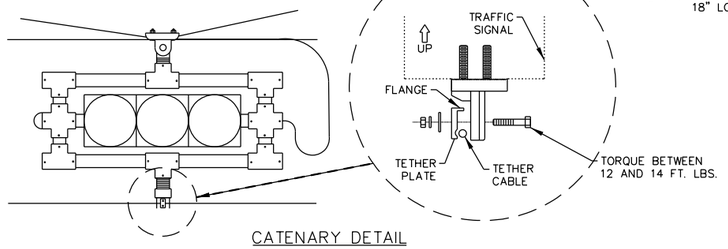
IF DESIGN LOAD IS GREATER THAN THE MAX. PERMISSIBLE LOAD FROM TABLE BELOW, A SPECIAL FOUNDATION DESIGN MAY BE REQUIRED.

IF DESIGN MOMENT IS GREATER THAN THE MAX. ALLOWABLE MOMENT FROM THE FOUNDATION DESIGN TABLE ON THE STRAIN POLE FOUNDATION STANDARD DETAIL, A SPECIAL FOUNDATION MAYBE REQUIRED.

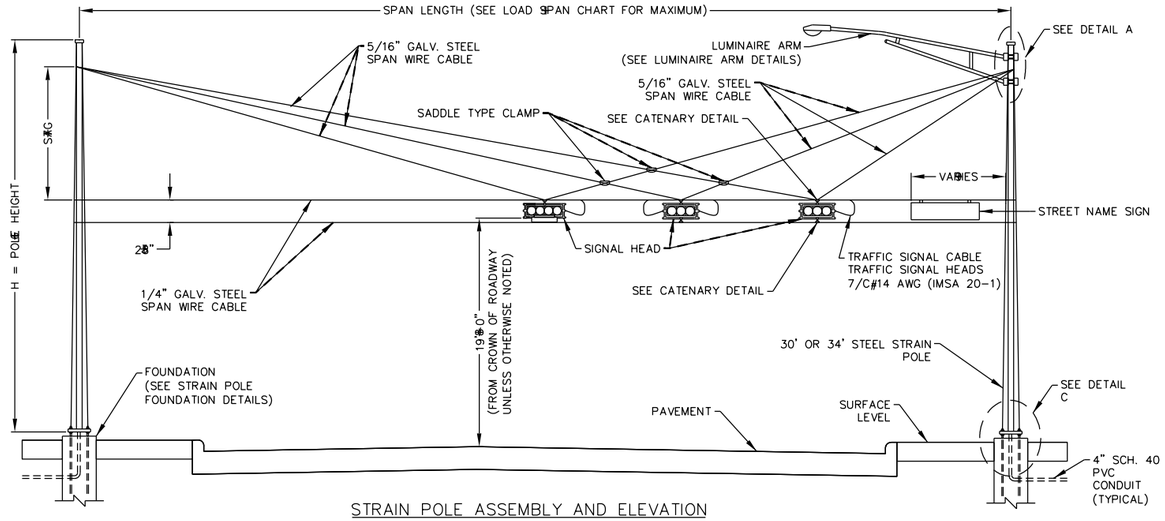
STRAIN POLE DESCRIPTION	POLE TYPE	FOUNDATION TYPE	MAX. PERMISSIBLE SPAN WIRE LOAD (lbs)
30' POLE	HC10030	10030	5800
30' POLE WITH LUMINAIRE	HC10030	10030	5500
34' POLE	HC10034	10036	6300
34' POLE WITH LUMINAIRE	HC10034	10036	6000

POLE TYPE	ROUND STRAIN POLE				OCTAGONAL STRAIN POLE			
	D_B	D_T	THK.	H	D_B	D_T	THK.	H
	IN.	IN.	IN.	FT.	IN.	IN.	IN.	FT.
HC10030	13.75	9.55	0.3125	30	13.75	9.55	0.3125	30
HC10034	15.5	10.74	0.3125	34	15.5	10.74	0.3125	34

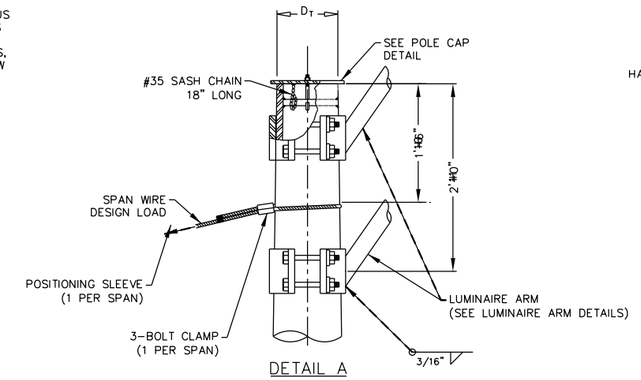
D_B = POLE BASE O.D.
D_T = POLE TOP O.D.
H = HEIGHT



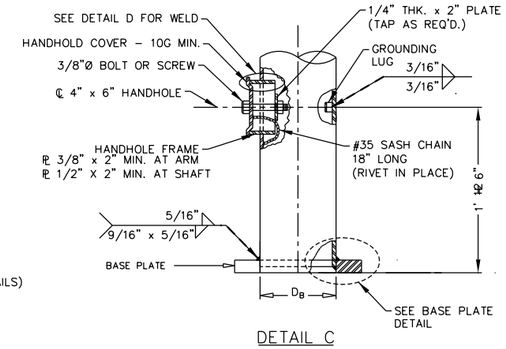
CATENARY DETAIL



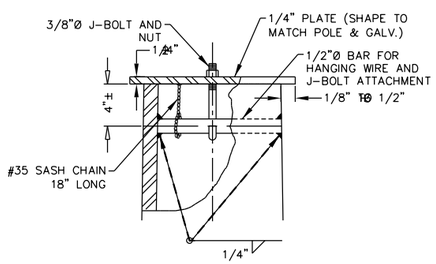
STRAIN POLE ASSEMBLY AND ELEVATION



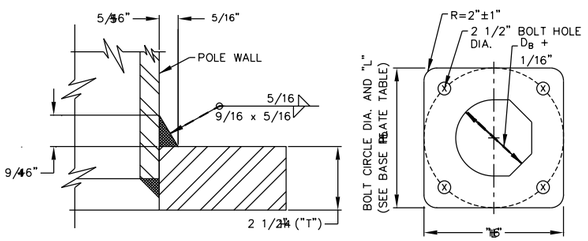
DETAIL A



DETAIL C



POLE CAP DETAIL



BASE PLATE TABLE				
FOUNDATION TYPE	ANCHOR BOLT DIAMETER	BOLT HOLE DIAMETER	BOLT CIRCLE DIAMETER	BASE ℘ DIMENSIONS "L" x "T"
10030	2 1/4"	2 1/2"	19"	19" 2 1/2"
10036	2 1/4"	2 1/2"	21"	21" 2 1/2"

BASE PLATE DETAIL

SHIPPING PARTS LIST

STRAIN POLE(S) (WITHOUT TRAFFIC SIGNAL ARM)						
POLE TYPE	STRAIN POLE(S) WITH LUMINAIRE			STRAIN POLE(S) WITHOUT LUMINAIRE		
	SHIP EACH STRAIN POLE WITH THE FOLLOWING HARDWARE ATTACHED: HANDHOLE AT BASE, POLE CAP, ETC.			SHIP EACH STRAIN POLE WITH THE FOLLOWING HARDWARE ATTACHED: HANDHOLD AT BASE, POLE CAP, ETC.		
	DESCRIPTION	DESIGNATION	QUANTITY	DESCRIPTION	DESIGNATION	QUANTITY
HC10030	30' STRAIN POLE	HC10030		30' STRAIN POLE	HC10030	
HC10034	34' STRAIN POLE	HC10034	2	34' STRAIN POLE	HC10034	2

LUMINAIRE ARMS	
ARM LENGTH	QUANTITY
15' ARM	2

ANCHOR BOLT ASSEMBLIES (1 PER POLE)*		
ANCHOR BOLT DIAMETER	BOLT HOLE DIAMETER	QUANTITY
2 1/4"	6'-3 1/2"	4

* EACH ANCHOR BOLT ASSEMBLY CONSIST OF THE FOLLOWING:
TOP AND BOTTOM TEMPLATES, 4 ANCHOR BOLTS, 8 NUTS, 8 FLAT, WASHERS, 4 LOCK WASHERS AND 4 NUT ANCHOR DEVICES (TYPE 2) PER STANDARD DRAWING STRAIN POLE FOUNDATION DETAILS.
(TEMPLATES MAY BE REMOVED FOR SHIPMENT)

MATERIALS	
ROUND STRAIN POLE OR OCTAGONAL STRAIN POLE	ASTM A570 GR50 OR ASTM A572 GR50
PLATES (1)	ASTM A36 OR A572 GR50
STEEL CABLE	ASTM A475, 7 WIRE, UTILITIES GRADE

(1) EITHER OF THE MATERIALS LISTED FOR PLATES MAY BE USED WHERE THE DRAWINGS DO NOT SPECIFY A PARTICULAR ASTM DESIGNATION.

NOTE: ENGINEER SHALL COMPLETE SHIPPING PARTS LIST TABLES

GENERAL NOTES:

1.) DESIGN SHALL CONFORM TO 2001 OR LATEST ADDITION TO AASHTO STANDARD SPECIFICATIONS FOR THE STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS AND INTERIM SPECIFICATIONS DESIGN WIND SPEED EQUALS 100 MPH PLUS A 1.3 GUST FACTOR.
2.) STRAIN POLES ARE DESIGNED TO SUPPORT SPAN WIRE WITH ONE CLAMP-ON MAST ARM. THE SPECIFIED SIGNAL LOAD APPLIED AT THE END OF THE TRAFFIC SIGNAL ARM EQUALS 180 LBS. VERTICAL DEAD LOAD PLUS THE HORIZONTAL WIND LOAD ON AN EFFECTIVE PROJECTED AREA OF 32.4 SQ. FT. THE MAXIMUM PERMISSIBLE SPAN WIRE DESIGN LOADS TABULATED ARE CALCULATED AT A STRESS LOAD OF 1.40 TIMES THE BASIC ALLOWABLE STRESS. A SIMULTANEOUS WIND ON THE POLE, MAST ARM, AND LUMINAIRE IS ALSO INCLUDED. DESIGNS ARE BASED ON A SPAN WIRE AND ARM INCLUDED ANGLE OF 90 DEG. ANGLES OF LESS THAN 75 DEG. OR MORE THAN 105 DEG. WILL REQUIRE A SPECIAL DESIGN.
3.) FABRICATION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND THE WITH THE DETAILS AND DIMENSIONS. ALL WELDING SHALL CONFORM TO THE REQUIREMENTS OF THE SPECIFICATIONS OF THE AMERICAN WIELDING SOCIETY STRUCTURAL WELDING CODE AWS LATEST EDITION.
4.) SEE SINGLE AND DUAL MAST ARM ASSEMBLIES DETAILS AND MAST ARM CONNECTIONS AND FABRICATIONS DETAILS STANDARD SHEETS FOR DETAILS OF CLAMP-ON MAST ARMS.
5.) SEE LUMINAIRE ARM DETAILS STANDARD SHEET FOR DETAILS OF LUMINAIRE ARM AND CONNECTION.
6.) SEE STRAIN POLE FOUNDATION DETAILS STANDARD SHEET FOR DETAILS OF ANCHOR BOLTS AND FOUNDATION.
7.) UNLESS OTHERWISE NOTED, ALL STEEL PARTS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 REQUIREMENTS WITH A MINIMUM OF 2 OUNCES PER SQUARE FOOT OF GALVANIZED COATING.
8.) ALL SMALL STEEL HARDWARE ITEMS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A153 REQUIREMENTS.
9.) SPECIAL DESIGNS REQUIRE SUBMISSION OF SHOP DRAWINGS IN ACCORDANCE WITH THE SPECIFICATION ITEM 680 "STEEL MAST ARM AND STEEL STRAIN POLE ASSEMBLIES".
10.) ALL BOLTS SHALL HAVE TWO FULL DIAMETER THREADS EXPOSED ABOVE THE NUT.
11.) CONTRACTOR SHALL INSTALL A CLOSE NIPPLE WITH LOCKNUTS AND METAL BUSHINGS (SIZE AS REQUIRED) TO PREVENT ABRASION WHERE CABLE(S) ENTER ANY PORTION OF THE STRAIN POLE.
12.) CONTRACTOR SHALL INSTALL AND/OR ADJUST CATENARY SYSTEM AND TRAFFIC SIGNAL HEADS. AND SHALL LEVEL ALL SIGNAL HEADS, PRIOR TO ATTACHING BOTTOM TETHER SPAN.

NO.	REVISIONS	DATE	NAME

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STATE OF TEXAS · ANTHONY P. VOIGT · 84845 · LICENSED · PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

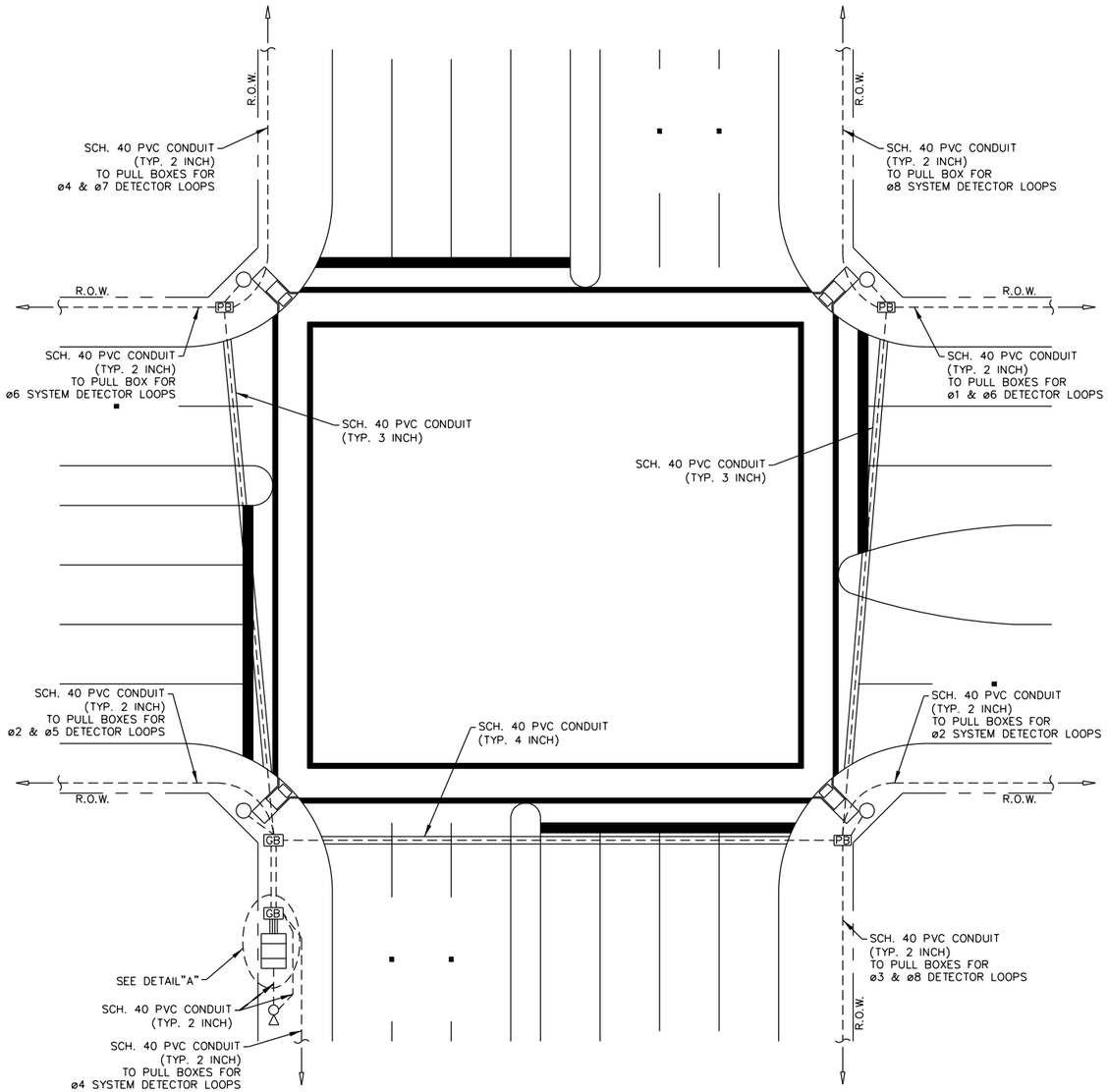
NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS			
STANDARD DETAILS			TRAFFIC STANDARD
SHEET DESCRIPTION: STRAIN POLE ASSEMBLY DETAILS			SP-100
DRAWN BY: BSH	(100 MPH WIND ZONE)		DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE		SHEET NO: 28 / 38

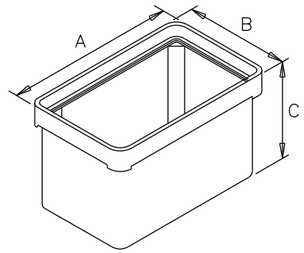
LEGEND:

- SIGNAL CONTROLLER
- SIGNAL POLE
- UNDERGROUND CONDUIT
- UNDERGROUND CONDUIT (BORE)
- PB PULL BOX
- GB GROUND BOX
- SERVICE POLE

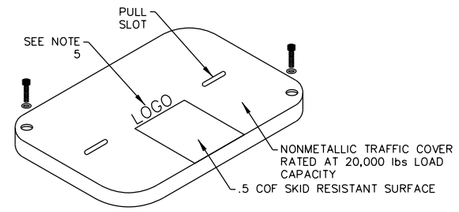
N



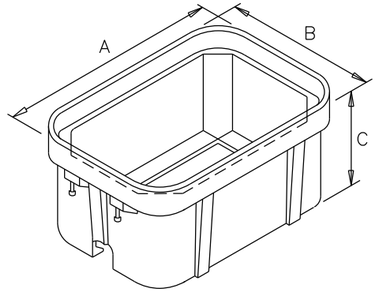
TYPICAL CONDUIT AND PULL BOX / GROUND BOX SYSTEM FOR SIGNALIZED MAJOR / MAJOR INTERSECTION



PULL BOX DETAIL



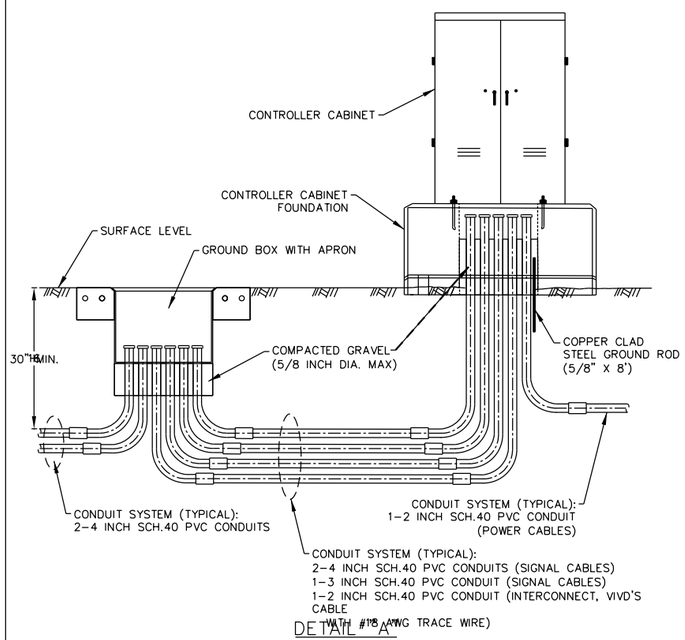
PULL BOX & GROUND BOX COVER DETAIL



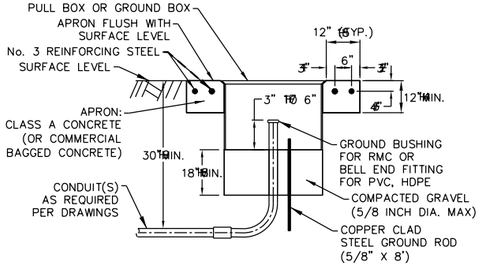
GROUND BOX DETAIL

TYPE	DIMENSIONS		
	A	B	C
PULL BOX (TYPE D)	32-1/4"±1"	19-1/4"±1"	22"±1"
GROUND BOX	37-5/8"±1"	26"±1"	30"±1"

PULL BOX & GROUND BOX DIMENSION DETAIL



DETAIL "A"



PULL BOX & GROUND BOX INSTALLATION DETAIL

GENERAL NOTES:

1.) ALL CONDUIT SPECIFIED IN PLANS SHALL BE INSTALLED AT A MINIMUM DEPTH OF 30 INCHES AND SHALL ENTER BOXES FROM THE BOTTOM.
2.) BOXES SHALL HAVE A CAPACITY LOADING OF 20,000 lbs OVER A 10 INCH BY 10 INCH AREA AND 600 lbs PER SQ. FOOT APPLIED OVER THE ENTIRE SIDE WALL.
3.) ALL BOXES AND COVERS SHALL BE PERMANENTLY MARKED BY EITHER IMPRESSION OR PERMANENT INK WITH MANUFACTURER'S MODEL NUMBER AND NAME/LOGO.
4.) BOX COVERS SHALL BE SECURED WITH TWO 1/2 INCH STAINLESS STEEL BOLTS. BOLTS SHALL BE WITHSTAND A MINIMUM OF 70 FT-lbs TORQUE AND A MINIMUM OF 750 lbs STRAIGHT PULL OUT STRENGTH. BOLT HOLES IN BOX SHALL BE ARRANGED TO DRAIN DIRT.
5.) BOX COVERS SHALL BE LEGIBLY IMPRINTED WITH THE WORDS "TRAFFIC SIGNAL - HCED" IN MINIMUM 1 INCH LETTERS.
6.) ALL BOXES SHALL BE INSTALLED WITH A 5/8 INCH (MIN.) BY 8 FOOT GROUNDING ROD AND ROD CLAMPS SHALL BE IN DIRECT CONTACT WITH THE SOIL.
7.) DETECTOR LOOP LEAD-IN CABLE FROM PULL BOX TO CONTROLLER CABINET SHALL BE 2/C #14 (IMSA 50-2).
8.) LEAVE A MINIMUM OF 10 FEET SLACK TRACE WIRE IN COMMUNICATION GROUND BOX AND CONTROLLER CABINET.

NO.	REVISIONS	DATE	NAME
1			
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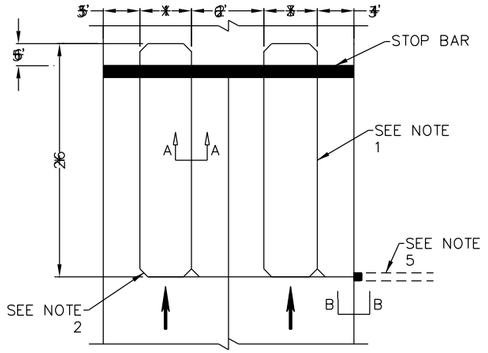
HARRIS COUNTY ENGINEERING DEPARTMENT

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4526
TBPLS Firm Reg. No.: 100282-00

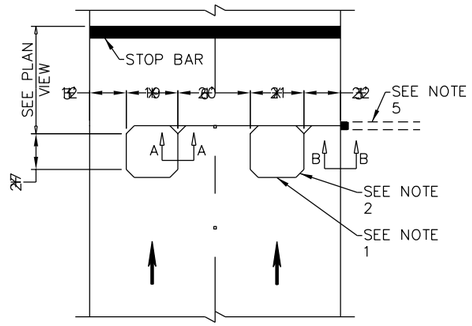
STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

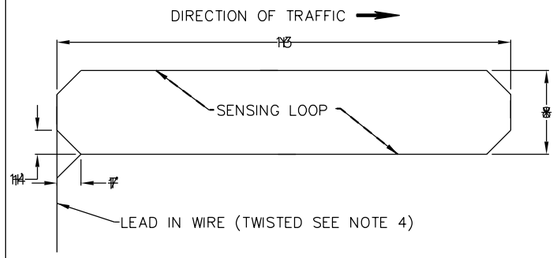
PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS			
STANDARD DETAILS			TRAFFIC STANDARD
SHEET DESCRIPTION: CONDUIT / PULL BOX / GROUND BOX			CPGT
DRAWN BY: BSH	TRAFFIC SIGNAL SYSTEM DETAILS		DATE: 3/21/19
CK'D BY: BSH	SCALE: NONE		SHEET NO: 29 / 38



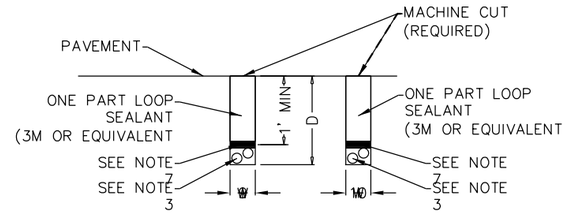
TYPICAL PRESENCE LOOP LAYOUT DETAIL



TYPICAL PULSE LOOP LAYOUT DETAIL



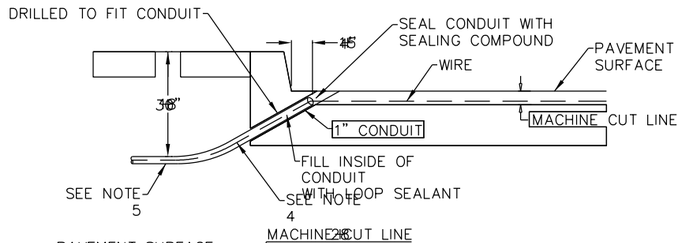
TYPICAL DIPOLE LOOP LAYOUT DETAIL

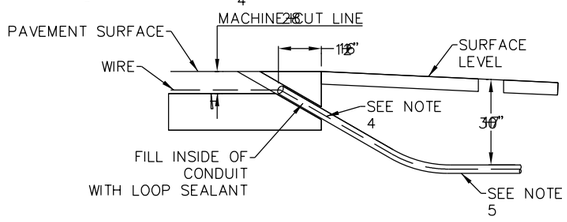


DIM.	CONC.	ASPHALT
D	*1-1/2"	* 2"
W	5/16"	5/16"

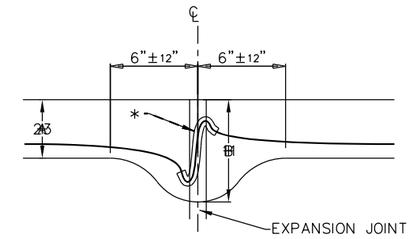
*MINIMUM 3" FOR LEAD LINE ON MULTIPLE LOOPS

SECTION A-A





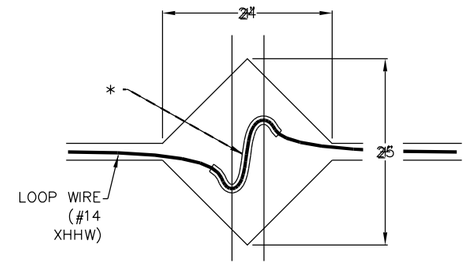
SECTION B-B



	A	B
SINGLE LOOP	1 1/2"	2 1/2"
MULTIPLE LOOPS	3"	4"

* WHEN USING A NON-HOT ASPHALT SEAL, A RUBBER OR PLASTIC SLEEVE IS REQUIRES WHEN CROSSING A EXPANSION JOINT

DETAIL "A"



* AREA REMOVED SHALL BE THE SAME DEPTH AS THE MACHINE CUT FOR THE LOOP WIRE. PROTECT LOOP WIRE WITH FIBERGLASS ROPE WHEN FILLING WITH HOT ASPHALT.

DETAIL "B"

GENERAL NOTES:

1.) MACHINE CUT PAVEMENT TO DEPTH AND WIDTH RECOMMENDED IN SECTION A-A ABOVE.
2.) CORNERS OF THE LOOP SHALL HAVE A ONE FOOT MACHINE CUT CHAMFER AT A 45° ANGLE.
3.) DETECTOR WIRES SHOULD BE WOUND FOR PROPER LOOP TUNING, SEE TABLE 3 ON STANDARD DETAIL FOR STANDARD INTERSECTION LOOP DETECTOR PLACEMENT AND SIZE DETAILS OR DIAMOND INTERSECTION LOOP PLACEMENT AND SIZE DETAILS (SHEET 2 OF 2), OR USE RECOMMENDATIONS OF MANUFACTURER. IT MAY BE NECESSARY TO ADD MORE TURNS TO INCREASE SENSITIVITY.
4.) THE LEAD IN WIRES ARE TO BE TWISTED A MINIMUM OF FIVE TIMES PER FOOT AND REMAIN UNDISTURBED AFTER THE LOOP HAS BEEN TUNED.
5.) MINIMUM 1" CONDUIT SHALL BE BURIED A MINIMUM 30" TO PULL BOX, CONTROLLER OR POLE AS SPECIFIED IN DRAWINGS.
6.) WHEN CUTTING IN ASPHALT, IF MACHINE CUT CLOSES DUE TO HIGH ATMOSPHERIC TEMPERATURE, CUTTING WILL BE HALTED UNTIL TEMPERATURE PERMITS.
7.) THE LOOP WIRE SHALL BE HELD IN PLACE WITH STRIPS OF RUBBER NEOPRENE FLEXIBLE TUBING OR POLYETHYLENE FOAM APPROXIMATELY ONE (1) INCH IN LENGTH EVERY TWO FEET. THESE STRIPS SHALL BE LEFT IN PLACE AND THE SLOT FILLED WITH ONE PART LOOP SEALANT (3M OR EQUIVALENT).
8.) DETECTOR LOOP LEAD-IN CABLE FROM PULL BOX TO CONTROLLER CABINET SHALL BE 2/C #14 (IMSA 50-2).
9.) LOCATION OF CONDUIT AND LOOP LEAD WIRES SUBJECT TO CHANGE.
10.) LOOP WIRES SHALL BE MINIMUM 14 GAUGE XHHW TYPE.
11.) NO EXPANSION JOINT SLOT SHALL BE USED IN LIEU OF SAWCUT SLOTS FOR VEHICLE DETECTOR WIRE PLACEMENT. LOOPS CUT ACROSS EXPANSION JOINTS SHALL HAVE SLACK CABLE FOR EXPANSION (SEE DETAIL "A" AND "B").
12.) THE SAWCUT SHALL BE CLEANED AND DRIED WITH AN AIR COMPRESSOR TO REMOVE ALL DEBRIS AND MOISTURE PRIOR TO INSTALLATION OF LOOP DETECTOR WIRE.
13.) ALL LOOPS SHALL BE TESTED WITH A MEGGER AT THE TIME OF INSTALLATION. INSULATION RESISTANCE MUST EXCEED 50MEG OHMS AND WIRE RESISTANCE MUST BE LESS THAN ONE MEG OHM.
14.) ALL CONNECTIONS SHALL BE SOLDERED. THE SOLDER JOINT SHALL BE SEALED WITH SCOTCHCAST A31 OR OTHER METHOD ACCEPTABLE TO THE ENGINEER.
15.) PRIOR APPROVAL MUST BE ATTAINED FROM HARRIS COUNTY BEFORE LOOP WIRES CAN CROSS AN EXPANSION JOINT.
16.) INSTALLATION OF THE LOOPS ARE TO BE MADE IN THE SHORTEST TIME PRACTICAL, NOT TO EXCEED FOUR HOURS AND SHALL BE SCHEDULED DURING THE OFF-PEAK HOURS TO MINIMIZE DELAY SCHEDULED DURING THE OFF-PEAK HOURS TO MINIMIZE DELAY IN VEHICULAR TRAFFIC.

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TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS ANTHONY P. VOIGT 84845 LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD LDI
SHEET DESCRIPTION: LOOP DETECTOR INSTALLATION DETAILS		
DRAWN BY: BSH		DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE	SHEET NO: 30 / 38

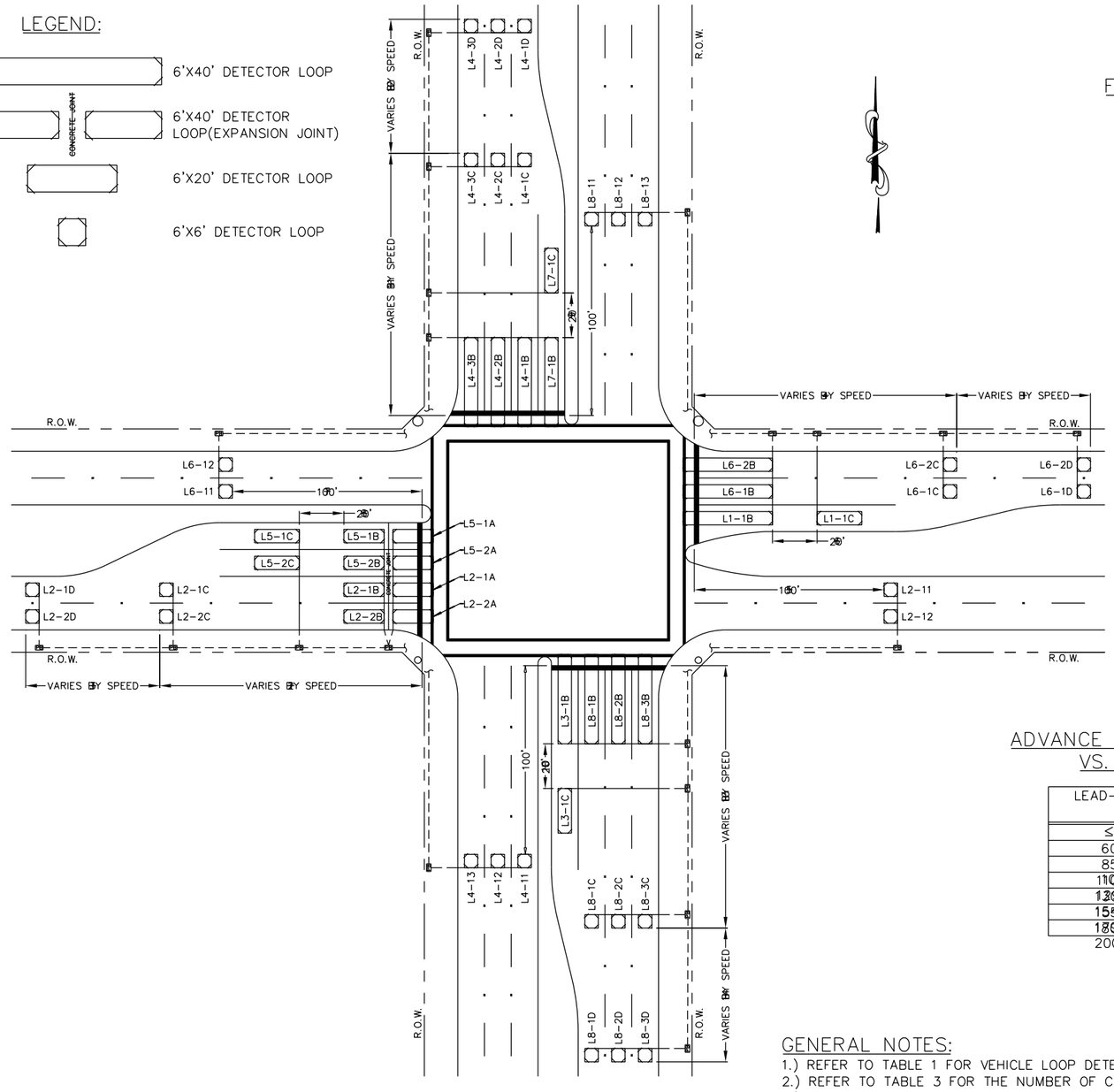
LEGEND:

6'X40' DETECTOR LOOP

6'X40' DETECTOR LOOP(EXPANSION JOINT)

6'X20' DETECTOR LOOP

6'X6' DETECTOR LOOP



VEHICLE LOOP DETECTOR SPACING FOR TRAFFIC SIGNAL INSTALLATIONS

DESIGN SPEED (MPH)	DISTANCE TO 1ST LOOP SET	DISTANCE TO 2ND LOOP SET
30	110'	220'
35	130'	260'
40	150'	300'
45	170'	340'
50	195'	390'
55	230'	460'
60	275'	550'
65	315'	630'
70	370'	740'
75	425'	850'

TABLE 1

RECOMMENDED NO. OF COILS (TURNS) FOR RECTANGULAR TYPE LOOPS

75 \ 6	8	10	12	14	16	18	20
100	1	1	1	1	1	1	1
75	1	1	1	1	1	1	1
50	2	2	2	2	2	2	2
45	2	2	2	2	2	2	2
40	2	2	2	2	2	2	2
35	2	2	2	2	2	2	2
30	2	2	2	2	2	2	2
25	2	2	2	2	2	2	2
20	2	2	2	2	2	2	2
15	2	2	2	2	2	2	2
10	2	2	2	2	2	2	2
8	2	2	2	2	2	2	2
6	3	3	3	3	2	2	2
4	4	3	3	3	3	3	2

75

6 8 10 12 14 16 18 20

6

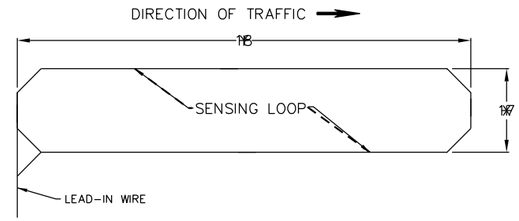
* RECOMMENDED NUMBER OF COILS (TURNS) FOR DIAMOND TYPE LOOPS = 4

TABLE 3

ADVANCE VEHICLE LOOP DETECTOR SIZE VS. LOOP LEAD-IN LENGTH

LEAD-IN LENGTH (FT)	LOOP SIZE (FT X FT)
≤ 550	6 x 6
600-849	6 x 10
850-1099	6 x 15
1100-1399	6 x 20
1400-1549	6 x 25
1550-1799	6 x 30
1800-2000	6 x 35

TABLE 4



TYPICAL DIPOLE LOOP LAYOUT DETAIL

GENERAL NOTES:

1.) REFER TO TABLE 1 FOR VEHICLE LOOP DETECTOR SPACING BASE ON THE POSTED SPEED LIMIT AND/OR 85th PERCENTILE SPEED.
2.) REFER TO TABLE 3 FOR THE NUMBER OF COILS (TURNS) BASED ON THE WIDTH AND LENGTH OF LOOP DETECTOR.
3.) REFER TO TABLE 4 FOR SIZING OF ADVANCE VEHICLE DETECTOR BASE ON LEAD-IN LENGTH FROM STOP BAR.
4.) FOR VEHICLE LOOP DETECTOR INSTALLATION REFER TO HARRIS COUNTY STANDARD DETAIL FOR "LOOP DETECTOR INSTALLATION DETAILS".

NO.	REVISIONS	DATE	NAME
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STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS			
STANDARD DETAILS			TRAFFIC STANDARD
SHEET DESCRIPTION: STANDARD INTERSECTION LOOP DETECTOR			SILD
DRAWN BY: BSH	DETAILS		DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE		SHEET NO: 31 / 38

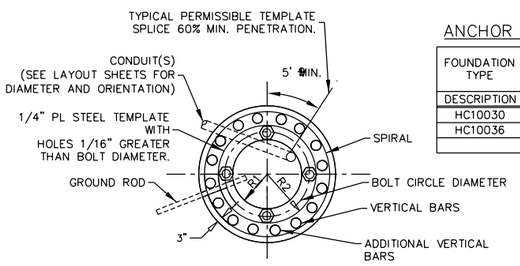
STRAIN POLE FOUNDATION DESIGN TABLE

FOUNDATION TYPE	DRILLED SHAFT DIAMETER	REINFORCING STEEL			DRILLED SHAFT DEPTH	ANCHOR BOLT DESIGN			FOUNDATION DESIGN LOAD			TYPICAL APPLICATION
		VERTICAL BARS	ADDITIONAL VERTICAL BARS	SPIRAL & PITCH		ANCHOR BOLT DIAMETER	Fy	BOLT CIRCLE DIAMETER	MOMENT	SHEAR	TORQUE	
DESCRIPTION	IN.				FT.	IN.	KSI	IN.	K-FT.	KIPS	K-FT.	
10030	30"	8-#9	8-#9x7'-6"	#3@9"	16'-0"	2 1/4"	55	19"	184	7	0	CLAMP-ON MAST ARM ASSEMBLY, 30' STRAIN POLE WITH OR WITHOUT LUMINAIRE
									103	5	93	
10036	36"	8-#10	8-#10x8'-0"	#3@9"	14'-0"	2 1/4"	55	21"	236	8	0	CLAMP-ON MAST ARM ASSEMBLY, 34' STRAIN POLE WITH OR WITHOUT LUMINAIRE
									133	5	104	

FOUNDATION SELECTION FOR STANDARD CLAMP-ON MAST ARM ASSEMBLIES

	FOUNDATION TYPE	HC10030	HC10036
100 MPH DESIGN WIND SPEED	MAXIMUM SINGLE CLAMP-ON MAST ARM LENGTH	44'	44'
	MAXIMUM DUAL CLAMP-ON MAST ARM LENGTH	35' x 35'	44' x 44'
		40' x 35'	
		42' x 30'	
		44' x 20'	

ANCHOR BOLT ASSEMBLY



TOP VIEW

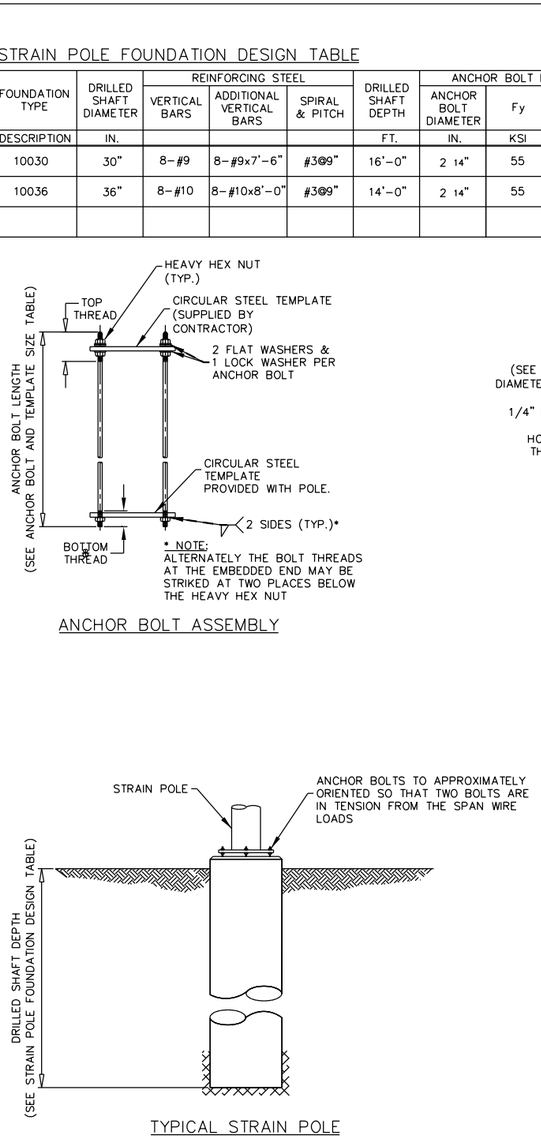
ANCHOR BOLT AND TEMPLATE SIZE TABLE

FOUNDATION TYPE	ANCHOR BOLT DIAMETER	*ANCHOR BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE DIAMETER	R1	R2
DESCRIPTION	IN.	FT.	IN.	IN.	IN.	IN.	IN.
HC10030	2 1/4"	6'-3 1/2"	9"	4"	19"	7 7/8"	11 1/8"
HC10036	2 1/4"	6'-3 1/2"	9"	4"	21"	8 7/8"	12 1/8"

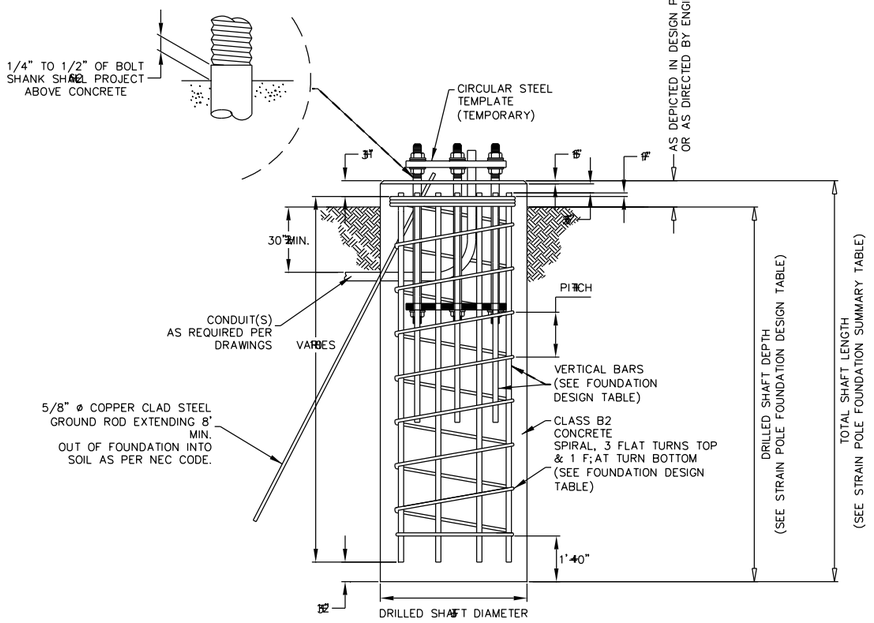
STRAIN POLE FOUNDATION SUMMARY TABLE

LOCATION IDENTIFICATION	FOUNDATION TYPE	NUMBER (EA)	DRILLED SHAFT LENGTH (FEET)		EXPOSED FOUNDATION (FEET)	TOTAL SHAFT LENGTH (FEET)
			HC10030	HC10036		
POLE 1 - MUESCHKE AT DESTINATION	10036	1		14.0	1.0	15.0
POLE 2 - MUESCHKE AT DESTINATION	10036	1		14.0	1.0	15.0
POLE 3 - MUESCHKE AT DESTINATION	10036	1		14.0	1.0	15.0
POLE 4 - MUESCHKE AT DESTINATION	10036	1		14.0	1.0	15.0
TOTAL DRILLED SHAFT LENGTHS						60.0

NOTE: ENGINEER SHALL COMPLETE STRAIN POLE FOUNDATION TABLE



TYPICAL STRAIN POLE FOUNDATION ASSEMBLY



STRAIN POLE FOUNDATION ELEVATION DETAILS

GENERAL NOTES:

1.) DESIGN SHALL CONFORM TO 2001 OR LATEST ADDITION TO AASHTO STANDARD SPECIFICATIONS FOR THE STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS AND INTERIM SPECIFICATIONS DESIGN WIND SPEED EQUALS 100 MPH PLUS A 1.3 GUST FACTOR.

2.) REINFORCING STEEL SHALL CONFORM TO THE PERTINENT HARRIS COUNTY STANDARD SPECIFICATION ITEM NUMBER 440 - REINFORCING STEEL.

3.) STRAIN POLE FOUNDATION SHALL BE INSTALLED WITH CLASS B2 CONCRETE.

4.) THREADS FOR ANCHOR BOLTS AND NUTS SHALL BE ROLLED OR CUT THREADS OF UNIFIED NATIONAL COARSE THREAD SERIES EXCEPT FOR A193B7 BOLTS WHICH SHALL HAVE 8 PITCH THREAD SERIES. BOLTS AND NUTS SHALL HAVE CLASS 2A AND 2B FIT TOLERANCES. GALVANIZED NUTS SHALL BE TAPPED AFTER GALVANIZING.

5.) THREADS FOR ANCHOR BOLTS SHALL BE COATED WITH PIPE JOINT COMPOUND PRIOR TO INSTALLATION OF UPPER NUTS WHEN ERECTING STRAIN POLE. AFTER STRAIN POLE IS PLUMBED AND IN PERMANENT ALIGNMENT, THE REMAINING EXPOSED THREADS OF PAINTED BOLTS SHALL BE CLEANED AND AN ADDITIONAL COATING OF ZINC-RICH PAINT SHALL BE APPLIED TO SEAL THE BOLT THREAD-NUT JOINT.

6.) ALL ANCHOR BOLTS SHALL CONFORM TO ASTM A193B7, A687 OR A36M55. ANCHOR BOLTS SHALL BE GALVANIZED THE ENTIRE LENGTH OF THE BOLT. NUTS FOR ANCHOR BOLTS SHALL CONFORM TO ASTM A563 GR A OR BETTER HEAVY HEX. EXPOSED NUTS AND WASHERS SHALL ALSO BE GALVANIZED. TEMPLATES AND EMBEDDED NUTS SHALL ALSO BE GALVANIZED.

7.) TOP OF STRAIN POLE FOUNDATION SHALL BE NO LOWER THAN THE PAVEMENT SURFACE ELEVATION. TYPICAL STRAIN POLE FOUNDATION SHOULD BE 6" ABOVE CROSS-SECTION CROWN OF MAJOR ROADWAY.

8.) ALL ANCHOR BOLTS SHALL HAVE A MINIMUM OF TWO FULL DIAMETER THREADS EXTENDED BEYOND THE NUTS.

9.) ANCHOR BOLT DESIGN DEVELOPS THE FOUNDATION CAPACITY GIVEN UNDER FOUNDATION DESIGN LOADS.

10.) STRAIN POLE FOUNDATION DESIGN LOADS ARE THE ALLOWABLE MOMENTS AND SHEARS AT THE BASE OF THE STRUCTURE.

11.) STRAIN POLE FOUNDATIONS MAY BE LISTED SEPARATELY OR GROUPED ACCORDING TO SIMILARITY OF LOCATION AND TYPE. QUANTITIES ARE FOR THE CONTRACTOR'S INFORMATION ONLY.

12.) STRAIN POLE FOUNDATION DESIGN IS BASED UPON UNDRAINED SHEAR STRENGTH OF 1500 PSF.

NO.	REVISIONS	DATE	NAME
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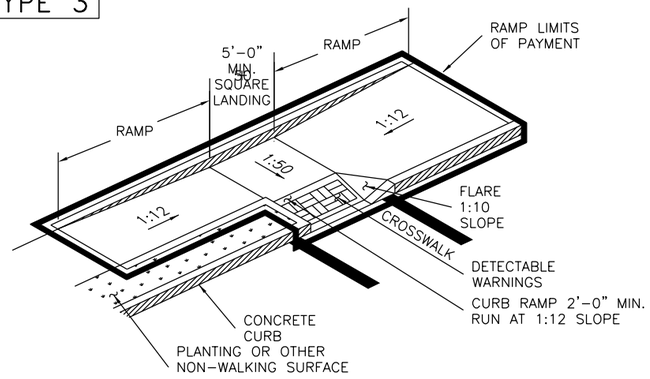
ANTHONY P. VOIGT 84845 LICENSED PROFESSIONAL ENGINEER STATE OF TEXAS

VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

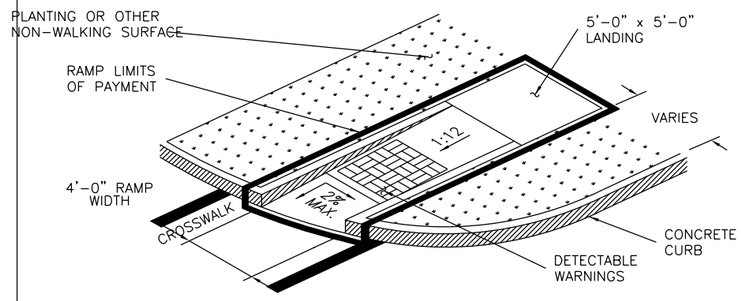
PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	STANDARD DETAILS
SHEET DESCRIPTION:	STRAIN POLE FOUNDATION DETAILS
TRAFFIC STANDARD	SPF
DRAWN BY: BSH	DATE: 7/19/22
CK'D BY: BSH	SCALE: NONE
SHEET NO:	32 / 38

TYPE 3



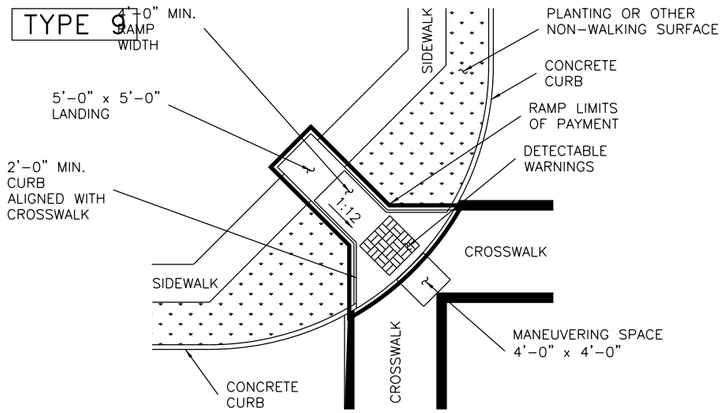
COMBINATION CURB RAMP
N.T.S.

TYPE 7



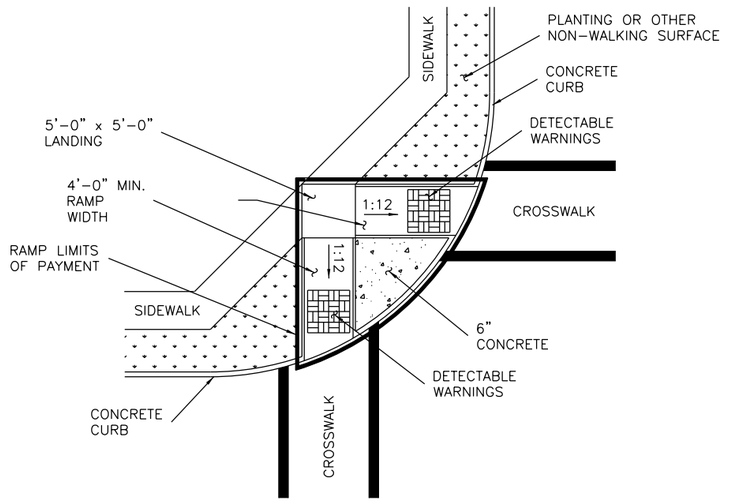
DIRECTIONAL CURB RAMP WITHIN RADIUS
N.T.S.

TYPE 9



DIAGONAL CURB RAMP (RETURNED CURB)
N.T.S.

TYPE 12

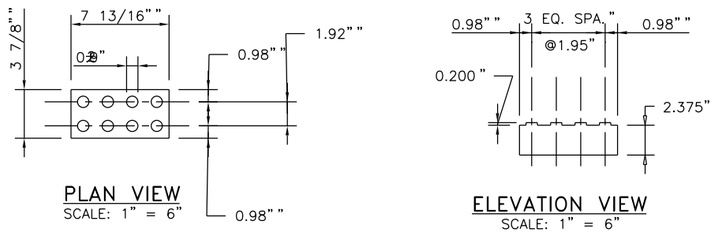


COMBINATION DIRECTIONAL CURB RAMP
N.T.S.

DETECTABLE WARNING GENERAL NOTES:

1. CONCRETE PAVER UNITS ARE REQUIRED FOR USE IN HARRIS COUNTY. ALTERNATIVE DETECTABLE WARNINGS THAT COMPLY WITH TAS AND TDLR GUIDELINES MAY BE SUBMITTED FOR CONSIDERATION TO HARRIS COUNTY PRIOR TO THE FINAL APPROVAL OF DESIGN DRAWINGS.
2. CONCRETE PAVER UNITS SHALL MEET ALL REQUIREMENTS OF ASTM C936, C33, AND SHALL BE LAID IN A TWO BY TWO UNIT BASKET WEAVE PATTERN, UNLESS OTHERWISE SHOWN IN THE PLANS.
3. CONCRETE PAVER UNITS SHALL BE BRICK RED AND HAVE A TRUNCATED DOME TOP SURFACE FOR DETECTABLE WARNING TO PEDESTRIANS.
4. CONCRETE PAVER UNITS SHALL BE SAW CUT ONLY AND ANY CUT UNIT SHALL BE NOT LESS THAN 25 PERCENT OF A FULL UNIT.
5. DETECTABLE WARNING SHALL BE A MINIMUM OF 24" IN DEPTH (IN THE DIRECTION OF PEDESTRIAN TRAVEL), AND EXTEND THE FULL WIDTH OF THE RAMP. (REFER TO TAS AND TDLR GUIDELINES)

TRUNCATED DOME PATTERN



PLAN VIEW
SCALE: 1" = 6"

ELEVATION VIEW
SCALE: 1" = 6"

CONCRETE PAVER WITH TRUNCATED DOME SURFACE

ACCESSIBLE CURB RAMPS AND LANDINGS GENERAL NOTES:

1. THE DESIGN AND CONSTRUCTION OF ALL ELEMENTS OF PEDESTRIAN FACILITIES SHALL MEET THE CRITERIA ESTABLISHED IN THE CURRENT EDITION OF THE TEXAS ACCESSIBILITY STANDARDS (TAS), AS PREPARED AND ADMINISTERED BY THE TEXAS DEPARTMENT OF LICENSING AND REGULATION (TDLR), UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
2. PEDESTRIAN FACILITIES AT SIGNALIZED INTERSECTION SHALL BE IN ACCORDANCE WITH APPLICABLE TRAFFIC SIGNAL DESIGN DRAWINGS.
3. ADJUSTMENT TO SIDEWALKS THAT CONNECT TO WHEELCHAIR RAMPS AND LANDINGS MAY BE NECESSARY TO MATCH BOTH THE GRADE AND THE WIDTH OF THE LANDING. THESE ADJUSTMENTS MAY NOT BE SHOWN ON THE DRAWINGS. WHEN DEEMED NECESSARY BY THE ENGINEER, FIELD ADJUSTMENT TO THE SIDEWALK SHALL BE MADE AS DIRECTED BY THE ENGINEER AND PAID FOR SEPARATELY, AS DIRECTED BY THE ENGINEER.
4. ALL ITEMS NECESSARY FOR THE CONSTRUCTION OF THE WHEELCHAIR RAMPS AND LANDINGS WITHIN THE "LIMITS OF PAYMENT" INDICATED ON APPROPRIATE WHEELCHAIR RAMP DETAILS AND DESIGN DRAWINGS (I.E., SAW CUT OF PAVEMENT. REMOVAL OF MATERIAL, EXCAVATION, DISPOSAL OF MATERIALS, ETC.) SHALL BE CONSIDERED INCIDENTAL TO THE COST OF THE WHEELCHAIR RAMP FOR PROJECTS THAT ARE DESIGNED AND/OR CONSTRUCTED USING HARRIS COUNTY RESOURCES.
5. FLATTER SLOPES THAT WILL STILL DRAIN PROPERLY MAY BE USED WHERE APPROPRIATE, SUBJECT TO THE REQUIREMENT OF NOTES 7, 8, AND 9.
6. RAMPS AND LANDINGS WITH DROP-OFFS GREATER THAT 6 INCHES IN HEIGHT SHALL HAVE CURB, RAILINGS, OR PROJECTING SURFACES. REFER TO TEXAS ACCESSIBILITY STANDARDS (TAS) AND THE ENGINEER.
7. ALL SLOPES SHOWN ARE MAXIMUM ALLOWABLE. THE CROSS SLOPE OF AN ACCESSIBLE ROUTE AND/OR LANDING MUST NOT EXCEED 1:50 (2%). ANY PART OF THE ACCESSIBLE ROUTE WITH A SLOPE GREATER THAN 1:20 (5%) SHALL BE CONSIDERED A RAMP.
8. IF A RAMP HAS A RISE GREATER THAT 6 INCHES, OR A HORIZONTAL PROJECTION GREATER THAT 72 INCHES, THEN IT SHALL HAVE HANDRAILS ON BOTH SIDES. THE ONLY EXCEPTIONS SHALL BE AT CURB RAMPS. HANDRAILS ARE NOT REQUIRED ON CURB RAMPS.
9. RAMP LENGTH OF GRADE OF APPROACH SIDEWALK SHALL BE SUBJECT TO ADJUSTMENT IN THE FIELD BY THE ENGINEER.
10. THE MAXIMUM ALLOWABLE CROSS SLOPE ON A SIDEWALK SHALL BE 2%.
11. THE MINIMUM THICKNESS FOR CURB RAMPS SHALL BE 4-1/2 INCHES.
12. CURB RAMPS WITH RETURN CURB MAY BE USED ONLY WHERE PEDESTRIANS WOULD NOT NORMALLY WALK ACROSS THE RAMP. OTHERWISE, FLARED SIDES SHALL BE PROVIDED.
13. CURB RAMPS AT MARKED CROSSINGS SHALL BE WHOLLY CONTAINED WITHIN THE MARKINGS. FLARED SIDES ASSOCIATED WITH CURB RAMPS ARE EXCLUDED FROM THIS REQUIREMENT.
14. A SMOOTH TRANSITION, IN ACCORDANCE WITH APPROPRIATE CONSTRUCTION DETAILS OR AS DIRECTED BY THE ENGINEER, AND SHALL BE PROVIDED WHERE CURB RAMPS CONNECT TO ADJACENT ROADWAY.
15. MANEUVERING SPACES AT THE BOTTOM OF THE CURB RAMPS SHALL BE A MINIMUM 4 FOOT X 4 FOOT CLEAR AREA, SHALL BE WHOLLY CONTAINED WITHIN THE CROSSWALK OUTSIDE OF THE PARALLEL VEHICULAR TRAVEL PATH.
16. A MINIMUM WIDTH OF 36 INCHES SHALL BE PROVIDED LANDINGS AROUND OBSTRUCTIONS (I.E., SIGN SUPPORTS, SIGNAL SUPPORTS, POLES, ETC.) LOCATED TO ADJACENT TO THE PEDESTRIAN ROUTE.
17. MINIMUM SIDEWALK WIDTH OF 4 FEET UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
18. CROSSWALKS WILL NOT BE REQUIRED AT UNSIGNALIZED INTERSECTIONS, UNLESS DIRECTED BY THE ENGINEER.
19. DETECTABLE WARNINGS ARE PLACED WHERE A PEDESTRIAN ACCESS ROUTE ENTERS THE ROADWAY, CROSSWALK, OR OTHER VEHICULAR AREA.
20. A MINIMUM OF 32 INCHES OF CLEARANCE IS REQUIRED FOR OBSTRUCTIONS LESS THAN 24 INCHES IN LENGTH, AND A MINIMUM OF 36 INCHES OF CLEARANCE IS REQUIRED FOR OBSTRUCTIONS GREATER THAN OR EQUAL TO 24 INCHES IN LENGTH.

NO.	REVISIONS	DATE	NAME
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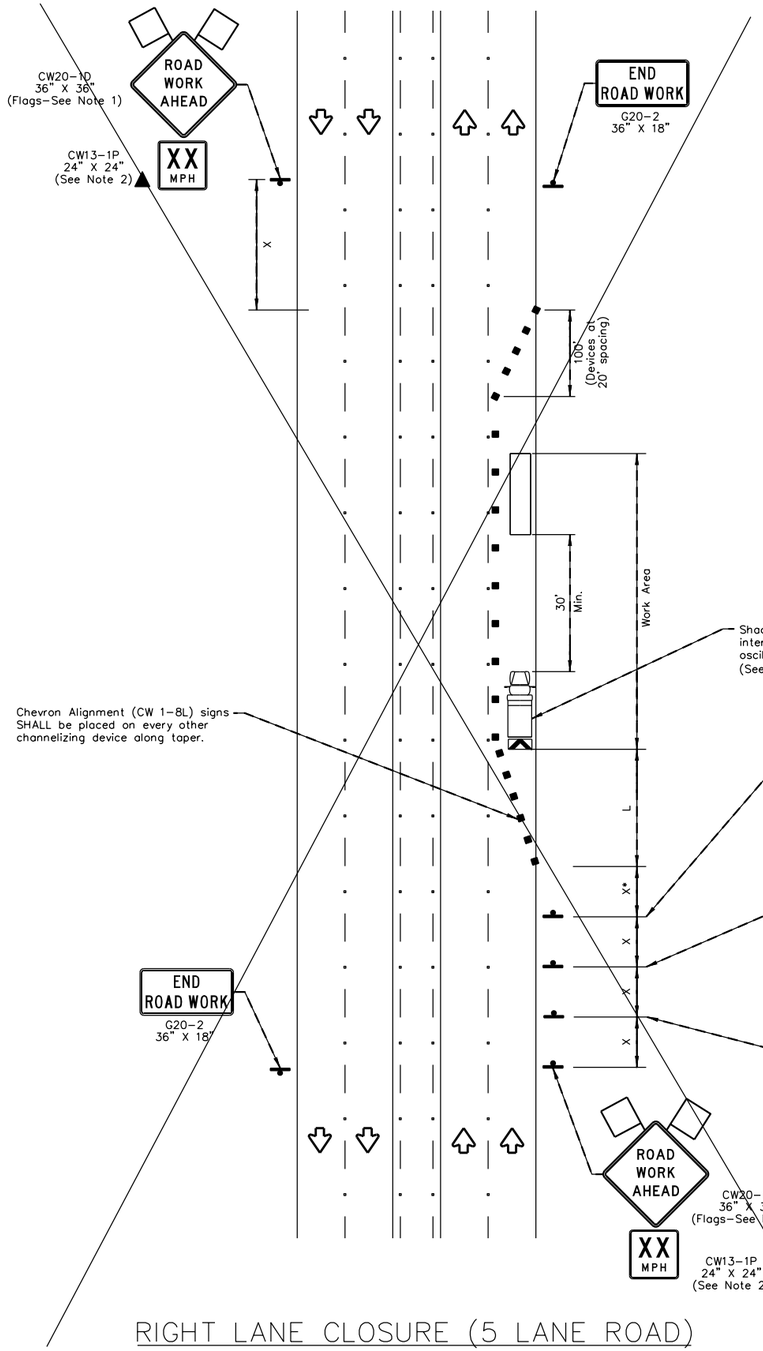
HARRIS COUNTY
ENGINEERING DEPARTMENT

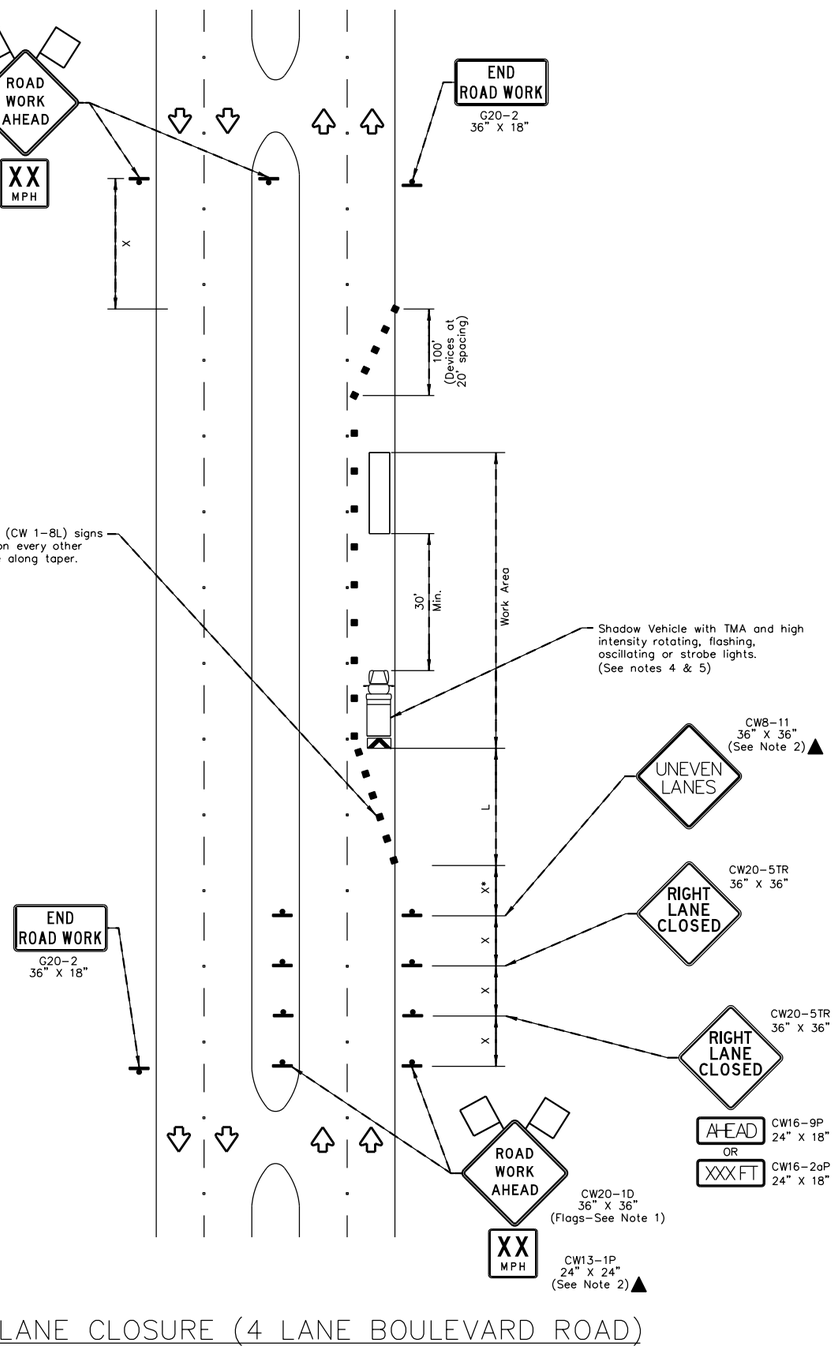
Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
NOVEMBER 20, 2023
VOIGT ASSOCIATES, INC. F-5333

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	STANDARD DETAILS
SHEET DESCRIPTION:	ADA RAMP DETAILS
CIVIL STANDARD	ADAR
DRAWN BY:	JDZ
DATE:	8/15/17
CK'D BY:	PDG
SCALE:	AS NOTED
SHEET NO:	33 / 38



RIGHT LANE CLOSURE (5 LANE ROAD)



RIGHT LANE CLOSURE (4 LANE BOULEVARD ROAD)

TRAFFIC CONTROL PLAN SECTION SHALL BE COMPLETED BY ENGINEER

ROADWAY	POSTED SPEED	TAPER LENGTH	SPACING CHANNELIZING DEVICES		SIGN SPACING	BUFFER SPACE
			TAPER	TANGENT		
MUESCHKE ROAD	45 MPH	540'	45'	90'	320'	195'
JUERGEN ROAD	45 MPH	540'	45'	90'	320'	195'

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

GENERAL NOTES

1. Flags attached to signs where shown are OPTIONAL.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol are OPTIONAL.
3. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
6. Contractor shall provide and install traffic control devices in conformance with part VI of Texas Manual on Uniform Traffic Control Devices (TMUTCD – Latest edition with revisions) during construction.
7. No lanes shall be blocked from 7am to 9am and 4pm to 6:30pm Monday thru Friday.
8. Off duty police officers/flaggers are required to direct traffic when applicable.
9. If project is within 400 feet from a signalized intersection, the Contractor shall contact Harris County Engineering Department, Traffic Signal Maintenance at (713) 881-3210 five (5) days prior to the start of construction.

NO.	REVISIONS	DATE	NAME
1			
2			
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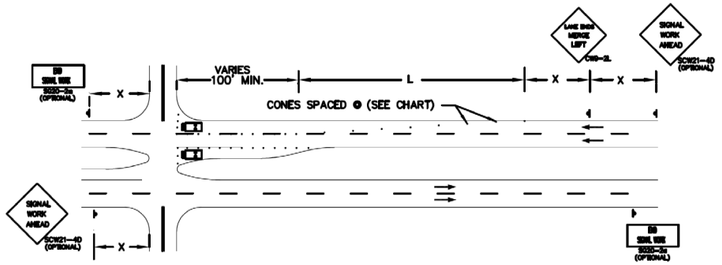
HARRIS COUNTY
ENGINEERING DEPARTMENT

Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100282-00

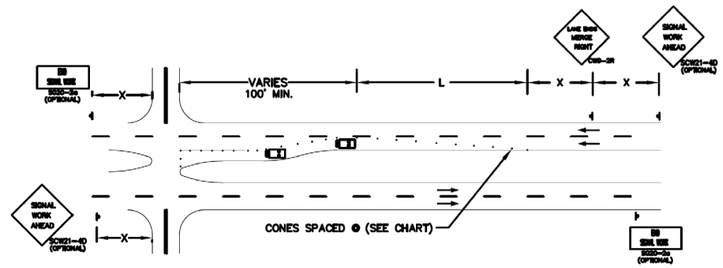
STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

PROJECT TITLE:	TOMBALL ISD TRAFFIC SIGNAL DESIGNS
	STANDARD DETAILS
SHEET DESCRIPTION:	TRAFFIC CONTROL PLAN (RIGHT LANE CLOSURE)
TRAFFIC STANDARD	TCP-RL
DRAWN BY: BSH	DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE
SHEET NO:	34 / 38

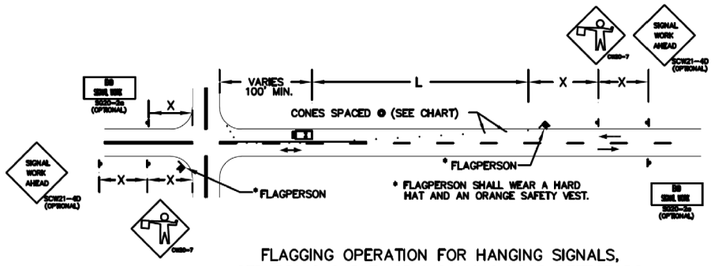


ONE LANE CLOSURE W/ LEFT TURN LANE CLOSED
FOR HANGING SIGNALS OR STRAPPING CABLE

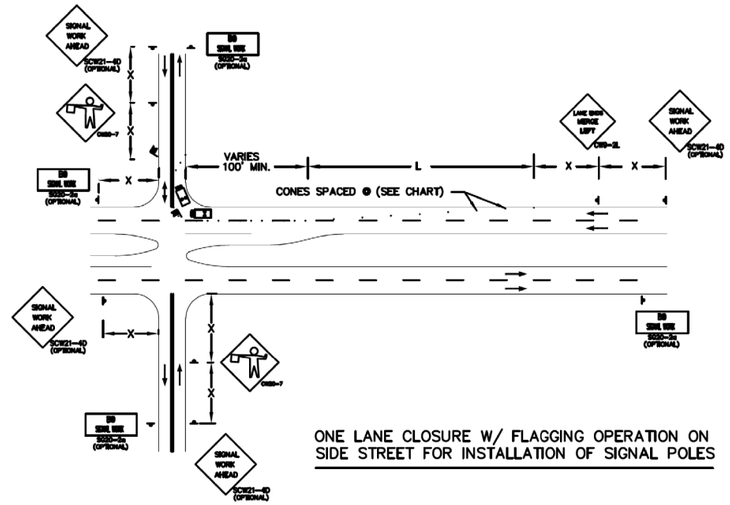


ONE LANE CLOSURE W/ LEFT TURN LANE CLOSED
FOR INSTALLATION OF LOOP DETECTORS

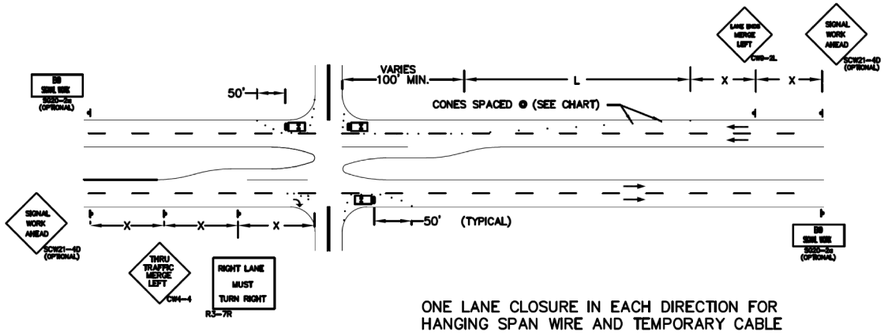
ONE LANE CLOSURE FOR INSTALLATION
OF CONDUIT OR LOOP DETECTORS



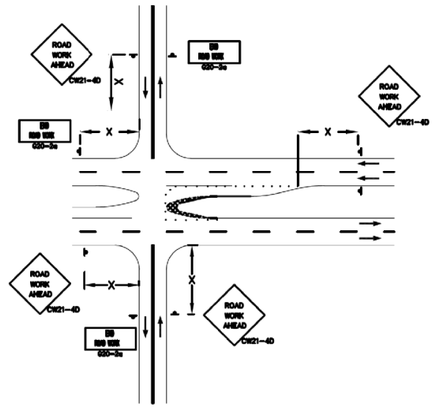
FLAGGING OPERATION FOR HANGING SIGNALS,
STRAPPING CABLE, OR INSALLING LOOP DETECTORS



ONE LANE CLOSURE W/ FLAGGING OPERATION ON
SIDE STREET FOR INSTALLATION OF SIGNAL POLES



ONE LANE CLOSURE IN EACH DIRECTION FOR
HANGING SPAN WIRE AND TEMPORARY CABLE



MEDIAN NOSE MODIFICATION

TYPICAL TRANSITION LENGTHS
AND
SUGGESTED MAXIMUM SPACING OF DEVICES

Posted * Speed	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Device On a Taper	On a Tangent
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'–75'
35		205'	225'	245'	35'	70'–90'
40		265'	295'	320'	40'	80'–100'
45	L=WS	450'	495'	540'	45'	90'–110'
50		500'	550'	600'	50'	100'–125'
55		550'	605'	660'	55'	110'–140'
60		600'	660'	720'	60'	120'–150'
65		650'	715'	780'	65'	130'–175'

* 85th Percentile Speed may be used on roads where traffic speeds normally exceed the posted speed limit.
** Taper lengths have been rounded off.

CONSTRUCTION WARNING
SIGN SPACING

Posted Speed or 85% Speed (MPH)	X Min. Distance (feet)
30 or less	120
35	160
40	240
45	320
50	400
55	500
65	750

X=SIGN SPACING
L=TAPER
HEAVY WORK VEHICLE

NOTES:

1. ALL TRAFFIC CONTROL DEVICES SHALL BE INSTALLED IN ACCORDANCE WITH THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST REVISION.
2. THE MINIMUM LANE WIDTH ALLOWED IS 10 FEET. THE MINIMUM BUFFER ZONE BETWEEN THE WORK ZONE AN ADJACENT TRAFFIC IS 2 FEET.
3. FLORESCENT ORANGE SHALL BE THE BACK GROUND COLOR ON ALL WORK ZONE SINGS.

NO.	REVISIONS	DATE	NAME
1			
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HARRIS COUNTY
ENGINEERING DEPARTMENT

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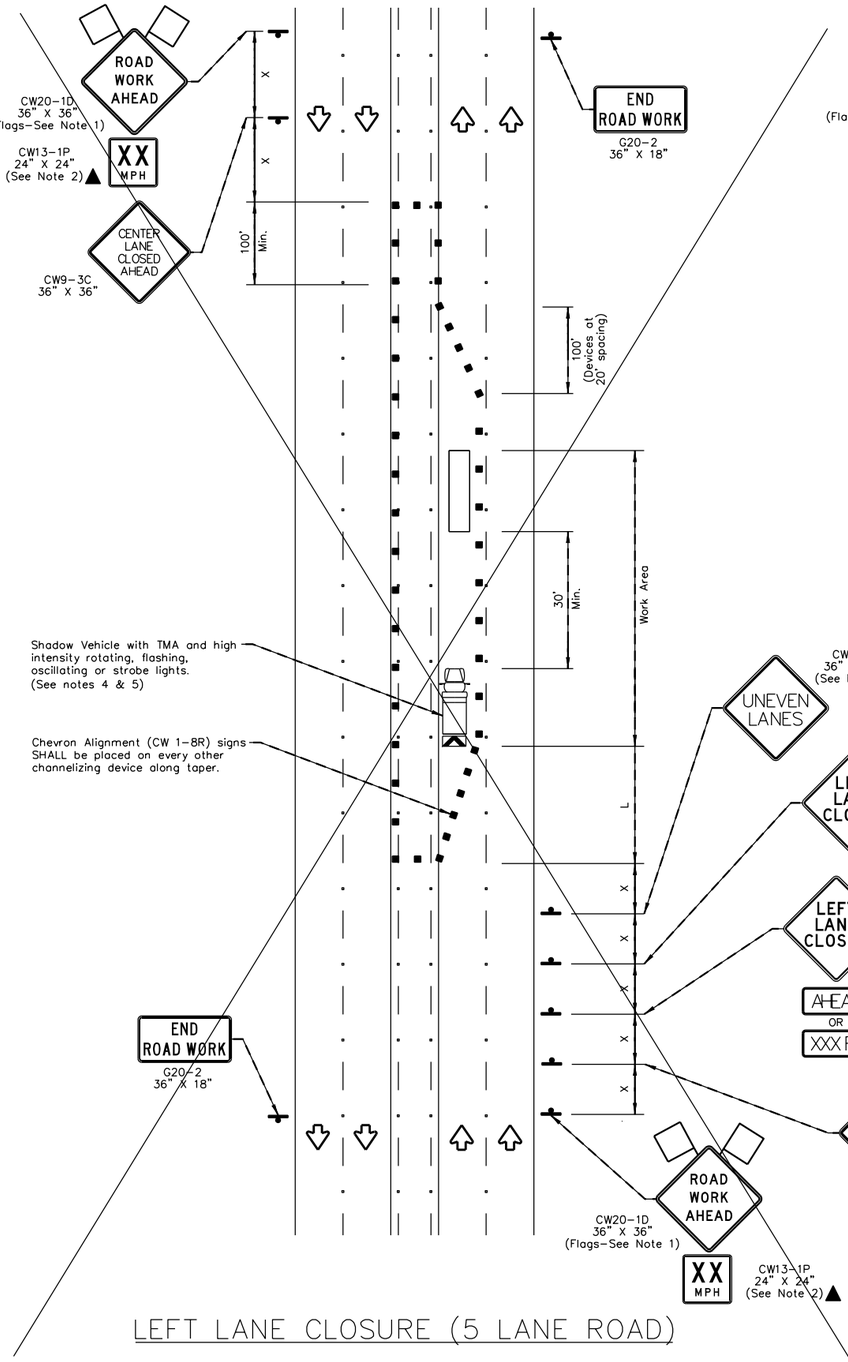
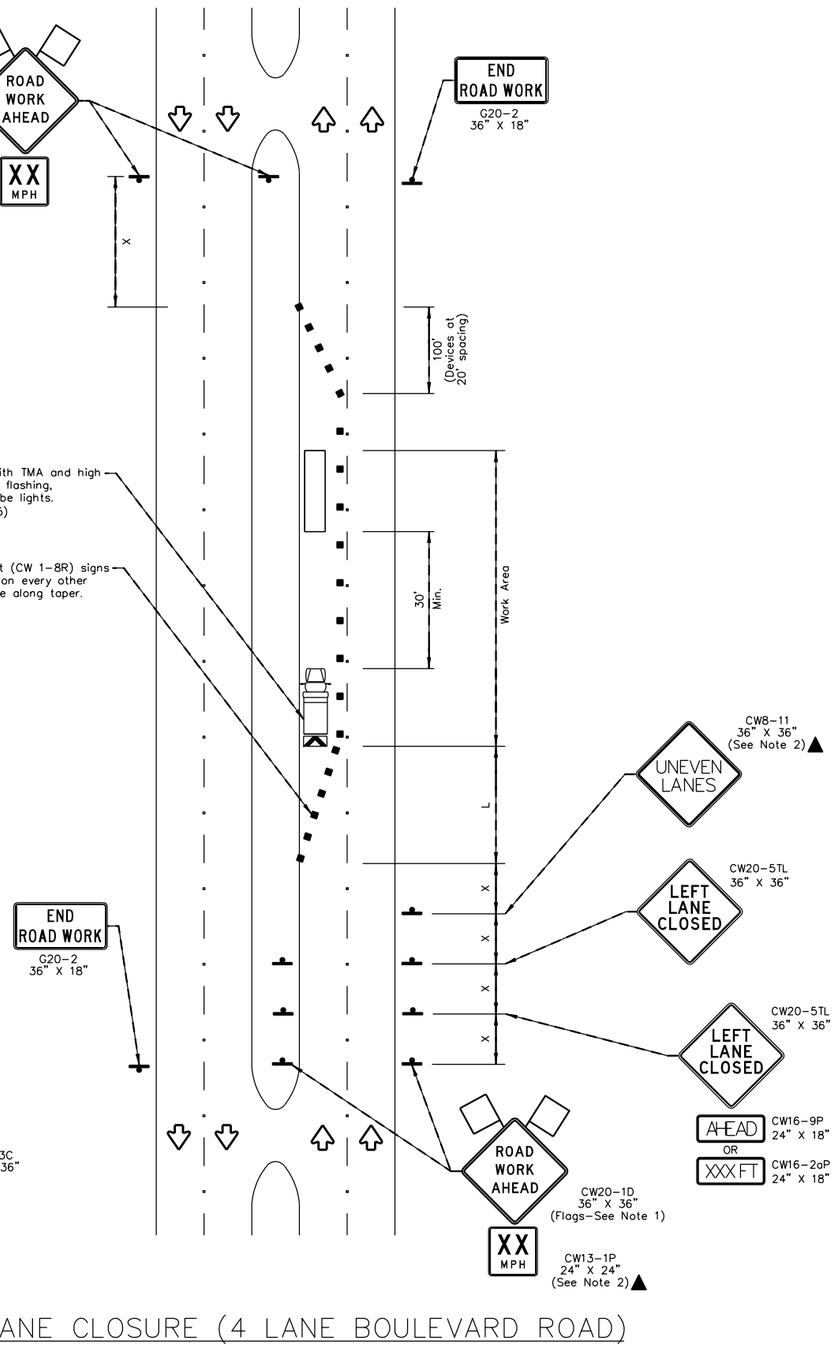
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100252-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
NOVEMBER 20, 2023
VOIGT ASSOCIATES, INC.
F-5333

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS
STANDARD DETAILS
TRAFFIC STANDARD
SHEET DESCRIPTION: TRAFFIC CONTROL PLAN
DRAWN BY: BSH
TRAFFIC SIGNAL INSTALLATION DETAILS
DATE: 8/18/17
CK'D BY: BSH
SCALE: NONE
SHEET NO: 35 / 38



LEFT LANE CLOSURE (5 LANE ROAD)



LEFT LANE CLOSURE (4 LANE BOULEVARD ROAD)

TRAFFIC CONTROL PLAN SECTION SHALL BE COMPLETED BY ENGINEER

ROADWAY	POSTED SPEED	TAPER LENGTH	SPACING CHANNELIZING DEVICES		SIGN SPACING	BUFFER SPACE
			TAPER	TANGENT		
MUESCHKE ROAD	45 MPH	540'	45'	90'	320'	195'
JUERGEN ROAD	45 MPH	540'	45'	90'	320'	195'

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
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45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

GENERAL NOTES

1. Flags attached to signs where shown are OPTIONAL.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol are OPTIONAL.
3. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
6. Contractor shall provide and install traffic control devices in conformance with part VI of Texas Manual on Uniform Traffic Control Devices (TMUTCD – Latest edition with revisions) during construction.
7. No lanes shall be blocked from 7am to 9am and 4pm to 6:30pm Monday thru Friday.
8. Off duty police officers/flaggers are required to direct traffic when applicable.
9. If project is within 400 feet from a signalized intersection, the Contractor shall contact Harris County Engineering Department, Traffic Signal Maintenance at (713) 881-3210 five (5) days prior to the start of construction.

NO.	REVISIONS	DATE	NAME
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HARRIS COUNTY ENGINEERING DEPARTMENT

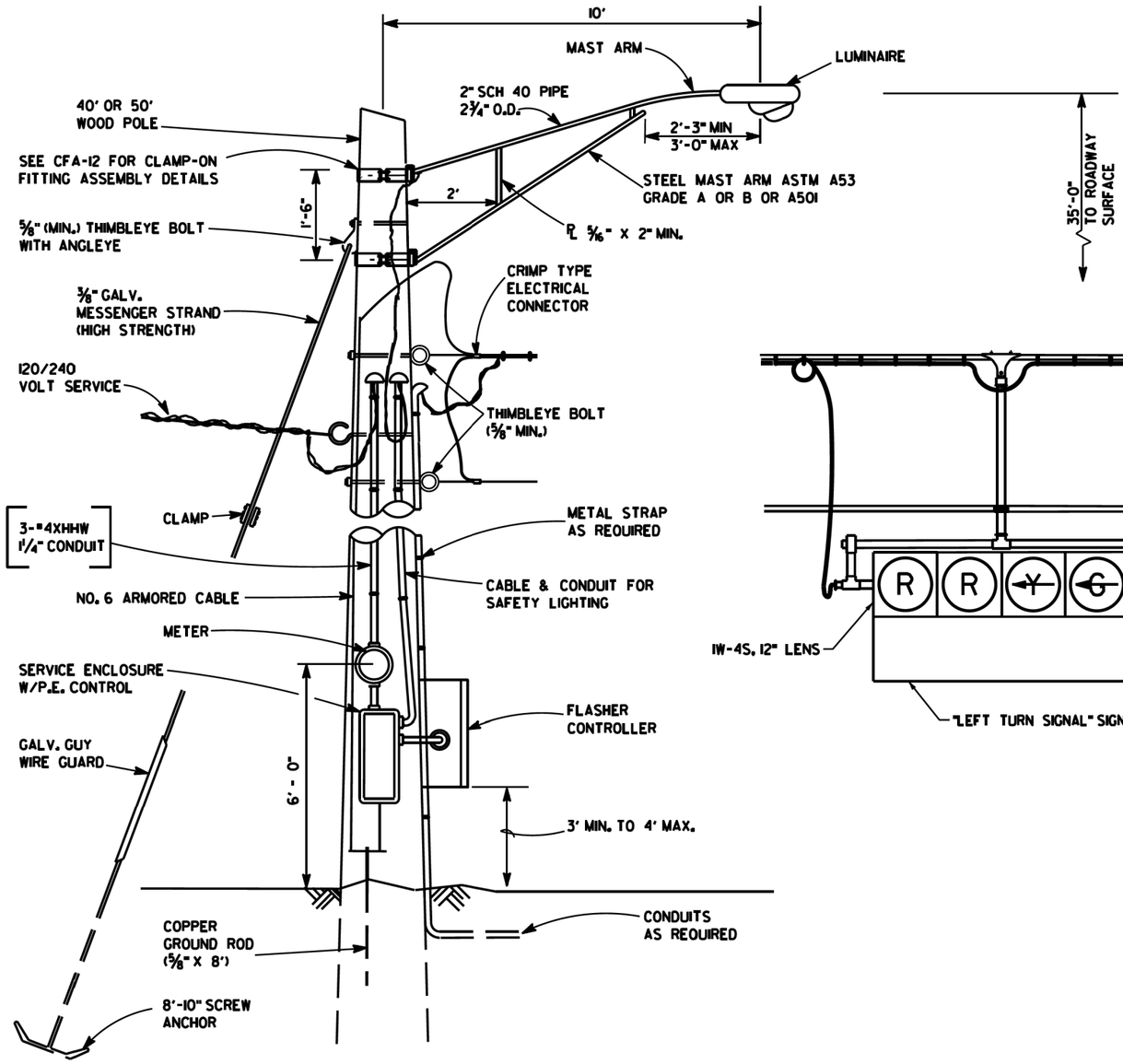
Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4578
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS — ANTHONY P. VOIGT — 84845 — LICENSED PROFESSIONAL ENGINEER

VOIGT ASSOCIATES, INC. F-5333

NOVEMBER 20, 2023

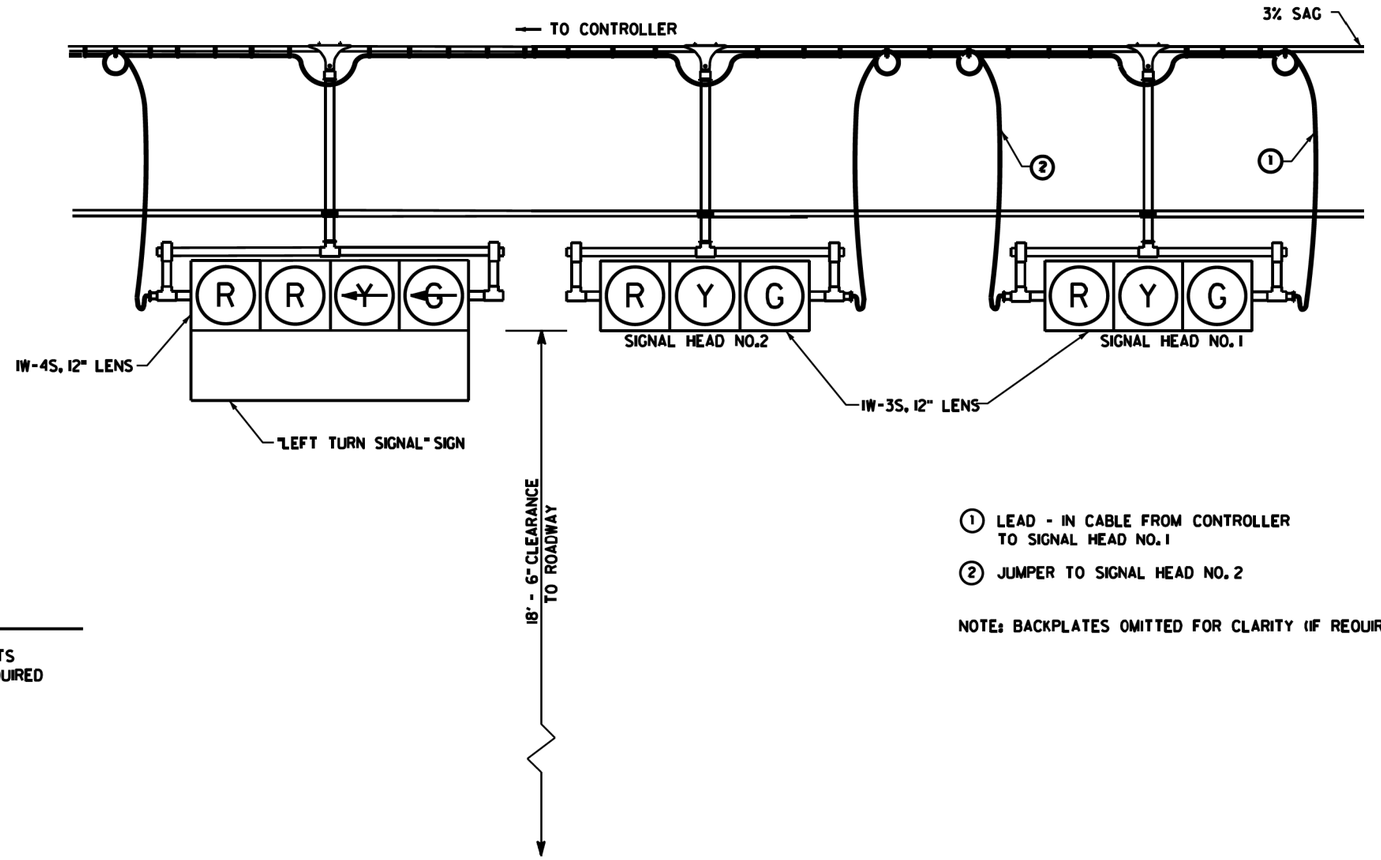
PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS			
STANDARD DETAILS			TRAFFIC STANDARD
SHEET DESCRIPTION: TRAFFIC CONTROL PLAN			TCP-LL
DRAWN BY: BSH	(LEFT LANE CLOSURE)		DATE: 8/18/17
CK'D BY: BSH	SCALE: NONE		SHEET NO: 36 / 38



NOTE: THE CONTRACTOR SHALL COIL ON THE SPAN WIRE A SUFFICIENT LENGTH OF SIGNAL CABLE FOR ADJUSTING SIGNAL HEADS DURING THE VARIOUS PHASES OF CONSTRUCTION.

NOTES:

1. WRAP SIGNAL HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF INSTALLATION UNTIL PLACING INTO OPERATION.
2. INSTALL GROUNDING BUSHINGS ON THE ENDS OF UNDERGROUND RIGID METAL CONDUITS. GROUND AND BOND CONDUITS, POLES, AND CONTROLLERS TO THE NEAREST GROUND ROD USING SOFT BARE NO. 6 COPPER WIRE.
3. FURNISH HIGH STRENGTH GALVANIZED SPAN WIRE.
4. FURNISH MINIMUM 2 SIGNAL HEADS PER APPROACH.
5. FURNISH LEFT TURN SIGNAL HEAD WHEN REQUIRED.
6. FOR TEMPORARY SIGNAL INSTALLATION, INSTALL A SEPARATE POWER SOURCE, IF REQUIRED.
7. FOR TEMPORARY SIGNAL INSTALLATION, INSTALL LUMINAIRES ON WOOD SIGNAL POLES, IF REQUIRED. CONSTRUCT STEEL UPSWEEP MAST ARM FOR WOOD POLE MOUNTING OF 2 IN. PIPE WITH SLIPFITTER MOUNTING OF THE LUMINAIRE.
8. FOR TEMPORARY SIGNAL INSTALLATION, COIL A SUFFICIENT LENGTH OF SIGNAL CABLE ON THE SPAN WIRE FOR ADJUSTING SIGNAL HEADS DURING THE VARIOUS PHASES OF CONSTRUCTION.



1. LEAD - IN CABLE FROM CONTROLLER TO SIGNAL HEAD NO. 1
2. JUMPER TO SIGNAL HEAD NO. 2

NOTE: BACKPLATES OMITTED FOR CLARITY (IF REQUIRED)

NO.	REVISIONS	DATE	NAME
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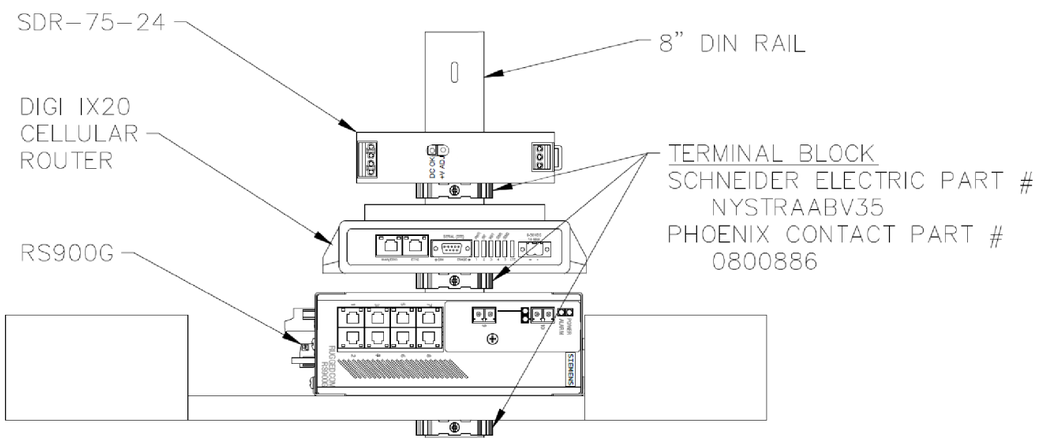
HARRIS COUNTY
ENGINEERING DEPARTMENT

HARRIS COUNTY 1836 TEXAS

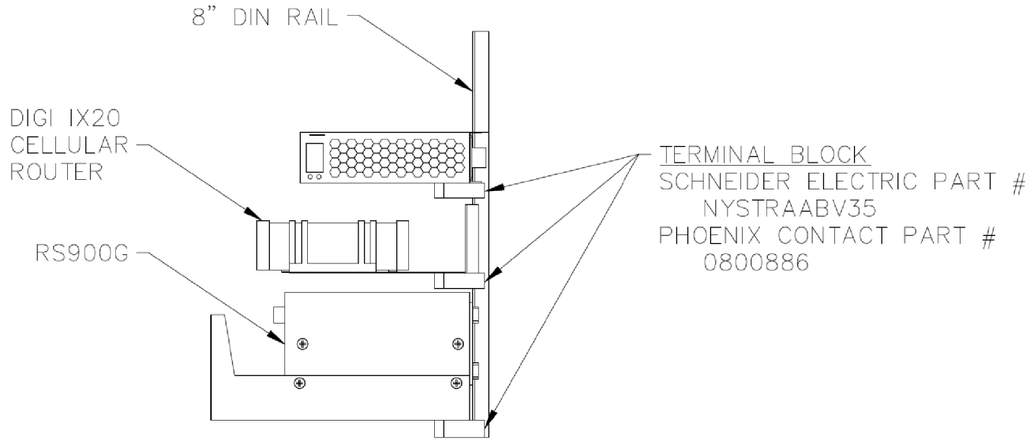
Amani Engineering, Inc.
• Engineers • Surveyors • Construction Managers
11011 RICHMOND AVE. SUITE 700 HOUSTON, TX. 77042
Tel (713) 270-5700 Fax (713) 271-3487
TBPE Firm Reg. No.: F-4528
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
NOVEMBER 20, 2023
VOIGT ASSOCIATES, INC.
F-5333

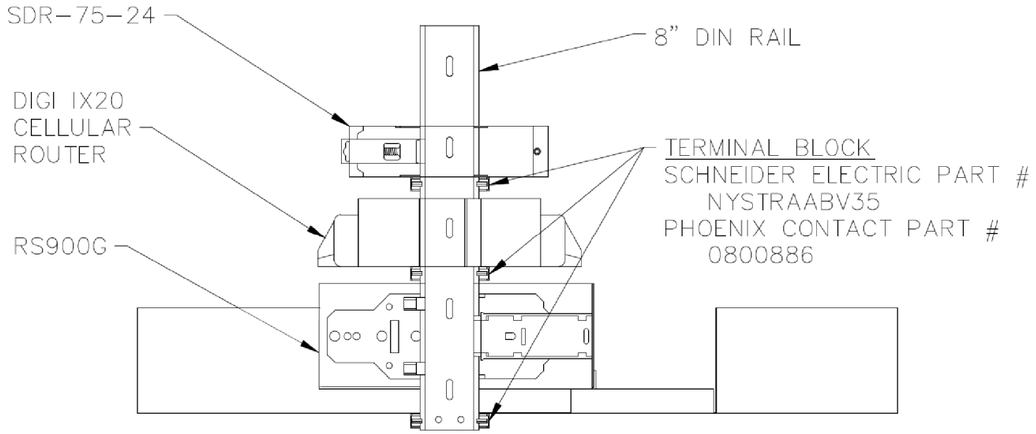
PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD
SHEET DESCRIPTION: CONSTRUCTION DETAILS FOR		CD/TS/WP
DRAWN BY:	TRAFFIC SIGNALS (WOOD POLE)	DATE: 8/18/17
CK'D BY:	SCALE: NONE	SHEET NO: 37 / 38



FRONT VIEW



SIDE VIEW



BACK VIEW

NO.	REVISIONS	DATE	NAME
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HARRIS COUNTY
ENGINEERING DEPARTMENT

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TBPE Firm Reg. No.: F-4728
TBPLS Firm Reg. No.: 100282-00

STATE OF TEXAS
ANTHONY P. VOIGT
84845
LICENSED
PROFESSIONAL ENGINEER
VOIGT ASSOCIATES, INC.
F-5333

NOVEMBER 20, 2023

PROJECT TITLE: TOMBALL ISD TRAFFIC SIGNAL DESIGNS		
STANDARD DETAILS		TRAFFIC STANDARD
SHEET DESCRIPTION: SIGNAL MODEM ASSEMBLY		CD/TS/WP
DRAWN BY:		DATE: 8/18/17
CK'D BY:	SCALE: NONE	SHEET NO: 38 / 38