BID NO. 16-10

6TH STREET OVERLAY PROJECT

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INVITATION TO BID

Sealed Bids marked **"Bid No. 16-10, 6TH STREET OVERLAY PROJECT"** will be received at the Purchasing Department, City Hall, Kingsville, Texas until 1:30 P.M. July 19, 2016. Immediately thereafter the bid proposals will be publicly opened and read aloud in the Robert H. Alcorn Commission Room. There will be a Pre-Bid Meeting and at 9:00 A.M. on Wednesday, July 6, 2016 at the Robert H. Alcorn Commission Chamber at City Hall, Kingsville, Texas.

The project involves the labor, material, supervision, equipment, tools, and all the incidentals required to complete the entire project as per specifications.

Prospective bidders must read the Instructions to Bidders, Contract Documents, and Detailed Specifications. Detailed plan and specifications on the above bid are on file and available in the office of the Capital Improvements Manager for a nonrefundable $25.00 deposit per bid package.

The successful bidder will be required to enter into a contract for the performance of the work for the price quoted on the Proposal and will provide evidence of current Personal Injury, Property Liability, Worker's Compensation, and Builder's Risk Insurance.

The Contractor will also be required to submit a Reference and Qualifications statement, if the Contractor has not performed a similar project for the City of Kingsville in the last three (3) years.

The bid will be awarded to the lowest responsible bidder whose bid is determined to be the most advantageous to the City, its officers, employees, and agents. Price, in accordance with law, will not be the sole evaluation factor. Misrepresentation, whether substantial or otherwise, at any stage of the bidding and award process, shall be considered in this and all future bids in determining whether or not a bid is "responsible".

THE CITY, IN ACCORDANCE WITH LAW, RESERVES THE RIGHT TO REJECT ANY AND ALL BIDS. The City shall be the sole judge of "responsible" and "advantageous" and this determination shall be final except in cases of a clear definitive showing that such determination is arbitrary, capricious, and unreasonable.

_____

David Mason
Purchasing/IT Director

6TH STREET OVERLAY PROJECT

INSTRUCTIONS TO BIDDERS

1.0 RECEIPT OF PROPOSALS

1.1 Proposals will be received at the time, place and under conditions set forth in the published Invitation to Bidders.

1.2 Bidding documents are obtainable from the City under conditions set forth in the Invitation to Bidders.

2.0 DISCREPANCIES AND INTERPRETATIONS

2.1 Notify the Engineering Department in writing, at least five (5) working days prior to the scheduled bid opening date, if discrepancies, ambiguities or omissions are found in the bidding documents, or if further information or interpretation is desired.

2.2 Answers will be given in writing to all bidders in addenda form. All provisions and requirements of such addenda will supersede or modify affected portions of the bidding documents. All addenda will be incorporated in and bound with the Contract Documents. No other explanation or interpretation will be considered binding. The contractor shall acknowledge receipt of addenda(s) by a signed statement included in the bid proposal.

3.0 SUBMITTAL PROCEDURE

3.1 Submit the Proposal in a large sealed envelope, marked **"Bid No. 16-10 6TH STREET OVERLAY PROJECT"**.

3.2 A smaller envelope shall be affixed to the outside of the larger envelope and contain the following documents.

- Bid Bond
- Qualifications Statement
- Addenda(s) Receipt Acknowledgement

3.3 Provide complete bidder identification on the outside of the large envelope.

3.4 If the Proposal is submitted by mail, place the smaller envelope inside a larger envelope. Delivery of the Proposal prior to the advertised time and the place set for the bid opening is the responsibility of the bidder.

4.0 PROPOSAL

4.1 The Proposal shall be based on conditions at the project site, the bidding documents and addenda issued.

4.2 The Proposal shall be authoritatively executed and submitted on the Proposal form furnished by the Owner.

4.3 Proposals showing omissions, alterations, conditions, or carrying riders or qualifications which modify the Proposal form shall be rejected as irregular.

4.4 Proposals must be submitted in a single copy. Utilize a copy of the blank proposal form included in the bidding documents for submission. If two or more Proposals are submitted by a bidder, either in one envelope or in separate envelopes, then such Proposals may be subject to rejection.

4.5 Proposals received after the advertised time for the bid opening will be ineligible and will be returned unopened.

4.6 The City of Kingsville reserves the right to reject any or all Proposals.

5.0 PROPOSAL GUARANTY

5.1 A certified or cashier's check on a State or National Bank in the State of Texas, or a bid bond on the City of Kingsville's Bid Bond Form, from a Surety authorized to transact business in the State of Texas, in the amount of not less than five percent (5%) of the greatest total amount of the bidder's Proposal, payable without recourse to the order of the City of Kingsville, must accompany the Proposal as a guarantee that, if awarded the Contract, the bidder will promptly enter into the Contract and execute the Performance and Payment Bonds (Bonds) on the forms provided.

5.2 The bid bond must be accompanied by an executed Power of Attorney with a Live Surety Seal on each document. Failure to do so will constitute an irregular bid which may be rejected. Use of a Surety Bid Bond Form will not be acceptable.

5.3 Should the successful bidder fail to execute the Contract and Bonds within fifteen (15) days after the date of transmittal of the Contract Documents for execution,

said Proposal Guaranty shall become the property of the Owner, not as a penalty, but as liquidated damages.

5.4 Proposal Guaranties of the three (3) lowest bidders shall be retained until after the Contract and Bonds have been executed.

6.0 QUALIFICATIONS OF BIDDER

6.1 Bidders shall submit with their bid, a list of at least three (3) jobs of the same type and scope as described in the invitation for bids that they have completed within the last three (3) years. This list should include the name, contract person, and telephone number for whom the prior work was performed. Utilize a copy of the Reference and Qualifications Statement form included with these bidding documents.

6.2 The Owner may make such investigations as necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish any requested information and data including an audited financial statement. The Owner reserves the right to reject any Proposal if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to complete the work.

6.3 Each bidder submitting a Proposal shall be prepared to furnish the firm's State Comptroller Vendor Identification Number, or the date on which an application was submitted. Contract payments to the successful bidder are contingent on submittal of this identification number.

6.4 Corporate bidders shall submit a State Comptroller "Certificate of Good Standing" with the Proposal, as issued by the Texas State Comptroller (512) 463-2605.

7.0 SITE INVESTIGATION

7.1 It is the responsibility of each bidder to examine the project site, existing improvements and adjacent property and be familiar with existing conditions before submission of the Proposal. Interested bidders shall arrange for a project site visit by contacting the Engineering Department at (361) 595-8004.

7.2 After investigating the project site and comparing the Pictures, Drawings, and Specifications with the existing conditions, the bidder should immediately notify the City Engineer, in accordance with paragraph 2.0, of any conditions for which requirements are not clear, or about which there is any question regarding the extent of the work involved.

7.3 Should the successful bidder fail to make the required investigation and should a question arise later as to the extent of the work involved in any particular case, then the decision shall be made by the Owner after recommendations by the City Engineer as to proper interpretation of the Contract Documents.

7.4 Any Contractor with intentions of submitting a bid shall become fully aware of all requirements of the work including site security, access, and parking requirements by the residents located within the project.

8.0 CONTRACT AWARD

8.1 The owner agrees that should the contract be awarded, it will be awarded to the lowest responsible bidder and the award will be made within sixty (60) days of the bid opening date, unless otherwise stated in the Proposal.

8.2 Immediately following action by the City Commission, the successful bidder will be notified of the award in writing.

8.3 The Owner reserves the right to accept or reject any or all bids and options or to accept any combination of options considered advantageous.

8.4 In 2015, the Texas Legislature adopted House Bill 1295, which added section 2252.908 of the Government Code and applies to all contracts entered into on or after January 1, 2016. The law states that a governmental entity may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties to the governmental entity at the time the business entity submits the signed contract to the governmental entity. The law applies to all contracts/purchases of a governmental entity that require an action or vote by the governing body of the entity.

With regards to City of Kingsville purchases, a vendor that is awarded a contract or purchase that is greater than $50,000 and/or awarded by City Commission is required to electronically create a Form 1295 through the Texas Ethics Commission website (https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm) and submit a signed and notarized copy of the form to the City. A contract, including City-issued purchase order, will not be enforceable or legally binding until the City receives and acknowledges receipt of the properly completed Form 1295 from the awarded vendor.

CITY OF KINGSVILLE

BID FORM

Bid Form from _____ a
(Corporation/Partnership/Individual) doing business as _____.

The undersigned, as bidder, declares that the only person or parties interested in this Proposal as principals are those named herein; that this Proposal is made, without collusion with any other person, form or corporation; that he/she has carefully examined the form of Contract, Instructions to Bidders, Specifications, and the Drawings therein referred to and that he has carefully examined the locations, conditions and the classes of materials of the proposed work; and agrees that he/she will provide all the necessary machinery, tools, apparatus and other means of construction and will do all the work and furnish all the materials called for in the Contract Documents in the manner therein prescribed, for the prices quoted below.

It is understood that the funds for payment of the work contemplated by this proposal are to be derived from an appropriation heretofore made or to be made by the City of Kingsville and that payments on the Contract will be by bank checks.

If a Bidder's Bond is furnished, and not a Certified or Cashier's Check, it is understood the bond will be executed on the Bid Bond form enclosed herein. Failure to do so will constitute an irregular bid, which will be rejected. Use of Surety Company's Bid Bond form will NOT be acceptable.

Addenda No._____ Received by _____ Date _____

Addenda No._____ Received by _____ Date _____

Addenda No._____ Received by _____ Date _____

Addenda No._____ Received by _____ Date _____

Bid Item, "Bid No. 16-10 6TH STREET OVERLAY PROJECT" including supervision, equipment, tools, and other incidental related work required to construct and complete the work in accordance with the drawings and specifications, as prepared by the City of Kingsville, plans dated February 1, 2016 for a price of:

$_____
Total Project Price - words

$_____
Total Project Price - figures

The work to be completed in ninety (90) consecutive calendar days after the notice to proceed has been issued by the City's Representative.

In submitting this bid, it is understood that the right is reserved by the City of Kingsville to reject any and all bids. *The City of Kingsville also reserves the right to award the bid on any or all individual bid items.* If written notice of the acceptance of this bid is mailed, e-mailed, faxed or delivered to the undersigned before this bid is withdrawn, the undersigned agrees to execute and deliver a contract in the prescribed form and furnish the required bond within ten (10) days after the contract is presented to him/her for signature.

BY SUBMITTING A BID, THE BIDDER AGREES TO ABIDE BY ALL OF THE TERMS AND CONDITIONS OF THE "INVITATION TO BID", GENERAL CONDITIONS, SPECIAL CONDITIONS AND SPECIFICATIONS.

I certify that the above **"Bid No. 16-10 6TH STREET OVERLAY PROJECT"** will meet or exceed all of the minimum specifications and conditions set forth by the City of Kingsville, Texas.

DATED THIS _____DAY OF _____, 2016.

_____
(BIDDING FIRM)

ADDRESS: _____

_____

TELEPHONE: _____

BY: _____

June 20, 2016 Bid No. 16-10

REFERENCE AND QUALIFICATIONS STATEMENT

All questions must be answered and the data given must be clear and comprehensive, additional information may be provided on separate attached sheets. This form must be complete with the most recent similar type projects within the past three years and other current information.

Project Owner: _____

Owner Address: _____

Owner Phone: _____

Date Completed: _____ Total Cost: _____

Project Owner: _____

Owner Address: _____

Owner Phone: _____

Date Completed: _____ Total Cost: _____

Project Owner: _____

Owner Address: _____

Owner Phone: _____

Date Completed: _____ Total Cost: _____

Contracts in Progress:

Owner Expected Completion Date Amount

_____

_____

_____

Name of Bank Reference: _____

Name of Bank Officer: _____ Phone: _____

CITY OF KINGSVILLE
BID BOND

KNOW ALL MEN BY THESE PRESENTS,

That we, _____
(Name and Address of Bidder)

_____

hereinafter called the Principal, and _____, (Surety), a corporation or firm duly authorized to transact surety business in the City of Kingsville and listed in the current notice of the Department of Treasury list of companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies, hereinafter called the Surety, are held and firmly bound unto the City of Kingsville hereinafter called the Obligee, in the sum of not less than five percent (5%) of the greatest total amount of the bidder's proposal, as a proposal guarantee, the payment of which sum will and truly be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for: Project Number: _____

_____
(Full name and location of project)

NOW, THEREFORE, if the Obligee shall award the Contract to the Principal and the Principal shall enter into the Contract in writing with the Obligee in accordance with terms of such bid, and furnish such bonds and other instruments as may be specified in the Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, then this bond shall be null and void. If in the event of failure of the Principal to execute such contract and furnish such bonds and other instruments required by the Contract Documents to the Principal for execution, this bond shall become the property of the Obligee, without recourse of the Principal and/or Surety, not as a penalty but as liquidated damages.

Signed this _____DAY of _____, 2016.

By: _____
(Bidder)

_____

*By: _____
(Surety)

_____
(Attorney-in Fact)

*Attach Power of Attorney (Surety) for Attorney-in-Fact. **Surety Seal**

DISCLOSURE OF GUARANTY FUND NONPARTICIPATION

In the event the insurer is unable to fulfill its contractual obligation under this policy or contract or application or certificate or evidence of coverage the policyholder or certificateholder is not protected by an insurance guaranty fund or other solvency protection arrangement.

PAYMENT BOND

CITY OF KINGSVILLE
COUNTY OF **KLEBERG**

KNOW ALL MEN BY THESE PRESENTS:

That we, _____, as Principal, and _____, as Surety, are hereby held and firmly bound unto the City of Kingsville in the penal sum of:

_____Dollars $_____for the payment whereof, the said Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly and severally firmly by these presents.

The conditions of this obligation are such that, whereas the Principal entered into a certain contract, hereto attached and made part hereof, with the City of Kingsville, dated _____ for the _____
.

Now, if the Principal shall promptly make payments to all claimants, as defined in Article 5160, Revised Civil Statutes of Texas, 1925, as amended, supplying labor and materials in the prosecution of the work provided for in said contract documents, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

This bond is made and entered into solely for the protection of all claimants supplying labor and material in the prosecution of the work provided for in said contract documents, and all such claimants shall have a direct right of action under the bond as provided in Article 5160, Revised Civil Statutes, 1925, as amended.

The surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract documents or to the work to be performed thereunder shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract documents or to the work to be performed thereunder.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under their several seals this _____day of _____, 2016, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

_____, Principal (PRINCIPAL'S SEAL if a corporation)

By: _____ Title: _____

_____, Surety

By _____ (SURETY'S SEAL)
Attorney-in-Fact

PERFORMANCE BOND

CITY OF KINGSVILLE
COUNTY OF **KLEBERG**

KNOWN ALL MEN BY THESE PRESENTS:

That we, _____, as Principal, and_____, as Surety, are hereby held and firmly bound unto the City of Kingsville in the penal sum of:

_____ Dollars $_____for the payment whereof, the said Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly and severally firmly by these presents.

The conditions of this obligation are such that, whereas the Principal entered into a certain contract, hereto attached and made part hereof, with the City of Kingsville dated _____ for the _____
.

Now, if the Principal shall faithfully perform the contract in accordance with the plans, specifications and contract documents, and shall fully indemnify and save harmless the City of Kingsville from all costs of damage which the City of Kingsville may suffer by reason of the Principal's default or failure to perform and shall fully reimburse and repay the City of Kingsville all outlay and expense which the City of Kingsville may incur in making good any such default, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

In the event Principal is in default under the contract as defined herein, Surety will within fifteen (15) days of determination of such default take over and assume completion of such contract and become entitled to the payment of the balance of the contract price, or the Surety shall make other arrangements satisfactory with the obligee for the completion of the defaulted work but in no event shall the surety's liability exceed the penalty of this bond.

The surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or to the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under their several seals this _____ day of _____, 2016, the name and corporate seal of each corporate party being hereto affixed, and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

_____, Principal (PRINCIPAL'S SEAL if a corporation)

By _____ Title _____

_____, Surety

By _____ (SURETY'S SEAL)
Attorney-in-Fact

6TH STREET OVERLAY PROJECT

GENERAL CONDITIONS

SECTION 02050
DEMOLITION

Part 1 GENERAL

1.01 Existing Condition

A. Owner assumes no responsibility for actual condition of structures to be demolished. Existing conditions at the time of inspection for bidding purposes will be remain unchanged by the Owner insofar as practicable.

B. Minimize interference with adjacent facilities or areas of usage. Do not obstruct existing ways of traffic circulation, vehicular or pedestrian.

C. Provide and maintain temporary fences, coverings barriers and/or safety devices required to protect damage to any persons or property.

D. Maintain egress, access and exists at all times, unless obstruction is approved forty-eight (48) hours in advance by the Owner.

E. Protect existing structures and surfaces scheduled to remain. Promptly repair damaged structures and surfaces at no additional cost.

F. Maintain existing utilities and protect from damage for duration of operations. Interruption of services is to be only with Owner approval forty-eight (48) hours in advance of interruption. When so required by the Owner, provide temporary services for duration of utilities interruption.

G. Where demolition operations require the removal of an item or structure which will compromise the security of the existing facility, provide temporary closures or barrier until new material acquisition for such work so that such situations are minimized and provide Owner forty-eight (48) hours advance notice prior to commencement.

1.02 Pollution Control

A. Use water sprinkling, temporary enclosures or other suitable methods to limit dust and dirt to a condition of “lowest possible emissions”. Clean adjacent structures and improvements and return adjacent areas to condition existing prior to start of work.

B. Conform to applicable requirements of the TCEQ, EPA, OSHA, and any other regulatory authority having jurisdiction over this work. Provide monitoring and

other evidence of compliance as required to statute or safe-work practice, at no additional cost of the Owner.

Part 2 PRODUCTS

2.01 Material Disposition

A. Unless indicated otherwise, all demolished material is to be removed from the site and properly disposed of. Items of salvageable value to the Contractor but not indicated for reuse or turning over the Owner, shall be removed as the work progresses in a timely manner. Storage (or sale) of these items on site will not be permitted.

B. Reused Items: Certain items may be indicated on the Drawings or in the Specifications to be salvaged and/or reused. Where items are so identified, Contractor shall store and protect said items for duration of the project.

Part 3 EXECUTION

3.01 Preparation

A. Prevent movement or settlement of adjacent structures. Provide all necessary shoring and bracing. Protect existing landscaping materials, areas, surfaces, and structures that are to be demolished. Disconnect, remove and cap utility lines within demolition areas.

3.02 Execution

A. Perform all demolition required to effect the requirement of this project in an orderly and careful manner. Remove all items scheduled to reuse or to be turned over to the Owner in such a manner as to minimize damage.

B. Construct and maintain dust partitions to confine dirt, dust, fumes and other forms of air pollution to the construction area. Partitions must have perimeters sealed. Protect HVAC system from intake and/or distribution of such contaminates.

C. Cease operations and notify Engineer immediately if adjacent structures appear to be endangered. Do not resume operations until corrective measures have been taken. Repair damage to adjacent structures caused by demolition operations.

D. Remove demolished materials not scheduled for reuse or turning over to Owner from the site in a timely fashion. Broom clean demolished areas at end of each day's work.

E. Store and protect items scheduled for reuse. Prior to reinstallation, clean said items and prepare for reuse and, where applicable, refinishing.

F. Notify the Owner at such time when items scheduled to be submitted to the Owner are available. Unless otherwise indicated, the Owner will pick up these materials at the project site. The Contractor shall obtain a written receipt from the Owner for same.

G. Demolished materials shall not be sold on site or the Owner's employees.

H. Do not burn or bury demolished materials on site.

I. Backfill open pits and holes caused as a result of demolition.

J. Rough grade and compact areas affected by demolition to maintain site grades and contours.

K. Replace or restore to Engineer's satisfaction existing structures, finishes, or items damaged by demolition operations. Replace or restore to Engineer's satisfaction all landscaping materials, including turf, damaged by demolition operations.

SECTION 02070
GEO-GRID REINFORCEMENT

Part 1 GENERAL

1.01 Description

A. This item shall consist of finishing and installing geo-grid reinforcement in accordance with the lines and grades shown on the plans.

1.02 Related Work

A. Section 02310: Earthwork for Pavements

1.03 Measurement and Payment

A. This item will be measured by the square yard of surface area as shown on the plans. No measurement will be made for lapping of material.

B. The work performed and materials furnished, as prescribed by this item, will be paid for at the unit price bid for "Geo-Grid Reinforcement", which shall be full compensation for furnishing all labor, material fright, tools, equipment and incidentals, and for doing all the work involved in placement of the geo-grid, complete in place.

1.04 Submittals

A. Contractor shall submit manufacturer technical date of all material for Engineer approval.

Part 2 PRODUCTS

2.01 Material

A. The geo-grid shall be single layer grid structures formed by a regular network of integrally connected polymeric ensile elements with apertures designed to interlock with the surrounding fill material. The fabric shall be capable of maintaining dimensional stability during placement and under normal construction traffic. The geo-grid shall be resistant to damage during construction, including ultraviolet degradation, and it shall have long-term resistance to chemical and biological degradation caused by the material being reinforced. <u>Tenser BX-1100 or approved equal.</u>

B. The geo-grid shall also conform to the properties specified below.

Property	Test Method	Requirement
Aperture Size	I.D. Calipered	0.75-1.5 inches
Open Area	COE Method CW-02215	70% min.
Rib Thickness	ASTM D 1777	0.025 inches, nom
Junction Thickness	ASTM D 1777	0.06 inches, nom
Secant Aperture Stability	In-Plane-Rotation Test	3.2 cm-kg/deg. Min
Modulus @ 20 cm-kg	Kinney, Univ. of Alaska	
Flexural Rigidity	ASTM D 1388 64	250,000 mg-cm. min
Both directors		
Tensile Modulus	GRI-GG1-87	14,000 lb/ft. min
Junction Strength	GRI-GGI-87	765 lb/ft. min
Junction Efficiency	GRI-GG2-87	90%, min

C. Alternate geo-grid material will be considered. Such material must be pre-approved in writing by the Engineer prior to bid date. Alternate material packages must be submitted to the Engineer a minimum of fifteen (15) days prior to bid date. Submittal packages must include, as a minimum, the following:

1. Full-scale laboratory testing and in-ground testing of pavement structures reinforced with the specific geo-grid that qualifies the structural contribution of the geo-grid to the pavement structure. The increase in structural layer coefficient of the base course must meet or exceed that of the design geo-grid.
2. Independent certified test results stating that the alternate geo-grid has a secant aperture stability modulus at 20 cm-kg, when tested in accordance with the “Grid Aperture Stability by In-Place-Rotation” test of 3.2 or greater.
3. A list of five (5) comparable projects, in terms of size and applications, in the United States, here the results of the specific alternate geo-grid’s use can be verified after a minimum of one (1) year service.
4. A sample of the geo-grid and certified specification sheets.

Part 3 EXECUTION

A. Subgrade shall be prepared as specified and as indicated on the plans.

B. The geo-grid shall be installed in accordance with the lines and grades shown on the plans. The geo-grid shall be oriented such that the roll lengths run parallel

to the road direction. Geo-grid sections shall be overlapped a minimum of one foot (1') unless otherwise indicated on the plans.

C. Care shall be taken to ensure the geo-grid sections do not separate during construction; adjacent rolls may be tied together every thirty feet (30') using suitable plastic ties. Placement of geo-grid around corners may require cutting and diagonal lapping. The geo-grid may be pinned, or held in place by other means, at the beginning of the backfill section but will be left free elsewhere to relieve wrinkles or folds in material during placement.

D. Should the geo-grid be ripped or torn during installation, the damaged area shall be uncovered to determine full extent of the damage. New geo-grid section shall overlap all torn or damaged geo-grid a minimum of three feet (3') in all directions.

E. Fill material shall be placed in lift thickness and compacted as shown on the plans. Tracked construction equipment shall operate on the grid only when a minimum of four-inch (4") cover is provided. Rubber-tired equipment may operate directly on the grid at speeds less than five (5) miles per hour if the underlying material is capable of supporting the loads. Sections of geo-grid that are damaged by construction activity shall be repaired at the Contractor's expense.

SECTION 02300
EARTHWORK

Part 1 GENERAL

1.01 Related Work

A. Section 02070: Geo-Grid Reinforcement
B. Section 02310: Earthwork for Pavement
C. Section 02320: Lime Stabilized Soils
D. Section 02510: PVC Water Pipe System
E. Section 02550: PVC Sanitary Sewer System
F. Section 02600: Storm Drain System
G. Section 03300: Cast-in-Place Concrete
H. Section 03400: Precast Concrete

1.02 Job Conditions

A. The contractor shall examine the site prior to bidding and shall be held to have knowledge of existing grades, topography, obstructions, and other visible site related conditions.

B. Maintain all benchmarks and other necessary reference points throughout construction. Replace if disturbed or destroyed.

C. Keep all excavations free from water at all times furnishing such pumps, equipment and power as may be required. Maintain surface drainage during construction.

D. Existing Utilities: Locate by hand excavation and protect from damage. Stake and identify locations and maintain same. Coordinate with Owner and utility companies to maintain services. Do not disrupt service without providing temporary means of service acceptable to the Owner. Repair any damages to utilities as promptly as possible, at no expense to the Owner.

E. Protection: Protect structures, sidewalks, pavement and other facilities on the site. Stake and identify locations of active utilities to remain and protect same. Barricade open excavations and provide means of warning as required. Provide necessary bracing and shoring at excavations to maintain the integrity of the excavation prior to backfilling. Comply with all governing safety regulations.

F. Use of explosives will not be permitted. Burning of removed materials will not be permitted.

G. Perform all work with experienced personnel and appropriate equipment to insure first class workmanship in a timely fashion.
H. Excavation and backfill required by any trade or subcontractor shall be performed by the affected parties in the manner described hereafter.

1.03 Warranty

A. Contractor shall for a period of two (2) years from acceptance correct any area exhibiting settlement, ponding or otherwise improper conditions at no expense to the Owner.

1.04 Geotechnical Testing and Quality Control

A. A recognized Independent Testing Laboratory will be selected by the owner to perform field and lab testing services. The expense of these tests and re-tests shall be borne by the Contractor. These services will include proctors, in-place densities, Atterberg limits, and any other testing procedures deemed appropriate by the Owner. These services will be identified to the contractor for his use in coordinating with the Testing Laboratory. The scope of testing services may be adjusted at the Owner's discretion prior to or at any point during the project.

B. All inspections and tests shall be performed in accordance with applicable ASTM Standards. Standard proctors to be in accordance with ASTM D698. Atterberg limits to be in accordance with ASTM D4318.

C. The Contractor will be responsible for notifying the Testing Laboratory at appropriate points of progress so that the identified scope of testing can be affected. Such notification to be made in a timely fashion. The Contractor shall cooperate with the Testing Laboratory so that the functions of the laboratory may be properly performed.

D. Should test results indicate that materials or placement do not conform to the requirements of these specifications, non-conforming work in-place shall be removed, replaced or reworked or any combination thereof until such work, after re-testing, conforms to these requirements. All expenses of re-testing to be born by the Contractor. Scope of re-testing to be as determined by Engineer.

E. Testing of materials described herein in no way relieves the Contractor of his obligation to provide materials and construction in full compliance with the requirements of the Contract Documents.

Part 2 PRODUCTS

A. All fill materials for the project site to obtain grades and conditions indicated on the drawings. Natural excavated fill may be reused as common fill if so approved by the Engineer.

B. All select fill to be new material. Stripped topsoil may be reused for topsoil.
C. Additional fill materials from Contractor's source shall be supplied by the Contractor as needed at no additional expense to the Owner.

D. All fill materials shall be clean and free from deleterious matter.

E. Sand Bedding for envelopes around utility lines shown on the drawings shall meet the following requirements:

Passing ½" Sieve	100% by weight
Passing 3/8" Sieve	90% to 100% by weight
Passing No. 4 Sieve	80% to 100% by weight
Passing No. 200	maximum 20% by weight
Plasticity Index	non-plastic 8 maximum
Liquid Limit	30 maximum

F. Select fill shall be placed under all concrete work on grade, thickness as indicated on the drawings. Select fill shall be natural uniform mixture of light tan sand and clay (maximum P.I. of 12). Common caliche meeting the P.I. requirement may also be utilized under concrete slabs on grade. Material to be free from debris and organic material.

G. Select fill under sidewalks, curbs and gutters, and other site related structures to be two inch (2") thickness minimum, unless noted otherwise on the drawings.

H. Common fill shall be placed at all locations requiring fill material, except at areas under concrete work on grade and under concrete or asphalt paving flexible base. Common fill to be natural excavated soil or a mixture of soil and clay. All common fill to be free from debris, organic matter and lumps or clods in excess of two inch (2") in any dimension. Provide common fill to elevations necessary to bring the covering topsoil material to required finish elevations.

I. Topsoil shall be placed at a minimum four inch (4") layer over all areas to receive turf or planting or where shown on the plans for topsoil. Topsoil to be fertile agriculture topsoil capable of sustaining healthy plant growth.

Part 3 EXECUTION

3.01 Delivery, Storage and Handling

A. Handle and neatly stockpile materials both new and excavated (suitable for reuse) with a minimum of interference with traffic, existing site facilities and other trades as approved by the Engineer.

B. Stockpile different sell types separately.

C. Prevent dirt and dust from blowing or otherwise becoming a nuisance to the occupants of adjacent facilities, to the public or to the procedure of this work.

3.02 Excavation

A. Perform all excavations for the completion of the entire project. Remove and dispose of material required to obtain subgrade elevations, including existing paving and visible obstructions; also underground structures and utilities indicated to be removed.

B. Excavate to elevations and dimensions indicated, plus sufficient space for forms, erections, shoring and removal.

C. Keep excavations clean and free of loose materials. Keep excavations free of water. Remove water and reshape excavations prior to placing concrete. Provide and maintain all pumps, piping and equipment required to properly dewater excavation.

D. All excavations to be inspected and approved by the Engineer prior to pouring concrete, backfilling, or otherwise covering.

E. Contractor to bear cost of extra work and materials caused by excavations beyond dimensions and grades required.

3.03 Trenches

A. Provide excavation for trenches required by piping, conduits and work of all trades including mechanical and electrical work. Trenches to be depths and dimensions required for finished installation.

B. All trenches shall meet or exceed the latest requirements of OSHA.

C. Shape trenches as required to prevent sides from caving by back sloping vertical sides. Contractor shall be solely responsible for back-slope used. Provide bracing and/or shoring as required to protect existing structures as well as workers. Remove bracing/shoring in a timely fashion as backfill occurs.

SECTION 02310
EARTHWORK FOR PAVEMENTS

Part 1 GENERAL

1.01 Description

A. This specification shall govern for the excavation and placement of earthwork and subgrades.

1.02 Related Work

A. Section 02070: Geo-Grid Reinforcement
B. Section 02300: Earthwork
C. Section 02320: Lime Stabilized Solis
D. Section 02500: Caliche Base
E. Section 02505: Limestone Base

1.03 Submittals

A. Contractor shall provide technical data and/or samples for each of the following material items:

1. Common Fill, only when source is offsite
2. Five (5) gallon sample of cliché on-site and Geotechnical Lab report
3. Geotechnical Soil and Density Field reports

1.04 Geotechnical Testing and Quality Control

A. A recognized Independent Testing Laboratory will be selected by the Owner to perform field and lab testing services. The expense of these tests and re-tests shall be borne by the Contractor. These services will include proctors, in-place densities, Atterberg limits, and any other testing procedures deemed appropriate by the Owner. These services will be identified to the Contractor for his use in coordinating with the Testing Laboratory. The scope of testing services may be adjusted at the Owner's discretion prior to or at any point during the project.

B. All inspections and tests shall be performed in accordance with applicable ASTM Standards. Standard proctors to be in accordance with ASTM-D698. Atterberg limits to be in accordance with ASTM D4318.

C. The contractor will be responsible for notifying the Testing Laboratory at appropriate points of progress so that the identified scope of testing can be affected. Such notification to be made in a timely fashion. The contractor shall

cooperate with the Testing Laboratory so that the functions of the laboratory may be properly performed.

D. Should test results indicate that materials or placement do not conform to the requirements of these specifications, non-conforming work in place shall be removed, replaced or reworked or any combination thereof until such work, after re-testing to be as determined by Engineer.

E. Testing of materials described herein in no way relieves the Contractor of his obligation to provide materials and construction in full compliance with the requirements of the Contract Documents.

Part 2 PRODUCTS

A. Backfill is a specified material used in refilling a cut, trench, or other excavation, placed at a specified degree of compaction.

B. Compaction is the process of mechanically stabilizing a material by increasing its density at a controlled moisture condition.

C. Degree of Compaction is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D698, 1991 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49-kg) Hammer and 12-in (304.8-mm) Drop, for general soil types abbreviated in this specification as a percentage of maximum density (ASTM D 698).

D. Embankment is “fill” having a top that higher that adjoining ground.

E. Excavation is the removal of soil, rock, or hard material to obtain a specified depth or elevation.

F. Fill is a specified material placed at a specified degree of compaction to obtain an indicated grade or elevation.

G. In-Situ Soil is existing in-place soil.

H. Lift is a layer (or course) of soil placed on top of a previously prepared or placed soil.

I. Soil is the surface material of the earth’s crust resulting from the chemical and mechanical weathering of rock and organic material.

J. Subgrade is the material in excavation (cuts) and fills (embankments) immediately below any sub base, base, pavement, or other improvement. Also, as a secondary definition, the level below which work above is referenced.

K. Topsoil is a natural or undisturbed soil formation, the fine-grained, weathered material on the surface or directly below any loose or partially decomposed organic matter. Topsoil may be a dark-colored, fine, silty, or sandy material with a high content of well decomposed organic matter, often containing traces of the parent rock material.

L. Unsatisfactory Material is existing, In-Situ soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in fill or embankment without excessive consolidation or loss of stability.

Part 3 EXECUTION

3.01 Application

A. Materials and workmanship specified herein with reference to State Department of Highways and Public Transportation, SDHPT, shall be in accordance with the referenced articles, sections and paragraphs of the standard except that contractual and payment provisions do not apply.

B. Deliver and store materials in a manner to prevent contamination or segregation.

3.02 Weather Limitation

A. Fill and backfill shall not be constructed when weather conditions detrimentally affect the quality of the finished course.

B. Place fill and backfill only if the atmospheric temperature is above freezing in the shade and is rising.

C. Do not construct fill and backfill in the rain or on saturated subgrades.

D. If weather conditions, in the opinion of the Engineer, are not suitable for construction, the work shall be scheduled for a later time, approved by the Engineer.

E. The Contractor shall furnish equipment to add moisture to the fill or backfill during and after placement.

3.03 Compaction

A. Compact each layer or lift of material specified so that the in-place density tested is not less than ninety-five percent (95%) of the maximum density of the standard proctor (ASTM D 698).

B. Subgrade shall be tested at a rate of one (1) proctor and Atterberg limits per type of soil and one (1) field density per 300 square yards of subgrade surface area.

3.04 Site Grading

A. Grade to finished grades indicated within 0.10 foot.

B. Grade areas to drain water away from structures and to provide suitable surfaces for mowing machines.

C. Existing grades, which are to remain but are disturbed by the Contractor's operations, shall be restored to the original condition.

3.05 Finishing Subgrades

A. Finish surface of top lift or top of subgrade to the elevation and cross section indicated.

B. Finished surface shall be smooth and of uniform texture.

C. Lightly scarify or blade the finished surface to bring the finished surface to within 0.05 foot of the indicated grade and to eliminate imprints made by compaction and shaping equipment.

D. Surface shall show no deviations in excess of ½-inch when tested with a ten (10) foot straightedge.

3.06 Disposition of Surplus Material

A. Surplus or other soil material that is not required or suitable for filling or backfilling shall be stock piled at a location within the Owner's premises.

3.07 Protection of Surfaces

A. Protect newly graded areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes prior to acceptance of work.

SECTION 02320
LIME STABILIZED SOILS

Part 1 GENERAL

1.01 Description

A. This specification shall govern for all material, labor, equipment, workmanship, testing, and other incidentals required to lime stabilize the soils as shown on the drawings and as specified herein.

B. Lime stabilization shall be used only for soils having a plasticity index greater than twelve (12).

1.02 Related Work

A. Section 02300: Earthwork
B. Section 02310: Earthwork for Pavements
C. Section 02500: Caliche Base
D. Section 02705: Asphalt Pavement Repair
E. Section 03305: Concrete Paving, Curbs, and Sidewalks

1:03 References: The publications listed below form a part of this specification to the extent referenced.

1.04 Submittals

A. When the quantity of lime required for stabilization is being determined by laboratory testing, the laboratory shall submit design data to the Engineer for review and approval.

B. Ten (10) days prior to the construction, the Contractor shall submit a list of equipment to be used and their relation to method of mixing proportioning, spreading, pulverizing and compacting subgrade, and slurry application.

C. Geotechnical reports shall be submitted directly to the Engineer's office. Test reports shall include Field Sample of Optimum Moisture-Maximum Density of Lime Stabilized Soil and Field In-Place Moisture and Density of Lime Stabilized Soil.

D. Contractor shall submit to the Engineer a Certificate of Compliance for the Lime.

Part 2 PRODUCTS

A. Hydrated lime shall be Type 1, AASHTO M216 Grade A.

B. Water utilized for the lime process shall be potable.

Part 3 EXECUTION

3.01 Weather Limitations

A. Do not construct subgrade when weather conditions detrimentally affect the quality of the materials.

B. Do not apply lime unless the air temperature is at least forty (40) degrees F in the shade and rising.

C. Do not apply lime to soils that are frozen or contain frost. If the air temperature falls below 35 degrees F in the shade, protect completed lime-treated areas by approved methods against the detrimental effects of freezing.

D. Remove and replace any damaged portion of the completed soil-lime treated area with new soil-lime material in accordance with this specification.

3.02 Application

A. Site Preparation shall be performed where shown on the drawings and as required by Section 02300 Earthwork, Clean debris from area to be stabilized. Remove rocks larger than two (2) inches. Inspect original ground for adequacy for the forthcoming compactive effort of lime treatment work.

B. When stabilized course is to be constructed to meet a fixed grade, provide adequate line and grade stakes for control. Finished and completed stabilized areas shall conform to the lines, grades, cross section, and dimensions indicated.

C. Locate grade stakes in lanes parallel to centerline of areas under construction, and suitably placed for string lining. The Contractor shall be responsible for maintaining line and grade. After the subgrade has been brought to the line and grade as shown on the typical sections, the subgrade should be scarified to the specified depth and width of stabilization and then partially pulverized. All deleterious materials like stumps, roots, and turf, etc. and aggregate larger than two (2) inches should be removed.

D. Lime treatment and sequence of construction shall comply with NLA BUL326 and sequence of construction operations, unless specified otherwise hereinafter.

E. The Engineer shall approve the lime slurry preparation facilities. Provisions shall be made for agitation in the distributor truck to prevent setting of lime solids.

The hydrate slurry may be prepared either in a central mixing tank or tank trucks, with agitation provided for mixing. Prepare quicklime slurry using a portable batch-slacking unit. Accurately weigh or meter lime and water. Standard water or asphalt trucks, properly cleaned, with or without pressure distributors, may be used to apply lime treatment.

F. After site preparation, scarify subgrade and spread lime.

G. Hydrated lime shall be uniformly spread at a rate of five (5) percent by weight. A typical lime slurry ration is one (1) ton lime to five hundred (500) gallons of water. Maintain the water content at five (5) percent above optimum during application to lime-subgrade mixture. Distribute lime in successive passes over subgrade material until proper amount of lime has been spread to the proper depth. Continually agitate slurry to keep mixture uniform. Keep pumps, distribution spray bars, slurry injection equipment and other equipment clean of excessive lime slurry. The Contractor's laboratory shall verify the specified amount and rate of application of lime for the various materials encountered.

H. The lime-subgrade shall be thoroughly rotary mixed throughout the proper depth and width of the subgrade and pulverized to a minus two (-2) inch. Water shall be added to raise the moisture of the subgrade-lime mixture at least five (5) percent above optimum moisture content. The soil-lime shall be rotary mixed. The mixer shall continue making passes until it has produced a homogeneous, uniform mixture of lime, subgrade, and water. Continue mixing or re-mixing operations, until material is free of streaks or pockets of lime and mixture is uniform.

I. After initial mixing, the lime-treated layer should be shaped and sealed to the approximate section and compacted lightly for curing and to minimize evaporation loss, lime carbonation, or to prevent excessive wetting for possible heavy rain. Moisture cure lime-subgrade mixture up to forty-eight (48) hours until adhesive quality of clay is reduced to almost normal subgrade consistency. Heavy clays may require up to seven (7) days of curing.

J. During curing, the surface shall be maintained in a moist condition by light sprinkling and rolling. Heavy traffic loads shall be kept off, and the surface shall be maintained in a smooth condition by rolling as required.

K. Re-scarify, mix, and pulverization of the lime-soil shall continue until all of the clods are broken down to pass a one (1) inch screen and at least sixty (60) percent pass a No-4 Sieve. Additional water may be required to raise the mixture approximately two (2) percent above optimum moisture content prior to compaction.

L. Compact the lime-soil material to ninety-five (95) percent of the density (Standard Proctor). The density value shall be based on a representative field sample of the lime-subgrade mixture, not the untreated (raw) subgrade. Compaction should begin immediately after final mixing, but in no case should any delay exceed five (5) days. The surface of the lime-treated soil shall be graded after compaction to achieve the finish grades shown on the drawings.

M. Finish completed section by rolling with a pneumatic roller or other suitable light roller that will sufficiently compact and prevent hairline cracking. Keep the compacted lime treated surface moist until covered by a subsequent layer. When a bituminous wearing course is schedule for application, the surface shall be broom cleaned and dampened.

N. Temporary joints shall be made at the end of each working day, prepare a temporary joint in fully compacted material normal to paved surface centerline. Construct a longitudinal temporary joint for partial width sections against which future material is to be placed.

O. Remove temporary joints during next work period by trimming three (3) inches into treated material for continuity. Trimmed material shall be incorporated in subsequent work. Temporary joints shall not coincide with any longitudinal or transverse temporary joint location of previous or subsequent construction. Re-mixing four (4) inches into the previous day's work may be substituted for joints providing the method and equipment is acceptable to the Engineer.

P. The Contractor shall provide warning signs and barricades so that traffic will not travel over freshly treated surfaces. Do not permit equipment or traffic on lime-treated material until subgrade stability is assured.

Q. Maintain the finished surface until work has been completed. The Contractor shall provide drainage during entire period of construction to prevent water from collecting or standing on area to be stabilized.

3.03 Equipment and Limitations

A. The type of equipment to be used for each category of work shall conform to the NLA Bulletin 326 unless specified otherwise. Maintain equipment in satisfactory and safe operating condition.

B. Spreading hydrated lime by aggregate spreaders, dump trucks, end-dumping or tailgate control methods, or agricultural spreaders in not allowed.

C. Motor graders will not be allowed to mix lime with clays. Deep-lift rotary mixers may be used and may facilitate changes in specified depths of operation,

providing equipment and method of operation sustains uniform distribution of lime with required compacted density throughout the deeper layer, with approval of Engineer.

D. Unauthorized equipment such as hauling or transportation vehicles will not be allowed for compaction purposes.

3.04 Safety Requirements

A. The Contractor shall insure the prevention of employee eye or skin contact with quicklime during transport or application. Provide and require employees to user protective clothing, high top boots, gauntlet-type gloves, protective headwear, splash-proof safety goggles and face shields, and protective cream.

3.05 Testing

A. A recognized Independent Testing Laboratory will be approved by the Owner to perform field and lab testing services. These services may include proctors, in-place densities, Atterberg limits, and any other testing procedures deemed appropriate by the Owner. All geotechnical testing and retesting shall be paid for by the Contactor without additional charge to the Owner.

B. The Contractor shall coordinate the scope and frequency of testing with Geotechnical Testing Laboratory. The scope of testing services may be adjusted at the Owner's discretion prior to or at any point during the project.

C. Frequency of sampling and testing of materials for conformance and quality control shall be as specified herein and shall be performed at such other times as necessary to document contract compliance. The laboratory shall certify all test reports.

D. Geotechnical testing shall be performed as follows in accordance with ASTM D698.

E. Lime Sample Optimum Moisture-Maximum Density: One (1) per type of material.

F. Lime Field In-Place Density: One (1) per three-hundred (300) square yards.

G. Thickness of final lime treated subgrade and base course shall be not less than thickness shown on the drawings. Final grade smoothness shall not deviate by more than 3/8 inch, when tested with a ten (10) foot straightedge.

SECTION 02500
CALICHE BASE

Part 1 GENERAL

1.01 Description

A. This specification shall govern for all material, labor, equipment, workmanship, testing, and other incidentals required to provide and install a caliche base course in accordance with the drawings and as specified herein.

1.02 Related Work

A. Section 02070: Geo-Grid Reinforcement
B. Section 02310: Earthwork for Pavements
C. Section 02320: Lime Stabilized Soils
D. Section 02700: Asphalt Surface Treatment
E. Section 02705: Asphalt Pavement Repair
F. Section 02710: Hot Mix Asphaltic Concrete
G. Section 03305: Concrete Paving, Curb, and Sidewalks

1.03 Submittals: Contractor shall submit technical data and certification as follow:

A. Laboratory Test reports for the Caliche:

1. Standard Proctor
2. Atterberg Limits
3. Optimum Moisture and Compaction
4. Wet Ball Mill
5. Field Densities

1.04 Field Quality Control

A. A recognized Independent Testing Laboratory, selected by the Owner, shall perform all testing.

B. The Contractor shall cooperate and coordinate all tests with the Lab, Engineer, and Owner.

C. Contractor shall pay for all testing and retesting of failures.

D. Caliche Base Course Testing

1. Raw Sample Optimum Moisture-Maximum Density of Limited Soil: One (1) per type of material
2. Raw Sample Standard Proctor: One (1) per type of material
3. Raw Sample Wet Ball Mill: One (1) per type of material
4. Raw Sample Atterburg Limits and Gradation: One (1) per type of material
5. Field In-Place Densities: One(1) per three-hundred (300) square yards

E. When lime stabilization is required refer to the "Lime Stabilized Soils" specification for additional testing. Test in accordance with ASTMD 698, Method D.

Part 2 MATERIALS

2.01 Caliche Base Material

A. The material shall be from a source approved by the Engineer. The Material shall conform to TxDot Item 247, Type D, Grade 6, and shall consist of argillaceous limestone, calcareous or calcareous clay particles, with or without stone, conglomerate, gravel, or sand and shall be free of vegetation.

B. All materials shall be screened, and the oversize shall be crushed and returned to the screened materials again in such a manner that a uniform product will be produced, and will meet the following requirement of the current TxDOT Standard Specifications for Construction of Highways, Streets and Bridges.

2.01 Caliche Gradation

Sieve Size	Percent Retained
2-1/2"	0
1-3/4"	0-10
No. 4"	45-75
No. 40	60-85

2.03 Caliche Physical Properties

A. The untreated caliche material passing the 40 mesh, "Soil Binder" shall have the following properties:

Liquid Limit (LL)	40 maximum
Plasticity Index (PI)	5 to 16
Wet Ball Mill Mix Amount	50 (Tex 116E)

B. The soil binder shall be tested to determine the gradation, LL, PI, Wet Ball Mill, and standard proctor moisture density relation.

Part 3 EXECUTIONS

3.01 Placement of Caliche Base Course

A. Caliche base course shall be of compacted thickness and at locations indicated.

B. Spread base course uniformly and compact to ninety-eight (98) percent of maximum laboratory density as determined in accordance with ASTM D698. Method D.

C. When compacted, finished surface of base course shall not vary more than 3/8-inch when tested with a ten-foot straightedge.

D. Finished thickness of base course shall not vary more than one-half inch from the required thickness at any point.

E. Areas not meeting the specified requirements will be rejected until corrected by the Contractor.

SECTION 02505
LIMESTONE BASE

Part 1 GENERAL

1.01 Description

A. This specification shall govern for all material, labor, equipment, workmanship, testing, and other incidentals required to provide and install a limestone base course in accordance with the drawings and as specified herein.

1.02 Related Work

A. Section 02070: Geo-Grid Reinforcement
B. Section 02310: Earthwork for Pavements
C. Section 02320: Lime Stabilized Soils
D. Section 02700: Asphalt Surface Treatment
E. Section 02705: Asphalt Pavement Repair
F. Section 02710: Hot Mix Asphaltic Concrete
G. Section 03305: Concrete Paving, Curb, and Sidewalks

1.03 Submittals: Contractor shall submit technical data and certification as follow:

A. Laboratory Test reports for the limestone:

1. Standard Proctor
2. Atterberg Limits (ASTM D698)
3. Wet Ball Mill

1.04 Field Quality Control

A. A recognized Independent Testing Laboratory, selected by the Owner, shall perform all testing.

B. The Contractor shall cooperate and coordinate all tests with the Lab, Engineer, and Owner.

C. Contractor shall pay for all testing and retesting of failures.

D. Limestone Base Course Testing

1. Wet Ball Mill
2. Atterburg Limits and Gradation

3. Field In-Place Densities with moisture control, one (1) per 300 square yards.

Part 2 MATERIALS

2.01 Limestone Base Material

A. The material shall be from a source approved by the Engineer. The material shall conform to TxDot Item 247 Type A, Grade 6, and shall be free of vegetation.

B. All materials shall be screened, and oversize shall be crushed and returned to the screened materials again in such a manner that a uniform product will be produced, and will meet the following requirements of the current TxDOT Standard Specifications for Construction of Highways, Streets and Bridges.

2.02 Limestone Gradation

Sieve Size	Percent Retained
2-1/2”	0
1-3/4”	0-10
No. 4”	45-75
No. 40	60-85

2.03 Limestone Physical Properties

A. The limestone material passing the 40 mesh, “Soil Binder” shall have the following properties:

Liquid Limit (LL)	40 maximum
Plasticity Index (PI)	5 to 12
Wet Ball Mill	45 Max (TEX 116E)

B. The Soil binder shall be tested to determine the Liquid Limit and Plasticity Index.

Part 3 EXECTION

3.01 Placement of Limestone Base Course

A. Limestone base course shall be of compacted thickness and at location indicated.

B. Spread base course uniformly and compact to 98 percent of maximum laboratory dry density as determined in accordance with ASTMD 698, Method C and within 1.5 percent of the optimum moisture content.

C. When compacted, finished surface of base course shall not vary more than 3/8-inch when tested with a ten-foot straightedge.

D. Finished thickness of base course shall not vary more than one-half inch from the required thickness at any point.

E. Areas not meeting the specified requirements will be rejected until corrected by the Contractor.

TX DOT ITEM 247
FLEXIBLE BASE

247.1 Description. Construct a foundation course composed of flexible base.

247.2 Materials. Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer of the proposed material sources and of changes to material source. The Engineer may sample and test project materials at any time before compaction throughout the duration of the project to assure specification compliance. Use Tex-100-E material definitions.

A. Aggregate. Furnish aggregate of the type and grade shown on the plans and conforming to the requirements of Table 1. Each source must meet Table 1 requirements for liquid limit, plasticity index, and wet ball mill for the grade specified. Do not use additives such as, but not limited to, lime, cement, or fly ash to modify aggregates to meet the requirements of Table 1, unless shown on the plans.

Table 1
Material Requirements

Property	Test Method	Grade 1	Grade 2	Grade 3	Grade 4
Master gradiation sieve size (% retained)	Tex-110-E				As shown on the plans
2-1/2 in.		——	0	0	
1-3/4 in.		0	0-10	0-10	
7/8 in.		10-35	——	——	
3/8 in.		30-50	——	——	
No.4		45-65	45-75	45-75	
No. 40		70-85	60-85	50-85	
Liquid limit, %max.[1]	Tex-104-E	35	40	40	As shown on the plans
Plasticity index, max[1]	Tex-106-E	10	12	12	As shown on the plans
Plasticity index, min.[1]		As shown on the plans			
Wet ball mill, % max.[2]	Tex-116-E	40	45	——	As shown on the plans
Wet ball mill, % max. increase passing the No. 40 sieve		20	20	——	
Classification [3]	Tex-117-E	1.0	1.1-2.3	——	As shown on the plans
Min.Compressive strength [3], psi lateral pressure 0 psi lateral pressure 15psi		 45 175	 35 175	 —— ——	As shown on the plans

1. Determine plastic index in accordance with Tex-107-E (linear shrinkage) when liquid limit is unattainable as defined in Tex-104-E.
2. When a soundness value is required by plans, test material in accordance with Tex-411-A.
3. Meet both the classification and the minimum compression strength, unless otherwise shown on the plans.

1. **Material Tolerances.** The Engineer may accept material if no more than 1 of the 5 most recent gradation tests has an individual sieve outside the specified limits of the gradation.

   When target grading is required by the plans, no single failing test may exceed the master grading by more than 5 percentage points on sieves No. 4 and larger or 3 percentage points on sieves smaller than No. 4.

   The Engineer may accept material if no more than 1 of the 5 most recent plasticity index tests is outside the specified limit. No single failing test may exceed the allowable limit by more than 2 points.

2. **Material Types**. Do not use fillers or binders unless approved. Furnish the type specified on the plans in accordance with the following:

   a. **Type A.** Crushed stone produced and graded from oversize quarried aggregate that originates from a single, naturally occurring source. Do not use gravel or multiple sources.

   b. **Type B.** Crushed or uncrushed gravel. Blending of 2 or more sources is allowed.

   c. **Type C.** Crushed gravel with a minimum of 60% of the particles retained on a No. 4 sieve with 2 or more crushed faces as determined by Tex-460-A, Part I. Blending of 2 or more sources is allowed.

   d. **Type D.** Type A material or crushed concrete. Crushed concrete containing gravel will be considered Type D material. Crushed concrete must meet the requirements in Section 247.2.A.3.b "Recycled Materials (Including Crushed Concrete) Requirements", and be managed in a way to provide for uniform quality. The Engineer may require separate dedicated stockpiles in order to verify compliance.

   e. **Type E.** As show on the plans.

3. **Recycled Material.** Recycled Asphalt Pavement (RAP) and other recycled materials may be used when shown on the plans. Request approval to blend 2 or more sources of recycled materials.

a. **Limits on Percentage.** When RAP is allowed, do not exceed 20% RAP by weight unless otherwise shown on the plans. The percentage limitations for other recycled materials will be as shown on the plans.

b. **Recycled Material (Including Crushed Concrete) Requirements.**

1) Contractor Furnished Recycled Materials

Contractor furnishes the recycled materials, including crushed concrete; the final product will be subject to the requirements of Table 1 for the grade specified. Certify compliance with DMS-11000, "Evaluating and Using Nonhazardous Recyclable Materials Guidelines," for Contractor furnished recycled materials. In addition, recycled materials must be free from reinforcing steel and other objectionable material and have most 1.5% deleterious material when tested in accordance with Tex-413-A. Test RAP without removing the asphalt.

B. Water. Furnish water free of industrial wastes and other objectionable matter.

C. Material Sources. When non-commercial sources are used, expose the vertical faces of all strata of material proposed for use. Secure and process material by successive vertical cuts extending through all exposed strata, when directed.

247.3 Equipment. Provide machinery, tools, and equipment necessary for proper execution of the work. Provide rollers in accordance with Item 210, "Rolling". Provide proof rollers in accordance with Item 216, "Proof Rolling", when required.

247.4 Construction. Construct each layer uniformly, free of lose or segregated areas, and with the required density and moisture content. Provide a smooth surface that conforms to the typical sections, lines, and grades shown on the plans or as directed.

Stockpile base material temporarily at an approved location before delivery to the roadway. Build stockpiles in layers no greater than 2 ft. thick. Stockpiles must have a total height between 10 and 16 ft. unless otherwise shown on the plans. After construction and acceptance of the stockpile, loading from the stockpile for delivery is allowed. Load by making successive vertical cuts through the entire depth of the stockpile.

Do not add or remove material from temporary stockpiles that require sampling and testing before delivery unless otherwise approved. Charges for additional

sampling and testing required as a result of adding or removing material will be deducted from the Contractor's estimates.

Haul approved flexible base in clean trucks. Deliver the required quantity to each 100-ft. station or designated stockpile site as shown on the plans. Prepare stockpile sites as directed. When delivery is to the 100 ft. station, manipulate in accordance with the applicable Items.

A. Preparation of Subgrade or Existing Base. Remove or scarify existing asphalt concrete pavement in accordance with Item 105, "Removing Stabilized Base and Asphalt Pavement", when shown on the plans or as directed. Shape the subgrade or existing base to conform to the typical sections shown on the plans or as directed.

When new base is required to be mixed with existing base, deliver, place, and spread the new flexible base in the required amount per station. Manipulate and thoroughly mix the new base with existing material to provide a uniform mixture to the specified depth before shaping.

When shown on the plans or directed, proof roll the roadbed in accordance with Item 216, "Proof Rolling", before pulverizing or scarifying. Correct soft spots as directed.

B. Placing. Spread and shape flexible base into a uniform layer with an approved spreader the same day as delivered unless otherwise approved. Construct layers to the thickness shown on the plans. Maintain the shape of the course. Control dust by sprinkling, as directed. Correct or replace segregated areas as directed, at no additional expense to the City of Kingsville.

Place successive base courses and finish courses using the same construction methods required for the first course.

C. Compaction. Compact using density control unless otherwise shown on the plans. Multiple lifts are permitted when shown on the plans or approved. Bring each layer to the moisture content directed. When necessary, sprinkle the material in accordance with Item 204, "Sprinkling".

Begin rolling longitudinally at the sides and proceed towards the center, overlapping on successive trips by at least ½ the width of the roller unit. On super elevated curves, begin rolling at the low side and progress toward the high side. Offset alternate trips of the roller. Operate rollers at a speed between 2 and 6 miles per hour.

Rework, re-compact and refurnish material that fails to meet or that loses required moisture, density, stability, or finish before the next course is placed or the project is accepted. Continue work until specification requirements are met. Perform the work at no additional expense to the City of Kingsville.

1. **Ordinary Compaction**. Roll with approved compaction equipment as directed. Correct irregularities, depressions, and weak spots immediately scarifying the areas affected, adding or removing approved material as required, reshaping and re-compacting.

2. **Density Control**. Compact to at least 100% of the maximum density determined by the Tex-113-E unless otherwise shown on the plans. Determine the moisture content of the material at the beginning and during compaction in accordance with Tex-103-E.
   The Engineer will determine roadway density of completed sections in accordance with Tex-115-E. The Engineer may accept the section if no more than 1 of the 5 most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density.

D. Finishing. After completing compaction, clip, skin, or tight-blade the surface with a maintainer or subgrade trimmer to a depth of approximately ¼ in. Remove loosened material and dispose of it at an approved location. Seal the clipped surface immediately by rolling with a pneumatic tire roller until a smooth surface is attained. Add small increments of water as needed during rolling. Shape and maintain the course and surface in conformity with the typical sections, lines and grades as shown on the plans or as directed.

In areas where surfacing is to be placed, correct grade deviations greater than ¼ in. in 16 ft. measured longitudinally or greater than ¼ in over the entire width of the cross-section. Correct by loosening, adding, or removing material. Reshape and re-compact in accordance with Section 247.4.C “Compaction”.

E. Curing. Cure the finished section until the moisture content is at least 2 percentage points below optimum or as directed before applying the next successive course or prime coat.

247.5 Measurement. Flexible base will be measured as follows:

- **Flexible Base (Complete in Place).** The ton, square yard, or any cubic yard method.
- **Flexible Base (Roadway Delivery).** The ton or cubic yard in vehicle.
- **Flexible Base (Stockpile Delivery).** The ton, cubic yard in vehicle, or cubic yard in stockpile.

Measurement by the cubic yard in final position and square yard is a plans quantity measurement. The quantity to be paid for is the quantity shown in the proposal unless modified by Article 9.2, "Plans Quantity Measurement". Additional measurements or calculations will be made if adjustments of quantities are required.

Measurement is further defined for payment as follows:

A. Cubic Yard in Vehicle. By the cubic yard in vehicles of uniform capacity at the point of delivery.

B. Cubic Yard in Stockpile. By the cubic yard in the final stockpile position by the method of average end areas.

C. Cubic Yard in Final Position. By the cubic yard in the completed and accepted final position. The volume of base course is computed in place by method of average end areas between the original subgrade or existing base surfaces and the lines, grades, and slopes of the accepted base course as shown on the plans.

D. Square Yard. By the square yard of surface area in the completed and accepted final position. The surface area of the base course is based on the width of the flexible base as shown on the plans.

E. Ton. By the ton of dry weight in vehicles as delivered. The dry weight is determined by deducting the weight of the moisture in the material at the time of weighing from the gross weight of the material. The Engineer will determine the moisture content in the material in accordance with Tex-103-E from samples taken at the time of weighing.

When material is measured in trucks, the weight of the material will be determined on certified scales, or the Contractor must provide a set of standard platform truck scales at a location approved by the Engineer. Scales must conform to the requirements of Item 520, "Weighing and Measuring Equipment".

247.6 Payment. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for the types of work shown below. No additional payment will be made for thickness or width exceeding that shown on the typical section provided on the plans for cubic yard in the final position or square yard measurement.

Sprinkling and rolling, except proof rolling, will not be paid for directly but will be subsidiary to this Item unless otherwise shown on the plans. When proof rolling is shown on the plans or directed, it will be paid for in accordance with Item 216, "Proof Rolling".

Where subgrade is constructed under this Contract, correction of soft spots in the subgrade will be at the Contractor's expense. Where subgrade is not constructed under this project, construction of soft spots in the subgrade will be paid in accordance with pertinent Items or Article 4.2, "Changes in the Work".

A. **Flexible Base (Complete In Place).** Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle", "In Stockpile", or "In Final Position" will be specified. For square yard measurement, a depth will be specified. This price is full compensation for furnishing materials, temporary stockpiling, assistance provided in stockpile sampling and operations to level stock piles for measurement, loading, hauling, delivery of materials, spreading, blading, mixing, shaping , placing, compacting, reworking, finishing, correcting locations where thickness is deficient, curing, furnishing scales and labor for weigh and measuring, and equipment, labor, tools, and incidentals.

B. **Flexible Base (Roadway Delivery).** Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle" will be specified. The unit price bid will not include processing at the roadway. This price is full compensation for furnishing materials, temporary stockpiling, assistance provided in stockpile sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials, furnishing scales and labor for weighing and measuring, and equipment, labor, tools, and incidentals.

C. **Flexible Base (Stockpile Delivery).** Payment will be made for the type and grade specified. For cubic yard measurement, "in Vehicle" or "In Stockpile" will be specified. The unit bid price will not include processing at the roadway. This price is full compensation for furnishing and disposing of materials, preparing the stockpile area, temporary or permanent stockpiling, assistance provided in stockpile area, sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials to the stockpile, furnishing scales and labor for weighing and measuring, and equipment, labor, tools, and incidentals.

SECTION 02510
PVC WATER PIPE SYSTEM

Part 1 GENERAL

1.01 Related Work

A. Section 02300: Earthwork
B. Section 02525: Valves, Fittings, and Hydrants

1.02 Description

A. This specification shall govern for furnishing of all equipment, materials, labor, and performance of all operations required to provide and install all pressure pipes, valve and fittings shown on the drawings and as specified herein.

B. Installation of PVC pressure pipe complying with AWWA C900 for 4-12 inch diameter and C905 for 14-36 inch diameter including all labor, equipment, and material, not specifically provide for by others, necessary to complete the work as stipulated in the specification and other contact documents.

C. Remove pavement or other improved surfaces, excavated the trenches and pits to the required dimensions, provided for the maintenance of traffic and other utilities, support the adjoining ground or structures where necessary, and handle all drainage or ground water.

D. Replace all damaged utilities, drains, sewer or other structures, backfill the trench and pits, remove surplus excavated material and clean the site of all debris.

E. Test the completed pipeline for pressure and leakage requirements and disinfect the completed pipeline.

F. Restore the pavement and other improved surfaces over the trenches.

1.03 Submittals

A. Contractor shall submit manufacturer technical data for engineer's approval as follows for:
   - Pipe
   - Fittings and Joint Restraints
   - Valves and Boxes
   - Hydrants

1.04 Warranty

A. This contractor shall guarantee this work to be free of defects, for a period of one year from the date of acceptance in writing by the Engineer.

Part 2 PRODUCTS

2.01 Pipe

A. Pipes 4-inches in diameter and larger shall be PVC C900 and shall comply with AWWA C900, pressure class 150, and a dimension ratio 18.

B. Pipes 2-inchess in diameter and smaller shall be PVC, schedule 40, pipe shall be type 1, bell end, PR-120, PVC 1120, ATSM D-2241, SDR-21.

C. 4-inch pipe fittings and larger shall be mechanical joint type. The fittings shall be lined with enameled cement mortar in accordance with AWWA C104. Fittings shall have a pressure rating of 250 P.S.I.

D. 4-inch gate valves and larger shall conform to the latest revision of AWWA standards C-509 covering resilient seated gate valves and be approved by UFLM. The valves shall be non-rising stem, opening by turning stem left or right and provided with 2" square operating nut. Prior to shipment from factory, each valve shall be tested by hydrostatic pressure equal to requirements for both AWWA (twice the specified working pressure) and 400 PSI UFLM requirements.

E. All fitting shall utilize joint restraints, Uni-flange or Meg-a-Lug, AWWA C111, as shown on the plans.

Part 3 EXECTUTION

3.01 Handling and Storage

A. The pipe, valves, fittings, and accessories shall at all times be handled with care to avoid damage.

B. The contractor shall be responsible for the safe storage of material furnished by or to him, and accepted by him, and intended for the work until it has been incorporated in the completed project.

C. The interior all pipes, fittings and other accessories shall be kept free from dirt and foreign matter at all times.

3.02 Alignment and Grade

A. All pipes shall be laid low and maintained at the required lines and grades.

B. Fittings, valves, air vents and hydrants shall be installed at the required locations with valve and hydrant stems plumb. No deviation shall be made from the required line or grade without approval in writing from the engineer or his representative.

C. Deviations Occasioned by Other Structures: Temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers and other structures encountered in the progress of the wok shall be furnished by the contractor at his own expense. Where the grade or alignment of the pipe is obstructed by existing utility structures such as conduits, ducts, pipes, branch connections to main sewers or main drains, the obstruction shall be permanently support, relocated, removed, or reconstructed by the contractor in cooperation with the owners of such utility structures.

D. All pipes shall be laid to the depth of cover shown on the drawings.

3.03 Excavation and Preparation of Trench

A. The trench shall be dug in accordance with section 02300, Earthwork, to the required alignment and depth shown on the drawings.

B. Trench Width: The minimum clear width of the trench measured at the horizontal diameter of the pipe shall be 18 inches or 1 foot greater that the outside diameter of the barrel of the pipe, whichever is greater. The maximum clear width of the trench at the top of the pipe shall not be more than the outside barrel of the pipe plus two feet.

C. Preparation of Trench Bottom: The trench bottom shall be constructed to provide a firm, stable and uniform support for the full length of the pipe. Bell holes at each joint shall be provided to permit the joint to be made properly.

D. Stockpiling of Excavated Material: All excavated material shall be stockpiled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Gutters shall be kept clear or other satisfactory provisions made for street drainage, and natural watercourses shall not be obstructed.

3.04 Lowering Pipe and Accessories into Trench

A. All pipe, fittings, valves, hydrants and accessories shall be carefully lowered into the trench using suitable equipment in such a manner as to prevent damage to pipe and fittings. Under no circumstances shall the pipe or accessories be dropped or dumped into the trench.

B. The pipe and accessories shall be inspected for defects prior to lowering into trench. Any defective damaged or unsound material shall be repaired or replaced.

C. All foreign matter or dirt shall be removed from the interior of the pipe before lowering into position in the trench. Pipe shall be kept clean after lying.

D. The sealing surface of the pipe, the bell to be joined and the elastomeric gaskets shall be cleaned immediately before assembly, and assembly shall be made as recommended by the manufacture. When pipe lying is not in progress, the open ends of installed pipe shall be closed to prevent entrance of trench water into the line.

E. Whenever water is excluded from the interior of the pipe, enough backfill shall be placed on the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and the bedding restored. No pipe shall be laid when the trench conditions or the weather are unsuitable for proper installation as determined by the engineer.

F. The pipe shall be cut in a neat and workmanlike manner without damage to the pipe so as to have a smooth end at right angles to the axis of the pipe.

3.05 Joining PVC Pipe to Fitting and Accessories

A. General: Valves, hydrants or fittings connected to PVC plastic pipes shall be equipped with bells having a profile that permits a seal to be made directly between the pipe end and the bell of the fitting with an elastomeric gasket. The elastomeric gasket shall be supplied by the fitting or accessory manufacturer.

B. Pipe ends shall be cut square, deburred and beveled in accordance with pipe manufacturer's recommendations.

C. The push on joint is an elastomeric gasket joint. It is assembled by positioning the elastomeric gasket(s) in the annular groove(s) of the bell or coupler and inserting the spigot end of the pipe into the bell or coupler after approved lubricant has been applied as recommended by the manufacturer. The spigot end of the pipe compresses the gasket radially to form a positive seal. The gasket and annular groove are designed, sized and shaped so that the gasket will resist displacement. Care shall be taken so that only the correct elastomeric gasket, compatible with the angular groves of the bell or coupler is used. Insertion of the elastomeric gasket in the annular groove must be in accordance with the manufacturer's recommendations.

D. The mechanical joint is a bolted joint of the stuffing box type. Each joint shall consist of:

1. A bell provided with an exterior gland having bolt holes or slots and socket with an annular recess for the sealing gasket;
2. A sealing gasket;
3. A follower gland with bolt holes matching those in the fitting;
4. Tee bolts and hexagonal nuts. Installation recommendations from the manufacturer should be followed.

E. Install mechanical joint restraints on all fittings and on pipes according to the scheduled shown on the plans.

3.06 Setting of Hydrants, Valves and Fittings

A. Hydrants, valves and fittings shall be provided and installed as shown on the drawings. They shall be inspected and cleaned prior to installation.

B. Thrust blocking shall be provided at each hydrant, valve, bend, tee, and at reducers or fittings where changes in pipe diameters or directions occur. Anchorage may also be made to the water main pipe with rods and clamps. The size and shape of the thrust blocking is as shown on the drawings.

C. Plugs shall be inserted into the bells of all dead-end fittings. Spigot ends of accessories, fittings and plain ends of plastic pipe shall be capped. Thrust blocking shall be provided at all dead ends of pipe that are capped or plugged.

3.07 Pressure and Leakage Tests

A. Sufficient backfill shall be placed prior to filling with water and field testing to prevent lifting of the pipe. Where conditions permit, it is recommended that joints be lift uncovered to allow any leaks that occur to be easily located. When local conditions require that the trenches be backfilled immediately after the pipe has been laid, the testing may be carried out after backfilling has been completed, but before placement of permanent surface. In all cases, sufficient backfill shall be placed to confine the pipe system during testing.

B. Each section of the pipeline shall be slowly filled with water and all air expelled by means of taps at high points. The specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the engineer. The test pressure shall be maintained by additional pumping if necessary for the specified time during which the system and all exposed pipe, fittings, valves and hydrants shall be carefully examined for leakage. All defective elements shall be

repaired or removed and replaced and the test repeated until all visible leakage has been stopped and the allowable leakage requirements have been met.

C. The contractor shall furnish the gauges and measuring device for the leakage test, pump, pipe, connections and all other necessary apparatus, and shall furnish the necessary assistance to conduct the test. The duration of each leakage test shall be two hours. The new pipe system shall be tested at twice the system operating pressure but not less that 100-psi. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within after the pipe has been filled with water and the air in the pipeline has been expelled. A pressure variation of five psi from the specified test pressure is allowable during test duration. However, determination of actual leakage shall be made after line has been returned to specified test pressure at the end of test duration.

D. No installation will be accepted in the leakage is greater than that determined by the formula:

$$L = N \times D \times P \div 7400$$

L is the allowable leakage, in gallons per hour.
N is the number of joints in the length of pipeline tested.
D is the nominal diameter of the pipe, in inches.
P is the average test pressure during the leakage test, in pounds per square inch.

3.08 Backfilling

A. Pipe bedded in sand to four-inch minimum above the pipe.

B. After the bedded material has been placed, the balance of the backfill shall be machine placed as required but shall contain no large stones or rocks or frozen debris. Unless otherwise specified, trenches under pavements, sidewalks or roads shall be backfilled and compacted to 90 percent density per ASTM D698.

C. Additional backfill material shall be supplied if needed to completely backfill the trenches, or to fill depressions caused by subsequent settlement.

3.09 Restoration of Surfaces and-or Structures

A. The contractor shall restore and/or replace paving, curbing, sidewalks, gutter, shrubbery, fences, sod or other disturbed surface or structure to a condition equal to that before the work began and to the satisfaction of the Engineer and shall furnish all labor and material incidental thereto.

3.10 Cleaning Up

A. The contractor shall remove and dispose surplus material, pipe, and temporary structures. All dirt, rubbish and excess earth from excavations shall be disposed of by the contractor in compliance with applicable laws and ordinances. The construction site shall be left clean, to the satisfaction of the engineer.

3.11 Disinfection

A. Before being placed in service, the new pipeline and all exposed sections of existing pipeline shall be disinfected in accordance with AWWA Standard C651, “Disinfection of Water Mains”.

SECTION 02600
REINFORCED CONCRETE PIPE STORM DRAIN SYSTEM

1.0 GENERAL

1.1 Related Work

A. Section 02050: Demolition
B. Section 02200: Earthwork
C. Section 03300: Cast-in-Place Concrete

1.2 Description

A. This specification shall govern all equipment, plant, materials, labor and performance of all operation required to provide and performance of all operation required to provide and install all Storm Drain System as shown on the drawings and as specified herein.

B. This specification is for the proper installation of a reinforced concrete pipe (RCP) system for storm drain applications.

1.3 Submittal

A. Pipe

B. Joint material

C. Sand Bedding material (5-gallon bucket)

2.0 MATERIALS

A. Concrete structures shall be constructed as shown on the plans and as specified in Section 03300.

B. Reinforced concrete pipe shall comply with the requirements of ASTM C76, Class III, tongue and groove pipe.

C. Joint material shall be asphalt mastic or “ram-nek” or approved equal.

3.0 EXECUTION

3.1 Deliver, Storage, and Handling

A. Upon arrival at the jobsite the pipe shall be inspected for quantity and shipping damage.
B. The pipe shall not be dropped. Tie down straps shall not be removed until the pipe is secured from rolling or from being dropped.

C. Store pipe as close as possible in an organized manner. Pipe shall be stored on level ground. Blocking should be provided to prevent rolling.

D. Protective covers on joint material shall remain on the pipe until it is ready for installation.

E. Any damaged pipe should be removed and replaced with new pipe.

3.2 Installation

A. Install pipe to the proper line and grade shown on the plans and per manufacturer recommendations.

B. Trench shall be excavated on line the pipe bedding shall be placed to the proper thickness. The top of the bedding must be adjusted to allow for the difference between the invert (flowline) and pipe profile wall thickness.

C. Trench shall be excavated to the width shown on the plans and as specified. When excavation depths or soil conditions require shoring or use of a trench box, the bottom of the shoring or trench box should be placed not lower that the top of the pipe.

D. Joints shall be installed according to the manufacturer recommendations. The ends of the pipe should be clean and free of debris just prior to placing the joint sealant material. The joint is designed to prevent infiltration of soil and exfiltration of storm water.

High Density Polyethylene (HDPE)

Part 1 GENERAL

1.01 Section Includes

A. High Density Polyethylene (HDPE) pipe for gravity sewers and drains, including fittings.

B. HDPE pipe for sanitary sewer force mains, including fittings.

C. HDPE pipe for water service lines, including fittings.

1.02 Unit Prices

A. No separate payment will be made for HDPE pipe under this Section. Include cost in unit prices for gravity sanitary sewers and storm sewers.

1.03 Submittals

A. Conform to requirements of Section 01300 - Submittals.

B. Submit shop drawings showing design of pipe and fittings indicating alignment and grade, laying dimensions, fabrication, fittings, flanges, and special details.

1.04 Quality Control

A. Provide the manufacturer's certificate of conformance to the Specifications.

Part 2 PRODUCTS

2.01 Approved and Pre-Approved Products

A. Provide HDPE pipe as follows:

WALL CONSTRUCTION	MANUFACTURER	PRODUCT OPTIONS	ASTM DESIGNATION	PIPE STIFFNESS (MIN)	DIAMETER RANGE (INCHES)
Solid Wall	Provide Submittals	Approved	F714	115 psi 72 psi or as shown in bid sheet or on plans	8 to 10 12 to 48

B. Solid wall pipe shall be produced with plain end construction for heat joining (butt fusion) conforming to ASTM D2657. Utilize controlled temperatures and pressures for joining to produce a fused leak-free joint.

C. Water service line to be copper tubing size (CTS) and conform to ASTM D2737 and AWWA C901 Standards. It can be joined with heat fusion or mechanical fittings designed for CTS tubing.

2.02 MATERIALS

A. Pipe and Fittings: High density, high molecular weight polyethylene pipe material meeting the requirements of Type III, Class C, Category 5, Grade P34, as defined in ASTM D1248. Materials meeting the requirements of cell classification in accordance with ASTM D3350 are also suitable for making pipe products under these specifications.

B. Gaskets

1. Use gaskets meeting requirement of ASTM F477. Use gasket molded into a circular form or extruded to the proper section and then spliced into circular form. When no contaminant is identified, us gaskets of properly cured, high-grade elastomeric compound. The basic polymer shall be natural rubber, synthetic elastomer, or a blend of both.
2. Pipes to be installed in potentially contaminated areas, especially where free product is found near the elevation of the proposed sewer, shall have the following gasket materials for the noted contaminants:

CONTAMINANT	GASKET MATERIAL
Petroleum (diesel, gasoline)	Nitrile Rubber
Other Contaminants	As recommended by the pipe

C. Lubricant. Use a lubricant for assembly of gasket joints which has no detrimental effect on the gasket or on the pipe, in accordance with manufacturer's recommendations.

2.03 WORKMANSHIP

A. Furnish pipe and fittings that are homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. Provide pipe as uniform as commercially practical in color, opacity, density, and other physical properties.

2.04 INSPECTIONS

A. The Engineer or City Engineer reserves the right to inspect pipes or witness pipe manufacturing. Such inspection shall in no way relieve the manufacturer of the responsibilities to provide products that comply with the applicable standards and these Specifications.

B. Manufacturer's Notification to Customer. Should the Engineer or City Engineer wish to witness the manufacture of specific pipes, the manufacturer shall provide the Engineer or City Engineer with adequate advance notice of when and where the production of those specific pipes will take place.

C. Failure to Inspect. Approval of the products or tests is not implied by the Engineer's or City Engineer's decision not to inspect the manufacturing, testing, or finished pipes.

2.05 TEST METHODS

A. Conditioning. Conditioning of samples prior to and during tests is subject to approval by the Engineer and City Engineer. When referee tests are required, condition the specimens in accordance with Procedure A in ASTM D618 at 73.4 degrees F plus or minus 3.6 degrees F (23 degrees C plus or minus 2 degrees C) and 50 percent relative humidity plus or minus 5 percent relative humidity for not less than 40 hours prior to test. Conduct tests under the same conditions of temperature and humidity unless otherwise specified.

B. Flattening. Flatten three specimens of pipe, prepared in accordance with Paragraph 2.05A, in a suitable press until the internal diameter has been reduced to 40 percent of the original inside diameter of the pipe. The rate of loading shall be uniform and at 2-inches per minute. The test specimens, when examined under normal light and with the unaided eye, shall show no evidence of splitting, cracking, breaking, or separation of the pipe walls or bracing profiles.

C. Joint Tightness. Test for joint tightness in accordance with ASTM D3212, except replace the shear load transfer bars and supports with 6-inch-wide

support blocks that can be either flat or contoured to conform to the pipe's outer contour.

D. Purpose of Tests. The flattening and the joint tightness tests are not intended to be routine quality control tests, but rather to qualify pipe to a specified level of performance.

2.06 MARKING

1. Mark each standard and random length of pipe in compliance with these Specifications with the following information:

    1. Pipe size
    2. Pipe class
    3. Production code
    4. Material designation

Part 3 EXECUTION

3.01 INSTALLATION

A. Conform to requirements of the following Sections:
    1. Section 02720 - Storm Sewers
    2. Section 02730 - Gravity Sanitary Sewers

B. Install pipe in accordance with the manufacturer’s recommended installation procedures.

SECTION 02705
ASPHALT PAVING REPAIR

Part 1 GENERAL

1.01 Related Work

A. Section 02310: Earthwork for Pavements
B. Section 02500: Caliche Base
C. Section 02700: Asphalt Surface Treatment
D. Section 02710: Hot Mix Asphalt Pavement
E. Section 03305: Concrete Paving, Curbs & Sidewalks

1.02 Quality Assurance

A. Work in this area shall be done by a paving contractor approved by the Engineer and by personnel experienced in asphalt paving.

B. This work shall be coordinated with other related work and conform to the applicable regulatory standards.

1.03 Guarantee

A. This contractor shall guarantee this work to be free of defects, for a period of one year from the date of acceptance in writing by the Engineer.

Part 2 PRODUCTS

2.01 Materials

A. Subgrade shall be compacted existing subgrade, compacted to 95% standard AASHTO.

B. Flexible base shall consist of an 8” minimum thickness caliche base conforming to Texas Department of Transportation Item 247, Type “D” Grade 3. It shall be compacted to 95% Proctor (standard).

C. Asphalt Paving shall consist of a 2-inch layer of conforming to Texas Department of Transportation, Item 340, Hot Mix Asphaltic Concrete Pavement, Type D. It shall be compacted to 98% of optimum density

D. Prime Coat shall be Medium Curing Cutback asphalt, MC-30, per ASTM D-2027.

E. Tack coat shall be Asphalt Emulsion, SS-1, per ASTM D-977.

F. Herbicide shall be commercial chemical for weed control, acceptable to and approved by EPA and authorities having jurisdiction.

G. Pavement marking paint shall be Alkyd-Resin, ready-mixed AASHTO M248, Type 1, yellow.

3.01 Performance

A. After the completion of all general sites grading in areas to receive asphalt pavement repair, backfill and compact subgrade to within 10-inches of finished grade. Compact as specified.

B. Apply herbicide in strict accordance with manufacturer's requirements and recommendations for performance and safety.

C. After successful testing of the subgrade, apply the specified flexible base (maximum lift of 8" per lift). Fine grade and compact as specified.

D. After successful testing of flexible base, apply tack coat and 2-inch layer of hot mix asphalt in accordance with specified standards.

E. The joint between existing paving and new asphalt work shall be in a straight uniform line, all in a smooth grade. Prime all surfaces as required.

F. When applicable, apply striping, directional markings and other graphics indicated using specified coating system and as specified.

SECTION 02710
HOT MIX ASPHALTIC CONCRETE (HMAC) PAVEMENT

Part 1 GENERAL

1.01 Summary

A. This specification shall govern for all material, labor, equipment, workmanship, testing, and other incidentals required to provide and install the bituminous asphaltic concrete pavement in accordance with the drawings and as specified herein.

1.02 Related Work

A. Section 02500: Caliche Base
B. Section 02720: Prime Coat
C. Section 02725: Tack Coat
D. Section 02740: Pavement Marks and Stripes
E. Section 03300: Cast-in-Place Concrete
F. Section 03400: Precast Concrete

1.04 Quality Control and Warranty

A. Contractor shall submit a certificate from the manufacturer that the material supplied meets or exceeds the requirement of the specification.

B. Finished surface shall not vary more than 1/8-inch when tested with a 10-foot straightedge.

C. Areas not meeting the above requirements will be rejected until corrected by the Contractor.

D. This contractor shall guarantee this work to be free of defects, for a period of one year from the date of acceptance in writing by the Engineer.

Part 2 MATERIALS

2.01 Hot Mix Asphaltic Concrete

A. The hot mix asphaltic concrete (HMAC) shall be produced, transported, and applied in accordance with the latest edition of the Texas Department of Transportation (TxDOT), Standard Specifications for Construction of Highways, Streets and Bridges.

B. The Contractor shall submit a one year recent plant mix design certifying the hot mix asphaltic concrete design complies with the TxDOT specifications for Engineer approval at least one week prior to installation.

C. The contractor shall attain a laboratory specimen of the design mix prepared in accordance with MIL-STD-620, Method 100, at the contractor's expense.

D. The hot mix asphaltic concrete shall be TxDOT Item 340, Type "D". Hot mix-cold laid asphaltic concrete pavement, TxDOT Item 334, may be used for asphalt repair and level-up courses upon Engineer approval.

E. The HMAC shall be placed to the compacted thickness indicated on the drawings.

Part 3 EXECUTION

3.01 Placement

A. The surface to receive the HMAC shall be prepared and approved before placing the HMAC.

B. Apply tack coat to surface, when requested by the Engineer, as specified in Section 02744.

C. Spread wearing course with a bituminous spreader at a temperature of not less than 250 degrees F no more than 300 degrees F.

D. When compacted, the finished surface shall be smooth, uniform in texture and density, and conform to the cross sections and surface tests.

E. Placement of the asphaltic mixture shall be done without tearing, shoving, gouging, or segregating the mixture and without producing streaks.

F. The asphaltic concrete shall be rolled while hot. The first roller shall be a steel-wheel roller weighing not less than 10 tons.

G. In areas where the use of machine-spreading is impractical, spread the mixture by hand. Spread mixture with hot rakes in a uniformly loose layer of a thickness that when compacted will conform to the required grade and thickness. During hand spreading carefully place each shovelful of mixture by turning the shovel over in a manner that will prevent segregation.

H. Do not dump the loads any faster than can be properly handled by the shovel and/or rake workers.

I. Geotechnical testing on core samples shall be performed at intervals of 500-square yards at locations requested by the Engineers. Compaction of each layer shall be 98% of maximum laboratory density.

SECTION 02715
HOT MIX (HMAC) OVERLAY

Part 1 GENERAL

1.01 SUMMARY

A. This specification shall govern for all material, labor, equipment, workmanship, testing, and other incidentals required to provide and install the asphalt hot-mix (HMAC) overlay in accordance with the drawings and as specified herein.

1.02 Related Work

A. Section 02310: Earthwork for Pavement
B. Section 02500: Caliche Base
C. Section 02710: Hot Mix Asphaltic Pavement
D. Section 02725: Tack Coat
E. Section 02740: Pavement Marks and Stripes
F. Section 03300: Cast-in-Place Concrete

1.03 Quality Control and Warranty

A. Contractor shall submit a certificate from the manufacturer that the material supplied meets or exceeds the requirements of this specification.

B. The contractor shall submit a one-year recent plant mix design certifying the hot mix asphaltic concrete design certifying the hot mix asphaltic concrete design complies with the TxDOT specifications for Engineer approval at least one-week prior to installation.

C. The HMAC shall be placed to the compacted thickness indicated on the drawings and not less than 1.5 inches in thickness.

D. Finished surface shall not vary more than 1/8-inch when tested with a 10-foot straightedge.

E. Areas not meeting the above requirements will be rejected until corrected by the Contractor.

F. This contractor shall guarantee this work to be free of defects, for a period of one year from the date of acceptance in writing by the Engineer.

Part 2 MATERIALS

2.01 Hot Mix Asphaltic Concrete

A. The hot mix asphaltic concrete (HMAC) shall be produced, transported, and applied in accordance with the latest edition of the Texas Department of Transportation (TxDOT) Standard Specifications for Construction of Highways, Streets, and Bridges.

B. The hot mix asphaltic concrete shall be TxDOT Item 340, Type D.

C. The Tack Coat material shall be as specified elsewhere.

Part 3 EXDECUTION

A. The asphalt material and tack coat shall be placed only when weather conditions, in the opinion of the Engineer, are suitable.

B. The existing pavement surface shall be cleaned and swept of all grass, weed, dirt, and other deleterious material. Weed and grass herbicide shall be applied according to manufacturer instructions.

C. All existing potholes, ruts, and any other weak section of the existing pavement shall be cut out and repaired with hot-mix level-up.

D. Tack coat shall be as specified but not in access of 0.05 gallons per square yard.

E. The hot-mix overlay shall be spread on a prepared and approved surface so that it will receive initial rolling during daylight. The hot-mix material shall be spread with an approved paving-finishing machine in such a manner that when properly compacted, the finished pavement will be smooth and of uniform density.

F. Compaction shall be 98-percent of maximum laboratory density.

G. Geotechnical testing on core samples shall be performed at intervals of 500-square yards at locations requested by the Engineer.

SECTION 02720
PRIME COAT

Part 1 GENERAL

1.01 Summary

A. This specification shall govern for furnishing all plant, labor, equipment, supplies, materials, and in performing all operations required to apply a prime coat of asphaltic material on an approved base course completed in accordance with the applicable section of this specifications.

1.02 Related Work

A. Section 02500: Caliche Base
B. Section 02710: Hot Mix Asphaltic Concrete
C. Section 02725: Tack Coat

1.03 Submittal

A. Contractor shall submit a letter of certification from the asphaltic material supplier for Engineer approval.

Part 2 PRODUCTS

A. The asphaltic materials used for prime coat shall be MC-30, ASTM D2027, Medium-Curing Cutback Asphalt, or RC-30 or RC-70, ASTM D2028, Rapid Curing Cutback asphalt.

B. Attention is directed to the fact that the flash point for cutback asphalt is approximately 80-F.

C. Care shall be taken to prevent open flames from coming in contact with cutback asphalt or gases of the cutback asphalt.

D. The Contractor shall be responsible for any fires or accidents, which may result from heating the cutback asphalt.

Part 3 EXECUTION

A. Before the application of the prime coat the surface shall be cleaned by sweeping or other approved methods and all loose materials compacted.

B. If found necessary by the Engineer, the surface shall be lightly sprinkled just prior to application of the asphaltic materials.

C. The asphaltic materials shall be applied on the clean surface by an approve type of self-propelled pressure distributor so operated as to distribute the material in the quantity specified, evenly and smoothly under a pressure necessary for proper distribution.

D. The contractor shall provide all necessary facilities for determining the temperature of the asphaltic material in all the heating equipment and in the distributor and for determining the rate at which it is applied.

E. The prime coat shall be applied at 60-F.

F. The asphaltic material shall be applied at the rate not more than 0.4 and not less than 0.3 gallons per square yard, the exact rate to be determined by the Engineer.

G. Prime coat shall not be applied when the air temperature is below 60-F and falling, but it may be applied when the air temperature is above 50-F and is rising.

H. Asphaltic materials shall not be place when general weather conditions, in the opinion of the Engineer, are not suitable.

I. No traffic or hauling will be permitted over the freshly applied prime coat until authorized by the Engineer.

SECTION 02725
TACK COAT

Part 1 GENERAL

1.01 Summary

A. This specification shall govern for furnishing all plant, labor, equipment, supplies, materials, and in performing all operations required to apply a tack coat of asphaltic material on an approved surface.

1.02 Related Work

A. Section 02500: Caliche Base
B. Section 02710: Hot Mix Asphaltic Concrete
C. Section 02715: Hot Mix Overlay
D. Section 02720: Prime Coat

1.03 Submittals

A. The Contractor shall submit a manufacturer statement certifying the material meets or exceeds the requirements of this specification.

Part 2 MATERIALS

A. The asphaltic materials used for tack coat shall be either Cutback Asphalt or Asphalt Emulsion. Cutback Asphalt shall be RC-70 or RC-250, ASTM D2028, Rapid Curing Cutback asphalt.

B. Asphalt emulsion shall be SS-1, ASTM D 977. Asphalt Emulsion may be diluted with not more than 50 percent water.

C. Care shall be taken to prevent open flames from coming in contact with cutback asphalt or gases of the cutback asphalt.

D. The Contractor shall be responsible for any fires or accidents, which may result from heating the cutback asphalt.

Part 3 EXECUTION

A. Before the application of the tack coat, the surface shall be cleaned by sweeping or other approved methods and all loose materials compacted.

B. The asphaltic materials shall be distributed the material in the quantity specified, evenly and smoothly under a pressure necessary for proper distribution.

C. The contractor shall provide all necessary facilities for determining the temperature of the asphaltic material in all the heating equipment and in the distributor and for determining the rate at which it is applied.

D. The temperature of the tack coat material shall be 60-F during application.

E. The asphaltic material shall be applied at the rate not more than 0.12 and not less than 0.08 gallons per square yard, the exact rate to be determined by the Engineer.

F. Tack coat shall not be applied when the air temperature is below 60-F and falling, but it may be applied when the air temperature is above 50-F and is rising.

G. Asphaltic material shall not be placed when general weather conditions, in the opinion of the Engineer, are not suitable.

H. No traffic or hauling will be permitted over the freshly applied tack coat.

SECTION 03100
CONCRETE FORMWORK

Part 1 GENERAL

1.01 Related Work

A. All concrete formwork, including forms, shores, reshores, and required braces to be the responsibility of the Contractor, who shall be responsible for the design, engineering and constructing of the formwork as required to meet construction loading requirements and applicable code requirements. Forms to be provided so that resultant concrete conforms to required lines, shapes and dimensions. Design formwork to be readily removed without impact, shock or damage to the in-place concrete surfaces and adjacent finishes.

B. Formwork to be in compliance with ACI Recommended Practice for Concrete Formwork and with applicable sections of ACI 301.

1.03 Design

A. Contactor shall be responsible for designing, erecting, shoring, bracing and maintaining formwork required to place concrete and to safely transmit all vertical and lateral loads that might be applied to the structure and formwork until the reinforced concrete has attained sufficient strength to safely accommodate such loads. Form design shall include considerations of live load, deed load, weight of equipment, weight of materials, impact loads, vibrator frequencies, ambient temperatures, foundation pressures, stress and any other factor affecting the safety of the structure during construction.

B. Provide supports, reshores and bracing in such a manner as to provide a means of field adjustment of forms due to shift and/or settlement during placement procedures.

C. Design formwork to minimize joints. Design formwork assemblies to facilitate form removal and to allow forms to be stripped without removal of shoring and bracing that may be required to remain in place. Forms to be readily removable with a minimum of impact to concrete structure.

Part 2 PRODUCTS

2.01 Form Materials, Accessories, and Ties

A. Plywood: Douglas fir conforming to PS-1 for Construction and Industrial grade plywood.

B. Lumber: Douglas fir, structural grade with grade stamp clearly visible.

C. Form Release Agent: Commercial formulation that will not bond with, stain or adversely affect concrete surfaces. Agent shall not impair subsequent treatment of concrete surfaces requiring bond or adhesion.

D. Form Ties: Factory fabricated, adjustable length, removable or snap-off metal ties designed to prevent form deflection and to prevent spalling of concrete surfaces upon removal. Provide ties so that portion remaining within concrete is at least 1-1/2 from outer surfaces. Provide face disk not larger than 1" in diameter with water seal feature.

E. Chamfers: Wood or PVC strips, ¾" x ¾"; unless indicated otherwise on the plans; maximum lengths as practical.

F. Anchorage: Provide nails, lag bolts and other anchorage items as required of sufficient size, strength and character to maintain formwork in place while placing concrete.

G. Waterstops: Refer Section 03300.

Part 3 EXECTUTION

3.01 Inspection and Installation

A. Verify lines, levels, elevations and measurements before proceeding with the formwork. Inspect formwork construction before any concrete is placed to insure adequate bracing and shoring to meet loading requirements.

B. Construct forms in accordance with ACI 301 to exact sizes, shapes, elevations and dimensions required. Provide for openings, offsets, keyways and recesses as required. Provide all shoring and bracing required to ensure stability of formwork during and after placement. Support form-facing materials by structural members spaced sufficiently to prevent deflection. Provide extra studs and/or girts at intersecting planes to maintain true square intersections. Seal all openings and joints to prevent leakage and "fins".

C. Provide openings in forms to accommodate the work of other trades, including mechanical and electrical work.

D. Set and build into formwork anchorage such devices, accessories and other embedded items required for other work that is attached or supported by cast in place concrete. Use setting drawings and instructions provided by manufacturer of such items. Ensure that items are installed level and plumb and that they are not disturbed during concrete placement operations.

E. Provide temporary openings where interior areas of formwork are inaccessible for cleanout. Inspection and/or concrete placement. Brace openings and set lightly to forms. Provide openings at bottom of forms to allow water to drain. Close all temporary openings with tight fitting panels flush with inside face of forms.

F. Forms for Exposed Concrete: Drill forms to suit ties utilized and to prevent concrete leakage. Provide chamfer strips at all sight-exposed external corners. Provide all other form-mounting shapes, recesses and projections with smooth finish materials and install in forms with sealed joints to prevent displacement.

G. Edge Forms and Screed Strips for Slabs: Set edge forms and intermediate screed strips for slabs to obtain required elevations in the finish slab surface. Provide and secure units required to support screeds.

H. Construction Joints: Locate construction joints not shown on the Drawings so as not to impair the strength and appearance of the structure, as approved by the Engineer. Provide keyways for slabs and all other construction joints in walls and beams. Place construction joints perpendicular to the main reinforcement with the reinforcement continued across the joint, unless otherwise indicated.

3.02 Form Releases, Form Removal, and Form Reuse

A. Coat form surfaces with form release agent. Apply in strict accordance with manufacturer's printed instructions. Apply prior to placement of reinforcing steel, inserts, anchor devices and other embedded items.

B. Forms shall be left in place until concrete has attained sufficient strength to support its own weight and construction and design load, which may be imposed upon it. Reshore structural members as required by construction conditions to permit successive construction; such restoring being the sole responsibility of the contractor.

C. Remove forms progressively so that no unbalanced loads are imposed on the structure. Do not damage concrete surfaces during removal of the forms.

D. Clean and repair forms to be reused. Patching of voids will not be permitted at exposed faces of concrete.

E. Store forms to prevent damage until reuse.

F. Reapplication of form release agent is required prior to each reuse of forms.

SECTION 03200
CONCRETE REINFORCEMENT

Part 1 GENERAL

1.01 Related Work

A. Section 03100: Concrete Formwork
B. Section 03300: Cast In Place Concrete

1.02 Quality Assurance

A. Comply with CRSE "Manual of Standard Practice for Detailing Reinforced Concrete Structures" and Documents 63 and 65.

B. Conform to ACI 301 Specifications for Structural Concrete for Building and 315 manual of Standard Practice for Detailing Reinforced Concrete Structures.

1.03 Submittals

A. Shop Drawings: If requested by Engineer, submit shop drawings indicating fabrication, bending and placement of reinforcing steel. Show locations and quantities of steel sizes, spacing, bending and cutting requirements, splicing, stirrup spacing, support and spacing devices.

B. Certificates: If requested by the Engineer, submit 4 copies of steel mill test certificates for supplied concrete reinforcing. Indicate physical and chemical analysis.

C. Foreign Manufactured Reinforcing Steel: Test supplied steel for compliance to ASTM requirements by an independent testing laboratory located in the United States, approved by the Owner. All costs for testing to be borne by the Contractor.

Part 2 PRODUCTS

2.01 Materials

A. Reinforcing steel: ASTM A615, 60 ksi yield billet-steel deformed bars: No. 3 bars and less, and No. 4 bars used as stirrups or ties- Grade 40; all others- Grade 60; uncoated finish.

B. Welded Wire Fabric: ASTM A185. Sizes and gauge as indicated on the Drawings. Provide in flat sheets (rolled sheets are unacceptable).

C. Tie Wire: 16 gauges annealed.

D. Chairs, Bolsters, and Supports: Plastic-coated, type of proper size, type, and spacing required to support reinforcing steel and to maintain required clearances prior to and during placing procedures. Provide flat "tins" welded to feet of bolsters to be placed over insulation, void forms or other otherwise unstable surfaces.

2.02 Materials

A. Fabricate reinforcing steel to required shapes and sizes with fabrication tolerances in accordance with ACI 315.

B. Do not re-bend or straighten reinforcing in a manner, which will damage or weaken the material.

C. Splices: Locate splices for scheduled reinforcing. Splices for unscheduled reinforcing to be minimized. Where splices area required, stagger splices in adjacent bars.

Part 3 EXECUTION

3.01 Delivery, Storage, Handling, and Preparation

A. Deliver reinforcing steel to the project site bundled with weather resistant tags and marks. Store at site in such a manner as to prevent damage and accumulation of dirt, mud and excessive rust.

B. Contractor shall, prior to placement of any reinforcing steel, secure Engineer's approval for placement, tying and supporting procedures. Required interpretations shall be obtained prior to initiation of placement.

3.02 Installation

A. Comply with specified standards for details and methods of reinforcement placement and support.

B. Clean reinforcement to remove loose rust and scale and any other materials which will reduce bond between reinforcing and concrete.

C. Place reinforcement to obtain required coverage. Provide chairs, bolsters and bar supports in sufficient types, quantities and locations to carry reinforcement. Arrange space and securely tie bars and bar supports together with tie wire to hold reinforcement accurately in position. Set wire ties so the ends are directed away from exposed concrete surfaces.

D. Position support and secure reinforcement against displacement by formwork, construction or concrete placement operations.

E. Where required, install wire fabric in as long lengths as practical. Lap adjoining pieces at least one full mesh and lace together with wire. Do not make end laps between supporting beams or directly over beams of continuous structures. Offset end laps with adjacent widths to prevent continuous laps.

F. Splices: Unless otherwise shown all laps and splices shall be equal to 30 bar diameters, but in no case less than 12". This also applies to temperature reinforcing.

3.03 Inspections

A. Notify Engineer 24 hours in advance of concrete placement operations to permit inspection of reinforcing steel and preparatory work and allow necessary corrections to be made before such operations are commended.

SECTION 03300
CAST IN PLACE CONCRETE

Part 1 GENERAL

1.01 Related Work

A. Section 03100: Concrete Formwork
B. Section 03200: Concrete Reinforcement
C. Section 03400: Precast Concrete

1.02 Quality Assurance

A. Perform work in accordance with ACI 301- Specifications for Structural Concrete for Buildings and ACI 304- Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

B. Obtain materials from same source throughout the work.

C. All concrete work included in other sections of these Specifications that NOT specifically described therein shall comply with the requirements of this Section.

Part 2 PRODUCTS

2.01 Concrete Materials

A. Cement: ASTM C-150; normal- Type 1 Portland cement; gray color. Concrete for the various members of the structure to minimum compression strength in pounds per square inch within 28 days as indicated on the drawings.

B. Fine and course aggregates: ASTM C-33; maximum aggregate size to be 1-1/2, unless noted otherwise.

C. Water; clean, potable and free from oil, acid alkaline, salts and other deleterious materials.

2.02 Admixtures and Accessories

A. Except for air-entrainment averaging 3% but not exceeding 5% no other admixtures to be used with Engineer's approval. Air-entrainment admixture to conform to ASTM C-260.

B. Bonding Agent: Polymer resin emulsion or latex emulsion.

C. Curing Compound: ASTM C-309, Type 1, curing compound shall not affect finishes to be installed nor adhesives used to install them. Sonnerborn Kure-Seal or equal.

D. Waterstop: Volcay “Waterstop-Rx” or equal.

E. Expansion Joint Filler: Performed, non-extruded resilient, ASTM D-994.

Part 4 EXECUTION

3.01 Inspections and Job Conditions

A. Verify inserts, pipes, sleeves, conduits, anchors, plates, reinforcement and other items to be cast into concrete are accurately placed, securely position and will not obstruct placement of concrete.

B. Conform to ACI recommendations for hot-weather (ACI 305) and for cold-weather (ACI 306) concrete mixing and placement.

C. Perform no concrete operations when temperature is below 40 degrees F. or is expected to fall below 40 degrees F. within the ensuing 24 hours. Temperature of mixed concrete shall not exceed 90 degrees F. nor be less than 60 degrees F.

3.02 Concrete Design and Mixing

A. Mix concrete in accordance with ACI 613. Volumetric proportioning not allowed. Measurement of materials to be by weight only by methods that will permit proportions to be accurately controlled.

B. Concrete may be proportioned and mixed on the job, dry batched for mixing on the job or procured from a “transit mixed” concrete. If transit-mixed, mixing and transporting operation to conform to ASTM C-94. Mixing water shall not be added after a truck has left the plant except by permission of Engineer or his representative. No concrete shall be used in work, which has been held longer than 1-1/2 hours in a mixer truck. If dry batched to job site, the batching plant operations to conform with ASTM C-94. Transportation of dry materials shall be performed in such a manner as to prevent loss, segregation or contamination of ingredients. If job proportioned and mixed, aggregates must be stock piled separately and handled in such a manner as to prevent inclusion of any foreign materials. Except for emergency hand-mixing under approved condition, all concrete to be machine mixed in an approved type mixer for a minimum period of 1-1/2 minutes in a drum rotating at a peripheral speed of about 200 feet per minute. All equipment to be clean.

C. Aggregates to be proportioned by weight. Use of fractional sacks of cement will not be permitted unless the cement is proportioned by weight. Water to be measured by an accurate measuring device, which can be adjusted to compensate for variations in free moisture content or aggregates. Re-tempering of partially hardened concrete or mortar will not be permitted. Concrete to be proportioned so as to include the minimum amount of water to obtain a workable mix in accordance with the limits prescribed.

D. The determination of the proportions of cement, aggregate and water to attain the required strengths shall be established by tests which shall be made in advance of the beginning of operations using the consistencies suitable for the work and in accordance with the "Standard Method of Making compression Tests of Concrete" ASTM C-39.

E. Unless noted otherwise on the Drawings, all concrete shall be 3000-psi minimum compression strength at 28 days.

3.03 Placement

A. No concrete to be placed at any time without the Engineer's direct presence, unless approved by the Engineer.

B. Notify the Engineer 24 hours prior to commencement of placement operations. Placement of concrete will not be allowed until inspection and approval of reinforcement, formwork and other conditions of placement has been done by the Engineer.

C. Maintain concrete coverage around reinforcing as shown on the Drawings. In no case shall coverage be less than 1-1/2", unless noted otherwise.

D. All concrete placements to be in strict accordance with ACI 301. For standard concrete, elapsed time between proportioning of materials and placing of concrete shall not exceed 1-1/2 hours. Delivery of concrete to be scheduled so that continuity of a pouring operation is not interrupted for more than 15 minutes between trucks.

E. Before depositing concrete, remove debris and water from spaces to receive concrete. Wet forms and abutting concrete surfaces as directed.

F. When depositing new concrete against old, wire brush clean and thoroughly wet old surfaces and cover with bonding agent in accordance with manufacturer's recommendations.

G. Convey concrete from mixer to forms immediately by means of approved equipment that will avoid segregation upon placement. Deposit continuously and in layers of such thickness so that no concrete will be deposited on concrete that has hardened. Consolidate concrete to insure avoidance of excessive voids and honeycombs using mechanical vibrators, supplemented by hand-rodding and tamping where required. Do not vibrate to the point that segregation occurs. Vibration to conform to ASTM C-309.

H. After placement, screed concrete to required lines and levels working with horizontal and vertical strokes. Use bull-float or darbies to smooth surface and to rise fills to surface. Check for humps, depressions or other surface irregularities and correct. Float surface to ¼" in 10"-0 tolerances. Finish in accordance with Paragraph 3,4, finishing.

I. Construction loads on in-place construction shall at no time exceed the live load for which the in-place structure was designed. Contractor to obtain same from Engineer and engineer prior to loading structure.

J. If, for any reason, it shall become necessary to stop placing of concrete at places other than those indicated on the Drawings, such places and the manner of making the joint, shall require the approval of the Engineer. Adequate provisions shall be made against shear by means of keys or added reinforcement or as otherwise directed. Before deposing new concrete against old, forms to be retightened and hardened surfaces cleaned and covered and covered with a coating of mortar and neat cement grout.

K. Where shown on the Drawings and wherever else concrete cannot be placed continuously, provide construction joints made and located in accordance with methods which will least impair the strength of the structure. Where water stops are indicated, installing strict accordance with manufacture's recommendations. Place concrete continuously between construction joints. Unless indicated otherwise, continue reinforcing across joint and provide 1-1/2" keyways. Prior to pouring, clean previously-poured concrete and apply bonding agent throughout joint area. Do not break or otherwise interrupt successive pours such that cold joints occur.

3.02 Finishing

A. Concrete surfaces to be left exposed to be smooth rubbed finish. Wet surfaces while concrete is green and rub with a carborundum brick until uniform color and texture are produced. Remove burrs, fins and other surface irregularities.

B. Concrete slabs to be steel-troweled finished unless indicated otherwise. Machine troweling is acceptable, subject to Engineer's approval. Concrete floor areas

NOT scheduled to receive floor finish shall be hand troweled after machine troweling and light broomed.

C. Curing: Apply one coat of Super Rez Seal, by Euclid Chemical Co. to entire slab surface in strict accordance with manufacturer's recommendations. Apply second coat a minimum of twenty-one (21) days later to all areas to have exposed, sealed, concrete floor.

D. Slope slabs to drain as indicated on the Drawings.

E. Patch all surface defects immediately upon removal of forms. Defects include, but are not limited to, cracks in excess of .01", honeycombs, rock pockets, spalls and any surface voids or cracks extending back to reinforcing. Patch all tie holes full and solid. Patching material to be 1 part cement to 2-1/2 pars sand. Color to match concrete surrounding defective area by use of appropriate volumes of white cement. Mix with water to stiffest consistency allowing handling and placing. Dampen area to be patched and an area 6" around. Coat with bonding agent. Patch, thoroughly consolidating mortar into patched area. Keep patched area damp cured for 7 days.

F. Remove and replace all concrete not conforming to lines, levels, details and elevations required by the Drawings. Slabs to be level to ¼" in 10-0 tolerance. Grind all slabs, where required.

3.03 Testing

A. Contractor shall coordinate with testing laboratory and shall notify same to insure laboratory representation at all required pour.

B. A recognized Independent Testing Laboratory will be selected by the Owner to perform the following field and laboratory testing services at the expense of the Owner:
   1. Inspect and test all concrete materials, except those items such as domestic cement and domestic reinforcing steel covered by mill certificates, which need not be tested by the Laboratory.
   2. Make and test concrete cylinders at the frequency of one set of four specimens per 50 cubic yards of concrete for each class placed or fraction thereof per day's pour.

C. The scope of testing services may be adjusted at the Owner's discretion prior to or at any time during the project.

D. All inspections and tests to be performed in accordance with applicable ASTM Standards. Slump tests to be in accordance with ASTM C-43. Compression tests

to be in accordance with ASTM C-31. In the event the Laboratory determines deviations from the Specifications, the Engineer and Contractor shall be notified immediately. Written reports covering all inspection and testing operation to be furnished promptly to the Engineer and Contractor.

E. In addition to the foregoing function, the Testing Laboratory shall be considered available to consult with the Contractor will be responsible for notifying the Testing Laboratory at appropriate points of progress so that the identified scope of testing can be reflected. Such notification to be made in a timely fashion. The Contractor shall cooperate with the Testing Laboratory so that the functions of the laboratory may be properly performed.

F. Should cylinder breaks indicate that below-specified strength tests shall be made on those areas so affected. The method of loading shall conform to the ACI 318. Such tests to be made by the Independent Testing Laboratory and at the expense of the Contractor. Any area or member found to be inadequate by the above test shall be removed and replaced to the satisfaction of the Engineer.

G. The testing of materials described herein in no way relieves the Contractor of his obligation to provide materials and construction in full compliance with the requirements of the Contract Documents.

3.04 Protection and Cleanup

A. Immediately after placement, protect concrete from premature drying and excessively hot or cold temperatures.

B. Maintain concrete with minimum moisture loss at uniform temperature for sufficient time to insure hydration of cement. Perform curing of all concrete by applying curing compound to horizontal concrete surfaces in two coats, with second coat at right angles to first. Apply curing compound in strict accordance with manufacturer's recommendations. Moist-curing or moisture-retaining coverage methods are acceptable, but will require approval prior to concrete placement.

C. Immediately after completion of concrete operations, remove all debris from site. Immediately prior to final inspection, wash, clean and mop all exposed concrete floors.

SECTION 03305
CONCRETE PAVING, CURB, AND SIDEWALKS

Part 1 GENERAL

1.01 Related Work

A. Section 02310: Earthwork for Pavement
B. Section 03200: Concrete Reinforcing
C. Section 03300: Cast in Place Concrete
D. Section 03310: Joint Sealant

1.02 Quality Assurance, Job Conditions and Warranty

A. All work done in this area to be paid by personnel experienced in concrete finishing work.

B. Perform no concrete operations when temperature is below 40 degrees F or is expected to fall below 40 degrees F within the ensuing 24 hours.

C. Temperature of mixed concrete shall not exceed 90 degrees F nor be less than 60 degrees F.

D. This contractor shall guarantee this work to be free of defects, for a period of one year from the date of acceptance in writing by the Engineer.

Part 2 PRODUCTS

A. Concrete shall be of material composition as specified Section 03300; 3000 P.S.I. at 28 days. Maximum aggregate size to be 1-1/2".

B. Expansion Joint Material (Wood): 3/4" B or better redwood.

C. Expansion Joint Material (Sealant) shall be as specified in Section 02760.

D. Curing compound to be resin base ASTM C309, Type 1.

E. Reinforcing Steel shall be as shown on the drawings and as specified Section 03200.

F. Dowels, except as otherwise detailed, shall be No. 4 reinforcing bars 18" long at 24" on center with one side wrapped with plastic tubing to form a slip joint.

G. Subgrade and Base materials to be placed as shown on the drawings and as specified elsewhere.

Part 3 EXECUTIONS

3.01 Performance

A. Excavate earthwork as required to obtain required finish grades, allowing for required thickness of fill material and concrete. Compact earthwork true to line and grade. Earthwork shall be free from soft spots and loose materials. Fill areas to receive concrete with select fill. Level and compact as specified elsewhere.

B. Forms to be straight, durable and have a depth equal to the required depth. The forms to be securely staked to line and grade in such a manner that there shall be no movement when the concrete is placed. Wet down subgrade before placing concrete.

C. Reinforcing steel and expansion joints with dowels to be located and accomplished in accordance with the Drawings. Expansion joints with dowels to be located and accomplished in accordance with the drawings. Expansion joints and transverse markings to be square with the form-work. Transverse markings to be 1/5 depth of concrete thickness and to be located between expansion joints at a distance not to exceed 10 feet intervals.

D. Concrete shall be placed in such a manner so that segregation does not occur. Concrete shall be thoroughly tamped with a “jitterbug” or other approved tool. All pours shall begin and end at expansion joints; no cold joints allowed.

E. Immediately after the finishing has been completed, curing compound shall be evenly applied in strict accordance with manufacture’s recommendations. Forms shall be carefully removed so that the concrete work is not damaged. All “honeycombs” shall be plastered before backfilling is accomplished. Protect work for duration of project. Replace portions of work that become damaged prior to acceptance of building by owner.

3.02 Finishes

A. All joints and edges shall be tooled and surface of sidewalks and paving shall receive a medium broom finish unless otherwise indicated. Broom marks shall be uniform and even. The marks shall break the surface to prevent surface from becoming slick when wet. Run broom marks across the width of the forms. Concrete curbs shall have a rubbed and grout coat finish.

B. Non-slip finish, if required, shall be installed as per manufacturer's recommendations.

C. Where washed aggregate surface is called for on the plans, aggregate size shall not exceed ¾".

SECTION 03310
JOINT SEALANT

Part 1 GENERAL

A. This section shall govern for sealing control, expansion, and/or construction joints in concrete to create a continuous diaphragm to prevent fluid migration and accumulation of debris.

1.01 Related Work

A. Section 03300: Cast In Place Concrete
B. Section 03305: Concrete Paving, Curb and Sidewalk
C. Section 03400: Precast Concrete

1.02 References

A. American Society for Testing Materials (ASTM)

1.03 Submittal

A. Contractor shall submit manufacturer technical data for Engineer approval.

Part 2 PRODUCTS

2.01 Materials

A. Dow Corning 888 Silicone Joint Sealant over wood expansion material or approved equal.

Part 3 EXECUTION

3.01 Installation for Silicone Sealant

A. Clean and blowout joint of contaminants and impurities to a minimum ½-inch depth. Joint must be properly recessed immediately after installation.

B. Apply sealant in a continuous operation to properly fill the joint. The sealant shall only be applied when temperature is above 40 degrees F.

C. Excess sealant shall be cleaned off with an appropriate solvent.

6TH STREET OVERLAY PROJECT

SPECIAL CONDITIONS

1.01 CONTRACT DOCUMENTS

The contract Documents consist of the Instructions to Bidders, General Conditions, Special Conditions, Specifications, Bid Proposal, Plans and all modifications thereof incorporated into any of the documents before the proper execution of the bonds and of the attached and of the Agreement, all of which are attached and are part of the contract following execution of the agreement by an authorized representative of the City and Contractor. The Contract Documents are complementary and what is called for by any one is as binding as if called for by all.

1.02 DRAWINGS AND SPECIFICATIONS

Detailed drawings are included in this package.

1.03 EXCEPTIONS TO PLANS AND SPECIFICATIONS

Exceptions and inconsistencies in Plans and Specifications shall be brought to the attention of the City Engineer, promptly before the bid date. Unless the City Engineer receives notice before the bid opening, it shall be assumed that all contract documents are acceptable as written and that the successful bidder will complete the project satisfactorily in the scheduled time period, for the amount bid having examined the plans, specifications, other contract documents, and the site of proposed work; and being familiar with all the conditions surrounding the construction of the proposed project, including the availability of materials and labor.

1.04 VERIFICATION OF MEASUREMENTS

It is the Contractor's responsibility to verify all measurements and quantities before ordering materials. Significant deviations from those on the plans shall be reported to the City Engineer on a timely basis.

1.05 SCOPE OF WORK/TIMING OF CONSTRUCTION

The Plans and Specifications provide for construction of the **6th Street Overlay Project** for the City of Kingsville. It is the responsibility of the Contractor to provide all work, materials, labor, equipment, tools and supervision to fully complete the project in the construction period specified, in accordance with the Specifications, Drawings, and other Contract Documents. Completion of the project in a timely manner is very important to the normal operations of the City.

1.06 NOTICE OF AWARD AND NOTICE TO PROCEED

Successful bidders will be informed by phone, fax or e-mail by the City Engineer of acceptance of the Bid Proposal. In turn, Contractor shall obtain bonds duly executed by a corporate surety(ies) attorney and deliver these along with three (3) signed originals of the Agreement (Contract) to the City Engineer within ten (10) days following Notice of Award. An original copy and two (2) duplicates bearing original signatures of these documents are required.

After acceptance of the bonds and execution of the Contract by the appropriate City Official(s), Contractor will be informed by letter of the date that construction can begin in the written Notice to Proceed issued by the City Engineer.

Contractor shall begin work within fourteen (14) calendar days of the date specified in the Notice to Proceed and diligently pursue completion of the project within the required time. The Contractor will be responsible to schedule his work and receipt of materials in order that the project is fully completed within the period specified on the Agreement.

1.07 TIME OF COMPLETION

The Contractor shall complete the project within the number of days required by the special Conditions, counted from the date specified on the Notice to Proceed. Allowances for weather days will be permitted upon approval of the City. Contractor shall be responsible for analyzing inclement weather schedule and forecasting a suitable work schedule.

1.08 DELAYS AND EXTENSION OF TIME

Contractor may be granted an extension of time because of inclement weather, changes in scope of work, or other causes beyond reasonable expectation of the Contractor.

Claims for an extension(s) of time shall be submitted in writing to the City Engineer within ten (10) days after the occurrence of the event that results in a request for a delay.

1.09 SATISFACTORY COMPLETION

At completion of work, Contractor shall notify the City Engineer who will schedule an inspection of the work and make a written list of any items of work that do not meet the Specifications or are unsatisfactory in quality, quantity or appearance. Contractor shall make all corrections on this list before applying for final payment. <u>It shall be agreed that the purpose of this project is to construct a complete project and that omission of incidental items that might be necessary for a complete project will be provided and installed by the Contractor before the final payment is approved.</u>

1.10 CITY REPRESENTATIVE

The City Representative is Mr. Charlie Cardenas, City Engineer. His office phone number is (361) 595-8004.

1.11 CONTRACT PAYMENTS

If requested by the contractor, the City will make one (1) progress payment per thirty (30) day periods during the construction work for work in place and for materials stored on site at that time. A 10% retainage will be withheld pending satisfactory final completion of the project and certification by City Representative. Contractor may make application for payment by the procedure described herein. **Failure to provide this documentation within ninety (90) calendar days of final acceptance of the project will result in the contractor forfeiting the entire 10% retainage payment of the contract.**

In order to apply for payment, Contractor shall submit an itemized invoice to the City Engineer. Note that it normally takes from three (3) to four (4) weeks to receive payment following receipt of the Application for Payment. All payments will be subject to the City Engineer's approval.

1.12 CHANGE ORDER ADMINISTRATION

Request for extra or modified work initiated on behalf of the City or Contractor shall be presented in three (3) originals to the City Engineer. Proposals shall include itemized costs for the proposed work. Proposals shall include itemized costs along with any time extension required to complete the work. **Work authorized by a change order shall not commence before the change order is signed by the Contractor, the City Engineer and the Purchasing/IT Director**.

1.13 WARRANTY

Contractor shall warrant all workmanship and furnished materials to be free from defects and remain in perfect condition for two (2) years following the date of acceptance or final completion, whichever is later. Losses and damages resulting from negligence by City or vandalism shall not be covered under this warranty. Signing of the contract shall constitute Contractor's acceptance of this warranty provision.

1.14 INSURANCE

. I. CONTRACTOR'S LIABILITY INSURANCE

A. Contractor must not commence work under this contract until all insurance required has been obtained and such insurance has been approved by the City. Contractor must not allow any subcontractor to commence work until all similar insurance required of any subcontractor has been obtained.

B. Contractor must furnish to the City's Risk Manager and Public Works Director, 1 copy of Certificates of Insurance (COI) with applicable policy endorsements showing the following minimum coverage by an insurance company(s) acceptable to the City's Risk Manager. The City of Kingsville must be listed as an additional insured on the General Liability and Auto Liability policies by endorsement, and a waiver of subrogation is required on all applicable policies including Workers' Compensation. Endorsements must be provided with COI. Project name and or number must be listed in Description Box of COI.

TYPE OF INSURANCE MINIMUM INSURANCE COVERAGE

30-written day notice of cancellation, required on all certificates or by applicable policy endorsements

Bodily Injury and Property Damage

Per occurrence - aggregate
Commercial General Liability including:

1. Commercial Broad Form
2. Premises – Operations
3. Products/ Completed Operations
4. Contractual Liability
5. Independent Contractors

$1,000,000 Per Occurrence
$2,000,000 Aggregate

AUTO LIABILITY (including)

1. Owned
2. Hired and Non-Owned
3. Rented/Leased $1,000,000 Combined Single Limit

WORKERS' COMPENSATION

EMPLOYER'S LIABILITY

Statutory

$500,000 /$500,000 /$500,000

C. In the event of accidents of any kind related to this agreement, Contractor must furnish the Risk Manager with copies of all reports of any accidents within 10 days of the accident.

II. ADDITIONAL REQUIREMENTS

A. Applicable for paid employees, Contractor must obtain workers' compensation coverage through a licensed insurance company. The coverage must be written on a policy and endorsements approved by the Texas Department of Insurance. The workers' compensation coverage provided must be in an amount sufficient to assure that all workers' compensation obligations incurred by the Contractor will be promptly met.

B. Contractor shall obtain and maintain in full force and effect for the duration of this Contract, and any extension hereof, at Contractor's sole expense, insurance coverage written on an occurrence basis, by companies authorized and admitted to do business in the State of Texas and with an A.M. Best's rating of no less than A- VII.

C. Contractor shall be required to submit a copy of the replacement certificate of insurance to City at the address provided below within 10 days of the requested change. Contractor shall pay any costs incurred resulting from said changes. All notices required by this exhibit shall be given to City at the following address:

City of Kingsville
Attn: Risk Manager
P.O. Box 1458
Kingsville, TX 78364

D. Contractor agrees that with respect to the above required insurance, all insurance policies are to contain or be endorsed to contain the following required provisions:

- List the City of Kingsville and its officers, officials, employees, volunteers, and elected representatives as additional insured by endorsement, as respects operations, completed operation and activities of, or on behalf of, the named insured performed under contract with the City, with the exception of the workers' compensation policy;

- Provide for an endorsement that the "other insurance" clause shall not apply to the City of Kingsville where the City is an additional insured shown on the policy;

- Workers' compensation and employers' liability policies will provide a waiver of subrogation in favor of the City. An All States Endorsement will be required for companies not domiciled in Texas; and

- Provide thirty (30) calendar days advance written notice directly to City of any suspension, cancellation, non-renewal or material change in coverage, and not less than ten (10) calendar days advance written notice for nonpayment of premium.

E. Within five (5) calendar days of a suspension, cancellation, or non-renewal of coverage, Contractor shall provide a replacement Certificate of Insurance and applicable endorsements to City. City shall have the option to suspend Contractor's work should there be a lapse in coverage at any time during this contract. Failure to provide and to maintain the required insurance shall constitute a material breach of this contract.

F. In addition to any other remedies the City may have upon Contractor's failure to provide and maintain any insurance or policy endorsements to the extent and within the time herein required, the City shall have the right to order Contractor to stop work hereunder, and/or withhold any payment(s) if any, which become due to Contractor hereunder until Contractor demonstrates compliance with the requirements hereof.

G. Nothing herein contained shall be construed as limiting in any way the extent to which Contractor may be held responsible for payments of damages to persons or property resulting from Contractor's or its subcontractor's performance of the work covered under this contract.

H. It is agreed that Contractor's insurance shall be deemed primary and non-contributory with respect to any insurance or self insurance carried by the City of Kingsville for liability arising out of operations under this contract.

I. It is understood and agreed that the insurance required is in addition to and separate from any other obligation contained in this contract.

1.15 HOLD HARMLESS CLAUSE

Except for loss or damage caused solely by the negligence of the City, established by clear and convincing evidence thereof, the contractor shall save and hold the City harmless from and against all liability, claims and demands for personal injuries, including death, or property loss or damage to anyone (including contractor, subcontractors, third parties, and employees of such parties), arising out of or in any manner connected with or related to the performance of this contract, even if such loss or damage is due in part to the City's negligence; and the Contractor shall, at its own expense, pay all charges of attorneys and all costs and other expenses arising therefrom.

1.16 LAWS TO BE OBSERVED AND WORK STANDARD

Contractor shall familiarize himself/herself with, and at all times comply with Federal, State and Local laws, ordinances, and regulations that affect the conduct of the work. The installation of materials shall be in accordance with the plans and specifications, and if a conflict arises between these then it should be brought immediately to the attention of the City Engineer. In any event, such a conflict shall not invalidate the other portions of the contract or other requirements of the contract documents on the part of the City or Contractor.

Items of work that are required but not specifically drawn or specified shall be completed in a workmanlike manner and be consistent with standard construction practice at the time of installation. In cases of conflict, a sufficient test for work quality will be that the installed work meets, or exceeds the standards set by the International Building Code or other recognized agency.

1.17 SAFETY

The Contractor shall be responsible for initiating, maintaining, and supervising a safety program during the construction phase. The Contractor's Superintendent or Supervisor shall be considered responsible for safety on the job site. The Contractor shall take precautions for the safety and protection of:

a. Employees, the City, and Citizens.
b. All work and materials to be incorporated in the job, whether in use or storage on the job site, or off.
c. All other property on or adjacent to the job site.
d. Proper warning, barricading and traffic control and/or signs, when applicable.

The Contractor shall provide sufficient, safe and proper facilities at all reasonable times for the observation and/or inspection of the work by the City of Kingsville Representative and any other City Representative who may make periodic visits to the site to inspect the progress and quality of the work and to determine if the work is proceeding in accordance with the specifications. The Contractor shall comply with all applicable laws, ordinances and regulations.

1.18 STATE AND LOCAL TAXES/BUILDING PERMIT

All prices quoted for this project shall include taxes, permits, and fees required to complete the project. The Contractor shall comply with all applicable requirements of the State of Texas during

construction. The project is tax exempt and the contractor should request a tax-exempt certificate from the City Purchasing Department prior to purchasing any materials. No permits are required for this project.

1.19 PARKING

Contractor's employees may park their vehicles near the construction site in areas designated by the City Representative. These areas will be identified by the City Engineer. Contractor must become familiar with parking requirements of the City of Kingsville.

1.20 SUPERINTENDENT

The Contractor shall maintain a competent, responsible, fluent English or English bilingual superintendent on the job site to provide guidance during the work in progress. The superintendent shall represent the Contractor in his absence, and all directives given him by the City Engineer shall be as binding as if given to the Contractor.

1.21 WORKERS OF GOOD CHARACTER

Contractor shall insure employment by him/her and by associated Subcontractors of persons of good character and shall insure that all behave in a manner consistent with recognized adult behavior while working on this Project. In addition, the Contractor shall instruct and/or convey to all such employees that any display of bad manners or sloppy dress deemed objectionable to the City Engineer, or to visitors on the site, will not be tolerated.

1.22 SUBCONTRACTOR LIST/RESPONSIBILITY

Contractor shall furnish a listing of all subcontractors who will be involved in the project prior to beginning work on the project. Should a subcontractor consistently fail to perform satisfactorily, it shall be the Contractor's responsibility to remove the subcontractor and correct any substandard work at no additional cost to the City.

1.23 MATERIAL STORAGE/SECURITY

The Contractor and subcontractors shall maintain such office and storage facilities on the site as may be necessary for the proper conduct of the work. These shall be located so as to cause no interference with any work to be performed on the site. The City Representative shall be consulted with regard to locations.

Contractor shall confine storage of materials to those areas designated by the City. The Contractor shall properly secure the construction area and material storage site in order to protect his/her work, tools, and all materials (including City's) from unauthorized access and vandalism.

1.24 CLEANUP/EXCESS MATERIALS/DEBRIS CONTROL

Regular cleanup by the Contractor shall be an integral part of the work. Debris and spoils shall be neatly stockpiled and hauled from the job site in a timely manner. Proper measures shall be taken

to prevent debris from being carried and/or blown out of the construction area. Aggregates, fuels, liquids, and tools shall be protected from environmental forces so as to protect personnel and property in and around the work site. The Contractor shall be responsible for disposal of construction debris and trash. Hazardous material shall be the property of the Contractor for removal and disposal in accordance with TCEQ regulations. Any provisions for showering or clean-up must be provided by the Contractor. All excess materials and construction debris shall become property of the Contractor for disposal at a location approved by the City Engineer. The Contractor will remove all debris and broom clean the work site at completion of the project.

1.25 OWNERSHIP OF EXCESS DEMOLITION MATERIALS

Materials and/or equipment that are removed during the demolition process and not scheduled for re-use in the Plans are the property of the City. Thus the City reserves the right to take possession and make use of these in other ways. A listing of those materials to be retained will be provided to Contractor's superintendent at the beginning of construction work. These items shall be carefully removed during demolition and turned over to the City at a mutually agreeable location near the work site.

CONTRACT

THIS AGREEMENT made this _____ day of _____ ,2016 by and between _____ hereinafter called the CONTRACTOR, and the City of Kingsville, hereinafter called the OWNER or CITY.

WITNESSETH, that the Contractor and Owner for the consideration hereinafter named agree as follows:

Article 1 - Scope of Work: The Contractor shall furnish all the materials and perform all the work called for in the Contract Documents and described in the Specifications entitled:

BID NO 16-10 6TH STREET OVERLAY PROJECT

Article 2 - Time of Completion: The Contractor shall begin work at the job site within fourteen (14) days after the date of the Notice to Proceed issued by the Owner's Representative. The work to be performed under this contract shall be completed in ninety (90) consecutive calendar days plus any extended days approved by the Owner's Representative in accordance with the Specifications. For each calendar day that any work is not completed after the expiration of the time, as calculated fourteen (14) days from the date of the Notice to Proceed plus consecutive calendar days stated above plus approved extended days, the sum of Two Hundred Dollars ($200.00), per calendar day, will be deducted from the money due or to become due the Contractor, not as a penalty, but as liquidated damages and added for administration.

Article 3 - The Contract Sum: The Owner shall pay for the performance of the Contract, subject to additions and deductions provided therein, the sum of [**$**_____].

Article 4 - Partial Payment: Owner shall make progress payments as approved by the Owner's Representative in accordance with the General Conditions.

Article 5 - Acceptance and Final Payment: Final payment shall be due on acceptance of the work, provided the Contract has been completed as provided in the General Conditions.

Before issuance of the final payment, the contractor shall submit evidence, satisfactory to the City of Kingsville that all payrolls, material bills, subcontractors and other indebtedness connected with the work have been paid in full. **Failure to provide this documentation within ninety (90) calendar days of final acceptance of the project will result in the contractor forfeiting the entire 10% retainage payment of the contract.**

Article 6 - The Contract Documents: The Specifications, the Proposal, the Instructions to Bidders and the Drawings, together with this Agreement, form the Contract Documents and they are as fully a part of the Contract Documents as if hereto attached or herein repeated.

IN WITNESS WHEREOF, the parties to these present have executed this Contract in the year and day first above mentioned.

CITY OF KINGSVILLE
OWNER

By: _____

Title: _____

_____
CONTRACTOR

_____
(Signature)

_____
Printed or Typed Name

_____
Title

_____
Mailing Address

_____
City, State & Zip

TECHNICAL SPECIFICATION
6th STREET OVERLAY PROJECT

CITY OF KINGSVILLE
ENGINEERING DEPARTMENT

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PLANS OF PROPOSED
HIGHWAY ROUTINE MAINTENANCE CONTRACT

KINGSVILLE, TEXAS
6TH ST.

LIMITS: FROM: CORRAL AVE.
TO: BU 77/LOOP 428 KINGSVILLE

FOR THE CONSTRUCTION OF FLEXIBLE PAVEMENT STRUCTURE REPAIR, AND RESURFACING OF ROADWAY CONSISTING OF ULTRA–THIN BONDED HOT MIX WEARING COURSE

NET LENGTH OF PROJECT = 13,895.00 FT = 2.632 MI.
ROADWAY = 13,763.00 FT = 2.607 MI.
BRIDGE = 132.00 FT = 0.025 MI.

BEG PROJECT
STA 0+00.00

END PROJECT
STA 138+95

EQUATIONS: NONE
EXCEPTIONS:
(1) KING ST: STA 5–+17.00 TO STA 59+77.00 = 60.00'
NO RAILROAD CROSSING

TITLE SHEET

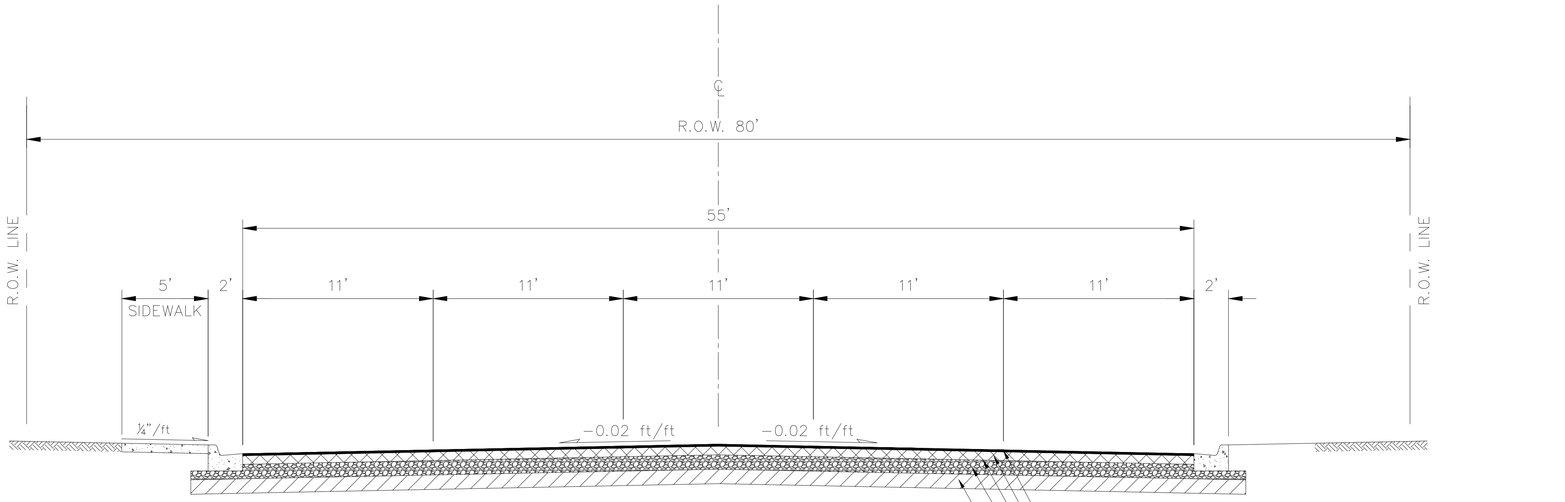
6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
2		
3		
4		
5		
6		
7		

STATE OF TEXAS — JAUN CARLOAS CARDENAS — 99227 — LICENSED PROFESSIONAL ENGINEER

ENGINEER NO. 99227. THESE PLANS WERE PREPARED UNDER THE RESPONSIBLE SUPERVISION OF JUAN CARLOS CARDENAS LICENSED PROFESSIONAL ENGINEER
THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY JUAN CARLOS CARDENAS P.E. #99227

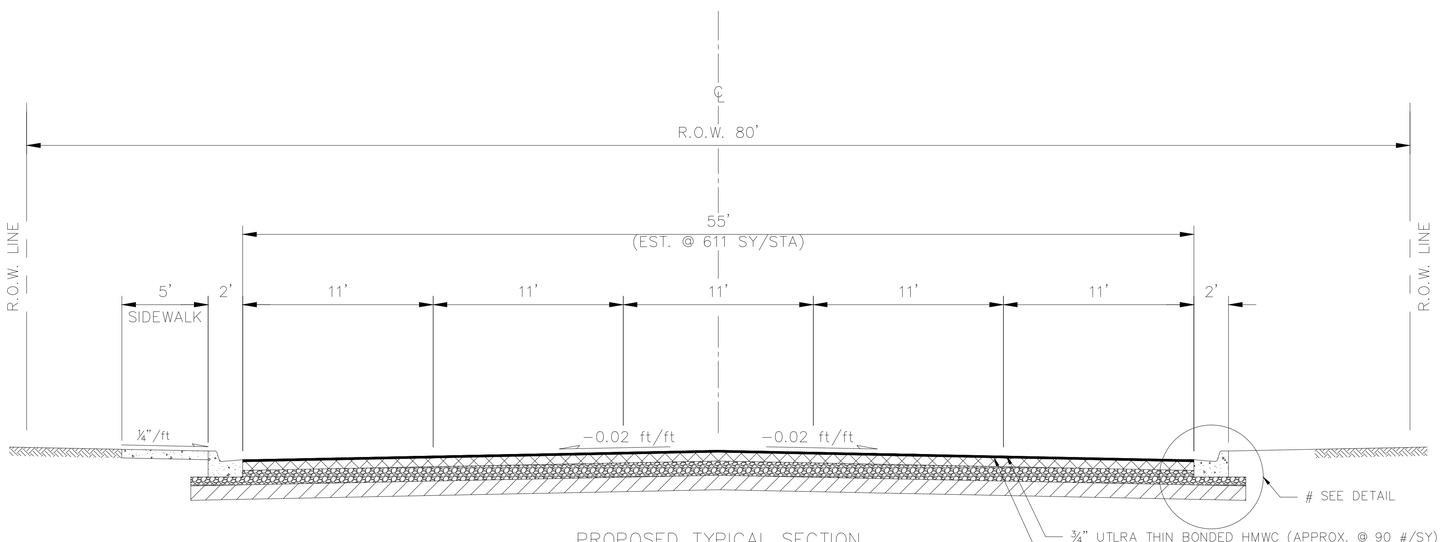
DATE: 04/12/16	SCALE: NTS
DRAWN:	CHECKED BY:
PROJECT #	
SHEET NO: 1	



EXISTING TYPICAL SECTION
STA. 0+00.00 TO STA 3+00.00
APPROX 3.0 STAS.

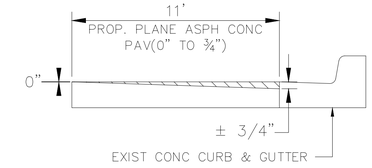
- APPROX. 150 #/S.Y. H.M.A.C.P. (TY. "D") (SURFACE)
- APPROX. 300 #/S.Y. H.M.A.C.P. (TY. "B")
- EMULSIFIED ASPHALT TREATMENT (0.10 GALS/SY)
- APPROX. 8" FLEX. BASE (EST @ 146 CY/STA) STAB. W/1 ½% LIME BY WEIGHT (EST @ 3.43 TONS/STA.)
- APPROX. 8" STAB. SUBGR. EST @ 678 S.Y./STA W/4% LIME BY WEIGHT (EST @ 8.13 TONS/STA)

TRANSITIONS BETWEEN
TYPICAL SECTIONS
STA. 3+00.00 TO 6+25.00



PROPOSED TYPICAL SECTION
STA. 0+00.00 TO STA 3+00.00
APPROX 3.0 STAS.

- ¾" UTLRA THIN BONDED HMWC (APPROX. @ 90 #/SY) (EST. @ 27.5 TON/STA)
- ULTRA THIN BONDED HMWC (MEMBRANE) (EST. @ 0.2 GAL/SY) (EST. @ 122.33 GAL/STA)



#PLANNING DETAIL AT C/G
NOTE: FINISHED GRADE AT GUTTER SHALL BE APPROX. ¼ " ABOVE EDGE OF CONCRETE

TYPICAL SECTIONS

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
2		
3		
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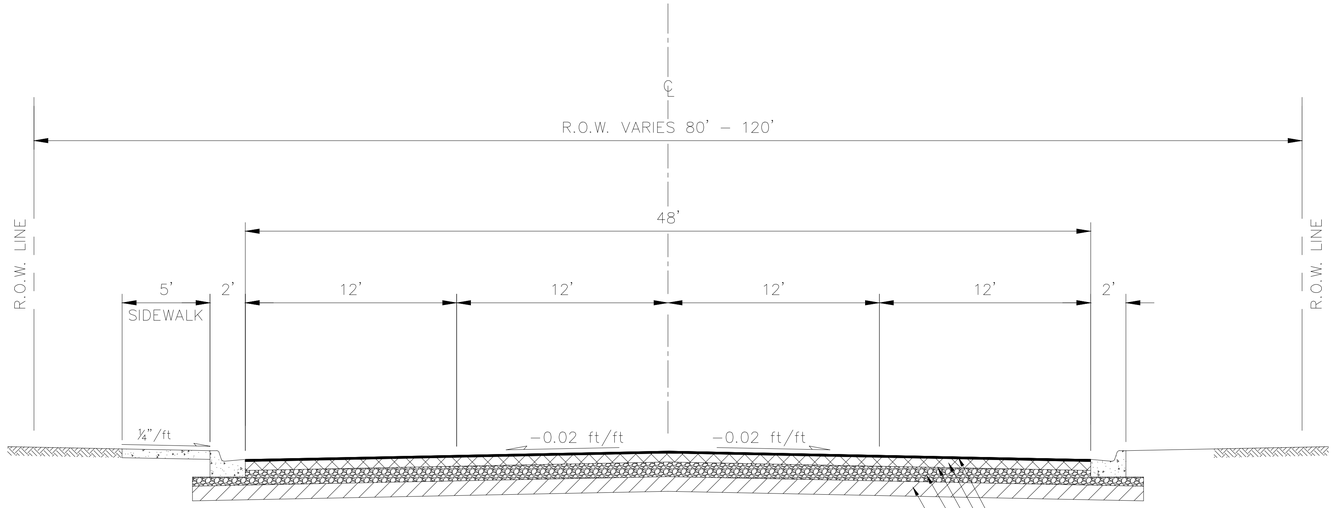
7		

ENGINEER NO. 99227. THESE PLANS WERE PREPARED UNDER THE RESPONSIBLE SUPERVISION OF ALAN CARLOS CARDENAS LICENSED PROFESSIONAL ENGINEER
THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY ALAN CARLOS CARDENAS P.E. #99227

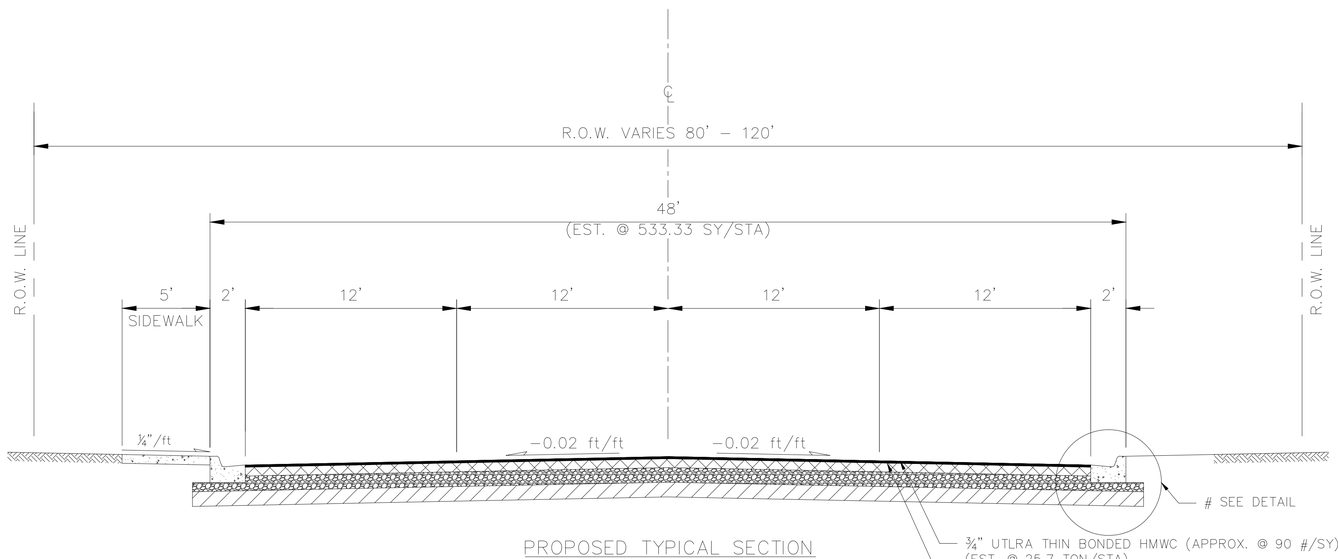
STATE OF TEXAS
ALAN CARLOS CARDENAS
99227
LICENSED
PROFESSIONAL ENGINEER

DATE: 04/12/16	SCALE: NTS
DRAWN:	CHECKED BY:
PROJECT #	
SHEET NO: 2	

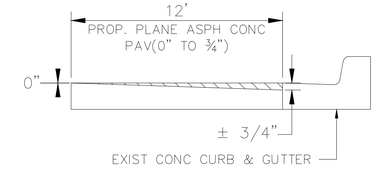


EXISTING TYPICAL SECTION
STA. 6+25.00 TO STA 25+90.00
APPROX 18.33 STAS.
(EXCEPTION STA. 19+72.7 TO STA. 21+04.7)

TRANSITIONS BETWEEN THESE
TYPICAL SECTIONS
STA. 25+90.00 TO STA. 26+77.00



PROPOSED TYPICAL SECTION
STA. 6+25.00 TO STA 25+90.00
APPROX 18.33 STAS.
(EXCEPTION STA. 19+72.7 TO STA. 21+04.7)



#PLANNING DETAIL AT C/G
NOTE: FINISHED GRADE AT GUTTER SHALL BE
APPROX. ¼ " ABOVE EDGE OF CONCRETE

TYPICAL SECTIONS

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
2		
3		
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5		
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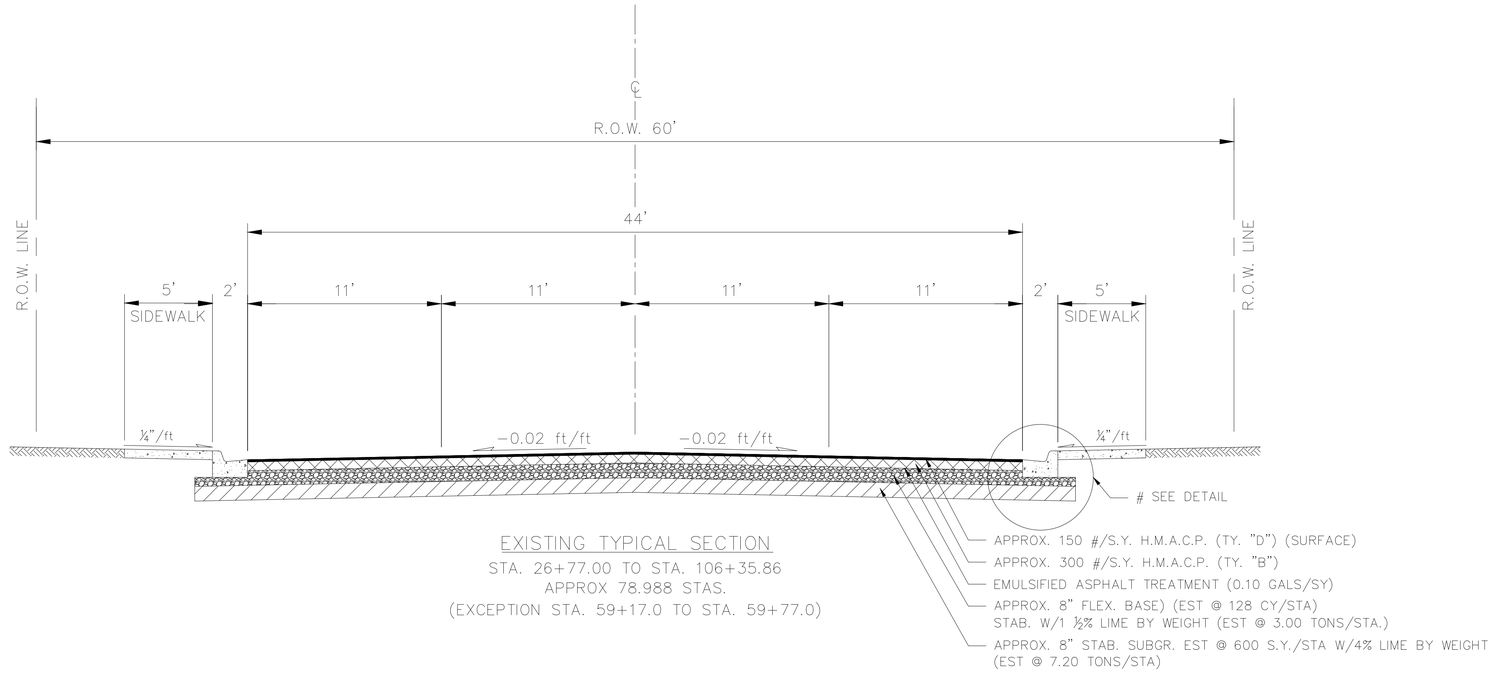
7		

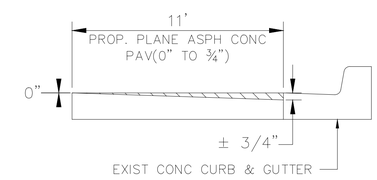
STATE OF TEXAS
JUAN CARLOS CARDENAS
9227
LICENSED
PROFESSIONAL ENGINEER

ENGINEER NO. 99227. THESE PLANS WERE PREPARED UNDER THE RESPONSIBLE SUPERVISION OF JUAN CARLOS CARDENAS LICENSED PROFESSIONAL ENGINEER
THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY JUAN CARLOS CARDENAS P.E. #99227

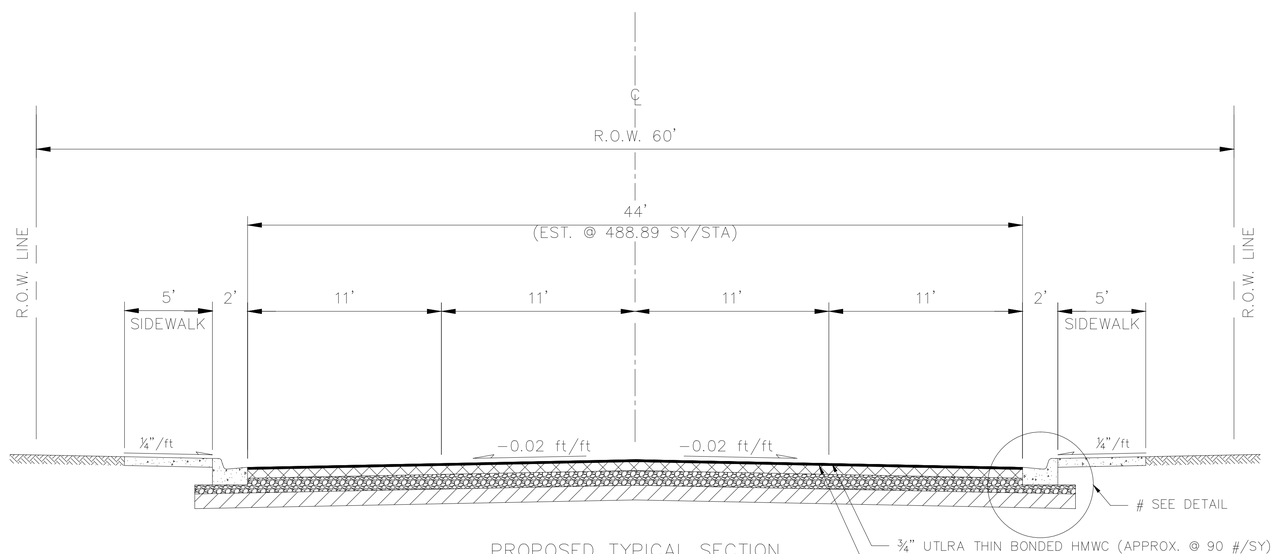
DATE: 04/12/16	SCALE: NTS
DRAWN:	CHECKED BY:
PROJECT #	
SHEET NO: 3	



EXISTING TYPICAL SECTION
STA. 26+77.00 TO STA. 106+35.86
APPROX 78.988 STAS.
(EXCEPTION STA. 59+17.0 TO STA. 59+77.0)



#PLANNING DETAIL AT C/G
NOTE: FINISHED GRADE AT GUTTER SHALL BE
APPROX. ¼ " ABOVE EDGE OF CONCRETE



PROPOSED TYPICAL SECTION
STA. 26+77.00 TO STA. 106+35.86
APPROX 78.988 STAS.
(EXCEPTION STA. 59+17.0 TO STA. 59+77.0)

TYPICAL SECTIONS

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
2		
3		
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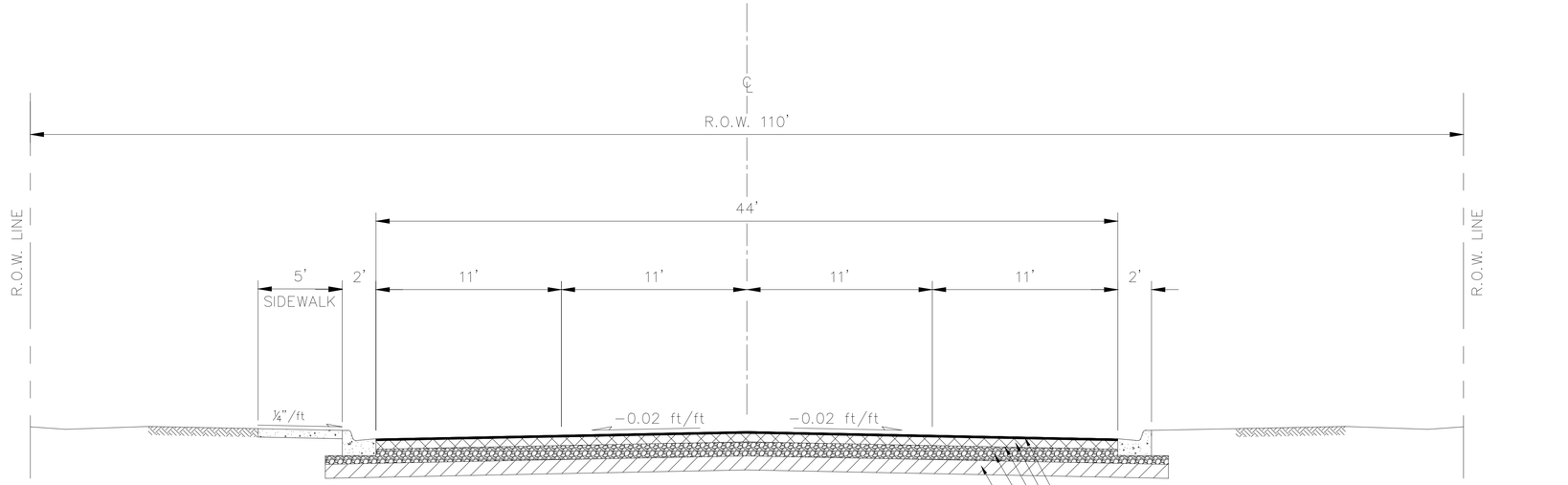
ENGINEER NO. 99227, THESE PLANS WERE PREPARED UNDER THE RESPONSIBLE SUPERVISION OF JUAN CARLOS CARDENAS LICENSED PROFESSIONAL ENGINEER
THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY JUAN CARLOS CARDENAS P.E. #99227

STATE OF TEXAS
JUAN CARLOS CARDENAS
99227
LICENSED
PROFESSIONAL ENGINEER

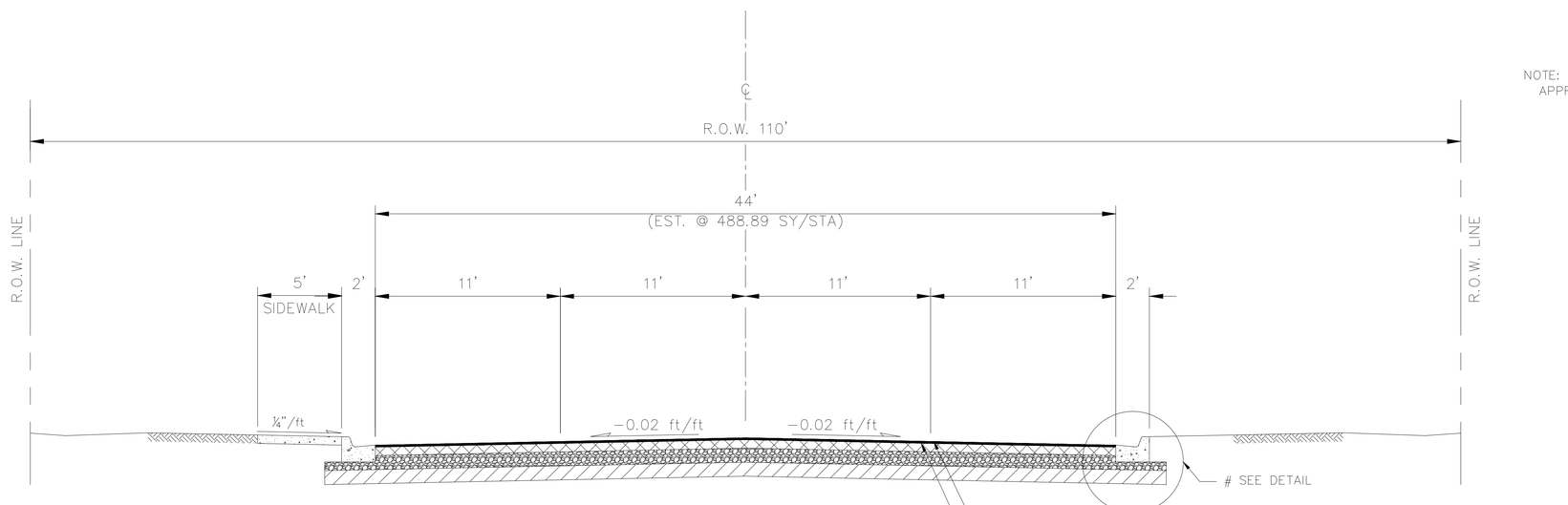
DATE: 06/31/13	SCALE: NTS
DRAWN:	CHECKED BY:
PROJECT #	
SHEET NO: 4	



EXISTING TYPICAL SECTION
STA. 106+35.86 TO STA. 120+00.00
APPROX 13.641 STAS.

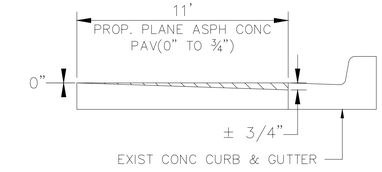
- APPROX. 150 #/S.Y. H.M.A.C.P. (TY. "D") (SURFACE)
- APPROX. 300 #/S.Y. H.M.A.C.P. (TY. "B")
- EMULSIFIED ASPHALT TREATMENT (0.10 GALS/SY)
- APPROX. 8" FLEX. BASE (EST @ 119 CY/STA)
  STAB. W/1 ½% LIME BY WEIGHT (EST @ 2.80 TONS/STA.)
- APPROX. 8" STAB. SUBGR. EST @ 556 S.Y./STA W/4% LIME BY WEIGHT
  (EST @ 6.67 TONS/STA)

TRANSITIONS BETWEEN
TYPICAL SECTIONS
STA. 120+00.00 TO STA. 120+80.00



PROPOSED TYPICAL SECTION
STA. 106+35.86 TO STA. 120+00.00
APPROX 13.641 STAS.

- ¾" UTLRA THIN BONDED HMWC (APPROX. @ 90 #/SY)
  (EST. @ 22.0 TON/STA)
- ULTRA THIN BONDED HMWC (MEMBRANE)
  (EST. @ 0.2 GAL/SY)
  (EST. @ 97.79 GAL/STA)



#PLANNING DETAIL AT C/G
NOTE: FINISHED GRADE AT GUTTER SHALL BE APPROX. ¼ " ABOVE EDGE OF CONCRETE

TYPICAL SECTIONS

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
2		
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ENGINEER NO. 99227, THESE PLANS WERE PREPARED UNDER THE RESPONSIBLE SUPERVISION OF JUAN CARLOS CARDENAS LICENSED PROFESSIONAL ENGINEER
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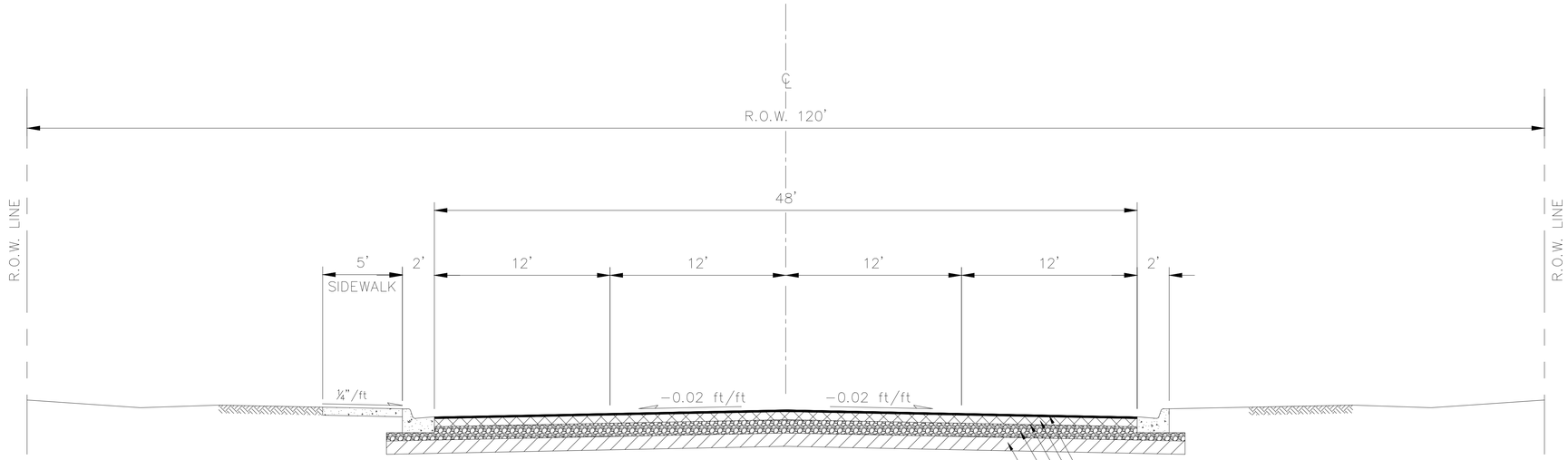
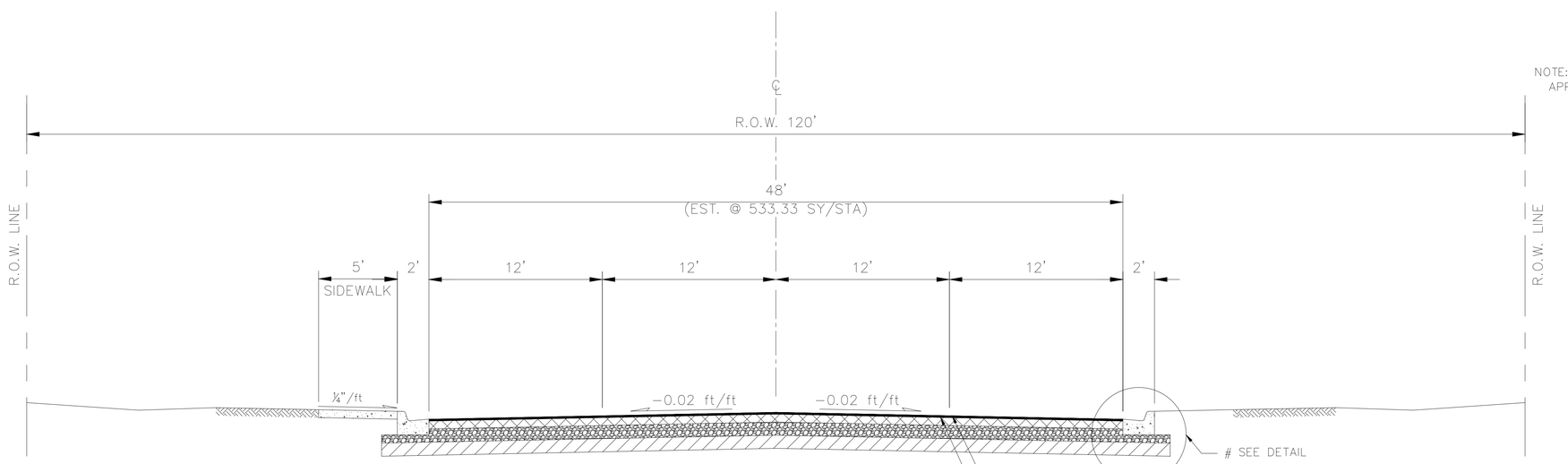
STATE OF TEXAS
JUAN CARLOS CARDENAS
99227
LICENSED
PROFESSIONAL ENGINEER

DATE: 04/12/16	SCALE: NTS
DRAWN:	CHECKED BY:
PROJECT #	
SHEET NO: 5	



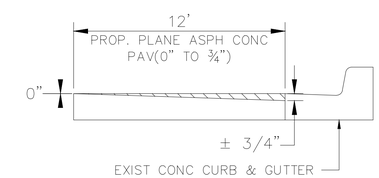
EXISTING TYPICAL SECTION
STA. 120+80.00 TO STA. 138+95.00
APPROX 18.15 STAS.

- APPROX. 150 #/S.Y. H.M.A.C.P. (TY. "D") (SURFACE)
- APPROX. 300 #/S.Y. H.M.A.C.P. (TY. "B")
- EMULSIFIED ASPHALT TREATMENT
- APPROX. 8" FLEX. BASE (EST @ 128 CY/STA)
  STAB. W/1 ½% LIME BY WEIGHT (EST @ 3.00 TONS/STA.)
- APPROX. 8" STAB. SUBGR. EST @ 600 S.Y./STA W/4% LIME BY WEIGHT
  (EST @ 7.20 TONS/STA)



PROPOSED TYPICAL SECTION
STA. 120+80.00 TO STA. 138+95.00
APPROX 18.15 STAS.

- ¾" ULTRA THIN BONDED HMWC (APPROX. @ 90 #/SY)
  (EST. @ 24.0 TON/STA)
- ULTRA THIN BONDED HMWC (MEMBRANE)
  (EST. @ 0.2 GAL/SY)
  (EST. @ 106.67 GAL/STA)



#PLANNING DETAIL AT C/G
NOTE: FINISHED GRADE AT GUTTER SHALL BE
APPROX. ¼ " ABOVE EDGE OF CONCRETE

TYPICAL SECTIONS

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
2		
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STATE OF TEXAS
JUAN CARLOS CARDENAS
99227
LICENSED
PROFESSIONAL ENGINEER

DATE: 04/12/16	SCALE: NTS
DRAWN:	CHECKED BY:
PROJECT #	
SHEET NO: 6	

GENERAL NOTES

PLANS ARE REQUIRED FOR THIS PROJECT.

General

In the event of a called evacuation, emergencies, impending adverse weather or as directed, do not perform any work without written authorization. The City of Kingsville reserves the right to suspend all work in support of evacuations or emergencies. Any work performed, other than work directed by the City of Kingsville, is unauthorized work in accordance with Item 5.

The contract will commence upon issuance of a work order by the Engineer. The work is to be completed within 30 working days.

Project limits shall consist of the work on 6th street – from Corral Street to Loop 428. Work shall begin upon commencement of contract time and shall continue until the proposed work for 6th street is complete. The road-user cost liquidated damage amount for 6th street is $20,000. 6th Street is to be complete before August 31, 2016 or the road-user cist liquidated damage will be assessed to the contractor.

Sweep, clean and remove any construction waste, surplus materials or debris from the roadway and right of way at the end of each day unless otherwise approved. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Each project location will be opened to traffic at the end of the workday. All work necessary to achieve the final riding surface will be completed at the end of the workday. At no point should any milled or seal coated surfaces be open to traffic unless specifically noted in the plans for a particular location, or as approved in writing by the Engineer.

Equipment that remains in the ROW outside of working hours must be parked outside of the clear zone and in a way that does not obstruct sight distance for the traveling public.

Asphalt application season will be established in accordance with Item 316.4.D Adverse Weather Conditions or as directed by the Engineer.

Advise the Engineer in advance as to proposed methods for accommodating traffic during construction at all locations. These methods will be approved by the Engineer before any portion of an existing road or street is disturbed.

Cut existing pavement using a saw or other approved method to ensure a neat traverse/or longitudinal line to assure a smooth tie-in with new pavement. Cut to a minimum depth of the final lift thickness. The work performed will not be measured or paid directly, but will be subsidiary to pertinent Items.

A vacuum sweeper is required for this project for use during milling and HMAC operations. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

All existing pavements which are cut or damaged by the Contractor in the process of his work will be repaired as soon as possible and as directed by the Engineer.

Promptly pick up and properly dispose of paper and other materials used for pavement joints.

All pavement markings shall be in accordance with the latest edition of MUTCD.

ITEM 2

It is recommended that prospective bidders examine the specified work locations with the Engineer to view the nature of the work, the need for close coordination with the various utilities, traffic control considerations, and other factors influencing the prosecution of the work.

This project includes plan sheets that are not part of the bid proposal.

Bid/Contract documents, including drawings and technical specifications are available at City Hall at 200 E Kleberg Street, Kingsville, TX, 78363 and will be forwarded to prospective or supplied upon depositing $50.00 with the Engineer for each set of documents obtained. If mailed, an additional non-refundable fee of $10.00 will be required from all prospective bidders to cover shipping.

ITEM 5

Questions regarding the plan work limits should be brought to the Engineer’s attention prior to commencing work. Measuring equipment will be in working condition and calibrated to the manufacturer’s specification.

Field verify all dimensions and notify Engineer prior to initiating any work.

Verify the locations of utilities, underground or overhead, shown within the limits of the right-of-way. Contact the utility companies for locations and notify the Texas One Call System at 1-800-245-4545 (Toll Free) at least 48 hours prior to beginning any work in the area. Also, notify the TxDOT Corpus Christi traffic signals operations office at (361) 808-2225 when working in the vicinity of intersections to identify buried signal conduit. Adhere to OSHA Standards when working within the vicinity of overhead power lines. Coordinate with the utility companies and notify the Engineer of any possible conflicts. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Notify the Engineer immediately of utility conflicts in accordance with Item 5.5.B. Refer to Item 4.3 for consideration of differing site conditions.

The responsibility for the construction surveying on this contract will be in accordance with Item 5.6.C, “Method C”.

Establish and mark the location of existing standard pavement markings including but not limited to edge lines, transitions, passing and no passing zones, gore areas, etc.

ITEM 7

The work performed for Item 7.7, “Public Safety and Convenience” will not be measured or paid for directly, but will be subsidiary to pertinent Items.

When working at street, farm-to-market, state highway, and county road intersections, schedule work to minimize intersection closures. During nonworking hours, all public road intersections will be open to the traveling public.

The total disturbed area for this project is less than 0.5 acres (stockpile location in ROW).The disturbed area in this project, all project locations in the Contract, and Contractor’s project specific locations (PSLs), within 1 mile of the project limits, for the Contract will further establish the authorization requirements for storm water discharges. The City of Kingsville will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor PSLs for construction support activities on or off ROW. When the total area disturbed for all projects in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer.

Comply with the Texas Aggregate Quarry and Pit Safety Act for waste areas or material source areas resulting from this project.

ITEM 8

The Contractor shall submit a proposed critical path method schedule of work utilizing the Arrow Diagram or Bar Chart Method. This schedule shall be submitted prior to setting of barricades and prior to commencing any work.

Submit an updated progress schedule as directed to show proposed major changes, changes affecting compliance with the contract requirements, or changes affecting the critical path/controlling item of work.

The Contractor shall complete work for all tracts on a given group before beginning work on tracts belonging to another group.

The Contractor’s attention is brought to the fact that other contracted projects may be under construction concurrently within the same limits of the project. This includes utility work performed by the utility companies or their respective contractors.

Working days will be computed and charge in accordance with Article 8.3.A.4, “Standard Workweek”.

Work above traffic is not allowed.

Nighttime work is required.

Contractor shall work at night from 8:00 PM to 6:00 AM. Lane closures are not permitted Monday through Friday before 8:00 PM or after 6:00 AM unless approved, in writing, by the Engineer. All personnel, equipment, and traffic control devices will be off the roadway at the end of each working day by 6:00 AM or at a predetermined time agreed upon with the Engineer.

The Engineer reserves the right to change working hours as working conditions warrant.

Notify the Engineer at least 48 hours in advance of weekend or night work.

ITEM 320

Provide the type of windrow pick-up equipment for approval prior to beginning paving operations.

Use of motor grader will not be permitted unless approved.

ITEM 348

Use asphalt with a PG binder of 76-22.

If the materials furnished are found to have stripping characteristics, the Engineer may require the addition of an approved antistripping agent conforming to the requirements of Item 301, “Asphalt Antistripping Agents”. The cost of the antistripping additives will not be paid for separately but shall be considered subsidiary to the various bid items. If an antistripping agent is used, a test section with the antistripping agent may be required.

Provide for approval a method to prevent any materials from falling off the sides of rail when working over water. The method used and work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Provide for approval a method to prevent any materials from falling into any type of inlet. The method used and work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

ITEM 351

Use of a motor grader will not be permitted.

ITEM 354

Reclaimable asphalt material (R.A.P.) or "millings" produced by this project shall become the property of the City of Kingsville and stock piled at 6th Street and West Ave B or specified by the Engineer.

ITEM 438

Provide for approval a method of cleaning and scaling joints to prevent any materials from falling through the joint when working over water or traffic.

ITEM 479

Manhole adjustments shall consist of the use of prefabricated extension rings to adjust the top of the manhole to proposed finished grade by the City of Kingsville.

ITEM 500

"Materials on Hand" payments are not considered when determining partial payments.

ITEM 502

Furnish additional barricades, signs, and traffic handling as directed. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Traffic control for nighttime land closures shall be in accordance with applicable standard streets.

All land closures will require a truck mounted attenuator. The work performed will not be measured or paid for directly, but will be subsidiary to Item 502.

Project limit traffic control devices at the beginning and ending of each work area, prior to the work limits will conform to BC (2)-13 standard streets. Crossroad signing is required at all signalized intersections.

When advanced warning flashing arrow panels are specified, furnish one (1) standby unit in good condition at the job site for immediate use.

A minimum of two (2) off-duty uniformed law enforcement officers in marked vehicles will be required for all intersection closures. The City of Kingsville will allow access to off-duty law enforcement offices to control traffic signals to safely move traffic through intersections.

The Contractor's Responsible Person (CRP) or his representative(s) shall be located within one hour of traveling time to the project site. The Contractor shall notify the Engineer in writing of the name, physical address, and telephone number of this employee or these employees. The Engineer shall furnish this information to local law enforcement officials.

Maintain traffic control devices by taking corrective action as soon as possible. Complete corrective action within 48 hours of written notification regardless of the day of the week involved unless otherwise directed.

Provide a positive means of communication between flaggers unless otherwise approved.

Attach stop/slow paddle to a staff with a minimum length of 6 feet to the bottom of the sign.

The use of a pilot vehicle in conjunction with flaggers will be permitted. If used, provide positive and unrestricted communication between the driver of the pilot vehicle and the flaggers. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

ITEM 504

No field office will be required for this project.

Apply for and secure permits necessary for the buildings, and pay all utility meter deposits and service bills. The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Maintain all mechanical, electrical, and plumbing facilities at all times.

Furnish and install adequate equipment, outlets, lighting, air conditioning, heating and ventilation as approved. Arrange and install outlets as directed with no less than 1 outlet per wall. Portable toilets will not be allowed.

Provide hot water or a hot water dispenser capable of generating one (1) gallon of water at 140 degrees Fahrenheit with acceptable water pressure.

Use support blocks for stability and tied down portable structures according to applicable zoning requirements or as directed.

Provide Safety Equipment as follows:

(1) ONE EYE WASH STATION
(2) ONE FIRE EXTINGUISHER
(3) ONE FIRST AID KIT

Provide doors with a minimum width of 36 inches and 80 inches in height. Secure all exterior openings with bars.

Provide electrical service for the asphalt content by Ignition Method.

ITEM 506

Designate in writing a Contractor Responsible Person (CRP) for implementing, maintaining, and reviewing environmental requirements.

It is the Contractor's responsibility to avoid excess or loose aggregate from entering adjacent storm drains. Biodegradable erosion control logs shall be placed at inlets before the start of milling operations and maintained in place until after final sweeping before opening to traffic.

The work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items and will be approved by the Engineer prior to use.

Cleaning of asphaltic equipment will be done in such a manner that will not leave any petroleum contaminants in the right-of-way. Any petroleum products spilled will be cleaned up and disposed of properly. No construction waste materials will be buried within the right-of-way.

ITEM 585

For 6th Street, use Surface Test Type A to evaluate ride quality of the travel lanes in accordance with Item 585, "Ride Quality for Pavement Surfaces."

Use the latest version of approved Ride Quality Software.

For QC Testing, provide inertial profiler results the same working day after paving.

For QA Testing, provide the Engineer the opportunity to witness the testing. Provide a seat for the Engineer in the test vehicle or arrange for the Engineer to follow the test vehicle if requested.

ITEM 662

Use temporary flexible-reflective roadway marker tabs as shown on the WZ (STPM)-13 standard.

ITEM 666 & 668

Establish and mark the location of existing standard pavement markings including but not limited to edge lines, transitions, passing and no passing zones, gore areas, etc.

Place pavement markings no later than 14 calendar days after the placement of the surface. When inclement weather prohibits placement of the markings, the 14-day period may be extended until weather permits proper application.

Contractor will stripe entire project with the same configuration as existing striping except for the proposed cross walks. Use provided standards for proposed cross walks.

ITEM 677

Eliminate all conflicting prefabricated pavement markings such as words, arrows, cross walk markings, and stop bars as work progresses or as directed.

Contractor will use Method D to remove existing striping.

This work shall be considered subsidiary to Item 348.

Provide for approval a method to prevent any materials from falling off the sides of rail when working over water. The method used and work performed will not be measured or paid for directly, but will be subsidiary to pertinent Items.

ITEM 6001

Furnish the portable changeable message signs displaying the correct message at least seven (7) days prior to beginning work or as directed.

The Contractor's Responsible Person (CRP) will maintain full control of messages at all times.

The Engineer will provide the sign message text to use at each sign.

A minimum of 2 PCMS will be required. However, additional units may be necessary depending on the work in progress.

Standby time will not be measured or paid for directly, but will be subsidiary to pertinent Items.

****

SPECIFICATION DATA

UNIT WEIGHT ESTIMATES

ITEM 351 – D-GR HMA TY-B SAC-B PG70-22----------110 LBS/SY/IN

ITEM 348- THIN BONDED WEARING COURSE (UTBHMWC)

THIN BONDED WEARING COURSE (MEMBRANE)—0.2 GAL/SY

THIN BONDED WEARING COURSE (TYPE C)------90 LBS/SY

94.5% AGGREGATE

5.5% ASPHALT

						PROJECT								
						CONTROL		A	ITEM-CODE			DESCRIPTION		TOTAL
						ROADWAY VARIOUS		L						
								T						
EST.	FINAL	EST.	FINAL	EST.	FINAL	EST.	FINAL		ITEM NO.	DESC CODE	SP NO		UNIT	EST.	TOTAL
									348			TBWC (MEMBRANE)	GAL	13998	
									348			TBWC (ASPHALT)	TON	173	
									348			TBWC (AGGREGATE) (TY C)	TON	2976	
									351			FLEXIBLE PAVEMENT STRUCTURE REPAIR (5")	SY	117	
									354			PLANE ASPH CONC PAV (0" TO 3/4")	SY	700	
									438			CLEANING AND SEALING EXISTING JOINTS	LF	336	
									479			ADJUSTING MANHOLES	EA	23	
									479			ADJUSTING MANHOLES (WATER VALVE BOX)	EA	7	
									500			MOBILIZATION	LS	1	
									502			BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	3	
									662			WK ZN PAV MARK SHT TERM (TAB) TY W	EA	1749	
									662			WK ZN PAV MARK SHT TERM (TAB) TY Y-2	EA	1456	
									666			REFL PAV MRK TY 1 (W) 4" (BRK) (090MIL)	LF	5830	
									666			REFL PAV MRK TY 1 (W) 8" (SLD) (090MIL)	LF	460	
									666			REFL PAV MRK TY 1 (Y) 4" (SLD) (090MIL)	LF	29120	
									668			PREFAB PAV MRK TY C (W) (12") (SLD)	LF	900	
									668			PREFAB PAV MRK TY C (W) (24") (SLD)	LF	375	
									668			PREFAB PAV MRK TY C (W) (ARROW)	EA	7	
									668			PREFAB PAV MRK TY C (W) (WORD)	EA	2	
									672			REFL PAV MARK TY I-C	EA	356	
									672			REFL PAVE MRKR TY II-A-A	EA	780	
									6001			PORTABLE CHANGEABLE MESSAGE SIGN	DAY	30	

ESTIMATE QUANTITY SHEET

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
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STATE OF TEXAS
JUAN CARLOS CARDENAS
99227
LICENSED
PROFESSIONAL ENGINEER

DATE: 04/12/16	SCALE: NTS
DRAWN:	CHECKED BY:
PROJECT #	
SHEET NO: 12	

STA		REMARKS	TOTAL PROP. OVERLAY THICKNESS	PLANING WIDTH	AVG PVMNT WIDTH	LENGTH	SURFACE AREA	ITEM 354	ITEM 348		
								PLANE ASPH CONC PAVE (0" TO 3/4")	TBWC (MEMBRANE)	TBWC (ASPHALT)	TBWC (AGGREGATE) (TY C)
FROM	TO		IN	LF	LF	LF	SY	SY	GAL	TON	TON
6TH STREET											
0+00.00	3+00.00	PLANING, 3/4" UTBHMWC	3/4"	22	55	300	1833	733	367	5	78
3+00.00	6+25.00	PLANING, UTBHMWC	3/4"	23	51.5	325	1860	831	372	5	79
6+25.00	25+90.00	PLANING, UTBHMWC	3/4"	24	48	1965	10480	5240	2096	26	446
25+90.00	26+77.00	PLANING, UTBHMWC	3/4"	23	46	87	445	222	89	1	19
26+77.00	59+17.00	PLANING, UTBHMWC	3/4"	22	44	3240	15840	7920	3168	39	674
59+77.00	106+35.86	PLANING, UTBHMWC	3/4"	22	44	4659	22777	11388	4555	56	969
106+35.86	120+00.00	PLANING, UTBHMWC	3/4"	22	44	1364	6669	3335	1334	17	284
120+00.00	120+80.00	PLANING, UTBHMWC	3/4"	23	46	80	409	204	82	1	17
120+80.00	138+95.00	PLANING, UTBHMWC	3/4"	24	48	1815	9680	4840	1936	24	412
PROJECT TOTALS						13835	69992	34714	13998	173	2976

ROADWAY SUMMARY

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
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PROFESSIONAL ENGINEER

DATE: 04/12/16	SCALE: NTS
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PROJECT #	
SHEET NO: 13	

STA/STREET	DIRECTION	REMARKS	REPAIR THICKNESS	REPAIR WIDTH	LENGTH	ITEM 354	ITEM 351	NON-PAY		
						PLANE ASPH CONC PAV (3/4")	FLEXIBLE PAVEMENT STRUCTURE REPAIR (5")	ITEM 354	ITEM 341	
								PLANE ASPH CONC PAV (5")	D-GR HMA TY -B SAC B PG70-22	NON-TRACKING TACK COAT
			IN	LF	LF	SY	SY	SY	TON	GAL
6TH STREET										
WARREN	SOUTH-BOUND	PLANE INTERSECTION 5" FLEX PAV STR RPR	5	21	50	700	117	117	32	7
PROJECT TOTAL:					50	700	117	117	32	7

NOTE: SPECIFIC LOCATIONS FOR ADD-ON WORK WILL BE DETERMINED, IN THE FIELD, BY THE ENGINEER

PAVEMENT REPAIR SUMMARY

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
2		
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7		

STATE OF TEXAS
JUAN CARLOS CARDENAS
99227
LICENSED
PROFESSIONAL ENGINEER

ENGINEER NO. 99227. THESE PLANS WERE PREPARED UNDER THE RESPONSIBLE SUPERVISION OF JUAN CARLOS CARDENAS LICENSED PROFESSIONAL ENGINEER
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DATE: 04/12/16	SCALE: NTS
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PROJECT #	
SHEET NO: 14	

LOCATION		REMARKS	TOTAL PROP. OVERLAY THICKNESS	SURFACE AREA	ITEM 530	FOR CONTRACTOR'S INFO ONLY; NON-PAY			
					TURNOUTS (ACP)	ITEM 354	ITEM 348	ITEM 348	ITEM 348
						PLANE ASPH CONC PAV (0" TO 3/4")	TBWC (MEMBRANE)	TBWC (ASPHALT)	TBWC (AGGREGATE) (TY C)
			IN	SY	SY	SY	GAL	TON	TON
6TH STREET									
CORRAL	LT	PLANING, 3/4' TBWC	3/4"						
	RT								
MESQUITE	LT	PLANING, 3/4' TBWC	3/4"						
AVE D	LT	PLANING, 3/4' TBWC	3/4"						
	RT								
AVE C	LT	PLANING, 3/4' TBWC	3/4"						
AVE B	LT	PLANING, 3/4' TBWC	3/4"						
NETTIE	LT	PLANING, 3/4' TBWC	3/4"						
ELLA	LT	PLANING, 3/4' TBWC	3/4"						
SANTA GERTRUDIS	LT	PLANING, 3/4' TBWC	3/4"						
	RT								
RICHARD	LT	PLANING, 3/4' TBWC	3/4"						
ALICE	LT	PLANING, 3/4' TBWC	3/4"						
	RT								
LEE	LT	PLANING, 3/4' TBWC	3/4"						
HENRIETTA	LT	PLANING, 3/4' TBWC	3/4"						
YOAKUM	LT	PLANING, 3/4' TBWC	3/4"						
	RT								
KLEBERG	LT	PLANING, 3/4' TBWC	3/4"						
	RT								
KENEDY	LT	PLANING, 3/4' TBWC	3/4"						
	RT								
LOTT	LT	PLANING, 3/4' TBWC	3/4"						
HUISACHE	LT	PLANING, 3/4' TBWC	3/4"						
	RT								
FORDYCE	LT	PLANING, 3/4' TBWC	3/4"						
JOHNSTON	LT	PLANING, 3/4' TBWC	3/4"						
DODDRIDGE	LT	PLANING, 3/4' TBWC	3/4"						
RAGLAND	LT	PLANING, 3/4' TBWC	3/4"						
CAESAR	LT	PLANING, 3/4' TBWC	3/4"						
HOFFMAN	LT	PLANING, 3/4' TBWC	3/4"						
SHELTON	LT	PLANING, 3/4' TBWC	3/4"						
MILLER	LT	PLANING, 3/4' TBWC	3/4"						
ALEXANDER	LT	PLANING, 3/4' TBWC	3/4"						
AILSIE	LT	PLANING, 3/4' TBWC	3/4"						
	RT								
OTIS	LT	PLANING, 3/4' TBWC	3/4"						
CAROL	LT	PLANING, 3/4' TBWC	3/4"						
BUS 77	LT	PLANING, 3/4' TBWC	3/4"						
PROJECT TOTALS				0	0	0	0	0	0

TURNOUT SUMMARY

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
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STATE OF TEXAS
JUAN CARLOS CARDENAS
99227
LICENSED
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DATE: 04/12/16	SCALE: NTS
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PROJECT #	
SHEET NO: 15	

LOCATION			ITEM 662		ITEM 666								
			WRK ZN PAV MRK SH TRM		REFL PAV MRK TY I								
			(TAB) TY W	(TAB) TY Y-2	(W) (4") (BRK) (90 MIL)	(W) (8") (SLD) (90 MIL)	(Y) (4") (SLD) (90 MIL)	(W) (12") (SLD) (90 ML)	(W) (24") (SLD) (90 ML)	ARROW (W)	WORD (W)	TY I-C	TY II-A-A
			EA	EA	LF	LF	EA	LF	LF	EA	EA	EA	EA
6TH STREET													
CORRAL	TO	LOOP 428	1749	1456	5830	460	29120	900	375	7	2	356	780
PROJECT TOTAL:			1749	1456	5830	460	29120	900	375	7	2	356	780

PAVEMENT MARKING SUMMARY

6TH ST. OVERLAY FROM CORALL TO LOOP 428

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DATE: 04/12/16	SCALE: NTS
DRAWN:	CHECKED BY:
PROJECT #	
SHEET NO: 16	

SUMMARY OF MANHOLE & VALVE ADJUSTMENTS					
STATION	OFFSET	(FT)	DESCRIPTION	VALVE BOXES	MANHOLES
18+49.50	54.40'	LT	WATRE VALVE	1	
26+34.40	30.90'	RT	SANITARY SEWER		1
29+83.00	30.00'	LT	WATER VALVE	1	
29+86.00	32.90'	LT	WATRE VALVE	1	
31+74.00	1.30'	LT	SANITARY SEWER		1
31+74.00	28.00'	RT	SANITARY SEWER		1
36+97.10	28.70'	LT	WATER VALVE	1	
37+16.00	28.00'	RT	SANITARY SEWER		1
40+76.00	28.00'	RT	SANITARY SEWER		1
44+24.90	29.60'	RT	WATER VALVE	1	
44+39.00	28.00'	RT	SANITARY SEWER		1
50+12.10	26.50'	RT	SANITARY SEWER		1
53+78.60	4.00'	LT	SANITARY SEWER		1
66+77.00	28.00'	RT	SANITARY SEWER		1
66+77.00	1.00'	LT	SANITARY SEWER		1
70+37.00	28.00'	RT	SANITARY SEWER		1
74+00.00	28.00'	RT	SANITARY SEWER		1
77+56.00	28.00'	RT	SANITARY SEWER		1
81+17.00	28.00'	RT	SANITARY SEWER		1
84+77.00	28.00'	RT	SANITARY SEWER		1
85+00.00	29.00'	LT	WATER VALVE	1	
88+37.00	28.00'	RT	SANITARY SEWER		1
91+96.00	28.00'	RT	SANITARY SEWER		1
97+25.00	28.00'	RT	SANITARY SEWER		1
102+25.00	28.00'	RT	SANITARY SEWER		1
104+15.30	29.00'	RT	SANITARY SEWER		1
104+39.00	25.80'	RT	WATER VALVE	1	
106+60.00	28.00'	RT	SANITARY SEWER		1
120+42.00	35.00'	LT	SANITARY SEWER		1
120+57.70	19.50'	RT	SANITARY SEWER		1
			TOTAL	7	23

MANHOLE SUMMARY

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
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DATE: 04/12/16	SCALE: NTS
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GENERAL NOTES FOR THE CONSTRUCTION SEQUENCE

1. THE CONTRACTOR MAY BE REQUIRED TO FURNISH ADDITIONAL SIGNS AND BARRICADES IN ADDITION TO THE ONES SHOWN ON THE TRAFFIC CONTROL PLAN, TCP STANDARD SHEETS, AND BC STANDARD SHEETS. THIS WORK WILL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS.
2. CW20-1D & G20-2A SIGNS WILL BE REQUIRED AT ALL SIGNALIZED INTERSECTIONS WITHIN THE PROJECT LIMITS. G20-2A SIGNS MAY BE MOUNTED ON BACK OF CW20-1D, SEE BC (2) -07.
3. FOR THIS PROJECT, ALL TEMPORARY LANE CLOSURES SHALL BE IN ACCORDANCE WITH THE APPLICABLE STANDARD SHEETS SHOWN IN THE PLANS.
4. THE CONTRACTOR WILL BE RESPONSIBLE FOR MARKING THE LOCATION OF TRAFFIC CONTROL STRIPING, AND ALL PERMANENT STRIPING AS DIRECTED BY THE ENGINEER.
5. THE CONTRACTOR MAY VARY THE SPACING OF SIGNS TO MEET TRAFFIC CONDITIONS AS APPROVED AND DIRECTED BY THE ENGINEER.
6. ALL SIGNS, BARRICADES, AND POSTS SHALL BE NEW AND CLEAN FOR THE DURATION OF THE PROJECT.
7. ALL BEGINNING AND ENDING BARRICADES AND SIGNS ARE TO REMAIN IN PLACE FOR THE DURATION OF THE PROJECT.
8. REFER TO THE BARRICADE AND CONSTRUCTION STANDARD SHEETS FOR REQUIRED SPACING OF SIGNS AND BARRICADES.
9. DURING NIGHT WORK OPERATIONS, THE CONTRACTOR SHALL MAINTAIN ADEQUATE LIGHTING DURING CONSTRUCTION. A LIGHTING PLAN MUST BE SUBMITTED AND APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION. LIGHTING NEEDED TO PERFORM WORK SHALL NOT BE PAID FOR DIRECTLY AND SHOULD BE CONSIDERED SUBSIDIARY TO ITEM 502.
10. THE CONTRACTOR SHALL PROVIDE FOR SAFE AND CONVENIENT INGRESS AND EGRESS TO ABUTTING PROPERTY, HIGHWAY, PUBLIC ROAD, AND STREET CROSSINGS WITHIN PROJECT LIMITS AT ALL TIMES. CONTRACTOR SHALL COORDINATE HIS WORK ACTIVITIES TO MINIMIZE ANY INCONVENIENCE TO THE PUBLIC.
11. THE CONTRACTOR SHALL VACUUM SWEEP ALL MILLED SURFACES BEFORE OPENING TO TRAFFIC.
12. THE CONTRACTOR MAY SUBMIT AN ALTERNATE TCP AND/OR AN ALTERNATE SEQUENCE OF CONSTRUCTION, IN ADVANCE AND IN WRITING, SUBJECT TO THE APPROVAL OF THE ENGINEER.

PAVEMENT DROP-OFF

1. MAXIMUM ELEVATION DROP-OFF ON PAVEMENT EDGE SHALL NOT EXCEED ONE (1) INCH WHEN TRAFFIC IS ALLOWED ADJACENT TO THE DROP-OFF. THE SLOPE MUST BE COMPACTED MATERIAL CAPABLE OF SAFELY SUPPORTING VEHICLES. THIS WORK WILL NOT BE PAID FOR DIRECTLY, BUT SHALL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS.
2. SIGNING FOR PAVEMENT DROP-OFF (CW8-9A) SHOULD BE INSTALLED IN ADVANCE OF THE CONDITION AND REPEATED EVERY ONE (1) MILE, AS NECESSARY. SIGNS INSTALLED ALONG THE PAVEMENT EDGE SHOULD BE SUPPLEMENTED WITH EITHER "NEXT XX MILES" SIGN (CW21-16) OR ADVISORY SPEED SIGN (CW13-1) AS DIRECTED BY THE ENGINEER.

UNEVEN LANES

1. SIGNING FOR UNEVEN LANES (CW8-11) SHOULD BE INSTALLED IN ADVANCE TO THE CONDITION AND REPEATED EVERY ONE (1) MILE, AS NECESSARY. SIGNS INSTALLED ALONG THE UNEVEN LAND CONDITION SHOULD BE SUPPLEMENTED WITH EITHER "NEXT XX MILES" SIGN (CW21-16) OR ADVISORY SPEED SIGN (CW13-1), SEE STANDARD SHEET WZ (UL)-13 FOR ADDITIONAL DETAILS.
2. UNEVEN LAND SIGNS (CW8-11) SHALL BE ERECTED ON BOTH ENDS ON THE AREA WHERE THERE IS A DIFFERENCE IN ELEVATION BETWEEN ADJACENT LANES.

SUGGESTED SEQUENCE OF CONSTRUCTION (LOCATION #1)

1. PLACE ADVANCE WARNING SIGNS AND BARRICADES AT EACH END OF THE PROJECT LIMITS AS DEPICTED WITHIN THE BARRICADE AND CONSTRUCTION STANDARD SHEETS AND THE WORK ZONE STANDARD SHEETS.
2. INSTALL BIODEGRADABLE EROSION CONTROL LOGS AT THE LOCATIONS SPECIFIED IN THE PLANS.
3. ALL WORK FOR THIS PROJECT SHALL BE PERFORMED AT NIGHT. NIGHT WORK WILL COMMENCE AT 8:00 PM AND CONTINUE UNTIL 6:00 AM. ALL EQUIPMENT AND TRAFFIC HANDLING DEVICES SHALL BE REMOVED BY 6:00 AM, PRIOR TO OPENING TO TRAFFIC.
4. PLANE PAVEMENT 3/4", PERFORM FLEXIBLE PAVEMENT STRUCTURE REPAIR, AND PLACE TBWC AS SHOWN ON THE TYPICAL SECTIONS. THE PLANED AREA SHALL BE LIMITED, IN LENGTH, TO THAT WHICH CAN BE COMPLETED WITH TBWC IN ONE NIGHT. TRAFFIC WILL NOT BE ALLOWED TO RIDE ON PLANED SURFACES. ROADWAY SHALL BE PLANED BEFORE PERFORMANCE OF FLEXIBLE PAVEMENT STRUCTURE REPAIR. OPERATIONS SHALL BE PLANNED TO MINIMIZE THE IMPACT TO TRAFFIC AT THE SIGNALIZED INTERSECTIONS. THE CONTRACTOR WILL TAPER THE TBWC AT THE END OF THE NIGHT TO PROVIDE A SMOOTH DRIVING SURFACE.
5. PLACE PERMANENT STRIPING IN ACCORDANCE WITH ALL APPLICABLE STANDARDS.

NOTE: SHORT TERM MARKERS (TABS) SHALL BE USED TO DELINEATE THE LANE LINES FOR A MAXIMUM OF 14 DAYS. PERMANENT STRIPING SHALL THEN BE PLACED. THE STRIPING CREW MAY HAVE SEVERAL MOVE-INS DEPENDING ON THE SEQUENCE OF CONSTRUCTION.

SEQUENCE OF CONSTRUCTION

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
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PROJECT #	
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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. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20–10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.

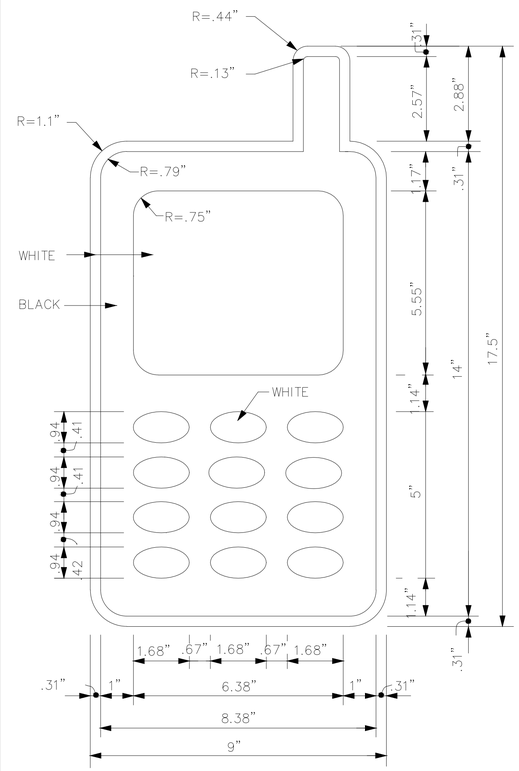
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

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 APPAREL 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.



3.0" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[STAY ALERT] Font: D
3.0" Radius, 1.25" Border, 0.75" Indent, Black on Orange;
[TALK OR TEXT LATER] Font: C specified length;

SIGN DETAIL (G20–10T)

Only pre–qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre–qualified products and their sources and may be found on–line at the web address given below or by contacting:

Texas Department of Transportation
Traffic Operations Division – TE
Phone (512) 416–3118

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

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)–14

FILE: bc–14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4–03 5–10 8–14 9–07 7–13	DIST	COUNTY		SHEET NO. 19

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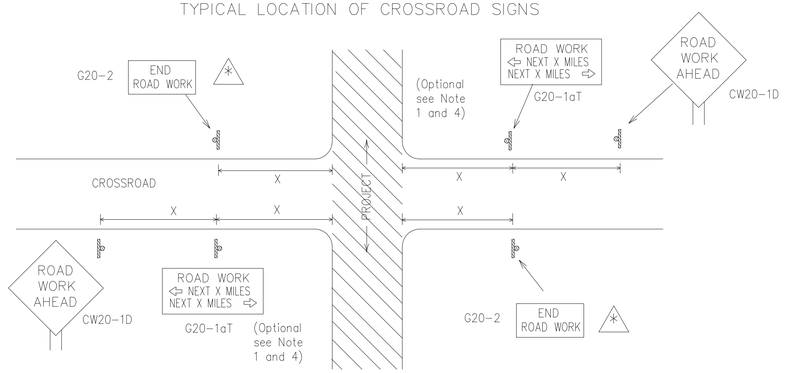
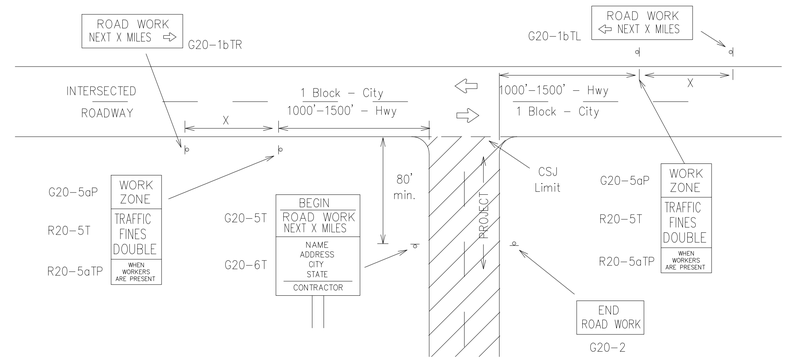
TYPICAL LOCATION OF CROSSROAD SIGNS



(*) 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. 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" (Δ)
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]

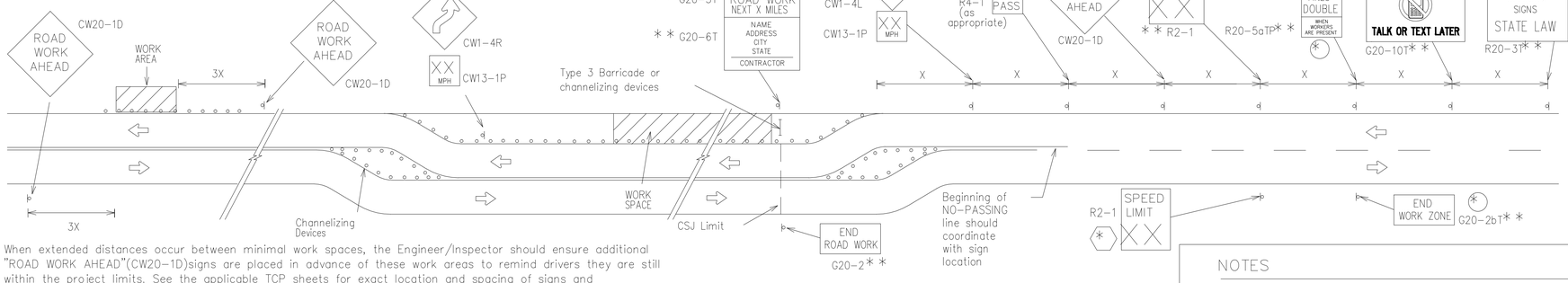
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

Δ 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. 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.

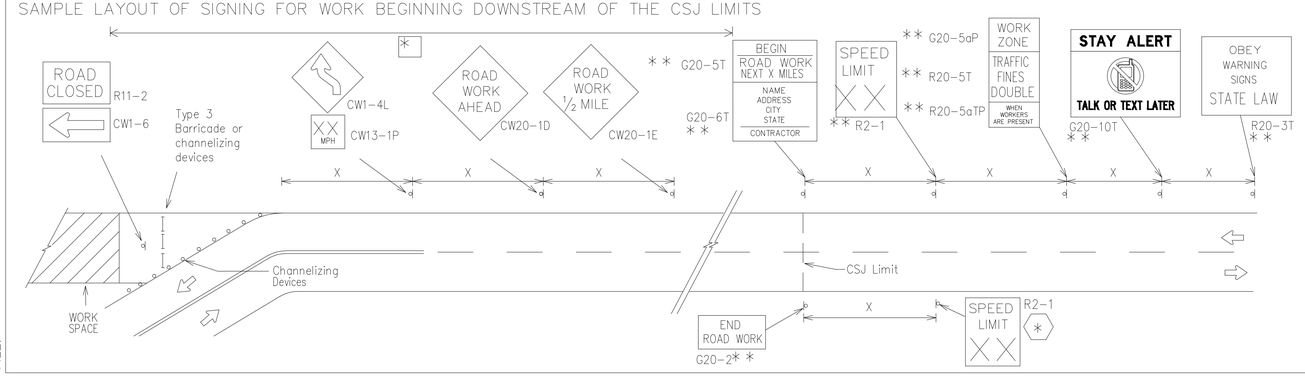
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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.

** Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

(*) 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.

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Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

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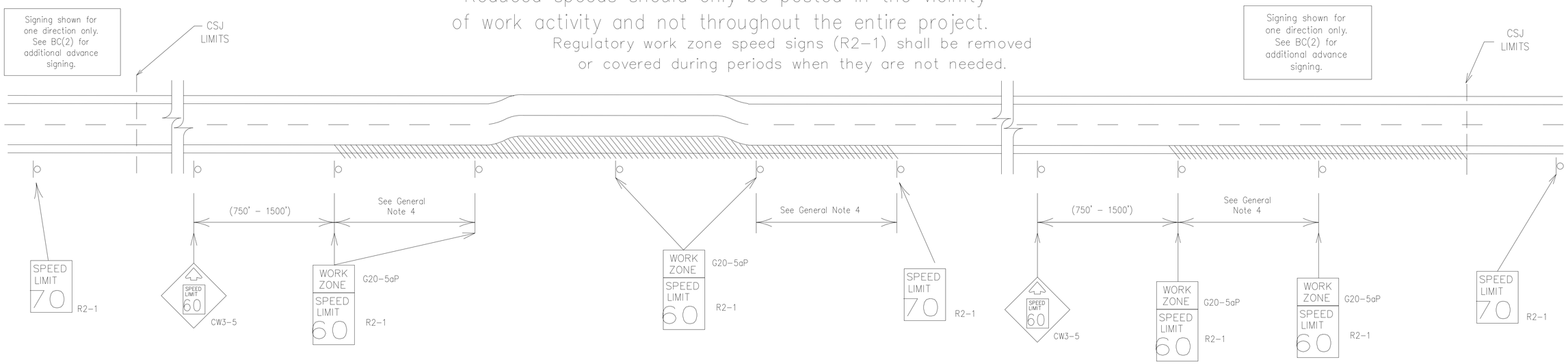
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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 travelled 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.

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Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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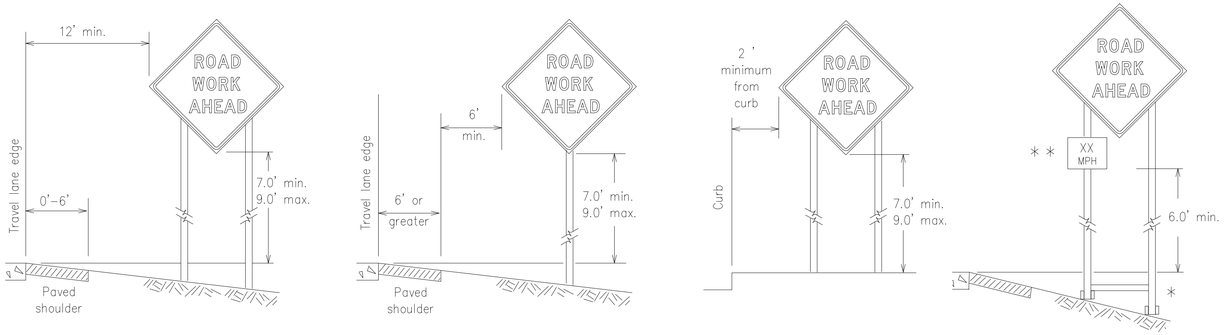
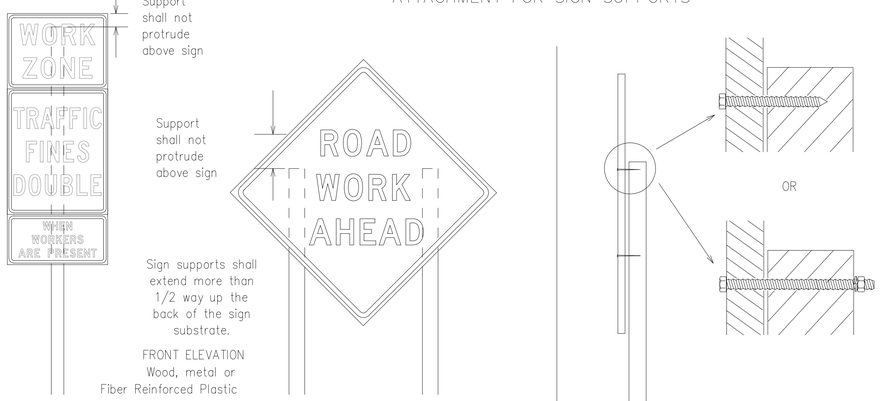
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



* 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



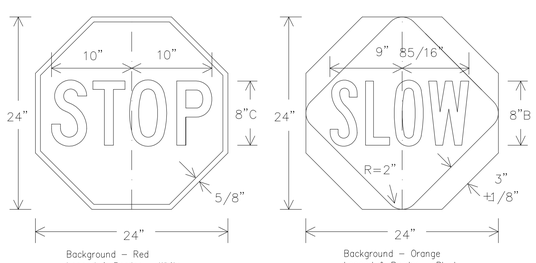
Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should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

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.

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" as detailed below.
2. When used at night, the STOP/SLOW paddle shall be retroreflectorized.
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.



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, 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.
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 sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards 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). 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 or Type 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 Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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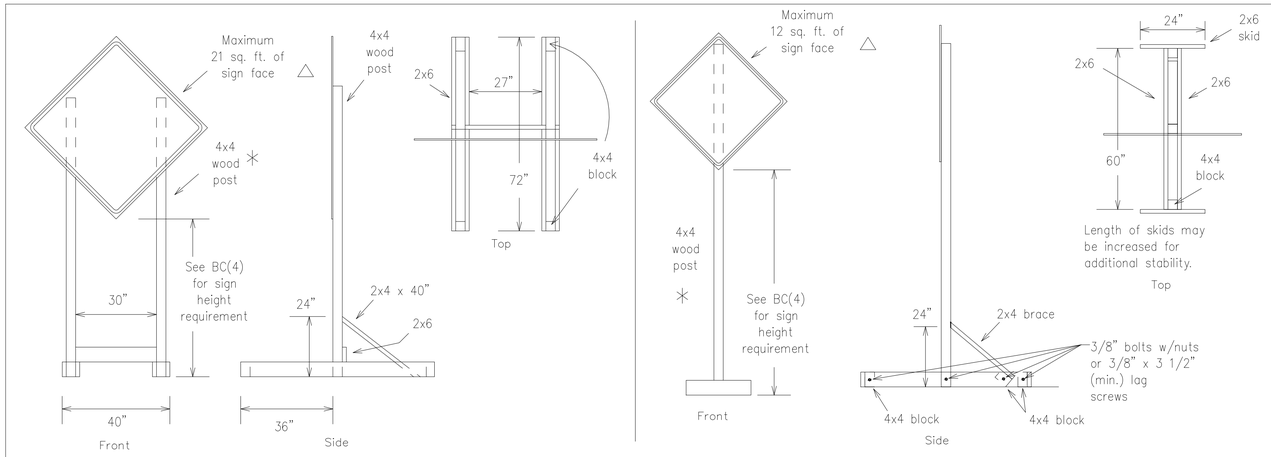
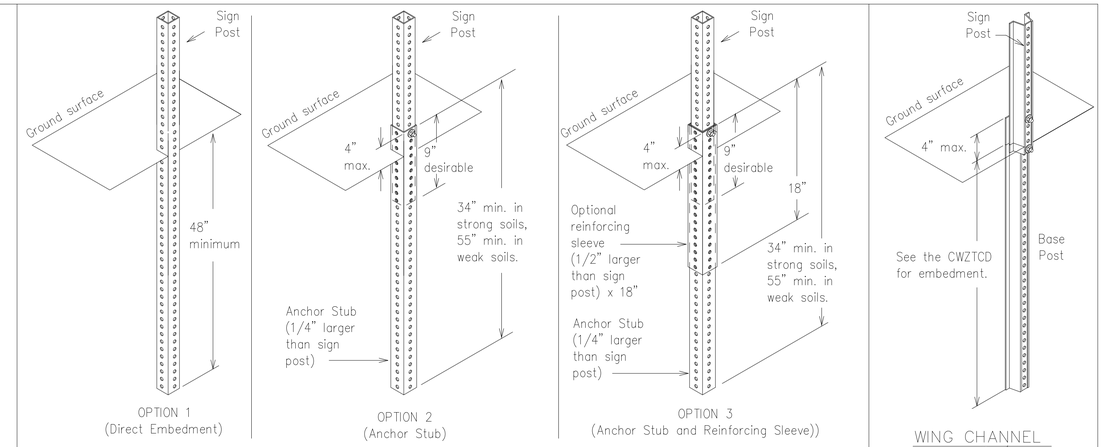


SKID MOUNTED WOOD SIGN SUPPORTS

LONG/INTERMEDIATE TERM STATIONARY – PORTABLE SKID MOUNTED SIGN SUPPORTS □

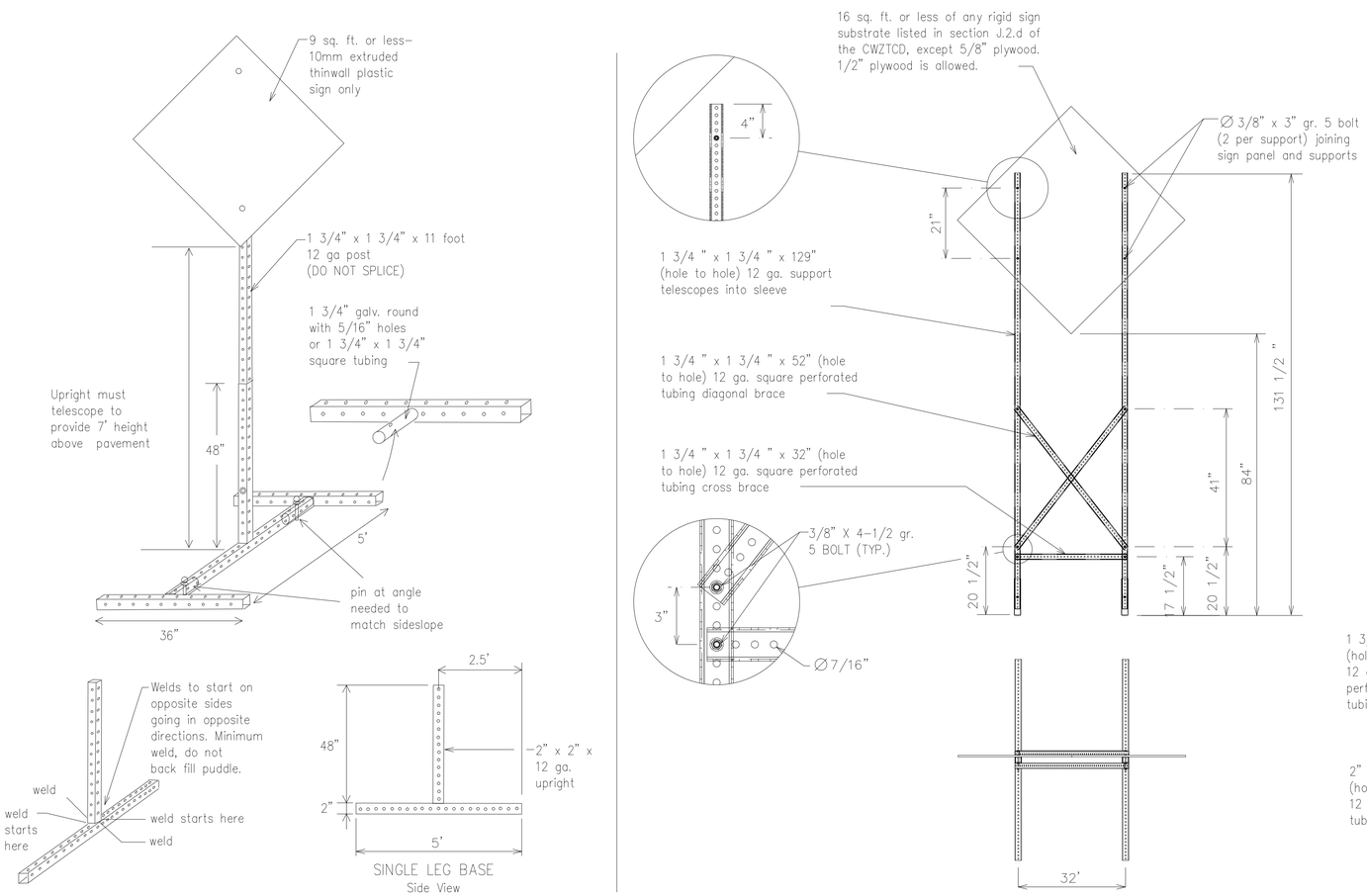


PERFORATED SQUARE METAL TUBING

WING CHANNEL
Lap-splice/base bolted anchor

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.



Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS

SKID MOUNTED PERFORATED SQUARE STEEL TUBING 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.

SHEET 5 OF 12

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)–14

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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	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Cannot	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
Emergency	EMER	Slippery	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWNTN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLRS
High-Occupancy	HOV	Tuesday	TUES
Vehicle Highway	HWY	Time Minutes	TIME MIN
Hour(s)	HR, HRS	Upper Level	UPR LEVEL
Information	INFO	Vehicles (s)	VEH, VEHS
It Is	ITS	Warning	WARN
Junction	JCT	Wednesday	WED
Left	LFT	Weight Limit	WT LIMIT
Left Lane	LFT LN	West	W
Lane Closed	LN CLOSED	Westbound	(route) W
Lower Level	LWR LEVEL	Wet Pavement	WET PVMT
Maintenance	MAINT	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

** 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.

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Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

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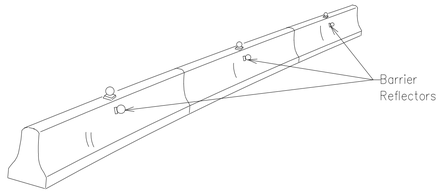
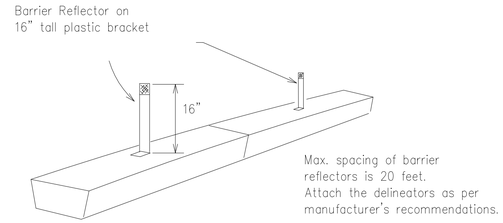
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

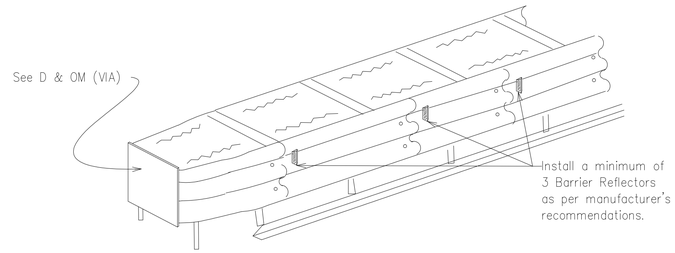


CONCRETE TRAFFIC BARRIER (CTB)

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.



LOW PROFILE CONCRETE BARRIER (LPCB)

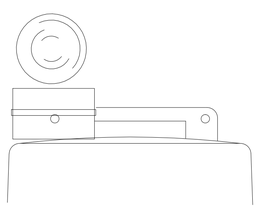


DELINEATION OF END TREATMENTS

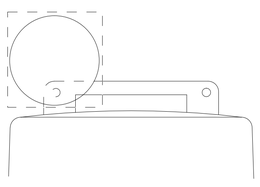
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. 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 or C 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

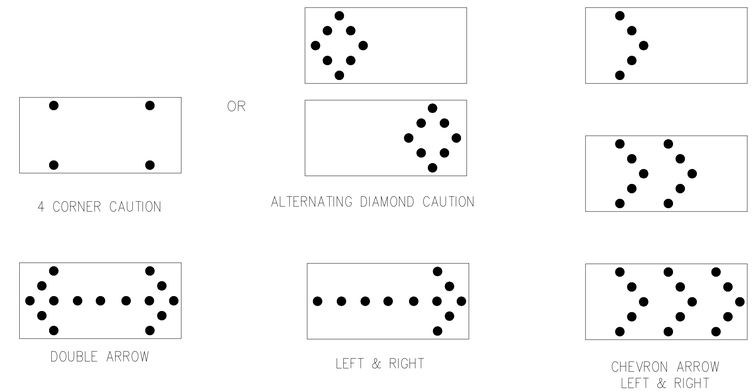
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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 National Cooperative Highway Research Report No. 350 (NCHRP 350) or 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 Operations Division Standard

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

BC(7)-14

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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:

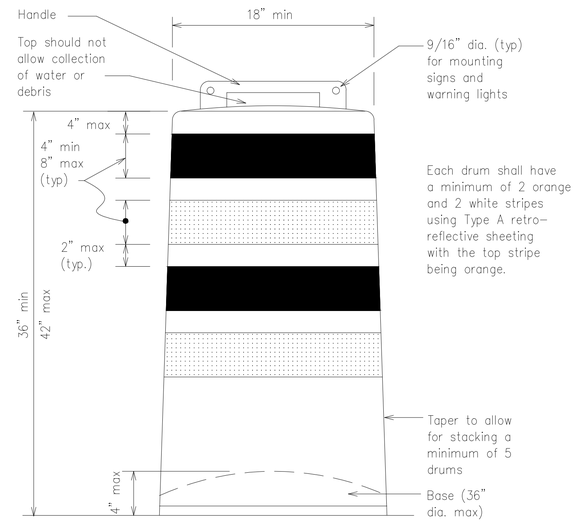
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents 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.

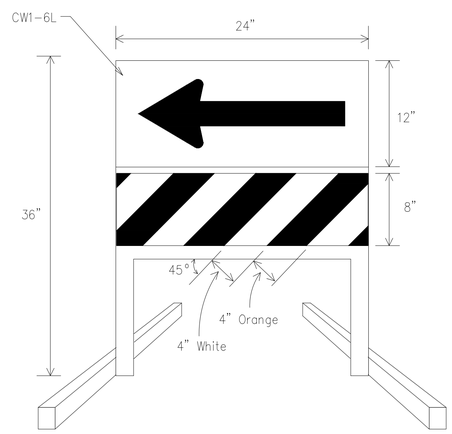
RETROREFLECTIVE SHEETING

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 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.

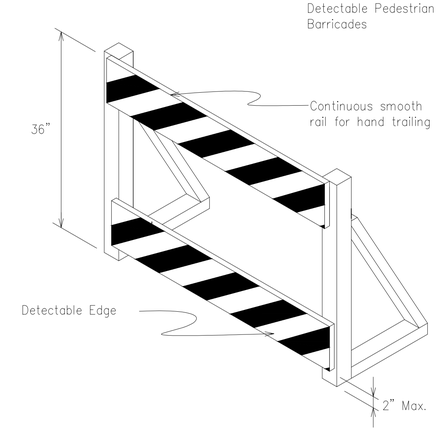




DIRECTION INDICATOR BARRICADE

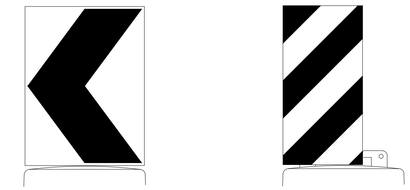
1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B or Type C Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades



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.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.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 for Buildings and Facilities (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 may 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

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 or Type C Orange$_{FL}$ 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 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 Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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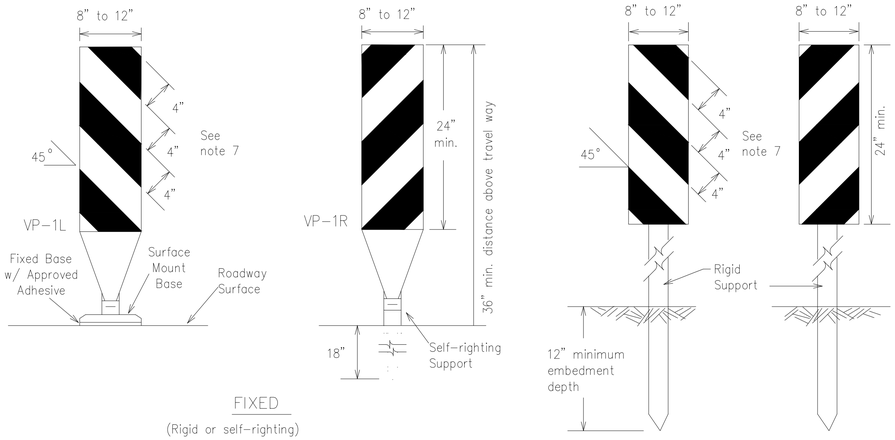
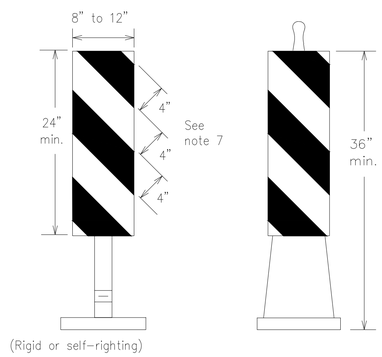


FIXED

(Rigid or self-righting)

DRIVEABLE

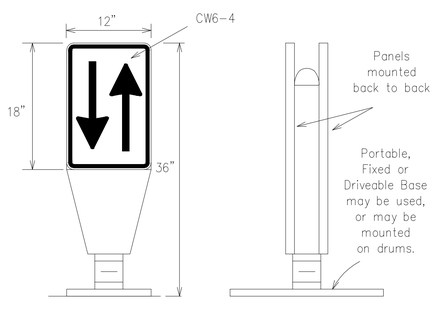


(Rigid or self-righting)

PORTABLE

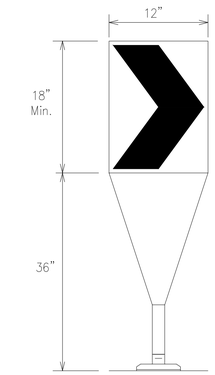
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of 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 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 or Type C conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



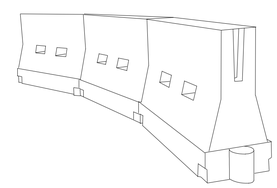
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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 or Type C 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) placed 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 NCHRP 350 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 **			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	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

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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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 conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

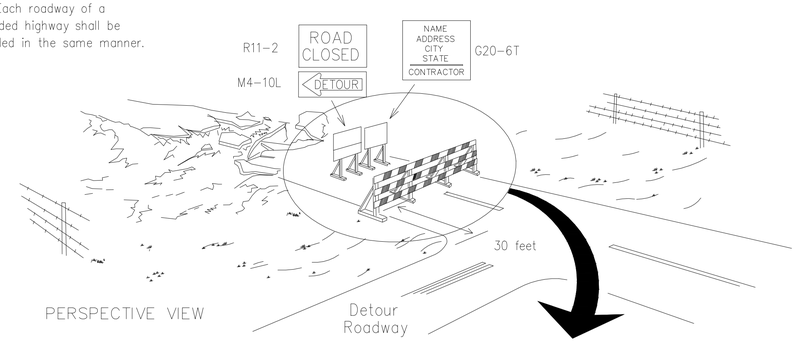
Barricades shall NOT be used as a sign support.

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

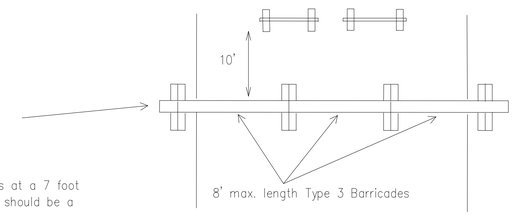
Each roadway of a divided highway shall be barricaded in the same manner.



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.

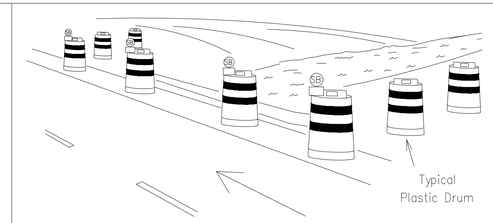
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

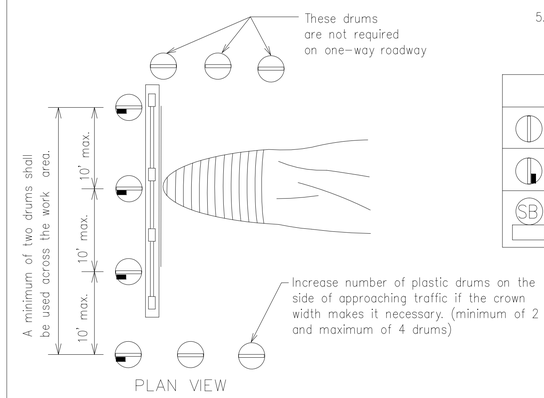
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

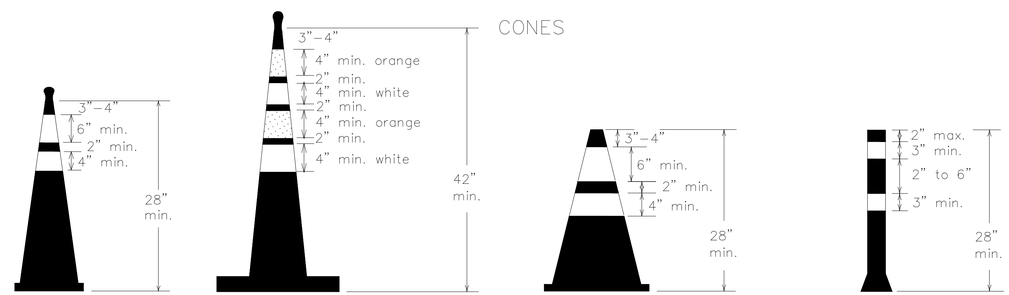
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder 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



Two-Piece cones

One-Piece cones

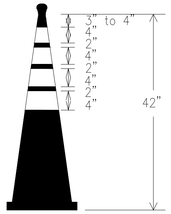
Tubular Marker

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.

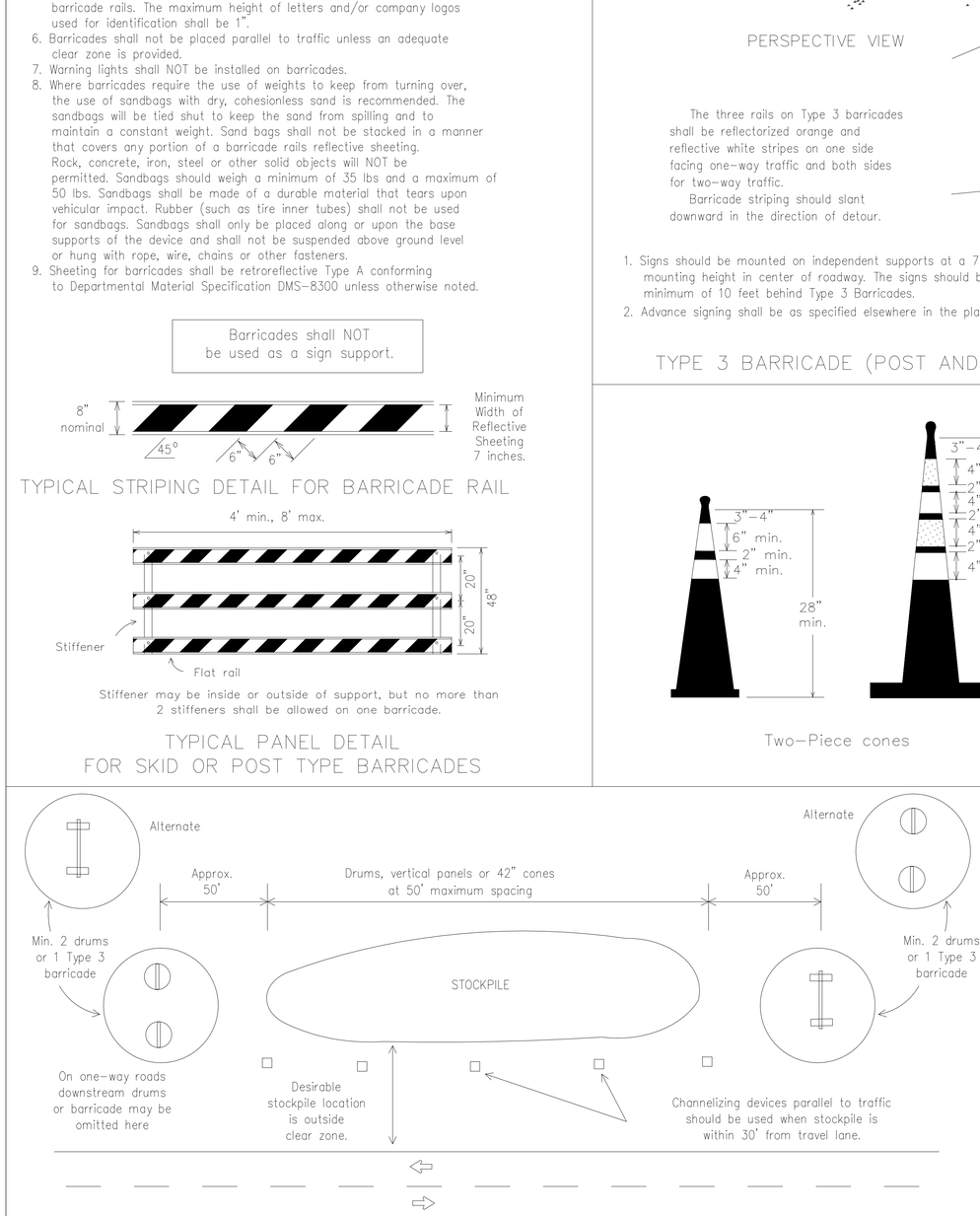
1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added 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 used at night 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.
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.

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGELINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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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.

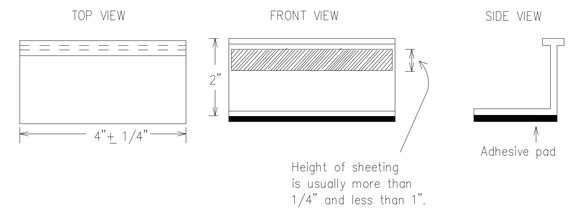
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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 Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

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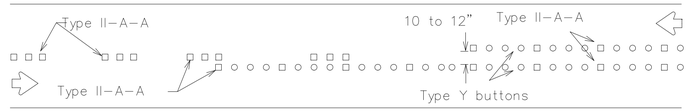
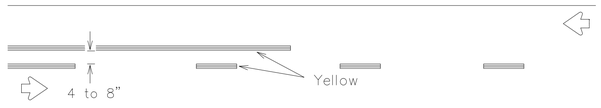
PAVEMENT MARKING PATTERNS

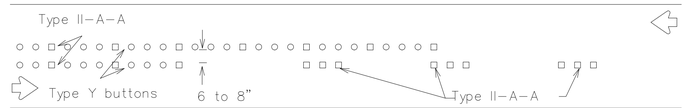
REFLECTORIZED PAVEMENT MARKINGS – PATTERN A



RAISED PAVEMENT MARKERS – PATTERN A



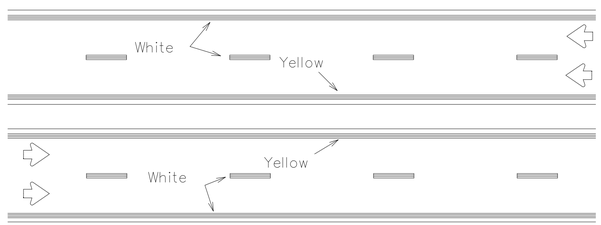
REFLECTORIZED PAVEMENT MARKINGS – PATTERN B



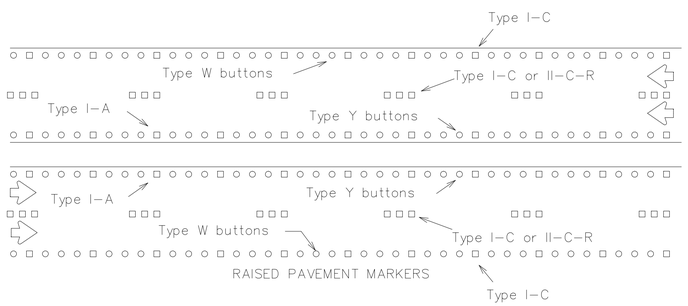
RAISED PAVEMENT MARKERS – PATTERN B

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



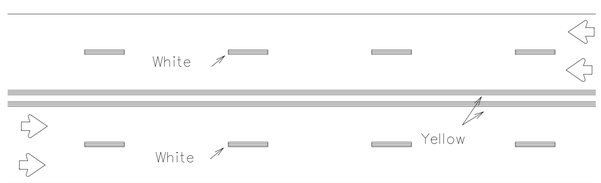
REFLECTORIZED PAVEMENT MARKINGS



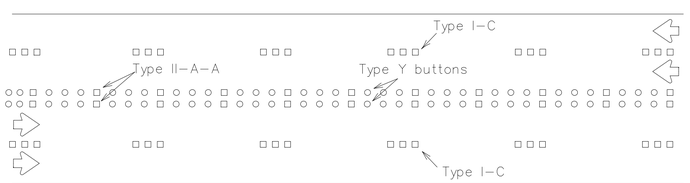
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



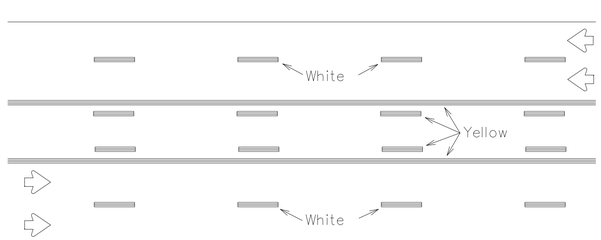
REFLECTORIZED PAVEMENT MARKINGS



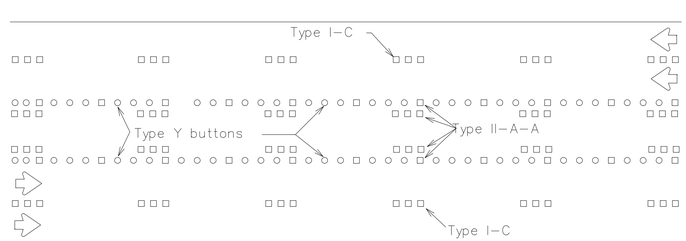
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



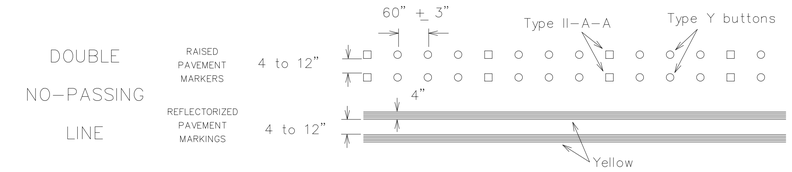
RAISED PAVEMENT MARKERS

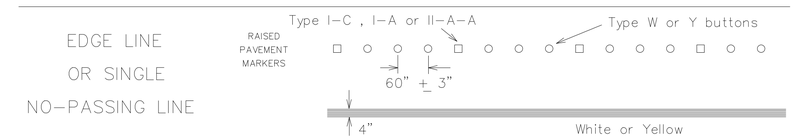
Prefabricated markings may be substituted for reflectorized pavement markings.

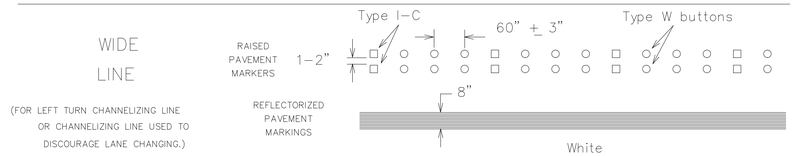
TWO-WAY LEFT TURN LANE

STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

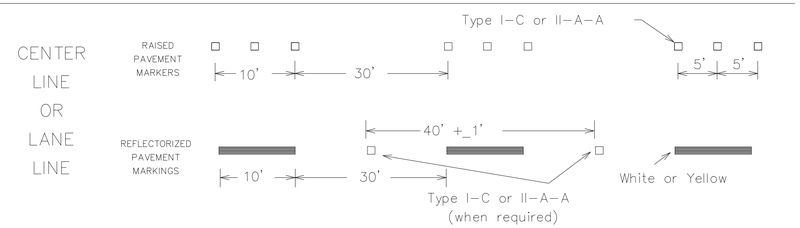
SOLID LINES

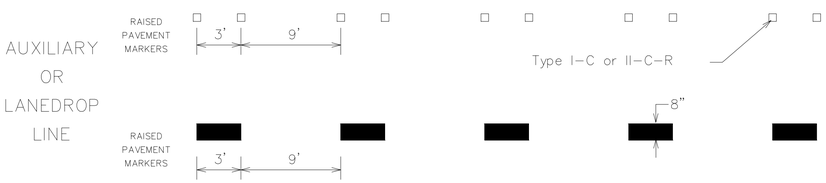






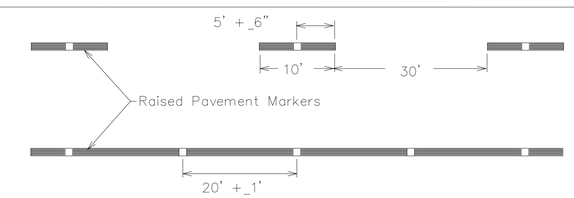
BROKEN LINES





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."

SHEET 12 OF 12

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 2-98 7-13 11-02 8-14	DIST	COUNTY		SHEET NO. 30
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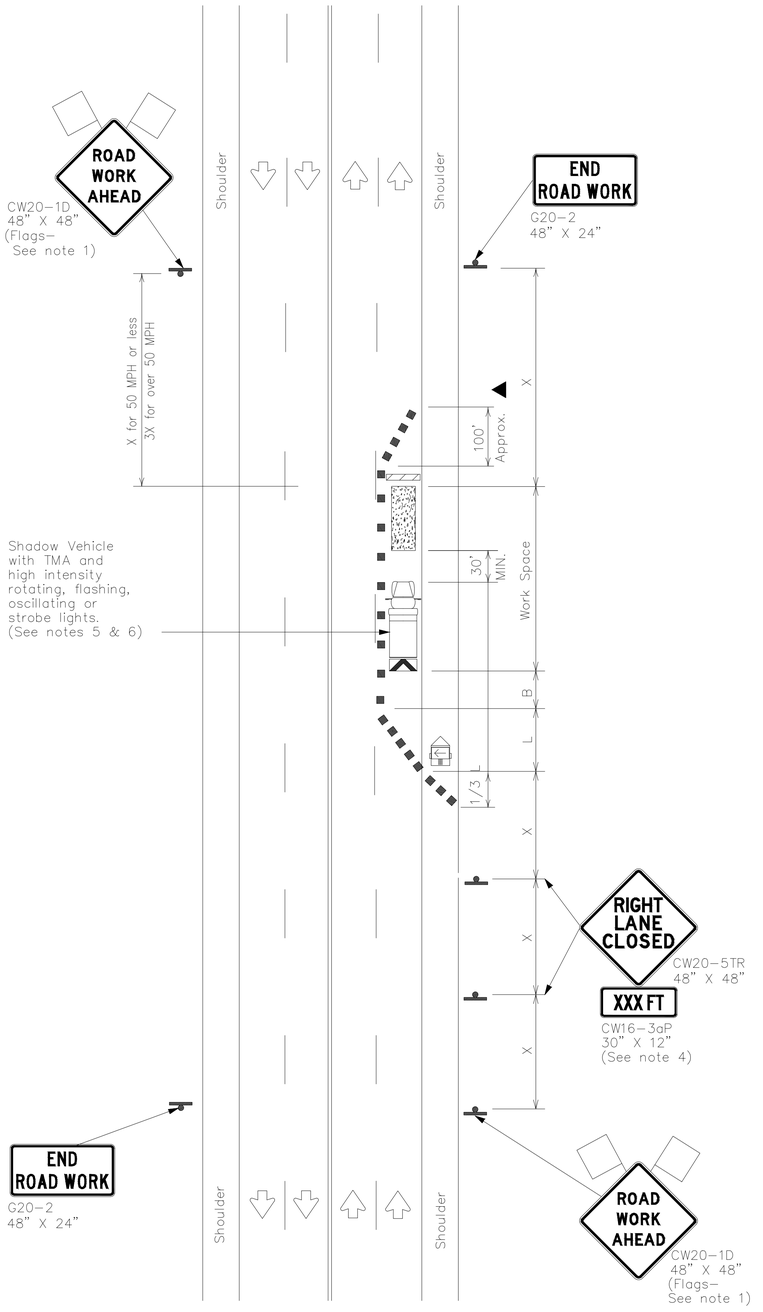
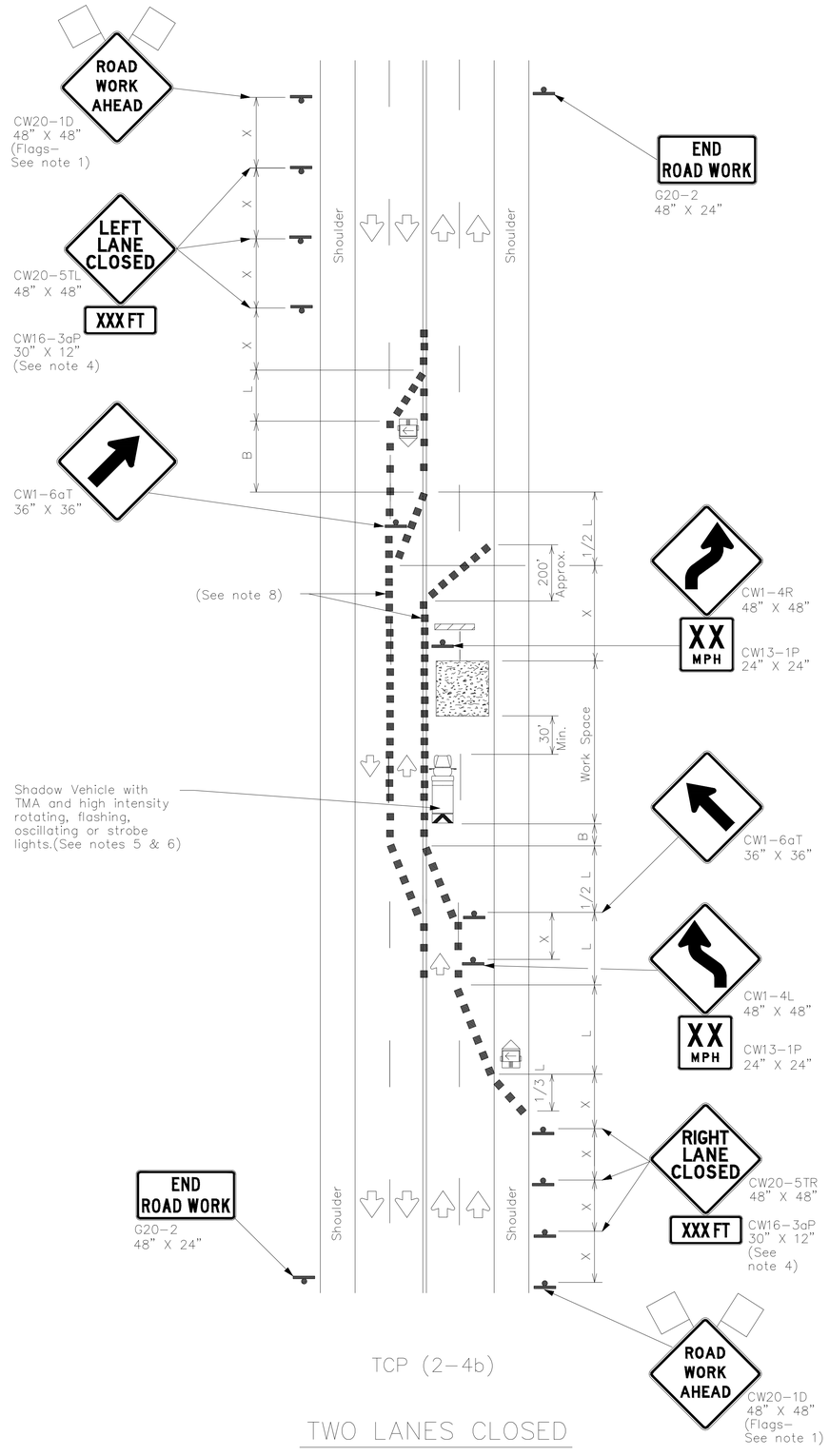


TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

LEGEND

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
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)

TYPICAL USAGE

MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
		✓	✓	

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
4. For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3aP supplemental plaque.
5. 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.
6. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-4a)

7. If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED"signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic with the arrow board placed in the closed lane near the end of the merging taper.

TCP (2-4b)

8. For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter devices spacing is intended for the area of conflicting markings, not the entire work zone.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(2-4)-12

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REVISIONS
8-95 2-12
1-97
4-98
3-03

CONT	SECT	JOB	HIGHWAY

DIST	COUNTY	SHEET NO.
		31

DATE:
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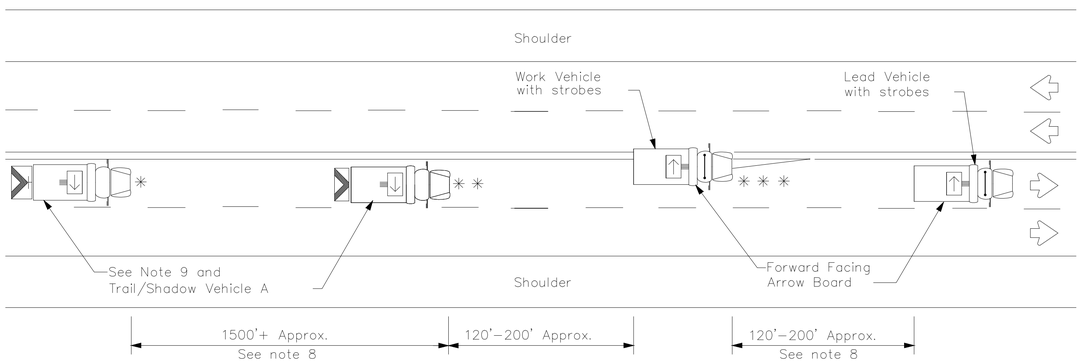
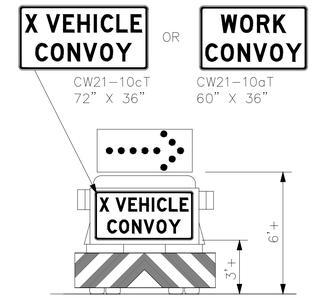


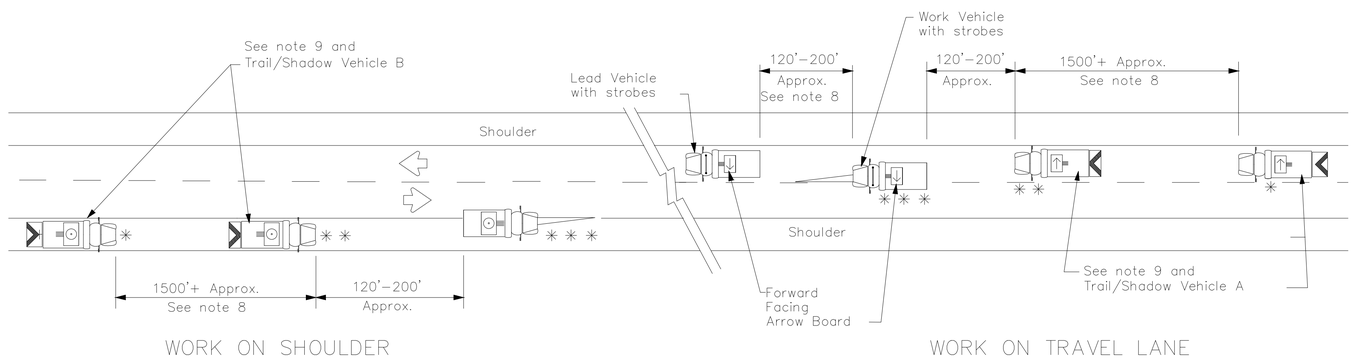
TCP (3–1a)

UNDIVIDED MULTILANE ROADWAY



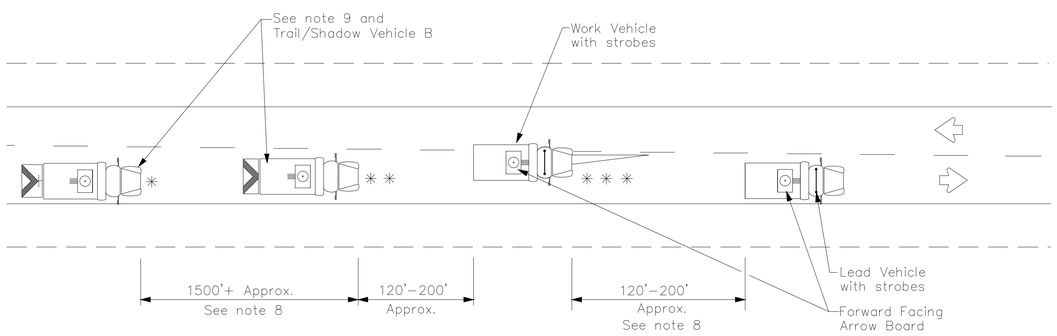
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board



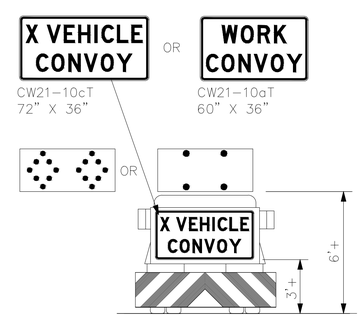
TCP (3–1b)

TWO–WAY ROADWAY WITH PAVED SHOULDERS



TCP (3–1c)

TWO–WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in CAUTION display

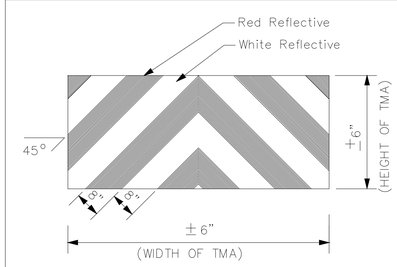
LEGEND

✳	Trail Vehicle	ARROW BOARD DISPLAY	
✳ ✳	Shadow Vehicle		
✳ ✳ ✳	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two–way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. "X VEHICLE CONVOY" (CW21–10cT) or "WORK CONVOY" (CW21–10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY"(CW21–10T) or "X VEHICLE CONVOY" (CW21–10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. On two–lane two–way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4–1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3–1)–13

FILE: tcp3–1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 2–94 4–98 8–95 7–13 1–97	DIST		COUNTY	SHEET NO. 32
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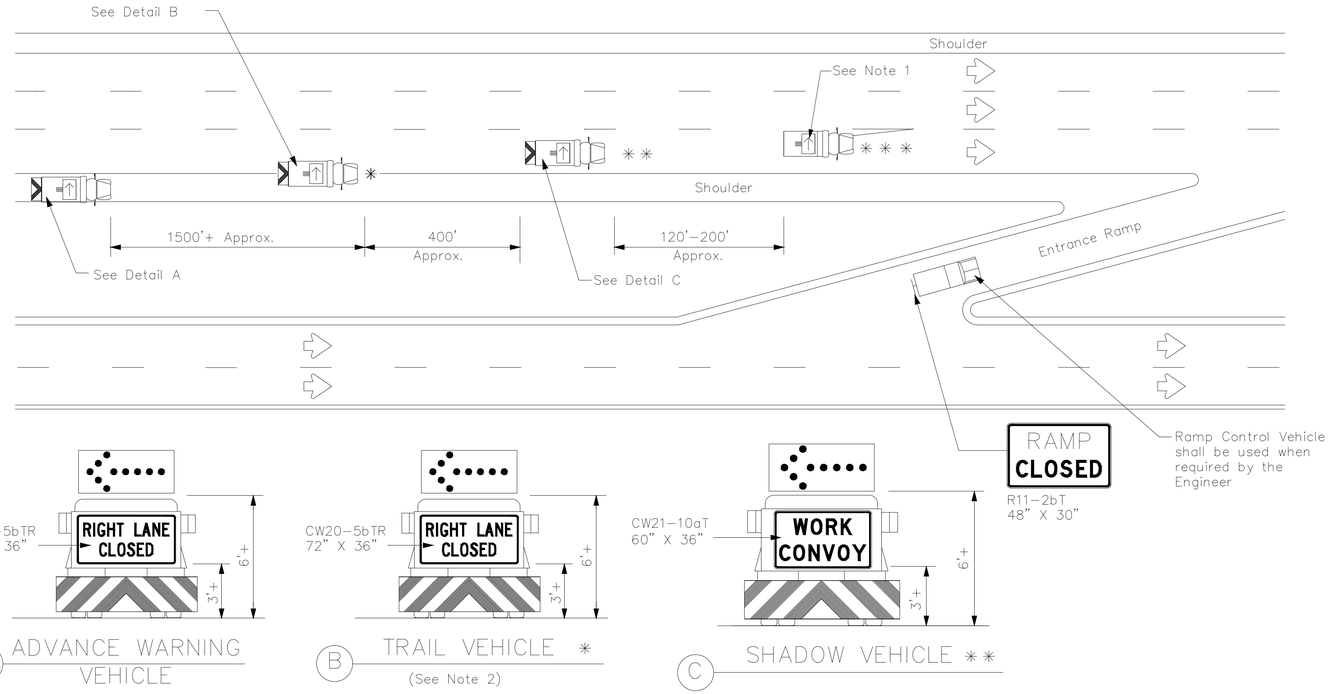
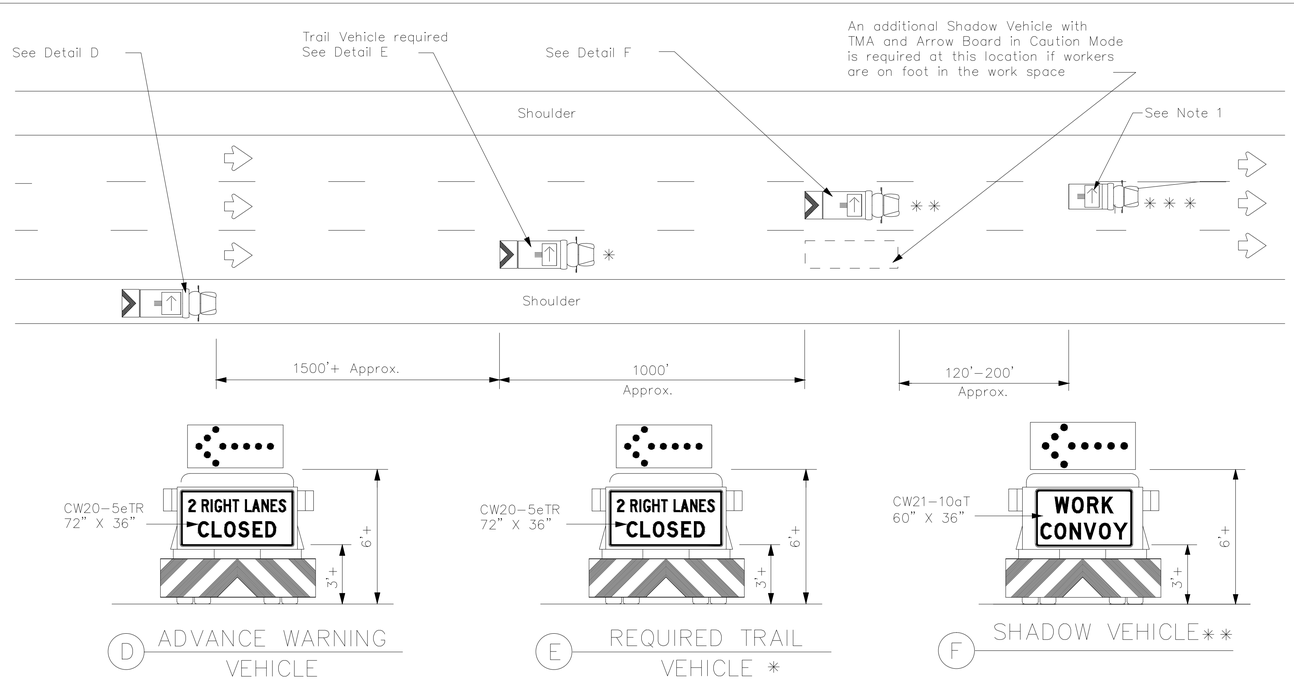


RIGHT LANE CLOSURE ON DIVIDED HIGHWAY – TCP(3-2a)



INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY – TCP(3-2b)

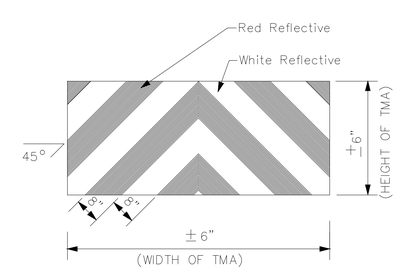
LEGEND

*	Trail Vehicle	ARROW BOARD DISPLAY	
* *	Shadow Vehicle		
* * *	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

GENERAL NOTES

1. ADVANCE WARNING, TRAIL and SHADOW vehicles shall be equipped with Type B or Type C flashing arrow boards as per the Barricade and Construction (BC) standards. Arrow boards on WORK vehicles will be optional based on the type of work being performed. The arrow boards shall be operated from inside the vehicle.
2. For TCP(3-2a) the Engineer will determine if the TRAIL VEHICLE is required based on prevailing roadway conditions, traffic volume, and sight distance restrictions. All other vehicles shown for both TCP(3-2a) and TCP(3-2b) are required.
3. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
4. The use of truck mounted attenuators (TMA) on the ADVANCE WARNING, SHADOW, and TRAIL vehicles are required.
5. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DMS 8300, Type A.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE may vary according to terrain, work activity and other factors.
9. Standard 48" X 48" diamond shaped warning signs with the same message as those shown may be used where adequate mounting space exists.
10. The signs shown should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or a truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board, must be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
12. The principles on this sheet may be used to close lanes from the left side of the roadway considering the number of lanes, shoulder width, sight distance,and ramp frequency.
13. Signs and flashing arrow board modes shall be appropriately altered when implementing left lane closures or interior closures which close the left lanes.
14. The Advance Warning Vehicle may straddle the edgeline when shoulder width makes it necessary.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS

TCP(3-2)-13

FILE: tcp3-2.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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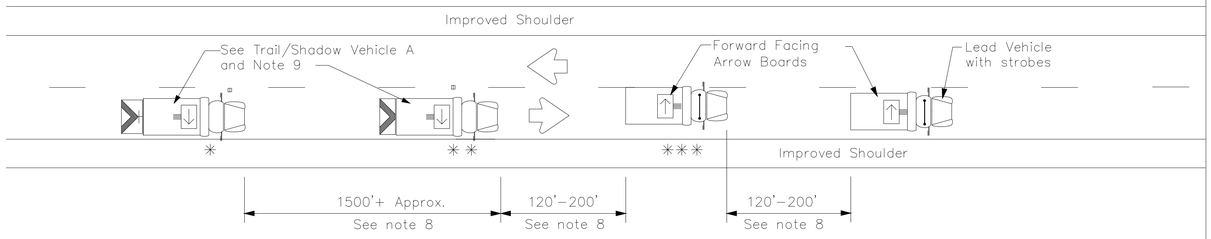
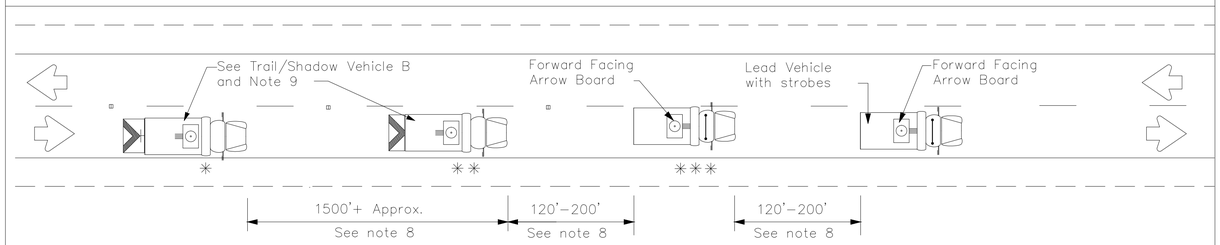
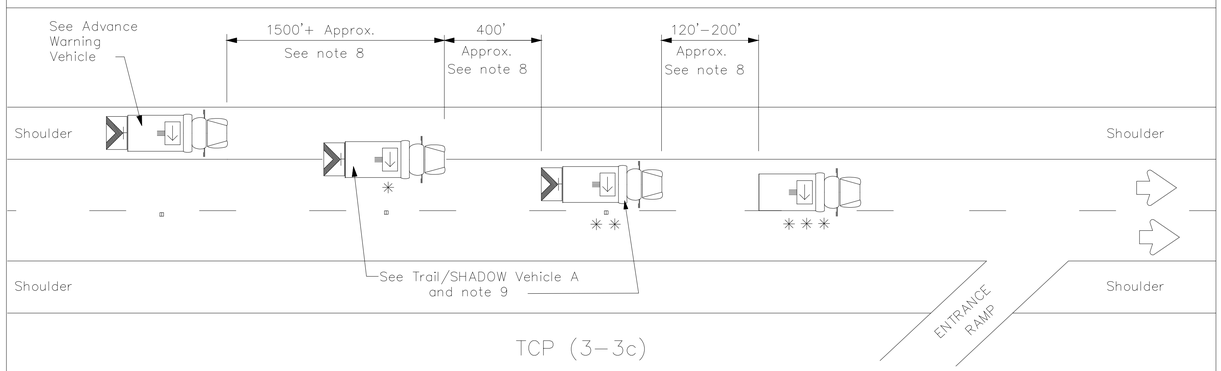


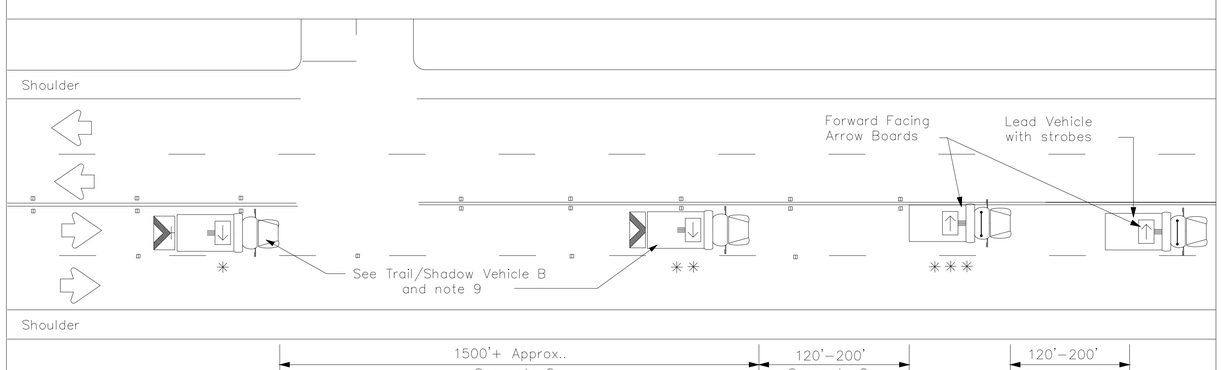
TCP (3–3a)
TWO LANE HIGHWAY WITH PAVED SHOULDERS
(WORK ON TRAVEL LANE)



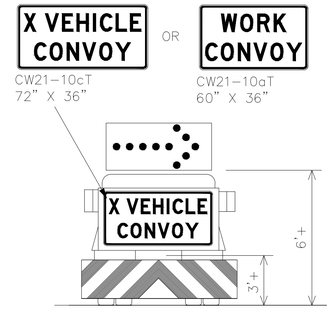
TCP (3–3b)
TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS
(WORK ON TRAVEL LANE)



TCP (3–3c)
DIVIDED MULTILANE HIGHWAY

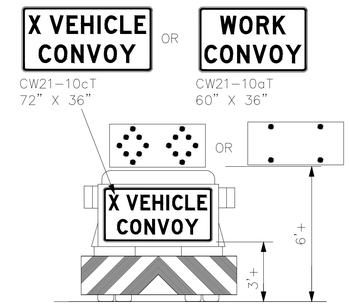


TCP (3–3d)
UNDIVIDED MULTILANE HIGHWAY



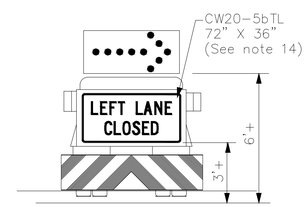
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

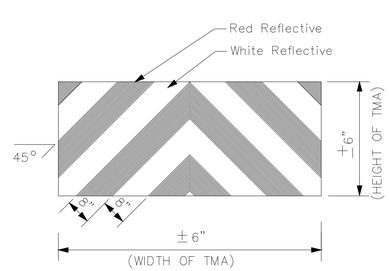


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
* *	Shadow Vehicle		
* * *	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer will determine if the LEAD vehicle and/or TRAIL vehicle are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating, or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two–way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. X VEHICLE CONVOY (CW21–10cT) or WORK CONVOY (CW21–10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" x 48" diamond shaped WORK CONVOY (CW21–10T) or X VEHICLE CONVOY (CW21–10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The X VEHICLE CONVOY sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. For divided highways with two or three lanes in one direction, the appropriate LEFT LANE CLOSED (CW20–5bTL), RIGHT LANE CLOSED (CW20–5bTR), or CENTER LANE CLOSED (CW20–5dT) sign should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board may be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
12. For divided highways with three or four lanes in each direction, use TCP(3–2).
13. Standard diamond shape versions of the CW20–5 series signs may be used as an option if the rectangular signs shown are not available.
14. The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
15. On two–lane two–way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4–1) sign should be placed on the back of the rearmost protection vehicle.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3–3)–14

FILE: tcp3–3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS 2–94 4–98 8–95 7–13 1–97 7–14	DIST	COUNTY		SHEET NO. 34

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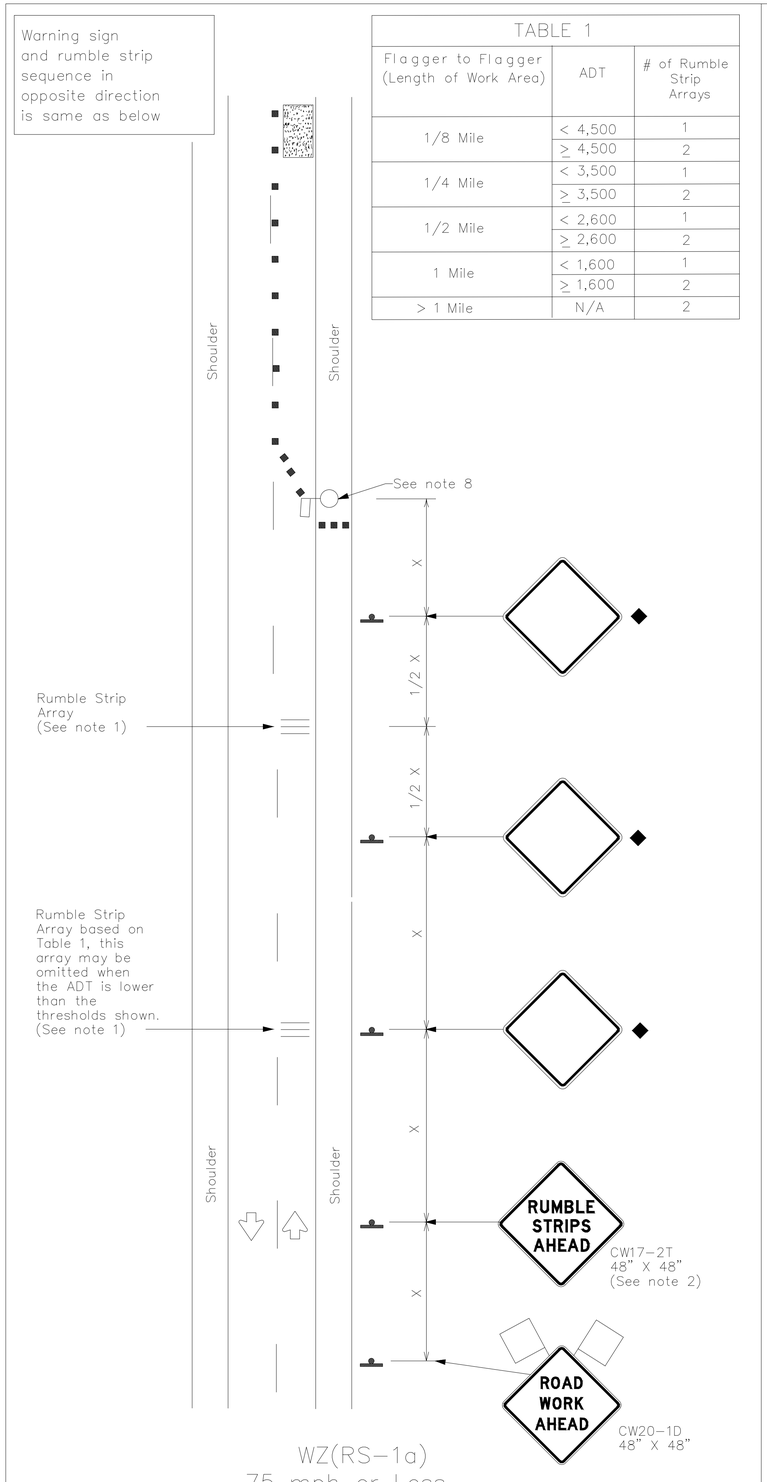
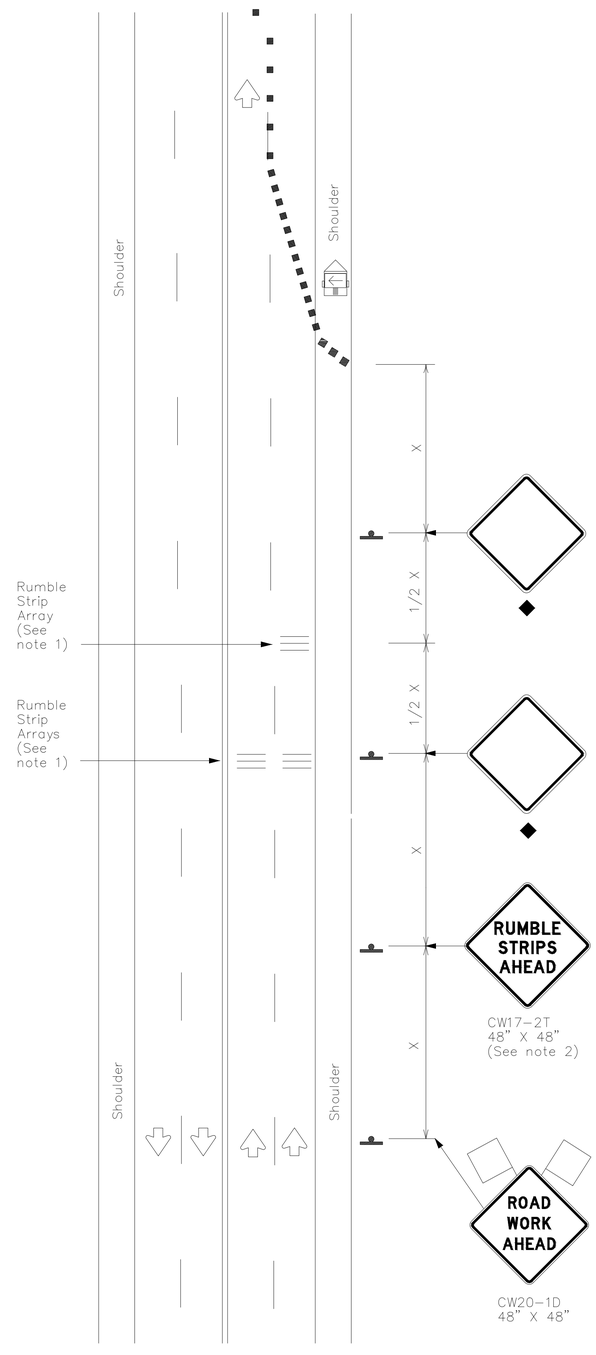


TABLE 1		
Flagger to Flagger (Length of Work Area)	ADT	# of Rumble Strip Arrays
1/8 Mile	< 4,500	1
	≥ 4,500	2
1/4 Mile	< 3,500	1
	≥ 3,500	2
1/2 Mile	< 2,600	1
	≥ 2,600	2
1 Mile	< 1,600	1
	≥ 1,600	2
> 1 Mile	N/A	2

WZ(RS-1a)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

1. Each Rumble Strip Array should consist of three rumble strips spaced center to center at the spacing shown in Table 2, placed transverse across the lane at locations shown.
2. The CW17-2T "RUMBLE STRIPS AHEAD" sign should be located after the CW20-1D "ROAD WORK AHEAD sign and spaced as shown. If traffic is observed to be queuing, or is expected to queue beyond the Rumble Strips, the CW17-2T sign and the first Rumble Strip Array may be located upstream of the CW20-1D sign as necessary to provide needed warning.
3. Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
4. Removal of the Temporary Rumble Strips should be accomplished before removing the advance warning signs.
5. Temporary Rumble Strips should not be used on horizontal curves, loose gravel,soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
6. Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
7. This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
8. The one-lane two-way application may utilize a flagger, an AFAD or a portable traffic signal.
9. Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment.

TABLE 2	
Speed	Approximate distance between strips in an Array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
> 55 MPH	20'

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
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)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

◆ Signs are for illustrative purposes only. Signs required may vary depending on the TCP,TMUTCD Typical Application, or project specific details for the project.

Texas Department of Transportation — Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-16

FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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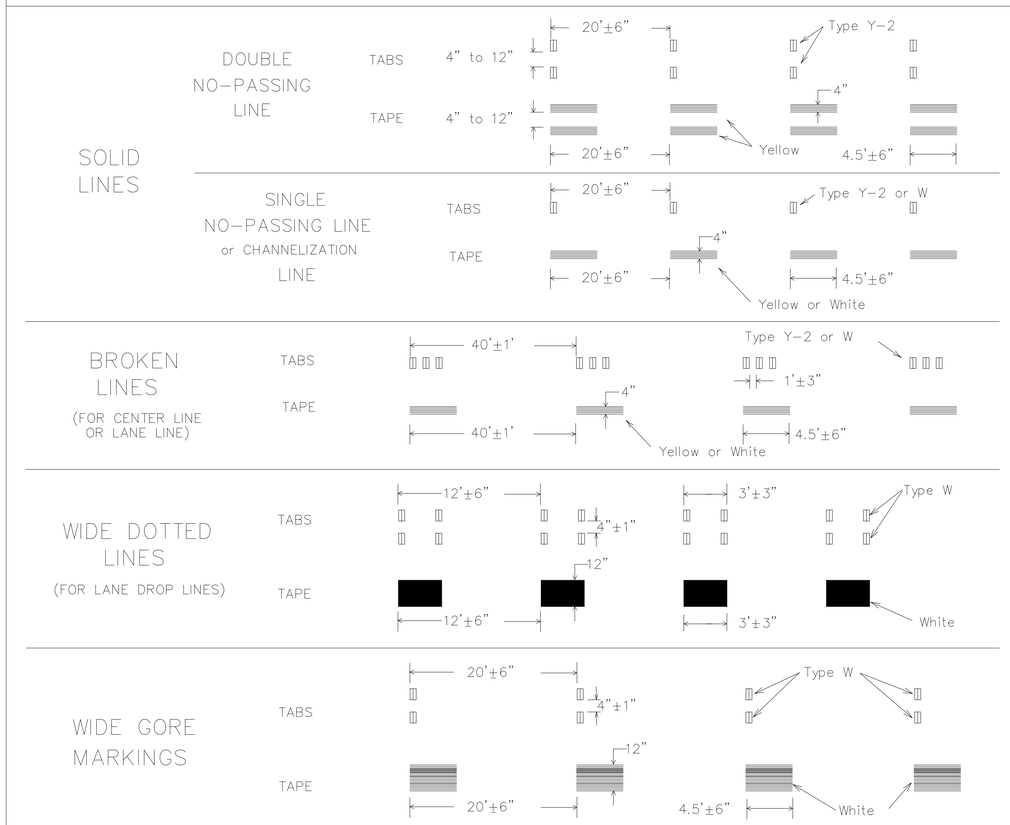
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



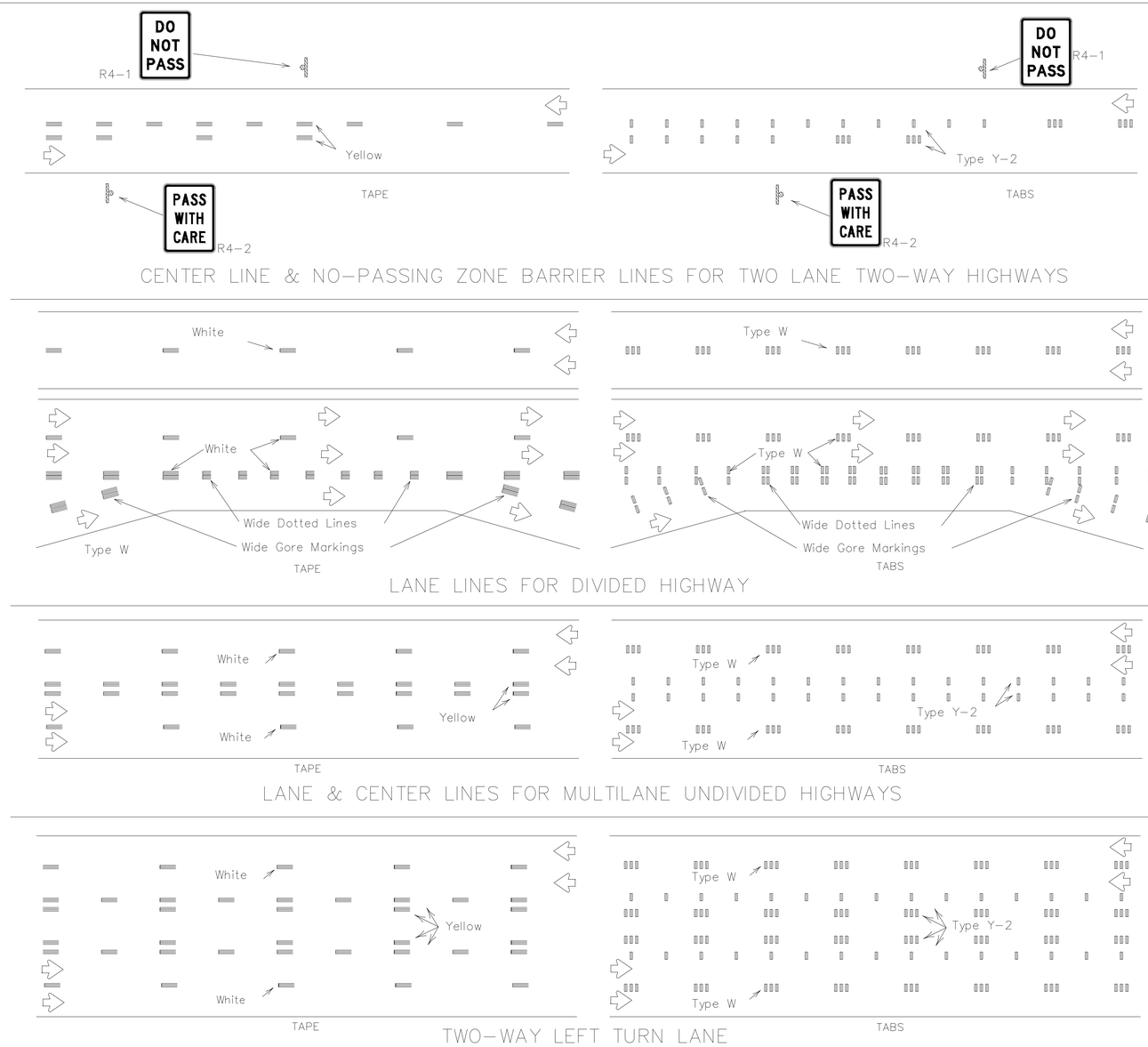
NOTES:

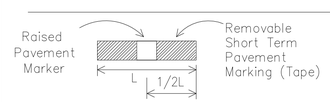
1. Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
2. Short term pavement markings shall NOT be used to simulate edge lines.
3. Dimensions indicated on this sheet are typical and approximate. Variations in size and height may occur between markers or devices made by manufacturers, by as much as 1/4 inch, unless otherwise noted.
4. Temporary flexible-reflective roadway marker tabs will require normal maintenance replacement when used on roadways with an ADT per lane of up to 7500 vehicles with no more than 10% truck mix. When roadways exceed these values, additional maintenance replacement of devices should be planned.
5. No segment of roadway open to traffic shall remain without permanent pavement markings for a period greater than 14 calendar days. The Contractor will be responsible for maintaining short term pavement markings until permanent pavement markings are in place. When the Contractor is responsible for placement of permanent pavement markings, no segment of roadway shall remain without permanent pavement markings for a period greater than 14 calendar days unless weather conditions prohibit placement. Permanent pavement markings shall be placed as soon as weather permits.
6. For two lane, two-way roadways, DO NOT PASS signs shall be erected to mark the beginning of sections where passing is prohibited and PASS WITH CARE signs shall be erected to mark the beginning of sections where passing is permitted. Signs shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and may be used to indicate the limits of no-passing zones for up to 14 calendar days. Permanent pavement markings should then be placed.
7. For low volume two lane, two-way roadways of 4000 ADT or less, no-passing lines may be omitted when approved by the Engineer. DO NOT PASS and PASS WITH CARE signs shall be erected (see note 6).
8. For exit gores where a lane is being dropped place wide gore markings or retroreflective channelizing devices to guide motorist through the exit. If channelizing devices are to be used it should be noted elsewhere in the plans. One piece cones are not allowed for this purpose.

TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

1. Temporary flexible-reflective roadway marker tabs detailed on this sheet will be designated Type Y-2 (two amber reflective surfaces with yellow body); Type Y (one amber reflective surface with yellow body); and Type W (one white or silver reflective surface with white body). Additional details may be found on BC(11).
2. Tabs shall meet requirements of Departmental Material Specification DMS-8242.
3. When dry, tabs shall be visible for a minimum distance of 200 feet during normal daylight hours and when illuminated by automobile low-beam head light at night, unless sight distance is restricted by roadway geometrics.
4. No two consecutive tabs nor four tabs per 1000 feet of line shall be missing or fail to meet the visual performance requirements of Note 3.

WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS





If raised pavement markers are used to supplement REMOVABLE short term markings, the markers shall be applied to the top of the tape at the approximate mid length of the tape. This allows an easier removal of raised markers and tape.

PREFABRICATED PAVEMENT MARKINGS

1. Temporary Removable Prefabricated Pavement Markings shall meet the requirements of DMS-8241.
2. Non-removable Prefabricated Pavement Markings shall meet the requirements of either DMS-8240 "Permanent Prefabricated Pavement Markings" or DMS-8243 "Temporary Costruction-Grade Prefabricated Pavement Markings."

RAISED PAVEMENT MARKERS

1. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and DMS-4200.

DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS) & MATERIAL PRODUCER LISTS (MPL)

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:

http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

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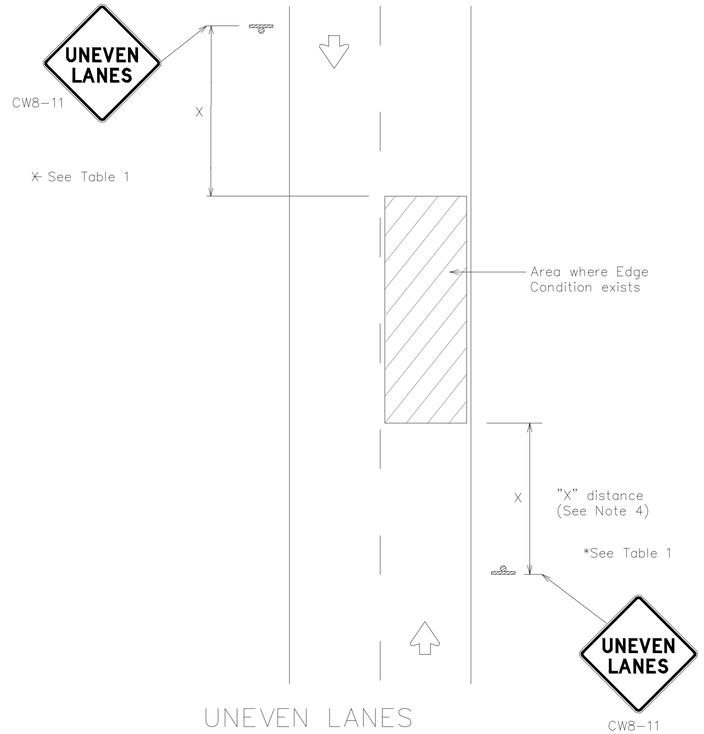
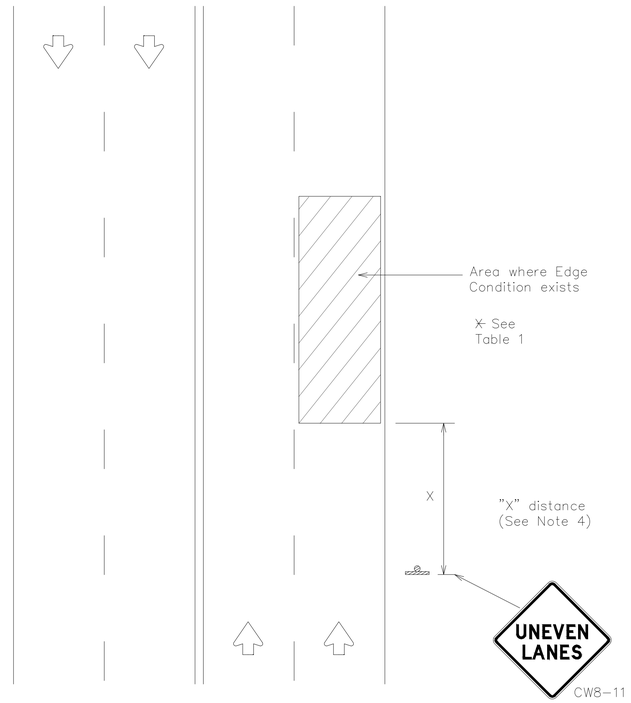
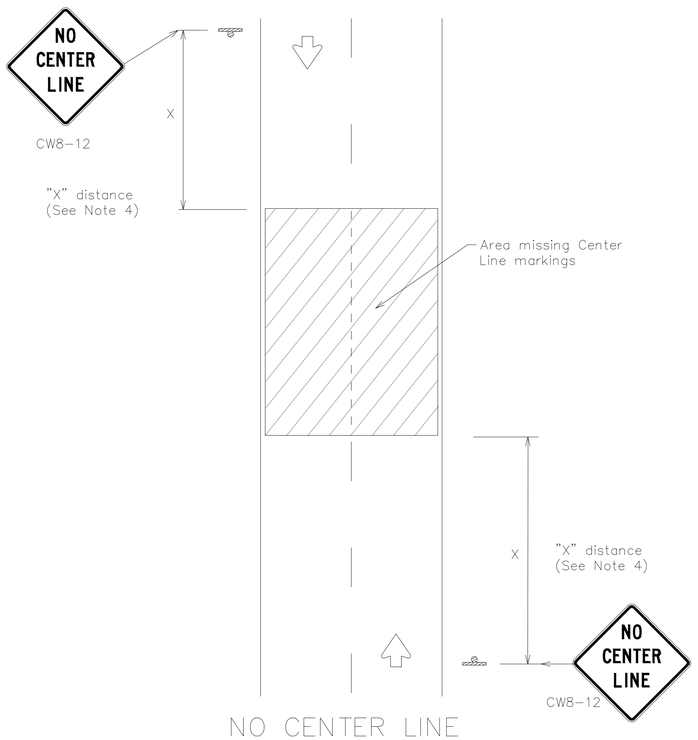


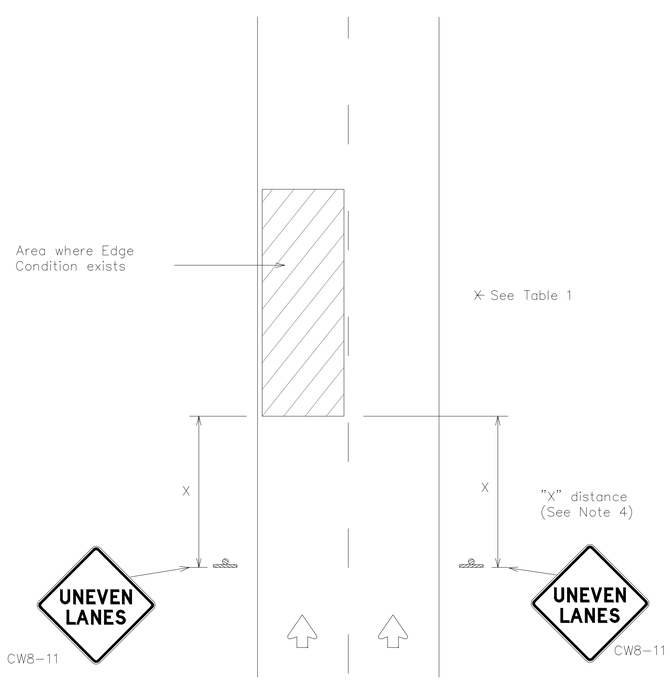
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

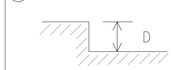
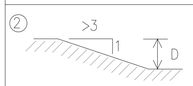
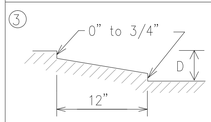
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS–8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS–8241
SIGN FACE MATERIALS	DMS–8300

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

GENERAL NOTES

1. If spalling or holes occur, ROUGH ROAD (CW8–8) signs should be placed in advance of the condition and be repeated every two miles where the condition persists.
2. UNEVEN LANES (CW8–11) signs shall be installed in advance of the condition and repeated every mile. Signs installed along the uneven lane condition may be supplemented with the NEXT XX MILES (CW7–3aP) plaque or Advisory Speed (CW13–1P) plaque.
3. NO CENTER LINE (CW8–12) signs and temporary pavement markings as per the WZ(STPM) standard shall be installed if yellow centerlines separating two way traffic are obscured or obliterated. Repeat NO CENTER LINE signs every two miles where the center line markings are not in place. The signs and markings shall remain in place until permanent pavement markings are installed.
4. Signs shall be spaced at the distances recommended as per BC standards.
5. Additional signs may be required as directed by the Engineer. Signs shall remain in place until final surface is applied. Signs shall be considered subsidiary to Item 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING."
6. Signs shall be fabricated and mounted on supports as shown on the BC standards and/or listed on the "Compliant Work Zone Traffic Control Devices" list.
7. Short term markings shall not be used to simulate edge lines.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition.

TABLE 1

Edge Condition	Edge Height (D)	✳ Warning Devices
① 	Less than or equal to: 1–1/4" (maximum–planing) 1–1/2" (typical–overlay)	Sign: CW8–11
	Distance "D" may be a maximum of 1 1/4 " for planing operations and 2" for overlay operations if uneven lanes with edge condition 1 are open to traffic after work operations cease.	
② 	Less than or equal to 3"	Sign: CW8–11
③  Notched Wedge Joint	Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3".	

TRAFFIC CONTROL DURING PLANING, OVERLAY AND LEVELING OPERATIONS ARE SHOWN ELSEWHERE IN THE PLANS.

MINIMUM WARNING SIGN SIZE	
Conventional roads	36" x 36"
Freeways/expressways, divided roadways	48" x 48"

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)–13

FILE: wzul–13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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1–97 3–03				37
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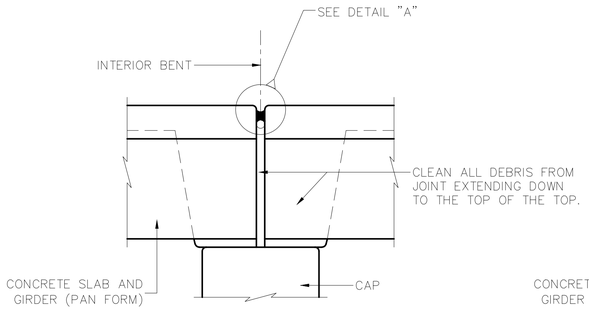
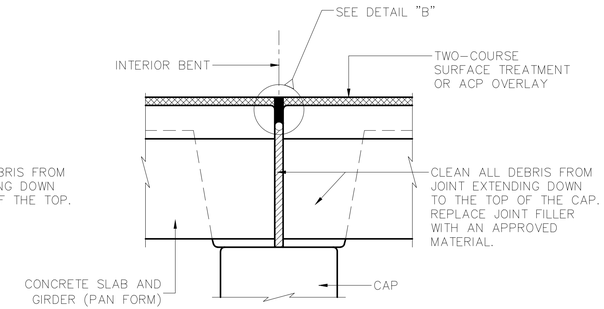


JOINT WITH SILICONE SEAL

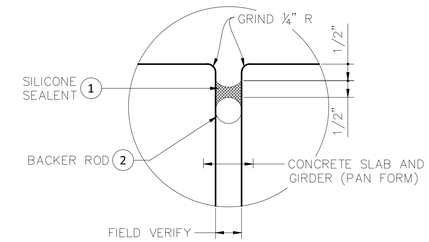
(USED WITHOUT ACP OVERLAY)



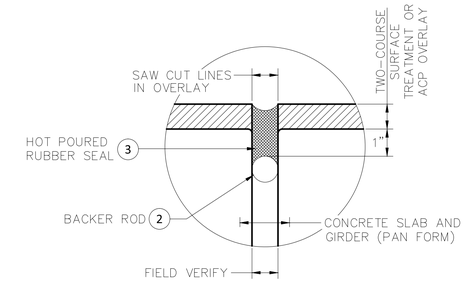
JOINT WITH HOT POURED RUBBER SEAL

(USED WITH\ACP OVERLAY)

EXISTING CONCRETE SLAB & GIRDER JOINT REPAIR



DETAIL "A"



DETAIL "B"

1. USE CLASS 7 SILICONE SEALANT. PREPARE JOINT AND SEAL IN ACCORDANCE WITH ITEM 438 "CLEANING AND SEALING JOINTS AND CRACKS."
2. BAKER ROD MUST BE 25% LARGER THAN JOINT OPENING AND MUST BE COMPATIBLE WITH THE SEALANT.
3. USE CLASS 3 HOT POURED RUBBER SEAL. PREPARE JOINT AND SEAL IN ACCORDANCE WITH ITEM 438 "CLEANING AND SEALING JOINTS AND CRACKS."

PROCEDURE FOR CLEANING AND SEALING EXISTING CONCRETE GIRDER JOINT WITH SILICONE SEAL:

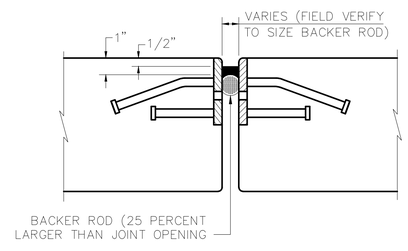
1) Clean joint opening of all old expansion materials/devices, dirt, and all other deleterious materials in accordance with Item 438, "Cleaning and Sealing Joints and Cracks." Clean joint out full depth of the joint.
2) Obtain approval of cleaned joint prior to proceeding with joint sealing operation.
3) Place backer rod into joint opening 1" below the top of concrete. The backer rod must be 25% larger than the joint opening.
4) Seal the joint opening with a Class 7 Silicone. Recess seal ½" below top of concrete in travel lanes and ⅛"below top of concrete in shoulders.

PROCEDURE FOR CLEANING AND SEALING EXISTING CONCRETE GIRDER JOINT WITH HOT POURED RUBBER SEAL:

1) Saw cut through the asphalt at the centerline of joint. Make multiple saw cuts to create a ½" minimum joint opening or match the existing joint opening. Clean joint opening of all old expansion materials/devices,bituminous materials, dirt, grease and oil and other deleterious materials in accordance with Item 438, "Cleaning and Sealing Joints and Cracks."
2) Obtain approval of cleaned joint prior to proceeding with joint sealing operation.
3) Place backer rod into joint opening 1" below the top of concrete. Backer rod must be of the type that can handle the heat and be compatible with the hot poured rubber seal. The backer rod must be 25% larger than the joint opening.
4) Seal the joint opening with a Class 3, "Hot Poured Rubber." Seal flush to the top pf the asphaltic concrete pavement.

PROCEDURE FOR CLEANING AND SEALING EXISTING ARMOR JOINTS:

1) Remove existing seal.
2) Abrasive blast clean existing steel surface where silicone seal is to be placed.
3) Obtain approval of cleaned joint prior to proceeding with joint sealing operation.
4) Place baker rod into joint opening 1" below the top of concrete. The backer rod must be 25% larger than the joint opening.
5) Seal the joint opening with a Class 7 Silicone. Recess seal ½" below top of concrete in the travel lanes and ⅛" below top of concrete in shoulders.



CLEANING AND SEALING EXISTING ARMOR JOINTS

(SHOWING ARMOR JOINT SECTION)

GENERAL NOTES:

Cleaning existing joint opening (full depth) of all debris, providing and placing backer rod, saw-ctting joint opening, and sealing joint is paid for by Item 438, "Cleaning and Sealing Joints and Cracks" and measured by the foot of "Cleaning and Sealing of Existing joints."

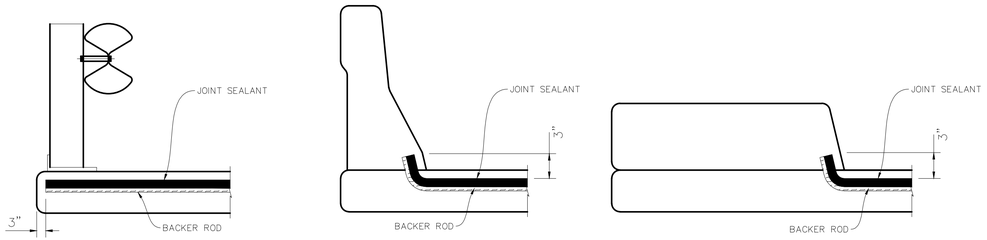
Obtain approval for all tools, equipment, materials and techniques proposed for use to prepare the joint.

For Class 3 Hot Poured Rubber Seal, provide backer rod compatible with the hot poured rubber sealant and rated for a minimum of 400 F.

Provide Class 3 sealant in accordance with DMS-6310, "Joint Sealants and Fillers" for joints in asphalt overlay.

Provide Class 7 silicone sealant in accordance with DMS-6310, "Joint Sealants and Fillers" for joints in concrete.

Extend sealant up into rail or curb 3 inches on low side or sides of deck. If the Class 7 Sealant cannot be effectively placed in the vertical position, a Class 4 Sealant compatible with the Class 7 is allowed for the extension of the seal into the curb or rail. Prepare surfaces where sealant is to be placed in accordance with manufacturer's specifications.



SHOWN AT STEEL RAIL **SHOWN AT BARRIER RAIL** **SHOWN AT CURB**

JOINT SEALANT TERMINATION DETAILS

CLEANING AND SEALING EXISTING BRIDGE JOINTS

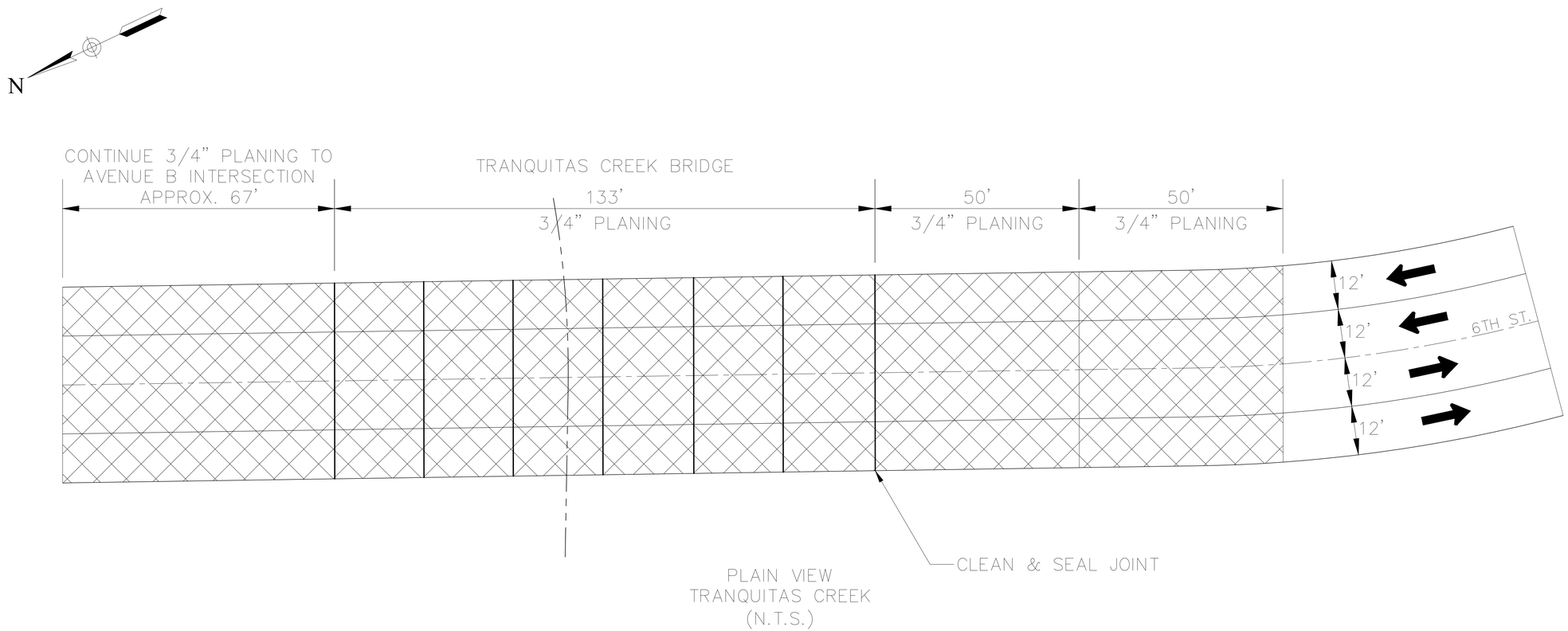
6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
2		
3		
4		
5		
6		
7		

ENGINEER NO. 99227, THESE PLANS WERE PREPARED UNDER THE RESPONSIBLE SUPERVISION OF JUAN CARLOS CARDENAS LICENSED PROFESSIONAL ENGINEER
THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY JUAN CARLOS CARDENAS P.E. #99227

STATE OF TEXAS JUAN CARLOS CARDENAS 99227 LICENSED PROFESSIONAL ENGINEER

DATE: 04/12/16	SCALE: NTS
DRAWN:	CHECKED BY:
PROJECT #	
SHEET NO: 38	



ESTIMATED QUANTITIES		
DESCRIPTION	UNIT	QUANTITY
CLEAN & SEAL JOINTS	L.F.	336

LEGEND

LIMITS OF PLANING

CLEANING AND SEALING EXISTING BRIDGE JOINTS

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
2		
3		
4		
5		
6		
7		

STATE OF TEXAS
JUAN CARLOS CARDENAS
99227
LICENSED
PROFESSIONAL ENGINEER

ENGINEER NO. 99227, THESE PLANS WERE PREPARED UNDER THE RESPONSIBLE SUPERVISION OF JUAN CARLOS CARDENAS LICENSED PROFESSIONAL ENGINEER
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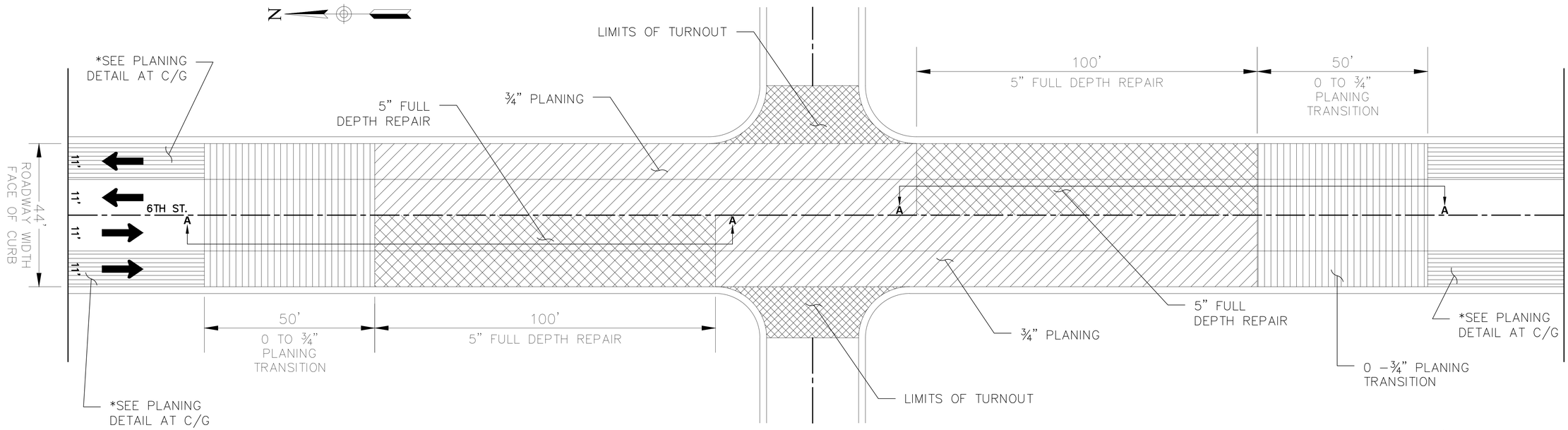
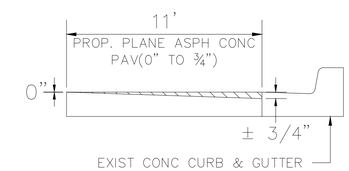
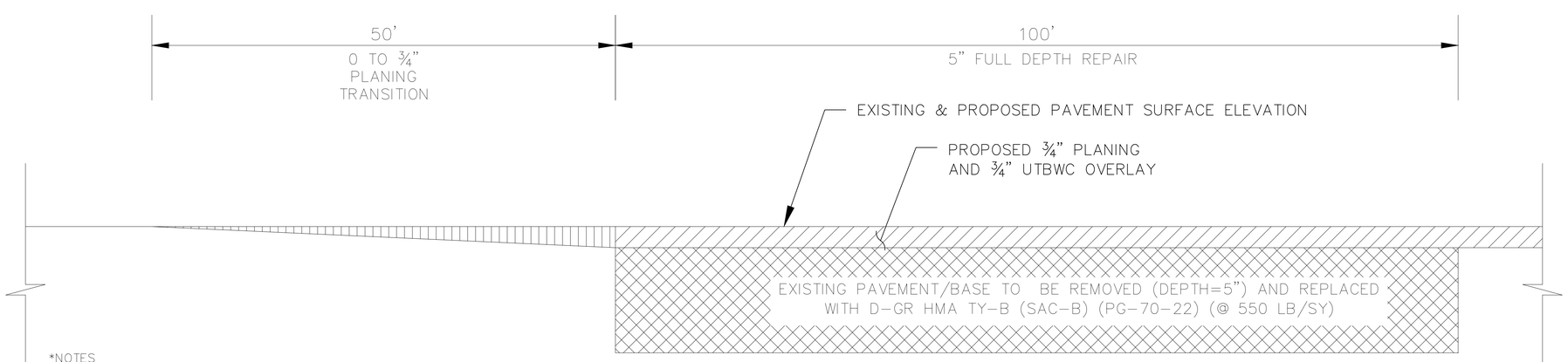
DATE: 04/12/16	SCALE: NTS
DRAWN:	CHECKED BY:
PROJECT #	
SHEET NO: 39	



TYPICAL INTERSECTION
ALONG 6TH ST.
SCALE: 1" = 15'



#PLANNING DETAIL AT C/G
NOTE: FINISHED GRADE AT GUTTER SHALL BE APPROX. ¼ " ABOVE EDGE OF CONCRETE



*NOTES

1. CONTRACTOR SHALL TACK ALL SIDES OF FULL DEPTH REPAIR CUT.
2. CONTRACTOR SHALL LEAVE A SAW CUT BUTT JOINT AT ALL FULL DEPTH REPAIR CUTS AND ¾" MILL TIE-INS AT INTERSECTIONS.

SECTION A-A
5" FULL DEPTH REPAIR
N.T.S.

5" FULL DEPTH REPAIR

0 TO ¾" PLANING TRANSITION LONGITUDINAL

¾" PLANING

*PLANING AT CURB AND GUTTER

LIMITS OF TURNOUT

INTERSECTION PLANING/REPAIR DETAILS

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
2		
3		
4		
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7		

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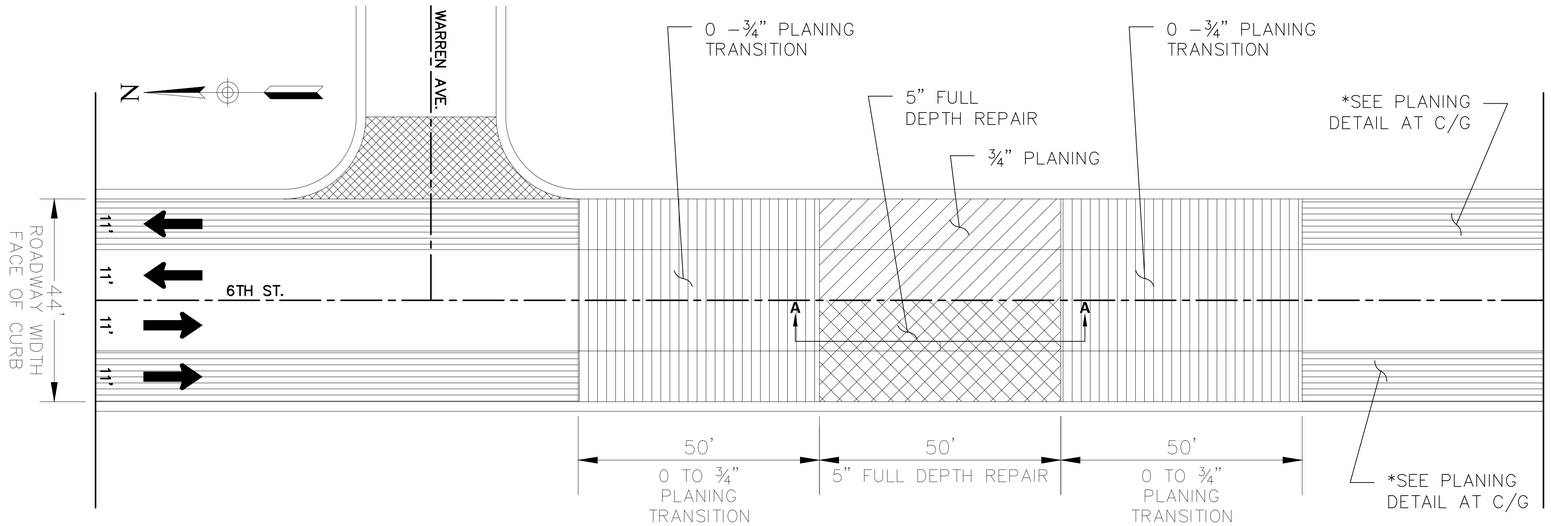
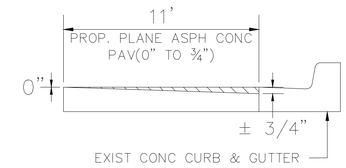
STATE OF TEXAS
JUAN CARLOS CARDENAS
99227
LICENSED
PROFESSIONAL ENGINEER

DATE: 04/12/16	SCALE: NTS
DRAWN:	CHECKED BY:
PROJECT #	
SHEET NO: 40	



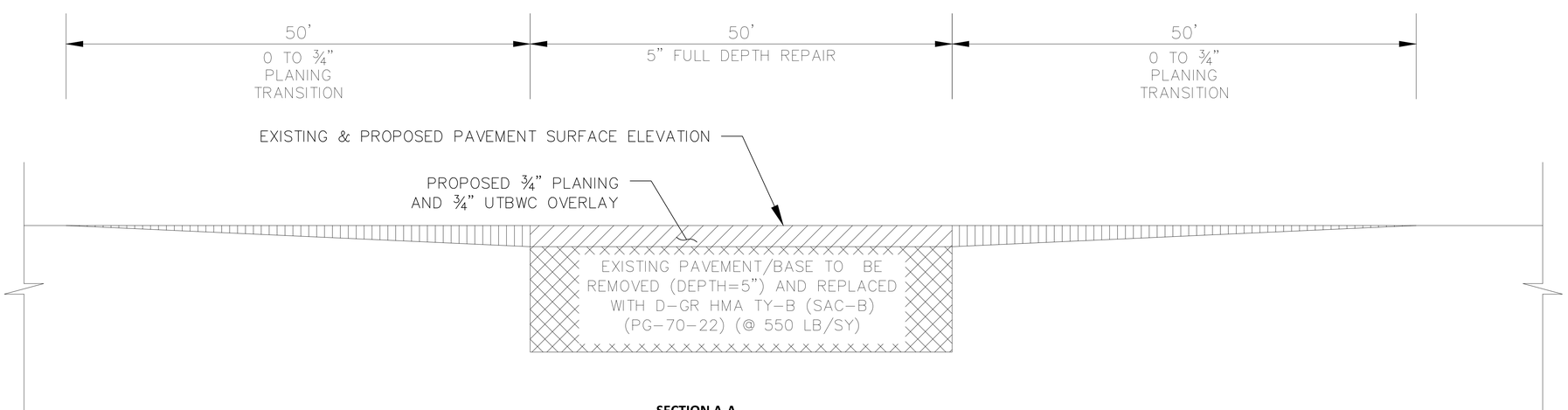
INTERSECTION
6TH ST. AT WARREN AVE.
N.T.S.



#PLANNING DETAIL AT C/G
NOTE: FINISHED GRADE AT GUTTER SHALL BE APPROX. ¼ " ABOVE EDGE OF CONCRETE

LEGEND

- 0 TO ¾" PLANING TRANSITION LONGITUDINAL
- *PLANING AT CURB AND GUTTER
- 5" FULL DEPTH REPAIR
- ¾" PLANING
- LIMITS OF TURNOUT



SECTION A-A
5" FULL DEPTH REPAIR
N.T.S.

*NOTES

1. CONTRACTOR SHALL TACK ALL SIDES OF FULL DEPTH REPAIR CUT.
2. CONTRACTOR SHALL LEAVE A SAW CUT BUTT JOINT AT ALL FULL DEPTH REPAIR CUTS AND ¾" MILL TIE-INS AT INTERSECTIONS.

INTERSECTION PLANING/REPAIR DETAILS

6TH ST. OVERLAY FROM CORALL TO LOOP 428

No.	DATE	REVISION
1		
2		
3		
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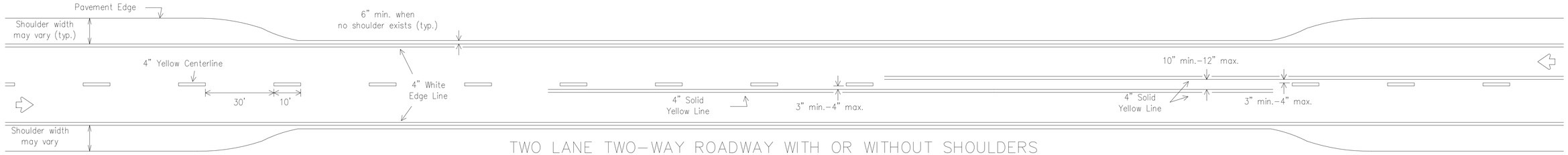
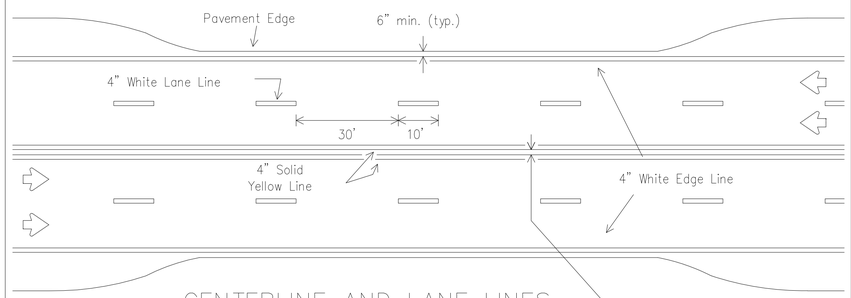
99227
LICENSED
PROFESSIONAL ENGINEER

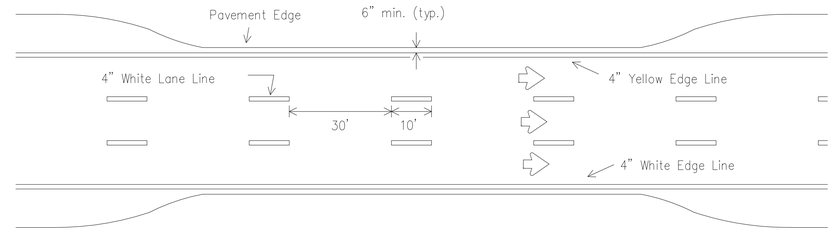
DATE: 04/12/16	SCALE: NTS
DRAWN:	CHECKED BY:
PROJECT #	
SHEET NO: 41	



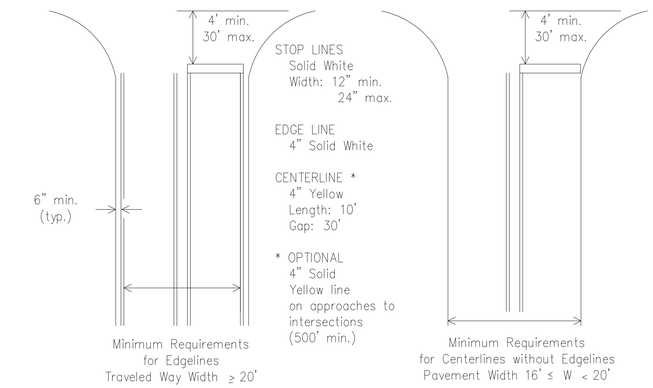
TWO LANE TWO–WAY ROADWAY WITH OR WITHOUT SHOULDERS



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

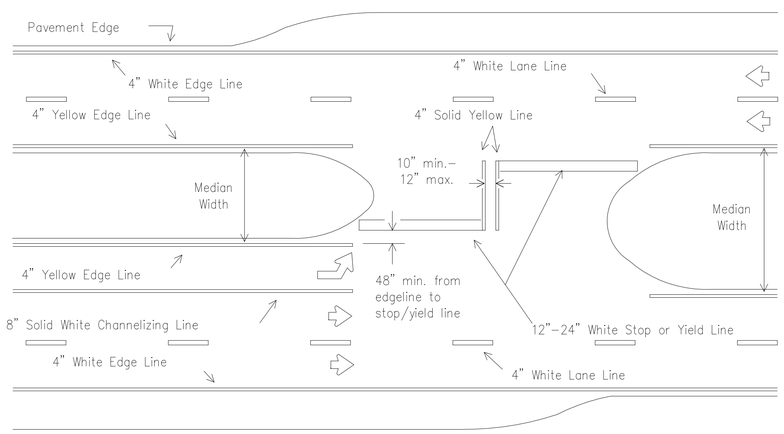


EDGE LINE AND LANE LINES ONE–WAY ROADWAY WITH OR WITHOUT SHOULDERS



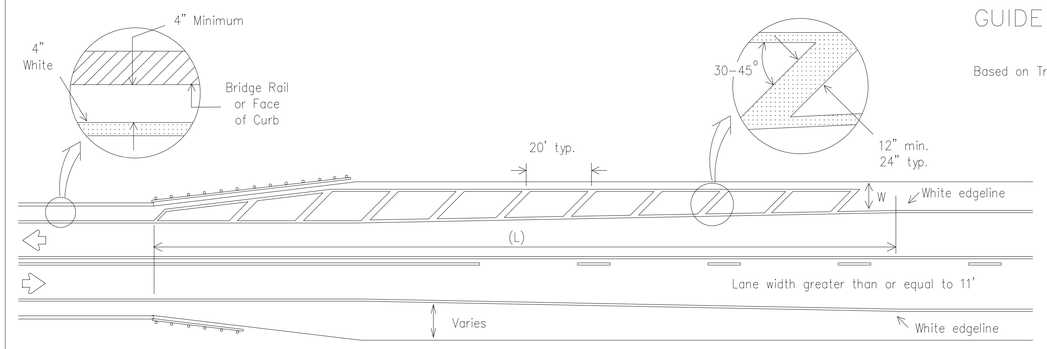
GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways



All medians shall be field measured to determine the location of necessary striping. Stop/Yield bars and centerlines shall be placed when the median width is greater than 30 ft. The median width is defined as the area between two roadways of a divided highway measured from edge of traveled way to edge of traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges and of opposite approaches of the same intersection. The narrow median width will be the controlling width to determine if markings are required.

FOUR LANE DIVIDED ROADWAY INTERSECTIONS



NOTES:

1. No–passing zone on bridge approach is optional but if used, it shall be a minimum 500 feet long.
2. For crosshatching length (L) see Table 1.
3. The width of the offset (W) and the required crosshatching width is the full shoulder width in advance of the bridge.
4. The crosshatching is not required if delineators or barrier reflectors are used along the structure.
5. For guard fence details, refer elsewhere in the plans.

ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT

TABLE 1 – TYPICAL LENGTH (L)

Posted Speed *	Formula
≤ 40	$L = \frac{WS^2}{60}$
≥ 45	L=WS

* 85th Percentile Speed may be used on roads where traffic speeds normally exceed the posted speed limit.
Crosshatching length should be rounded up to nearest 5 foot increment.

L=Length of Crosshatching (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

EXAMPLES:

An 8 foot shoulder in advance of a bridge reduces to 4 feet on a 70 MPH roadway. The length of the cross–hatching should be:

$L = 8 \times 70 = 560$ ft.

A 4 foot shoulder in advance of a bridge reduces to 2 feet on a 40 MPH roadway. The length of the cross–hatching should be:

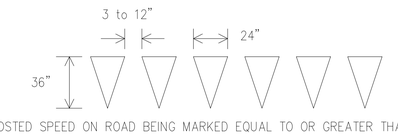
$L = 4(40)^2 / 60 = 106.67$ ft. rounded to 110 ft.

GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should typically be placed a minimum of 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines 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 and not the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to inside of edgeline 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.



FOR POSTED SPEED ON ROAD BEING MARKED EQUAL TO OR GREATER THAN 45 MPH

FOR POSTED SPEED ON ROAD BEING MARKED EQUAL TO OR LESS THAN 40 MPH

YIELD LINES

Texas Department of Transportation
Traffic Operations Division

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)–12

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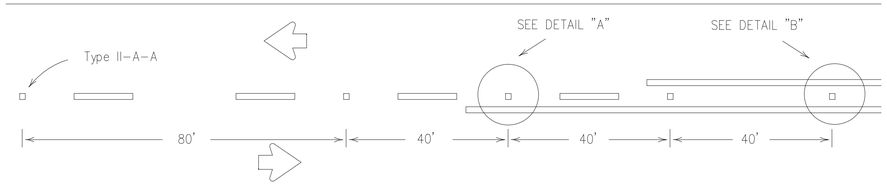
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
DIST	COUNTY		SHEET NO.
			42

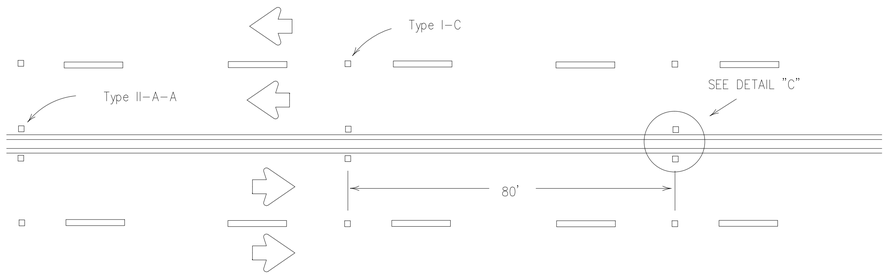
REVISIONS
8–95 2–12
5–00
8–00
3–03
22A

DATE:
FILE:

REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

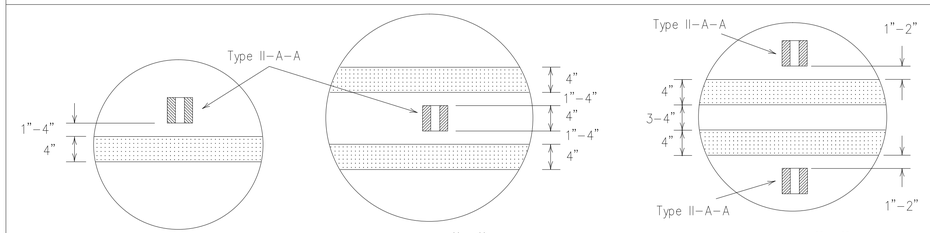


CENTERLINE FOR ALL TWO LANE ROADWAYS

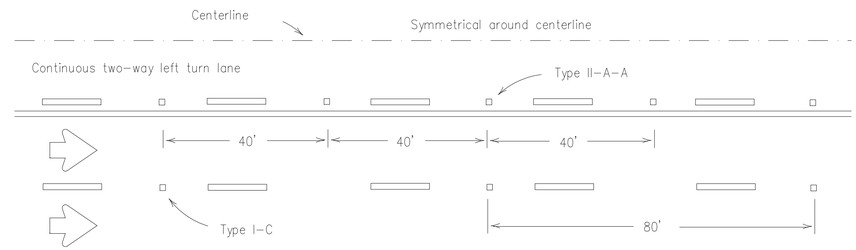


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS

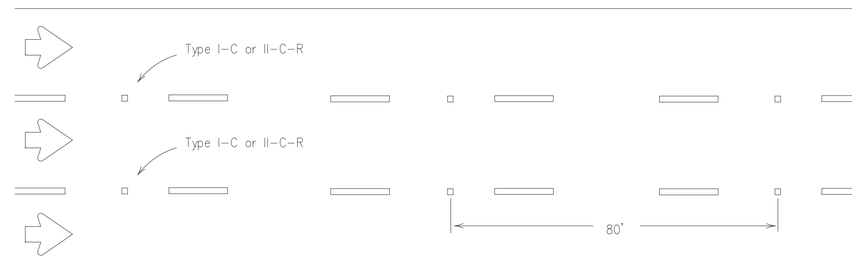
Raised pavement marker Type I-C, clear face toward normal traffic, shall be placed on 80-foot centers.



DETAIL "A" DETAIL "B" DETAIL "C"

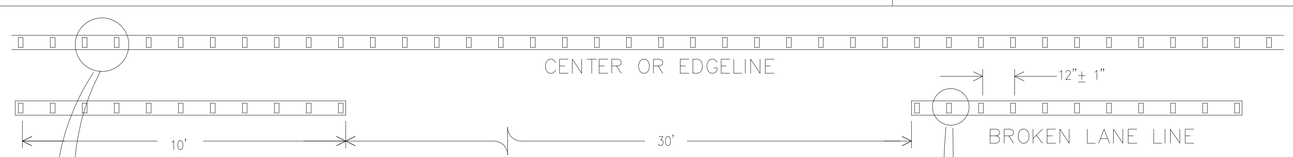


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



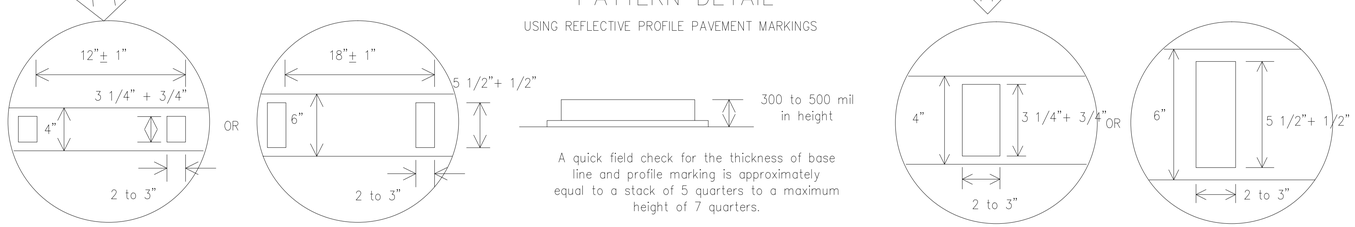
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

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



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



4" EDGE LINE OR CENTERLINE

OPTIONAL 6" EDGE LINE OR CENTERLINE

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.

4" LANE LINE

OPTIONAL 6" LANE LINE

NOTE:

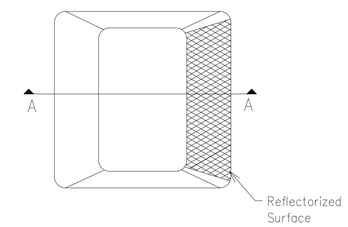
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

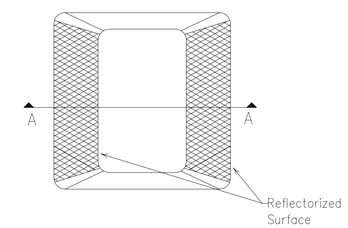
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

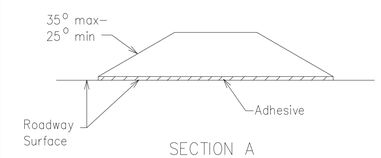
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation
Traffic Operations Division

POSITION GUIDANCE USING RAISED MARKERS

REFLECTORIZED PROFILE MARKINGS

PM(2)-12

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DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
4-92 2-10
5-00 2-12
8-00
2-08

CONT	SECT	JOB	HIGHWAY
DIST	COUNTY		SHEET NO.
			43

22B

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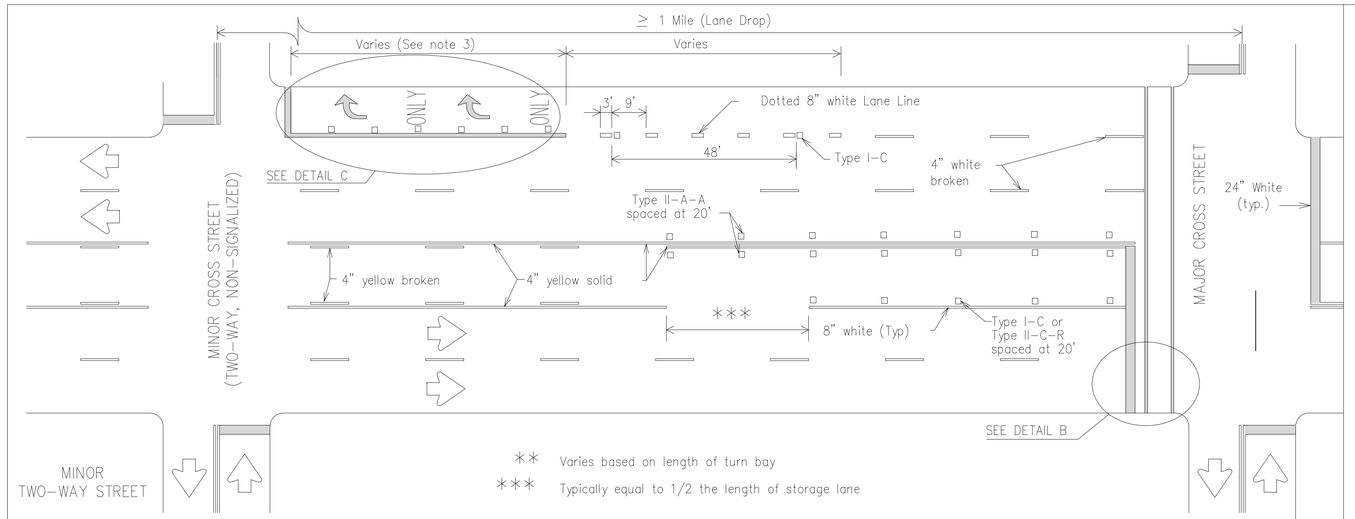
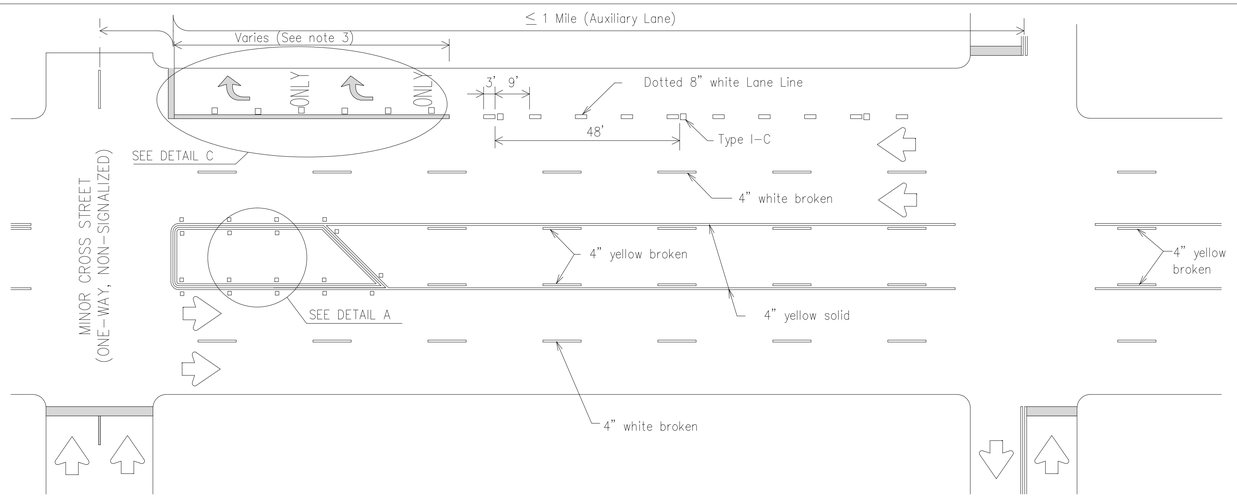
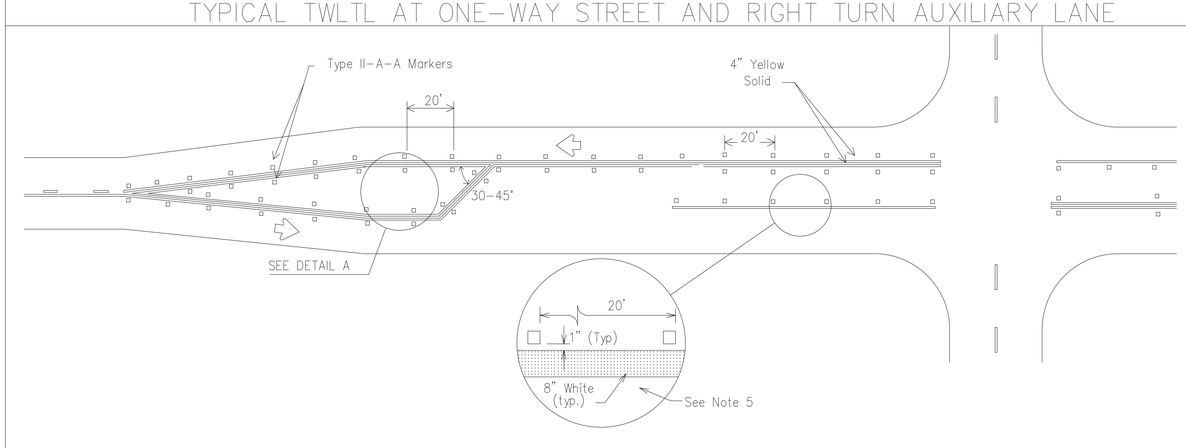


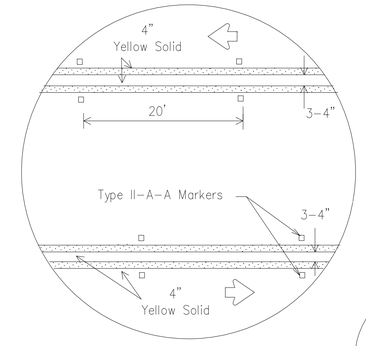
TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



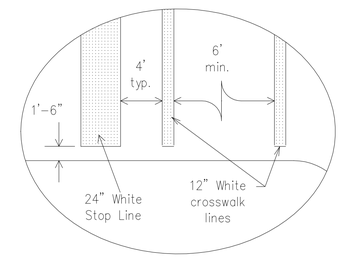
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS

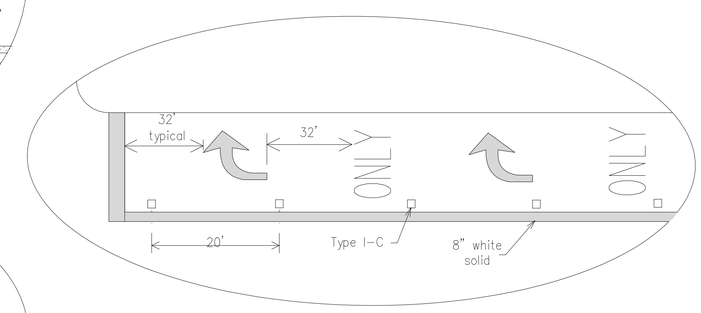


DETAIL A



Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

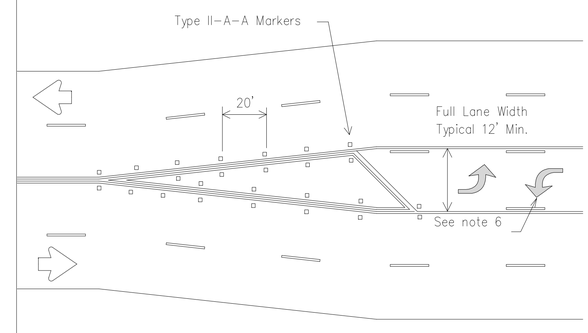
DETAIL B



DETAIL C

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 TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

1. Refer elsewhere in plans for additional RPM placement and details.

2. 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 as shown in the Standard Highway Sign Designs for Texas. 3. When lane used word 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.

4. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used.

5. Raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Raised pavement marker Type II-C-R with divided highways and raised medians. 6. 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.

Texas Department of Transportation
Traffic Operations Division

PAVEMENT MARKINGS FOR TWO-WAY LEFT TURN LANES DIVIDED HIGHWAYS AND RURAL LEFT TURN BAYS

PM(3)-12

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DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
5-00 2-12
8-00
3-03
2-10

CONT	SECT	JOB	HIGHWAY
DIST		COUNTY	SHEET NO.
			44

22C

DATE:
FILE:

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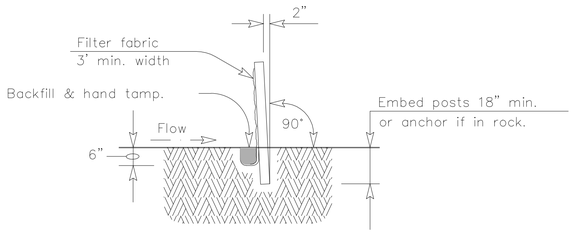


SECTION A–A

GENERAL NOTES

1. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

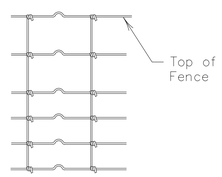
Sediment Control Fence —SCF—

SEDIMENT CONTROL FENCE USAGE GUIDELINES

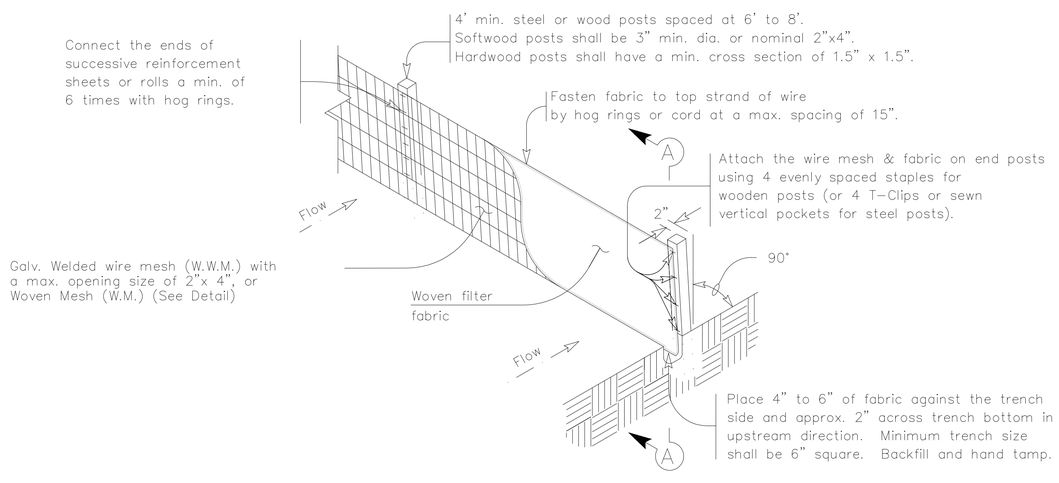
A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a max. flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

Galv. Hinge joint knot woven mesh (12.5 Ga. Min.) requires a minimum of five horizontal wires spaced at a max.12 inches apart and all vertical wires spaced at a max. 12 inches apart.

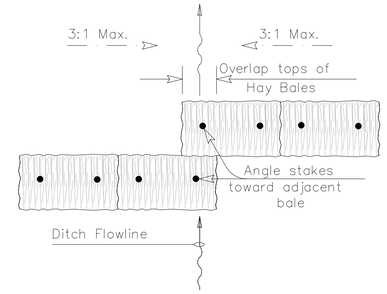


Hinge Joint Knot Woven Mesh (Option)

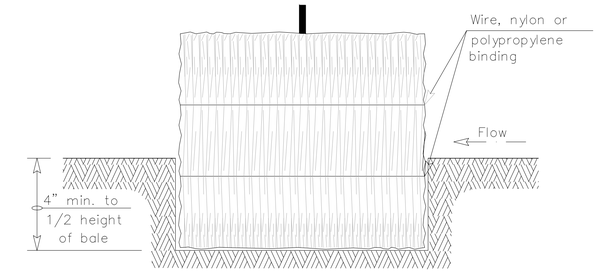


TEMPORARY SEDIMENT CONTROL FENCE

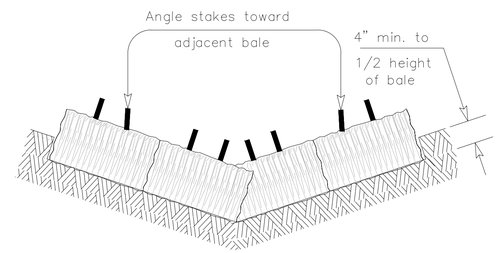
—SCF—



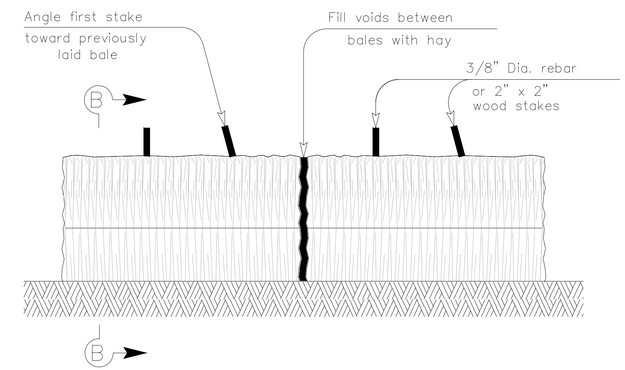
PLAN VIEW



SECTION B–B



PROFILE VIEW



BALED HAY FOR EROSION CONTROL

—BH—

PLANS SHEET LEGEND

Baled Hay —BH—

BALED HAY USAGE GUIDELINES

A Baled Hay installation may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A two year storm frequency may be used to calculate the flow rate to be filtered. The installation should be sized to filter a maximum flow thru rate of 5 GPM/FT^2 of cross sectional area. Baled hay may be used at the following locations:

1. Where the runoff approaching the baled hay flows over disturbed soil for less than 100'. If the slope of the disturbed soil exceeds 10%, the length of slope upstream the baled hay should be less than 50'.
2. Where the installation will be required for less than 3 months.
3. Where the contributing drainage area is less than 1/2 acre.

For Baled Hay installations in small ditches, the additional following considerations apply:

1. The ditch sideslopes should be graded as flat as possible to maximize the drainage flowrate thru the hay.
2. The ditch should be graded large enough to contain the overtopping drainage when sediment has filled to the top of the baled hay.

Bales should be replaced usually every 2 months or more often during wet weather when loss of structural integrity is accelerated.

GENERAL NOTES

1. Hay bales shall be a minimum of 30" in length and weigh a minimum of 50 Lbs.
2. Hay bales shall be bound by either wire or nylon or polypropylene string. The bales shall be composed entirely of vegetative matter.
3. Hay bales shall be embedded in the soil a minimum of 4" and where possible 1/2 the height of the bale.
4. Hay bales shall be placed in a row with ends tightly abutting the adjacent bales. The bales shall be placed with bindings parallel to the ground.
5. Hay bales shall be securely anchored in place with 3/8" Dia. rebar or 2" x 2" wood stakes, driven through the bales. The first stake shall be angled towards the previously laid bale to force the bales together.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & BALED HAY

EC(1)–09

FILE: ec109.dgn	DN: TxDOT	CK: AM	DW: TV	CK: BD
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REVISIONS				
	DIST	COUNTY		SHEET NO.
				45

DATE:
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