READVERTISEMENT

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

CONSTRUCTION PROPOSAL

(REVISED 03/21/07)

STATE PROJECT NOS. 015-04-0039, 015-05-0034 AND 022-04-0036
GEORGETOWN – TULLOS
ROUTE US 165
GRANT AND LASALLE PARISHES

STATE PROJECT NOS. 015-04-0039, 015-05-0034 AND 022-04-0036
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NOTICE TO CONTRACTORS (01/06)

Sealed bids for the following project will be received by the Louisiana Department of Transportation and Development (DOTD), 1201 Capitol Access Road, Headquarters Administration Building, Room 405-L, Baton Rouge, Louisiana 70802 until 8:00 a.m. on **Wednesday, April 25, 2007**. After 8:00 a.m., bids will be received in the Headquarters Auditorium until 10:00 a.m., at which time and place bids will be publicly opened and read. No bids will be received after 10:00 a.m. Any person requiring special accommodations shall notify the Department of Transportation and Development (DOTD) at (225) 379-1111 not less than 3 business days before bid opening.

READVERTISEMENT
STATE PROJECT NOS. 015-04-0039, 015-05-0034 AND 022-04-0036
DESCRIPTION: **GEORGETOWN - TULLOS**
ROUTE: **US 165**
PARISHES: **GRANT AND LASALLE**
LENGTH: **8.026 miles.**
TYPE: **DRAIN STRUCT, CLASS II BC, SUPERPAVE ACP (ALT. A-1), PCCP (ALT. A-2), CONCRETE SLAB SPAN BRIDGES, PRESTRESSED CONCRETE GIRDER BRIDGES AND RELATED WORK.**
LIMITS: State Project No.015-04-0039 : **BEGINS AT THE INTERSECTION OF LA 502 THENCE NORTHERLY TO THE US 84 INTERSECTION.**
LIMITS: State Project No.015-05-0034: **BEGINS AT THE INTERSECTION OF LA 502 THENCE NORTHERLY TO 0.6 MILES NORTH OF INTERSECTION.**
LIMITS: State Project No 022-04-0036: **BEGINS 984 FT WEST OF INTERSECTION OF US 165 TO APPROXIMATELY 248 FT EAST OF US 165 INTERSECTION.**
ESTIMATED COST RANGE: **$30,000,000 TO $50,000,000**
PROJECT ENGINEER: **JOHNSON, THEODORE, LA TIMED MANAGERS, WINNFIELD AREA OFFICE, 517 THOMAS MILL ROAD, WINNFIELD, LA 71485, (225) 906-3203.**
DOTD COORDINATOR: **DEAN, WILLIAM, 10403 LA 8, COLFAX, LA 71417, (318) 627-5522.**
PROJECT MANAGER: **HODGES, JACK, (225) 906-1300.**
COST OF PROPOSAL FORMS: **$25.00**
COST OF PLANS: **$79.50**

Bids must be submitted in accordance with Section 102 of the 2000 Louisiana Standard Specifications for Roads and Bridges as amended by the project specifications, and must include all information required by the proposal.

Plans and/or proposals may be obtained in Room 101-A of the DOTD Headquarters Administration Building, 1201 Capitol Access Road in Baton Rouge, or by contacting the DOTD; Email: sknight@dotd.louisiana.gov, Phone (225) 379-1111, FAX: (225) 379-1714, or by written requests sent to the Louisiana Department of Transportation and Development, Contracts Management Section, P. O. Box 94245, Baton Rouge, LA 70804-9245. Proposals will not be issued later than 24 hours prior to the time set for opening bids. Purchase price for plans and proposals is non-refundable. Plans and specifications may be seen at the Project Engineer's office or in Room 101-A of the DOTD's Headquarters Administration Building in Baton Rouge. Upon request, the Project Engineer will show the work.

The U. S. Department of Transportation (DOT) operates a toll free "Hotline" Monday through Friday, 8:00 a.m. to 5:00 p.m., eastern time. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should call 1-800-424-9071. All information will be treated confidentially and caller anonymity will be respected.

GENERAL BIDDING REQUIREMENTS (01/06): The specifications, contract and bonds governing the construction of the work are the 2000 Edition of the Louisiana Standard Specifications for Roads and Bridges, together with any supplementary specifications and special provisions attached to this proposal.

Bids shall be prepared and submitted in accordance with Section 102 of the Standard Specifications.

The plans herein referred to are the plans approved and marked with the project number, route and Parish, together with all standard or special designs that may be included in such plans. The bidder declares that the only parties interested in this proposal as principals are those named herein; that this proposal is made without collusion or combination of any kind with any other person, firm, association, or corporation, or any member or officer thereof; that careful examination has been made of the site of the proposed work, the plans, Standard Specifications, supplementary specifications and special provisions above mentioned, and the form of contract and payment, performance, and retainage bond; that the bidder agrees, if this proposal is accepted, to provide all necessary machinery, tools, apparatus and other means of construction and will do all work and furnish all material specified in the contract, in the manner and time therein prescribed and in accordance with the requirements therein set forth; and agrees to accept as full compensation therefore, the amount of the summation of the products of the quantities of work and material incorporated in the completed project, as determined by the engineer, multiplied by the respective unit prices herein bid.

It is understood by the bidder that the quantities given in this proposal are a fair approximation of the amount of work to be done and that the sum of the products of the approximate quantities multiplied by the respective unit prices bid shall constitute gross sum bid, which sum shall be used in comparison of bids and awarding of the contract.

The bidder further agrees to perform all extra and force account work that may be required on the basis provided in the specifications.

The bidder further agrees that within 15 calendar days after the contract has been transmitted to him, he will execute the contract and furnish the Department satisfactory surety bonds.

If this proposal is accepted and the bidder fails to execute the contract and furnish bonds as above provided, the proposal guaranty shall become the property of the Department; otherwise, said proposal guaranty will be returned to the bidder; all in accordance with Subsection 103.04.

TRANSPORTATION INFRASTRUCTURE MODEL FOR ECONOMIC DEVELOPMENT (TIMED) PROJECT (06/05): This project is a Transportation Infrastructure Model for Economic Development (TIMED) project as defined in Act No. 16 of the 1989 First Extraordinary Session of the Legislature which enacted Part V of Chapter 7 of Subtitle II of Title 47 of Louisiana Revised Statutes of 1950, comprised of R.S. 47:820.1 through 820.6.

The contractor understands and agrees that compliance with Louisiana R.S.47:820.3 is mandatory as stated below:

820.3 EMPLOYMENT OF LOUISIANA RESIDENTS

At least eighty percent of the employees employed on any Transportation Infrastructure Model for Economic Development (TIMED) project must be Louisiana residents. A "Louisiana resident" shall be defined for the purposes of this Part as a person who has resided in this state

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for at least one hundred eighty consecutive days at the time of initial employment, as evidenced by a valid Louisiana motor vehicle operator's license or bill for utility services.

The contractor shall maintain sufficient records to ensure compliance herewith and shall submit by the end of the first estimate period, copies of valid Louisiana Motor Vehicle Operator's License or bill for utility services for all project personnel. Proof of residency must be submitted for each new employee hired or assigned to the project until completion. The contractor shall submit proof of residency to the project engineer. The project engineer will forward proof to the Compliance Programs Section at P.O. Box 94245, Baton Rouge, LA 70804-9245.

SPECIAL NOTICES TO CONTRACTOR:

ASBESTOS INVESTIGATION REPORT: The Contractor may obtain a report entitled "Asbestos Site Investigation Report, 015-04-0039 (Georgetown – Tullos), Grant and LaSalle Parishes", Louisiana" from Louisiana Timed Managers, 6300 Corporate Boulevard, Suite 200, Baton Rouge, LA 70809-1000, phone (225) 906-1300; fax (225) 906-1400. The report may also be reviewed online at ftp://66.135.25.121/asbestos_reports. The name of the report is 015-04-0039-Georgetown - Tullos Asbestos Report.pdf. This report is for informational purposes only.

CONTRACTOR'S RIGHT OF ENTRY AGREEMENT AND UNION PACIFIC RAILROAD MINIMUM REQUIREMENTS: The Right of Entry Agreement between the contractor and Union Pacific Railroad Company and the Union Pacific Railroad Minimum Requirements (Exhibit C) are included elsewhere herein.

ELECTRONIC BIDDING (04/06). The 2000 Louisiana Standard Specifications for Roads and Bridges and supplemental specifications thereto are amended as follows.

SECTION 101 - GENERAL INFORMATION, DEFINITIONS AND TERMS:

Subsection 101.03 - Definitions.

Revise the following definitions.

Bid. The binding offer of a responsible bidder that was submitted to the Department on the bid forms or via approved electronic media, in accordance with the bidding documents.

Bid Forms. The portion of the bidding documents, either paper or electronic, required to be submitted, in accordance with the bidding documents, in order to constitute a bid.

Add the following definitions.

Bid Express. An on-line service provided by Bidx.com, an Info Tech company, which is under contract to DOTD to facilitate two-way Internet electronic bidding.

Bidx.com. The subsidiary company owned by Info Tech that provides the Bid Express service.

Electronic Bidding. The process by which the Department and the bidder can utilize the Internet to facilitate the bidding process.

Electronic Bid Bond. An instrument by which a contractor and surety can submit a bid guarantee with a bid electronically in lieu of a written, signed paper.

Electronic Signature. A secure and verifiable alpha-numeric code assigned to an individual, replacing or acting instead of a traditional signature.

Expedite. Software developed for AASHTO by Info Tech that enables and facilitates electronic bidding.

SECTION 102 – BIDDING REQUIREMENTS.

Subsection 102.02 - Contractor's Licensing Laws.

Delete the first sentence of the third paragraph and substitute the following.

> When the estimated project cost is greater than $50,000 and no FHWA funds are involved, the contractor shall show his license number on the bid envelope unless the contractor submits the bid via the DOTD approved electronic bidding process.

Subsection 102.03 - Contents of Bidding Documents.

Amend the first paragraph to include the following.

> The prospective bidder may use the Bid Express services through Bidx.com. The use of these services will require payment by the contractor of additional fees to the service provider.

Delete the first sentence of the third paragraph and substitute the following.

> Unless the contractor properly submits the bid forms electronically, the bid forms bound with or attached to the construction proposal should be detached, completed, and returned by the bidder.

Subsection 102.04 - Issuance of Bid Documents.

Delete the first sentence of the first paragraph and substitute the following.

> The Department may refuse to issue bid documents to a bidder or allow a bidder access to Bid Express for bidding purposes, for any of the following reasons:

Subparagraphs (b), (c), (f), and (g) are reinstated.

Subsection 102.06 - Examination of Bid Documents and Site of Work.

Amend this subsection to include the following.

> Written instructions necessary to use the electronic bidding service and prepare and submit a bid electronically are provided on the Bidx.com Internet site. Fees payable to Bidx.com are required of the contractor to use the service and to establish electronic signatures. The contractor is advised to timely make all necessary arrangements with Bidx.com and to familiarize himself with system and process requirements prior to using the service to submit a bid.

Subsection 102.07 - Preparation of Bid.

Delete the first sentence of the first paragraph and substitute the following.

> For paper bids, bids shall be submitted on bid forms provided by the Department or obtained through Bidx.com.

Delete the first sentence of the second paragraph and substitute the following.

> A unit bid price, in English and U.S. dollars, shall be specified in the Schedule of Items in words or numerals, either typed or printed in ink, or computer printed in the spaces provided for each pay item or alternate pay item.

Delete the first sentence of the third paragraph and substitute the following.

> The Construction Proposal Signature and Execution Form shall be signed either with an authorized electronic signature or with ink by the individual; or a member of the partnership; or an officer of one of the firms representing a joint venture; or an officer of a corporation; or an agent of the contractor legally qualified and acceptable to the state.

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Add the following paragraph.

Bid bonds may be furnished and completed by a DOTD approved electronic bond verification service if the contractor elects to prepare and submit an electronic bid.

Subsection 102.08 - Irregular Bids.

Delete Subparagraph (a) and substitute the following.

(a) If the bid, except for legible facsimiles, is on a form other than that furnished by the Department or Bidx.com, or if the bid forms are materially altered.

Delete Subparagraph (j) and substitute the following.

(j) If the portion of the construction proposal form designated as Bid Forms is not properly executed either by hand or electronically and submitted with the bid.

Subsection 102.09 - Proposal/Bid Guaranty.

Delete the fourth paragraph and substitute the following.

All signatures required on the bid bond may be original, mechanical reproductions, facsimiles or electronic. Electronic bonds issued in conjunction with electronic bids must have Departmental approval prior to use. The Department will make a listing of approved electronic sureties providers on the Bidx.com site.

Subsection 102.10 - Delivery of Bids.

Delete this subsection and substitute the following.

Unless delivered electronically through the approved electronic bid submission service, each bid should be submitted in the envelope furnished by the Department. The blank spaces on the envelope shall be filled in correctly to clearly indicate its content. When an envelope other than the one furnished by the Department is used, it shall be the same general size and shape and be similarly marked to indicate its contents. Bids shall be received no later than the time and at the place specified in the Notice to Contractors. Paper bids received after the time set for opening bids will be returned to bidders unopened. Electronic bids shall be submitted via the Internet in accordance with Subsection 102.07. Electronic bids transmitted by the bidder, after the time set for bid opening will not be accepted.

A proposal guarantee and all other required returnables not submitted electronically with an electronic bid must be delivered by the contractor to the Department in a sealed envelope as specified above prior to the date and time of the bid opening.

Subsection 102.11 - Withdrawal or Revision of Bids.

Delete this subsection and substitute the following.

A bidder may withdraw or revise a bid after it has been deposited with the Department, provided the request for such withdrawal or revision is received by the Department in person or in writing before the time set for opening bids and at the location set forth in the Notice to Contractors. Electronic bids submitted to Bid Express may be withdrawn prior to the specified bid opening time by the authorized bidder.

Subsection 102.12 - Public Opening of Bids.

Delete this subsection and substitute the following.

Paper or electronic bids will be publicly opened and read or presented at the time and place indicated in the Notice to Contractors.

SECTION 103 – AWARD AND EXECUTION OF CONTRACT

Subsection 103.01 - Consideration of Bids.

Delete the first paragraph and substitute the following.

After paper or electronic bids are opened and read, they will be compared on the basis of summation of the products of the quantities and the unit bid prices in the Schedule of Items. Results of such comparisons will be available to the public.

Subsection 103.04 - Return of Proposal/Bid Guaranty.

Amend this subsection to include the following.

Electronic bid bonds of unsuccessful bidders will not be returned but will be deemed by the Department to have no force or effect after sixty days.

COST-PLUS TIME PLUS LIFE CYCLE COST BIDDING PROCEDURE (A+B+C METHOD): The 2000 Standard Specifications, as amended elsewhere herein, are further amended as follows:

General. There are two (2) pavement alternates under consideration for this project. Each contractor should choose his preferred alternate to bid. The process for bidding and the award of this project will take into account not only the contract amount bid, but also the bidders stated contract time and the life cycle cost adjustment factor (life cycle cost adjustment factors are provided by the Department). This method will only be used to determine the successful bidder. It will not be used to determine the award amount nor final payment to the contractor.

Definition of terms. For this project the following definitions apply:

(a) Calendar day- Refer to Subsection 101.03.

(b) Contract Amount - The summation of the products of the quantities shown in the Schedule of Items multiplied by the unit bid prices.

(c) Contract Time – The number of calendar days for the bidder's preferred pavement alternate stated in the proposal to complete the project to final acceptance as adjusted by authorized extensions.

(d) Daily Road User Cost – The amount which represents the average daily cost of delay and inconvenience to the road user. The Department has assigned a daily road user cost of $3,200 per calendar day for this project.

(e) Life Cycle Cost Adjustment Factor – a dollar amount to be added to each bid which is based on costs for future rehabilitation needs of the alternate pavements over the 40 year analysis period. These values are determined by the Department, based on anticipated performance and engineering judgment.

(f) Final Acceptance - Refer to Subsection 105.17(b).

Preparation of Proposal. In addition to all other bidding requirements of the project specifications, the bidder shall state his required time in the space provided on the "CONTRACT TIME" form contained elsewhere herein. The proposed completion time shall be based on the construction phases shown in the plans in their respective order. The completion time and the Life Cycle Cost Adjustment amount will be factors used in considering bids for award.

The stated number of calendar days required for completion of the selected pavement alternate will be the contract time for this project should the bidder be successful. The total number of days stated by the bidder to complete the project shall not exceed the maximum allowable contract time stated on the "Contract Time" form contained elsewhere herein.

Bids not including a contract time, or showing time to completion in excess of the maximum amount will be considered irregular and will be rejected.

Consideration of bids. After bids are opened and read, they will be compared based on the Total Bid Amount as determined by the following formula. In case of equal total bid amounts between qualified bidders, award will be made to the bidder proposing the shortest contract time.

Total Bid amount = A +B+ C
Where:

A = the contract amount as defined herein:
Base Bid + Alternate A1 (Superpave Asphaltic Concrete Pavement), or
Base Bid + Alternate A2 (Portland Cement Concrete Pavement).

B = the product of the required number of calendar days of contract time as stated by the bidder for his preferred pavement alternate, and the daily road user cost contained herein.

C = the lump sum Life Cycle Cost Adjustment Factor for the relevant pavement alternate.
C1Superpave Asphaltic Concrete Pavement = $1,643,900;
C2 Portland Cement Concrete Pavement = $ 688,300.

(see Life Cycle Cost Analysis contained elsewhere herein).

Late Completion. Should the contractor fail to complete the project to final acceptance price to expiration of the contract time, stipulated damages will be charged in accordance with the special provision entitled **"FAILURE TO COMPLETE ON TIME"** contained elsewhere herein.

LIFE CYCLE COST ANALYSIS

STATE PROJECT NO. 015-04-0039, 015-05-0034, & 022-04-0036
GEORGETOWN - TULLOS
GRANT & LASALLE PARISHES
ROUTE US 165

ALTERNATE	YEAR 0	YEAR 15	YEAR 20	YEAR 30	YEAR 40	PRESENT VALUE TOTALS
		PV FACTOR = 0.5553	PV FACTOR = 0.4564	PV FACTOR = 0.3083		
	6000 ADT	8300 ADT	9300 ADT	10200 ADT	11,300 ADT	
FOR INFORMATION ONLY **A2**	**NEW JPC PAVEMENT** 200mm JPCP 200mm CLASS II BASE COURSE (CRUSHED STONE/RECYCLED PCCP) CONST. COST: $6,398,500 USER COST: $110,300 TOTAL COST: $6,508,800	**NO ACTION** TOTAL COST: $0	**CLEAN/SEAL JOINTS** SILICONE **PATCHING** PATCH 1% OF JOINTS **SHOULDERS** COLD PLANE 50MM WITH OVERLAY CONST. COST: $705,900 USER COST: $463,000 TOTAL COST: $1,168,900	**RETEXTURE** TRAVEL LANES & TURN LANES **PATCHING** PATCH 2% OF JOINTS CONST. COST: $368,400 USER COST: $133,700 TOTAL COST: $502,100	REMAINING INVESTMENT LIFE 0 YEARS TOTAL COST: $0	TOTAL INVESTMENT LIFE = 40 YEARS CONST. COST: $6,834,300 USER COST: $362,800 TOTAL COST: $7,197,100
A1	**NEW AC PAVEMENT** 50mm AC WEARING COURSE 100mm AC BINDER COURSE 250mm CLASS II BASE COURSE (CRUSHED STONE/RECYCLED PCCP) CONST. COST: $4,726,000 USER COST: $164,700 TOTAL COST: $4,890,700	**STRUCTURE REHAB** **COLD PLANE 50mm** **(EXCLUDING SHOULDERS)** **WITH OVERLAY** 40mm AC WEARING COURSE 50mm AC BINDER COURSE 100mm EXISTING AC PAVEMENT 250mm EXISTING CLASS II BASE (CRUSHED STONE/RECYCLED PCCP) CONST. COST: $1,853,000 USER COST: $182,600 TOTAL COST: $2,035,600	**NO ACTION** TOTAL COST: $0	**STRUCTURE REHAB** **COLD PLANE 50mm** **(INCLUDING SHOULDERS)** **WITH OVERLAY** 50mm AC WEARING COURSE 140mm EXISTING AC PAVEMENT 250mm EXISTING CLASS II BASE (CRUSHED STONE/RECYCLED PCCP) CONST. COST: $1,446,300 USER COST: $219,300 TOTAL COST: $1,665,600	REMAINING INVESTMENT LIFE 0 YEARS TOTAL COST: $0	TOTAL INVESTMENT LIFE = 40 YEARS CONST. COST: $6,200,900 USER COST: $333,700 TOTAL COST: $6,534,600

AWARD OF CONTRACT (04/04): Section 103 of the Standard Specifications is amended as follows.

Subsection 103.02, Award of Contract is amended to include the following.

The award of contract, if awarded, will be made to the lowest responsible bidder on the total of one of the following combinations:

General Items (Base Bid) plus Alternate (A1), plus the product of the number of calendar days of contract time stated by the bidder for Alternate (A1) and the daily road user cost contained herein, plus the life cycle cost adjustment factor for Superpave Asphaltic Concrete Pavement (C1) assigned by the Department; or

General Items (Base Bid) plus Alternate (A2), plus the product of the number of calendar days of contract time stated by the bidder for Alternate (A2) and the daily road user cost contained herein, plus the life cycle cost adjustment factor for Portland Cement Concrete Pavement (C2) assigned by the Department.

INTENT OF CONTRACT (11/95): Subsection 104.01, Intent of Contract, is amended to include the following.

(a) Covenant of Good Faith and Fair Dealing.

This contract imposes an obligation of good faith and fair dealing in its performance and enforcement.

The contractor and the Department agree from the beginning to focus on creative cooperation, to avoid adverse confrontation, and to foster mutual respect, along with a positive commitment to honesty and integrity, and agree to the following mutual duties.

(1) Each will function within the laws and statutes applicable to their duties and responsibilities.
(2) Each will communicate in an open and candid manner.
(3) Each will assist in the other's performance.
(4) Each will avoid hindering the other's performance.
(5) Each will proceed to fulfill its obligations diligently.
(6) Each will cooperate in the common endeavor of the contract.

(b) Voluntary Partnering.

The Louisiana Department of Transportation and Development intends to encourage the foundation of a cohesive partnership with the contractor and its principal subcontractors and suppliers. This partnership will be structured to draw on the strengths of each organization to identify and achieve reciprocal goals. The objective is a cooperative approach to contract management that will reduce costs, litigation, and "stress" while completing the project in accordance with the plans and specifications.

This partnership will be bilateral in makeup, and participation in partnering will be totally voluntary and is not a requirement of the contract.

A partnering conference is to be implemented and held prior to beginning construction. The contractor's management personnel and the Project Engineer will initiate a partnering development conference. They, working with the assistance of the District Construction Engineer, will make arrangements to determine the facilitator, the attendees at the conference, agenda of the conference, duration, and location. Persons required to be in attendance will be the Project Engineer and key project personnel; the contractor's on-site project manager and key project supervision personnel of both the prime and principal subcontractors and suppliers. The project design engineers, FHWA, key company representatives, and key local government personnel will also be invited to attend as necessary. The contractor and DOTD will also be required to have Regional/District and Corporate/State level managers on the project team.

Any cost associated with effectuating this partnering will be agreed to by both parties and will be shared equally and will be paid for in accordance with Subsection 109.04. The

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contractor, DOTD, FHWA and all others invited to the partnering conference will be responsible for any expenses incurred by their respective employees which includes salaries, travel, and lodging.

Follow-up conferences may be held periodically throughout the duration of the contract as agreed by the contractor and the DOTD.

The establishment of a partnership charter on a project will not change the legal relationship of the parties to the contract nor relieve either party from any of the terms of the contract. This partnership charter is intended only to establish an environment of cooperation and communication between all parties involved with the completion of the project.

MAINTENANCE OF TRAFFIC (04/06): Subsection 104.03 of the Standard Specifications is amended to include the following requirements.

The contractor shall provide for and maintain through and local traffic at all times and shall conduct his operations in such manner as to cause the least possible interference with traffic at junctions with roads, streets and driveways.

In order to maintain traffic, the contractor shall construct temporary detours as required by the contract.

All asphaltic concrete pavement new construction, overlays, and shoulder surfacing operations open to traffic shall be conducted in accordance with the following requirements.

1. Shoulder Subgrade Preparation: Any required embankment widening shall be completed before placement of the asphaltic concrete overlay. All vegetation shall be removed from existing shoulders before beginning temporary or final shoulder construction.

2. Temporary Shoulder Construction: Temporary shoulder construction described herein shall be completed at the end of each day's operations for all asphaltic concrete courses except the final wearing course. There shall be no drop-off from the pavement edge to the shoulder. The contractor shall blade and shape existing shoulder material against, and approximately level with, the top of the pavement surfacing to form a temporary shoulder with a uniform slope from the pavement edge to the existing shoulder line, or to a point 10 feet (3 m) from the pavement edge. If existing shoulder materials are insufficient, the contractor shall furnish, place and shape additional shoulder surfacing materials to form the temporary shoulder. Existing and/or additional materials for temporary shoulders shall be to the satisfaction of the engineer. Compaction shall be by approved methods.

No direct payment will be made for constructing and subsequently reshaping temporary shoulders, except payment for additional materials under appropriate pay items.

All lane closures, including ramps, shall be authorized by the engineer. Unless otherwise authorized, lane closures will only be allowed while work is being performed. The contractor shall provide the engineer a five calendar day notice, prior to any lane closure unless a shorter notification period is allowed by the engineer. A late lane opening rental will be charged to the contractor for any lane closure on any roadway or ramp that extends beyond the allowed closure times. The rental shall be computed in hourly increments only, with fractions of an hour rounded up to the next whole hour. The rental will also apply to any unauthorized lane closures by the contractor, whether short term or long term. Any monies assessed as a late lane opening rental or for an unauthorized lane closure will be deducted from payments due the contractor. The late lane opening rental or unauthorized lane closure rental will be in accordance with the following table for a maximum of four continuous hours.

Unauthorized Lane Closure or Late Lane Opening Rental	
Current Average Daily Traffic (Vehicles per Day)	**Hourly Rate ($/Hour)**
<10,000	250
10,000 - 20,000	1,250
20,000 - 35,000	5,000
35,000 - 50,000	11,500
>50,000	15,000

NIGHTTIME CONSTRUCTION OPERATIONS (02/06): Section 105, Control of Work, of the 2000 Standard Specifications is amended to add the following.

105.20 NIGHTTIME CONSTRUCTION OPERATIONS.

(a) Description: This work consists of furnishing, installing, operating, maintaining, moving, and removing portable light towers and equipment-mounted fixtures for nighttime construction operations. Nighttime construction operations are defined as work performed after sunset and before sunrise.

(b) Equipment Requirements: Materials and equipment shall be in good operating condition and in compliance with applicable OSHA, NEC, and NEMA codes.

The contractor shall furnish, to the engineer, two light meters capable of measuring the level of illuminance. These light meters will be used by the engineer to check the adequacy of illumination throughout the nighttime construction operations. The light meters will become the property of the contractor after final acceptance.

Suitable brackets and hardware shall be provided to mount lighting fixtures on equipment and machinery. Mountings shall be designed so that light fixtures can be positioned as necessary to reduce glare and provide the required illumination. Mounting brackets and fixtures shall not interfere with the equipment operator or any overhead structures and shall be securely connected to the fixtures to insure minimum vibration.

Equipment-mounted systems shall be attached to construction equipment to provide Level II and Level III illuminance. Equipment mounted lighting shall be designed and positioned to be operated independently of general illumination.

Portable systems may consist of ground-mounted, trailer-mounted, or equipment mounted light towers. Portable light towers shall be sturdy and free-standing without the aid of guy wires or bracing. Towers shall be capable of being moved as necessary to keep pace with the construction operation. Extreme caution shall be used when moving portable light towers in the vicinity of overhead utilities. Portable lighting systems shall be positioned to minimize the risk of being impacted by traffic on the roadway or by construction equipment.

Conventional vehicle headlights shall not be permitted as the sole means of illumination while working. All motorized vehicles shall be equipped with conventional vehicle headlights to permit safe movement in non-illuminated areas. Use of strobe lights on vehicles and equipment is prohibited. Use of flashing lights shall be kept to a minimum to prevent motorist distraction. Flashing lights shall not be used behind barrier protection systems

Switches shall be provided to adequately control the various lights. All wiring shall be weatherproof and installed according to local, state, federal, and OSHA requirements. Ground fault circuit interrupters shall be provided for electrical outlets used for electrical tools and extension cords. The contractor shall provide sufficient fuel, spare lamps, generators and qualified personnel to ensure that all required lights operate continuously during nighttime

construction operations. In the event of any failure of the lighting system, the construction operation shall be discontinued until the required level of illumination is restored. In residential areas, generator systems shall be selected to comply with local noise ordinances. A supply of emergency flares shall be maintained by the contractor for use in the event of emergency or unanticipated situations.

(c) Illumination Requirements: All operations that are performed during nighttime hours shall be properly illuminated to allow for the safe performance and inspection of the work.

Work area is defined as a minimum of 50 feet (15 m) ahead and behind the employee, where work is to be performed. A minimum of 5 foot-candles (54 lux) shall be maintained throughout the work area during nighttime construction operations, and during the setup and removal of lane or roadway closures.

Lighting shall be adequate to meet the required level of illuminance and uniformity over the work area as follows:

(1) Level I (5 foot-candles, 54 lux): This level of illuminance shall be provided for all work areas of general construction operations, such as excavation and embankment; cleaning and sweeping; landscaping; planting and seeding. Stockpiles shall also be illuminated to Level I to enhance safety and improve work efficiency.

(2) Level II (10 foot-candles, 108 lux): This level of illuminance is required for areas on or around construction equipment such as that used for drainage installations, striping, base course construction, milling, asphalt paving operations, and concrete placement and removal. This level is necessary for safe operation of equipment and for obtaining an acceptable level of accuracy.

(3) Level III (20 foot-candles, 215 lux): This level of illuminance is required for tasks requiring a higher level of visual performance or for tasks with a higher level of difficulty. Such tasks include, pavement or structural crack filling, joint repair, joint cleaning, joint sealing, pavement patching and repairs, saw-cutting, installation of signal equipment or other electrical/mechanical equipment, and other tasks involving fine details or intricate parts and equipment.

(d) Glare Control: All lighting provided under this item shall be designed, installed, and operated to avoid glare interference with roadway traffic or discomfort for residences adjoining the roadway. The contractor shall locate, aim, and adjust the lights to provide the required level of illuminance and uniformity in the work area without the creation of objectionable glare. The engineer shall determine when glare exceeds acceptable levels, either for traffic or adjoining residences. The contractor shall provide shields, visors, or louvers on luminaries as necessary to reduce objectionable levels of glare.

At a minimum, the following requirements shall be met to avoid objectionable glare to oncoming traffic:

(1) Tower-mounted luminaries shall generally be aimed either parallel or perpendicular to the roadway.

(2) All luminaries shall be aimed such that the center of the beam axis is no greater that 60 degrees from the vertical.

(3) Luminous intensity of any luminary shall not exceed 20,000 candela at an angle of 72 degrees from the vertical.

(e) Operational Requirements: Thirty days prior to the start of night time operations, the contractor shall submit a lighting plan to the engineer for approval. The contractor shall select appropriate lighting systems and design a lighting plan to achieve the required illuminance levels.

The lighting plan shall include location of lights necessary for every aspect of work; description of light equipment to be used; description of power source; attachment and mounting details for lights to be attached to equipment; technical details pertaining to the lighting fixtures;

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details on hoods, louvers, shields, or other glare control methods; and lighting calculations confirming that the illumination requirements will be met by the layout plan.

Lighting inspection will include (1) light meter measurements to determine illumination levels, (2) subjective observation of the lighting setup to evaluate glare potential for drivers and workers, and (3) a physical check of the lighting equipment to ensure that it complies with the specification requirements included in the contractor's lighting plan.

Prior to the first night of operation, the engineer will check the adequacy of the installed lighting using a light meter. A summary of these measurements will be noted in the inspection records to provide a basis for comparing subsequent measurements. If the required illuminance levels are not met, the contractor shall make the necessary adjustments before any work proceeds.

Operational checks shall be made when construction phasing changes and lighting plan changes are required to accommodate different phases of construction. Periodic checks will be made throughout the duration of nighttime operations. If the required illuminance levels are not met, the contractor shall make the necessary adjustments to the lighting plan before work continues.

During construction operations, in the event of any failure of the lighting system, the operations shall be discontinued until the required level of illumination is restored.

CONTRACTOR QUALITY CONTROL: Subsection 106.05 of the 2000 Standard Specifications is amended as follows:

The second paragraph is deleted and the following substituted.

Quality Control requirements shall be as specified in the appropriate specification section and as specified in the latest edition of the Department's "Quality Control/Quality Assurance Manual". In case of a discrepancy, the project specification shall govern over the manual.

The contractor shall perform sufficient testing to assure that his processes are providing work in accordance with the plans and specifications. The minimum frequency of quality control testing shall be equal to or greater than the minimum frequencies shown for acceptance in the DOTD Materials Sampling Manual. The results of the contractor's tests shall be furnished to the engineer on a routine basis, usually daily, and upon completion of an item of work, a summary of the quality control tests shall be provided to the engineer.

PUBLIC CONVENIENCE AND SAFETY (09/05): Subsection 107.07 of the Standard Specifications is amended to include the following.

The procurement of police officers for public safety during construction shall be in accordance with the Department's Policy for Use of Police Officers in Construction/Maintenance Work Zones. The DOTD project engineer shall determine the need for police officers to assist in controlling traffic in a particular work zone. The number of officers needed, the tasks they will perform, and their location within the work zone will vary as a function of the zone type. Police officers shall be placed at strategic locations at times during construction as determined by the DOTD project engineer.

The three types of law enforcement services are Police Presence, Police Enforcement and Police Traffic Control. Police Presence is defined as the use of police officers at the beginning of the active work zone area utilizing their blue lights to gain the attention of drivers. Police Enforcement is utilized when enforcement is required to enhance the safe operation of the work zone. Police Traffic Control is to be used in detour / diversion situations.

The DOTD project engineer will extend an invitation to the appropriate Louisiana State Police (LSP) Troop Commander to attend the pre-construction conference.

Prior to commencing the work on the project, the contractor shall contact the LSP Troop Commander to obtain law enforcement services of police officers during construction. If the

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LSP Troop is unable to provide law enforcement services for the project work zone, the LSP Troop Commander or the contractor will extend the invitation to the appropriate local law enforcement authorities.

Police officers will report directly to the contractor. However, the contractor will not have the authority to direct the placement of the police officer or the patrol vehicle in situations that are contrary to established procedures and/or could endanger the police officer. The DOTD project engineer will make the final determination on all issues regarding police officer responsibility in work zones.

Prior to the beginning of the shift, the contractor shall provide a daily work zone briefing to the police officer. For major changes in traffic patterns, advanced notification shall be provided to the police agency working the detail. This information should also be provided to the motoring public through the DOTD district and / or the LSP Troop.

The contractor shall pay for law enforcement services provided by the police officers based on the hourly wage and vehicle rate fee schedule below. The Department will reimburse the contractor monthly for the incurred cost. The contractor shall furnish time record documentation with the request for reimbursement. The provisions of Subsection 109.04 shall not apply to this reimbursement.

The agreed upon fee schedule for police officers in the work zone is as follows:

$25 per vehicle per day - vehicle use fee

$40 per hour per officer (one officer per vehicle) (minimum 2 hours).

RAILWAY-HIGHWAY PROVISIONS (04/01): Subsection 107.08 of the 2000 Standard Specifications is amended as follows.

Heading (n) is amended to include the following. The required Railroad Protective Liability Insurance shall be purchased on behalf of the Union Pacific Railroad. The contact person for the railroad is Paul Rathgeber, Manager of Public and Industry Projects, Engineering, Room 280N, 24125 Aldine Westfield, Spring, TX 77373, phone: (281) 350-7671.

The ratio of the estimated cost of operations within the Railway's property to the total estimated project cost is 3.5 percent. No direct payment will be made for providing the required insurance coverages.

NAVIGABLE WATERS AND WETLANDS (07/05): Subsection 107.09 of the Standard Specifications is amended to include the following.

In accordance with the provisions of this Subsection, the Department has obtained the required U.S. Army Corps of Engineers permit.

The Department has obtained a Class B Natural and Scenic Stream System Permit or other approval from the Louisiana Department of Wildlife and Fisheries, for work within the Louisiana Natural and Scenic Stream System.

Bidders shall comply with the permit requirements. Bidders may obtain a copy of these permits by contacting the Department's Environmental Section at (225) 379-1317.

ENVIRONMENTAL PROTECTION (01/04): Subsection 107.14 of the 2000 Standard Specifications is amended to include the following paragraphs at the end of this subsection.

The contractor, by signing this contract, certifies under penalty of law that he understands and will abide by the terms and conditions of the Storm Water Pollution Prevention Plan (SWPPP) and the National Pollution Discharge Elimination System (NPDES) General Permit that requires the discharges from construction sites be managed to prevent pollutants from entering waters of the United States in accordance with the Environmental Protection Agency's (EPA) regulations for storm water discharges with respect to 33 U.S.C. § 1342 (Sections 402 (p) and 405 of Public Law 100-4).

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The Notice of Intent (NOI) will be submitted by the Department to the Louisiana Department of Environmental Quality (LADEQ) prior to the project letting. The project engineer will complete and submit the Notice of Termination (NOT) to the LADEQ after final stabilization of the site, in accordance with the terms of the permit.

The use of erosion control features or methods other than those in the contract shall be as directed.

The Storm Water Pollution Prevention Plan shall be comprised of Section 204 of the standard specifications along with applicable supplemental specifications and special provisions, and Standard Plan EC-01, "Temporary Erosion Control Details."

DAMAGE CLAIMS: Subsection 107.17 of the 2000 Standard Specifications is amended as follows:

Subsection 107.17, Damage Claims, is deleted and the following substituted.

The contractor shall indemnify the Department, its officers and employees and its program management consultant (LTM), from all suits, actions, or claims brought because of injuries or damage sustained by any person or property due to operations of the contractor; due to negligence in safeguarding the work; or use of unacceptable materials in constructing the work; or any negligent act, omission, or misconduct of the contractor; or claims or amounts recovered from infringements of patent, trademark, or copyright; or from claims or amounts arising or recovered under the Workmen's Compensation Act or other law, ordinance, order, or decree; any money due the contractor as considered necessary by the Department for such purpose may be retained for use of the State; or in case no money is due, the surety bond may be held until such suits, actions, claims for injuries or damages have been settled and suitable evidence to that effect furnished to the Department; except that money due to the contractor will not be withheld when the contractor produces satisfactory evidence that adequate Workmen's Compensation, Public Liability, and Property Damage Insurance are in effect.

SUBLETTING OF CONTRACT (1/83): In accordance with Subsection 108.01 of the Standard Specifications, the following items are designated as "Specialty Items":

Item 202-02-02, Removal of 5.0 m x 16.8 m Wood Frame Church (Lt. of Sta. 11+320 on US 165)(Contains Non-Friable Asbestos)
Item 202-02-09, Removal of 14.8 m x 9.3 m Wood Frame Residence on Blocks (Rt. of Sta. 12+790 on US 165)(Contains Non-Friable Asbestos)
Item 202-02-12, Removal of 8.7 m x 9.2 m Wood Frame Residence (Rt. of Sta. 12+940 on US 165)(Contains Non-Friable Asbestos)
Item 202-02-24, Removal of 13.5 m x 17.8 m Brick Building on Slab (Lt. of Sta. 39+625)(Contains Non-Friable Asbestos)
Item 202-02-36, Removal of 9.5 m x 17.7 m Wood Frame Residence on Piers (Rt. of Sta. 5+075)(Contains Non-Friable Asbestos)
Item 704-01-A, Guard Rail (Single Thrie Beam)(950 mm Post Spacing)
Item 704-03, Blocked Out Guard Rail
Item 704-08-A, Guard Rail Transitions (Single Thrie Beam)
Item 704-11-A, Guard Rail End Treatment (Flared)
Item 705-01, Barbed Wire Fence
Item 705-02, Combination Mesh and Barbed Wire
Item 705-04, Single Swinging Driveway Gates
Item 705-05, Double Swinging Driveway Gates
Item 705-06-A, Chain Link Fence (1200 mm Height)
Item 705-07-A, 4.0 Meter Single Gates for Chain Link Fence (1200 mm Height)
Item 705-08-A, 4.0 Meter Double Gates for Chain Link Fence (1200 mm Height)

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Item 729-01-A, Sign (Type A)(R1-1)(0.762 m x 0.762 m)
Item 729-16-C, Object Marker Assembly (Type 3)
Item 729-21, U-Channel Post (12 Foot)
Item 731-01, Nonreflectorized Raised Pavement Markers
Item 732-02, Reflectorized Raised Pavement Markers
Item 732-02-A, Plastic Pavement Striping (Solid Line)(100 mm Width)
Item 732-02-C, Plastic Pavement Striping (Solid Line)(200 mm Width)
Item 732-03-A, Plastic Pavement Striping (Broken Line)(100 mm Width)
Item 732-03-A-01, Plastic Pavement Striping (Broken Line)(100 mm Width)(Preformed Marking Tape (Type V)
Item 732-04-A, Plastic Pavement Legends and Symbols (Arrow)
Item 732-04-C, Plastic Pavement Legends and Symbols (Only)
Item 732-05, Removal of Existing Markings
Item 736-01, Trenching and Backfilling
Item 736-04-B, Signal Support (9.1 m Strain Pole)
Item 736-05-B, Signal Head (1 Section Y)(LED)
Item 736-05-C, Signal Head (1-Section R)(LED)
Item 736-06-A, Signal Service (Pole Mounted for Flasher Switch Assembly)
Item 736-11-A, Conduit (76.2 m Sch. 80)
Item 736-12-A, Conductor, 3C (Power)
Item S-004, Flasher Switch (Flasher Assembly, 2 Circuit, Pole Mounted Cabinet)

INCENTIVE TO CONSTRUCT EXPEDITIOUSLY. (03/04): Section 108 of the Standard Specifications is amended as follows.

In order to minimize construction duration and construction operations' impact on roadway users, the following provisions shall apply to this project.

The Department will pay the contractor the daily road user cost, as specified in the special provision entitled Cost-Plus-Time Bidding Procedures contained elsewhere herein, per calendar day for each day of early completion to final acceptance of the project prior to the expiration of total contract time as specified elsewhere herein. The total amount of the incentive shall not exceed $288,000. If the construction duration exceeds the total contract time, the daily road user cost per calendar day for each day of delinquent completion to final acceptance will be deducted from payments due to the contractor, not as a penalty but as stipulated damages.

The contractor is directed to the special provisions and the plans for any restrictions that may affect work schedules.

In the event of plan changes, any extensions of contract time will be in accordance with Subsection 108.07 of the project specifications.

CASH MANAGEMENT PLAN - "PHASE FUNDED" CONSTRUCTION (07/04)

This project has been selected by the Department to be implemented under the cash management plan, "phase funding," authorized by LSA-R.S. 48:251 and LAC 70:101 et seq., for certain long-term construction contracts. This construction project will be segmented by fiscal year, and only those funds necessary to carry out planned construction activities in each fiscal year will be appropriated by the Legislature and budgeted by the Department.

The continuation of this contract is contingent upon the continuation of an appropriation of funds by the Legislature to fulfill the requirements of the contract. If the Legislature fails to appropriate sufficient monies to provide for the continuation of this contract or if such appropriation is reduced by the veto of the governor or by any means provided in the Capital Outlay Act, Title 39 of the Louisiana Revised Statutes of 1950, or any other applicable laws to prevent the total appropriations for the year from exceeding revenues for that year or for any

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other lawful purpose and the effect of such reduction is to provide insufficient monies for the continuation of the contract, the contract shall terminate on the date of the beginning of the first fiscal year for which funds are not appropriated. When a contract, or portion thereof, is terminated for the reasons enumerated herein, the Louisiana Standard Specifications for Roads and Bridges, Subsection 108.11, Termination of Contract, shall govern.

In order to insure adequate funds are budgeted each year for this phase-funded project, the contractor shall comply with the special provision, "Critical Path Method (CPM) For Construction Progress Scheduling", contained elsewhere herein.

Nothing herein shall relieve the contractor from any other requirement or obligation as set forth in the standard specifications, special provisions, supplemental provisions or any other contract requirement.

CRITICAL PATH METHOD (CPM) FOR CONSTRUCTION PROGRESS SCHEDULING (01/06): Critical Path Methods (CPM) as described and with terms as defined in the Associated General Contractors of America (AGC) publication, *Construction Planning and Scheduling*, latest edition, shall be used in construction scheduling, establishing the critical items of work, and measuring progress of the work. In case of discrepancy between these specifications and *Construction Planning and Scheduling*, these specifications shall govern.

Subsection 108.03, Construction Progress Schedule: This subsection is deleted and the following substituted.

The contractor shall submit to the project engineer for approval, CPM Construction Schedules, Summary of Activities tabulations, and Scheduled Earnings tabulations, all as described hereinafter, and altogether defined as "Construction Progress Schedule" or "Construction Schedule". The Construction Progress Schedule shall be based on the planned and specified finished work, the maintenance of traffic restrictions, and other design requirements given in the plans and specifications. Each sheet or page of each submittal shall be identified with the contractor's company name, state project number, project name, date prepared, revision dates, and sheet or page number. If the submittals are not prepared by the contractor's own staff, the company name of the preparer shall be shown on each sheet or page.

The critical activities as shown on the approved Construction Schedule will be considered in establishing the controlling item of work. Scheduled Earnings will be the basis for measurement of contractor's progress.

Approved Construction Progress Schedules and approved associated data shall become part of the contract documents. Un-approved Construction Progress Schedules and associated data shall not be considered relevant or applicable for any purposes during or after completion of the project and shall not be binding on the Department. The sequence of work as represented on the Construction Progress Schedule and subsequent updates shall be interpreted as being the intention of the contractor at the time that the schedule was made.

(a) Construction Schedule: The Construction Schedule shall be a Critical Path Method (CPM) graphic diagram, computer prepared, utilizing the Precedence Diagramming Method (PDM). For the calendar day contract, the Gregorian calendar shall be used.

The schedule shall show and describe the various activities of work required to complete the contract in sufficient detail so that all activities are readily identifiable and progress on the activities can be readily measured. Sufficient detail in bridge work means each element of work (piles, footings, columns, caps, rebar, cure time, etc.) of individual bents; each element of work in individual spans (girders, strip seal joints, Class AA, rebar, cure time, etc.); individual approach slabs; railings; rebar for all of the above as separate activities; and, miscellaneous other bridge work. Sufficient detail in road work means individual runs of pipe in drainage structures; individual box culverts; individual detour roads; the embankment, excavation, base and paving layers within definable geometric limits (e.g. from station to station, within a single ramp, etc.)

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It shall include submittals and approvals of critical samples, shop drawings, procedures, order lists (pilings for example), or other things that could have a significant schedule impact.

Relatively minor items of work, similar or non-similar, may be grouped together into one activity (or more). Activities to be performed by subcontractors shall be included and identified. The schedule shall show the sequence in which the activities are to be accomplished and their dependency relationships. The estimated contract earnings and pay item quantities associated with each activity shall be included, and the sum of the estimated earnings shall equal the current contract amount.

The duration of activities shall be in whole calendar days and no activity shall have duration of less than one calendar day or more than 30 calendar days. The ending event of the schedule shall be a finish milestone identified as "Contract Completion Date". Its sole predecessor shall be "Reserved Float". The sole predecessor of "Reserved Float" shall be "Final Inspection" which shall be a finish milestone and shall have as predecessors all of the activities that must be completed prior to the Department's final inspection of the work. The duration of "Reserved Float" is the difference between "Final Inspection" and "Contract Completion Date". "Reserved Float" is defined as that part of the shared float reserved exclusively for the contractor's use. The contract date for stipulated damages will be adjusted by change order to the beginning date of the activity "Reserved Float".

The Construction Schedule shall be computer plotted on sheets not larger than 22 inches x 36 inches and shall show a continuous flow of information from left to right with no arrows from right to left and shall be drawn to a time scale of calendar days. The critical path shall be clearly identified. Resource constraints shall be identified, as shall scheduled starts or completions imposed on the schedule by the contractor.

The contractor shall submit color-coded graphics in the required multiple copies. The choice of the color coding must remain in effect for the life of the contract.

The contractor shall provide the Department with the means to electronically translate the Construction Schedule data into a configuration that can be read and processed by the Department or its consultants' hardware and Primavera software. If the contractor elects to use SureTrak Project Manager software, the following defaults must be placed: (1) resources shall be non-driving; (2) default activity type shall be "Task"; (3) activity type shall not be "Independent"; (4) duration display style shall be "Day (d)"; (5) float style shall be "Days"; and, (6) dates time format shall be "Don't show time". The revenue feature in SureTrak Project Manager does not translate to Primavera Project Planner (P3), so in SureTrak Project Manager the earnings must be entered as cost data. In both the SureTrak Project Manager and in the Primavera Project Planner (P3) "Back up" menu selection, the contractor will ensure that the option "Remove access list during backup" is checked. In addition, the project must be saved in SureTrak as a "Concentric P3" Type project.

(b) Summary of Activities: The Summary of Activities shall be a tabulation of all activities shown on the Construction Schedule, and shall accurately reflect the data used in preparation of the Construction Schedule. The summary shall be computer generated and sequenced by activity number. Each activity shall include as a minimum the following, in calendar days:

1. Activity numbers.
2. Activity description.
3. Estimated duration of activity.
4. Early start.
5. Late start.

6. Constrained start, if constrained.
7. Early finish.
8. Late finish.
9. Constrained finish, if constrained.
10. Status (whether critical).
11. Free float.
12. Total float.
13. Monetary value of the activity.
14. Remaining duration and calendar days used.

(c) Scheduled Earnings: The Scheduled Earnings shall be a product of the software creating the Construction Schedule and shall be a tabulation of accumulated scheduled contract earnings, based on late starts, measured in accumulated dollars for all activities, for each monthly partial estimate. The tabulation shall be prepared from the Construction Schedule and shall be computer generated. The Schedule of Earnings will not include advanced payments for stockpiled materials.

(d) Cash Management Document: When designated as a Cash Management Project, prior to the issuance of the Notice to Proceed, the contractor shall provide to the Department and obtain approval from the Department of the Scheduled Earnings report as described above, except that it shall be based on early starts. The Department will use this report for its cash management purposes. Failure of the contractor to provide and obtain approval of the Scheduled Earnings Report will result in withholding of any funds due the contractor.

(e) Submittal: Prior to or at the preconstruction conference the contractor shall submit to the project engineer for approval, in triplicate, a Construction Schedule giving a proposed schedule of operations that provides for completion of the work, a Summary of Activities tabulation, a Scheduled Earnings tabulation, and a Forty-Five Day Look-Ahead task list. The contractor shall also submit the Construction Schedule data electronically capable of being processed with the hardware and software being used by the Department or its consultants.

Within 7 calendar days after receipt of the submittal, the project engineer and contractor shall meet and review the proposed schedules and tabulations. Any revisions resulting from the review shall be submitted, in triplicate, for approval within 7 calendar days after the meeting. This procedure will be repeated as necessary. The approved final schedule shall be called the "Baseline Schedule".

Failure to have obtained approval of a Baseline Schedule and tabulations within 20 calendar days after the Notice to Proceed will result in withholding twenty-five percent of the amount of partial estimates until such schedules and tabulations are submitted and approved.

(f) Construction Schedule Updates: The contractor shall update and submit each month, within 7 calendar days after the partial estimate is submitted, the Construction Schedule critical path diagram, Summary of Activities tabulation, Scheduled Earnings tabulation, a Forty-Five Day Look-Ahead task list, and a current Turnaround Document as follows:

(1) The updated Construction Schedule critical path diagram will be in the same form as that submitted in (e) Submittal. It will be updated for progress through the estimate closing date, recalculated and plotted. The Construction Schedule critical path diagram will show both the look ahead critical path for the duration of the project and the look back critical path as reported in the prior months.

(2) The updated Summary of Activities and Scheduled Earnings tabulation will be in the same form as that submitted in (e) Submittal. It will be updated for progress through the estimate closing date, recalculated and printed.

(3) The Forty-Five Day Look-Ahead task list will show all incomplete activities which the logic has determined either should be or may be active during the next

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forty-five days. It will be plotted in a graphic form similar to that of the Construction Schedule critical path diagram.

(4) The Turnaround Document will be a listing of the log record of a new activity added monthly to the schedule for the purpose of keeping a current presentation of the following information:

a. The original contract completion date presented as actual calendar date.
b. The number of days added to the contract by approved change order (if any, if none, so state).
c. The present computed completion date presented as an actual calendar date and as a workday number, if applicable.
d. A list of activities deleted and added (if any, if none, so state), including their descriptions.
e. A list of logic changes (if any, if none, so state).
f. A list of budget changes (if any, if none, so state).
g. A narrative description of any other changes to the Construction Schedule critical path diagram.

Failure to submit the monthly updates of the Construction Progress Schedules within 7 calendar days after the partial estimate was submitted will result in withholding of twenty-five percent of the amount of partial estimate payments until such schedules are submitted and approved.

(g) CPM Reviews: The project engineer will designate the time and location for review of construction progress. The contractor's representative designated under Subsection 105.05 will be required to attend the construction progress review or a contractor's representative directed by the project engineer shall attend. The current approved Construction Schedule, Summary of Activities and Scheduled Earnings tabulations shall be reviewed, and required or desired changes discussed and documented.

As a minimum the following shall be discussed: contractor's compliance with approved schedules and tabulations, delays, proposed and approved contract quantity increases and decreases, proposed and approved extra work, actual starts, durations and finishes, and actual contract earnings.

If requested by the project engineer, within 7 calendar days following the review meeting the contractor shall submit to the project engineer for approval, in triplicate, a revised Construction Schedule, Summary of Activities tabulation, and Scheduled Earnings tabulation, and Forty-Five Day Look-Ahead, all in accordance with paragraph (e) Submittal, and all brought up to date to reflect agreements made at the review meeting. Failure to submit the revision of the Construction Progress Schedules within 7 calendar days after the request will result in withholding of twenty-five percent of the amount of partial estimate payments until such schedules are submitted and approved.

(h) The CPM Construction Schedule will be provided at no direct pay.

Subsection 108.04, Prosecution of Work: Heading (b), Disqualification, is deleted and the following is substituted.

(b) Disqualification. The contractor's progress will be determined monthly at the time of each partial estimate, and will be based on the total amount of money earned by the contractor, excluding advanced stockpiled material, as shown by the partial estimate compared to scheduled earnings as shown by the approved Scheduled Earnings tabulation, as of the end of the partial estimate period. If the contractor's progress is more than 10 percent behind scheduled earnings, the contractor may be notified that disqualification will occur if progress becomes delinquent by

more than the percentages specified hereinafter, and additional notifications will be made, as the engineer deems necessary.

Prior to the elapsing of 55 percent of the contract time, the contractor will be disqualified if progress is more than 20 percent behind scheduled earnings. After 75 percent of the contract time has elapsed, the contractor will be disqualified if progress is more than 10 percent behind scheduled earnings. Disqualification will be applied between 55 and 75 percent contract time elapsed on a pro-rata basis; for example, when 65 percent of the contract time has elapsed, the contractor will be disqualified if progress is more than 15 percent behind scheduled earnings.

During the period of disqualification, the contractor will not be permitted to bid on contracts nor be approved as a subcontractor on contracts. Any bid submitted by the contractor during the period of disqualification will not be considered and will be returned. The period of disqualification will continue until the completed work on the contract is within the foregoing percentages or until all work on the contract has been satisfactorily completed.

Subsection 108.07, Determination and Extension of Contract Time: This subsection is amended as follows.

The ninth and tenth paragraphs are deleted and the following substituted.

The contract time for the work as awarded is based on the original quantities as defined in Subsection 102.05 and includes time to procure material, equipment and an adequate labor force to complete the work. If satisfactory fulfillment of the contract requires performance of work in greater quantities than those specified, or requires performance of extra work in accordance with Subsection 104.02 and the contractor requests additional contract time, the contractor shall submit a proposed CPM schedule based on the latest approved CPM schedule showing the increased time and revised completion date for approval by the Department. When the contract is altered in accordance with Subsection 104.02 and the engineer determines that a reduction in contract time is warranted due to decreased effort, the contractor shall submit a proposed CPM schedule based on the latest approved CPM schedule showing the reduced time and revised completion date for approval by the Department. A CPM schedule will be required for the engineer to process a change order that either increases or decreases the contract time.

If the contractor finds it impossible, for reasons beyond the contractor's control, to complete the work within the contract time as specified or as extended in accordance with the provisions of this subsection, the contractor may, at any time prior to the expiration of the contract time as extended, make written request to the engineer for an extension of time setting forth therein the reasons which justify granting the request. The contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the engineer finds that the work was delayed because of conditions beyond the control and without the fault of the contractor, the engineer may extend the contract time in such amount as conditions justify. The contractor's written request to the engineer for an extension of contract time shall include a proposed CPM schedule based on the latest approved CPM schedule update showing the increased time and revised completion date for approval by the Department. This CPM schedule document will be required for the engineer to process a change order that changes the contract time.

DETERMINATION AND EXTENSION OF CONTRACT TIME (1/04): Subsection 108.07 Determination and Extension of Contract Time is amended to include the following.

The contractor shall document for each month of scheduled construction, the occurrence of adverse weather conditions having an impact on controlling items of work. An adverse weather day is one on which rainfall or wet soil conditions will prevent construction operations from proceeding for at least 5 continuous hours of the day or 65 percent of the normal work day, whichever is greater, with the normal working force engaged in performing the controlling item of work. If the contractor submits a written request for additional contract time due to adverse

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weather conditions, the contractor's request will be considered only for adverse weather days in excess of the allowable number of days per month stated below. An equitable adjustment in contract time will be made at the conclusion of the project by comparing the total number of excess adverse weather days requested by the contractor to the number of adverse weather days that were included in the construction schedule but were not used. Contract time will not be reduced due to the adjustments for adverse weather. An adjustment in the contract time due to adverse weather will not be cause for an adjustment in the contract amount.

The following are anticipated adverse weather days that the contractor shall include in each month of his calendar day construction schedule.

January	9 days	May	4 days	September	4 days
February	8 days	June	5 days	October	3 days
March	6.days	July	5 days	November	5 days
April	5 days	August	4 days	December	7 days

FAILURE TO COMPLETE ON TIME: Subsection 108.08 of the Standard Specification is amended as follows:

Table 108-1, Stipulated Damages, is amended as follows: The Daily Charge (Dollars) for Calendar Day is deleted, and the following substituted. Daily Charge (Dollars) for Calendar Day shall equal the Daily Road User Cost stated herein.

COMPENSATION FOR ALTERATIONS OF THE CONTRACT (07/06): Subsection 109.04 of the 2000 Standard Specifications and the supplemental specifications thereto is amended as follows. Delete this subsection and substitute the following.

109.04 COMPENSATION FOR ALTERATIONS OF THE CONTRACT.

Payment for work performed in accordance with Subsections 104.02 and 105.19 will first be made at the contract's established unit prices. If unit prices are not applicable, the second basis of payment will be negotiated prices agreed to by change order prior to the start of the work. If an acceptable negotiated price cannot be established prior to the work being performed, the Department may require the contractor to perform the work on a "force account" basis.

(1) Unit Prices – When payments are made at the contract's established unit prices, and the work requires a material change in construction method or sequence, adjustment to the unit prices for or against the contractor shall be made in accordance with Subsections 104.02 and 109.03.

(2) Negotiated Prices – The Department's objective is to compensate the contractor using the same pricing formulas established in determining the original bid contract prices. Therefore, reasonable rates for labor burden, company owned equipment internal cost recovery rates, jobsite overhead items and rates, home office overhead and profit mark-upon direct costs, and other subjective pricing components established by the contractor at the time the original contract bid prices were determined will also be used in determining the negotiated prices for the change order work. The change order authorizing the work shall include a detail cost breakdown showing direct labor, materials, equipment, and subcontractor costs, as well as each of the subjective pricing components listed above.

(3) Force Account -When "force account" is the method of payment, the contractor shall be paid the direct cost of the work as determined and documented in Headings (a) through (g) below. Jobsite and home office overhead indirect expenses, and profit for all parties shall be considered fully compensated by a 15 percent mark-up on allowable direct cost items described in the Headings (a) through (d) below, and the mark-up on direct cost for the subcontractor and contractor described in Heading (e) below. The Department may consider additional reimbursement to the contractor for indirect fixed jobsite overhead costs for delays that are not the contractor's fault or responsibility but are the Department's fault or

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responsibility or determined by judicial proceeding to be the Department's sole responsibility or are the fault and responsibility of a local government when the change order results in extension of the project's critical work path and the 15 percent mark-up on direct costs is deemed by the Department to be insufficient.

(a) Direct Labor: For labor and working foremen in direct charge of operations, the contractor shall receive the wage rates agreed on in writing before beginning work for each hour that said labor and foremen are engaged in such work. Jobsite and home office supervisory personnel shall not be included as direct labor.

The contractor shall receive the actual costs paid to, or in behalf of, workers for subsistence and travel allowances, health and welfare benefits, pension fund benefits or other benefits when such amounts are required by collective bargaining agreement or other employment contract applicable to the classes of labor employed on the work, but limited to a maximum daily rate for subsistence and travel allowances. This maximum shall be agreed upon prior to the contractor incurring such charges.

(b) Direct Materials: For materials accepted by the engineer and used, the contractor shall receive the actual cost of such materials delivered to the work, including transportation charges and sales taxes if applicable.

(c) Equipment: For authorized machinery or special equipment the contractor shall receive the rental rates agreed on in writing before such work is begun. For equipment rented from independent outside sources, the contractor will be reimbursed the reasonable actual cost as shown on paid rental invoices. For company owned equipment, the contractor will be reimbursed his internal cost recovery equipment charge rate consistent with his original bid cost estimates. The Department's Engineering Directives and Standards Manual, EDSM III.1.1.27, entitled Equipment Rental Rates, provides additional guidance concerning allowable equipment rental rates and their application. If the contractor chooses to use a rental rate guide book instead of his internal cost recovery rates to establish rental rates for company owned equipment, adjustments to the allowable type of equipment and hours per day must be made as described in the EDSM. In addition, no 15 percent mark up on equipment direct cost for jobsite and home office overhead expenses and profit will be allowed if the contractor chooses to use rental rate guide book prices instead of his internal cost recovery rates.

(d) Bond, Insurance and Tax: For property damage, liability and workmen's compensation insurance premiums, unemployment insurance contributions, social security taxes, and bond costs on force account work, the contractor shall receive the actual cost thereof. The contractor shall furnish satisfactory evidence of the rates paid for such bond, insurance and tax.

(e) Subcontractor Costs: For change order work performed by an approved subcontractor, the subcontractor shall receive the subcontractor's actual and reasonable allowable direct cost of such work as described in Headings (a) through (d) above plus a 15 percent mark-up for the subcontractor's indirect jobsite and home office overhead expenses and profit. In addition, the contractor will be paid a 10 percent mark-up on the subcontractor's total direct and indirect costs, and profit for general supervision and sequencing of the change order work.

(f) Non-allowable Costs: No additional contractor cost reimbursement will be made for general superintendence, small tools or craft specific tool allowances, or other direct or indirect costs not specifically included in Headings (a) through (e) above.

(g) Statements: No payment will be made for force account work until the contractor has furnished the engineer with duplicate itemized statements of the cost of such work detailed as follows:

(1) Name, classification, date, daily hours, total hours, rate and extension for each laborer and foreman.

(2) Designations, dates, daily hours, total hours, rental rate and extension for each unit of machinery and equipment.

(3) Quantities of materials, prices and extensions.

(4) Transportation of materials.

(5) Cost of property damage, liability and workmen's compensation insurance premiums, unemployment insurance contributions, social security taxes, and bond costs.

The contractor's representative and the engineer shall compare records of the cost of work done as ordered on a force account basis. Such comparison shall be made daily. Statements shall be accompanied by invoices for materials used and transportation charges. If materials used on force account work are not purchased for such work, but are taken from the contractor's stock, in lieu of invoices, the contractor shall furnish an itemized list of such materials showing that the quantity claimed was actually used, and that the price and transportation costs claimed represent the actual cost to the contractor. Invoices shall be accompanied by the contractor's notarized statement that payment in full has been made for the materials.

PAYMENT ADJUSTMENT (05/06): Section 109, Measurement and Payment of the 2000 Standard Specifications is amended to add the following.

This project is designated for payment adjustment for asphalt cements and fuels in accordance with Subsection 109.10 as follows.

109.10 PAYMENT ADJUSTMENT (ASPHALT CEMENTS AND FUELS).

(a) General: Payment for contract items indicated herein will be adjusted to compensate for cost differentials of Performance Graded (PG) asphalt cements, gasoline, and diesel fuel when such costs increase or decrease more than 5 percent from the Department's established base prices for these items. The base price indices for asphalt cements and fuels will be the monthly price indices in effect at the time bids are opened for the project. The base price indices for asphalt cements will be as stated in paragraph (b) below. The base price index for fuels will be as stated in paragraph (c) below.

Payment adjustments will be made each monthly estimate period when a price index for this period varies more than 5 percent from its respective base price index. The monthly price indices to be used with each monthly estimate will be the price indices for the month in which the estimate period begins.

If the project is placed in default, payment adjustments will be based on the monthly price indices used for the last monthly estimate period prior to the project being placed in default, unless a monthly price index decreases in which case the lower monthly price index will be used.

If it is determined after completion of work on any eligible item that the total quantity paid to date must be adjusted to reflect more accurate quantity determinations, the Department will prorate the additional quantity to be added or subtracted over all previous estimate periods in which the item of work was performed in order to determine additional payment adjustments. If payment adjustments were made during any of these partial estimate periods, this added or subtracted quantity that has been prorated will likewise have payment adjustments calculated and included.

(b) Performance Graded (PG) Asphalt Cements: The base price index will be the monthly price index in effect at the time of bid opening as shown elsewhere herein. The monthly price indices will be the average of the unit prices for PG 64-22, the average of the unit prices for PG 70-22m, and the average of the unit prices for PG 76-22m. The monthly prices for each of these asphalt materials will be F.O.B. refinery or terminal as determined from the quoted prices

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effective on the first calendar day of each month from major suppliers of these materials. These suppliers and materials shall be listed on the Department's Qualified Products List (QPL 41) and must be marketed in Louisiana.

Payment adjustments will be made in accordance with the following formulas:

If Monthly Price Index exceeds Base Price Index,

$$P_a = (A - 1.05B) \times C \times D \times (1.00 + T)$$

If Base Price Index exceeds Monthly Price Index,

$$P_a = (0.95B - A) \times C \times D \times (1.00 + T)$$

Where:

P_a	=	Price adjustment (increase or decrease) for asphalt cement.
A	=	Monthly Price Index for respective PG 64-22, PG 70-22m, or PG 76-22m in dollars per ton/megagram.
B	=	Base Price Index for respective PG 64-22, PG 70-22m, or PG 76-22m in dollars per ton/megagram.
C	=	Tons/megagrams of asphaltic concrete.
D	=	Percent of respective asphalt cement, per job mix formula, in decimals.
T	=	Louisiana sales tax percentage and local sales tax percentage, in decimals.

The engineer will furnish the weights (mass) of asphaltic concrete placed during the monthly estimate period with the respective asphalt cement content. If the asphalt cement content changes during the estimate period, the respective weight (mass) of asphaltic concrete produced at each cement content will be reported.

Item 724-02, Pavement Widening, and all contract pay items under Sections 501, 502, and 508, will be eligible for payment adjustments of asphalt materials. No payment adjustment will be made for other asphalt materials, including emulsions and cutbacks.

The base price indices in dollars per ton/megagram of asphalt cement to be used for payment adjustments for this project are as follows:

GRADE OF ASPHALT CEMENT	BASE PRICE INDEX $/TON	$/Mg
PG 64-22	$349	$385
PG 70-22m	$424	$467
PG 76-22m	$465	$513

(c) Fuels: The base price index for this project will be the monthly price index in effect when bids are opened for the project. The monthly price index will be the minimum price quotations for unleaded gasoline and No. 2 diesel fuel listed for the New Orleans area in *Platt's Oilgram and Price Report* effective on the first calendar day of each month.

Payment adjustment will be made in accordance with the following formulas:

If Monthly Price Index exceeds Base Price Index,

$$P_a = (A - 1.05B) \times Q \times F$$

If Base Price Index exceeds Monthly Price Index,

$$P_a = (0.95B - A) \times Q \times F)$$

Where:

P_a	=	Price adjustment
A	=	Monthly Price Index in dollars per gallon/liter.
B	=	Base Price Index in dollars per gallon/liter.
Q	=	Pay Item Quantity (Pay Units)
F	=	Fuel Usage Factor Gal(L)/Pay Unit

The following is a listing of contract pay items that are eligible for payment adjustment and the fuel usage factors that will be used in making such adjustment. Contract items that expand the items listed herein by use of letter designations are also eligible for fuel price adjustments; for example:

Item 601-01-G, Portland Cement Concrete Pavement 8 inches (200 mm) thick.

STATE PROJECT NOS. 015-04-0039, 015-05-0034 AND 022-04-0036
SPECIAL PROVISIONS
ELIGIBLE CONTRACT PAY ITEMS & FUEL USAGE FACTORS FOR FUEL PAYMENT ADJUSTMENT

ITEM NO.	PAY ITEM	UNITS	MIN. ORIGINAL CONTRACT QUANTITY FOR PAY ADJUSTMENT	FUEL USAGE FACTORS	
				Diesel[2]	Gasoline
203-01[1]	General Excavation	gal/cu yd	10,000 cu yd	0.29	0.15
203-02	Drainage Excavation	gal/cu yd	10,000 cu yd	0.29	0.15
203-03	Muck Excavation	gal/cu yd	10,000 cu yd	0.29	0.15
203-04[1]	Embankment	gal/cu yd	10,000 cu yd	0.29	0.15
203-05	Nonplastic Embankment	gal/cu yd	10,000 cu yd	0.29	0.15
203-08	Borrow (Vehicular Measurement)	gal/cu yd	10,000 cu yd	0.29	0.15
301-01	Class I Base Course	gal/cu yd	3,000 cu yd	0.88	0.57
301-02	Class I Base Course (" Thick)	gal/sq yd	50,000 sq yd	0.04	0.03
302-01	Class II Base Course	gal/cu yd	3,000 cu yd	0.88	0.57
302-02	Class II Base Course (" Thick)	gal/sq yd	50,000 sq yd	0.04	0.03
303-01	In-Place Cement Stabilized Base Course	gal/sq yd	50,000 sq yd	0.04	0.03
304-02	Lime Treatment (Type B)	gal/sq yd	50,000 sq yd	0.04	0.03
304-03	Lime Treatment (Type C)	gal/sq yd	50,000 sq yd	0.04	0.03
304-04	Lime Treatment (Type D)	gal/sq yd	50,000 sq yd	0.04	0.03
305-01	Subgrade Layer (" Thick)	gal/sq yd	50,000 sq yd	0.04	0.03
308-01	In-Place Cement Treated Base Course	gal/sq yd	50,000 sq yd	0.04	0.03
401-01	Aggregate Surface Course (Net Section)	gal/cu yd	3,000 cu yd	0.88	0.57
401-02	Aggregate Surface Course (Adjusted Vehicular Measurement)	gal/cu yd	3,000 cu yd	0.88	0.57
501-01	Asphaltic Concrete	gal/ton	1,000 ton	2.40[3]	0.2
501-02	Asphaltic Concrete	gal/cu yd	500 cu yd	4.80[4]	0.4
501-03	Asphaltic Concrete (" Thick)	gal/sq yd	10,000 sq yd	0.13[5,6]	0.01[6]
502-01	Superpave Asphaltic Concrete	gal/ton	1000 ton	2.40[3]	0.2
502-02	Superpave Asphaltic Concrete	gal/cu yd	500 cu yd	4.80[4]	0.4
502-03	Superpave Asphaltic Concrete (" Thick)	gal/sq yd	10,000 sq yd	0.13[5,6]	0.01[6]
508-01	Asphaltic Concrete (SMA)	gal/ton	1000 ton	2.40[3]	0.2
601-01	Portland Cement Concrete Pavement (" Thick)	gal/sq yd	15,000 sq yd	0.11	0.15
724-02	Pavement Widening	gal/sq yd	3,000 sq yd	0.86	0.24

1 If project has both 203-01 & 203-04, only the item with larger quantity is eligible.
2 For fuel adjustment purposes, the term "diesel" shall represent No. 2 or No. 4 fuel oils or any of the liquified petroleum gases, such as propane or butane.
3 If natural gas or coal is used instead of diesel for aggregate drying and heating the fuel usage factor shall be 1.67 gal/ton.
4 If natural gas or coal is used instead of diesel for aggregate drying and heating the fuel usage factor shall be 13.34 gal/cu yd.
5 If natural gas or coal is used instead of diesel for aggregate drying and heating the fuel usage factor shall be 0.09 gal/sq yd.
6 Per inch of thickness.

STATE PROJECT NOS. 015-04-0039, 015-05-0034 AND 022-04-0036
SPECIAL PROVISIONS
ELIGIBLE CONTRACT PAY ITEMS & FUEL USAGE FACTORS FOR FUEL PAYMENT ADJUSTMENT (METRIC)

ITEM NO.	PAY ITEM	UNITS	MIN. ORIGINAL CONTRACT QUANTITY FOR PAY ADJUSTMENT	FUEL USAGE FACTORS	
				Diesel[2]	Gasoline
203-01[1]	General Excavation	l/m^3	7,600 m^3	1.44	0.74
203-02	Drainage Excavation	l/m^3	7,600 m^3	1.44	0.74
203-03	Muck Excavation	l/m^3	7,600 m^3	1.44	0.74
203-04[1]	Embankment	l/m^3	7,600 m^3	1.44	0.74
203-05	Nonplastic Embankment	l/m^3	7,600 m^3	1.44	0.74
203-08	Borrow (Vehicular Measurement)	l/m^3	7,600 m^3	1.44	0.74
301-01	Class I Base Course	l/m^3	2,300 m^3	4.36	2.82
301-02	Class I Base Course (mm Thick)	l/m^2	41,800 m^2	0.18	0.14
302-01	Class II Base Course	l/m^3	2,300 m^3	4.36	2.82
302-02	Class II Base Course (mm Thick)	l/m^2	41,800 m^2	0.18	0.14
303-01	In-Place Cement Stabilized Base Course	l/m^2	41,800 m^2	0.18	0.14
304-02	Lime Treatment (Type B)	l/m^2	41,800 m^2	0.18	0.14
304-03	Lime Treatment (Type C)	l/m^2	41,800 m^2	0.18	0.14
304-04	Lime Treatment (Type D)	l/m^2	41,800 m^2	0.18	0.14
305-01	Subgrade Layer (mm Thick)	l/m^2	41,800 m^2	0.18	0.14
308-01	In-Place Cement Stabilized Base Course	l/m^2	41,800 m^2	0.18	0.14
401-01	Aggregate Surface Course (Net Section)	l/m^3	2,300 m^3	4.36	2.82
401-02	Aggregate Surface Course (Adjusted Vehicular Measurement)	l/m^3	2,300 m^3	4.36	2.82
501-01	Asphaltic Concrete	l/Mg	900 Mg	10.01[3]	0.83
501-02	Asphaltic Concrete	l/m^3	400 m^3	23.77[4]	1.98
501-03	Asphaltic Concrete (mm Thick)	l/m^2	8,400 m^2	0.59[5,6]	0.45[6]
502-01	Superpave Asphaltic Concrete	l/Mg	900 Mg	10.01[3]	0.83
502-02	Superpave Asphaltic Concrete	l/m^3	400 m^3	23.77[4]	1.98
502-03	Superpave Asphaltic Concrete (mm Thick)	l/m^2	8,400 m^2	0.59[5,6]	0.45[6]
508-01	Asphaltic Concrete (SMA)	l/Mg	900 Mg	10.01[3]	0.83
601-01	Portland Cement Concrete Pavement (mm Thick)	l/m^2	12,500 m^2	0.5	0.68
724-02	Pavement Widening	l/m^2	2,500 m^2	3.89	1.09

1 If project has both 203-01 & 203-04, only the item with larger quantity is eligible.
2 For fuel adjustment purposes, the term "diesel" shall represent No. 2 or No. 4 fuel oils or any of the liquified petroleum gases, such as propane or butane.
3 If natural gas or coal is used instead of diesel for aggregate drying and heating the fuel usage factor shall be 6.97 l/mg.
4 If natural gas or coal is used instead of diesel for aggregate drying and heating the fuel usage factor shall be 16.53 l/m^3.
5 If natural gas or coal is used instead of diesel for aggregate drying and heating the fuel usage factor shall be 0.41 l/m^2.
6 Per mm of thickness.

EXCAVATION AND EMBANKMENT: Section 302 of the 2000 Standard Specifications and the supplemental specifications thereto is amended as follows:

Subsection 203.06, Soil Usage is amended as follows.

Heading (a) Usable Soils is deleted and the following substituted.

Usable soils shall have a PI of 25 or less and an organic content of 5 percent or less.

IN-PLACE CEMENT STABILIZED BASE COURSE: Section 303 of the Standard Specifications and the supplemental specification thereto is amended as follows.

Subsection 303.08, Protection and Curing, is amended as follows.

Upon completion of final finishing, the base shall be immediately protected against rapid drying by applying an asphalt curing membrane in accordance with Section 506, Asphalt Curing Membrane. Asphalt curing membrane shall be placed on the same day as stabilizing. Complete coverage of curing membrane shall be maintained from initial application until the placement of the next course, at least the first lift of surfacing shall be placed within 30 calendar days unless otherwise directed.

Subsection 303.09, Maintenance, is amended as follows.

The second and third paragraphs are amended as follows.

When maintenance of traffic is not required, neither public traffic nor construction traffic shall be allowed on the completed base course for a 7-day curing period. When maintenance of traffic is required, both public traffic and construction traffic shall be routed off the completed base course onto shoulders or other suitable areas during the 7-day curing period when conditions permit.

When traffic is permitted to use the completed base after a 7-day curing period and prior to construction of the surface course, the base shall be further protected by additional applications of asphalt during curing membrane as directed and at no direct pay in accordance with Subsection 302.10, Maintenance of Base Course.

SUBGRADE LAYER: Section 305 of the 2000 Standard Specifications and the supplemental specifications is amended as follows:

Subsection 305.04, Construction Requirements, is amended as follows:

Subgrade soils to be treated shall be not more than 79 percent sand when tested in accordance with DOTD TR 407, and shall not have a Plasticity Index (PI) exceeding 25 when tested in accordance with DOTD TR 428.

SUPERPAVE ASPHALTIC CONCRETE MIXTURES (01/05): Section 502 of the 2000 Standard Specifications and the supplemental specifications thereto is amended as follows.

Subsection 502.01, Description.

The fourth paragraph is amended to include the following. A mixture of any design level, including Level A, may be used on the shoulders at the contractor's option.

Subsection 502.12, Quality Control and Acceptance.

The third and fourth paragraphs of Heading (b) are deleted and the following substituted.

Pavement density and surface tolerance requirements will not be applied for short irregular sections, such as drives, aprons and turnouts; however, hot mix shall be placed to provide a neat, uniform appearance and shall be compacted by satisfactory methods. Any mixtures used for shoulders, curbs, driveways, turnouts, crossovers, joint repair, leveling, guardrail widening, islands, bike paths, patching, widening, and miscellaneous handwork will be paid separately in 1000 ton sublots, or portions thereof, in accordance with Section 502.12(c) and Table 502-8.

The first paragraph of Heading (f)(2) is deleted and the following substituted.

Acceptance testing for pavement density will be conducted by the Department. Three pavement samples for each mix use shall be obtained from each sublot within 24 hours after placement. When this falls on a day the contractor is not working, sampling shall be done within 3 calendar days. Sampling shall be performed using the random number tables shown in DOTD S605. If there are different mix uses within the same sublot, i.e. shoulder and roadway, then an additional core may be taken to ensure that there is at least one core per mix use. The density requirement for each lot will be as shown in Table 502-3 determined in accordance with DOTD TR 304. Payment will be made in accordance with Table 502-6 using the total number of cores for the lot in accordance with Subsection 502.12(g). Payment for small quantity lots will be made in accordance with Table 502-8.

Subsection 502.13, Measurement.

The first sentence of the second paragraph of Heading (a) is deleted and the following substituted. Estimated quantities of asphaltic concrete shown on the plans are based on 110 lb/sq yd/inch (2.35 kg/sq m/mm) thickness.

ASPHALTIC CONCRETE EQUIPMENT AND PROCESSES (11/04): Section 503 of the 2000 standard specifications is amended as follows.

Subsection 503.02 Plant Equipment.

Heading (c) Anti-Strip Additive Equipment is amended to include the following. The anti-strip delivery system shall ensure that the proper amount of material is delivered continuously. This system may be a paddle-type no-flow indicator, which triggers a light or alarm in the control room and an alarm in the plant lab when the anti-strip material is not flowing. Other similar systems may be allowed with approval by the District Laboratory Engineer. In either system, if the anti-strip flow is not restored within 15 minutes, production shall be discontinued until the system is repaired.

CULVERTS AND STORM DRAINS (12/06): Section 701, Culverts and Storm Drains, of the 2000 Standard Specifications, and the supplemental specifications thereto, is deleted and the following substituted.

SECTION 701
CULVERTS AND STORM DRAINS

701.01 DESCRIPTION. This work consists of furnishing, installing, and cleaning pipe, pipe arch, storm drains and sewers, also referred to as culverts or conduit, in accordance with these specifications and in conformity with lines and grades shown on the plans or established.

701.02 MATERIALS. Materials shall comply with the following sections and subsections:

Usable Soil	203.06(a)
Selected Soil	203.06(b)
Plastic Soil Blanket	203.10
Mortar	702.02
Flowable Fill	710
Portland Cement Concrete	901
Recycled Asphaltic Pavement (RAP)	1003.01
Stone	1003.03(d)

Recycled Portland Cement Concrete	1003.03(e)
Granular Material	1003.07
Bedding Material	1003.08
Concrete Sewer Pipe	1006.02
Reinforced Concrete Pipe	1006.03
Reinforced Concrete Pipe Arch	1006.04
Gasket Materials	1006.06
Plastic Pipe	1006.07
Split Plastic Coupling Bands	1006.07(d)(4)
Plastic Yard Drain Pipe	1006.09
Bituminous Coated Corrugated Steel Pipe and Pipe Arch	1007.02
Structural Plate for Pipe, Pipe Arch and Arch	1007.04
Corrugated Aluminum Pipe and Pipe Arch	1007.05
Coupling Bands	1007.09
Reinforcing Steel	1009
Geotextile Fabric	1019

(a) Side Drain Pipe or Side Drain Pipe Arch: When the item for Side Drain Pipe or Side Drain Pipe Arch is included in the contract, the contractor has the option of furnishing reinforced concrete pipe or reinforced concrete pipe arch, corrugated metal pipe or corrugated metal pipe arch, or plastic pipe, as allowed by EDSM II.2.1.1 or unless otherwise specified.

(b) Cross Drain Pipe or Cross Drain Pipe Arch: When the item for Cross Drain Pipe or Cross Drain Pipe Arch is included in the contract, the contractor has the option of furnishing reinforced concrete pipe or reinforced concrete pipe arch, corrugated metal pipe or corrugated metal pipe arch, or plastic pipe, as allowed by EDSM II.2.1.1 or unless otherwise specified.

(c) Storm Drain Pipe or Storm Drain Pipe Arch: When the item for Storm Drain Pipe or Storm Drain Pipe Arch is included in the contract, the contractor has the option of furnishing reinforced concrete pipe or reinforced concrete pipe arch, or plastic pipe, as allowed by EDSM II.2.1.1 or unless otherwise specified.

(d) Yard Drain Pipe: When the item for Yard Drain Pipe is included in the contract, the contractor has the option of furnishing concrete sewer pipe, plastic yard drain pipe or plastic pipe in accordance with Section 1006 unless otherwise specified.

(e) Material Type Abbreviations:

(1) Reinforced Concrete Pipe:

RCP	Reinforced Concrete Pipe
RCPA	Reinforced Concrete Pipe Arch

(2) Corrugated Metal Pipe:

CAP	Corrugated Aluminum Pipe
CAPA	Corrugated Aluminum Pipe Arch
CMP	Corrugated Metal Pipe
CMPA	Corrugated Metal Pipe Arch
CSP	Corrugated Steel Pipe
CSPA	Corrugated Steel Pipe Arch
BCCSP	Bituminous Coated Corrugated Steel Pipe
BCCSPA	Bituminous Coated Corrugated Steel Pipe Arch

(3) Plastic Pipe:

PP	Plastic Pipe
PVCP	Polyvinyl Chloride Pipe
RPVCP	Ribbed Polyvinyl Chloride Pipe

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CPEPDW Corrugated Polyethylene Pipe Double Wall

(f) Joint Type Abbreviations:

T1 Type 1 Joint
T2 Type 2 Joint
T3 Type 3 Joint

(g) Quality Assurance for Pipe: Manufacturing plants will be periodically inspected for compliance with specified manufacturing methods, and material samples will be randomly obtained for laboratory testing for verification of manufacturing lots. Materials approved at the manufacturing plant will be subject to visual acceptance inspections at the jobsite or point of delivery.

701.03 EXCAVATION. For all pipe, when the sides of the trench are stable as evidenced by the sides of the trench being able to maintain a vertical cut face, the minimum trench width at the bottom of the excavation will be 18 inches (460mm) on either side of the outside diameter of the pipe. If the sides of the trench are unstable, the width of the trench at the bottom of the excavation, for plastic or metal pipe, shall be a minimum width of at least 18 inches (460mm) or one pipe diameter on each side of the outside diameter of the pipe, which ever is greater. Surplus material or excavated material that does not conform to the requirements of Subsection 203.06(a) shall be satisfactorily disposed of in accordance with Subsection 202.02. Moisture controls including backfill materials selection and dewatering using sumps, wells, well points or other approved processes may be necessary to control excess moisture during excavation, installation of bedding, over-excavated trench backfilling, pipe placement and pipe backfill.

(a) Over-excavation: When unsuitable soils as defined in Subsection 203.04 or a stable, non-yielding foundation cannot be obtained at the established pipe grade, or at the grade established for placement of the bedding, unstable or unsuitable soils below this grade shall be removed and replaced with granular material meeting the requirements of Subsection 1003.07, bedding materials meeting the requirements of Subsection 1003.08 or Type A backfill. All granular, backfill materials placed below the established pipe or bedding grade shall be placed in lifts not exceeding 8 inches (200 mm) thick and sufficiently compacted by hand or a dynamic mechanical hand compaction device over the surface of each lift to form a stable, non-yielding foundation at the surface of the established bedding or pipe grade.

When rock is encountered, it shall be removed below grade and replaced with material complying with Subsection 1003.07, bedding materials meeting the requirements of Subsection 1003.08 or Type A backfill. The compacted earth cushion shall have a thickness under the pipe of at least 1/2 inch per foot (40 mm/m) of fill height over the top of the pipe with a minimum thickness of 8 inches (200 mm). All granular, backfill materials placed below the established pipe or bedding grade shall be placed in lifts not exceeding 8 inches (200 mm) thick and sufficiently compacted by hand or a dynamic mechanical hand operated compaction device over the surface of each lift to form a stable, non-yielding foundation at the surface of the established bedding or pipe grade.

Materials used to backfill in an over-excavated portion of a trench do not require encasement in a Geotextile Fabric.

Density of approved materials placed in over-excavated trenches will not be measured or determined.

701.04 FORMING PIPE BED. Bedding material, when specified, shall be constructed in accordance with Section 726. Materials allowed for bedding shall be as specified in Section 1003.08 or may be Type A backfill materials. When bedding materials are specified, additional excavation shall be performed below established pipe grade and the bedding material placed in

lifts not exceeding 8 inches (200 mm) thick and lightly compacted by hand or a dynamic hand compaction device over the surface of each lift.

When the bottom of the pipe is not laid in a trench but is constructed above natural soils, a uniform bed shall be constructed as specified for the bottom of a trench.

Density of approved bedding materials will not be measured or determined.

701.05 LAYING PIPE. Pipe laying shall begin at the downstream end of the line. The pipe shall be in contact with the foundation throughout its length. Bell or groove ends of pipe and outside circumferential laps of riveted metal pipe shall be placed facing upstream. Riveted seam metal pipe shall be placed with longitudinal laps at sides. Pipes in each continuous line shall have the same wall thickness. Metal pipes provided with lifting lugs shall be handled only by these lugs.

After pipe has been laid and before backfill is placed, the engineer will inspect the pipe for alignment, grade, integrity of joints, and coating damage.

701.06 JOINING PIPE.

(a) Joint Usage:

(1) Type 1 (T1) joints shall be used for side drains under drives and similar installations.

(2) Type 2 (T2) joints shall be used for cross drains under roadways, including turnouts.

(3) Type 3 (T3) joints shall be used for closed storm drain systems, flumes and siphons.

(b) Concrete Pipe: Concrete pipe may be either bell and spigot, or tongue and groove. The method of joining pipe sections shall be such that ends are fully entered and inner surfaces are flush and even.

An approved mechanical pipe puller shall be used for joining pipes over 36 inches (900 mm) in diameter. For pipe 36 inches (900 mm) or less in diameter, any approved method for joining pipe may be used which does not damage the pipe.

Joints shall comply with Subsection 1006.05, and shall be sealed with gasket material installed in accordance with the manufacturer's recommendations.

(c) Metal Pipe: Metal pipe shall be firmly joined by coupling bands. Bands shall be centered over the joint.

For Type 1 joints, approved gasket material shall be placed in one corrugation recess on each side of the joint at the coupling band and on each band connection in such manner to prevent leakage.

When Type 2 or 3 joints are specified, joining of metal pipe sections shall conform to the following provisions:

(1) General: Band joints shall be sealed with gasket material. Gasket material shall be placed in accordance with the plan details.

(2) Circular Section: Connecting bands shall be of an approved design and shall be installed in accordance with plan details.

(3) Arch Section: Connecting bands shall be a minimum of 12 inches (300 mm) wide for pipe arch less than 36 inches (900 mm) round equivalent diameter, and a minimum of 21 inches (525 mm) wide for 36 inches (900 mm) round equivalent diameter pipe arch and greater. Bands shall be connected at the ends by approved angle or strap connections. Connecting bands used for 36 inches (900 mm) round equivalent diameter pipe arch and above shall be 2-piece bands.

(d) Plastic Pipe: Joints for plastic pipe shall be either bell and spigot or split coupling bands.

(1) Bell and Spigot Type Joint System: The method of joining pipe sections shall be such that ends are fully entered and inner surfaces are flush and even.

Any approved method for joining pipe may be used which does not damage the pipe.

Joints shall be approved and shall be sealed with a gasket system utilizing gasket material complying with Subsection 1006.06(a).

(2) Split Coupling Type Joint System: Split coupling bands shall comply with all dimensional and material requirements of Subsection 1006.07. The bands shall be centered over the joint. The split coupling band shall be secured to the pipe with a minimum of five stainless steel or other approved corrosion resistant bands.

Joints shall be approved and shall be sealed with gasket material. Gasket material shall be placed in the first two corrugation recesses on each side of the pipe connections. Gasket material shall also be placed on each band connection to prevent leakage. When flexible plastic gasket material is used it shall be a minimum of 1/2 inch (13 mm) in size. The bands shall be tightened to create overlap of the band and shall adequately compress the gasket material.

(e) Connections: Approved connections shall be used when joining new pipes to existing pipes. When concrete collars are required in order to extend the ends of existing pipes that have been damaged or to join different types or sizes of pipes, the concrete collars shall be constructed in accordance with plan details, the applicable requirements of Section 901, and as directed.

(f) Geotextile Fabric, Pipe Joints: For concrete, metal and plastic pipes, Types 2 and 3 joints shall be wrapped with geotextile fabric for a minimum of 12 inches (300 mm) on each side of joint for pipe 36 inches (900 mm) or less in diameter and a minimum of 18 inches (450 mm) on each side of the joint for pipe greater than 36 inches (900 mm) in diameter. Ends of the fabric shall be lapped at least 10 inches (250 mm). The edges and ends of fabric shall be suitably secured for the entire circumference of the pipe.

701.07 RELAYING PIPE. If specified or directed, existing pipes shall be removed and suitable sections relaid as specified for new pipes.

701.08 BACKFILLING.

(a) General: Prior to backfilling, pipes found to be damaged or out of alignment or grade shall be removed and reinstalled, or replaced.

Type A backfill material shall be stone, recycled portland cement concrete, flowable fill, or RAP.

Type B backfill materials are selected soils. Where Type B backfill materials are called for, Type A backfill materials may be substituted.

When corrugated metal pipe is used, the backfill material shall be tested and shall have a resistivity greater than 1500 ohm-cm and a pH greater than 5 when tested in accordance with DOTD TR 429 and DOTD TR 430 respectively.

When Type A backfill material is used, geotextile fabric surrounding this backfill shall be placed in accordance with Subsection 726.03 between the aggregate backfill material and all other natural or placed soils in the trench or embankment. Care shall be taken to prevent damage to geotextile fabric during placement of backfill material. For concrete pipe, the fabric shall enclose not only the initial backfill but shall be wrapped over the top of the pipe with at least 12 inches (300 mm) of overlap.

When a trench box or trench sheeting is used in unstable soils and/or for worker safety, and when moved during backfilling operations, filling and additional compaction of the disturbed zone of backfill must take place immediately and in a manner acceptable to the engineer.

Initial backfill is a structural backfill encasing the pipe from the bottom of the pipe to the springline for concrete pipe and to a point one foot (0.3 m) above the top of the pipe for both

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metal and plastic pipe. Final backfill is not a structural backfill and shall extend from the top of the initial backfill to the top of the natural ground or subgrade in cut areas or to the top of existing ground in fill areas. Any fill required above the final backfill is considered and treated as embankment.

(b) Backfill Applications:

(1) Under Concrete Pavements: Type B backfill may be used as initial and final backfill for all pipes, culverts or drains under concrete pavements. Placement and compaction shall be as specified in Heading (d) below.

(2) Cross Drains Under Flexible Pavements: All reaches, exclusive of those portions of the pipe which are under shoulders, of cross drains and all other culverts, pipes or drains that cross the centerlines of the new roadway or centerlines of existing roadways, such as intersections and are under flexible pavements shall receive an initial backfill of Type A material. Type B backfill materials may be used as final backfill for all pipes. Placement and compaction shall be as specified in Heading (c) and (d) below. Where the subgrade is above existing ground, embankment material as specified for the remainder of the project shall be used from the top of the final backfill to the top of the established embankment grade.

(3) Other Drains Under Flexible Pavements: All reaches of all culverts, pipes or drains under flexible pavements that do not cross the centerlines of new roadway or centerlines of existing roadways, and exclusive of those portions of the pipe which are totally under shoulders, shall receive an initial and final backfill of Type B material. Placement and compaction shall be as specified in Heading (d) below. Where the subgrade is above existing ground, embankment material as specified for the remainder of the project shall be used from the top of the final backfill to the top of the established embankment grade.

(4) Other Areas: All culverts, pipes or drains in nonpaved areas or paved areas that serve as driveways or shoulders shall receive an initial and final backfill of Type B material. Placement and compaction shall be as specified in Heading (d) below.

(5) Pipes Subject to Construction Traffic; The embankment or pipe backfill shall be constructed to a minimum of 24 inches (600 mm) over the pipe before heavy construction equipment is allowed to cross the installation. Where practical, installations with less than 24 inches (600 mm) of cover over the top of the pipe shall be constructed after heavy hauling is completed over the pipe location. After completion of hauling operations, the contractor shall remove excess cover material. Pipe damaged by hauling and backfilling operations shall be removed and reinstalled, or replaced, at no direct pay.

(c) Placement and Compaction; Type A Backfill: For all pipes, culverts and conduits under paved and nonpaved areas, where Type A backfill material is used, the Type A backfill shall be thoroughly hand compacted under the pipe haunches and then dynamically compacted in layers not exceeding 8 inches (200 mm) compacted thickness. Compaction under the haunches of the pipe shall initially be by hand tamping or other acceptable means, until a level is reached that the dynamic tamping can commence. Each lift shall be compacted by applying at least eight passes of a hand operated, dynamic mechanical compaction device over the surface of each lift. With approval of the engineer, layer thickness may be increased to 12 inches (300 mm) with verification of satisfactory installation and performance. If flowable fill is used it shall be furnished, placed and consolidated in accordance with Section 710. The contractor shall control placement operations during initial backfill operations so as not to damage protective coatings on metal pipes. The contractor shall repair damaged coatings at no additional pay.

(d) Placement and Compaction; Type B Backfill: For all pipes, culverts and conduits, where Type B backfill is allowed, the Type B material shall be placed in layers not exceeding 8 inches (200 mm) compacted thickness. Compaction shall be with suitable mechanical equipment. With approval of the engineer, layer thickness may be increased to 12 inches (300 mm) with verification of satisfactory installation and performance.

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(e) Placement and Compaction; Trenchless or Partial Trench Condition: All pipes, culverts, drains and conduits placed with any portion of the pipe above existing ground must also comply with Subsections (a),(b) (c) and (d) above for the portion of the pipe within a trench and that portion of the pipe not constructed in a trench. The width of initial and final backfill of that portion above existing ground and not within a trench will be constructed to such a width that the requirements for placement, compaction and density are met.

(f) Density Requirements: The in place density of Type A backfill materials and bedding materials, will not be measured or determined. Type A backfill, exclusive of RAP and flowable fill, shall be placed at or near optimum moisture content determined in accordance with DOTD TR 415 or 418. RAP materials shall be placed and compacted in a slightly moist condition.

The maximum dry density of initial or final Type B backfill under all paved areas which are to be under traffic will be determined in accordance with DOTD TR 415 or TR 418 and in-place density determined in accordance with DOTD TR 401. Initial and final Type B backfill under all paved areas, under traffic, shall be placed at or near optimum moisture content determined in accordance with DOTD TR 415 or TR 418. Each layer shall be compacted by approved methods prior to the placement of a subsequent layer. The engineer will approve the compaction method based upon validation that such method, including moisture control, will achieve at least 95 percent of maximum dry density as determined in accordance with DOTD TR 401. With approval of the engineer, density testing may be waived on subsequent layers with backfill installation in accordance with approved compaction methods and continued satisfactory performance.

Initial and final backfill in unpaved areas or paved areas such as shoulders or driveways, shall be placed evenly and compacted along the length of the culvert, pipe or drain from the top of the initial backfill to the top of the subgrade. Layered backfill shall be compacted at least to the density of the adjoining existing soils or the compaction required of the laterally adjoining layers of soil immediately outside the trench for embankment elevations. Initial and final backfill shall be placed and compacted at or near optimum moisture content determined in accordance with DOTD TR 415 or TR 418.

701.09 INSPECTION OF PIPES. After completion of embankment and prior to roadway surfacing, the engineer shall inspect pipes for proper alignment and integrity of joints. Any misaligned pipe or defective joints shall be corrected by the contractor at no direct pay.

(a) Plastic Pipe: Installed plastic pipe shall be tested to ensure that vertical deflections do not exceed 5.0 percent. Maximum allowable deflections shall be governed by the mandrel requirements stated herein.

Deflection tests shall be performed no sooner than 30 calendar days after installation and compaction of backfill. The pipe shall be cleaned and inspected for offsets and obstructions prior to testing.

For pipe 36 inches (900 mm) and less in diameter, a mandrel shall be pulled through the pipe by hand to ensure that maximum allowable deflections have not been exceeded. The mandrel shall be approved by the engineer prior to use. Use of an unapproved mandrel or a mandrel altered or modified after approval will invalidate the test. If the mandrel fails to pass, the pipe is overdeflected.

Unless otherwise permitted, overdeflected pipe shall be uncovered and, if not damaged, reinstalled. Damaged pipe shall not be reinstalled, but shall be removed and replaced with new pipe. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure any overdeflection, shall be removed and replaced with new pipe.

The mandrel shall be a rigid, nonadjustable, odd-numbered legged (minimum 9 legs) mandrel having a length not less than its nominal diameter or 24 inches (600 mm), whichever is less. The minimum diameter at any point shall be 5.0 percent less than the base inside diameter

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of the pipe being tested. The mandrel shall be fabricated of steel, aluminum or other approved material fitted with pulling rings at each end. The nominal pipe size and outside diameter of the mandrel shall be stamped or engraved on some segment other than a runner. A suitable carrying case shall be furnished.

For pipe larger than 36 inches (900 mm) in diameter, deflection shall be determined by a method approved by the engineer. If a mandrel is selected, the minimum diameter, length, and other requirements shall conform to the above requirements.

Mandrel testing shall be conducted by the contractor in the presence of the engineer. Mandrel testing shall be at no direct pay.

(b) Metal Pipe: If the inside diameter of metal pipe or rise dimension of metal pipe arch deflects more than 5.0 percent from original dimensions, they shall be removed and reinstalled, unless they do not rebound or are damaged. Pipe or pipe arch which are damaged or do not rebound shall be removed and replaced at no direct pay. Measurement of deflection will be made by the engineer away from rerolled ends.

701.10 CLEANING PIPES.

(a) Existing Pipes: Pipes designated to be cleaned shall be cleaned of soil, debris and other materials to the invert of the pipe. Designated pipes shall be cleaned by approved methods that will not damage the pipes. Any damage caused by the contractor's operations shall be satisfactorily repaired at no direct pay.

Removed soil, debris and other materials shall be disposed of in accordance with Subsection 202.02 or as otherwise approved in writing.

(b) Contractor Installed Pipes: Prior to final acceptance, pipes shall be cleaned of all debris and soil to the invert of the pipe at no direct pay.

Removed soil, debris and other materials shall be disposed of in accordance with Subsection 202.02 or as otherwise approved in writing.

701.11 STUBBING AND PLUGGING PIPES. When it is required that pipes be plugged, such plugs shall be constructed of Class R concrete complying with Section 901. Thickness of plug and method of construction shall be as directed.

When new pipes are to be stubbed into new or existing pipes or other structures, the connection shall be made with approved mortar complying with Subsection 702.02.

701.12 MEASUREMENT. Pipe, both new and relaid, will be measured in linear feet (lin m) as follows unless stated otherwise.

(a) Pipe not confined by fixed structures will be measured by the number of joints at the nominal length of each joint.

(b) Pipe confined by fixed structures will be measured along the pipe between the termini of pipe in structure walls.

(c) Pipe confined by a fixed structure on one end and unconfined at the other end will be measured along the pipe from the terminus of pipe in the structure wall to the unconfined end of pipe.

(d) Fabricating of pipe tees, elbows and other fittings will be measured per each fitting. The length of pipe in such fittings will be included in the pay length measurement of pipes of which they form a part.

(e) Excavation required for installation of pipes will not be measured for payment, except as otherwise specified in Subsection 203.14.

(f) Furnishing and placing backfill material below existing ground level for pipes will not be measured for payment. Backfill material needed to complete backfill above natural ground and around pipes that extend above natural ground will be measured and payment will be made

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under applicable earthwork items. When specified, flowable fill will be measured and paid for in accordance with Section 710.

(g) Plugging and stubbing of pipes will not be measured for payment.

(h) Cleaning existing pipes will be measured by the length of pipe cleaned and accepted.

(i) Concrete collars will be measured per each.

701.13 PAYMENT.

(a) Payment for pipe will be made at the contract unit price per linear foot (lin m) of the types and sizes specified.

When plastic pipe is specified on the plans or elected to be used by the contractor, payment will be made at the contract unit price per linear foot (lin m) of the types and sizes specified in accordance with the payment schedule of Table 701-1.

Table 701-1
Payment Schedule for Plastic Pipe

Percent Payment	Stage of Completeness
75	After placement and backfill has been completed
25	After the pipe has met vertical deflection requirements in accordance with Subsection 701.09(a)

(b) Payment for fabricating pipe tees, elbows and other fittings will be made at the contract unit price per each fitting.

(c) When unstable conditions are encountered, the additional excavation will not be measured for payment; however, the additional materials furnished and placed for the pipe foundation will be measured and paid for as follows:

(1) Granular Materials: Payment will be made under the embankment item. The net section volume of the materials will be multiplied by 3 to determine the pay volume. When the contract does not include a pay item for embankment, payment will be made in accordance with Subsection 104.02.

(2) Bedding Material: Measurement and payment will be made in accordance with Section 726. When the contract does not include a pay item for bedding material, payment will be made in accordance with Subsection 104.02.

(d) Payment for cleaning existing pipes will be made at the contract unit price per linear foot (lin m).

(e) Payment for concrete collars will be made at the contract unit price per each.

Payment will be made under:

Item No.	Pay Item	Pay Unit
701-01	Cross Drain Pipe (Size & Type)	Linear Foot (Lin m)
701-02	Cross Drain Pipe Arch (Size & Type)	Linear Foot (Lin m)
701-03	Storm Drain Pipe (Size & Type)	Linear Foot (Lin m)
701-04	Storm Drain Pipe Arch (Size & Type)	Linear Foot (Lin m)
701-05	Side Drain Pipe (Size)	Linear Foot (Lin m)
701-06	Side Drain Pipe Arch (Size)	Linear Foot (Lin m)

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701-07	Yard Drain Pipe (Size)	Linear Foot (Lin m)
701-08	Relaying Pipe	Linear Foot (Lin m)
701-09	Fabricating Pipe Fittings	Each
701-10	Reinforced Concrete Pipe (Extension)	Linear Foot (Lin m)
701-11	Reinforced Concrete Pipe Arch (Extension)	Linear Foot (Lin m)
701-12	Corrugated Metal Pipe (Extension)	Linear Foot (Lin m)
701-13	Corrugated Metal Pipe Arch (Extension)	Linear Foot (Lin m)
701-14	Cleaning Existing Pipes	Linear Foot (Lin m)
701-15	Concrete Collar	Each
701-16	Plastic Pipe (Extension)	Linear Foot (Lin m)

TEMPORARY SIGNS, BARRICADES, BARRIERS AND PAVEMENT MARKINGS (01/06): Section 713 of the 2000 Standard Specifications and the Supplemental Specifications is amended as follows:

Subsection 713.02, Materials is amended as follows. Heading (b)(1) is deleted and the following substituted.

(1) Temporary Signs and Barricades: On the mainline of freeways and expressways, the initial sequence of advanced warning construction signs shall be fabricated using ASTM D 4956 Type X fluorescent orange reflective sheeting. Reflective sheeting for all other temporary signs and barricades shall comply with the requirements of ASTM D 4956, Type III.

Subsection 713.04, Temporary Signs and Barricades, is amended to include the following:

(d) Project Signs: The contractor shall furnish, install, maintain, and upon completion of the project remove "project signs" in accordance with the following requirements.

Project signs shall conform to the requirements of Section 713 and the project sign detail contained elsewhere herein. Shop drawings will be furnished to the successful bidder by contacting the Department's Traffic Services Sign Shop at (225) 935-0121 or 935-0142.

Project signs shall be required at the beginning and end of the project and shall follow sign G-20-1, "Road Work Next 'X' Miles", or as directed by the engineer.

Payment for project signs shall be included in the contract unit price for Item 713-01 Temporary Signs and Barricades.

Subsection 713.07 Measurement is renumbered to 713.08.

Subsection 713.07 is added as follows.

713.07 Portable Work Zone Traffic Control Devices. All Category I, II, and III portable work zone traffic control devices, as described below, shall be crashworthy as determined by evaluations through the National Cooperative Highway Research Program (NCHRP) 350 for Test Level 3 (TL-3).

(1) Category I devices are low-mass, single-piece traffic cones, tubular markers, single-piece drums and flexible delineators and are, by definition, considered crashworthy devices meeting NCHRP Report 350 TL-3 criteria. Drum and light combinations with Type A or C warning lights and fastener hardware consisting of vandal resistant 1/2 inch (13 mm) diameter cadmium plated steel bolts and nuts used with 1 1/2 inch (38 mm) diameter by 3/4 inch (19 mm) cup washers are included as Category I devices. In lieu of testing for crashworthiness, acceptance of Category I devices for compliance with NCHRP 350 will be allowed based on self-certification by the supplier. The supplier shall certify that the product is crashworthy in accordance with the evaluation criteria of NCHRP 350. This certification may be a one-page affidavit signed by the supplier, with supporting documentation kept on file to be furnished if requested.

(2) Category II devices include other low mass traffic control devices such as portable barricades either with or without lights and/or signs, portable sign stands, portable vertical panel

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assemblies, and drums with lights not meeting the drum and light combination requirements for Category I. Individual crash testing is required for Category II devices. FHWA letters of approval shall serve as verification that these devices comply with the crash testing requirements of NCHRP Report 350 TL-3. The contractor shall provide the engineer a listing of all the Category II devices to be used on the project prior to installation including a reference to the FHWA Work Zone letter number for each device. The contractor shall also certify that each device has been crash tested and meets the NCHRP 350 requirements.

(3) Category III devices include massive devices such as concrete barriers, water filled barriers and portable attenuators. Individual crash testing is required for Category III devices. FHWA letters of approval shall serve as verification that these devices comply with the crash testing requirements of NCHRP Report 350 TL-3. The contractor shall provide the engineer a listing of all the Category III devices to be used on the project prior to installation including a reference to the FHWA Work Zone letter number for each device. The contractor shall also certify that each device has been crash tested and meets the NCHRP 350 requirements.

Subsection 713.08 Payment is renumbered to 713.09, and amended as follows.

Table 713-2 Payment Schedule is deleted and the following substituted.

Table 713-2
Payment Schedule
Temporary Signs, Barricades and Related Devices

Percent of Total Contract Amount Earned	Allowable Percent of Lump Sum Price for Temporary Signs and Barricades
Initial Erection	20
25	40
50	60
75	80
100	100

The third sentence of the second paragraph is deleted and the following substituted. The concrete in temporary precast barriers furnished by the contractor will be identified by lots and shall be subject to pay adjustments in accordance with Table 901-3 and Note 1 therein.

A pay item is added as follows.

Pay Item	
713-10	Temporary Portable Barrier (Type), Each

PROJECT SITE LABORATORY (EQUIPPED): Subsection 722 of the 2000 Standard Specifications is amended as follows:

Subsection 722.02 General Requirements. The first sentence of the second paragraph is deleted and the following substituted.

Each laboratory shall have a minimum floor space of 160 square feet, or other approved size that provides sufficient space with a minimum ceiling of 7 feet.

The following is added to the second paragraph.

The contractor shall be required to furnish, install and maintain the following equipment in satisfactory condition, as needed, throughout the life of the project.

1.) An automatic soil compaction hammer capable of compacting both standard and modified proctors, with arrangement for both 12″ and 18″ drop and also accommodates 4″ and 6″ molds with adjustable hammer weight from 5.5 to 10 pounds. The specifications for the hammer shall be in accordance with TR415, Field Moisture-Density Relationships, and TR 418, Moisture Density

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Relationships, and shall have a striking face which is a 3.1416 in^2 (2026,83mm^2) sector face as specified for each mold diameter. The equipment shall include two (2) molds of each size (1/30 ft^3 and 1/33.33 ft^3 or 1/10ft^3).

2.) A compaction block or pedestal composed of Portland cement concrete shall be supplied for use with the automatic compaction hammer. The block shall weigh a minimum of 200 pounds. The hammer shall be secured to the block.

3.) An electronic scale capable of measuring in both English and metric units and shall have a capacity of 13.6 kgs or more with a sensitivity of 5 grams.

4.) An electronic scale capable of measuring in metric units and shall be capacity of 2 kilograms or more with a sensitivity of 0.1 grams.

5.) Two (2) electric or gas hot plates. An open flame hot plate shall be equipped with suitable shield to disperse heat evenly and to prevent direct contact of the flame with the drying pan. The hot plates shall be of sufficient size to accommodate the drying pans.

Note: The automatic soil compaction hammer and scales noted above shall be calibrated by an independent laboratory on an annual basis and shall be verified by the project engineer's personnel on each project.

6.) An approved nuclear device (Troxler Model 3440) with a transport case, locks and keys. Also, included shall be an operator's manual, referenced standard block, scraper plate/drill rod guide, and 3/4″ auger.

The nuclear device shall be wiped test every 6 months and calibrated every 2 years by an independent laboratory and shall be verified by the project engineer's personnel on each project.

STRUCTURAL CONCRETE (12/05): Section 805 of the 2000 Standard Specifications and the Supplemental Specifications thereto is amended as follows.

Table 805-2 is deleted and the following substituted.

Table 805-2
Concrete Placement Rates for Bridge Decks

Pour Size Cubic Yards (Cu m)	Minimum Placement Rate Cubic Yards (Cu m) Per Hour
0-50 (0-40)	20 (15)
51-75 (41-60)	25 (20)
76-125 (61-100)	30 (25)
Over 125 (Over 100)	40 (30)

PORTLAND CEMENT CONCRETE (06/20/06): Section 901 of the 2000 Standard Specifications and the supplemental specifications thereto is amended as follows.

Subsection 901.06 is amended as follows.

Heading (b) is deleted and the following substituted.

(b) Quality Control Tests: The contractor shall be responsible for determining gradation and moisture content of fine and coarse aggregates used in the concrete mixture and for testing the mixture at the job site for slump, unit weight (mass), temperature, and air content (when used). The contractor shall conduct operations to produce a mix complying with the reviewed and accepted mix design, except that variations will be permitted within specified control limits for individual samples. The contractor shall be responsible for monitoring the components (cement, mineral and chemical admixtures, aggregates) in their mix to protect against any changes due to component variations. As component shipments arrive, the

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contractor shall verify slump, air content and set time by testing at ambient temperatures. The contractor shall make adjustments to the mix design to rectify any changes which would adversely affect constructability, concrete placement or the specifications. The contractor shall submit test results to the Department for review each day of paving. Testing to validate component consistency will be documented on the control logs. Conformance or variation in mix parameters (workability, set times, air content, etc.) shall be noted on the control logs. The contractor shall provide a copy of the proposed testing plan to the engineer for record. Acceptance of the plan does not relieve the contractor's responsibility for consistency. Test results for gradation, slump, unit weight (mass), and air content shall be plotted on control charts for individual samples. These control charts shall be submitted to the engineer.

Times at which to obtain control test samples shall be set by the contractor using random number tables in accordance with DOTD S 605 or by random selection. Gradation control limits of aggregates shall be as shown in Subsection 1003.02. When required, additional test samples shall be taken as directed for slump, concrete temperature, and air content.

The minimum number of quality control tests to be performed by the contractor for structural and pavement concrete shall be in accordance with the Materials Sampling Manual.

For minor structure concrete only, the contractor will not be required to have a Certified Concrete Technician or Authorized Concrete Field Tester, but shall implement a quality control testing program to ensure that the concrete meets the requirements of these specifications.

When producing concrete for Type B and D pavements, gradations shall be determined daily on each stockpile of aggregate to be used. All gradation calculations shall be based on percent of dry weight (mass). Upon determination of the gradation of each stockpile, the percent of the total aggregates retained shall be determined mathematically based on the proportions of the combined aggregate blend, and checked for conformance with Table 1003-1A.

Subsection 901.08 is amended as follows.

The second paragraph of Heading (a) is deleted and the following substituted.

For concrete placements having a least dimension of 48 inches (1200 mm) or greater, or if designated on the plans or the project specifications as being mass concrete, the allowable cement type shall be Type II portland cement, Type IP portland-pozzolan cement, or Type IS portland blast furnace slag cement. The cement or combination of cement and fly ash or ground granulated blast furnace slag, shall be certified to generate a heat of hydration of not more than 70 calories/gram (290 kJ/kg) at 7 days.

Table 901-02, Master Proportion Table for Portland Cement Concrete, is deleted and the following substituted.

Table 901-2
Master Proportion Table for Portland Cement Concrete

	Average Compressive Strength, psi (MPa) at 28 days	Grade of Coarse Aggregate	Min. Cement, lb/yd^3 (kg/m^3) of Concrete [9]	Maximum Water/Cement ratio, lb/lb(kg/kg) [1,9]	Total Air Content (Percent by volume) [4]	Slump Range [10], inches (mm)		
						Non-Vibrated	Vibrated	Slip Form Paving [2]
Structural Class [11]								
AA(M)	4400 (30.4)	A, P	560 (332)	0.44	5±1	2-5 (50-125)	2-4 (50-100)	N.A.
AA	4200 (29.0)	A, P	560 (332)	0.44	5±1	2-5 (50-125)	2-4 (50-100)	N.A.
A(M)	4400 (30.4)	A, P	510 (302)	0.53	5±2	2-5 (50-125)	2-4 (50-100)	N.A.
A	3800 (26.2)	A, F [8], P	510 (302)	0.53	5±2	2-5 (50-125)	2-4 (50-100)	1-2.5 (25-65)
D	3300 (22.8)	A, B, D, P	420 (249)	0.58	5±2	2-5 (50-125)	1-3 (25-75)	N.A.
F	3400 (23.5)[5]	A,P	460 (273)	0.44	5±1	2-5 (50-125)	2-4 (50-100)	N.A.
P(X)	7500 (51.7)[5]	A, F [8], P	700 (415)	0.40	5±2	N.A.	2-10 (50-250)	N.A.
P(M)	6000 (41.4)[5]	A, F [8], P	600 (356)	0.44	5±2	N.A.	2-6 (50-150)[7]	N.A.
P	5000 (34.5)[5]	A, F [8], P	560 (332)	0.44	5±2	N.A.	2-6 (50-150)[7]	N.A.
S	3800 (26.2)	A,P	650 (385)	0.53	5±2	6-8 (150-200)	N.A.	N.A.
Minor Structure Class [11]								
M	3000 (20.7)	A, B, P	470 (279)	0.56	5±2	2-5 (50-125)	2-4 (50-100)	1-2.5 (25-65)
R	1800 (12.4)	A, B, D, P	370 (219)	0.70	5±2	2-5 (50-125)	2-4 (50-100)	N.A.
Y	3000 (20.7)	Y	560 (332)	-[3]	6-9	N.A.	1-3 (25-75)	N.A.
Pavement Type [11]								
B	4000 (27.6)[6]	N/A [13]	475 (282)	0.53	5±2	N.A.	2-4 (50-100)	1-2.5 (25-65)
D	4000 (27.6)[6]	N/A [13]	450 (267)	0.53	5±2	N.A.	2-4 (50-100)	1-2.5 (25-65)
E	4000 (27.6)[6]	A, F[12], P	600 (356)	0.40	5±2	N.A.	2-4 (50-100)	1-2.5 (25-65)

N.A. – Not Applicable

[1] Except for Class AA, AA(M), or F concrete, the maximum volume of water; gal. (L), shall be reduced 5 percent when a water-reducing admixture is used, and 10 percent when an air-entraining admixture, or air-entraining and water-reducing admixtures, is used. When the coarse aggregate portion of the mix is 100 percent crushed aggregate, the water may be increased by 5 percent provided the maximum water listed in Table 901-2 is not exceeded.

[2] Also slump range for other concrete placed by extrusion methods.

[3] Refer to Subsection 901.08(c).

[4] Total air content ranges when air-entrainment is allowed or specified. Air content shall be designed at midrange.

[5] Values shown represent the minimum compressive strengths allowed.

[6] Average compressive strengths for Pavement Type concrete shall be 3600 psi (24.8 MPa) when air-entrainment is used.

[7] No more than a 2 inch (50 mm) slump differential for any design pour.

[8] Grade F coarse aggregate shall be used only when specified or permitted. The minimum cement content shall be increased when this aggregate is used.

[9] For mixes including partial replacement of cement with fly ash or ground granulated blast furnace slag, the minimum cement and maximum water contents shown apply to the total cement and fly ash or ground granulated blast furnace slag content of the mix. Additional cementmay be required to achieve minimum compressive strength.

[10] When a slump range is specified in other sections, that range shall govern.

[11] See Subsection 901.08(a) for allowable types of cement.

[12] For use in partial depth patching.

[13] Aggregate grading shall comply with the requirements of Subsection 1003.02(c).

COOPERATION WITH UTILITIES: Subsection 105.06 of the Standard Specifications is amended to include the following.

Utility facilities will be removed, relocated, adjusted or abandoned in accordance with agreements between the Department and utility owners listed below. Starting dates for such work will be determined by the engineer and may be different for each utility and may not be underway concurrently with the contractor's work or with other utility relocations.

UTILITY OWNER	Estimated Calendar Days After Right-Of-Way is Clear*
Atmos Energy 300 Industrial Road Natchitoches, LA 71457 Phone: (318) 357-1558 Cell: (318) 357-1558 Attn.: Charles Penrod	90
BellSouth Telecommunications 825 Murray Street Alexandria, LA 71301 Phone: (318) 473-1655 Cell: (318) 623-7066 Attn.: Clarence Frasier	120
Century Tel 6501 Coliseum Boulevard Alexandria, LA 71303 Phone: (318)449-5426 Attn.: William "Bill" Norris or Lamar Skains	20
Crosstex LIG, LLC P. O. Box 1352 Alexandria, LA 71309 Phone: (318) 445-8225, Ext. 5675 Cell: (318) 619-5675) Attn.: Mike Risley	45
Entergy Louisiana, Inc. 2901 Cypress Street West Monroe, LA 71294-5803 Phone: (318) 329-5404 Cell: (318) 376-1510 Attn.: Ellis Alford Or Entergy Louisiana, Inc. P. O. Box 35803 West Monroe, LA 71294-5803 Phone: (318) 329-5475) Attn.: Jerry Smith	120
Grant Gas Utility District No. 5 506 Main Street Colfax, LA 71417 Phone: (318) 627-3333 Cell: (318) 447-9160) Attn.: Donald Foster	0
Rapid Communications 515 East Longview Arp, TX 75750 Phone: (318) 481-7002 Attn.: Mark Graves	60

UTILITY OWNER	Estimated Calendar Days After Right-Of-Way is Clear*
Town of Tullos P. O. Box 749 Tullos, LA 71479 Phone: (318) 534-6499 Cell: (318) 640-6076 Attn.: Fred Book	45
Red Hill Waterworks P. O. Box 357 Georgetown, LA 71432 Phone: (318) 419-5295 Attn.: John Bruce	60
Valero Pipeline, LP 7340 W. 21st Street North, Suite 200 Wichita, KS 67205 Phone: (800) 759-0033, Ext. 344 Attn.: Ryan Schiffelbein	30
Village of Georgetown P. O. Box 220 Georgetown, LA 71432 Phone: (318) 827-5527 Attn.: Danny Olden	90
Chadco, Inc. P. O. Box 370 Tullos, LA 71470 Phone: (318) 534-6551 Attn.: Chad McCartney	0
Feldco, Inc. 16614 Cougar Falls Court Spring, TX 77379 Phone: (281) 376-4258 Attn.: Feldor Hollenshead	0
S. H. Oil Corporation P. O. Box 248 Tullos, LA 71479 Phone: (318) 534-6161 Attn.: Shelby Loe	0

UTILITY OWNER	Estimated Calendar Days After Right-Of-Way is Clear*
Page Development P. O. Box 142 Calvin, LA 71410 Phone: (318) 534-6121 Attn.: Kenny Cox	0
Plains Pipeline P. O. Box 1199 Ferriday, LA 71334 Phone: (601)807-9191, Ext. 118 Attn.: Mike Green	0

ITEM S-001, RUMBLE STRIPS (GROUND-IN)(04/01): This item consists of cutting 1/2 inch (13 mm) deep depressions into asphaltic concrete shoulders in accordance with plan details, this special provision, and as directed.

The cutting tool shall be equipped with a rotary type cutting head and a power unit. The cutting head shall have the cutting tips arranged in a pattern to provide a relatively smooth cut (approximately 1/16 inch (1.5 mm) between peaks and valleys). The cutting head shall be suspended independently from the power unit to allow the cutting head to self-align with the slope of the shoulder and any irregularities in the shoulder surface. The cutting tool shall be equipped with guides to provide a consistent alignment of each cut in relation to the roadway and to provide uniformity and consistency throughout the project.

The rumble strips shall be cut into the finished shoulders after the final wearing course has been placed.

Solid residue resulting from cutting operations shall be removed from pavement and shoulder surfaces by the contractor before such residue is blown by traffic or wind.

The contractor shall demonstrate to the project engineer the ability to achieve the desired surface inside each depression without tearing or snagging the asphalt prior to beginning the work.

Acceptance measurements will be performed by the Department on a random basis to ensure conformance with the specifications.

Rumble strips (ground-in) will be measured by the mile (km), plan quantity, constructed and accepted in accordance with these specifications. The plan quantity is based on the roadway length minus bridge lengths for each shoulder on which ground-in rumble strips are constructed.

Payment for rumble strips (ground-in) will be made at the contract unit price in accordance with Subsection 109.02.

Payment will be made under:

Item S-001, Rumble Strips (Ground-in), per mile (km).

ITEM S-002, REMOVAL OF S. P. 015-04-0038 TRANSITION ROAD (STA. 110+600.000 TO STA. 111+125.880): This item shall consist of the complete removal of the existing temporary transition road at the north end of this project, outside of the project limits given on the plans. This temporary transition road is from approximate Station 110+600.000 to Station

111+125.880) and is shown in the plans. The complete removal of the existing temporary transition road includes the sawcutting along the lines shown, and removal of traffic striping, pavement, base, drainage structures (if any), geotextile fabric (if any), embankment, and the fine grading and shaping to drain. The installation of permanent seeding, mulching, and fertilizing will be paid under the appropriate pay items elsewhere in this contract. Permanent pavement striping will be paid under the appropriate permanent striping pay items elsewhere in this contract.

Payment will be made under:

Item S-002, Removal of S.P. 015-04-0038 Transition Road (Sta. 110+600.000 to Sta. 111+125.880), per lump sum.

ITEM S-003, REMOVAL OF S. P. 015-04-0035 TRANSITION ROAD (STA. 40+727.600 TO STA. 41+260.000): This item shall consist of the complete removal of the existing temporary transition road at the north end of this project, outside of the project limits given on the plans. This temporary transition road is from approximate Station 40+727.600 to Station 41+260.000 and is shown in the plans. The complete removal of the existing temporary transition road includes the sawcutting along the lines shown, and removal of traffic striping, pavement, base, drainage structures (if any), geotextile fabric (if any), embankment, and the fine grading and shaping to drain. The installation of permanent seeding, mulching, and fertilizing will be paid under the appropriate pay items elsewhere in this contract. Permanent pavement striping will be paid under the appropriate permanent striping pay items elsewhere in this contract.

Payment will be made under:

Item S-003, Removal of S.P. 015-04-0035 Transition Road (Sta. 40+727.600 to Sta. 41+260.000), per lump sum.

ITEM S-004, FLASHER SWITCH (FLASHER ASSEMBLY, 2 CIRCUIT, POLE MOUNTED CABINET): This item consists of furnishing a flasher switch assembly in accordance with the following:

General: The flashing switch specified herein shall be designated to operate on 110-130 volt, 60 cycle, alternating current, and shall be delivered completely wired and enclosed in a weatherproof cabinet. The flasher shall meet NEMA standards for a two-circuit flasher rated at 15 amps per circuit (Type 3).

These specifications define solid-state flashers that are used to periodically interrupt a source of alternating-current line power for the purpose of providing flashing traffic signals and flashing beacons. For the purpose of these specifications, the term "solid-state" shall be defined as the main current to the signal load which is not switched by electro-mechanically operated contacts.

The flasher shall be certified by an independent laboratory as conforming to NEMA TS-1, Section 8, and Section 2.2.3.2. This certificate shall be included with the drawing and literature for this equipment.

Cabinet: Unless otherwise specified, the vendor shall furnish the controller completely housed in a weatherproof aluminum housing of clean-cut design and appearance. A hinged door shall be provided permitting complete access to the interior of the box. When closed the door shall butt against a resilient neoprene sponge gasket to create a waterproof seal between the door and the housing. The door shall be provided with a standard lock with one key (sample key to be furnished by the Department) and shall have an outside designation "Traffic Control" or "Traffic

Signals" cast or embossed into the metal with letters 3/4″ high or larger. The cabinet interior shall a minimum dimensions measuring 9-3/4″ wide, 12″ long and 5-1/2″ deep.

All cabinets, unless otherwise specified, shall be suitable for wood pole mounting. The manufacturer shall drill the cabint for two (2) 2″ wire entrance holes, one (1) in the top and one (1) in the bottom, as shown in Detail 1, Cabinet Wire Entrance. The wire entrance holes shall be located on the back edge of the cabinet and centered on the width of the cabinet. When the installer attaches the hubs to the cabinet, the hub shall align on the center of the entrance hole. The vendor shall supply lock washers and hex nuts for the bolts to attach to the hub. The bolt pattern for the hub is 2-1/8″ centered on a line perpendicular to the outside back of the cabinet and 3-3/4″ parallel to the back of the cabinet. Mounting holes for the bolts shall be 3/8″. The centers of the bolt pattern on the hub and the wire entrance hole shall coincide. The location of the hubs shall allow minimum clearance for box end wrenches to fit onto the nuts within the cabinet. The cabinet exterior shall be finished with two coats of high-grade green enamel (Outdoor Advertising Association of America No. 144). A color chip shall be available on request. Each coat shall be independently baked to resist peeling and chipping. The interior shall be furnished with gloss white enamel by the manufacturer.

Hub, Conduit: Hubs for the cabinet shall be cast aluminum ASTM B-108. The bolt pattern shall be as shown in Detail 1, Cabinet Wire Entrance. The blank hub shall be a flat plate, 1/4″ thick. All threaded hubs shall have a threaded collar a minimum of 2″ from the base of the hub. The manufacturer shall center the threaded opening within the 3-3/4″ dimension of the hub and the outside edge of the threaded collar in line with the back of the hub. The manufacturer shall make all hubs with stainless steel bolts casted into the hub. The manufacturer shall design the hub with the outside smooth to shed water. On hubs with a larger threaded collar, the design shall maintain the bolting pattern.

TYPE	OPENING (S) SIZE	OPENING DESCRIPTION
blank	-0-	no opening, flat plate, 1/4″ minimum thickness
single	3/4″	one (1) opening, 3/4″ conduit thread
single	1″	one (1) opening, 1″ conduit thread
single	1-1/2″	one (1) opening, 1-1/2″ conduit thread
single	2″	one (1) opening, 2″ conduit thread
single	2-1/2″	one (1) opening, 2-1/2″ conduit thread
single	3″	one (1) opening, 3″ conduit thread
double	3/4″	two (2) openings, each 3/4″ conduit thread
double	1″	two openings, each 1″ conduit thread

Unless otherwise noted on the order, the vendor shall provide two (20 Hubs for each cabinet. One (1) hub shall be a double 3/4″ and the other shall be blank.

Mounting Adapter: The vendor shall provide two (2) pole adapters as shown in Detail 2, Pole Mounting Adapter. The adapter shall be comformable for mounting to round poles with diameters of 4-1/2″ or larger. Material for the adapter shall be aluminum alloy 6061 or 5052-H32. The minimum thickness shall be 1/8″. The material shall have the mechanical strength to hold, in addition to the cabinet, the added weight and load of items such as conduit, cables, service equipment, etc. The mounting holes in the adapter shall be 5/8″ and slots for steel banding shall be 1-1/8″ by 1/4″. The adapter shall be installed with the hubs and use the same

mounting bolts of the hub. The vendor shall supply gaskets for installation between the cabinet, hub and adapter.

Gasket: The manufacturer shall cut the gasket to fit the bolt pattern specified for the hub and wire-way opening. The material for the gasket shall be 50% cork/50% neoprene material. The vendor shall send four (4) gaskets with each cabinets.

Flasher Characteristics: Flashers shall the following physical characteristics.

A. The overall dimensions of the flasher shall not exceed 8.25 inches from the mating connector, including any handle or gripping device. The flasher shall be no more than 4.2 inches high.

B. Intermate with a Cinch-Jones socket Type S-406-SB or equivalent.

C. Be so constructed that its lower surface will be no more than 2.1 inches below the centerline of connector configuration.

D. Be so constructed that no part of it will extend more than 0.9 inches to the left and 1.1 inches to the right of the centerline of connector pin configuration as viewed from the front. (See Figure 8.02-1).

E. Be so constructed that personnel inserting or removing the module will not be exposed to live parts nor be required to insert either their hands or fingers into a load rack.

F. All printed circuit boards shall be made from NEMA (FR-4) glass-epoxy, or equivalent (See NEMA Standards Publication No. LI 1-1971). Circuit boards exceeding 2 inches in any dimension shall have a nominal thickness of least 1/32 inches.

Note: All PC boards shall be coated with an epoxy or approved equal type material to prevent erratic performance due to high humidity, condensation, and growth of fungus and mildew. This coating will not cover the components on the board, but once the components are in place, the soldered joints shall be covered with moisture and fungus proof, clear type of acrylic lacquer. This coating shall not be injurious to the board or components and shall not interfere with the repair of the circuitry or replacement of components. The walls of all plated through holes shall have a minim**um copper plating thickness of 0.001 inches. All circuit tracks shall have conductivity equivalent to at least 2 ounces per square foot of cooper (2 oz/ft^2 Cu).**

All electrical mating surfaces shall be made of non-corrosive material. The unit shall be designed so that each component is identified by a circuit reference symbol. This identification may be affixed to the printed circuit boards, the cover of the unit, or in an assembly drawing provided with the unit.

Back Panel Characteristics: The manufacturer shall mount a back panel in the cabinet and shall have mounted on it cartridge type fuse, connector for NEMA Type 3 flasher, flasher support bracket, and permanently identified field terminals. The back panel size shall be 9″ wide and 12″ high. The manufacturer shall have the back panel constructed of 1/4″ electrical grade *masonite*. The panel shall have four (4) mounting holes approximately 11/32″ in diameter. The holes shall be centered on an 8″ x 9″ bolt pattern. The bolt pattern shall be centered on the back panel. The back panel shall support the NEMA flasher from the panel along its longest dimension. The support shall not restrict removal or installation of the flasher unit on the back panel while the panel is in the cabinet. All wiring shall be on the front of the panel. The field terminals shall have wired to it only the circuits from the field.

Electrical Characteristics: Flashers shall have the following electrical characteristics:

A. The rating of the output circuit shall be the minimum rating for a tungsten lamp or gas-tuning-transformer load over a voltage range of 60 to 135 volts at 60 hertz. The output circuit shall not be de-rated for the operation over the ambient range of -30 degrees to +165 degrees F and the humidity range as both detailed in TS 1-2.1.05.

B. Input to the solid-state flashers shall consist solely of the 60-hertz alternating-current power source. This input shall supply the power for output circuit and also provide power to the flasher logic. The flasher shall turn on within 5 degrees of the zero voltage point of the alternating-current line sinusoid and shall turn off within 5 degrees of the zero current point of the alternating-current line sinusoid. The flasher need not turn on with 5 degrees of the zero point of the alternating-current sinusoid for the first flash cycle (one-off cycle) after the initial application of alternating-current power to the flasher.

C. The "flashing" voltage output shall provide not less than 50, nor more than 60, flashes per minute with an on period of 50+/-5%.

D. The flasher output shall have a dv/dt rating of 100 volts per microsecond at 50 degrees F.

E. The flasher output shall have a peak standoff voltage of 480 volts or greaterat 70 degrees F.

F. The output current from the flasher through the load, when the flasher is in the off state, shall not exceed a maximum of 15 milliamperes rms.

G. The flashing current shall consist of two (2) outputs each rated at 15 amperes.

H. Flashers shall be so designed that circuit #1 will be essentially ON when circuit #2 is OFF, and vice-versa. The principal purpose served by this arrangement is to smooth out the loading on the power source. The maximum OFF period when both circuit #1 and circuit #2 are OFF, or the maximum ON period when both circuit #1 and circuit #2 are ON, shall not exceed 17 milliseconds during the transition from OFF to ON to OFF.

I. The line power shall be fused with NON 0-30 amp fuse. This fuse shall be sized properly for the load limit of the flasher. The wiring shall be properly sized for the design current of each circuit. Separate terminals for the line and field neutral shall be provided.

J. Lightning protection shall be provided for line input and each signal circuit. A gas filled fuse shall be across the line input on the load side of the fuse. It shall be capable of clamping input voltage at 350 volts. A MOV shall be on each signal circuit and provide a minimum clamping voltage of 395 volts and dissipate 30 joules of energy (GE – V150LA10A or approved equal).

K. All electrical connectors shall be insulated from the back panel at a 600 VAC rating.

Literature: One set of complete literature shall be furnished with the unit. The literature must include, at least, the following information: Parts List, Operating Instructions, Wiring Diagrams complete with (when appropriate) waveform data, peak voltage data, and schematic diagrams.

Method of Measurement and Payment: The flashing switch, including cabinet, shall be measured per each for payment by the actual number of units installed, tested and accepted.

Payment will be under:

Item S-004, Flasher Switch (Flasher Assembly, 2 Circuit, Pole Mounted Cabinet), per each.

Item S-005, SPECIAL PRECAUTIONS REGARDING WATER SUPPLY: This item consists of special requirements to be taken by the contractor to protect the water supply reservoir of the Town of Georgetown.

A portion of the required right-of-way (ROW) for the project, located in the vicinity of the existing overpass for the Union Pacific (UP) railway, is located within the watershed of a reservoir used by Georgetown for its drinking water supply. In order to construct the project in a way that is protective of the reservoir's water quality, and in addition to all other storm water pollution prevention measures required for construction of the project, the contractor will implement the measures stipulated in this Special Provision.

For that area within the project ROW bound by the existing route of Louisiana Highway (LA) 500, the realigned route of LA 500, the existing route of Fifth Street and the realigned route of Fifth Street / LA 1230, the contractor shall preserve the existing vegetative cover for as long as possible and to the maximum extent possible. The following provisions shall also apply:

1. No clearing and grubbing will be conducted until the point that it is absolutely necessary, immediately prior to the construction of improvements in the area;
2. Clearing and grubbing, when performed, shall only be conducted to the minimum extent necessary;
3. Construction of the realigned routes for LA 500 and Fifth Street / LA 1230 shall be delayed as long as possible;
4. No vehicle or equipment staging, maintenance or washing will occur within the area;
5. No hazardous materials or petroleum products will stored or stockpiled in the area;
6. Activities that would degrade the existing vegetative cover of the area will be minimized.

Storm water runoff from the vicinity of the existing overpass and UP railway drains via a culvert located along the existing LA 500 at Station No. 12+510 into a ditch that carries the runoff in an easterly direction. The contractor shall improve the existing ditch by constructing a v-bottom ditch with an invert located approximately one meter below ground surface (BGS), along the same alignment as the existing ditch, for that reach of the ditch located within the project ROW (approximately 100 meters). Within the v-bottom ditch the contractor shall construct four stone check dams using 15-kilogram stone. The first check dam will be placed 25 meters downstream from the outlet of the existing LA 500 culvert. The three additional check dams will be placed 25 meters, 50 meters and 75 meters, respectively, downstream from the first check dam. The tops of the four check dams will be constructed to approximately 0.2 meters BGS, resulting in a height of approximately 0.8 meters for each check dam. Two meters upstream from each check dam the contractor will place an oil spill containment boom (or equivalent) across the v-bottom ditch in order to retard the flow of any surface contaminants, if present, contained within storm water flow through the ditch, and the containment booms shall be placed securely so that they are not displaced during runoff events. With time, and after runoff events, it is anticipated that reaches of the v-bottom ditch located between the check dams will become filled with sediments. The contractor shall remove theses sediments, as necessary, to maintain an invert approximately one meter BGS. These sediments shall be incorporated into earthwork for the project, but not within the watershed described above.

Storm water flows from the watershed described above are currently discharged from the project area via a culvert located along the existing Fifth Street route that will be replaced with culvert 500-3 located along the realigned route of Fifth Street / LA 1230. The contractor shall improve the existing ditch upstream and downstream of the existing culvert by constructing a v-bottom ditch with an invert located approximately one meter BGS, along the same alignment as the existing ditch, for that reach of the ditch located within the project ROW. Within the v-

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bottom ditch the contractor shall construct two stone check dams using 15-kilogram stone. One check dam will be constructed approximately three meters upstream of the culvert's inlet, and the other will be constructed along the project ROW downstream from the culvert. The contractor shall place an oil containment boom (or equivalent) approximately two meters upstream of the downstream culvert. Construction and maintenance of the check dams and containment boom will be as described above. Once the realigned route for Fifth Street / LA 1230 has been constructed, the contractor shall construct identical storm water runoff controls for culvert 500-3.

The contractor shall keep earthmoving equipment and containment booms in the vicinity of the existing culvert located along Fifth Street (and, once constructed, culvert 500-3) so that he can construct earthen berms and place containment booms sufficient to completely contain runoff from the culvert(s) in the event that hazardous substances or petroleum products are spilled or released within the watershed described above. Earthmoving equipment and containment booms shall be placed close enough to the culvert to allow for the construction of berms and the placement of booms as quickly as possible of the spill or release of hazardous substances or petroleum products that would negatively impact water quality of the water supply reservoir. Additionally, in the event of such a spill or release, the contractor will notify the following as quickly as possible:

Louisiana State Police – Hazardous Materials Unit	(877) 925-6595
Louisiana Department of Environmental Quality	(888) 763-5424
Mr. Ray Baum, Georgetown Public Works	(318) 312-0706

The storm water and pollution control measures stipulated in this Special Provision shall be initiated prior to any construction in the vicinity of the watershed described above and shall be regularly inspected and properly maintained for the duration of the project.

Payment Schedule shall be at the same rate as payment for Item 727-01, Mobilization.

Payment shall be made under:

Item S-005, Special Precautions Regarding Water Supply, per lump sum.

ITEM S-101, RETROREFLECTIVE SHEETING PANELS: This item consists of installing aluminum signs with Type III retroreflective adhesive sheeting on the exterior piles of bents as shown on the plan details. Aluminum panels shall conform to ASTM B-209 and retroreflective sheeting shall conform to Section 1015 of the 2000 Standard Specifications and the Supplemental Specifications thereto, and as directed by the engineer.

Payment for the retroreflective sheeting panels will be made at the contract unit price per lump sum, which all labor, materials, tools and equipment necessary to complete the item of work.

Payment will be made under:

Item S-101, Retroreflective Sheeting Panels, per lump sum.

CONTRACT TIME (02/05): The contractor's attention is directed to the Special Provision entitled **"INCENTIVE TO CONSTRUCT EXPEDITIOUSLY"** contained elsewhere herein.

The contractor will be issued a "Conditional Notice to Proceed" as defined in Subsection 101.03. The "Conditional Notice to Proceed" will expire thirty (30) calendar days after its issuance, unless the contractor begins regular construction operations, whereupon a "Notice to Proceed" will become effective. The entire contract shall be completed in all details and ready for final acceptance in accordance with Subsection 105.17(b) within the time specified by the contractor, which shall not exceed the maximum allowable contract time stated on the "Contract

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Time" form contained elsewhere herein. The incentive/disincentive contract time period will commence on the effective date of the "Notice to Proceed."

The contractor is directed to the special provisions and the plans for any restrictions that may affect work schedules.

LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
SUPPLEMENTAL SPECIFICATIONS

STANDARD PROVISIONS
GENERAL LIABILITY POLICIES

GENERAL INSTRUCTIONS

1. STANDARD LANGUAGE: This form is expressed in standard language which may not be amended and no part of which may be omitted except (a) as indicated by these instructions, or (b) as indicated in reference notes shown below referring to specific portions of the form, or (c) by an endorsement which states an amendment or exclusion of some provision of the form in accordance with the provisions of a manual rule, the form of which endorsement has been approved, if required, by the supervising authority of the State in which the policy is issued.

2. OPTIONAL SEQUENCE AND ARRANGEMENT: The several parts of the form, viz. "Insuring Agreements," "Exclusions," " Conditions" and "Declarations" may appear in the policy in such sequence as the company may elect and the sequence and arrangement of the several provisions of those parts are also optional with the company.

3. DESCRIPTIVE HEADINGS--IDENTIFYING OR INDEXING DESIGNATIONS: The descriptive headings of the parts of the form (as quoted above) and of the major insuring agreements ("Bodily Injury Liability," "Property Damage Liability," etc.) are standard expressions which may not be amended or omitted, but all other identifying or indexing designations (such as "Coverage A," "Defense, Settlement, Supplementary Payments," "Cancellation," etc.), including literal or numerical designations or paragraphs or phrases, may be amended or omitted at the company's option. When such identifying or indexing designations, used for the purpose of reference in the text of the form or any endorsement form applicable thereto, are amended or omitted, descriptive designations shall be substituted.

4. **ADDITIONAL COVERAGES OR COMPANIES, EXPLANATORY OR CONNECTIVE LANGUAGE:** When policies are issued to provide insurance in this form together with insurance covering other risks, the addition of necessary explanatory or connective language which does not amend the expression of this form is permissible and the introductory language of the "Insuring Agreements" which provides for the issuance of a policy by 2 companies may be used and, if necessary, paraphrased to permit such policies to be issued by more than 2 companies.

5. DECLARATIONS--INCLUDING OTHER RISKS: A common set of declarations may be used in those cases where policies in this form are issued with policies covering other risks.

6. INSTALLMENT PREMIUM PAYMENT: Policies written to provide for payment of premium in installments may provide for lapse or suspension of the policy upon default of payment when due.

7. ADDITION OF COVERAGE BY ENDORSEMENT: When insuring agreements and other provisions relating to any particular class of insurance are added to this policy by endorsement, such additional insurance must be expressed in approved standard language relating to the particular class and must be subject to all standard provisions applicable to that class by the expressions of the endorsement or of the policy or of both taken together.

8. DEFINITION OF "STANDARD" AND "APPROVED": "Standard language" or "approved standard language" when used in these instructions means the form and endorsements either prescribed or approved by the insurance supervising authority of the State in which policy forms and endorsements are approved or prescribed. In those States where supervising authorities do not have the authority to approve or prescribe policies, forms and endorsements, the terms mean the forms and endorsements adopted by the companies for use in such States.

9. PREMIUM STATEMENT: The statement with respect to payment of premium may be amended by an endorsement to make necessary provision with respect to payment of premium, payment of additional premium and return of premium and dividends under the policy.

10. SPECIAL CONDITIONS FOR MUTUALS, RECIPROCALS, AND PARTICIPATING STOCK COMPANIES: When the policy is issued by a mutual company, a reciprocal association or a participating stock company having special provisions applicable to its membership or policyholders, such provisions, when approved by the supervising authority of the State in which the policy is issued if such approval is required, may be inserted in the policy.

BLANK INDEMNITY COMPANY
BLANK INSURANCE COMPANY

[1]

Railroad Protective Liability Policy No. (State or Federal Highway Projects)

[1]Matter in box may be included, omitted or amended at the option of the company.

FOR INFORMATION ONLY

DECLARATIONS

Item 1. Named Insured _____

Address_____
(Street No. Town or City Parish or County State)

Item 2. Policy Period: From_____to_____
12:01 A.M. Central Standard (or Daylight) Time at the designated job site as stated herein.

Item 3. The insurance afforded is only with respect to such of the following coverages as are indicated [in Item 6] by specific premium charge or charges. The limit of the company's liability against such coverages shall be as stated herein, subject to all the terms of this policy having reference thereto. (A statement may be added that a definite notation may be made in the premium column to show that a particular coverage is not afforded.)

Coverages		Limits of Liability
Blank Indemnity Company	A-Bodily Injury Liability	$ each person $ each occurrence
Blank Insurance Company	B-Property Damage Liability C-Physical Damage to Property	$ each occurrence $ aggregate

Item 4. Name and Address of Contractor _____

Item 5. Name and Address of Governmental Authority for whom the work by the Contractor is being performed _____

Item 6. Designation of Job Site & Description of Work

Premium Bases	Rates Coverage A Coverages B & C	Advance Premiums Coverage A Coverages B & C
Contract Cost Rental Cost	Per $100 of Cost Per $100 of Rental Cost	

If Policy Period more than 1 year:

Premium is payable: On effective date of Policy $ 1st Anniversary

$ 2nd Anniversary

Date and Place of Issue _____

{Countersigned { _____ 20 __, at _____}
By _____

A. Renewal of policy number.
B. The name insured is a corporation.
C. Endorsement serial numbers.
D. Rating plan or premium discount.

(For policy issued by one company)

(Name and Location of Indemnity Company)

A (type of company) insurance company, herein called the company

agrees with the insured, named in the declarations made a part hereof, in consideration of the payment of the premium and in reliance upon the statements in the declarations made by the name insured and subject to all of the terms of this policy:

(For policy issued by two companies)

(Name and Location of Indemnity Company)
and
(Name and Location of Insurance Company)

Each a (type of company) insurance company, herein called the company,

severally agree with the insured named in the declarations made a part hereof, in consideration of the payment of the premium and in reliance upon the statements in the declarations made by the named insured and subject to all of the terms of this policy, provided the Blank Indemnity

Company shall be made the insurer with respect to coverage ———————
and no other and the Blank Insurance Company shall be the insurer with respect to coverage———————and no other.

INSURING AGREEMENTS

I. COVERAGE A - BODILY INJURY LIABILITY: To pay on behalf of the insured all sums which the insured shall become legally obligated to pay as damages because of bodily injury, sickness, or disease, including death at any time resulting therefrom, hereinafter called "bodily injury," either (l) sustained by any person arising out of acts or omissions at the designated job site which are related to or are in connection with the work described in Item 6 of the Declarations, or (2) sustained at the designated job site by the contractor or any employee of the contractor, or by any employee of the governmental authority specified in Item 5 of the declarations, or by any designated employee of the insured, whether or not arising out of such acts omissions.

COVERAGE B - PROPERTY DAMAGE LIABILITY: To pay on behalf of the insured all sums which the insured shall become legally obligated to pay as damages because of physical injury to or destruction of property, including loss of use of any property due to such injury or destruction, hereinafter called "property damage" arising out of acts or omissions at the designated job site which are related to or are in connection with the work described in Item 6 of the declarations.

COVERAGE C - PHYSICAL DAMAGE TO PROPERTY: To pay for direct and accidental loss of or damage to rolling stock and their contents, mechanical construction equipment, or motive power equipment, hereinafter called loss, arising out of acts or omissions at the designated job site which are related to or are in connection with the work described in Item 6 of the declarations; provided such property is owned by the named insured or is leased or entrusted to the named insured under a lease or trust agreement.

II. DEFINITIONS

(a) Insured - The unqualified word "insured" includes the name insured and also includes any executive officer, director or stockholder thereof while acting within the scope of his duties as such.

(b) Contractor - The word "contractor" means the contractor designated in Item 4 of the declarations and includes all subcontractors of said contractor but shall not include the name insured.

(c) Designated employee of the insured - The words "designated employee of the insured" mean:

(1) Any supervisory employee of the insured at the job site.

(2) Any employee of the insured while operating, attached to or engaged on work trains or other railroad equipment at the job site which are assigned exclusively to the contractor, or

(3) Any employee of the insured not within (1) or (2) who is specifically loaned or assigned to the work of the contractor for prevention of accidents or protection of property, the cost of whose services is borne specifically by the contractor or by governmental authority.

(d) Contract - The word "contract" means any contract or agreement to carry a person or property for a consideration or any lease, trust or interchange contract or agreement respecting motive power, rolling stock or mechanical construction equipment.

III. DEFENSE, SETTLEMENT, SUPPLEMENTARY PAYMENTS: With respect to such insurance as is afforded by this policy under coverages A and B, the company shall:

(a) Defend any suit against the insured alleging such bodily injury or property damage and seeking damages which are payable under the terms of this policy, even if any of the allegations of the suit are groundless, false or fraudulent, but the company may make such investigation and settlement of any claim or suit as it deems expedient;

(b) Pay, in addition to the applicable limits of liability:

(1) All expenses incurred by the company, all costs taxed against the insured in any such suit and all interest on the entire amount of any judgment therein which accrues after entry of the judgment and before the company has paid or tendered or deposited in court that part of the judgment which does not exceed the limit of the company's liability thereon;

(2) Premiums on appeal bonds required in any such suit, premiums on bonds to release attachments for an amount not in excess of the applicable limit of liability of this policy, but without obligation to apply for or furnish any such bonds;

(3) Expenses incurred by the insured for such immediate medical and surgical relief to others as shall be imperative at the time of the occurrence;

(4) All reasonable expenses other than loss of earnings, incurred by the insured at the company's request.

IV. POLICY PERIOD, TERRITORY: This policy applies only to occurrences and losses during the policy period and within the United States of America, its territories, or possessions, or Canada.

EXCLUSIONS

This policy does not apply:

(a) to liability assumed by the insured under any contract or agreement except a contract as defined herein;

(b) to bodily injury or property damage caused intentionally by or at the direction of the insured;

(c) to bodily injury, property damage or loss which occurs after notification to the named insured of the acceptance of the work by the governmental authority, other than bodily injury, property damage or loss resulting from the existence or removal of tools, uninstalled equipment and abandoned or unused materials;

(d) under Coverages A (l), B and C, to bodily injury, property damage or loss, the sole proximate cause of which is an act or omission of any insured other than acts or omissions of any designated employee of any insured;

(e) under Coverage A, to any obligation for which the insured or any carrier as his insurer may be held liable under any workmen's compensation, unemployment compensation or disability benefits law, or under any similar law; provided that the Federal Employers' Liability Act, U. S. Code (1946) Title 45, Sections 51-60, as amended, shall for the purposes of this insurance be deemed not to be any similar law;

(f) under Coverage B, to injury to or destruction of property (i) owned by the named insured or (ii) leased or entrusted to the named insured under a lease or trust agreement.

(g) 1. Under any Liability Coverage, to injury, sickness, disease, death or destruction.

(a) with respect to which an insured under the policy is also an insured under a nuclear energy liability policy issued by Nuclear Energy Liability Insurance Association, Mutual Atomic Energy Liability Underwriters or Nuclear Insurance Association of Canada, or would be an insured under any such policy but for its termination upon exhaustion of its limit of liability; or

(b) resulting from the hazardous properties of nuclear material and with respect to which (l) any person or organization is required to maintain financial protection pursuant to the Atomic Energy Act of 1954, or any law amendatory thereof or (2) the

insured is, or had this policy not been issued would be, entitled to indemnity from the United States of America, or any agency thereof, under any agreement entered into by the United States of America, or any agency thereof, with any person or organization.

2. Under any Medical Payments Coverage, or under any Supplementary-Payments provision relating to immediate medical or surgical relief, to expenses incurred with respect to bodily injury, sickness, disease or death resulting from the hazardous properties of nuclear material and arising out of the operation of a nuclear facility by any person or organization.

3. Under any Liability Coverage, to injury, sickness, disease, death or destruction resulting from the hazardous properties of nuclear material, if

(a) The nuclear material (l) is at any nuclear facility owned by, or operated by or on behalf of, an insured or (2) has been discharged or dispersed therefrom;

(b) The nuclear material is contained in spent fuel or waste at any time possessed, handled, used, processed, stored, transported or disposed of by or on behalf of an insured; or

(c) The injury, sickness, disease, death or destruction arises out of the furnishing by an insured of services, materials, parts of equipment in connection with the planning, construction, maintenance, operation or use of any nuclear facility, but if such facility is located within the United States of America, its territories or possessions or Canada, this exclusion (c) applies only to injury to or destruction of property at such nuclear facility.

4. As used in this exclusion:

"hazardous properties" include radioactive, toxic or explosive properties;

"nuclear material" means source material, special nuclear material or byproduct material;

"source material," "special nuclear material," and "byproduct material" have the meanings given them in the Atomic Energy Act of 1954 or in any law amendatory thereof;

"spent fuel" means any fuel element or fuel component, solid or liquid, which has been used or exposed to radiation in a nuclear reactor;

"waste" means any waste material (1) containing byproduct material and (2) resulting from the operation by any person or organization of any nuclear facility included within the definition of nuclear facility under paragraph (a) or (b) below;

"nuclear facility" means

(a) any nuclear reactor,

(b) any equipment or device designed or used for (1) separating the isotopes of uranium or plutonium, (2) processing or utilizing spent fuel, or (3) handling, processing or packaging waste,

(c) any equipment or device used for the processing, fabricating or alloying of special nuclear material if at any time the total amount of such material in the custody of the insured at the premises where such equipment or device is located consists of or contains more than 25 grams of plutonium or uranium 233 or any combination thereof, or more than 250 grams of uranium 235,

(d) any structure, basin, excavation, premises or place prepared or used for the storage or disposal of waste,

and includes the site on which any of the foregoing is located, all operations conducted on such site and all premises used for such operations;

"nuclear reactor" means any apparatus designed or used to sustain nuclear fission in a self-supporting chain reaction or to contain a critical mass of fissionable material;

with respect to injury to or destruction of property, the word "injury" or "destruction" includes all forms of radioactive contamination of property.

(h) Under Coverage C, to loss due to nuclear reaction, nuclear radiation or radioactive contamination, or to any act or condition incident to any of the foregoing.

CONDITIONS

[The conditions, except conditions 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 apply to all coverages. Conditions 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 apply only to the coverage noted thereunder.]

1. Premium: The premium bases and rates for the hazards described in the declarations are stated therein. Premium bases and rates for hazards not so described are those applicable in accordance with the manuals in use by the company.

The term "contract cost" means the total cost of all work described in Item 6 of the declarations.

The term "rental cost" means the total cost to the contractor for rental of work trains or other railroad equipment, including the renumeration of all employees of the insured while operating, attached to or engaged thereon.

The advance premium stated in the declarations is an estimated premium only. Upon termination of this policy the earned premium shall be computed in accordance with the company's rules, rates, rating plans, premiums and minimum premiums applicable to this insurance. If the earned premium thus computed exceeds the estimated advance premium paid, the company shall look to the contractor specified in the declarations for any such excess; if less, the company shall return to the said contractor the unearned portion paid.

In no event shall payment of premium be an obligation of the named insured.

2. Inspection: The named insured shall make available to the company records of information relating to the subject matter of this insurance.

The company shall be permitted to inspect all operations in connection with the work described in Item 6 of the declarations.

3. Limits of Liability - Coverage A: The limit of bodily injury liability stated in the declarations as applicable to "each person" is the limit of the company's liability for all damages, including damages for care and loss of services, arising out of bodily injury sustained by 1 person as the result of any 1 occurrence; the limit of such liability stated in the declarations as applicable to "each occurrence" is, subject to the above provision respecting each person, the total limit of the company's liability for all such damage arising out of bodily injury sustained by 2 or more persons as the result of any 1 occurrence.

4. Limits of Liability - Coverages B and C: The limit of liability under coverages B and C stated in the declarations as applicable to "each occurrence" is the total limit of the company's liability for all damages and all loss under coverages B and C combined arising out of physical injury to, destruction or loss of all property of one or more persons or organizations, including the loss of use of any property due to such injury or destruction under coverage B, as the result of any 1 occurrence.

Subject to the above provisions respecting "each occurrence," the limit of liability under coverages B and C stated in the declaration as "aggregate" is the total limit of the company's liability for all damages and all loss under coverages B and C combined arising out of physical injury to, destruction or loss of property, including the loss of use of any property due to such injury or destruction under coverage B.

Under coverage C, the limit of the company's liability for loss shall not exceed the actual cash value of the property, or if the loss is of a part thereof the actual cash value of such part, at time of loss, not what it would then cost to repair or replace the property or such part thereof with other of like kind and quality.

5. Severability of Interests - Coverages A and B: The term "the insured" is used severally and not collectively, but the inclusion herein of more than one insured shall not operate to increase the limits of the company's liability.

6. Notice: In the event of an occurrence or loss, written notice containing particulars sufficient to identify the insured and also reasonably obtainable information with respect to the time, place and circumstances thereof, and the names and addresses of the injured and of available witnesses, shall be given by or for the insured to the company or any of its authorized agents as soon as practical. If claim is made or suit is brought against the insured, he shall immediately forward to the company every demand, notice, summons or other process received by him or his representative.

7. Assistance and Cooperation of the Insured - Coverages A and B: The insured shall cooperate with the company and, upon the company's request, attend hearings and trials and assist in making settlements, securing and giving evidence, obtaining the attendance of witnesses and in the conduct of suits. The insured shall not, except at his own cost, voluntarily make any payment, assume any obligation or incur any expense other than for such immediate medical and surgical relief to others as shall be imperative at the time of accident.

8. Action Against Company - Coverages A and B: No action shall lie against the company unless, as a condition precedent thereto, the insured shall have fully complied with all the terms of this policy, nor until the amount of the insured's obligation to pay shall have been finally determined either by judgment against the insured after actual trial or by written agreement of the insured, the claimant and the company.

Any person or organization or the legal representative thereof who has secured such judgment or written agreement shall thereafter be entitled to recover under this policy to the extent of the insurance afforded by this policy. No person or organization shall have any right under this policy to join the company as a party to any action against the insured to determine the insured's liability. Bankruptcy or insolvency of the insured or of the insured's estate shall not relieve the company of any of its obligations hereunder.

9. Action Against Company - Coverage C: No action shall lie against the company unless, as a condition precedent thereto, there shall have been full compliance with all the terms on this policy nor until 30 days after proof of loss is filed and the amount of loss is determined as provided in this policy.

10. Insured's Duties in Event of Loss - Coverage C: In the event of loss the insured shall:

(a) protect the property, whether or not the loss is covered by this policy, and any further loss due to the insured's failure to protect shall not be recoverable under this policy; reasonable expenses incurred in affording such protection shall be deemed incurred at the company's request.

(b) file with the company, as soon as practicable after loss, his sworn proof of loss in such form and including such information as the company may reasonably require and shall upon the company's request, exhibit the damaged property.

11. Appraisal - Coverage C: If the insured and the company fail to agree as to the amount of loss, either may, within 60 days after the proof of loss is filed, demand an appraisal of the loss. In such event the insured and the company shall each select a competent appraiser, and the appraisers shall select a competent and disinterested umpire. The appraisers shall state separately the actual cash value and the amount of loss and failing to agree shall submit their differences to the umpire. An award in writing of any two shall determine the amount of loss. The insured and the company shall each pay his chosen appraiser and shall bear equally the other expenses of the appraisal and umpire.

The company shall not be held to have waived any of its rights by any act relating to appraisal.

12. Payment of Loss - Coverage C: The company may pay for the loss in money but there shall be no abandonment of the damaged property to the company.

13. No Benefit to Bailee - Coverage C: The insurance afforded by this policy shall not enure directly or indirectly to the benefit of any carrier or bailee, other than the named insured, liable for loss to the property.

14. Subrogation: In the event of any payment under this policy, the company shall be subrogated to all the insured's rights of recovery therefor against any person or organization and the insured shall execute and deliver instruments and papers and do whatever else is necessary to secure such rights. The insured shall do nothing after loss to prejudice such rights.

15. Application of Insurance: The insurance afforded by this policy is primary insurance.

16. Three Year Policy: A policy period of 3 years is comprised of 3 consecutive annual periods. Computation and adjustment of earned premium shall be made at the end of each annual period. Aggregate limits of liability as stated in this policy shall apply separately to each annual period.

17. Changes: Notice to any agent or knowledge possessed by any agent or by any other person shall not effect a waiver or a change in any part of this policy or stop the company from asserting any right under the terms of this policy; nor shall the terms of this policy be waived or changed, except by endorsement issued to form a part of this policy [signed by ———— ————————————————(here insert titles of authorized company officials or representatives); provided, however, changes may be made in the written portion of the declaration by ————————(here insert titles of authorized company representatives) when initialed by such ———————————— (here insert titles of authorized company representatives) or by endorsement issued to form a part of this policy signed by such ————————————————

(here insert titles of authorized company representatives)].

18. Assignment: Assignment of interest under this policy shall not bind the company until its consent is endorsed hereon.

19. Cancellation: This policy may be cancelled by the named insured by mailing to the company written notice stating when thereafter the cancellation shall be effective. This policy may be cancelled by the company by mailing to the named insured, contractor and governmental authority at the respective addresses shown in this policy written notice stating when not less than 30 days thereafter such cancellation shall be effective. The mailing of notice as aforesaid shall be sufficient proof of notice. The effective date and hour of cancellation stated in the notice shall become the end of the policy period. Delivery of such written notice either by the named insured or by the company shall be equivalent to mailing.

If the named insured cancels, earned premium shall be computed in accordance with the customary short rate table and procedure. If the company cancels, earned premium shall be computed pro rata. Premium adjustment may be made either at the time cancellation is effected or as soon as practical after cancellation becomes effective, but payment or tender of unearned premium is not a condition of cancellation.

20. Declarations: By acceptance of this policy the named insured agrees that such statement in the declarations as are made by him are his agreements and representations, that this policy is issued in reliance upon the truth of such representations and that this policy embodies all agreements existing between himself and the company or any of its agents relating to this insurance.

(For policy issued by one company)

In witness whereof, the Blank Indemnity Company has caused this policy to be signed by this president and a secretary at ———————————— and countersigned on the declarations page by a duly authorized agent of the company.

(FACSIMILE OF SIGNATURE) (FACSIMILE OF SIGNATURE)
Secretary President

(For policy issued by two companies)

In witness whereof, the Blank Indemnity Company has caused this policy with respect to coverages ———————————— and such other parts of the policy as are applicable thereto, to be signed by its president and a secretary at ————————————, and countersigned on the declarations page by a duly authorized agent of the company.

(FACSIMILE OF SIGNATURE) (FACSIMILE OF SIGNATURE)
Secretary President

In witness whereof, the Blank Insurance Company has caused this policy, with respect to coverages ———————————— and such other parts of the policy as are applicable thereto, to be signed by its president and a secretary at ————————————, and countersigned on the declarations page by a duly authorized agent of the company.

(FACSIMILE OF SIGNATURE) (FACSIMILE OF SIGNATURE)
Secretary President

LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
SUPPLEMENTAL SPECIFICATIONS
(FOR 2000 STANDARD SPECIFICATIONS)

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LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
SUPPLEMENTAL SPECIFICATIONS

The 2000 Louisiana Standard Specifications for Roads and Bridges and supplemental specifications thereto are amended as follows.

SECTION 101 – GENERAL INFORMATION, DEFINITIONS AND TERMS

Subsection 101.03 – Definitions (11/04), Pages 3 – 12.

Delete the third paragraph and substitute the following.

Assembly Period. Time the contractor is given to acquire approvals of required drawings, brochures, and other submittals, assemble or relocate asphaltic concrete plants or portland cement concrete plants, begin the purchase and assembly of materials, perform maintenance patching only, perform selective clearing or structural removal if utility relocations are involved, perform construction layout, perform pile tests, erect or install a project site laboratory, conduct preexisting site survey, install erosion control items, install fencing if existing fencing is removed during clearing, and perform bleeder ditching to prevent water table rise during winter months. The contractor will not be charged contract time during an assembly period.

SECTION 102 – BIDDING REQUIREMENTS:

Subsection 102.03 – Contents of Bidding Documents (05/02), Pages 14 and 15.

Delete the second sentence of the second paragraph and substitute the following.

The construction proposal will state the time in which the work must be completed, and the date, time and place of opening bids.

Subsection 102.08 – Irregular Bids (02/04), Pages 17 and 18.

Add the following subparagraphs.

(m) If the bidder is disqualified in accordance with Subsection 108.04.

(n) If the bidder is debarred in accordance with Part XIII-B of Chapter I of LRS 48.

(o) If the bidder is disqualified for Proposal/Bid Guaranty forfeiture or non-payment in accordance with Subsection 103.07.

Subsection 102.09 – Proposal/Bid Guaranty (05/02), Pages 18 and 19.

Delete the text of this subsection and substitute the following:

Each bid shall be accompanied by a proposal/bid guaranty in an amount not less than five percent of the total bid amount when the bidder's total bid amount as calculated by the Department in accordance with Subsection 103.01 is greater than $250,000. No proposal/bid guaranty is required for projects when the bidder's total bid amount as calculated by the Department is $250,000 or less. The official total bid amount for projects that include alternates is the total of the bidder's base bid and all alternates bid on and accepted by the Department. The

proposal/bid guaranty submitted by the bidder shall either be a certified check, cashier's check, bidder's company check, postal money order, bank money order or bid bond made payable to the Louisiana Department of Transportation and Development or as specified.

When the proposal/bid guaranty submitted by the bidder is a bid bond, this bond shall be on the "Bid Bond" form provided in the construction proposal; on a form that is materially the same in all respects to the "Bid Bond" form provided, or an electronic form that has received Department approval prior to submission. The bid bond shall be filled in completely, shall be signed by an authorized officer, owner or partner of the bidding entity, or each entity representing a joint venture; shall be signed by the surety's agent or attorney-in-fact; and shall be accompanied by a notarized document granting general power of attorney to the surety's signer. The bid bond shall not contain any provisions that limit the face amount of the bond.

When a bid bond is used it will be written by a surety or insurance company that is in good standing and currently licensed to write surety bonds in the State of Louisiana by the Louisiana Department of Insurance and also conform to the requirements of LSA-R.S. 48:253.

All signatures required on the bid bond may be original, mechanical reproductions, facsimiles or electronic. Electronic signatures must have written Departmental approval prior to use.

Subsection 102.13 – Withdrawal of Bids Due to Mistake (05/02), Pages 19 – 21.

Delete Heading (a) and substitute the following:

(a) Criteria:

(1) Withdrawal of Bid: The Department may allow a bidder to withdraw a bid after the scheduled time of bid opening in accordance with state law upon a determination that:

a. A mistake was in fact made in preparation of the bid; and,

b. The mistake in the bid is of a mechanical, clerical or mathematical nature and not one of bad judgment, careless inspection of the work site, or in reading the plans and specifications; and,

c. The mistake is found to be in good faith and was not deliberate or by reason of gross negligence; and,

d. The mistake is patently obvious on the face of the bid; and,

e. The notice of the mistake, request for withdrawal of the bid by reason of the mistake, and written evidence of the mistake, is delivered to the DOTD Chief Engineer within 72 hours after the bid opening, excluding Saturdays, Sundays, and legal holidays. The written evidence of the mistake supplied to the DOTD Chief Engineer shall be duly sworn before a Notary Public as original, unaltered documents used in the preparation of the bid or any other facts relevant to the bidder's request to withdraw the bid as evidence of the existence of a mistake; and,

f. The sworn, written evidence furnished to the DOTD Chief Engineer within 72 hours of the bid opening, excluding Saturdays, Sundays, and legal holidays, constitutes clear and convincing evidence of the bidder's mistake.

(2) Other bid protests: The Department may also allow a bidder to protest any matter regarding the bidding or award of a contract after the scheduled time of bid opening in accordance with the following provisions:

a. The protest of a bidder must be submitted in writing and, specifically set forth the grounds and/or reasons for the protest; and,

b. The written protest must be delivered to the DOTD Chief Engineer within 72 hours after notice of bid rejection, irregularity or any other action regarding the bidding of the contract, excluding Saturdays, Sundays, and legal holidays.

SECTION 103 – AWARD AND EXECUTION OF CONTRACT:

Subsection 103.05 – Payment, Performance, and Retainage Bonds (01/02), Pages 23 and 24.

Delete the text of this subsection and substitute the following:

At the time of execution of the contract, the successful bidder shall furnish the following bonds on the forms provided by the Department.

(a) Payment bond in a sum equal to one hundred percent (100%) of the contract amount.

(b) Performance bond in a sum equal to one hundred percent (100%) of the contract amount.

(c) Retainage bond in a sum equal to five percent (5%) of the contract amount for contract amounts greater than $500,000 unless an election is made to have the Department withhold five percent (5%) of the contract amount; and, retainage bond in a sum equal to ten percent (10 %) of the contract amount for contract amounts equal to or less than $500,000 unless an election is made to have the Department withhold ten percent (10 %) of the contract amount.

The bonds shall be written by a surety or insurance company that is in good standing and currently licensed to write surety bonds in the State of Louisiana by the Louisiana Department of Insurance and also conform to the requirements of LSA-R.S. 48:255.

All signatures required on the "Bond Form" shall be original signatures, in ink, and are not to be mechanical reproductions or facsimiles.

Subsection 103.07 – Failure to Execute Contract (01/02), Pages 24 and 25.

Delete the text of this subsection and substitute the following:

Failure by the bidder to comply with Subsection 103.06 will be cause for cancellation of the award and forfeiture of the proposal/bid guarantee. For those projects wherein a proposal/bid guarantee was not provided with the bid, failure to comply with Subsection 103.06 will be cause for cancellation of the award and bidder to be disqualified from bidding or subcontracting for a period of one year from the award date. Awards, which were cancelled, may then be made to the next lowest responsible bidder or the work may be readvertised for bids, at the Department's discretion.

Should a proposal/bid guaranty be required to be forfeited by the bidder to the Department or other named obligee, and if for any reason the full amount of the proposal/bid guaranty is not collected or collectable by the Department upon demand, the bidder will be disqualified from bidding or subcontracting for a period of one year from the date of non-payment.

SECTION 104 – SCOPE OF WORK:

Subsection 104.03 – Maintenance of Traffic (06/01), Page 27.

Delete the third sentence of the third paragraph and substitute the following:

The contractor shall maintain existing drainage and also provide and maintain in a safe condition all temporary approaches or crossings, intersections with roads, streets, businesses, parking lots, residences, garages and farms, at no direct pay.

SECTION 105 – CONTROL OF WORK:

Subsection 105.05 – Cooperation by Contractor (04/01), Page 33.

Delete the third paragraph and substitute the following:

The contractor shall have on the work site at all times, as the contractor's agent, a competent representative capable of reading and understanding the plans and project specifications and experienced in the type of work being performed, who shall receive and execute directions from the engineer. At the preconstruction conference or upon request, the contractor shall furnish the engineer written notice of the name and home telephone number of the representative. The representative shall have authority to execute orders or directions of the engineer without delay and to promptly supply such materials, equipment, tools, labor and incidentals as required. The representative shall be furnished regardless of the amount of work sublet.

Subsection 105.15 – Maintenance During Construction (05/02), Page 38.

Add the following:

The contractor shall maintain the roadway in a satisfactory condition to allow traffic to safely travel through the work zone at the posted speed limit.

Subsection 105.16 – Failure to Maintain Roadway or Structure (05/02), Page 39.

Delete the text of this subsection and substitute the following.

If the contractor fails to comply with Subsections 104.03 and 105.15, the engineer will immediately notify the contractor in writing of such noncompliance. If the contractor fails to remedy the condition within 24 hours after receipt of the written notice, the Department will have the option to immediately remedy the condition with its own in-house forces or by another contractor, and the cost thereof will be deducted from payments for the work.

When the condition requires more immediate remedy due to hazard to life, health and property, the engineer will immediately remedy the condition as above and the costs thereof will be deducted from payments for the work.

Subsection 105.19 – Value Engineering Proposals (03/05), Pages 40 - 44.

Delete the fifth sentence of the seventh paragraph and substitute the following.

Proposed changes in basic configuration and design of a bridge, hydraulic capacity of drainage facilities, typical roadway section, type or minimum thickness of pavements, or changes in grade or alignment which do not meet the geometric standards of the project as conceived, will not be considered as acceptable VE Proposals. Typically, changes in materials for roadway sections will not be considered as acceptable VE proposals.

SECTION 107 – LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC:

Subsection 107.07 – Public Convenience and Safety (02/06), Page 53.

Delete the third paragraph and substitute the following:

When the contractor works at night, adequate artificial lighting shall be provided in accordance with Subsection 105.20. Signs, flaggers or other traffic controls shall also be provided to protect workers, the work and the traveling public. When such work affects traffic safety, the contractor shall submit to the engineer for approval a plan of lighting, signing, flagmen or other traffic controls. If the approved plan proves inadequate after work begins, the contractor shall make such changes as directed. If the engineer finds that the night work is so hazardous as to preclude the beginning or require the discontinuing of such work, the contractor shall immediately cease all such operations.

SECTION 108 – PROSECUTION AND PROGRESS:

Subsection 108.04 – Prosecution of Work (03/05). Pages 69 and 70.

Delete the third paragraph of Heading (b) and substitute the following.

During the period of disqualification, the contractor will not be permitted to bid on contracts nor be approved as a subcontractor on contracts. Any bid submitted by the contractor during the period of disqualification will be considered irregular under Subsection 102.08. The period of disqualification shall continue until the contractor completes the work on the contract within the foregoing percentages or until all work on the contract has been satisfactorily completed. Should the surety or the Department take over prosecution of the work, the contractor shall remain disqualified for a period of one year from the completion of the project, unless debarment proceedings are instituted.

When the Department of Transportation and Development is not the contracting agency on the project, the second paragraph under Heading (c) is deleted.

Subsection 108.09 – Default and Termination of Contract (09/04), Pages 73 – 75.

Delete the second sentence of subparagraph (c) and substitute the following.

Within thirty days of receipt of such notification, the surety shall present to the Department either a plan to assume performance of the contract and procure completion of the project, or provide the Department in writing with a reasonable response for the contractor's default.

SECTION 109 – MEASUREMENT AND PAYMENT:

Subsection 109.04 – Compensation for Alterations of the Contract (11/02), Pages 80 – 82.

Delete Heading (f) and substitute the following.

When the Department authorizes the work to be performed by an approved subcontractor(s), the contractor will be paid the actual and reasonable cost of such subcontracted work computed as outlined above, plus an additional allowance of 10 percent of the first $50,000 of the total cost of all subcontracted work and 5 percent of the total cost of all subcontracted work that exceeds $50,000. Reimbursement for bond costs will be in accordance with Heading (b).

SECTION 201 – CLEARING AND GRUBBING:

Subsection 201.02 General Construction Requirements (06/02), Page 88.

Delete the fifth sentence and substitute the following.

The contractor shall, at no direct pay, use a licensed landscape arborist to repair damage to bark, trunks, limbs or roots of vegetation marked to remain using horticultural and tree surgery practices published by the American Association of Nurserymen (AAN).

SECTION 202 – REMOVING OR RELOCATING STRUCTURES AND OBSTRUCTIONS:

Subsection 202.02 – General Construction Requirements (07/05), Pages 91 – 95.

Add the following.

The contractor shall provide a DEQ accredited asbestos inspector to inspect any structure that is to be removed or relocated for the existence of asbestos and the condition thereof. Copies of the inspection report for each structure shall be provided to the project engineer.

Add the following to Heading (c).

When underground storage tanks (UST) have been filled with concrete, sand, or other such material and are designated on the plans for removal, the contractor or certified UST subcontractor shall remove, transport and dispose of such tanks in accordance with the recommendations of the American Petroleum Institute (API) and the requirements of the Louisiana Department of Environmental Quality (DEQ) or other regulatory agency of jurisdiction. When such UST are discovered during construction and removal is necessary to achieve soil compaction or to meet other construction requirements, the contractor shall stop construction activity in the immediate vicinity of the UST and notify the project engineer in accordance with this subsection elsewhere in the standard specifications. The DOTD Materials and Testing Section will verify the closure status of such filled UST discovered during construction prior to any UST site activity by the contractor or certified UST subcontractor.

The contractor or certified UST subcontractor shall collect and submit for laboratory analysis, a representative sample of the storage tank fill material for landfill acceptance. The results of the laboratory analysis shall be used to determine the disposition of the UST fill material. The contractor or certified UST subcontractor shall provide a copy of all laboratory analyses to the Department's Materials and Testing Section for verification prior to profiling materials for landfill acceptance.

Delete the second paragraph of Heading (f) and substitute the following.

Unless otherwise directed or shown on the plans, substructures shall be removed to natural stream bottom and those parts outside the stream shall be removed to 1 foot (0.3 m) below natural ground surface. Existing structures within the limits of a new structure shall be removed as necessary to accommodate construction of the new structure.

Add the following to Heading (h).

When the existing shoulder underdrain at the pavement edge is to remain in place and in service and removal of the shoulder surfacing and base is required, the work shall be done in such manner as to avoid damaging the existing shoulder underdrains. Damaged shoulder underdrains shall be satisfactorily repaired at no direct pay.

Add the following headings.

(i) Paint Containing Lead or Other Hazardous Materials on Metal Surfaces: Steel members of structures protected by paint containing lead or other hazardous materials as shown on the plans or as discovered in the field shall be removed and prepared for transport by methods approved by the Department.

Such steel members shall be delivered to a licensed recycling center capable of processing steel members coated with paint identified by the Resource Conservation and Recovery Act (RCRA) as hazardous.

Prior to removal, transport, treatment or disposal of any steel members, the contractor shall submit the following to the engineer.

(1) Plan of removal of steel members.
(2) Plan for transport of steel members.
(3) Name and address of the licensed recycling center.

All steel members shall be transported in accordance with all federal, state and local laws. Certificates of Disposal, Chain of Custody forms, or other applicable documents shall be provided within 21 days following each shipment.

(j) Treated Timber: Creosoted and other treated timber or lumber shown on the plans or discovered in the field shall be removed and prepared for transport by methods approved by the Department. All materials that are not designated to be salvaged by the Department or salvaged by the contractor are to be disposed of in an appropriate landfill. Certificates of Disposal, Chain of Custody Forms, or other applicable documents shall be provided within 21 days following each shipment.

(k) Universal Wastes. Universal wastes are hazardous wastes defined in LAC Title 33, Part V, Chapter 38, Section 3813 to include batteries, pesticides, thermostats, lamps and antifreeze. Universal wastes shall be removed by the contractor in accordance with the plans and shall be stored and prepared for transport as specified in LAC Title 33, Part V, Chapter 38 and herein.

A lamp is the bulb or tube portion of an electric lighting device. Universal waste lamps include, but are not limited to, fluorescent, high intensity discharge, neon, mercury vapor, high pressure sodium, and metallic halide. Such lamps shall be removed and stored in containers or packages that are structurally sound, adequate to prevent breakage, and compatible with the contents of the lamps. Such containers shall remain closed and lack evidence of leakage, spillage or damage that could cause releases of mercury or other hazardous constituents to the environment under reasonably foreseeable conditions. The containers shall be clearly labeled or marked with the words "Universal Waste – Lamps" and with the earliest date that any lamp in the container was discarded as waste. If a container develops a leak, it shall be placed into an over-pack container. The contractor shall immediately clean up any leakage and place in a container any lamp that shows evidence of breakage, leakage, or damage.

Universal waste lamps will not be allowed to accumulate for a period longer than one year from the date the lamps were discarded. The waste lamps shall be delivered to a universal waste disposal site or destination facility by a Universal Waste Transporter in accordance with the applicable U.S. Department of Transportation Regulations, 49 CFR, Parts 172-180.

The contractor shall be responsible for informing all employees who handle universal wastes of the proper handling and emergency procedures appropriate to the type of waste.

Subsection 202.05 – Measurement (07/05), Page 97.

Delete the fourth paragraph and substitute the following.

When an item is included for the removal of bridges, the removal of the approach slabs, superstructure, and substructure will be considered part of the work unless otherwise shown on the plans.

Add the following.

Removing steel members of structures protected by paint containing lead or other hazardous materials, or creosoted timbers or lumber, and transporting them to the designated recycling center or landfill will be considered part of the work when shown on the plans and will not be measured for payment.

When a structure to be removed or relocated is shown on the plans to contain universal wastes, the removal, storage and transport of the universal waste to an approved disposal site or destination facility will not be measured for payment but will be included in the structure to be removed or relocated.

Subsection 202.06 – Payment (07/05), Pages 97 – 99.

Add the following to the second paragraph.

Payment for removal of bridges will include removal of the approach slabs, superstructure and substructure.

Delete the last sentence of the third paragraph and substitute the following.

When a structure is found to contain friable or non-friable asbestos and it has not been identified on the plans as containing asbestos, payment for the removal and disposal of the asbestos will be made in accordance with Subsection 109.04, including the cost of all testing.

Payment for inspection to determine the presence and condition of asbestos by DEQ certified asbestos abatement contractors or subcontractors will be included in the appropriate pay items for the removal or relocation of structures.

Add the following:

Payment for removing steel members of a structure identified on the plans as being protected by paint containing lead or other hazardous materials, or creosoted timbers or lumber, and transporting them to the designated recycling center or landfill, will be included in the bid price for removal or relocation of the structure. When a structure is found to have steel members protected by paint containing lead or other hazardous materials, or creosoted timber or lumber, and it has not been identified on the plans as such, payment for removal and transport of the members to a licensed recycling center or landfill will be made in accordance with Subsection 109.04.

When the plans show that a structure to be removed or relocated contains a universal waste, payment for the removal of the universal waste will be included in the contract unit price for the removal or relocation of the structure which will also include all equipment, labor, and, materials required for the removal, storage, and transport of the universal waste in accordance with LAC Title 33, Part V, Chapter 38. When a structure to be removed or relocated is found to contain a universal waste and it is not identified as such on the plans, payment for the removal, storage and transport of such universal waste in accordance with LAC Title 33, Part V, Chapter 38 will be made in accordance with Subsection 109.04.

SECTION 203 – EXCAVATION AND EMBANKMENT:

Subsection 203.04 – Muck Excavation (06/01), Page 101.

Delete the text of this subsection and substitute the following:

Muck excavation consists of the removal of saturated or unsaturated mixtures of soils, organic matter, and debris that are unsuitable for foundation material. Materials, which will decay or produce subsidence in the embankment, or materials containing decaying stumps, roots, logs, humus or other material are not satisfactory for use in the embankment. The engineer will determine the material to be classified as muck and to be removed. Material, which cannot be used, shall be removed and disposed of in accordance with Subsection 202.02.

Subsection 203.05 – Borrow (12/04), Pages 101 and 102.

Add the following.

Soils contaminated with hazardous or toxic materials shall not be used for borrow material.

Subsection 203.06 – Soil Usage (11/02) Pages 102 – 104.

Delete Headings (a) and (b) and substitute the following:

(a) Usable Soils: Usable soils shall have a maximum PI of 25 and a maximum organic content of 5 percent. Soils with a silt content of 50 percent or greater and also a PI of 10 or less will not be allowed.

(b) Selected Soils: Selected soils are natural soils with a maximum PI of 20, maximum Liquid Limit of 35, and a maximum organic content of 5 percent. Soils with a silt content of 50 percent or greater and also a PI of 10 or less will not be allowed. Soils to be used for in-place cement stabilization shall be in accordance with Subsection 302.02(a).

Subsection 203.07 – General Requirements (12/04), Pages 104 – 107.

Delete the term "maximum dry weight density" and substitute "maximum dry density".

Delete the fifth sentence of the third paragraph and substitute the following:

The moisture content at the time of compaction, tested in accordance with DOTD TR 403, shall be within a range of ±2.0 percent of optimum established in accordance with DOTD TR 418 or the lifts shall be reprocessed and recompacted until these requirements are met.

Subsection 203.09 – Nonplastic Embankment (05/01), Pages 108 and 109.

Delete the term "maximum dry weight density" from Heading (d) and substitute "maximum dry density".

Subsection 203.14 – Measurement (03/02), Pages 111 – 113.

Delete the first and second paragraphs of Heading (b) and substitute the following.

The measurement of quantities will be computed by the average end area method and will be that area bound by (1) the original ground line established by location (plan) cross sections (if accurate) or new original cross sections obtained by the contractor, and (2) the final theoretical pay line as shown on the plans, or established by the engineer, adjusted for field changes.

After clearing and grubbing operations, the contractor will take original cross sections for the entire length of the project. All original cross section shall be taken in the presence of a designated DOTD employee. Cross sections shall be taken at sufficient intervals to accurately determine earthwork quantities, not to exceed 100 linear feet (30 lin m). The cross sections shall be taken in accordance with DOTD procedures, and results must be furnished to the Department in a format satisfactory to the engineer. The Department reserves the right to take additional cross sections as needed to verify the contractor's cross sections. In the event the cross sections do not verify, the contractor will investigate and reconcile any differences.

The original cross sections will be used to determine the accuracy of the location cross sections by using random sections not farther apart than 1000 linear feet (300 lin m) and centerline elevations at intervals of 100 linear feet (30 lin m). The location cross sections will be considered to be usable if the average of the differentials do not exceed ±0.3 foot (±0.1m). For significant portions of the project with obvious errors between location and original cross sections, the contractor's original field cross sections will be used, and will not be part of the verification process. In all cases where location sections are unavailable, new originals are to be taken and used.

Add the following to Heading (b)(1):

No payment will be made to the contractor to recompute new plan quantities.

SECTION 301 – CLASS I BASE COURSE:

Subsection 301.06 – Mixing of Soil Cement, Cement Stabilized Sand Shell, and Cement Stabilized Sand Clay Gravel (04/02), Page 130.

Delete the first sentence of the fourth paragraph and substitute the following:

Optimum moisture of the mixture will be determined in accordance with DOTD TR 415 or TR 418.

Subsection 301.16 – Acceptance Requirements (11/02), Pages 136 – 140.

Delete the third sentence of the second paragraph and substitute the following:

The percent cement being incorporated into the mixture shall not be more than 0.1 percent by weight (mass) of the total material below the approved percent cement, or operations shall be discontinued until corrections have been made.

Delete the sentence in Heading (a)(3) and substitute the following.

When any test value is less than that required in Table 301-1, compaction shall continue until the specified density is obtained.

SECTION 302 – CLASS II BASE COURSE:

Subsection 302.02 – Materials (01/03), Page 143.

Add the following to the first paragraph:

Geotextile Fabric	203.11 & 1019

Delete the seventh sentence of Heading (a) and substitute the following:

Soils may be blended to adjust the percentages of sand or silt to meet specification requirements; however, in-place blending will not be allowed. The District Laboratory Engineer

will approve materials prior to blending and the final product. Soils that do not meet PI requirements shall not be blended or treated to reduce PI.

Subsection 302.04 – General Construction Requirements (12/04), Page 144.

Add the following:

If an aggregate base course is to be placed on untreated or lime-treated soils, a Class D geotextile separator fabric will be required.

Subsection 302.05 – Mixing (04/02), Pages 144 – 146.

Delete the term "maximum dry weight density" from Heading (a)(1) and substitute "maximum dry density".

Subsection 302.13 – Measurement (09/02), Pages 153 and 154.

Add the following:

Geotextile fabric used beneath the base course will not be measured for payment.

Subsection 302.14, - Payment (09/02), Page154.

Add the following:

Payment for geotextile fabric will be included in the contract unit price for base course.

SECTION 303 – IN-PLACE CEMENT STABILIZED BASE COURSE:

Subsection 303.02 – Materials (05/01), Page 155.

Delete the third paragraph and substitute the following:

Soils or soil-aggregate combinations furnished by the contractor for stabilization in accordance with this section shall comply with the requirements of Subsection 302.02(a).

Subsection 303.04 – Preparation of Roadbed (05/01), Pages 156 and 157.

Delete the term "maximum dry weight density" and substitute "maximum dry density".

Subsection 303.05 – Mixing (05/01), Pages 157 and 158.

Delete the first sentence of the fourth paragraph and substitute the following:

Optimum moisture of the mixture will be determined in accordance with DOTD TR 415 or TR 418.

SECTION 304 – LIME TREATMENT:

Subsection 304.07 – Compacting and Finishing (05/01), Pages 167 and 168.

Delete the term "maximum dry weight density" from Heading (a) and substitute "maximum dry density".

SECTION 305 –SUBGRADE LAYER:

Subsection 305.02 – Materials (09/02), Pages 173 and 174.

Add the following to the first paragraph:

Geotextile Fabric	203.11 & 1019

Subsection 305.04 – Construction Requirements (12/04), Pages 174 and 175.

Add the following sentence to Heading (a)(2):

The bid price for pay item 305-01, Subgrade Layer, will be adjusted for the actual percentage of cement required.

Add the following to Heading (b):

If an aggregate subgrade layer is used, a Class D geotextile fabric will be required to separate the aggregate subgrade layer from untreated soil.

Delete the term "maximum dry weight density" from Heading (d) and substitute "maximum dry density".

Subsection 305.05 – Measurement (12/02), Page 175.

Add the following:

Geotextile fabric used beneath the subgrade layer will not be measured for payment.

Subsection 305.06 – Payment (12/02), Pages 175 and 176.

Add the following:

Payment for geotextile fabric will be included in the contract unit price for subgrade layer.

SECTION 306 – SCARIFYING AND COMPACTING ROADBED:

Subsection 306.02 – Construction Requirements (05/01), Page 177.

Delete the term "maximum dry weight density" and substitute "maximum dry density".

SECTION 401 – AGGREGATE SURFACE COURSE:

Subsection 401.04 – Shoulder Construction (05/01), Pages 184 and 185.

Delete the term "maximum dry weight density" from Headings (b) and (c) and substitute "maximum dry density".

SECTION 402 – TRAFFIC MAINTENANCE AGGREGATE:

Subsection 402.02 – Materials (05/02), Page188.

Delete the text of this subsection and substitute the following.

Aggregate for maintenance of traffic shall be stone, wash gravel, recycled portland cement concrete, reclaimed asphaltic pavement (RAP), or shell satisfactory to the engineer.

SECTION 507 – ASPHALTIC SURFACE TREATMENT:

Subsection 507.02 – Materials (07/02), Pages 278 and 279.

Delete the last paragraph and substitute the following.

Hot asphalt shall be smooth and homogeneous and shall comply with the specifications for gelled asphalt or PAC-15 as shown in Table 1002-11.

Delete Tables 507-1 and 507-2 and substitute with Tables 507-1 and 507-2 contained elsewhere herein.

Delete Table 507-3.

FOR INFORMATION ONLY

Table 507-1
Asphaltic Surface Treatment (AST) Requirements
(Emulsion)

TYPE AST	Course No.	TYPE A[1]		TYPE B[1]		TYPE C[1]	TYPE D			TYPE E[2] (Interlayer)
Agg. Friction Rating		I, II		I, II, III		I, II, III	I, II, III, IV			I, II, III, IV
Asphalt Emulsion		CRS-2P		CRS-2P		CRS-2P	CRS-2P			CRS-2P
Application Temp. Minimum Maximum		160°F (70°C) 175°F (80°C)		160°F (70°C) 175°F (80°C)		160°F (70°C) 175°F (80°C)	160°F (70°C) 175°F (80°C)			160°F (70°C) 175°F (80°C)
Number of Applications		2	1	2	1	1	3	2	1	2
Asphalt Emulsion[3] Application Rates Per Course	1	0.39 (1.77)	0.41 (1.86)	0.39 (1.77)	0.31 (1.40)	0.41 (1.86)	0.46 (2.08)	0.39 (1.77)	0.31 (1.40)	0.39 (1.77)
	2	0.29 (1.31)	---	0.29 (1.31)	---	---	0.36 (1.63)	0.29 (1.31)	---	0.29 (1.31)
	3	---	---	---	---	---	0.26 (1.18)	---	---	---
Aggregate[4] Application Rates Per Course	1	S2-0.0111 (S2-0.010)	S2-0.0111 (S2-0.010)	S2-0.0111 (S2-0.010)	S3-0.0075 (S3-0.007)	S2-0.0111 (S2-0.010)	S1-0.0200 (S1-0.018)	S2-0.0111 (S2-0.010)	S3-0.0075 (S3-0.007)	S2-0.0111 (S2-0.010)
	2	S3-0.0075 (S3-0.007)	---	S3-0.0075 (S3-0.007)	---	---	S2-0.0111 (S2-0.010)	S3-0.0075 (S3-0.007)	---	S3-0.0075 (S3-0.007)
	3	---	---	---	---	---	S3-0.0075 (S3-0.007)	---	---	---

[1] Only lightweight aggregate, crushed slag or crushed stone shall be used for Types A, B or C Asphaltic Surface Treatment.
[2] Lightweight aggregate will not be allowed.
[3] Application rates are in gallons of asphalt emulsion per square yard (liters of asphalt emulsion per sq m) of AST.
[4] Size aggregate and application rates. For example, S2 is Size 2 aggregate and 0.0111 is the application rate in cubic yards of aggregate per square yard (0.010 cu m of aggregate per sq m) of AST.

FOR INFORMATION ONLY

Table 507-2
Asphaltic Surface Treatment (AST) Requirements
(Hot Application)

TYPE AST	Course No.	TYPE A[1]		TYPE B[1]		TYPE C[1]	TYPE D			TYPE E[2] (Interlayer)
Agg. Friction Rating		I, II		I, II, III		I, II, III	I, II, III, IV			I, II, III, IV
Asphalt Cement[3]		Gelled Asphalt or PAC-15		Gelled Asphalt or PAC-15		Gelled Asphalt or PAC-15	Gelled Asphalt or PAC-15			Gelled Asphalt or PAC-15
Application Temp. Minimum Maximum		300°F (149°C) 360°F (182°C)		300°F (149°C) 360°F (182°C)		300°F (149°C) 360°F (182°C)	300°F (149°C) 360°F (182°C)			300°F (149°C) 360°F (182°C)
Number of Applications		2	1	2	1	1	3	2	1	2
Asphalt Cement[4] Application Rates Per Course	1	0.30 (1.36)	0.31 (1.40)	0.30 (1.36)	0.24 (1.09)	0.31 (1.40)	0.36 (1.63)	0.30 (1.36)	0.24 (1.09)	0.30 (1.36)
	2	0.23 (1.04)	---	0.23 (1.04)	---	---	0.28 (1.27)	0.23 (1.04)	---	0.23 (1.04)
	3	---	---	---	---	---	0.20 (0.91)	---	---	---
Aggregate[5] Application Rates Per Course	1	S2-0.0111 (S2-0.010)	S2-0.0111 (S2-0.010)	S2-0.0111 (S2-0.010)	S3-0.0075 (S3-0.007)	S2-0.0111 (S2-0.010)	S1-0.0200 (S1-0.018)	S2-0.0111 (S2-0.010)	S3-0.0075 (S3-0.007)	S2-0.0111 (S2-0.0010)
	2	S3-0.0075 (S3-0.007)	---	S3-0.0075 (S3-0.007)	---	---	S2-0.0111 (S2-0.010)	S3-0.0075 (S3-0.007)	---	S3-0.0075 (S3-0.007)
	3	---	---	---	---	---	S3-0.0075 (S3-0.007)	---	---	---

[1] Only lightweight aggregate, crushed slag or crushed stone shall be used for Types A, B or C Asphaltic Surface Treatment.
[2] Lightweight aggregate will not be allowed.
[3] See Table 1002-11.
[4] Application rates are in gallons of asphalt cement per square yard (liters of asphalt cement per sq m) of AST.
[5] Size aggregate and application rates. For example, S2 is Size 2 aggregate and 0.0111 is the application rate in cubic yards of aggregate per square yard (0.010 cu m of aggregate per sq m) of AST.

SECTION 508 – STONE MATRIX ASPHALT:

Subsection 508.01, Description (03/03). Page 288.

Delete the fourth sentence and substitute the following.

Mineral filler and/or fibers shall be used to control draindown.

Subsection 508.02, Materials (03/03), Pages 288 and 289.

Delete the sentence in Heading (a), Asphaltic Cement, and substitute the following.

Asphalt cement shall be PG76-22m as listed on QPL 41 and complying with Section 1002.

Delete the first sentence of Heading (c), Additives, and substitute the following.

Additives shall meet the requirements of Subsection 502.02(b) except mineral filler and/or fibers will be required.

Delete the sentence in Heading (c)(2), Mineral Filler, and substitute the following.

Mineral filler shall comply with Subsection 1003.06(a)(6).

Delete the first sentence of Heading (c)(3), Fibers, and substitute the following.

A cellulose or mineral fiber, pre-approved by the Department, shall be used to prevent draindown or to serve as a filler.

Subsection 508.03, Job Mix Formula (JMF)(03/03), Page 289.

Delete the fifth sentence of the first paragraph and substitute the following.

An anti-strip additive shall be included in accordance with Section 502.

Delete Heading (a), Marshall Design.

Subsection 508.04, Validation (03/03), Page290.

Delete the second sentence and substitute the following.

Validation will be on the first sublot and will include the QC and QA results on mixture gradation, percent asphalt cement, volumetrics, asphalt draindown, percent anti-strip additive, and moisture susceptibility testing.

Subsection 508.05, Quality Control (03/03), Page290.

Delete the first sentence of the first paragraph and substitute the following.

Percent asphalt cement, gradation, G_{mm}, and volumetrics shall be measured in accordance with Section 502. A lot size shall be 5000 tons (5000 Mg) and a sublot size shall be 1000 tons (1000 Mg).

Delete Heading (b), Marshall Design.

Subsection 508.06, Acceptance Testing (03/03), Pages 290 and 291.

Delete the fifth sentence of the first paragraph and substitute the following.

Plant acceptance tests will include, percent anti-strip, air voids, VMA and gradation [No. 4 and No. 200 (4.75 mm and 75 μm) sieves].

Delete Heading (b), Marshall Design.

Delete the sentence in Heading (f), Surface Tolerance and substitute the following.

Surface tolerance will be measured in accordance with Section 502.

FOR INFORMATION ONLY

Subsection 508.07, Acceptance for Pay (03/03), Pages 291-293.

Delete the second sentence of the first paragraph and substitute the following.

Acceptance is based on Plant Acceptance Tests and Roadway Acceptance Tests as follows:

Delete Heading (a), Asphalt Cement Properties.

Delete the first sentence of Heading (c)(2), Surface Tolerance, and substitute the following.

The percent payment reported for surface tolerance will be for the entire lot in accordance with Section 502.

Delete the second sentence of Heading (d), Total Percent Payment.

Subsection 508.10, Compaction (03/03), Page293.

Add the following.

Excessive rippling of the mat surface will not be accepted. Ripples are small bumps in the pavement surface, which usually appear in groups in a frequent and regular manner. Specifically, a ripple is visible on the profilograph trace, but does not necessarily appear above or below the 0.2 inch (5 mm) blanking band required by DOTD TR 641. There shall be no more than 12 ripples or peaks in any 100-foot (30 m) section. Rippling indicates a problem with the paving operation or mix that requires immediate corrective action by the contractor; otherwise operations shall cease. Unacceptable areas shall be corrected at no direct pay.

Subsection 508.11, Measurement (03/03), Page 293.

Delete the first sentence and substitute the following.

SMA will be measured by the ton (Mg) lot in accordance with Subsection 502.13(a) and as amended herein.

Subsection 508.12, Payment (03/03), Pages 293 and 294.

Delete the second sentence and substitute the following.

Payment will be made at an adjusted contract unit price per lot in accordance with Table 508 -2.

Delete Tables 508-1 and 508-2 and substitute with Tables 508-1 and 508-2 contained herein.

FOR INFORMATION ONLY

Table 508-1
Stone Matrix Asphalt (SMA) Mix Properties

A. MIXTURE REQUIREMENTS					
GRADATION			VOLUMETRICS		
US Sieve (Metric Sieve)	Percent Passing	JMF Tolerance, %	Properties	Requirements	Tolerance
3/4 inch (19 mm)	100	±4	Air Voids, %		
1/2 inch (12.5 mm)	90 - 100	±4	Superpave Gyratory Compactor	4.0	±1.0
3/8 inch (9.5 mm)	75 Max.	±4	(@ 100 revolutions)		
No.4 (4.75 mm)	24 - 34	±4	VMA, %	16.0 minimum	
No.8 (2.36 mm)	16 - 28	±4	VFA, %	For Info. Only	
No. 30 (600 µm)	12 - 25	±3	G_{mb} (Control Only)	Per JMF	±0.022
No. 50 (300 µm)	11 - 22	±3	G_{mm} (Control Only)	Per JMF	±0.020
No. 200 (75 µm)	7 - 13	±1			

B. PAVEMENT DENSITY REQUIREMENTS

Density, Minimum 94.0 % (Percent of Theoretical Maximum Specific Gravity, AASHTO T 209) Travel Lanes
Density, Minimum 92.0 % (Percent of Theoretical Maximum Specific Gravity, AASHTO T 209) Shoulders

C. SURFACE TOLERANCE REQUIREMENTS

Surface Tolerance Variation - Refer to Section 502, Table 502-3

FOR INFORMATION ONLY

Table 508-2
Payment Adjustment Schedules

Values shall be based on average of sublots unless otherwise noted:	Percent of Contract Unit Price Per Lot			
	100	95	80	50 or Remove[1]
A. Asphalt Properties, % (Reference Table 1002-1)	---	---	---	---
B. Plant Acceptance:				
Anti-Strip Additive, % Below JMF per Sublot	---	0.2 or More Below	---	---
% Air Voids, Average Sublot % Deviation from JMF Limits/Lot	0.0 - 0.1	0.2 - 0.3	0.4 - 0.5	0.6 and Greater
% VMA, Average Sublot % Deviation from JMF Below the Minimum Limit/Lot	0.0 - 0.2	0.3 - 0.5	0.6 - 0.8	0.9 and Greater
Aggregate Gradation, Average Sublot % Deviation from JMF Limits/Lot				
No. 4 (4.75 mm)	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 and Greater
No. 200 (75 µm)	0.0 - 0.5	0.6 - 1.0	1.1 - 2.0	2.1 and Greater
C. Roadway Acceptance:				
Roadway Density, Average Individual Sublot % Deviation from Minimum	0.0	0.1 - 1.0	1.1 - 2.5	2.6 and Greater
Surface Tolerance, Profilograph Reading in inches/mile (mm/km) (Reference Table 502-7)	---	---	---	---

[1] At the option of the engineer.

FOR INFORMATION ONLY

SECTION 509 – COLD PLANING ASPHALTIC PAVEMENT

Subsection 509.03, Construction Requirements (03/02), Pages 297-299.

Delete the eighth paragraph of Heading (a), General, and substitute the following.

The DOTD encourages reclamation and recycling of all materials obtained within the project limits. All reclaimed asphaltic pavement (RAP) material to be retained by the DOTD for its recycling program, or by other government entities, shall be hauled by the contractor to the storage facility indicated on the plans and stockpiled as directed. The contractor may also be required to retain a specified percentage or quantity of the RAP generated by the project. When so specified, the bidder shall indicate in his bid the value of the retained material that he used in calculating his bid.

Delete Heading (b) and substitute the following.

(b) The surface tolerance requirements of the cold planed surface for single lift overlays shall meet the requirements for binder course in Sections 501 and 502.

Subsection 509.04, Measurement (03/02), Page 299.

Delete this subsection and substitute the following.

Measurement of cold planing will be made by the square yard (sq m) of asphaltic concrete surfacing satisfactorily removed. The quantity of asphaltic concrete surfacing to be removed from a project and retained by the contractor will be measured by the cubic yard (cu m), theoretical in-place plan quantity, and will be credited to the Department by treating it as a negative quantity in the Schedule of Pay Items.

Subsection 509.05, Payment (03/02), Page 299.

Delete this subsection and substitute the following.

Payment for cold planing of asphaltic pavement will be made at the contract unit price per square yard (sq m), which includes the costs for removing, hauling and stockpiling of RAP material retained by either the Department or the contractor. The value of the RAP material retained by the contractor will be credited to the Department at the contract unit price for the retained material.

Payment for temporary pavement markings will be included under appropriate pay items.

Payment will be made under:

Item No	Pay Item	Pay Unit
509-01	Cold Planing Asphaltic Pavement	Square Yard (Sq m)
509-02	Contractor Retained Reclaimed Asphaltic Pavement	Cubic Yard (Cu m)

SECTION 601 – PORTLAND CEMENT CONCRETE PAVEMENT:

Subsection 601.02 - Materials (06/05), Page 302.

Add the following to the first paragraph.

Aggregates 1003.

Delete the second paragraph and substitute the following.

The contractor shall furnish either Type B or D concrete. The same type of concrete shall be used throughout the project, unless otherwise authorized in writing.

FOR INFORMATION ONLY

Subsection 601.09 – Joints (06/05), Pages 310 – 317.

Delete the fourth paragraph of Heading (i) and substitute the following.

Dowel bars with slightly damaged coatings may be used with the approval of the engineer provided the bars are lightly oiled or greased prior to placement.

Delete the first sentence of the fourth paragraph of Heading (k) and substitute the following.

The concrete used for full depth pavement patching repair shall be the same type used throughout the project. If approved by the engineer, full depth patching can be substituted with Type E concrete.

Add the following paragraph to Heading (k).

Concrete used for panel replacement repair shall be the same type used throughout the project. If approved by the engineer, Class A concrete can be substituted for panel replacement pavement repair.

Subsection 601.17 - Opening to Traffic (09/02), Page 331.

Delete the text of this subsection and substitute the following.

The pavement shall not be opened to traffic until standard test specimens complying with Subsection 601.07 have attained a compressive strength of 3,000 psi (21.0 MPa) when tested in accordance with DOTD TR 230. For regular portland cement concrete, if the compressive strength tests are not conducted, the pavement shall not be opened to traffic until 14 days after concrete has been placed. For concrete containing fly ash or ground granulated blast-furnace slag, the pavement shall be closed to all traffic, including vehicles of the contractor, until the test specimens have attained a compressive strength of 3,000 psi (21.0 MPa). The pavement shall be cleaned and joints sealed in accordance with Subsection 601.13 prior to opening to traffic.

SECTION 602 – PORTLAND CEMENT CONCRETE PAVEMENT REHABILITATION:

Subsection 602.07 - Full Depth Corner Patching of Jointed Concrete Pavement (06/05), Pages 339 – 341.

Delete the first sentence of the seventh paragraph and substitute the following.

Concrete for pavement patching shall be Type E complying with Section 901.

Subsection 602.08, Full Depth Patching of Jointed Concrete Pavement (06/05), Pages 341 and 342.

Delete the first sentence of the eighth paragraph and substitute the following.

Concrete for pavement patching shall be Type E complying with Section 901.

Subsection 602.09, Partial Depth Patching of Jointed Concrete Pavement (06/05), Pages 343 – 345.

Delete the first sentence of the first paragraph of Heading (b)(1) and substitute the following.

FOR INFORMATION ONLY

Portland cement concrete for pavement patching shall be Type E complying with Section 901, except that a Grade F aggregate shall be used.

Subsection 602.10, Patching Continuously Reinforced Concrete Pavement (06/05), Pages 345 – 347.

Delete the first sentence of the eighth paragraph and substitute the following.

Concrete for pavement patching shall be Type E complying with Section 901.

Subsection 602.18, Payment (06/01), Page 358.

Delete Pay Item No. 602-15, Cross-Stitching Longitudinal Joints.

Delete Pay Item No. 602.16, Cross-Stitching Random Longitudinal Joints and substitute the following.

Item No. 602-16 Cross-Stitching Random Longitudinal Cracks Linear Foot (lin m)

SECTION 701 – CULVERTS AND STORM DRAINS:

Subsection 701.02 – Materials (08/04), Pages 361 – 363.

Delete the text of this subsection and substitute the following.

701.02 Materials. Materials shall comply with the following:

FOR INFORMATION ONLY

Usable Soil	203.06(a)
Selected Soil	203.06(b)
Plastic Soil Blanket	203.10
Flowable Fill	710
Mortar	702.02
Portland Cement Concrete	901
Granular Material	1003.07
Bedding Material	1003.08
Concrete Sewer Pipe	1006.02
Reinforced Concrete Pipe	1006.03
Reinforced Concrete Pipe Arch	1006.04
Gasket Materials	1006.06
Plastic Pipe	1006.07
Sewer Pipe	1006.07
Split Plastic Coupling Bands	1006.07(d)(4)
Plastic Yard Drain Pipe	1006.09
Bituminous Coated Corrugated Steel Pipe and Pipe Arch	1007.02
Structural Plate for Pipe and Pipe Arch	1007.04
Corrugated Aluminum Pipe and Pipe Arch	1007.05
Coupling Bands	1007.09
Reinforcing Steel	1009
Geotextile Fabric	1019

(a) Quality Assurance: Manufacturing plants will be periodically inspected for compliance with specified manufacturing methods, and material samples will be randomly obtained for laboratory testing for verification of manufacturing lots. Materials approved at the manufacturing plant will be subject to visual acceptance inspections at the jobsite or point of delivery.

(b) Side Drain Pipe or Side Drain Pipe Arch: When the item for Side Drain Pipe or Side Drain Pipe Arch is included in the contract, the contractor has the option of furnishing reinforced concrete pipe or reinforced concrete pipe arch, corrugated metal pipe or corrugated metal pipe arch, or plastic pipe, unless otherwise specified.

(c) Cross Drain Pipe or Cross Drain Pipe Arch: When the item for Cross Drain Pipe or Cross Drain Pipe Arch is included in the contract, the contractor has the option of furnishing reinforced concrete pipe or reinforced concrete pipe arch, corrugated metal pipe or corrugated metal pipe arch, or plastic pipe, unless otherwise specified.

(d) Storm Drain Pipe or Storm Drain Pipe Arch: When the item for Storm Drain Pipe or Storm Drain Pipe Arch is included in the contract, the contractor has the option of furnishing reinforced concrete pipe or reinforced concrete pipe arch, or plastic pipe, unless otherwise specified.

FOR INFORMATION ONLY

(e) Material Type Abbreviations:

(1) Reinforced Concrete Pipe:

RCP	Reinforced Concrete Pipe
RCPA	Reinforced Concrete Pipe Arch

(2) Corrugated Metal Pipe:

CAP	Corrugated Aluminum Pipe
CAPA	Corrugated Aluminum Pipe Arch
CMP	Corrugated Metal Pipe
CMPA	Corrugated Metal Pipe Arch
CSP	Corrugated Steel Pipe
CSPA	Corrugated Steel Pipe Arch
BCCSP	Bituminous Coated Corrugated Steel Pipe
BCCSPA	Bituminous Coated Corrugated Steel Pipe Arch

(3) Plastic Pipe:

PP (or PCP)	Plastic Pipe
PVCP (or PVC)	Polyvinyl Chloride Pipe
RPVCP (or RPVCCP)	Ribbed Polyvinyl Chloride Pipe
CPEPDW (or CPECP)	Corrugated Polyethylene Pipe (Double Wall)

(f) Joint Type Abbreviations:

T1	Type 1 Joint
T2	Type 2 Joint
T3	Type 3 Joint

(g) Yard Drain Pipe: When the item for Yard Drain Pipe is included in the contract, the contractor has the option of furnishing concrete sewer pipe, plastic yard drain pipe or plastic pipe in accordance with Section 1006 unless otherwise specified.

Subsection 701.06 – Joining Pipe, (07/02), Pages 364 – 366.

Delete the second sentence of the second paragraph in Heading (b) and substitute the following.

For pipe equal to or less than 36 inches (900 mm) in diameter, any approved method for joining pipe may be used which does not damage the pipe.

Subsection 701.08 – Backfilling (09/05), Pages 366 and 367.

Delete this subsection and substitute the following.

701.08 BACKFILLING.

(a) General: Prior to backfilling, pipes found to be damaged or out of alignment or grade shall be removed and reinstalled, or replaced.

Type A backfill material shall be stone, recycled portland cement concrete, or flowable fill.

Type B backfill material shall be stone, recycled portland cement concrete, flowable fill, selected soils, or granular material.

FOR INFORMATION ONLY

When Type A backfill material is used, geotextile fabric shall be placed in accordance with plan details prior to placing backfill material. Care shall be taken to prevent damage to geotextile fabric during placement of backfill material.

Adjacent rolls of fabric shall be overlapped or sewn. When rolls are overlapped, the overlap shall be a minimum of 18 inches (450 mm), including the ends of the rolls. The top layer of the fabric shall be parallel with adjacent rolls and in the direction of backfill materials placement. When rolls are sewn, the contractor shall join adjacent rolls by sewing with polyester, or Kevlar thread. Field sewing shall employ the "J" seam or "Butterfly" seam with the two pieces of geotextile fabric mated together, turned in order to sew through 4 layers of fabric and sewn with 2 rows of Type 401, two-threaded locking chain stitch. Factory seams other than specified shall be submitted to the Materials and Testing Section for approval.

Damaged fabric shall be either removed and replaced with new fabric or covered with a second layer of fabric extending 2 feet (0.6 m) in each direction from the damaged area.

(b) Backfill Applications:

(1) Paved Areas: Cross drains and side drains in paved areas subject to traffic loads such as roadway travel lanes, shoulders, and turnouts shall be backfilled with Type A material. Type B backfill material shall be used in all other paved areas including driveways, detour roads and similar installations. Selected soils will not be allowed as backfill material. Placement and compaction shall be as specified in Heading (c) below.

(2) Nonpaved Areas: Pipe backfill material, except for plastic pipe, shall be Type B backfill material placed by approved methods and compacted to the density of surrounding soil. Plastic pipe shall be backfilled with granular material or Type A backfill Material.

(c) Placement and Compaction: When corrugated metal pipe is used, the backfill material shall be tested and shall have a resistivity greater than 1500 ohm-cm and a pH greater than 5 when tested in accordance with DOTD TR 429 and DOTD TR 430 respectively.

If the top of pipe is even with or below the top of the trench, backfill material shall be brought up evenly on both sides of pipe for its full length to an elevation of 12 inches (300 mm) above the top of pipe [or to subgrade if less than 12 inches (300 mm)] or to natural ground elevation, whichever is greater.

When the top of the pipe is above the top of the trench, backfill material shall be brought up evenly on both sides of pipe for its full length to 12 inches (300 mm) above the top of pipe or to subgrade if less than 12 inches (300 mm). Material in the trench and above the top of the trench for a distance on each side of the pipe equal to the horizontal outside diameter for corrugated metal or plastic pipe and 18 inches (450 mm) for concrete pipe, and to 12 inches (300 mm) above the top of pipe or to subgrade if less than 12 inches (300 mm) shall be backfill material.

The embankment shall be constructed to a minimum of 24 inches (600 mm) over the pipe before heavy construction equipment is allowed to cross the installation. Where practical, installations with less than 24 inches (600 mm) of cover over the top of the pipe shall be constructed after heavy hauling is completed over the pipe location. After completion of hauling operations, the contractor shall remove excess cover material. Pipe damaged by hauling and backfilling operations shall be removed and reinstalled, or replaced, at no direct pay.

FOR INFORMATION ONLY

(1) Backfill Methods:

a. General: Compaction by flooding will not be allowed.

b. Selected Soils: Backfill shall be placed at or near optimum moisture content determined in accordance with DOTD TR 415 or TR 418 in layers not exceeding 8 inches (200 mm) compacted thickness. Backfill material shall be thoroughly compacted under the haunches of the pipe. Each layer shall be compacted by approved methods to at least 95 percent of maximum dry density prior to placement of a subsequent layer.

c. Granular Material: Backfill shall be placed at or near optimum moisture content determined in accordance with DOTD TR 415 or TR 418. Backfill material shall be thoroughly compacted under the haunches of the pipe and then compacted in layers not exceeding 12 inches (300 mm) compacted thickness. Each layer shall be compacted by approved methods to at least 95 percent of maximum dry density prior to placement of a subsequent layer. Exposed slopes at the pipe ends shall be covered by at least 12 inches (300 mm) compacted thickness of plastic soil blanket.

d. Flowable Fill: Flowable fill shall be in accordance with Section 710.

e. Stone or Recycled Portland Cement Concrete: Backfill shall be placed at or near optimum moisture content determined in accordance with DOTD TR 415 or TR 418. Backfill material shall be thoroughly compacted under the pipe haunches and then compacted in layers not exceeding 8 inches (200 mm) compacted thickness. With approval of the engineer, layer thickness may be increased to 12 inches (300 mm) with verification of satisfactory installation and performance. Each layer shall be compacted by approved methods to at least 95 percent of maximum dry density prior to placement of a subsequent layer. The contractor shall control placement operations so as not to damage protective coatings on metal pipes. The contractor shall repair damaged coatings at no additional pay.

(2) Density Requirements: Maximum dry density will be determined in accordance with DOTD TR 415 or TR 418 and in-place density determined in accordance with DOTD TR 401.

Subsection 701.09 – Inspection of Pipe (07/02), Pages 367 and 368.

Delete the fifth paragraph of Heading (a) and substitute the following.

The mandrel shall be a rigid, nonadjustable, odd-numbered legged (minimum 9 legs) mandrel having a length not less than its nominal diameter or 24 inches (600 mm), whichever is less. The minimum diameter at any point shall be 5.0 percent less than the base inside diameter of the pipe being tested. The mandrel shall be fabricated of steel, aluminum or other approved material fitted with pulling rings at each end. The nominal pipe size and outside diameter of the mandrel shall be stamped or engraved on some segment other than a runner. A suitable carrying case shall be furnished.

Subsection 701.13 – Payment (08/04), Page 370.

Add the following to Heading (a), Payment.

When plastic pipe is specified on the plans or elected to be used by the contractor, payment will be made at the contract unit price per linear foot (lin m) of the types and sizes specified in accordance with the payment schedule of Table 701-1.

FOR INFORMATION ONLY

Table 701-1
Payment Schedule for Plastic Pipe

Percent Payment	Stage of Completeness
75	After placement and backfill has been completed
25	After the pipe has met vertical deflection requirements in accordance with Subsection 701.09(a)

Add the following pay item to the second paragraph of Heading (e).

Item No.	**Pay Item**	**Pay Unit**
701-16	Plastic Pipe (Extension)	Linear Foot (Lin m)

SECTION 702 – MANHOLES, JUNCTION BOXES, CATCH BASINS, AND END TREATMENTS:

Subsection 702.02 – Materials (06/02), Page371.

Delete "Manholes, Frames, Grates and Covers" from the first paragraph and substitute the following.

Frames, Grates and Covers for Manholes, Catch Basins and Junction Boxes 1018.04.

Delete the second sentence of the second paragraph.

Subsection 702.03 – Quality Assurance (06/02), Page 371.

Delete the second sentence of the first paragraph and substitute the following.

Material samples will be randomly obtained for laboratory testing for verification of manufacturing lots.

Subsection 702.07 – Payment (06/01), Page 374.

Delete the first sentence of the second paragraph and substitute the following:

The concrete in cast-in-place manholes, junction boxes, catch basins, and culvert end treatments and safety ends will be identified by lots and shall be subject to pay adjustments in accordance with Table 901-4 and Note 1 therein.

SECTION 704 – GUARD RAIL

Subsection 704.03 – General Construction Requirements (01/05), Pages 380 and 381.

Add the following to subparagraph (d), Guard Rail End Treatments.

All end treatments shall bear a label indicating the manufacturer and exact product name of the end treatment along with its assigned NCHRP 350 test level. This label shall resist weathering and shall be permanently affixed to the railing in such a way as to be readily visible.

FOR INFORMATION ONLY

SECTION 705 – FENCES:

Subsection 705.06 - Chain Link Fence and Gates (06/01), Pages 384 and 385.

Delete the second sentence of the first paragraph of Heading (a) and substitute the following:

Portable mixing of concrete in accordance with Subsection 901.10(g) will be permitted for small quantities of concrete.

SECTION 706 – CONCRETE WALKS, DRIVES AND INCIDENTAL PAVING:

Subsection 706.01 – Description (12/03), Page 387.

Delete this subsection and substitute the following.

This work consists of furnishing and constructing portland cement concrete walks, handicapped curb ramps, drives and incidental paving slabs in accordance with these specifications and in conformity with lines, grades and dimensions shown on the plans or established.

Subsection 706.03 – Construction Requirements (12/03), Pages 387 and 388.

Add the following.

(g) Detectable Warning Surface for Handicap Ramps: Handicapped curb ramps installed shall be equipped with a detectable surface warning system consisting of raised truncated domes as a transition between the sidewalk and the street as required by the Americans with Disabilities Act, 28 CFR Part 36, ADA Standards for Accessible Design. These standards are further described in the Americans with Disabilities Act Accessibility Guidelines (ADAAG), Section 4.29.2.

Detectable warnings (truncated domes) shall be installed on the ramp surface over the full width of the ramp throat for a distance of 24 inches (600 mm) in the direction of travel from the back of the curb. Truncated domes shall be laid out on a square or triangular grid in order to allow enough space for wheelchairs to roll between the domes.

Light reflectance of the truncated domes and the underlying surface must meet the 70 percent contrast requirement of ADAAG.

Subsection 706.04 – Measurement (12/03), Page 388.

Add the following.

Handicapped curb ramps included in the construction of a concrete walk, including the detectable surface warning system, will not be measured for payment.

SECTION 707 – CURBS AND GUTTERS:

Subsection 707.12 – Payment (06/01), Pages 392 and 393.

Delete the first sentence of Heading (b) and substitute the following:

The concrete in the curbs and/or gutters will be identified by lots and shall be subject to pay adjustments per linear foot (lin m) in accordance with Table 901-4.

FOR INFORMATION ONLY

SECTION 709 – STEEL CATTLE GUARDS:
Subsection 709.05 – Payment (06/01), Page 397.

Delete the second sentence and substitute the following:

The concrete placed in cattle guards will be identified by lots and shall be subject to pay adjustments in accordance with Table 901-4 and Note 1 therein.

SECTION 713 – TEMPORARY SIGNS, BARRICADES, BARRIERS AND PAVEMENT MARKINGS:
Subsection 713.08 – Payment (06/01), Pages 414 and 415.

Delete the third sentence of the second paragraph and substitute the following:

The concrete in temporary precast barriers furnished by the contractor will be identified by lots and shall be subject to pay adjustments in accordance with Table 901-3 and Note 1 therein.

SECTION 714 – SLAB SODDING
Subsection 714.08 – Measurement (07/03), Page 417.

Delete Heading (b), Water.

Subsection 714.09 – Payment (07/03), Page 417.

Delete the first sentence of the first paragraph and substitute the following.

Payment for slab sodding will be made at the contract unit price.

Delete Pay Item No. 714-02, Water.

SECTION 717 – SEEDING:
Subsection 717.06 – Temporary Seeding (06/01), Page 423.

Add the following to Table 717-1, Temporary Seeding. Type G, Seed Mixtures, is amended to add Unhulled Bermuda.

Subsection 717.08 – Measurement (07/03). Page 424.

Delete the second sentence and substitute the following.

Topsoil, fertilizer, and agricultural lime will be measured in accordance with Sections 715 and 718.

Subsection 717.09 – Payment (07/03), Page 424.

Delete the second sentence of the first paragraph and substitute the following.

Payment for topsoil, fertilizer, and agricultural lime will be made in accordance with Sections 715 and 718.

SECTION 719 – LANDSCAPING:
Subsection 719.07 – Period of Establishment and Replacement (05/05), Pages 433 – 435.

Delete the first paragraph of Heading (a) and substitute the following.

The contractor shall care for planted and mulched areas for a period of establishment, which shall be one full growing season, after provisional acceptance is made. A growing season

shall begin April 16 and extend one full year until April 16 of the next year. The contractor can complete planting any time during the planting season specified in Subsection 719.06(a) prior to April 16. If the contractor completes planting prior to April 16, the growing season shall begin at provisional acceptance and extend to April 16 of the following year. Any extension of the planting season past April 15 shall result in an extension of the period of establishment to October 31 of the following year. During the period of establishment, the contractor shall preserve plants in a healthy, growing condition. Such plant establishment work shall include cultivation, weeding, watering, pruning, controlling insects, pests and disease and other work determined necessary by the engineer to ensure healthy plant growth.

Subsection 719.08 – Measurement (07/03), Page 435.

Delete the second paragraph.

SECTION 723 – GRANULAR MATERIAL:

Subsection 723.03 – Construction Requirements (06/01), Page 442.

Delete the text of this subsection and substitute the following:

Materials shall be placed, properly shaped and uniformly compacted by approved methods to a minimum of 95 percent of maximum dry density. Maximum dry density will be determined in accordance with DOTD TR 415 or TR 418 and in-place density will be determined in accordance with DOTD TR 401. Granular materials shall not be displaced during subsequent operations.

SECTION 724 – PAVEMENT PATCHING, WIDENING AND JOINT REPAIR:

Subsection 724.02 – Materials (09/02), Page 444.

Delete the second paragraph and substitute the following.

Asphaltic concrete for patching and widening may be any type mixtures listed in Section 501 or 502, except that the 1/2-inch (12.5 mm) nominal size mixture shall not be used. Asphaltic concrete for joint repair shall be incidental paving wearing course complying with Section 501 or 502. Asphalt tack coat shall comply with Section 504.

SECTION 729 – TRAFFIC SIGNS AND DEVICES:

Subsection 729.02 – Materials (01/06). Pages 457 & 458.

Delete the second paragraph and Table 729-1 and substitute the following.

Reflective sheeting for the permanent signs of Table 729-1 shall meet the requirements of ASTM D 4956 Type IX.

FOR INFORMATION ONLY

Table 729-1
Permanent Signs for Use with ASTM D 4956
Type IX Reflective Sheeting

Sign	MUTCD Number
Stop	R1-1
Yield	R1-2
4-Way	R1-3
All Way	R1-4
Do Not Enter	R5-1
Wrong Way	R5-1a
Chevrons	W1-8
No Passing Zone Pennants	W14-3
Type 3 Object Marker	OM-3 (Right & Left)
Type 2 Object Marker	-------
Guardrail End Decals	-------

Subsection 729.03 – General Requirements (08/02), Pages 458 and 459.

Delete Heading (c) and substitute the following.

(c) Material Sampling and Certification: Material sampling and certification for sign faces, sign mountings and U-channel posts shall be in accordance with the Materials Sampling Manual.

Subsection 729.04 – Fabrication of Sign Panels and Markers (01/06), Pages 459 – 462.

Delete the third paragraph of Heading (c) and substitute the following.

ASTM D 4956 Type IX reflective sheeting shall be applied with an orientation determined by the engineer to obtain the optimum entrance angle performance. Fabricated vertical splices in ASTM D 4956 Type IX reflective sheeting will be allowed only when the horizontal dimension of the sign face or attached shield is in excess of the maximum manufactured width of the sheeting. Fabricated vertical splices in ASTM D 4956 Type IX reflective sheeting will also be allowed when the specified orientation will create excessive sheeting waste.

Subsection 729.09 – Payment (06/01), Pages 465 – 467.

Delete the second sentence of Heading (f) and substitute the following:

The concrete in footings will be identified by lots and shall be subject to pay adjustments in accordance with Table 901-4 and Note 1 therein.

SECTION 730 – ELECTRICAL SYSTEMS:

Subsection 730.02 – Equipment and Materials (05/04), Pages 468 and 469.

Delete the third line of the seventh paragraph and substitute the following.

Portland Cement Concrete (Classes M and S) 901

Subsection 730.09 – Payment (06/01), Page 474.

Delete the second sentence and substitute the following:

The concrete in foundations for light poles, high mast poles, and other electrical equipment will be identified by lots and shall be subject to pay adjustments in accordance with Table 901-4 and Note 1 therein.

SECTION 732 – PLASTIC PAVEMENT MARKINGS:

Subsection 732.02 – Materials, (05/02), Page 478.

Delete the fourth sentence of the second paragraph in Heading (a) and substitute the following.

Glass beads used on drop-on application to molten plastic shall be shipped in moisture resistant sacks (packages).

Subsection 732.03 – Construction Requirements (05/02), Pages 478 – 484.

Delete the eighth sentence of the first paragraph of Heading (a) and substitute the following.

Glass beads shall be applied to the molten surface of completed stripes by either a single drop or a double drop application depending on the thickness of the thermoplastic striping as shown in Table 1015-15. The first bead drop shall be applied by a gravity bead dispenser attached to the striping machine in such a manner that beads are dispensed simultaneously with the thermoplastic material at a controlled rate of flow on installed lines. The second bead drop shall be applied immediately after the first bead drop by a gravity bead dispenser attached to the striping machine.

Delete the second sentence of the second paragraph of Heading (d)(1) and substitute the following.

Immediately after application of the markings, glass beads for a single drop application shall be applied at a minimum rate of 300 pounds per mile (85 kg/km) for a 4-inch (100 mm) solid line stripe. Glass beads for a double drop application shall be applied at a rate of 211 pounds per mile (60 kg/km) for the first drop on a 4-inch (100 mm) solid line and 211 pounds per mile (60 kg/km) for the second drop.

Subsection 732.04 – Measurement (05/02), Pages 484 and 485.

Delete Heading (c) and substitute the following.

Removal of existing pavement markings for undivided highways will be measured by the linear mile (km) of full roadway width including shoulders. For divided highways, the full roadway width including shoulders and ramps will be measured separately for each direction of travel. Removal of pavement markings will include removal of lane lines, edge lines, gore markings, symbols, and raised pavement markings.

SECTION 733 – CONCRETE ROADWAY BARRIERS:

Subsection 733.05 – Payment (06/01), Page 487.

Delete the second and third sentences of the first paragraph and substitute the following:

The concrete in cast-in-place roadway barriers will be identified by lots and shall be subject to pay adjustments in accordance with Table 901-4 and Note 1 therein. The concrete in precast roadway barriers will be identified by lots and shall be subject to pay adjustments in accordance with Table 901-3 and Note 1 therein.

SECTION 736 – TRAFFIC SIGNALS:

Subsection 736.13 – Vehicle and Pedestrian Signal Heads (04/04), Page 498.

Add the following.

A 12-inch (300 mm) light emitting diode (LED) traffic signal lamp unit shall be provided as part of a new traffic signal head or as a retrofitted replacement into a new or existing signal housing in accordance with Section 1020, the plans and these specifications including all materials, tools, equipment, labor and incidentals necessary to complete the work.

Installation of a retrofitted replacement LED traffic signal lamp unit into a new or existing signal housing shall only require removal of the existing lens and incandescent lamp, fitting of the new unit securely in the housing door, and connecting the new unit to existing electrical wiring or terminal block by means of simple connectors. The LED retrofit shall not require the removal of the reflector. The existing wiring for the incandescent socket shall remain in place, but shall be disconnected from the terminal block, and neatly coiled adjacent to the terminal block with connectors taped with electrical tape to prevent accidental short circuits.

If proper orientation of the LED traffic signal lamp unit is required for optimum performance, prominent and permanent directional marking(s), such as an "UP arrow", for correct indexing and orientation shall exist on the unit.

The contractor shall neatly inscribe the installation date on the back of each LED traffic signal lamp unit.

Each LED traffic signal lamp unit shall be provided with the following documentation:

1. Complete and accurate installation wiring guide.
2. Contact name, address, and telephone number for the representative, manufacturer, or distributor for warranty replacement.

Each LED traffic signal lamp unit shall be individually packaged, and delivered securely bound on pallets. Each package shall be labeled with the manufacturer's name, individual serial number, manufactured date, model, and batch or lot number.

Subsection 736.21 – Measurement (04/04), Pages 502 and 503.

Delete Heading (c), Jacking or Boring Conduit, and substitute the following.

(c) Jacked or Bored Conduit: Jacked or bored conduit will be measured by the linear foot (lin m) of conduit furnished and installed. Measurement will include the conduit, fittings, excavation, backfilling and duct markers.

Delete Heading (e), Signal Heads, and substitute the following.

Signal heads will be measured per each head installed and/or retrofitted, and accepted. Measurement will include disconnect hangers, traffic signal wiring attached to overhead span, closure caps, mounting hardware, LED traffic signal lamp units, head programming, mounting connections and hardware.

FOR INFORMATION ONLY

Subsection 736.22 – Payment (07/03), Pages 503 and 504.

Delete the first sentence of the second paragraph and substitute the following:

The concrete in foundations for signal supports, signal controllers, and other signal equipment will be identified by lots and shall be subject to pay adjustments in accordance with Table 901-4 and Note 1 therein.

Delete Pay Item No. 736-03, Jacking or Boring Conduit (Size & Type), and substitute the following.

736-03	Jacked or Bored Conduit (Size & Type)	Linear Foot (lin. m)

SECTION 737 – PAINTED TRAFFIC STRIPING:

Subsection 737.03 – Equipment (03/02), Page 505.

Delete Heading (d) and substitute the following.

(d) Equipment shall provide a gravity bead dispenser for drop-on application of glass beads.

Subsection 737.06 – Application (03/02), Page 506.

Delete the first sentence of the second paragraph of Heading (b) and substitute the following.

Glass beads shall be applied at the same time, but in a separate operation, at the rate of 12 pounds of beads per gallon of paint (1.44 kg/L). Beads shall be applied at a rate of 10 miles per hour (16 km/h) or less.

SECTION 738 – MULCH SODDING

Subsection 738.06 – Payment (07/03), Page 509.

Delete the second sentence of the first paragraph.

SECTION 739 – HYDRO-SEEDING

Subsection 739.03 – Hydro-Seeding General (12/04), Pages 510 and 511.

Delete the first paragraph and substitute the following.

Hydro-seeding shall consist of mixing and applying seed, commercial fertilizer, water management gel, polyacrylamide tackifier, and mycorrhizal inoculum with paper or wood fiber and water. Seed and commercial fertilizer shall be uniformly spread over the area at the rates specified in Table 717-1 and Table 718-1. Paper or wood fiber shall be mixed and applied with the seed in accordance with the manufacturer's recommendations and as approved by the engineer. The contractor will be permitted to include fertilizer and lime in the seeding slurry for application during hydro-seeding operations.

SECTION 740 – CONSTRUCTION LAYOUT:

Subsection 740.01 – Description (07/04), Page 512.

Delete the second sentence and substitute the following.

The work consists of establishing lines and grades, taking all cross sections, and staking out the construction work in accordance with these specifications, plan details, and as directed.

Add the following.

FOR INFORMATION ONLY

This work also includes assistance in the coordination of utility relocation activities to ensure that the placement of relocated facilities will not conflict with required construction.

Subsection 740.02 – Construction Requirements (07/04), Pages 512 and 513.

Add the following.

The contractor shall provide sufficient qualified staff, of at least one employee, on site during relocation periods. The contractor shall provide any necessary survey work to ensure there are no utility conflicts with required construction. The contractor shall provide daily documentation of utility relocation activities for incorporation into the project diaries.

Subsection 740.03 – Measurement (07/04), Page 513.

Add the following.

Utility Oversight and Coordination will be measured as a lump sum which will include all labor, materials, and incidentals required to complete the work.

Subsection 740.04 – Payment (07/04), Page 513.

Add the following.

Payment for Utility Oversight and Coordination will be made at the contract lump sum price.

Payment will be made under:

Item No.	Pay Item	Pay Unit
740-02	Utility Oversight and Coordination	Lump Sum

SECTION 801 – GENERAL REQUIREMENTS FOR STRUCTURES:

Subsection 801.04 – Temporary Bridge Works (04/02), Page 522.

Delete the text of this subsection and substitute the following:

Guidance on the design and construction of all temporary bridge works is contained in two AASHTO publications: "Guide Design Specifications for Bridge Temporary Works" 1995 and "Construction Handbook for Bridge Temporary Works" 1995. These specifications should be followed to ensure the safe design and construction of temporary bridge works.

All field welding of temporary works shall be done by certified welders.

SECTION 805 – STRUCTURAL CONCRETE:

Subsection 805.02 – Materials (12/02), Pages 559 and 560.

Delete Table 805-1, Classes and Uses of Concrete and substitute the following:

FOR INFORMATION ONLY

Table 805-1
Classes and Uses of Concrete

Concrete Class	Use
A or A(M)	Concrete exposed to sea water, and all other concrete except as listed herein.
AA or AA(M)	Cast-in-place bridge superstructure
D	Pier footings
F	Dams and flood control structures
P or P(M)	Precast bridge members
P(X)	Precast-prestressed bridge girders
R	Nonreinforced sections
S	Underwater sections

Subsection 805.03 – Handling and Placing Concrete and Precast Units (12/02), Pages 560 – 564.

Add the following to the second paragraph of Heading (a):

For concrete containing fly ash or ground granulated blast-furnace slag, the deck shall be closed to all traffic, including vehicles of the contractor, until the test specimens have attained a compressive strength of 3,200 psi (22.0 MPa).

Subsection 805.11 – Removal of Falsework and Forms (12/02), Pages 569 and 570.

Add the following to the second paragraph:

For concrete containing fly ash or ground granulated blast-furnace slag, only Method 1 shall be used.

Subsection 805.14 – Prestressed Concrete (12/02), Pages 576 – 585.

Add the following to the fourth paragraph of Heading (a):

This office shall also contain two separate telephone lines, one dedicated to the telephone and the other dedicated to a computer.

Subsection 805.18 – Payment (06/01), Pages 588 and 589.

Add the following to Heading (d):

Acceptance and payment for bridge superstructure and substructure will be made on a lot basis at the contract unit price per span, adjusted in accordance with the following provisions. A lot will be considered an identifiable pour as described in Heading (a) of this subsection. Acceptance and payment for each cast-in-place bridge superstructure and substructure lot will be in accordance with Table 901-3 and Note 1 therein. Acceptance for each precast bridge superstructure and substructure lot will be in accordance with Table 901-2.

Add the following to Heading (e):

Acceptance and payment for reinforced concrete box culverts will be made on a lot basis at the contract unit price per linear foot (linear meter), adjusted in accordance with the following provisions. A lot will be considered an identifiable pour as described in Heading (a) of this subsection. Acceptance and payment for each cast-in-place reinforced concrete box culvert lot

will be in accordance with Table 901-3 and Note 1 therein. Acceptance for each precast reinforced concrete box culvert will be in accordance with ASTM C 1433 (C 1433M).

SECTION 807 – STRUCTURAL METALS:

Subsection 807.04 – Minimum Shop Requirements for Fabrication of Major Bridge Members (04/02), Pages 597 and 598.

Delete the heading and text of this subsection and substitute the following:

MINIMUM SHOP REQUIREMENTS FOR FABRICATION OF STEEL STRUCTURES.

The contractor (fabricator) shall provide sufficient lifting capacity, physical plant and equipment for the fabrication of structural steel. The cranes in each working area shall have a combined rated capacity equal to the lifting weight of the heaviest assembly fabricated for shipment unless alternate lifting and turning facilities are approved.

Lifting chains shall be provided with adequate softeners to prevent damage to the corners of material during lifting and turning. When hooks are used for lifting, they shall have sufficient width of jaw and throat to prevent damage to the flanges or to the web-to-flange welds.

Spreader beams, or multiple cranes, shall be provided for lifting plates and long slender members to prevent overstress and distortion from handling.

Shops shall have sufficient enclosed floor spaces to allow oxygen cutting, air carbon arc gouging, assembly and welding to be performed inside, except that shop assembly of field connections for trusses, girders and arches may be performed outside the shop buildings. The fabrication of major steel bridge components (includes all bridge structures other than unspliced rolled beam bridges) shall only be by fabrication shops having a current AISC Certification for Major Steel Bridges. Current AISC Certification for Simple Steel Bridges will be required for fabrication of highway sign structures, secondary members of bridges (such as cross frames), and unspliced rolled beam bridges. Structures that have fracture critical members shall require an AISC Fracture Critical Endorsement to the fabricator's Simple or Major Steel Bridge Certification. The contractor will be required to provide the engineer with documentation of the certification prior to beginning fabrication.

The engineer may approve limited fabrication and welding outside the shop, provided the fabricator has made provisions to ensure that the quality of the work produced outside the shop buildings will not be adversely affected by weather or other conditions.

All cutting, fitting and welding shall be done in areas that are kept dry. Areas for automatic and semiautomatic welding shall be kept at a temperature not lower than 40°F (5°C) for at least 1 hour before work begins and at all times when work is being performed.

Subsection 807.05 – Inspection (04/02), Pages 598 and 599.

Add the following to the sixth paragraph of Heading (a).

This office shall also contain two separate telephone lines, one dedicated to the telephone and the other dedicated to a computer. The contractor or fabricator shall be responsible for paying all utility bills.

Subsection 807.08 – Straightening Material and Curving Rolled Beams and Welded Girders (05/05), Page 600.

FOR INFORMATION ONLY

Delete the third sentence of the paragraph of Heading (a) and substitute the following.

Heat straightening of ASTM A 709, Grade 100 (A 709M, Grade 690), and A 709, Grade 100W (A 709M, Grade 690W) steel shall be done only under rigidly controlled procedures, each application subject to approval of the engineer.

Subsection 807.21 – Connections Using High Strength Bolts (05/05), Pages 607 – 623.

Delete the paragraph of Heading (e)(2) and substitute the following.

When the plans specify the steel as unpainted ASTM A 709, Grade 50W (A 709M, Grade 345W), A 709, Grade HPS 50W (A 709M, Grade HPS 345W), A 709, Grade HPS 70W (A 709M, Grade HPS 485W), or A 709, Grade 100W (A 709M, Grade 690W) contact surfaces within joints shall be thoroughly cleaned by Commercial Blast Cleaning in accordance with Subsection 811.06(c) or other approved methods that will remove all dirt, oil, grease, rust scale, loose mill scale, weld slag and other foreign matter, and shall remain unpainted.

Subsection 807.30 – Bent Plates (05/05), Pages 625 & 626.

Delete the fourth and fifth paragraphs and substitute the following.

Allowance for springback of ASTM A 709, Grade 100 (A 709M, Grade 690), and A 709, Grade 100W (A 709M, Grade 690W) steel should be about three times that for structural carbon steel. For brake press forming, the lower die span should be at least 16 times the plate thickness. Multiple hits are advisable.

If shorter radii are essential, plates shall be bent hot at a temperature not greater than 1150°F (620°C), except for ASTM A 709, Grade 100 (A 709M, Grade 690), and A 709, Grade 100W (A 709M, Grade 690W) steel. If ASTM A 709, Grade 100 (A 709M, Grade 690), and A 709, Grade 100W (A 709M, Grade 690W) steel plates to be bent are heated to a temperature greater than 1125°F (610°C), they must be requenched and tempered in accordance with the producing mill's practice. Hot-bent plates shall conform to the requirements herein for cold-bent plates.

Subsection 807.47 – Straightening Bent Material and Cambering (05/05), Page 632.

Delete the first paragraph of Heading (a) and substitute the following.

Straightening of plates, angles, other shapes and built-up members, when permitted, shall be done by methods that will not produce fracture or other damage. Distorted members shall be straightened by mechanical means or, if approved, by supervised application of a limited amount of localized heat, except that heat straightening of ASTM A 709, Grade 100 (A 709M, Grade 690), and A 709, Grade 100W (A 709M, Grade 690W) steel shall be done only under rigidly controlled procedures, each application subject to approval of the engineer. In no case shall the maximum temperature of ASTM A 709, Grade 100 (A 709M, Grade 690), and A 709, Grade 100W (A 709M, Grade 690W) steel exceed 1125°F (610°C), nor shall the temperature exceed 950°F (510°C) at weld metal or within 6 inches (150 mm) of weld metal. Heat shall not be applied directly on weld metal. In all other steels, the temperature of the heated area shall not exceed 1150°F (620°C) (a dull red) as controlled by temperature indicating crayons, liquids or bi-metal thermometers.

Delete the paragraph of Heading (b) and substitute the following.

FOR INFORMATION ONLY

Correction of errors in camber in welded beams and girders of ASTM A 709, Grade 100 (A 709M, Grade 690), and A 709, Grade 100W (A 709M, Grade 690W) steel shall be done only under rigidly controlled procedures, each application subject to approval.

Subsection 807.52 – Weathering Steel (05/05), Pages 633 & 634.

Delete the first paragraph and substitute the following.

When ASTM A 709, Grade 50W (A 709M, Grade 345W), A 709, Grade HPS 50W (A 709M, Grade HPS 345W), A 709, Grade HPS 70W (A 709M, Grade HPS 485W), or A 709, Grade 100W (A 709M, Grade 690W) weathering steel is specified to be left unpainted, the following modifications in the requirements of this subsection shall apply.

Subsection 807.53 – Measurement (05/05), Pages 634 & 635.

Delete the eighth paragraph of Heading (a) and substitute the following.

ASTM A 709, Grade 36 (A 709M, Grade 250), A 709, Grade 50 (A 709M, Grade 345), A 709, Grade 50W (A 709M, Grade 345W), A 709, Grade HPS 50W (A 709M, Grade HPS 345W), A 709, Grade HPS 70W (A 709M, Grade HPS 485W), A 709, Grade 100 (A 709M, Grade 690), or A 709, Grade 100W (A 709M, Grade 690W) steel shall include all steel classified as such in the plans or specifications.

Subsection 807.54 – Payment (05/05), Page 636.

Delete Pay Item 807-04 Steel (ASTM A 709, Grade 70W) (A 709M, Grade 485W).

Add the following Pay Items.

Item No.	Pay Item	Pay Unit
807-07	Steel (ASTM A 709, Grade HPS 50W) (A 709M, Grade HPS 345W)	Pound (kg)
807-08	Steel (ASTM A 709, Grade HPS 70W) (A 709M, Grade HPS 485W)	Pound (kg)
807-09	Steel (ASTM A 709, Grade 100W) (A 709M, Grade 690W)	Pound (kg)

SECTION 810 – BRIDGE RAILINGS AND BARRIERS:

Subsection 810.09 – Payment (06/01), Pages 659 and 660.

Delete the fourth sentence and substitute the following:

Payment for each lot will be subject to adjustments in accordance with Table 901-3 and Note 1.

SECTION 811 – PAINTING AND PROTECTIVE COATINGS:

Subsection 811.01 – Description (08/05), Page 661.

Delete the second paragraph and substitute the following.

Unless otherwise specified, an approved zinc paint system shall be used for coating metal surfaces requiring painting.

FOR INFORMATION ONLY

Subsection 811.03 – Materials (08/05), Page 661.

Add the following:

(d) Corrosion Inhibiting Alkyd Paint shall comply with Subsection 1008.06.

(e) Zinc Paint Systems for New Steel and 100 Percent Bare Existing Steel: The zinc paint system shall be an approved system listed on QPL 78. Each system shall be tested in accordance with AASHTO R 31 and meet the requirements of Subsection 1008.07.

The contractor has the option of using any one of these systems; however, no modifications or combinations of the systems will be permitted and the same system shall be used throughout the project.

Subsection 811.04 – Painting Metal (08/05), Pages 661 and 662.

Add the following:

(c) Corrosion Inhibiting Alkyd Paint System: Corrosion Inhibiting Alkyd Paint shall be a non-polluting pigmented alkyd paint to be used in a three-coat paint system on properly prepared structural steel surfaces to be permanently exposed. The contractor has the option of using either System A or System B, however, whichever system is selected shall be used on the entire project. The primer and intermediate coats shall be tinted for color contrast.

The minimum dry film thickness of the coatings shall be as follows:

Prime Coat	-	2.0 mils (50 μm)
Intermediate Coat	-	2.0 mils (50 μm)
Aluminum Topcoat	-	2.0 mils (50 μm) - AASHTO M69, Type I

(d) Zinc Paint Systems for New Steel and 100 Percent Bare Existing Steel: The specified dry film thickness of coatings shall be as published in QPL 78.

Subsection 811.08 – Application (08/05), Pages 664 & 665.

Add the following:

(c) Zinc Paint Systems for New Steel and 100 Percent Bare Existing Steel: Each coat of paint shall be applied with airless or conventional spray equipment. The spray equipment shall apply paint in a fine, even spray. If thinning of paint is allowed, it shall be done in accordance with the paint manufacturer's recommendations, but in no case shall exceed 10 percent. An approved oil/moisture trap shall be placed between air supply and pressure pot. Fluid pressure shall be regulated to deliver a uniform and wet coat of material from the spray gun.

On surfaces inaccessible to spray equipment, paint shall be applied with brush or approved daubers to ensure coverage.

(1) Primer (Shop Primer): Primer for new steel shall be applied after fabrication with one coat of the inorganic zinc paint applied at the shop. The dry-to-handle curing time shall be based on the temperature and relative humidity requirements of the manufacturer's product data sheet curing schedule. A 72 hour curing time will be required for steel painted at the shop before it can be shipped.

(2) Field Painting: Primer for existing steel and damaged areas of newly erected steel with a shop primer coat of inorganic zinc paint shall be applied after the steel is blast cleaned in accordance with Subsection 811.06(b) or power tool cleaned to bare metal in accordance with SSPC SP11 with an approved organic zinc paint system listed on QPL 78. Each coat of paint

shall be applied in accordance with the dry film thickness requirements listed on QPL 78 and allowed to cure in accordance with temperature and relative humidity requirements of the manufacturer's product data sheet curing schedule.

(3) Intermediate Coat and Topcoat: Unless otherwise specified, intermediate coat and topcoat paint for new steel shall be applied after field erection, field spot painting and cleaning of primer surfacing. Dust film, dry spray, overspray or other residue shall be removed prior to painting. The use of sand paper for cleaning is acceptable, provided the minimum dry film thickness of primer remains.

SECTION 813 – CONCRETE APPROACH SLABS:

Subsection 813.10 – Payment (06/01), Page 677.

Delete the last sentence of the second paragraph and substitute the following:

Acceptance and payment for each lot will be made in accordance with Table 901-3 and Note 1.

SECTION 814 – DRILLED SHAFT FOUNDATIONS:

Subsection 814.23 – Payment (06/01), Pages 703 and 704.

Delete the fifth sentence of the second paragraph of Heading (a) and substitute the following:

Acceptance and payment for each lot will be made in accordance with Table 901-3 and Note 1.

SECTION 901 – PORTLAND CEMENT CONCRETE:

The term "Ground Iron Blast-Furnace Slag is deleted and replaced by the term "Ground Granulated Blast Furnace Slag" throughout Section 901.

Subsection 901.06 – Quality Control of Concrete (03/04), Pages 713 - 715

Add the following to Heading (a).

In developing mix designs for portland cement concrete pavement Types B and D, the proportions of the aggregate sizes to be used shall meet the requirements of Subsection 1003.02(c). All gradation calculations shall be based on percent of dry weight (mass). The percent of the total aggregates retained on each sieve shall be determined mathematically based on the proportions of the combined aggregate blend, and checked for conformance with Table 1003-1A.

Add the following to Heading (b).

When producing concrete for Types B and D pavements, gradations shall be determined daily on each stockpile of aggregate to be used. All gradation calculations shall be based on percent of dry weight (mass). Upon determination of the gradation of each stockpile, the percent of the total aggregates retained shall be determined mathematically based on the proportions of the combined aggregate blend, and checked for conformance with Table 1003-1A.

Delete the first paragraph of Heading (c) and substitute the following.

The contractor may vary the proportions of the aggregate sizes as reviewed and accepted, but in no case shall they be varied so as to materially affect the volume of concrete. If the

proportions of the aggregate sizes used do not satisfy the gradation requirements of Subsection 1003.02(c) due to changes in the gradation of one or more stockpiles, the proportions shall be adjusted to bring the combined aggregates back within specification limits. These minor adjustments for gradation will not require a new mix design. The mix produced shall be uniform and within the specification limits of Table 901-2. When plant operations do not produce a uniform mix, plant operations will be discontinued.

Delete the first sentence in the third paragraph of Heading (c) and substitute the following.

Adjustments to the proportions of the sizes of aggregates shall not cause the minimum cement factor to deviate from that accepted on the mix design.

Add the following Heading (d).

(d) Acceptance and Verification for Types B and D Pavements: Sampling and testing for acceptance and verification for concrete for Types B and D pavements shall be in accordance with the provisions of the Materials Sampling Manual, except as follows:

(1) Gradation testing for acceptance will not be required.

(2) Verification tests will be performed by the District Laboratory to assure conformance to the gradation of the total combined aggregates shown in Table 1003-1A at the frequency of one sample per aggregate size per lot, with a maximum of one sample per aggregate size per day. Samples are to be obtained from the aggregate feed (conveyor) belt as described in the Materials Sampling Manual, DOTD Designation S101, Aggregates and Aggregate Mixtures.

(3) Upon determination of the gradation of each aggregate size sampled, the percent retained based on the dry weight (mass) of the total combined aggregates will be determined mathematically based on the proportions of the combined aggregate blend, and checked for conformance with Table 1003-1A.

(4) If the results of the verification sample indicate that the combination of aggregates being used does not meet the requirements of Subsection 1003.02(c), the aggregates shall be re-sampled and tested again. If the results of the second verification sample indicate that the combination of aggregates being used does not meet the requirements of Subsection 1003.02(c), the contractor will be notified and required to make adjustments to his operations to produce a mix meeting these specifications. No concrete from this plant shall be placed on DOTD projects until the adjustments are made and approved by the District Laboratory Engineer. An additional verification sample may be required prior to resuming operations.

<u>Subsection 901.07 – Substitutions (06/05), Pages 715 and 716.</u>

Delete this subsection and substitute the following.

901.07 SUBSTITUTIONS. Mixtures may be substituted with approval in accordance with Table 901-1.

FOR INFORMATION ONLY

Table 901-1
Portland Cement Concrete Mixture Substitutions

Structural Class[1]	Substitute
AA(M)	No Substitutions
AA	AA(M)
A(M)	AA(M), AA
A	AA(M), AA, A(M)
D	No Substitutions
F	No Substitutions
P(X)	No Substitutions
P(M)	No Substitutions
P	P(M)
S	No Substitutions
Minor Structure Class[1]	
M	AA(M), AA, A(M), A, B
R	AA(M), AA, A(M), A, B, M
Y	No Substitutions
Pavement Type[1,2]	
B	D
D	B
E	No Substitutions

[1]The mixture being substituted shall meet the requirements of Table 901-2 and the mix design for its class or type. The compressive strength of the substituted mix shall meet the strength requirements of the original mixture specified.

[2]When justified in writing and approved by the engineer, small irregular areas of paving projects using Types B or D concrete may be substituted with Class A concrete.

Subsection 901.08 – Composition of Concrete (12/05), Pages 716 – 719.

Delete the second paragraph of Heading (a) and substitute the following.

For concrete placements having a least dimension of 48 inches (1200 mm) or greater, or if designated on the plans or the project specifications as being mass concrete, the allowable cement type shall be Type II portland cement, Type IP portland-pozzolan cement, or Type IS portland blast furnace slag cement. The cement or combination of cement and fly ash or ground granulated blast furnace slag, shall be certified to generate a heat of hydration of not more than 70 calories/gram (290 kJ/kg) at 7 days.

Delete the fourth paragraph of Heading (a) and substitute the following:

The contractor will be permitted partial substitution on a pound (kilogram) for pound (kilogram) basis of fly ash, grade 100 or grade 120 ground granulated blast-furnace slag for portland cement in concrete mixes only when using Type I, I(B) or II portland cement. The contractor may use a maximum of 25 percent fly ash by weight (mass) of cement for concrete pipe, up to 20 percent fly ash by weight (mass) of cement for other minor structures and concrete pavement, and up to 15 percent fly ash by weight (mass) of cement for structural concrete. When substituted at the ready-mix plant, the contractor may use the substitution rate of grade

100 or grade 120 ground granulated blast-furnace slag conforming to Subsection 1018.28 up to 45 percent by weight (mass) of cement for minor structures (including concrete pipe), structures, and pavement. If the producer wants to increase the substitution rate of grade 100 or grade 120 ground granulated blast-furnace slag above 45 percent up to a maximum of 50 percent, the cement and slag must be blended at the cement plant or terminal. The blended cement containing over 45 percent of grade 100 or grade 120 ground granulated blast-furnace slag must be in compliance with Subsection 1001.04 for portland blast-furnace slag cement.

Delete the third sentence of the fifth paragraph of Heading (b) and substitute the following:

When the ambient air temperature is 85°F (30°C) or above, the water-reducing admixture shall be the set-retarding type, except for concrete containing fly ash or ground granulated blast furnace slag where this choice is optional.

Delete the first sentence of the second paragraph of Heading (c) and substitute the following:

Because of the absorptive nature of lightweight aggregate and the inability to obtain a true saturated surface dry condition for determining free moisture, a maximum amount of water cannot be specified for Class Y concrete.

Delete Heading (d) and substitute the following.

(d) Aggregate: All aggregates for use in portland cement concrete shall meet the requirements of Subsection 1003.01.

(1) Coarse Aggregate: Coarse aggregate, except for gradations for Types B and D pavements, shall be the grade specified in Table 901-2 and shall comply with the requirements of Subsection 1003.02(b).

(2) Fine Aggregate: Fine aggregate, except for gradations for Types B and D pavements, shall comply with the requirements of Subsection 1003.02(a).

(3) Aggregates for Types B and D Pavements: Aggregates shall comply with the requirements of Subsection 1003.02(c).

Subsection 901.11 – Temperature Limitations, (12/02), Pages 726 and 727.

Delete Heading (c) and substitute the following:

(c) Cold Weather Limitations: Mixing and concreting operations for concrete mixes not containing ground granulated blast-furnace slag or Type IS cement shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F (5°C), and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F (2°C) provided the high temperature forecasted by the U.S. Weather Service is above 40°F (5°C). For concrete mixes containing ground granulated blast-furnace slag or Type IS cement, operations shall be discontinued at a descending air temperature in the shade and away from artificial heat of 55°F (13°C) and can resume at a temperature of 50°F (10°C) and rising provided the high temperature forecasted by the U.S. Weather Service is above 55°F (13°C). Production shall not begin until the temperature at the point of placement is within the above limitations. Concrete shall not be placed if the temperature is forecasted by the U.S. Weather Service to be less than 35°F (2°C) within the 24 hour period following placement.

When concrete placement at lower air temperatures is authorized in writing, aggregates may be heated by either steam or dry heat prior to being placed in the mixer. The apparatus used shall heat the mass uniformly and shall be arranged to prevent occurrence of overheated areas. If the air temperature is less than 35°F (2°C) at the time of placing concrete, the engineer may require water or aggregates to be heated to not less than 70°F (20°C) nor more than 150°F (65°C). After placement the concrete shall be protected by additional covering, insulating materials, or other methods approved by the engineer.

Table 901-2, Master Proportion Table for Portland Cement Concrete (06/05), Page 728.

Delete this table and substitute the following.

FOR INFORMATION ONLY

Table 901-2
Master Proportion Table for Portland Cement Concrete

	Average Compressive Strength, psi (MPa) at 28 days	Grade of Coarse Aggregate	Min. Cement, lb/yd^3 (kg/m^3) of Concrete [9]	Maximum Water/Cement ratio, lb/lb(kg/kg) [1,9]	Total Air Content (Percent by volume) [4]	Slump Range [10], inches (mm)		
						Non-Vibrated	Vibrated	Slip Form Paving [2]
Structural Class [11]								
AA(M)	4400 (30.4)	A, P	560 (332)	0.44	5±1	2-5 (50-125)	2-4 (50-100)	N.A.
AA	4200 (29.0)	A, P	560 (332)	0.44	5±1	2-5 (50-125)	2-4 (50-100)	N.A.
A(M)	4400 (30.4)	A, P	510 (302)	0.53	5±2	2-5 (50-125)	2-4 (50-100)	N.A.
A	3800 (26.2)	A, F [8], P	510 (302)	0.53	5±2	2-5 (50-125)	2-4 (50-100)	1-2.5 (25-65)
D	3300 (22.8)	A, B, D, P	420 (249)	0.58	5±2	2-5 (50-125)	1-3 (25-75)	N.A.
F	3400 (23.5)[5]	A,P	460 (273)	0.44	5±1	2-5 (50-125)	2-4 (50-100)	N.A.
P(X)	7500 (51.7)[5]	A, F [8], P	700 (415)	0.40	5±2	N.A.	2-10 (50-250)	N.A.
P(M)	6000 (41.4)[5]	A, F [8], P	600 (356)	0.44	5±2	N.A.	2-6 (50-150)[7]	N.A.
P	5000 (34.5)[5]	A, F [8], P	560 (332)	0.44	5±2	N.A.	2-6 (50-150)[7]	N.A.
S	3800 (26.2)	A,P	650 (385)	0.53	5±2	6-8 (150-200)	N.A.	N.A.
Minor Structure Class [11]								
M	3000 (20.7)	A, B, P	470 (279)	0.53	5±2	2-5 (50-125)	2-4 (50-100)	1-2.5 (25-65)
R	1800 (12.4)	A, B, D, P	370 (219)	0.70	5±2	2-5 (50-125)	2-4 (50-100)	N.A.
Y	3000 (20.7)	Y	560 (332)	-[3]	6-9	N.A.	1-3 (25-75)	N.A.
Pavement Type [11]								
B	4000 (27.6)[6]	N/A [13]	475 (282)	0.53	5±2	N.A.	2-4 (50-100)	1-2.5 (25-65)
D	4000 (27.6)[6]	N/A [13]	450 (267)	0.53	5±2	N.A.	2-4 (50-100)	1-2.5 (25-65)
E	4000 (27.6)[6]	A, F[12], P	600 (356)	0.40	5±2	N.A.	2-4 (50-100)	1-2.5 (25-65)

N.A. – Not Applicable

[1] Except for Class AA, AA(M), or F concrete, the maximum volume of water; gal. (L), shall be reduced 5 percent when a water-reducing admixture is used, and 10 percent when an air-entraining admixture, or air-entraining and water-reducing admixtures, is used. When the coarse aggregate portion of the mix is 100 percent crushed aggregate, the water may be increased by 5 percent provided the maximum water listed in Table 901-2 is not exceeded.

[2] Also slump range for other concrete placed by extrusion methods.

[3] Refer to Subsection 901.08(c).

[4] Total air content ranges when air-entrainment is allowed or specified. Air content shall be designed at midrange.

[5] Values shown represent the minimum compressive strengths allowed.

[6] Average compressive strengths for Pavement Type concrete shall be 3600 psi (24.8 MPa) when air-entrainment is used.

[7] No more than a 2 inch (50 mm) slump differential for any design pour.

[8] Grade F coarse aggregate shall be used only when specified or permitted. The minimum cement content shall be increased when this aggregate is used.

[9] For mixes including partial replacement of cement with fly ash or ground granulated blast furnace slag, the minimum cement and maximum water contents shown apply to the total cement and fly ash or ground granulated blast furnace slag content of the mix. Additional cement may be required to achieve minimum compressive strength.

[10] When a slump range is specified in other sections, that range shall govern.

[11] See Subsection 901.08(a) for allowable types of cement.

[12] For use in partial depth patching.

[13] Aggregate grading shall comply with the requirements of Subsection 1003.02(c).

FOR INFORMATION ONLY

Tables 901-3E and 901-3M, Acceptance and Payment Schedules for Cast-In-Place Structural Concrete (03/04), Pages 729 and 730.

Delete these tables and substitute the following.

FOR INFORMATION ONLY

Table 901-3E
Acceptance and Payment Schedules
Cast-In-Place Structural Concrete

Average Compressive Strength per Lot, psi (28 to 31 days)					
Class A or S	Class AA	Class A(M) or AA(M)	Class D	Class F	Percent of Contract Price[1]
3800 & above	4200 & above	4400 & above	3300 & above	3400 & above	100
3400-3799	3800-4199	4200-4399	3000-3299	---	98
3000-3399	3500-3799	4000-4199	2500-2999	---	90
below 3000	below 3500	below 4000	below 2500	below 3400	50 or remove and replace[2]

Table 901-3M
Acceptance and Payment Schedules
Cast-In-Place Structural Concrete

Average Compressive Strength per Lot, MPa (28 to 31 days)					
Class A or S	Class AA	Class A(M) or AA(M)	Class D	Class F	Percent of Contract Price[1]
26.2 & above	29.0 & above	30.4 & above	22.8 & above	23.5 & above	100
23.5-26.1	26.2-28.9	29.0-30.3	20.7-22.7	---	98
20.7-23.4	24.1-26.1	27.6-28.9	17.2-20.6	---	90
below 20.7	below 24.1	below 27.6	below 17.2	below 23.5	50 or remove and replace[2]

[1]When concrete is part of an item or not a direct pay item, lot sizes, sampling and acceptance testing for the required quantities will be in accordance with Subsection 805.18. The value for each cubic yard (cu m) required will be assessed at $250 ($330) for the purpose of applying payment adjustment percentages. The amount of payment adjustment for the quantity of concrete involved will be deducted from payment.

Acceptance and payment schedules shall apply to the contract item itself for cast-in-place piling.

[2]When the average compressive strength of any batch in a lot is less than 4000 psi (27.6 MPa) for Class A(M) or AA(M), less than 3500 psi (24.1 MPa) for Class AA, less than 3000 psi (20.7 MPa) for Class A or S , less than 2500 psi (17.2 MPa) for Class D, or less than 3400 psi (23.5 MPa) for Class F, an investigation will be made. If concrete is allowed to remain in place, payment will be based on the average compressive strength for the lot. If concrete is not allowed to remain in place, the identifiable deficient areas shall be removed and replaced at no direct pay.

When the average compressive strength for a lot is less than 4000 psi (27.6 MPa) for Class A(M) or AA(M), less than 3500 psi (24.1 MPa) for Class AA, less than 3000 psi (20.7 MPa) for Class A or S , less than 2500 psi (17.2 MPa) for Class D, or less than 3400 psi (23.5 MPa) for Class F, an investigation will be made. If concrete is allowed to remain in place, payment for the lot will be based on 50 percent of the contract price.

Any cores obtained in these investigations will be used for evaluation purposes only and payment will be based on original acceptance samples.

FOR INFORMATION ONLY

Tables 901-4E and 901-4M, Acceptance and Payment Schedules for Cast-In-Place Minor Structure Concrete (06/05), Pages 729 and 730.

Delete these tables and substitute the following.

Table 901-4E

Acceptance and Payment Schedules
Cast-In-Place Minor Structure Concrete

Average Compressive Strength, psi (28 to 31 days)		
Class M or Y	Class R	Percent of Contract Price [1]
3000 & Above Below 3000	1800 & Above Below 1800	100 50 or Remove [2]

Table 901-4M
Acceptance and Payment Schedules
Cast-In-Place Minor Structure Concrete

Average Compressive Strength, MPa (28 to 31 days)		
Class M or Y	Class R	Percent of Contract Price [1]
20.7 & Above Below 20.7	12.4 & Above Below 12.4	100 50 or Remove [2]

[1]When concrete is part of an item or not a direct pay item, sampling and acceptance testing for the required quantities shall be in accordance with this section. The value for each cubic yard (cu m) of concrete required will be assessed at $250 ($330) for the purpose of applying payment adjustment percentages. The amount of payment adjustment for the quantity of concrete involved will be deducted from payment.

[2]When the average compressive strength is less than 3,000 psi (20.7 MPa) for Class M or Y, and 1,800 psi (12.4 MPa) for Class R, an investigation will be made. If concrete is allowed to remain in place, payment will be based on 50 percent of the contract price.

Any cores obtained in these investigations will be used for evaluation purposes only. Payment will be based on original acceptance samples.

SECTION 1001 – HYDRAULIC CEMENT:

Subsection 1001.01 – Portland Cement (11/04), Page 733.

Add the following subheading.

(c) Process Additions: Process additions may be used in amounts not to exceed 3 percent by weight (mass) of portland cement clinker provided it meets the requirements for the cement portion of ASTM C 465 and the test results are submitted to the Department for review and approval.

Subsection 1001.04 – Portland Blast-Furnace Slag Cement (09/02), Page 734.

Delete the fourth sentence and substitute the following:

Grade 100 and grade 120 ground granulated blast-furnace slag for use in Type IS cement shall comply with AASHTO M 302.

SECTION 1002 – ASPHALT MATERIALS AND ADDITIVES:

Subsection 1002.01 – Asphalt (03/03), Page 735.

Delete the second sentence of the third paragraph.

Delete the fifth paragraph and substitute the following.

When asphalt materials sampled at the point of delivery do not comply with specification requirements, and in the opinion of the engineer have resulted in an unsatisfactory product based on an investigation, the materials shall be removed and replaced or otherwise corrected at no direct pay.

Subsection 1002.02 – Asphalt Material Additives (03/03). Pages 735-744.

Delete Tables 1002-01, 1002-02, 1002-05, and 1002-11 and substitute the following.

FOR INFORMATION ONLY

Table 1002-1 (03/03)
Performance Graded Asphalt Cements

Property	AASHTO Test Method	PG76-22m[1]	PG70-22m[1]	PG64-22[1]	PG58-28[1]
Test on Original Binder					
Rotational Viscosity @ 135°C, Pa·s [2]	T 316	3.0	3.0	3.0	3.0
Dynamic Shear, 10 rad/s, G*/Sin Delta, kPa	T 315	1.00+ @ 76°C	1.00+ @ 70°C	1.30+ @ 64°C	1.00+ @ 58°C
Flash Point, °C	T 48	232+	232+	232+	232+
Solubility, % [3]	T 44	99.0+	99.0+	99.0+	99.0+
Separation of Polymer, 163°C, 48 hours, °C difference in R & B from top to bottom [5]	ASTM D 7173 AASHTO T 53	2-	2-	---	---
Force Ductility Ratio (f_2/f_1, 4°C, 5 cm/min., f_2 @ 30 cm elongation)	T 300	0.30+	---	---	---
Force Ductility, 4°C, 5 cm/min, 30 cm elongation, kg	T 300	---	0.23+	---	---
Tests on Rolling Thin Film Oven Residue	T 240				
Mass loss, %	T 240	1.00-	1.00-	1.00-	1.00-
Dynamic Shear, 10 rad/s, G*/Sin Delta, kPa	T 315	2.20+ @76°C	2.20+ @ 70°C	2.20+ @ 64°C	2.20+ @ 58°C
Elastic Recovery, 25°C, 10 cm elongation, % [4]	T 301	60+	40+	---	---
Ductility, 25°C, 5 cm/min, cm	T 51	---	---	100+	---
Test on Pressure Aging Vessel Residue	R 28				
Dynamic Shear, @ 25°C, 10 rad/s, G* Sin Delta, kPa	T 315	5000-	5000-	5000-	5000- @ 19°C
Bending Beam Creep Stiffness, S, MPa @ -12°C.	T 313	300-	300-	300-	300- @ -18°C
Bending Beam Creep Slope, m value,@ -12°C	T 313	0.300+	0.300+	0.300+	0.300+ @ -18°C

[1] PG76-22m or PG70-22m shall be required in the top two lifts of all hot mix asphalt construction for roadways; PG64-22 may be used in base course and incidentals; When 20-30% RAP is used in the base course PG 58-28 is required.

[2] The rotational viscosity will be measured to determine product uniformity. The rotational viscosity measured by the supplier shall be noted on the Certificate of Delivery. A binder having a rotational viscosity of 3.0 Pa·s or less will typically have adequate mixing and pumping capabilities. Binders with rotational viscosity values higher than 3.0 Pa·s should be used with caution and only after consulting with the supplier as to any special handling procedures and guarantees of mixing and pumping capabilities.

[3] Not all polymers are soluble in the specified solvents. If the polymer modified asphalt digested in the solvent will not pass the filter media, a sample of the base asphalt used in making the polymer modified asphalt should be tested for solubility. If the solubility of the base asphalt is at least 99.0%, the material will be considered as passing.

[4] AASHTO T 301 except the standard v-shaped sides for the specimen mold shall be replaced by straight-sided inserts of the same length, so that the specimen will contain a section 1 cm x 1 cm x 3 cm.

[5] Prepare samples per ASTM D 7173. Determine softening point of top and bottom per AASHTO T 53.

FOR INFORMATION ONLY

Table 1002-2 (03/03)
PG 70-22m Alternate[1]

Property	AASHTO Test Method	PG 70-22m Alternate[2] Specification
Test on Original Binder:		
Rotational Viscosity @ 135°C, Pa·s[3]	T 316	3.0-
Dynamic Shear, @ 70°C and 10 rad/s, G*/Sin Delta, kPa	T 315	1.50+
Flash Point, °C	T 48	232+
Solubility, %[4]	T 44	99.0+
Softening Point, Ring & Ball, °C	T 53	70.0+
Tests on Rolling Thin Film Oven Residue:	T 240	
Mass Loss, %	T 240	1.00-
Dynamic Shear, @ 70°C and 10 rad/s, G*/Sin Delta, kPa	T 315	2.20+
Tests on Pressure Aging Vessel Residue:	R 28	
Dynamic Shear, @ 25°C and 10 rad/s, G*Sin Delta, kPa	T 315	5000-
Bending Beam Creep Stiffness, S, @ -12°C, MPa	T 313	300-
Bending Beam Creep Slope, @ -12°C, m value	T 313	0.300+

[1] Use only with Superpave asphaltic concrete Level 1 and Level A mixes with less than 2500 ADT.
[2] Handling of all samples for testing shall be in accordance with ASTM D 4957, Section 7.2, which requires heating the sample in an oven maintained at 190° ± 2°C. Stir the sample occasionally until homogenous and pour in suitable container for testing. Pouring temperatures shall be 180° ± 2°C for all tests.
[3] The rotational viscosity will be measured to determine product uniformity. The rotational viscosity measured by the supplier shall be noted on the Certificate of Delivery. A binder having a rotational viscosity of 3.0 Pa·s or less will typically have adequate mixing and pumping capabilities. Binders with rotational viscosity values higher than 3.0 Pa·s should be used with caution and only after consulting with the supplier as to any special handling procedures and guarantees of mixing and pumping capabilities.
[4] Not all polymers are soluble in the specified solvents. If the polymer modified asphalt digested in the solvent will not pass the filter media, a sample of the base asphalt used in making the polymer modified asphalt should be tested for solubility. If the solubility of the base asphalt is at least 99.0%, the material shall be considered as passing.

FOR INFORMATION ONLY

FOR INFORMATION ONLY

Table 1002-5 (10/01)
Emulsified Polymerized Asphalt (CRS-2P)1

	Test Method	Percent of Contract Unit Price/Liter or Shipment[2]		
		Specifications	Deviatons	
		100	80	50 or Remove[3]
Viscosity, Saybolt Furol @ 50°C	AASHTO T 59	100-400	56-99 401-444	55- 445+
Storage Stability Test, 24 h, %	AASHTO T 59	1.0-	---	---
Settlement, 5 Day, %	AASHTO T 59	5.0-	---	---
Classification Test	AASHTO T 59	Pass	---	Fail
Particle Charge Test	AASHTO T 59	Pos.	---	Neg.
Sieve Test (Retained on 850 µm), %	AASHTO T 59	0.1-	---	---
Distillation:	AASHTO T 59			
Oil Distillate by Vol. of Emulsion, %		3.0-	---	---
Residue from Distillation, %		65+	61-64	60-
Tests on Residue by Distillation:				
Penetration, 25°C, 100 g, 5 s, dmm	AASHTO T 49	100-200	80-99 201-225	79- 226+
Softening Point (Ring & Ball), °C	AASHTO T 53	38.0-52.0	32.1-37.9 52.1-58.9	32.0- 59.0+
Solubility, %	AASHTO T 44	97.5+	---	---
Tests on Residue by Evaporation[4]:				
Force Ductility Ratio (f_2/f_1, 4°C, 5 cm/min, f_2 at second peak)	AASHTO T 300	0.30+	0.21-0.29	0.20-
Elastic Recovery, 10°C, 20 cm elongation, %	AASHTO T 301[5]	58+	51-57	50-

[1] The addition of latex, rubber or other additives to emulsified polymerized asphalt will not be allowed.
[2] When the unit of pay is not based on the liter, the deduction will be applied to the contract unit price.
[3] At the Department's option.
[4] The residue asphalt for running ductility tests, tensile stress test and elastic recovery test shall be obtained by means of residue by evaporation (Oven) rather than residue by distillation (Aluminum-alloy Still). The material supplier shall certify by independent testing that the Tensile Stress requirements have been attained.
[5] AASHTO T 301 except the standard v-shaped sides for the specimen mold shall be replaced by straight-sided inserts of the same length, so that the specimen will contain a section 1 cm x 1 cm x 3 cm.

Table 1002-11 (03/03)
Hot Applied Modified Asphalt Cements for Asphalt Surface Treatment[1]

Property	AASHTO Test Method	Gelled Asphalt		PAC 15	
		Spec.	Deviation	Spec.	Deviation
		100	90 or Remove	100	90 or Remove
Tire Rubber Content, %	---	---	---	5+	---
Penetration @ 25°C, 100 g., 5 s, dmm	T 49	55-100	54-101+	75-125	74-126+
Viscosity, @ 60°C, Pa·s	T 202	100+	99-	150+	149-
Rotational Viscosity @ 135°C, Pa·s[2]	T 316	0.7-3.0	0.6-3.1+	3.0-	3.1+
Force Ductility Ratio, f_2/f_1, 4°C, 5cm/min, f_2 @ 30 cm elongation	T 300	---	---	0.30+	0.29-
Softening Point, °C	T 53	53+	52-	45+	44-
Flash Point, °C	T 48	230+	228-	230+	228-
Solubility, %	T 44	99.0+	---	---	---
Separation of Rubber, 163°C, 48 hours difference in R & B from top to bottom sample, °C	DOTD TR 326	---	---	2-	---
Tests on Residue from Rolling Thin Film Oven Test:	T 240				
Elastic Recovery, 25°C, 10 cm elongation, %	T 301[3]	---	---	55+	54-
Penetration Retention 25°C, RTFO/Original	T 49	---	---	0.60+ 1.00-	0.59- 1.01+
Viscosity Ratio, 60°C, RTFO/ Original	T 202	2.5-	2.6+	---	---

[1]Handling of all samples for testing shall be in accordance with ASTM D 4957, Section 7.2, which requires heating the sample in an oven maintained at 195° ± 2°C. Stir the sample occasionally until homogenous and pour in suitable container for testing. Pouring temperatures shall be 180° ± 2°C for all tests.

[2]The rotational viscosity will be measured to determine product uniformity. The rotational viscosity measured by the supplier shall be noted on the Certificate of Delivery. A binder having a rotational viscosity of 3.0 Pa·s or less will typically have adequate mixing and pumping capabilities. Binders with rotational viscosity values higher than 3.0 Pa·s should be used with caution and only after consulting with the supplier as to any special handling procedures and guarantees of mixing and pumping capabilities.

[3]AASHTO T 301 except the standard v-shaped sides for the specimen mold shall be replaced by straight-sided inserts of the same length, so that the specimen will contain a section 1 cm x 1 cm x 3 cm.

SECTION 1003 – AGGREGATES:

Subsection 1003.02 – Aggregates for Portland Cement Concrete and Mortar (06/05), Pages 746-749.

Delete the first paragraph and substitute the following.

All aggregates for use in portland cement concrete shall comply with the requirements of Subsection 1003.01. Aggregates for use in Types B and D pavement concrete shall also conform to the requirements of Subsection 1003.02(c).

Delete the first sentence of Heading (a) and substitute the following.

Sand shall be a natural silica sand from a source listed in QPL 2.

Delete the second paragraph of Heading (a) and substitute the following.

Fine aggregate for all portland cement concrete except Types B and D pavements shall conform to the following gradations:

Concrete Sand

U.S. Sieve	Metric Sieve	Percent Passing
3/8 inch	9.5 mm	100
No. 4	4.75 mm	95-100
No. 16	1.18 mm	45-90
No. 50	300 µm	7-30
No. 100	150 µm	0-7
No. 200	75 µm	0-3

Mortar Sand

U.S. Sieve	Metric Sieve	Percent Passing
No. 4	4.75 mm	100
No. 8	2.36 mm	95-100
No. 100	150 µm	0-25
No. 200	75 µm	0-10

Delete Heading (b)(1) and substitute the following.

(1) Uncrushed Coarse Aggregate: Uncrushed coarse aggregate for all portland cement concrete except Types B and D pavements shall comply with Table 1003-1.

Delete Table 1003-1, Portland Cement Concrete Aggregates and substitute the following:

Table 1003-1
Portland Cement Concrete Aggregates

Percent Passing						
U.S. Sieve	Metric Sieve	Grade A (Size 57)	Grade B (Size 467)	Grade D (Size 357)	Grade F ---	Grade P (Size 67)
2 1/2 inch	63 mm	---	---	100	---	---
2 inch	50 mm	---	100	90-100	---	---
1 1/2 inch	37.5 mm	100	85-100	---	---	---
1 inch	25.0 mm	90-100	---	35-70	---	100
3/4 inch	19.0 mm	---	35-70	---	100	80-100
1/2 inch	12.5 mm	25-60	---	10-30	90-100	---
3/8 inch	9.5 mm	---	10-30	---	---	20-55
No. 4	4.75 mm	0-10	0-5	0-5	15-60	0-10
No. 8	2.36 mm	0-5	---	---	0-15	0-5
No. 16	1.18 mm	---	---	---	0-5	---
No. 200	75 µm	0-1	0-1	0-1	0-1	0-1

Delete the first sentence of Heading (b)(2) and substitute the following.

Crushed coarse aggregate for all portland cement concrete except Types B and D pavements shall comply with the uncrushed coarse aggregate gradations, except that when the material finer than the No. 200 (75 µm) sieve consists of the dust fraction from crushing, essentially free of clay or shell, this percentage shall be 0-2 percent.

Add the following.

(c) Aggregates for Types B and D Pavements:

For the combined aggregates for the proposed portland cement concrete pavement mix, the percent retained based on the dry weight (mass) of the total aggregates shall meet the requirements of Table 1003-1A for the type of pavement specified in the plans. Additionally, the sum of the percents retained on any two adjacent sieves so designated in the table shall be at least 13 percent of the total combined aggregates. The maximum amounts by weight (mass) of deleterious materials for the total aggregate shall be the same as shown in Subsection 1003.02(b).

Table 1003-1A
Aggregates for Types B and D Pavements

U.S. Sieve	Metric Sieve	Percent Retained of Total Combined Aggregates	
		Pavement Type	
		Type B	Type D
2 1/2 inch	63 mm	0	0
2 inch	50 mm	0	0-20
1 1/2 inch	37.5 mm	0-20	0-20
1 inch	25.0 mm	0-20	5-20
3/4 inch	19.0 mm	5-20	5-20
1/2 inch	12.5 mm	5-20	5-20
3/8 inch	9.5 mm	5-20	5-20
No. 4	4.75 mm	5-20	5-20
No. 8	2.36 mm	5-20	5-20
No. 16	1.18 mm	5-20	5-20
No. 30	600 µm	5-20	5-20
No. 50	300 µm	0-20	0-20
No. 100	150 µm	0-20	0-20
No. 200	75 µm	0-5	0-5
Note: For the sieves in the shaded areas, the sum of any two adjacent sieves shall be a minimum of 13 percent of the total combined aggregates.			

Each type of aggregate to be used in the proposed mixture shall be sampled and tested individually. The percent of total combined aggregates retained shall be determined mathematically based on the proportions of the combined aggregate blend. All gradation calculations shall be based on percent of dry weight (mass).

Subsection 1003.03 – Base Course Aggregates (05/01), Pages 749 – 751.

Delete the second paragraph of Heading (d) and substitute the following:

To facilitate meeting these gradation requirements, a calcium carbonate additive approved by the Materials and Testing Section may be added to the stone. The additive shall be thoroughly blended with the stone by approved methods prior to placement on the project. When tested according to DOTD TR 428, the fraction passing the No. 40 (425 µm) sieve, including any additive, shall have a liquid limit no greater than 25, and a plasticity index of no greater than 4.

Delete Heading (e) and substitute the following:

(e) Recycled Portland Cement Concrete: Recycled portland cement concrete shall be crushed portland cement concrete. After being crushed, recycled portland cement concrete may contain a minimal amount of other base course materials resulting from normal construction methods and shall conform with the following gradation.

U.S. Sieve	Metric Sieve	Percent Passing
1 1/2 inch	37.5 mm	100
1 inch	25.0 mm	90-100
3/4 inch	19.0 mm	70-100
No. 4	4.75 mm	35-65
No. 40	425 µm	12-32
No. 200	75 µm	0-8

The fraction of recycled portland cement concrete passing the No. 40 (425 µm) sieve shall be non-plastic.

Delete the last sentence of Heading (f)

Subsection 1003.06, Aggregates for Asphaltic Mixtures (02/02), Pages 754 – 757.

Delete the first word of the second sentence of Heading (a) and substitute "Coarse".

Delete the first sentence of Heading (a)(2) and substitute the following:

Fine aggregates shall comply with the requirements of Sections 501, 502, or 508 as applicable. Fine aggregates for Superpave mixtures shall also comply with the specification requirements for angularity and sand equivalent as shown in Section 502, Table 502-4.

Delete the first sentence of Heading (a)(2)b and substitute the following:

Sand equivalent shall be determined in accordance with DOTD TR120.

Add the following to Heading (a)(3):

For non-Superpave mixtures, the sand equivalent of the portion of the natural sand in the mixture passing the No. 4 (4.75mm) sieve shall not be less than 35 when tested in accordance with DOTD TR120. For Superpave mixtures, the sand equivalent of the portion of the natural sand in the mixture passing the No. 4 (4.75mm) sieve shall be as shown in Section 502, Table 502-4 when tested in accordance with DOTD TR120.

SECTION 1005 – JOINT MATERIALS FOR PAVEMENTS AND STRUCTURES:

Subsection 1005.02 – Poured and Extruded Joint Sealant (6/02), Pages 763 and 764.

Delete Heading (a) and substitute the following.

(a) Hot Poured Rubberized Asphaltic Type: This material shall comply with ASTM D6690, Type II. The sealant and backer materials shall be approved products listed in QPL 67. Backer materials of the appropriate size shall comply with ASTM D5249, Type I.

Subsection 1005.04 – Combination Joint Former/Sealer (11/05), Pages 765 and 766.

Delete Heading (a) and substitute the following.

(a) Description: This joint former/sealer is intended for use in simultaneously forming and sealing a weakened plane in portland cement concrete pavements.

The material shall consist of an elastomeric strip permanently bonded either mechanically or chemically at the top of each of two rigid plastic side frames and covered with a removable plastic top cap. Side frames shall be of such configuration that when the sealer is inserted into plastic concrete and vibrated, a permanent bond forms between side frames and concrete.

Delete Heading (b)(1) and substitute the following.

(1) Elastomer: The elastomer strip portion of the material shall be manufactured from vulcanized elastomeric compound using polymerized chloroprene or thermoplastic vulcanizate as the base polymer, and shall comply with the following requirements:

Property	ASTM Test Method	Requirements	
		Polymerized Chloroprene	Thermoplastic Vulcanizate
Tensile Strength, kPa, Min.	D 412	12,400	7,400
Elongation at Break, % Min.	D 412	200	400
Hardness, Shore A	D 2240	65 ± 10	65 ± 10
Properties after Aging, 70 h @ 100°C	D 573		
Tensile Strength, % Loss, Max.		20	20
Elongation, % loss, Max.		25	25
Hardness, pts. increase, Max.		10	10
Ozone Resistance, 20% strain or bentloop, 300 pphm in air, 70 h @ 40°C	D 1149	no cracks	no cracks
Oil Swell, IRM 903, 70 h @ 100°C, wt change, % Max.	D 471	45	75

Delete Headings (b)(2) and (b)(3) and substitute the following:

(2) Bond of Elastomer to Plastic: The force required to shear the elastomer from the plastic shall be a minimum of 5.0 pounds per linear inch (90 g/mm) of sealer when tested in accordance with DOTD TR 636.

(3) Bond of Plastic to Cement Mortar: This bond will be evaluated and shall meet the following requirements:

The force required to separate the cement mortar from the plastic shall be a minimum of 5.0 pounds per linear inch (90 g/mm) of sealer when tested in accordance with DOTD TR 636.

SECTION 1006 – CONCRETE AND PLASTIC PIPE:

Subsection 1006.01 – General (09/02), Page 768.

Delete Heading (a)(4) and substitute the following:

(4) Portland cement with ground granulated blast-furnace slag 1018.28.

Delete the second paragraph of Heading (a) and substitute the following:

The concrete pipe manufacturer may use up to 45 or 50 percent grade 120 ground iron blast-furnace slag as a substitution for portland cement on a pound-for-pound (kilogram for kilogram) basis in accordance with Subsection 901.08. Fly ash may be substituted up to 25 percent.

Delete Heading (h) and substitute the following.

Regardless of the ASTM specifications utilized, if concrete pipe is to be accepted based upon cored samples, all samples shall meet the minimum concrete strengths specified. No more than three (3) joints of pipe shall be tested per maximum of 300 joints or three (3) days

consecutive production, whichever is less, unless approved by the engineer. All coring shall be performed by the manufacturer as directed by the engineer.

Subsection 1006.03 – Reinforced Concrete Pipe (07/02), Page 769.

Delete the first sentence and substitute the following.

Reinforced concrete pipe shall be from an approved product source listed in QPL 77, and shall comply with ASTM C 76, amended as follows:

Subsection 1006.04 Reinforced Concrete Pipe Arch (07/02), Page 769.

Delete the first sentence and substitute the following.

Reinforced concrete pipe arch shall be from an approved product source listed in QPL 77, and shall comply with ASTM C 506, amended as follows:

Subsection 1006.06 Gasket Materials (07/02), Pages 770 – 772.

Delete Heading (b) and substitute the following.

(b) Flexible Plastic Gaskets: Flexible plastic gaskets for pipe joints shall comply with AASHTO M 198. The hydrostatic test shall be performed using AASHTO M 315. Flexible plastic gasket material and primer shall be approved products listed in QPL 4.

Subsection 1006.07 – Plastic Culvert Pipe (08/04), Pages 770 – 772.

Delete this subsection and substitute the following.

1006.07 Plastic Pipe: Plastic pipe and joint systems shall be approved products listed in QPL 66.

(a) Storm Drains: Plastic pipe for storm drains shall be Ribbed Polyvinyl Chloride Pipe (RPVCP). Ribbed Polyvinyl Chloride Pipe shall comply with ASTM F 794 or ASTM F 949, Series 46 with UV inhibitors. The resin shall have a minimum cell classification of 12454-C in accordance with ASTM D 1784.

(b) Cross Drains: Plastic pipe for cross drains shall be Ribbed Polyvinyl Chloride Pipe (RPVCP). Ribbed Polyvinyl Chloride Pipe shall comply with ASTM F 794 or ASTM F 949, Series 46 with UV inhibitors. The resin shall have a minimum cell classification of 12454-C in accordance with ASTM D 1784.

(c) Side Drains: Plastic pipe for side drains shall be one of the following:

(1) Ribbed Polyvinyl Chloride Pipe (RPVCP): Ribbed Polyvinyl Chloride Pipe shall comply with ASTM F 794 or ASTM F 949, Series 46 with UV inhibitors. The resin shall have a minimum cell classification of 12454-C in accordance with ASTM D 1784.

(2) Corrugated Polyethylene Pipe (Double Wall) (CPEPDW): Corrugated Polyethylene Pipe (Double Wall) shall comply with AASHTO M 294, Type S. The minimum cell classification shall be 335400C in accordance with ASTM D 3350.

(d) Joints for Plastic Pipe: Joints shall be approved by the DOTD Materials Engineer Administrator and listed on the QPL. Joint gasket materials shall comply with Subsection 1006.06. Joint requirements are as follows:

(1) Type 1 Joints (T1): These joints shall provide a soil tight joint.

(2) Type 2 Joints (T2): These joints shall pass a 5 psi (35 kPa) hydrostatic pressure test.

(3) Type 3 Joints (T3): These joints shall pass a 10 psi (70 kPa) hydrostatic pressure test.

(4) Joints With Split Coupling Bands: Split coupling bands shall be one piece and composed of the same material as the pipe. The bands shall be the same thickness as the base pipe. The width of the band shall be equal to one-half the diameter of the pipe but shall be a minimum of 12 inches (300 mm) wide. The band shall be secured to the pipe with a minimum of five stainless steel or other approved corrosion resistant circumferential bands.

Subsection 1006.08 – Plastic Underdrain Pipe (08/04), Page 772

Delete this subsection and substitute the following.

1006.08 Plastic Underdrain Pipe: Plastic pipe for underdrains shall be perforated or nonperforated, as specified, and shall be an approved product listed on QPL 73 and one of the following.

(a) Corrugated Polyethylene Pipe (Single Wall) (CPEPSW): Corrugated Polyethylene Pipe (Single Wall) shall be perforated and shall comply with AASHTO M 252, Type C. Perforations shall comply with AASHTO M 252. Corrugated Polyethylene Pipe (Single Wall) shall not be used as shoulder outlet underdrain pipe.

(b) Polyvinyl Chloride Pipe (PVCP): Polyvinyl Chloride Pipe shall comply with AASHTO M 278 or ASTM D 3034, SDR 35. Perforations, if specified, shall comply with AASHTO M 252.

(c) Corrugated Polyethylene Pipe (Double Wall) (CPEPDW): Corrugated Polyethylene Pipe shall comply with AASHTO M 252, Type S. Perforations, if specified, shall comply with AASHTO M 252.

Subsection 1006.09 – Plastic Yard Drain Pipe (08/04), Page 773.

Delete this subsection and substitute the following.

1006.09 Plastic Yard Drain Pipe:

(a) Pipe: Plastic pipe for yard drains shall be an approved product listed on QPL 73 and one of the following:

(1) Polyvinyl Chloride Pipe (PVCP): Polyvinyl Chloride Pipe shall comply with AASHTO M 278 or ASTM D 3034, SDR 35.

(2) Corrugated Polyethylene Pipe (Double Wall) (CPEPDW): Corrugated Polyethylene Pipe (Double Wall) shall comply with AASHTO M 252, Type S, with a resin of minimum cell classification of 324420C in accordance with ASTM D 3350 or AASHTO M 294, Type S, with a resin of minimum cell classification of 335400C in accordance with ASTM D 3350.

(3) Ribbed Polyvinyl Chloride Pipe (RPVCP): Ribbed Polyvinyl Chloride Pipe shall comply with ASTM F 794 or ASTM F 949.

(b) Joints: Gaskets for joining plastic yard drain pipe shall comply with the requirements of Subsection 1006.06.

SECTION 1007 – METAL PIPE:

Subsection 1007.07 – Polymer Coated Corrugated Steel or Aluminum Pipe and Pipe Arch (05/04), Page 776.

Delete this subsection.

SECTION 1008 – PAINTS:

Subsection 1008.02 – Three-Coat Waterborne Paint System (Two Primers And One Topcoat) (04/02), Pages 780 – 782.

Delete the text of this subsection and substitute the following:

The Three-Coat Waterborne Paint System (Two Primers and One Topcoat), shall be an approved system listed on QPL 68. Each system shall be tested for a minimum of 1500 hours in a salt spray (fog) apparatus and fluorescent UV-Condensation Exposure Apparatus in accordance with ASTM B 117 and G 53. The paint system shall show no rusting, checking, cracking, delamination or undercutting. There shall be only slight chalking or discoloration and there shall be no blisters larger than number 8 when rated in accordance with ASTM D 714.

Standard X-ray and infrared curves will be made of all approved coatings in accordance with ASTM D 5380 and DOTD TR 610. When the project sample deviates from these curves, the material represented by the sample will be rejected.

The following specification is not a formula. The manufacturer assumes all responsibility in formulating products which meet these specification requirements in laboratory testing, field application, and performance.

Each paint system shall comply with the following requirements.

(a) Primer:

(1) System A

a. Pigment: The pigment shall be composed of the following materials:

	Percent By Weight (mass)
Zinc Phosphate Dihydrate, Min.	22
Red Iron Oxide (ASTM D 3722), Min.	10
Barium Sulfate (ASTM D 602), Min.	50

The balance of the pigment shall include any application aids, thixotropes, tinting pigments, etc. which may enhance the performance of the material.

b. Vehicle: The vehicle shall be composed of a minimum of 80 percent resin solution with the balance being water, surfactants, antifoam additives, stabilizers, pH adjusters, etc. The resin shall be of vinyl acrylic copolymer latex having a pH between 1 and 2 and a chlorine content of 64 percent based on latex solids.

c. Mixed Paint: The mixed paint shall have the following properties:

PROPERTY	TEST METHOD	REQUIREMENT
Pigment, % by wt., Min.	ASTM D 3723	23
Weight/gallon, pounds, Min.	ASTM D 1475	12
Solids, % by wt. Min.	ASTM D 3723	60
Non-volatile in Vehicle, % by wt., Min.	ASTM D 3723	49
Viscosity, Ku	ASTM D 562	70 - 90
Fineness of Grind, Hegman Scale, Min.	ASTM D 1210	5
Dry to Touch, Minutes, Max.	ASTM D 1640	30
Dry Through, Hours, Max.	ASTM D 1640	1
PH	ASTM E 70	4.5 - 5.5
Sag, Lenetta, Mils, Min.	ASTM D 4400	12

(2) System B (Color Contrasting Primers)

a. First Coat Primer: See heading 1008.02(a)(1)a.

b. Second Coat Primer: The second coat primer shall meet the vehicle requirements of the first coat primer. The second coat primer pigmentation shall be changed to allow for color contrast between the first coat red primer, second coat primer and gray topcoat.

(b) Topcoat:

(1) Pigment: The pigment shall be composed of 95 percent by weight of Titanium Dioxide ($Ti0_2$) in accordance with ASTM D 476. The balance of the pigments shall include any application aids, thixotropes, tinting pigments, etc., which may enhance the performance of the material.

(2) Vehicle: The vehicle shall be composed of a minimum of 87 percent solution with the balance being water, dispersant, rheological modifiers, stabilizers, etc. The resin shall be a 41.5 percent solids small particle size aqueous dispersion copolymer consisting of acrylic, acrylonitrile and styrene monomers. The resin shall have a personal modulus between 38°C and 42°C and a pH between 7.2 and 7.8.

(3) The topcoat shall be tinted to match the standard "Louisiana Gray" topcoat available from the Materials and Testing Section. The paint shall have the following properties:

PROPERTY	TEST METHOD	REQUIREMENT
Pigment, % by wt., Min.	ASTM D 3723	13
Weight/gallon, pounds, Min.	ASTM D 1475	9.2
Solids, % by wt. Min.	ASTM D 3723	46
Non-volatile in Vehicle, % by wt., Min.	ASTM D 3723	39
Viscosity, Ku	ASTM D 562	90 - 110
Fineness of Grind, Hegman Scale, Min.	ASTM D 1210	5
Dry to Touch, Minutes, Max.	ASTM D 1640	30
Dry Through, Hours, Max.	ASTM D 1640	2
Sag, Resistance, Lenetta, Mils, Min.	ASTM D 4400	12

Subsection 1008.06 – Corrosion Inhibiting Alkyd Paint System (04/02), Page 783.

Add the following:

1008.06 CORROSION INHIBITING ALKYD PAINT SYSTEM. The Corrosion Inhibiting Alkyd Paint System shall be a three-coat paint system applied to properly prepared structural steel surfaces that are permanently exposed to weather. The paint shall be compatible with basic lead silico chromate paint. Either System A or System B can be used, however, whichever system is selected shall be used on the entire project. The corrosion inhibiting pigment in System A shall be zinc hydroxy phosphite and the corrosion inhibiting pigment in System B shall be calcium borosilicate. The primer and the intermediate coats shall be tinted for color contrast. An aluminum topcoat in accordance with AASHTO M69, Type I shall be applied in both systems.

SPECIFIC REQUIREMENTS: Test methods shall be the latest in effect. The manufacturer assumes all responsibility in formulating products which meet these specifications requirements.

Systems A and B shall comply with the following requirements.

PROPERTY	TEST METHOD	REQUIREMENT SYSTEM A MIN	MAX	SYSTEM B MIN	MAX
PRIMER					
Pigment, % by wt	ASTM D 2371	50	--	53	--
Vehicle, % by wt	ASTM D 2371	--	50	--	47
Weight/gallon, pounds @ 77°F	ASTM D 1475	12.3	--	11.4	--
Water, %		--	0.5	--	0.25
Coarse Particle and Skins (Total Residue Retained on No. 325 Sieve Based on Paint), %	ASTM D 185	--	1.0	--	1.0
Fineness of Grind (North Std)	ASTM D 1210	5	--	5	--
Viscosity (Stormer-Krebs Units) @ 77°F	ASTM D 562	70	80	75	85
Dry Through, Hours	ASTM D 1640	18	--	18	--
Non-volatile in Vehicle, % by wt	ASTM D 2369 & ASTM D 2372	66	--	57	--

PROPERTY	TEST METHOD	REQUIREMENT SYSTEM A MIN	SYSTEM A MAX	SYSTEM B MIN	SYSTEM B MAX
INTERMEDIATE COAT					
Pigment, % by wt	ASTM D 2371	50	--	44	--
Vehicle, % by wt	ASTM D 2371	--	50	--	56
Weight/gallon, pounds @ 77°F	ASTM D 1475	12.3	--	10.2	--
Water, %		--	0.25	--	0.25
Coarse Particle and Skins (Total Residue Retained on No. 325 Sieve Based on Paint), %	ASTM D 185	--	1.0	--	1.0
Fineness of Grind (North Std)	ASTM D 1210	5	--	5	--
Viscosity (Stormer-Krebs Units) @ 77°F	ASTM D 562	70	80	75	85
Dry Through, Hours	ASTM D 1640	--	18	--	10
Non-volatile in Vehicle, % by wt	ASTM D 2369 & ASTM D 2372	66	--	45	--

SYSTEM A

Vehicle: The vehicle shall consist of not less than 66.0 percent non-volatile vehicle. The balance shall be combined drier and thinner.

The non-volatile vehicle shall be composed of raw linseed oil and alkyd resin combined in the approximate proportions of 1:1 respectively by weight. The alkyd resin furnished as a solution shall meet the requirements of Federal Specifications TT-R-266C Type I, Class A. The raw linseed oil shall meet the requirements of ASTM D234.

The volatile vehicle shall be mineral spirits meeting the requirements of Rule 66.

PRIMER PIGMENT	PERCENT BY WEIGHT MIN	MAX
Zinc hydroxy phosphite, ASTM D 4462	73.0	75.0
Red Iron Oxide (98% Fe203)	24.0	26.0
Organo Montmorillonite	0.75	--

INTERMEDIATE PIGMENT	PERCENT BY WEIGHT MIN	MAX
Zinc hydroxy phosphite, ASTM D 4462	75.0	77.0
Titanium Dioxide, Rutile Non Chalking, ASTM D476	19.0	21.0
Organo Montmorillonite	0.75	--
Tinting Pigments*	--	--
Yellow Oxide	--	--
Red Oxide	3.0	3.5
Lampblack	--	--

*Tinting pigment may be added as predispersion pigment.

SYSTEM B

PRIMER

PIGMENT	MIN	MAX
Calcium Boro-Silicate, ASTM D 4288	80.0%	--
Synthetic Iron Oxide, ASTM D 84, Class I	16.0%	18.0%
Organo Montmorillonite	1.0%	2.0%
VEHICLE		
Alkyd Resin Solution, Fed. Spec TT-R-266, Type I, Class A	43.0%	50.0%
Linseed Oil, ASTM D 234	20.0%	27.0%
Mineral Spirits, Fed. Spec TT-T-291E, Type II*	--	28.0%
Driers	1.0%	2.0%

* Small quantities of alcohols or alcohol/water mixtures may replace some mineral spirits where such materials are used as polar additives for the suspending aid.

INTERMEDIATE COAT

PIGMENT	MIN	MAX
Calcium Boro-Silicate, ASTM D 4288	80.0%	--
Synthetic Iron Oxide, ASTM D 84, Class I	17.5%	18.5%
Organo Montmorillonite	1.5%	2.5%
Lampblack	--	2.0%
VEHICLE		
Alkyd Resin Solution, Fed. Spec TT-R-266, Type I, Class A	65.0%	--
Mineral Spirits, Fed. Spec TT-T-291E, Type II*	--	34.0%
Driers	1.0%	1.5%

*Small quantities of alcohols or alcohol/water mixtures may replace some mineral spirits where such materials are used as polar additives for the suspending aid.

Section 1008, Paints (09/05), Page 780.

Add the following subsection.

1008.07 ZINC PAINT SYSTEMS FOR NEW STEEL AND 100 PERCENT BARE EXISTING STEEL FOR BRIDGES. The zinc paint system shall be an approved system listed on QPL 78. Each system shall be tested in accordance with AASHTO R 31 and meet the following requirements.

Performance Requirements	Zinc Paint Systems: Inorganic Zinc Primer	Zinc Paint Systems: Organic Zinc Primer
Rust Criteria after 5000 hrs exposure to Salt Fog Resistance Test in accordance with ASTM B 117.		
Maximum Creep, mm - Evaluated in accordance with AASHTO R 31, Subsection 8.2.2.2.	4	4
Maximum Average Creep, mm - Evaluated in accordance with AASHTO R 31, Subsection 8.2.2.2.	2	2
Maximum length, mm - Evaluated in accordance with AASHTO R 31, Subsection 8.2.2.3.	3	15
Blister Criteria after 4000 hrs exposure to Salt Fog Resistance Test in accordance with ASTM B 117.		
Minimum Conversion # - Blistering evaluated in accordance with ASTM D 714. Blister size and frequency converted using blister value conversion table.	8	7
Rust Criteria after 5040 hrs exposure to Cyclic Weathering Resistance Test in accordance with ASTM D 5894.		
Maximum Creep, mm - Evaluated in accordance with AASHTO R-31, Subsection 8.2.2.2.	4	12
Maximum Average Creep, (mm) - Evaluated in accordance with AASHTO R 31, Subsection 8.2.2.2.	2	5
Blister Criteria after 4032 hrs exposure to Cyclic Weathering Resistance Test in accordance with ASTM D 5894.		
Minimum Conversion # - Blistering evaluated in accordance with ASTM D 714. Blister size and frequency converted using blister value conversion table.	9	8
Adhesion Criteria - Minimum pull-off strength shall be tested in accordance with ASTM D 4541.		
Minimum for both primer and PIT (Primer, Intermediate, Topcoat) panels.	(2.4 MPa) 350 psi	(4.1 MPa) 600 psi
Freeze Thaw Criteria – After 30 freeze/thaw cycles as defined in AASHTO R 31, Subsection 8.6.1 there shall be no loss of adhesion when compared with above adhesion results.		

Blister Value Conversion Table

Blister Size	Blister Frequency: Few	Medium	Medium Dense	Dense
#8	9	8	7	6
#6	8	7	6	5
#4	7	6	5	4
#2	6	5	4	3
#1	5	4	3	2

Products to be used on projects will be sampled and tested and shall comply with the following requirements:

PROPERTY	TEST METHOD	Specification Acceptance[1]
Pigment Content.	ASTM D 2698	Target Value ±2.0%
Density	ASTM D 1475	Target Value ±0.25 lbs/gal (±0.03 kg/l)
Solids Content	ASTM D 2369	Target Value ±2.0%
Non-volatile in Vehicle Content	ASTM D 2698	Target Value ±2.0%
Viscosity, Ku	ASTM D 562	Target Value ±5KU
Dry to Touch	ASTM D 1640	Target Value ±10%
Dry Through	ASTM D 1640	Target Value ±10%
Sag, Lenetta	ASTM D 4400	Target Value ±10%
Infrared Spectrum	ASTM D 2621	[2]
X-Ray Diffraction	ASTM D 2321	[2]

[1]Target Values shall be established by the Materials Section upon qualification of the paint system.
[2] Standards for infrared spectrum and x-ray diffraction shall be kept on file and compared to project samples for acceptance purposes.

The topcoat shall be tinted to match the standard "Louisiana Gray" topcoat available from the Materials and Testing Section. When weathering steel is used for structural members, such as bridge girders, the ends of the members shall be painted with the zinc paint system for a distance of 1.5 times the member depth, not to exceed 10 feet (3m). The topcoat color shall match the color of the weathered steel.

SECTION 1009 – REINFORCING STEEL AND WIRE ROPE:
Subsection 1009.01 – Reinforcing Steel (07/05), Page 784.

Delete Headings (b) and substitute the following.

(b) Rail-Steel and Axle-Steel Deformed and Plain Bars shall comply with ASTM A 996 (A 996M).

Delete Heading (c).

SECTION 1010 – FENCE AND GUARD RAIL:
Subsection 1010.06 – Gates for Field and Line Type Fence (01/02), Page 792.

Delete Heading (a) and substitute the following.

(a) Gates: Steel used in fabricating gates shall be galvanized in accordance with ASTM A 653 Coating Designation G60 (A653M Coating Designation Z180).

SECTION 1013 – METALS

Subsection 1013.01 – Structural Steel (05/05), Page 800.

Delete the second and third paragraphs and substitute the following.

Structural steel shall comply with ASTM A709 (A709M) specifications.

Longitudinal Charpy V-Notch Testing: When specified, the main load-carrying structural member components that are subject to tensile stress shall meet the longitudinal Charpy V-Notch requirements contained in the ASTM A709 (A709M) Supplemental Requirements in Table S1.2 for Non-Fracture Critical Impact Test Requirements and Table S1.3 for Fracture Critical Impact Test Requirements. Sampling and testing procedures shall be in accordance with ASTM A 673 (ASTM A 673M) and ASTM A 370 and the following requirements: the (H) frequency of heat testing shall be used for all steels except that for ASTM A 709, Grade 100 (ASTM A 709M, Grade 690) steel the (P) frequency of piece testing shall be used.

Tables 1013-1 through 1013-4 are deleted.

SECTION 1014 – TIMBER AND TIMBER PRESERVATIVES

Subsection 1014.06 – Quality Assurance (08/03), Page 811.

Delete Table 1014-2 and substitute the following.

FOR INFORMATION ONLY

Table 1014-2
Minimum Retention of Preservative
(Pounds Per Cubic Foot (kg/cu m) of Wood)

Material and Usage	Creosote	Creosote-Solutions	Pentachloro-phenol	CCA[1]
Timber & Lumber				
Above Ground:				
Southern Pine or Douglas Fir	12.0 (192)	12.0 (192)	0.60 (9.6)	0.60 (9.6)
Land and Fresh Water:				
Southern Pine or Douglas Fir	16.0 (256)	16.0 (256)	N/A	0.80 (12.8)
Coastal Water:				
Southern Pine or Douglas Fir	20.0 (320)	20.0 (320)	N/A	2.50 (40.0)
Piles[3]				
Non-Foundation				
Land & Fresh Water:				
Southern Pine	16.0 (256)	16.0 (256)	N/A	0.80 (12.8)
Douglas Fir	17.0 (272)	17.0 (272)	N/A	1.00 (16.0)
Coastal Water:				
Southern Pine or Douglas Fir	20.0 (320)	20.0 (320)	N/A	2.50 (40.0)
Foundation				
Land & Fresh Water:				
Southern Pine	12.0 (192)	12.0 (192)	0.60 (9.6)	0.80 (12.8)
Douglas Fir	17.0 (272)	17.0 (272)	0.85 (13.6)	N/A
Coastal Water:				
Southern Pine or Douglas Fir	20.0 (320)	20.0 (320)	N/A	2.50 (40.0)
Poles				
Southern Pine	12.0 (192)	N/A	0.60 (9.6)	0.60 (9.6)
Douglas Fir	15.0 (240)	N/A	0.80 (12.8)	0.80 (12.8)
Fence				
Gate Posts/Braces	8.0 (128)	8.0 (128)	0.40 (6.4)	0.40 (6.4)
Guard Rail Posts/Spacer Blocks, Bridge Rails & Dead End Road Installations	12.0[2] (192)	N/A	0.60 (9.6)	0.60 (9.6)

[1] Material treated with Chromated Copper Arsenate (CCA) shall be conditioned by kiln drying prior to treatment.
[2] Timber guard rail posts, spacer blocks, bridge rails, poles and dead end road installations treated with creosote shall be steam flushed for a minimum of 1 hour at 240°F (116°C) after treatment.
[3] A foundation pile is one which is embedded in the ground and capped with concrete. Pile supported approach slab piles are classified as non-foundation.

FOR INFORMATION ONLY

SECTION 1015 – SIGNS AND PAVEMENT MARKINGS:

Subsection 1015.04 – Sign Panels, (05/02), Pages 813 and 814.

Delete the first sentence of Heading (b) and substitute the following.

Substrate for barricade panels shall be either wood or rigid thermoplastic. Substrate for portable signs shall be aluminum, wood or plastic. Substrate for post mounted signs shall be aluminum, wood, rigid thermoplastic or aluminum clad low density polyethylene plastic.

Delete Heading (b)(2).

Delete Heading (b)(4) and substitute the following.

(4) Plastic: Plastic substrate for barricade panels and signs shall be as follows.

a. Fiber Reinforced Vinyl (PVC): The substrate shall have a nominal composite thickness of 0.04 inches (1 mm) and be bonded to an approved retroreflective material by the manufacturer.

b. Rigid Thermoplastic: Rigid thermoplastic substrate shall consist of either High Density Polyethylene (HDPE) or High Density Polycarbonate (HDPC). The rigid thermoplastic for barricade panels shall be hollow core HDPE or HDPC with a minimum thickness of 0.625 inch (16 mm). The thermoplastic for sign panels shall be either 0.40 inch (10 mm) thick thin wall, fluted substrate or 0.625 inch (16 mm) thick blow molded substrate. Substrates shall be sufficiently rigid to maintain a flat face and shall be capable of attachment to the sign mounting in such a manner as not to crush or otherwise deform the substrate. Reflectorized sheeting applied to rigid thermoplastic shall have its manufacturer's approval for use on the substrate.

c. Aluminum Clad Low Density Polyethylene (AL/LDPE) Plastic: The aluminum clad low density polyethylene plastic substrate shall be 0.080 inch (2 mm) thick. The substrates shall be sufficiently rigid to maintain a flat face and shall be capable of attachment to the sign mounting in such a manner as not to crush or otherwise deform the substrate. Reflectorized sheeting applied to aluminum clad low density polyethylene shall have its manufacturer's approval for use on this substrate.

Subsection 1015.05 – Reflective Sheeting (01/06), Pages 814-819.

Delete this subsection and substitute the following.

1015.05 REFLECTIVE SHEETING. Reflective sheeting shall be one of the following types as specified on the plans and complying with ASTM D 4956 except as modified herein. The sheeting shall be an approved product listed in QPL 13.

Type I - A medium-intensity retroreflective sheeting referred to as "engineering grade" and typically enclosed lens glass-bead sheeting.

Type II - A medium-high-intensity retroreflective sheeting sometimes referred to as "super engineering grade" and typically enclosed lens glass-bead sheeting.

Type III A high-intensity retroreflective sheeting, that is typically encapsulated glass-bead retroreflective material.

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Type VI - An elastomeric-high-intensity retroreflective sheeting without adhesive. This sheeting is typically a vinyl microprismatic retroreflective material.

Type IX - A very high-intensity retroreflective sheeting having highest retroreflectivity at short distances as determined by the R_A values at 1° observation angle. This sheeting is typically an unmetalized microprismatic retroreflective element material.

Delete DOTD Type VII (Fluorescent Orange).

Add the following.

Type-X (Fluorescent Orange) - A super high-intensity retroreflective sheeting having highest retroreflectivity characteristics at medium distances. This sheeting is typically an unmetalized microprismatic retroreflective element material.

(a) Adhesive Classes: The adhesive required for retroreflective sheeting shall be Class 1 (pressure sensitive) or Class 2 (heat activated) as specified in ASTM D 4956.

(b) Identification Marks: Type II sheeting shall be distinguished by integral identification marks that cannot be removed or affected by physical or chemical methods without causing damage to the sheeting. The markings shall be inconspicuously placed on 12-inch (300-mm) centers and shall be visible from a distance of not more than 3 feet (1.0 m).

Delete Heading (c), Alternate Sheeting Type.

Delete Tables 1015-1 and 1015-2.

(d) Accelerated Weathering: Reflective sheeting, when processed, applied and cleaned in accordance with the manufacturer's recommendations shall perform in accordance with the accelerated weathering standards in Table 1015-3.

Delete Table 1015-3 and substitute the following.

FOR INFORMATION ONLY

Table 1015-3
Accelerated Weathering Standards[2]

Type	Retroreflectivity[1]				Colorfastness[3]	
	Orange		All colors, except orange		Orange	All colors, except orange
I	Not used		2 years	50[4]	Not used	2 years
II	1 year	65[5]	Not used		1 year	3 years
III	1 year	80[6]	3 years	80[6]	1 year	3 years
III (for drums)	1 year	80[6]	1 year	80[6]	1 year	1 year
VI	1/2 year	50[7]	1/2 year	50[7]	1/2 year	1/2 year
IX	Not used		3 years	80[8]	Not used	3 years
X (Fluorescent Orange)	1 year	80[9]	Not used		1 year	Not used

[1]Percent retained retroreflectivity of referenced table after the outdoor test exposure time specified.
[2]At an angle of 45° from the horizontal and facing south in accordance with ASTM G7.
[3]Colors shall conform to the color specification limits of ASTM D 4956 after the outdoor test exposure time specified.
[4]ASTM D 4956, Table 5.
[5]ASTM D 4956, Table 7.
[6]ASTM D 4956, Table 8.
[7]ASTM D 4956, Table 13.
[8]ASTM D 4956, Table 3.
[9]ASTM D 4956, Table 4.

(e) Performance: Reflective sheeting for signs, when processed, applied and cleaned in accordance with the manufacturer's recommendations shall perform outdoors in accordance with the performance standards in Table 1015-4.

Delete Table 1015-4 and substitute the following.

Table 1015-4
Reflective Sheeting Performance Standards

Type	Retroreflectivity[1] -- Durability[2]				Colorfastness[3]
	Orange		All colors, except orange		
I	Not used		7 years	50[4]	3 years
II	3 years	65[5]	Not used		3 years
III	3 years	80[6]	10 years	80[6]	3 years
IX	Not used		7years	80[7]	3 years
X (Fluorescent Orange)	3 years	80[8]	Not used		3 years

[1]Percent retained retroreflectivity of referenced table after installation and the field exposure time specified.
[2]All sheeting shall maintain its structural integrity, adhesion and functionality after installation and the field exposure time specified.
[3]All colors shall conform to the color specification limits of ASTM D 4956 after installation and the field exposure time specified.
[4]ASTM D 4956, Table 5.
[5]ASTM D 4956, Table 7.
[6]ASTM D 4956, Table 8.
[7]ASTM D 4956, Table 3.
[8]ASTM D 4956, Table 4.

Delete Heading (f) and substitute the following.

(f) Temporary Signs, Barricades, Channelizing Devices, Drums and Cones: Reflective sheeting for temporary signs, barricades and channelizing devices, shall meet the requirements of ASTM D 4956, Type III except that the initial sequence of temporary advanced warning construction signs used on the mainline of freeways and expressways shall meet the requirements of ASTM D 4956 Type X (Fluorescent Orange).

Reflective sheeting for vertical panels shall meet the requirements of ASTM D 4956, Type III.

Reflective sheeting for drums shall be a minimum of 6 inches (150 mm) wide and shall meet the requirements of ASTM D 4956, Type III, and the Supplementary Requirement S2 for Reboundable Sheeting as specified in ASTM D 4956. Reflective sheeting for traffic cone collars shall meet the requirements of ASTM D 4956, Type VI.

(g) Sheeting Guaranty. The contractor shall provide the Department with a guaranty from the sheeting manufacturer stating that if the retroreflective sheeting fails to

comply with the performance requirements of this subsection, the sheeting manufacturer shall do the following:

Delete Table 1015-5 and substitute the following.

Table 1015-5
Manufacturer's Guaranty-Reflective Sheeting

Type	Manufacturer shall restore the sign face in its field location to its original effectiveness at no cost to the Department if failure occurs during the time period[1] as specified below		Manufacturer shall replace the sheeting required to restore the sign face to its original effectiveness at no cost to the Department if failure occurs during the time period[1] as specified below
	Orange	All colors, except orange	All colors, except orange
I	Not used	<5 years	5-7 years
II	<3 years	<5 years	5-10 years
III	<3 years	<7 years	7-10 years
IX	Not used	<5 years	5-10 years
X (Fluorescent Orange)	<3 years	Not used	Not used

[1]From the date of sign installation.

(1) Replacement sheeting for sign faces, material, and labor shall carry the unexpired guaranty of the sheeting for which it replaces.

(2) The sign fabricator shall be responsible for dating all signs with the month and year of fabrication at the time of sign fabrication. This date shall constitute the start of the guaranty obligation period.

Subsection 1015.09 - Raised Pavement Markers (10/03), Pages 821 and 822.

Delete Heading (b) and substitute the following.

(b) Reflectorized Markers: Reflectorized markers shall comply with ASTM D 4280, Designation H and Designation F. The type and color shall be in accordance with the plans and the MUTCD. The markers shall be either standard having approximate base dimensions of 4-by-4-inches (100-by-100-mm) and a maximum height of 0.80 inches (20 mm) or low profile having approximate base dimensions of 4-by-2-inches (100-by-50-mm) and a maximum height of 0.60 inches (15 mm).

Subsection 1015.13 – Glass Beads for Drop-on Application (05/02), Pages 829 and 830.

Delete this subsection and substitute the following.

1015.13 Large Embedment Coated Glass Beads for Pavement Markings. Large embedment coated glass beads for use with painted traffic striping and flat thermoplastic striping shall be transparent, clean, colorless glass, smooth and spherically shaped, free from milkiness, pits, or excessive air bubbles and conform to the specific requirements for the class designated. The beads shall be non-flotation, embedment coated and conform to the following specific requirements.

(a) Gradation: The testing for gradation of the beads shall be in accordance with ASTM D 1214 and shall meet the gradation requirements specified below.

(1) Painted Traffic Striping: Glass beads for painted traffic striping shall meet the gradation requirements of Table 1015-14.

TABLE 1015-14
Gradation of Large Embedment Coated Glass Beads for
Painted Traffic Striping

U.S. SIEVE (METRIC SIEVE)	PERCENT RETAINED
No. 12 (1.7 mm)	0
No. 14 (1.4 mm)	0-5
No. 16 (1.18 mm)	5-20
No. 18 (1.00 mm)	40-80
No. 20 (850 µm)	10-40
No. 25 (710 µm)	0-5
PAN	0-2

(2) Flat Profile Thermoplastic Striping: Drop-on beads for flat profile thermoplastic striping shall meet the gradation requirements of Table 1015-15 as determined by the thickness of the striping.

TABLE 1015-15
Gradation of Embedment Coated Glass Beads for
Flat Profile Thermoplastic Striping

THICKNESS	NUMBER OF BEAD DROPS	APPLICATION #1	APPLICATION #2
40 mils	Single Drop	See Table 1015-14	N/A
90 mils or greater	Double Drop	See Table 1015-16	AASHTO M 247 Type I

TABLE 1015-16
Gradation of Large Embedment Coated Glass Beads for
First Drop on Flat Thermoplastic Striping

U.S. SIEVE (METRIC SIEVE)	PERCENT RETAINED
No. 10 (2.0 mm)	0
No. 12 (1.7 mm)	0-5
No. 14 (1.4 mm)	5-20
No. 16 (1.18 mm)	40-80
No. 18 (1.00 mm)	10-40
No. 20 (850 μm)	0-5
PAN	0-2

(b) Roundness: The beads shall have a minimum of 80 percent rounds per screen for the two (2) highest sieve quantities. The remaining sieve fractions shall have no less than 75 percent rounds as determined by microscopic examination.

(c) Angular Particles: The beads shall have no more than three (3) percent angular particles per screen.

(d) Refractive Index: The beads shall have a refractive index of 1.50 to 1.52 when tested by the liquid immersion method.

(e) Embedment Coating: The large beads for thermoplastic striping shall be coated with an adhesion assuring coating. The smaller AASHTO M247 Type I beads shall be coated to provide free flowing characteristics when tested in accordance with AASHTO M247 Section 4.4.1. and assure adhesion. Glass beads shall be properly coated and conform to the requirements when tested as described in DOTD TR 530 Determination of Embedment Coating on Large Embedment Coated Glass Beads for Pavement Markings.

(f) Packaging and Marking: The beads shall be packaged in moisture proofed containers. Each container shall be stamped with the following information: Name and address of manufacturer, shipping point, trademark or name, the wording "Large Embedment Coated Glass Beads", class, weight, lot number and the month and year of manufacture. The container for the AASHTO M 247 Type I beads shall be similarly stamped except that the wording shall be "Glass Beads".

SECTION 1016 – PRECAST REINFORCED CONCRETE DRAINAGE UNITS:
Subsection 1016.01 – General (09/05), Page 831.

Delete Heading (a) and substitute the following.

(a) Portland Cement and Portland-Pozzolan Cement: Portland cement shall comply with Subsection 1001.01. Portland-pozzolan cement shall comply with Subsection 1001.02.

Delete Heading (e) and substitute the following.

The name or trademark of the manufacturer, the date of casting, the structure number or the station number as shown on the plans, and the lot number shall be indented into the concrete

or painted thereon with waterproof paint on each unit on the inside and outside of the unit in such a manner as to be legible at time of delivery.

Subsection 1016.02 – Precast Reinforced Concrete Box Culverts (09/05), Pages 831 and 832.

Delete the first sentence and substitute the following.

Precast reinforced concrete box culverts shall be approved products listed on QPL 77. The compressive strengths of the box culverts shall comply with ASTM C 76 (ASTM C 76M). Precast reinforced concrete box culverts shall comply with ASTM C 1433 (ASTM C 1433M) amended as follows:

Delete the first sentence of Heading (f) and substitute the following.

Culvert units shall be cured by one of the methods listed in ASTM C 1433.

Subsection 1016.03 – Precast Reinforced Concrete Manhole Sections (06/02), Page 832.

Delete the text of this subsection and substitute the following.

See Subsection 1016.04.

Subsection 1016.04 Precast Reinforced Concrete Catch Basins and Junction Boxes (06/02), Pages 832 and 833.

Delete this subsection and heading and substitute the following.

Precast Reinforced Concrete Manholes, Catch Basins, Junction Boxes, and Safety Ends. Precast reinforced concrete manholes, catch basins, junction boxes, and safety ends shall comply with the dimensions shown on the plans, and shall meet the following requirements:

(a) Materials:

(1) Precast reinforced concrete manholes, catch basins and junction boxes shall comply with the following Sections and Subsections:

Portland Cement Concrete, Class M	901
Reinforcing Steel	1009
Frames, Grates and Covers	1018.04

Portland cement concrete shall attain a minimum compressive strength of 4000 psi (27.5 MPa) before shipping of the units.

(2) Precast safety ends shall comply with Subsection 702.04(c).

(b) Casting Concrete: When multiple castings are to be made using the same forms, the engineer may require the use of metal forms. Concrete in each sectional unit shall be placed without interruption and shall be consolidated by the use of an approved vibrator, supplemented by hand-tamping as necessary, to force the concrete into the corners of forms and prevent formation of stone pockets or cleavage planes.

(c) Reinforcement: Reinforcement shall be as shown on the plans, and shall not vary more than 1/4 inch (6 mm) from the positions shown, except at pipe connections. At pipe connections no variance from the positions shown is allowed. Cover on reinforcement shall not be less than that shown on the plans.

(d) Curing: Units shall be cured in accordance with Subsection 805.10 or Subsection 805.14(e).

(e) Form Removal: Forms shall remain in place for 1 curing day in accordance with Subsection 805.11, Method 2.

(f) Joints and gasket material shall comply with Subsection 1006.06(b).

(g) Workmanship: Units shall be true to shape, and surfaces shall be smooth, dense and uniform in appearance. Units will be rejected for defeats in workmanship for any of the following:

(1) Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.

(2) Surface defects indicating honeycombed or open texture that would adversely affect the function of the unit.

(3) Damaged or cracked ends, where such damage would prevent making a satisfactory joint.

(4) Any continuous crack having a surface width of 0.01 inch (0.25 mm) or more and extending for a length of 12 inches (300 mm) or more, regardless of position.

When approved, minor surface cavities or irregularities which do not impair the service value of the unit and which can be corrected without marring its appearance shall be pointed with approved patching material listed in QPL 49 as soon as forms are removed.

(h) Quality Assurance: Acceptability of units will be determined by results of compression tests on concrete cylinders and by inspection during manufacture to determine their compliance with the design and workmanship prescribed in these specifications and on the plans. Units will be rejected for defects in workmanship in accordance with Subsection 1016.04(g).

A minimum of four cylinders for source approval and verification shall be made and cured in accordance with DOTD TR 226 or DOTD TR 227 and tested in accordance with DOTD TR 230 for each pour. Additional cylinders shall be made in pairs and used to determine the strength for moving within the plant.

SECTION 1018 – MISCELLANEOUS MATERIALS:

Subsection 1018.04 – Manhole Frames, Grates and Covers (09/02), Page 838.

Delete the Heading name and substitute the following.

Frames, Grates and Covers for Manholes, Catch Basins, and Junction Boxes.

Subsection 1018.13 – Roofing Pitch (05/01), Page 843.

Delete the first sentence and substitute the following:

Roofing pitch shall comply with ASTM D 4586.

Subsection 1018.20 – Fiber Glass Roving (05/01), Pages 847 and 848.

Delete this subsection.

Subsection 1018.22 – Hardware Cloth (06/02), Page 848.

Delete the text of this subsection and substitute the following.

Hardware cloth shall comply with the requirements of ASTM A 740, have a minimum wire diameter of 0.041 inch (1.04 mm), and be constructed of 1/2 inch x 1/2 inch (12.5 mm x 12.5 mm) mesh galvanized in accordance with ASTM A 153.

Subsection 1018.28 – Grade 120 Ground Iron Blast-Furnace Slag (09/02), Page 850.

Delete this subsection and substitute the following.

Ground Granulated Blast-Furnace Slag: Grade 100 and grade 120 ground granulated blast-furnace slag shall be from an approved source listed on QPL 70 and shall comply with AASHTO M 302, except alkali content calculated as sodium oxide equivalent shall not exceed 0.60 percent by weight.

SECTION 1019 – GEOTEXTILE FABRIC AND GEOCOMPOSITE SYSTEMS:

Subsection 1019.01 – Geotextile Fabric (09/02), Pages 851 and 852.

Add the following the Heading (b)(2).

Use	Classes
Base Course	D
Subgrade Layer	D

SECTION 1020 – TRAFFIC SIGNALS:

Subsection 1020.01 – Traffic Signal Heads (04/04), Pages 854 – 861.

Delete sub-heading (c)(1).

Delete sub-heading (c)(3) and substitute the following.

(3) 12-Inch (300 mm) LED Traffic Signal Lamp Unit (Mast Arm and Span Wire Mount):

a. General: The 12–inch (300 mm) LED traffic signal lamp unit shall be used in new traffic signal heads or as a retrofited replacement for existing incandescent signal lamps. No special tools will be required for installation. When used as a retrofitted replacement for existing incandescent signal lamps, the 12-inch (300 mm) LED traffic signal lamp unit shall fit into existing traffic signal housings without modifications.

If proper orientation of the LED traffic signal lamp unit is required for optimum performance, prominent and permanent directional marking(s), such as an "UP arrow", for correct indexing and orientation shall exist on the unit.

The manufacturer's name, individual serial number, manufactured date, model number, and batch number shall be permanently marked on the backside of the LED traffic signal lamp unit. A label shall be placed on the unit certifying compliance to ITE standards.

b. Physical and Mechanical Requirements: The LED traffic signal lamp unit shall be a single, self-contained device, not requiring on-site assembly for installation into a new or existing traffic signal housing.

The assembly and manufacturing process for the LED traffic signal lamp unit assembly shall be such as to assure all internal LED and electronic components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Each LED traffic signal lamp unit shall be comprised of a UV stabilized polymeric outer shell, multiple LED light source, and a regulated power supply. LEDs are to be mounted on a polycarbonate positioning plate or conformally coated printed circuit (PC) board.

The external lens shall be smooth on the outside to prevent excessive dirt/dust buildup. The optical lens/appearance of the lamp shall reflect a light distribution look similar to that of an incandescent lamp.

c. Optical and Light Output Requirements: The LEDs shall be manufactured using AlInGaP (Aluminum-Indium-Gallium-Phosphide) technology or other LEDs with lower susceptibility to temperature degradation than AlGaAs (Aluminum-Gallium-Arsenide). AlGaAs LEDs will not be allowed.

Each LED traffic signal lamp shall meet minimum laboratory light intensity values, color (chromaticity), and light output distribution as described in ITE VTCSH (Vehicle Traffic Control Signal Head Standard) part 2 of the specifications 6.4.2.1, 6.4.4.1, 6.4.4.2, 6.4.4.3, 6.4.5 and 6.4.6 as a minimum. The LED traffic signal lamp units shall be certified by the laboratory to meet initial luminous values that are at least 115 percent of the required minimum values in the tables below. The tables below replace the values in Table 1 of Section 4.1.1 of the ITE VTCSH. The 6.4.2.1 test shall include an expanded view with the following minimums:

Grid Specification for 12–Inch (300 mm) Red
(Minimum Luminous Intensity Values (candelas))
(Shaded area is ITE requirements for light intensity)

Degrees	27.5	22.5	17.5	12.5	7.5	2.5	-2.5	-7.5	-12.5	-17.5	-22.5	-27.5
22.5U												
17.5U			3			10	10			3		
12.5U			14			20	20			14		
7.5U			20			54	54			20		
2.5U			58			220	220			58		
2.5D			77	141	251	339	339	251	141	77		
7.5D	16	38	89	145	202	226	226	202	145	89	38	16
12.5D	16	22	34	44	48	50	50	48	44	34	22	16
17.5D	16	20	22	22	22	22	22	22	22	22	20	16
22.5D			7			10	10			7		
27.5D												

Grid Specification for 12–Inch (300 mm) Green and Yellow
(Minimum Luminous Intensity Values (candelas))
(Shaded area is ITE requirements for light intensity)

Degrees	27.5	22.5	17.5	12.5	7.5	2.5	-2.5	-7.5	-12.5	-17.5	-22.5	-27.5
22.5U												
17.5U			7			20	20			7		
12.5U			27			41	41			27		
7.5U			41			108	108			41		
2.5U			115			441	441			115		
2.5D			154	283	501	678	678	501	283	154		
7.5D	32	77	178	291	404	452	452	404	291	178	77	32
12.5D	32	44	69	89	97	101	101	97	89	69	44	32
17.5D	32	41	44	44	44	44	44	44	44	44	41	32
22.5D			14			20	20			14		
27.5D												

Arrow Indications (candelas/m²)

	Red	Yellow	Green
Arrow Indication	5 500	11 000	11 000

LEDs for arrow indications shall be spread evenly across the illuminated portion of the arrow area. Arrow LED traffic signal lamp units shall be tested in conformance with California Test 3001.

Measured chromaticity coordinates of LED traffic signal lamp units shall conform to the chromaticity requirements of the following table, for a minimum period of 60 months, over an operating temperature range of -40°F (-40°C) to 165°F (74°C). Each LED traffic signal lamp unit shall meet the minimum requirements for light output for the entire range from 80 to 135 volts.

Chromaticity Standards

Red	Y: not greater than 0.308, or less than 0.998x
Yellow	Y: not less than 0.411, nor less than 0.995 – x, nor greater than 0.452
Green	Y: not less than 0.506 – 0.519x, nor less than 0.150 + 1.068x, nor greater than 0.730 – x

LED traffic signal lamp units tested shall be representative of typical production units. Optical testing shall be performed with LED traffic signal lamp units mounted in standard traffic signal section without visors or hood attached to the signal sections.

After burn-in, LED traffic signal lamp units shall be tested for rated initial luminous intensity in conformance with the provisions contained herein above. Before measurement, LED traffic signal lamp units shall be energized at rated voltage, with 100 percent on-time duty cycle,

for a time period of 30 minutes. Test results for this testing shall record the current, voltage, total harmonic distortion (THD) and power factor (PF) associated with each measurement.

Photometric, luminous intensity and color measurements for yellow LED traffic signal lamp units shall be taken immediately after the units are energized. The ambient temperature for these measurements shall be 77°F (25°C). Test results for this testing shall record the current, voltage, total harmonic distortion (THD) and power factor (PF) associated with each measurement.

d. Electrical: Each LED traffic signal lamp unit shall incorporate a regulated power supply designed to electrically protect the LEDs and maintain a safe and reliable operation. The power supply shall provide capacitor filtered DC regulated current to the LEDs in accordance with the LED manufacturer's specification. Design of the power supply shall be such that the failure of an individual component or any combination of components cannot cause the LED traffic signal lamp unit to be illuminated after AC power is removed. The power supply must be current regulated.

The LED traffic signal lamp unit shall operate on a 60Hz AC line voltage ranging from 80 volts RMS to 135 volts RMS. The circuitry shall prevent flickering over this voltage range. Nominal rated voltage for all measurements shall be 117 volts RMS.

The LED traffic signal lamp unit shall be operationally compatible with all TS1, TS2, and 2070 controllers, conflict monitors with plus features, and malfunction management units. In the case of conflicts between specifications, the latest LADOTD specifications will control.

A circuitry shall be provided that will shutdown the LED traffic signal lamp unit and power supply when 85 percent ITE light intensity specifications as amended herein are not satisfied. The manufacturer may be required to effectively demonstrate this feature.

Each shipment shall be accompanied with a certified test report from an independent testing lab. Random testing of average production units shall be conducted to ensure compliance with specifications.

Two, color coded, 36 in. long, 600 V, 18 AWG minimum jacketed wires, properly terminated to the LED traffic signal lamp unit to prevent moisture, dust, and other environmental substances from entering the unit, conforming to the National Electric Code, and rated for service at 221°F (105°C), shall be provided for an electrical connection.

Individual LED's shall be wired so that a catastrophic failure of one LED light source will result in the loss of only one LED light source.

The LED traffic signal lamp unit shall operate with a minimum 0.90 power factor.

Total harmonic distortion (current and voltage) induced into an AC power line by an LED traffic signal lamp unit shall not exceed 20 percent.

LED traffic signal lamp units and associated on-board circuitry shall conform to the requirements in Federal Communications Commission (FCC) Title 47, SubPart B, Section 15 regulations concerning the emission of electronic noise.

e. Environmental Requirements: The LED traffic signal lamp unit shall be rated for use in the ambient operating temperature range of -40°F (-40°C) to 165°F (74°C). The unit shall consist of a housing that is a sealed watertight enclosure that eliminates dirt contamination and allows for safe handling in all weather conditions. Moisture resistance testing shall be

performed on LED traffic signal lamp units in conformance with the requirements in NEMA Standard 250-1991 for Type 4 enclosures. Evidence of internal moisture after testing shall be cause for rejection.

f. Production Testing Requirements: Each new LED traffic signal lamp unit shall be energized for a minimum of 24 hours at an operating temperature of 140°F (60°C) in order to cause any electronic infant mortality to occur, and to ensure electronic component reliability prior to shipment. After the burn-in procedure is completed, each LED traffic signal lamp unit shall be tested by the manufacturer for rated initial intensity at rated operating voltage.

g. Certifications: The contractor shall submit a test report certified by an independent laboratory that is certified to test in accordance with ITE standards that the LED traffic signal lamp unit model to be furnished meets ITE Standards for light distribution as amended herein, chromaticity, and power (consumption, power factor and harmonic distortion).

h. Warranty: The manufacturer shall provide a written warranty against defects in material, workmanship, or intensity for LED traffic signal lamp units for a period of 60 months after their installation. The traffic signal lamp units shall be warranted to maintain, throughout the warranty period, minimum luminous intensity values that are shown in the tables in paragraph c above. During the warranty period the manufacturer may be required to test any LED traffic signal lamp unit that is suspected to not meet the minimum intensity requirements at no cost to the Department. Any LED traffic signal lamp unit that fails during the warranty period shall be replaced. Replacement LED traffic signal lamp units shall be provided within 5 days after receipt of failed LED traffic signal lamp units at no cost to the Department.

The measured chromaticity coordinates of light emitting diode traffic signal lamp units shall conform to the requirements for chromaticity in Section 8.04 and Figure 1 of the ITE VTCSH over the temperature range of -40°F (-40°C) to 165°F (74°C).

LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
SUPPLEMENTAL SPECIFICATIONS

SECTION 502
SUPERPAVE ASPHALTIC CONCRETE MIXTURES

Section 502 of the 2000 Standard Specifications is deleted and substituted with the following.

502.01 DESCRIPTION. These specifications are applicable to Superpave asphaltic concrete wearing, binder and base course mixtures of the plant mix type.

This work consists of furnishing and constructing one or more courses of asphaltic concrete mixture applied hot in conformance with these specifications and in conformity with the lines, grades, thicknesses and typical sections shown on the plans or established. The mixture shall consist of aggregates and asphalt with additives combined in proportions which meet the requirements of this section including Tables 502-2, 502-3 and 502-4. Equipment and processes shall conform to Section 503.

Changes in design level will not be allowed, however, substitutions will be allowed for mixes within the same design level without requiring a plan change as follows. Wearing course [0.75 inch (19 mm)] may be substituted for binder course. Binder course [1 inch (25 mm)] may be substituted for base course. Wearing course shall not be substituted for base course.

When any substitution is made, all specification requirements for the mixture used shall apply with the following exceptions. When wearing course is substituted for binder course, RAP will be allowed in accordance with binder course requirements in Table 502-4. The lift thickness placed shall be as specified in Subsection 502.07 and Table 502-4 for the mix type used.

Quality assurance requirements and design procedures shall be as specified herein elsewhere and in the latest edition of the Department's publication entitled "Application of Quality Assurance Specifications for Asphaltic Concrete Mixtures" which is hereby made a part of this contract by reference.

502.02 MATERIALS. The contractor shall keep accurate records, including proof of deliveries of materials for use in asphaltic concrete mixtures. Copies of these records shall be furnished to the engineer upon request. Materials shall comply with the following Subsections:

Asphalt	1002.01
Silicone and Anti-Strip Additives	1002.02
Aggregates	1003.01 & 1003.06
Reclaimed Asphaltic Pavement (RAP)	1003.01 & 1003.06
Hydrated Lime	1018.03(a)
Mix Release Agent	1018.26

(a) Asphalt: The asphalt cement grades used shall be as specified in Table 502-1 using the design traffic load levels shown on the plans.

Asphalt cement shall be sampled in accordance with the Materials Sampling Manual and shall meet the requirements of Section 1002. If the asphalt cement does not comply with the requirements of Section 1002, mix production shall cease until proper asphalt material is supplied.

Table 502-1
Superpave Asphalt Cement Usage

Current Traffic Load Level	Mixture Type	Grade of Asphalt Cement
Level 1	Wearing Course	PG 70-22m
	Binder Course	PG 70-22m
	Base Course	PG 64-22
Level 2 and 3	Wearing Course	PG 76-22m
	Binder Course	PG 76-22m
	Base Course	PG 64-22
Level A	Incidental Paving	PG 70-22m

Base course mixtures containing 20 to 30 percent RAP shall use PG 58-28 asphalt cement.

When mixtures are specified for pavement patching, pavement widening, pavement joint repair, driveways, curbs, guardrail widening, islands, bike paths, parking lots, or temporary detour roads, PG 64-22 asphalt cement may be used in lieu of the modified asphalts.

Leveling courses shall use the same grade of asphalt cement as in the layer immediately above except when blade leveling is directed by the engineer, a PG 64-22 will be allowed.

PG 76-22m asphalt cement may be substituted for PG 70-22m or PG 64-22 asphalt cements at no increase in price. PG 70-22m asphalt cement may be substituted for PG 64-22 at no increase in price. When average daily traffic (ADT) is less than 2500, PG 70-22m Alternate asphalt cement may be substituted for PG 70-22m asphalt cement for Level 1 and Level A mixes at no increase in price.

If a wearing course is substituted for a binder course, or if a binder course is substituted for a base, the grade of asphalt cement required will be in accordance with the original mixture type shown in the plans and as specified in Table 502-1.

(b) Additives:

(1) Silicone: Silicone additives, when needed, shall be dispersed into the asphalt by methods and in concentrations given in QPL 22.

(2) Anti-Strip (AS): An anti-strip additive shall be added at the minimum rate of 0.5 percent by weight (mass) of asphalt and thoroughly mixed in-line with the asphalt cement at the plant. Additional anti-strip shall be added up to 1.2 percent by weight (mass) of asphalt in accordance with Subsection 502.03(b).

When the amount of anti-strip additive is not in accordance with the approved job mix formula, production shall be discontinued until satisfactory adjustments are made.

(3) Hydrated Lime: Hydrated lime additive may be incorporated into all asphaltic concrete mixtures at the rate specified in the approved job mix formula. The minimum rate shall not be less than 1.5 percent by weight (mass) of the total mixture. Hydrated lime additive shall be added to and thoroughly mixed with aggregates in conformance with Subsection 503.02(e). Hydrated lime may be added as a mineral filler in accordance with Heading (c)(3).

(c) Aggregates: Aggregates shall meet the requirements of Table 502-4 and Section 1003.

(1) Friction Ratings: Friction ratings for coarse aggregates shall be determined in accordance with Subsection 1003.06. The friction ratings and allowable usage of aggregates shall be as shown in Table 502-2. Friction rating requirements shall apply only to the final lift of the travel lane wearing course.

Table 502-2
Aggregate Friction Rating

Friction Rating	Allowable Usage
I	All mixtures
II	All mixtures
III	All mixtures, except travel lane wearing courses with plan ADT greater than 7000[1]
IV	All mixtures, except travel lane wearing courses[2]

[1] When plan current average daily traffic (ADT) is greater than 7000, blending of Friction Rating III aggregates and Friction Rating I and/or II aggregates will be allowed for travel lane wearing courses at the following percentages. At least 30 percent by weight (mass) of the total aggregates shall have a Friction Rating of I, or at least 50 percent by weight (mass) of the total aggregate shall have a Friction Rating of II. The frictional aggregates used to obtain the required percentages shall not have more than 10 percent passing the No. 8 (2.36 mm) sieve.

[2] When the average daily traffic (ADT) is less than 2500, blending of Friction Rating IV aggregates with Friction Rating I and/or II aggregates will be allowed for travel lane wearing courses at the following percentages. At least 50 percent by weight (mass) of the total aggregate in the mixture shall have a Friction Rating of I or II. The frictional aggregates used to obtain the required percentages shall not have more than 10 percent passing the No. 8 (2.36 mm) sieve.

(2) Reclaimed Asphaltic Pavement (RAP): Reclaimed asphaltic pavement shall be stockpiled separate from other materials at the plant and will be subject to approval prior to use. Such stockpiles shall be uniform and free of soil, debris, foreign matter and other contaminants. Reclaimed materials that cannot be broken down during mixing or that adversely affect paving operations shall be screened or crushed to pass a 2 inch (50 mm) sieve prior to use.

(3) Mineral Filler: Mineral filler complying with the requirements of Subsection 1003.06(a)(6) may be used in all mixtures.

(4) Natural Sand: Natural sand shall meet the requirements of Table 502-4 and Subsection 1003.06(a)(3).

502.03 DESIGN AND VALIDATION OF MIXTURES.

(a) General: It is the intent of these specifications that the mixtures produced and placed meet the requirements for 100 percent payment. The contractor shall be responsible for design, production, transportation and laydown of mixtures. Work shall meet the requirements of this section and be subject to acceptance by the Department.

The contractor shall exercise quality control over materials and their assembly, design, processing, production, hauling, laydown and associated equipment. Quality control is defined as the constant monitoring of equipment, materials and processes to ensure that mixtures produced and placed are uniform, within control limits, and meet specification requirements. When these specifications are not being met and satisfactory control adjustments are not being made, operations shall be discontinued until proper adjustments and uniform operations are established. Control shall be accomplished by a program independent of the Department's testing and shall ensure that the requirements of the job mix are being achieved and that necessary adjustments provide the specified results.

The contractor shall conduct such tests as necessary, in addition to the required tests, to design, control and place mixtures within specifications.

The quality of mixtures will be evaluated during two phases, mixture produced at the plant, and mixture hauled, placed and compacted. Quality of both phases will be evaluated continuously as stated herein elsewhere. A lot is a segment of continuous production of asphaltic concrete mixture from the same job mix formula produced for the Department at an individual plant. Plant quality control testing shall be conducted continuously throughout production independent of delivery points. Project site quality control testing shall be conducted on each project for the mix placed on that project.

When the plant is in operation, the contractor shall have a Certified Asphaltic Concrete Plant Technician at the plant or jobsite who is capable of designing asphaltic concrete mixes, conducting any test or analysis necessary to put the plant into operation and producing a mixture meeting specifications. Daily plant operations shall not begin unless the Certified Asphaltic Concrete Plant Technician is at the plant. The Asphaltic Concrete Technician certification will be awarded by the Department upon satisfactory completion of the Department's requirements.

(b) Job Mix Formula: The contractor shall design the mixtures for optimum asphalt content and comply with requirements of the Superpave Mix Design for the level of mixture in Table 502-4 in accordance with AASHTO PP 28. The job mix formula shall include the recommended formula, extracted gradation, and supporting design data. The recommended formula shall be submitted for approval to the District Laboratory Engineer on a properly completed Superpave Asphaltic Concrete Job Formula form with all supporting design data. No mixture shall be produced until the proposed job mix formula has been approved.

The contractor's proposed job mix formula shall indicate a single anti-strip additive rate which is 0.1 percent greater than the percentage which will yield a minimum Tensile Strength

Ratio (TSR) of 80 percent up to a maximum of 1.2 percent anti-strip additive when tested in accordance with DOTD TR 322.

Permeability shall be tested by the contractor and reported on the job mix formula. Permeability tests shall be performed on 6 inch diameter by 4 inch tall (150 mm by 100 mm) specimens compacted to 93% ±1% of theoretical maximum specific gravity (G_{mm}). The maximum coefficient of permeability shall be 3.5 ft./day (125 x 10-5 cm/second) as measured in accordance with ASTM PS 129. These same specimens may be used in moisture sensitivity testing.

The job mix formula shall indicate a single rate of hydrated lime additive when used. The job mix formula rate of hydrated lime additive shall not be less than 1.5 percent by weight (mass) of total mixture.

The job mix formula shall indicate the optimum mixing temperature. The job mix formula limits for mix temperature will be ±25°F (±14°C) from the optimum mixing temperature.

The job mix formula is to be inside the control points as detailed in Table 502-3. Blending of aggregates, i.e., gravel and stone, will be allowed provided the final composite mixture and final product meets or exceeds all specifications requirements.

The plant shall be operated to produce, on a continuing basis, a mixture uniformly conforming to the approved job mix formula. When this is not the case, the contractor shall make satisfactory adjustments or cease operations. The District Laboratory Engineer may permit the contractor to submit a new Asphaltic Concrete Job Mix Formula form for approval. The contractor shall submit a new job mix formula whenever a plant begins initial operations for the Department in a specific location or whenever a plant experiences a change in materials or source of materials. A new job mix formula will also be required whenever there are significant changes in equipment, such as the introduction of a new crusher, drum mixer, burner, etc.

When reclaimed asphaltic pavement (RAP) is used in a roadway mix, the quantity of RAP shall be designated in the job mix formula and meet the requirements of Table 502-4. The engineer may require the contractor to reduce the percentage of RAP to meet acceptance requirements.

When the contractor changes a source of RAP, the new mix design shall be submitted, validated and approved if the type of aggregate changes (e.g. gravel to limestone) or the source change causes a change in acceptance tolerances. If the contractor determines that the source change will not cause a change in acceptance tolerances, the contractor may elect to integrate the new RAP source into the existing approved mix design provided the contractor submits a revised job mix formula cover sheet which shows the new source of RAP and other changes. A new validation will not be required. If subsequent acceptance tests indicate that the mix is out of tolerance, a new design will be required and appropriate payment adjustments will apply.

(c) Job Mix Formula (JMF) Validation: The first day's production or a maximum of 2000 tons (2000 Mg) of mix shall be used to validate a new JMF. The contractor and the Department, using the stratified random sampling approach, shall jointly take five (5) samples, one per sublot, during the first day's production or a maximum of 2000 tons (2000 Mg) of mix. The contractor may elect to exclude test results representing the first 250 tons (250 Mg) from the

validation analysis in order to make slight adjustments to the mix. The remaining validation lot, up to 1750 tons (1750 Mg), shall be divided into five (5) equal sublots and tested for validation analysis. If excluded from validation, the 250 tons (250 Mg) will be paid in accordance with Table 502-8. Minimum testing shall include one theoretical maximum specific gravity (G_{mm}), one gyratory specimen compacted to N_{design}, one gyratory specimen compacted to N_{max}, and one oven extraction. As approved by the district laboratory engineer, the contractor and the Department shall jointly analyze the test results for the following parameters:

(1) Extracted Gradation
(2) Percent Extracted Asphalt Cement
(3) Percent Crushed Aggregate, (from cold feed blends)
(4) Theoretical Maximum Specific Gravity (Gmm) (aged for one hour)

The following parameters apply to samples aged for one hour in an oven at gyratory compaction temperature and compacted to N_{design}.

(5) Bulk Specific Gravity (G_{mb}) at N_{design}
(6) Percent G_{mm} at $N_{initial}$
(7) Percent Air Voids, VMA and VFA

The following parameters apply to samples aged for one hour in an oven at gyratory compaction temperature and compacted to N_{max}

(8) Bulk Specific Gravity (G_{mb}) at N_{max} measured and estimated
(9) Percent G_{mm} at N_{max} and Corrected percent G_{mm} at N_{design}
(10) Slope of the Gyratory Compaction Curve

The mean, standard deviation, Quality Index and percent within limits (PWL) of the test results shall be calculated in accordance with Subsection 502.12(g), Quality Level Analysis. The test data will be used to validate the JMF.

A JMF is considered validated if the following parameters are 90 percent within limits of the JMF and meet the specifications requirements.

(1) Extracted Gradations for the No. 8 and No. 200 (2.36 mm and 75 μm) sieves
(2) Theoretical Maximum Specific Gravity (G_{mm})
(3) Percent G_{mm} at $N_{initial}$ and N_{max}
(4) Percent Air Voids at N_{design}

Also for validation, all other parameters shall be within the specifications limits.

Should the JMF validate on all but one parameter, the contractor may make adjustments to the production and repeat the validation testing using the next day's production or a maximum of 2000 tons (2000 Mg). Should the JMF fail to validate on more than one parameter, the JMF will be considered non-valid, and the contractor will be required to submit a new JMF for approval. A previously approved JMF may be produced in lieu of the disapproved JMF. Upon validation of the JMF, the validation averages will be used for JMF target values. Payment for

validation lots will be in accordance with acceptance pay parameters, except that five cores shall be obtained to determine density pay. After validating the JMF for mix properties, the contractor, witnessed by the Department, shall sample the next day's production and perform validation testing at the plant for DOTD TR 322 and AASHTO TP 4 specimens. When the validation results are less than 80 percent, no further production for that job mix formula or any proposed job mix formula substituted for that mix type will be accepted on any DOTD project having DOTD TR 322 requirements until a passing plant-produced Tensile Strength Ratio (TSR) value is verified by the Department. A previously validated and approved JMF may be produced in lieu of the disapproved JMF.

Validation is not required for mixture designs used solely for curbs, driveways, turnouts, crossovers, joint repair, leveling, guardrail widening, islands, bike paths, patching, widening, shoulders less than 10 feet (3.0 m) wide, and miscellaneous handwork, but the mixture must meet specifications requirements.

502.04 WEATHER LIMITATIONS. Asphaltic concrete mixtures shall not be applied on a wet surface or when the ambient temperature is below 50°F (10°C) for wearing courses and 40°F (5°C) for base and binder courses, except that material in transit, or a maximum of 50 tons (45 Mg) in a surge bin or silo used as a surge bin at the time plant operation is discontinued may be placed; however, mixture placed shall perform satisfactorily and meet specification requirements. Inclement weather will be sufficient reason to terminate or not begin production.

When base course materials are placed in plan thicknesses of 2 3/4 inches (70 mm) or greater, these temperature limitations shall not apply provided all other specification requirements are met. When a wearing course is substituted for a binder course mixture the temperature limitation for binder course shall apply.

502.05 SURFACE PREPARATION. The surface to be covered shall be approved prior to placing mixtures. The contractor shall maintain the surface until it is covered.

(a) Cleaning: The surface to be covered shall be swept clean of dust, dirt, caked clay, caked material and loose material by revolving brooms or other mechanical sweepers supplemented with hand equipment as directed. When mixtures are to be placed on portland cement concrete pavement or overlaid portland cement concrete, the contractor shall remove excess joint filler from the surface by an approved burning method. The contractor shall remove any existing raised pavement markers prior to asphaltic concrete overlay operations.

When brooming does not adequately clean the surface, the contractor shall wash the surface with water in addition to brooming to clean the surface.

When liquid asphalt is exposed to traffic for more than 2 calendar days, becomes contaminated, or degrades due to inclement weather, the liquid asphalt shall be reapplied at the initial recommended rate at no direct pay.

(b) Applying Liquid Asphalt Materials:

(1) Existing Pavement Surfaces: Before constructing each course, an approved asphalt tack coat shall be applied in accordance with Section 504. The contractor shall protect the tack coat and spot patch as required.

(2) Raw Aggregate Base Course and Raw Embankment Surfaces: The contractor shall apply an approved asphalt prime coat to unprimed surfaces, or protect in place prime coat and spot patch as required with asphalt prime coat, in accordance with Section 505.

(3) Cement and Lime Stabilized or Treated Embankment and Base Course Surfaces: The contractor shall apply an approved asphalt curing membrane when none is in place, or protect the in place curing membrane and spot patch, as required, with asphalt material in accordance with Section 506.

(4) Other Surfaces: Contact surfaces of curbs, gutters, manholes, edges of longitudinal and transverse joints, and other structures shall be covered with a uniform coating of an approved asphalt tack coat complying with Section 504 before placing asphaltic mixtures.

502.06 JOINT CONSTRUCTION.

(a) Longitudinal Joints: Longitudinal joints shall be constructed by setting the screed to allow approximately 25 percent fluff and also overlapping the paver approximately 2 inches (50 mm) onto the adjacent pass. Prior to rolling, the overlapped mix shall be pushed back to the uncompacted side, without scattering loose material over the uncompacted mat, to form a vertical edge above the joint. The vertical edge shall then be compacted by rolling to form a smooth, sealed joint. Longitudinal joints in one layer shall offset those in the layer below by a minimum of 3 inches (75 mm); however, the joint in the top layer shall be offset 3 inches (75 mm) to 6 inches (150 mm) from the centerline of pavement when the roadway comprises two lanes of width, or offset 3 inches (75 mm) to 6 inches (150 mm) from lane lines when the roadway is more than two lanes. The narrow strip shall be constructed first.

Where adjacent paving strips are to be placed, the longitudinal edge joint of the existing strip shall be tacked.

(b) Transverse Joints: Transverse joints shall be butt joints formed by cutting back on the previously placed mixture to expose the full depth of the lift. An approved 10 foot (3.0 m) static straightedge shall be used to identify the location at which the previously placed mixture is to be cut back to maintain no greater than a 1/8 inch (3 mm) deviation in grade. The cut face of the previously placed mat shall be lightly tacked before fresh material is placed. The screed shall rest on shims that are approximately 25 percent of plan thickness placed on the compacted mat. Transverse joints shall be formed by an adequate crew. Transverse joints shall be checked by the engineer for surface tolerance using a stringline extended from a point 10 feet (3 m) before the joint to a point approximately 40 feet (12 m) beyond the joint. Any deviation in grade from the stringline in excess of 3/16 inch (5 mm) for roadway wearing courses and 1/4 inch (6 mm) for other courses shall be immediately corrected prior to the paving operation continuing beyond 100 feet (30 m) of the transverse joint. Additionally, the transverse joint shall meet the surface tolerance requirements of Table 502-3. The contractor shall make necessary corrections to the joint before continuing placement operations.

Transverse joints in succeeding lifts shall be offset at least 3 feet (1.0 m).

502.07 HAULING, PAVING AND FINISHING. Mixtures shall be transported from the plant and delivered to the paver at a temperature no cooler than 25°F (14°C) below the lower limit of

the approved job mix formula. The temperature of the mix going through the paver shall not be cooler than 250°F (120°C).

No loads shall be sent out so late in the day that completion of spreading and compaction of the mixture cannot be completed during daylight, unless artificial lighting has been approved.

When segregation occurs, haul trucks shall be loaded with a minimum of three drops of mix, the last of which shall be in the middle.

Each course of asphaltic mixture shall be placed in accordance with the specified lift thickness. When no lift thickness is specified, or when substitute mixtures are utilized as specified in Subsection 502.01, mixtures shall be placed in accordance with Table 502-4.

With the engineer's approval, motor patrols may be used to fill isolated depressions in the initial layer, provided this construction does not result in unsatisfactory subsequent lifts.

(a) Coordination of Production: The contractor shall coordinate and manage plant production, transportation of mix and placement operations to achieve a high quality pavement and shall have sufficient hauling vehicles to ensure continuous plant and roadway operations. The engineer will order a halt to operations when sufficient hauling vehicles are not available.

On final wearing course construction under traffic with pavement layers of 2 inches (50 mm) compacted thickness or less, the contractor will be permitted to pave one travel lane for a full day. The contractor shall pave the adjacent travel lane the next work day. When the adjacent travel lane is not paved the next calendar day and the longitudinal joint is exposed to traffic for more than 3 calendar days, and it has been determined that the subsequent roadway edge is not true to line and grade as previously constructed, the entire length of exposed longitudinal joint shall be cut back to plan thickness to a vertical edge and heavily tacked. When pavement layers are greater than 2 inches (50 mm) compacted thickness, the contractor shall place approximately 1/2 of each day's production in one lane and the remainder in the adjacent lane.

Pavement shall be protected from traffic until it has sufficiently hardened to the extent the surface is not damaged.

(b) Paving Operations: When placing the final two lifts of asphaltic concrete on the roadway travel lanes, a material transfer vehicle (MTV), as described in Subsection 503.10, will be required to deliver mixtures from the hauling equipment to the paving equipment, and to prevent segregation of the asphaltic concrete hot mix. The MTV is required regardless of ADT. All mixtures shall flow through the paver hopper. Mixtures dropped in front of the paver shall be either lifted into the hopper or rejected and cast aside. Delivery of material to the paver shall be at a uniform rate and in an amount within the capacity of paving and compacting equipment. The paver speed and number of trucks shall be adjusted to have one truck waiting in addition to the one at the paver in order to maintain continuous paving operations. The height of material in front of the screed shall remain uniform.

During mixture transfer, the paver shall not be jarred or moved out of alignment. The level of mix in the paver hopper shall not drop so low as to expose the hopper feed slats.

Pavers shall be designed and operated to place mixtures to required line, grade and surface tolerance without resorting to hand finishing.

Longitudinal joints and edges shall be constructed along lines established. Stringlines or other forms of longitudinal control shall be placed by the contractor for the paver to follow. The paver shall be positioned and operated to closely follow the established line. Irregularities in alignment shall be corrected by trimming or filling directly behind the paver.

After each load of material has been placed, the texture of the unrolled surface shall be checked to determine its uniformity. The adjustment of screed, tamping bars, feed screws, hopper feed, etc., shall be checked frequently and adjusted as required to assure uniform spreading of the mix to proper line and grade and adequate compaction. When segregation of materials or other deficiencies occur, paving operations shall be suspended until the cause is determined and corrected.

Surface irregularities shall be corrected directly behind the paver. Excess material forming high spots shall be removed. Indented areas shall be filled and finished smooth. Hand placement in accordance with Heading (c) for surface repair will be permitted. Material shall not be cast over the surface.

When paving and finishing operations are interrupted so that the mixture remaining in trucks, paver, paver hopper or on the pavement cools to such extent that it cannot be placed, finished or compacted to the same degree of smoothness and with the same texture and density as the uncooled mixture, the cooled mixture shall be removed and replaced at no direct pay.

When additional mix is required to increase superelevation in curves, the use of automatic slope control will be optional with the contractor.

The traveling reference plane method of construction will be required for airport runways unless designated otherwise on the plans. Pavers for roadway travel lanes shall be equipped with automatic screed and slope control devices used with an erected stringline, unless the contractor elects to use an approved automated base course grading machine. If the automated base course grading machine is used with an erected stringline, an approved traveling reference plane shall be used with the paver.

The following requirements shall apply for mechanical pavers:

(1) Traveling Reference Plane: An approved traveling reference plane shall be used. After the initial paving strip of each lift is finished and compacted, adjacent paving strips shall be placed to the grade of the initial paving strip using the traveling reference plane or shoe device to control grade and a slope control device to control cross slope.

On multilane pavements, the initial paving strip and the sequence of lane construction will be subject to approval.

When both outside edges of the paving strip being placed are flush with previously placed material, the slope control device shall not be used. A grade sensor is required for each side of the paver.

In superelevated curves, the cross slope shall be changed from that specified for tangents to that specified for superelevation in gradual increments while the paver is in motion so a smooth transition in grade is obtained. This change in cross slope shall be accomplished within the transition distance specified.

This is the minimum acceptable method and the contractor must meet or exceed current surface tolerance specifications.

(2) Erected Stringline: An erected stringline shall consist of a piano wire or approved equal stretched between stakes set at no greater than 25 foot (7.5 m) intervals tensioned between supports so that there is less than 1/8 inch (3 mm) variance between supports when the sensor is in place. The stringline elevation will be verified by the Department using standard surveying practices.

The initial paving strip of the first lift shall be constructed using an erected stringline referenced to established grade. When permitted, mixtures required to level isolated depressions may be placed without automatic screed control. Subsequent lifts may be constructed by use of the traveling reference plane, provided surface and grade tolerances are met on the previous lift.

Only one grade sensor and the slope control device are necessary for roadways with a normal crown on tangent alignment. Superelevated curves will require the use of two grade sensors and two erected stringlines to obtain proper grade and slope; however, when the automatic screed control device is equipped with a dial or other device which can be conveniently used to change the cross slope in small increments, superelevated curves may be constructed using this device and one erected stringline.

After the initial paving strip of the first lift is finished and compacted, adjacent paving strips shall be laid using an approved traveling reference plane.

(3) Without Automatic Screed Control: When permitted, pavers without automatic screed control may be used for pavement patching, pavement widening, paved drives and turnouts.

(c) Hand Placement: When the use of mechanical finishing equipment is not practical, the mix may be placed and finished by hand to the satisfaction of the engineer. No casting will be allowed including casting the mixture from the truck to the grade. During paving operations material shall be thoroughly loosened and uniformly distributed. Material that has formed into lumps and does not break down readily will be rejected. The surface shall be checked before rolling and irregularities corrected.

502.08 COMPACTION.

(a) General: After placement, mixtures shall be uniformly compacted, by rolling while still hot, to at least the density specified in Table 502-3. If continuous roller operation is discontinued, rollers shall be removed to cooler areas of the mat, where they will not leave surface indentations. The use of steel wheel rollers which result in excessive crushing of aggregate will not be permitted.

The rolling pattern established by the contractor shall be conducted by experienced operators in consistent sequences and by uniform methods that will obtain specified density and smoothness. Individual roller passes shall uniformly overlap preceding passes to ensure complete coverage of the paving area. The speed and operation of rollers shall not displace, tear or crack the mat. Nonvibrating steel wheel rollers shall be operated with drive wheels toward the paver. Any operations causing displacement, tearing or cracking of the mat shall be immediately corrected.

Equipment which leaves tracks or indented areas which cannot be corrected in normal operations or fails to produce a satisfactory surface shall not be used. Operation of equipment

resulting in accumulation of material and subsequent shedding of accumulated material into the mixture or onto the mat will not be permitted.

To prevent adhesion of mixture, wheels of steel wheel rollers shall be kept properly moistened, but excess water will not be permitted.

Pneumatic tire rollers shall be operated so that tires will retain adequate heat to prevent mix from adhering to tires. The pneumatic tire roller shall be operated at a contact pressure which will result in a uniform, tightly knit surface. The pneumatic tire roller shall be kept approximately 6 inches (150 mm) from unsupported edges of the paving strip; however, when an adjacent paving strip is down, the roller shall overlap the adjacent paving strip approximately 6 inches (150 mm).

Vibratory rollers may be used provided they do not impair the stability of the pavement structure or underlying layers. Vibratory rollers shall not be used on the first lift of asphaltic concrete placed over the asphalt treated drainage blanket. When mix is placed on newly constructed cement or lime stabilized or treated layers, vibratory rollers shall not be used for at least 7 days after such stabilization or treatment.

It is the responsibility of the contractor to determine the number, size, and type of rollers to sufficiently compact the mixture to the specified density and surface smoothness. The rolling equipment shall be capable of maintaining the pace of the paver and shall conform to Subsection 503.06.

The surface of mixtures after compaction shall be smooth and true to cross slope and grade within the tolerances specified. Mixtures that become loose, broken, contaminated or otherwise defective shall be removed and replaced with fresh hot mixture compacted to conform with the surrounding mixture.

Excessive rippling of the mat surface will not be accepted. Ripples are small bumps in the pavement surface which usually appear in groups in a frequent and regular manner. There shall be no more than 12 ripples or peaks in any 100-foot (30 m) section. Rippling indicates a problem with the paving operation or mix that requires immediate corrective action by the contractor; otherwise operations shall cease. Unacceptable areas shall be corrected at no direct pay.

(b) Rolling: After rolling, newly finished pavements shall have a uniform, tightly knit surface free of cracks, tears, roller marks or other deficiencies. Deficiencies shall be corrected at no direct pay and the contractor shall adjust operations to correct the problem. This may require the contractor to adjust the mix or furnish additional or different equipment.

(c) Hand Compaction: Along forms, curbs, headers, walls and at other places inaccessible to rollers, mixture shall be uniformly compacted to the satisfaction of the engineer with approved hand tampers or mechanical tampers, conforming to Subsection 503.07.

502.09 PAVEMENT SAMPLES. Samples shall be cores approximately 4 inches (100 mm) or 6 inches (150 mm) in diameter taken by an approved core drill. The contractor shall furnish samples cut from the completed work. The removed pavement shall be replaced with hot or cold mixture and refinished during the work day coring is performed. No additional compensation will be allowed for furnishing test samples and replacing the areas with new pavement. Samples shall be taken by the contractor in the presence of the engineer's representative from areas

selected by the Department in accordance with Subsection 502.12(c)(3). When the design thickness is greater than 1.75 inches (45 mm), cores less than 1 3/8 inches (35 mm) thick shall not be used as pavement samples for payment determination.

Cores shall be transported to the plant in approved styrofoam transport containers or one gallon (4 L) friction top cans. Regardless of transport container used, the container will be sealed, signed, and dated by the inspector using an approved method. The individually wrapped core will also be sealed, signed, and dated by the inspector using an approved method. Any evidence of tampering with the core wrappings, sticker, or of opening the container or friction top can will result in the cores being rejected. Additional pavement samples will be required.

502.10 SURFACE TOLERANCE REQUIREMENTS.

(a) General: This subsection outlines the method of measuring surface tolerance and the acceptance limits for quality control and assurance, including corrective actions and/or payment adjustments for asphaltic concrete surface tolerance. Longitudinal surface profile shall be measured in inches per mile (mm per km) in accordance with DOTD TR 644 and reported as the International Roughness Index (IRI), as defined in the National Cooperative Highway Research Program (NCHRP) Report No. 228 and World Bank Technical Paper No. 46.

Control of transverse, cross slope and grade shall be measured in inches (millimeters) using an approved 10-foot (3.0 m) metal static straightedge. For shoulders, turnouts, crossovers, detour roads, parking areas and roadway sections less than 500 feet (150 mm) in length, the wearing course shall be tested and the surface deviations shall not exceed 1/2 inch (15 mm). Areas with surface deviations in excess of 1/2 inch (15 mm) shall be isolated and corrected by the contractor in accordance with Heading (e).

The contractor shall furnish an inertial profiler to measure both wheelpaths simultaneously with laser or infrared height sensing equipment. The contractor shall also furnish an approved 10 foot (3.0 m) metal static straightedge for transverse acceptance testing.

Surface tolerance testing will be required on wearing and binder courses for roadway travel lanes. It will be required on the wearing course only for shoulders, parking areas and airport runways and taxiways. For surface tolerance purposes, the wearing course is defined as the final lift placed. The binder course is defined as the last lift placed prior to the final lift.

Other lifts on which additional asphaltic concrete is to be placed shall be finished so that succeeding courses will meet the requirements of this subsection. Base courses on which portland cement concrete pavement is to be placed shall be finished so that the portland cement concrete pavement will meet the requirements of Section 601.

(b) Equipment: Inertial profilers shall be capable of testing the finished surface in the longitudinal direction for conformance to the surface tolerance requirements listed in this subsection.

The Department will evaluate and verify the accuracy of the inertial profiler annually using static and dynamic tests in accordance with DOTD TR 644. Approved profilers will have a DOTD decal indicating the date of profiler verification and profiler system parameter settings. These settings shall be verified by the inspector before the first day of binder course paving and randomly thereafter.

For each project, a Department representative will observe the daily set up procedure and pre-operation tests which are performed by the contractor in accordance with the manufacturer's procedures and DOTD TR 644. A copy of the manufacturer's setup procedure, pre-operation procedures, and operating procedure for measuring surface tolerance shall be available at all times during measurement.

(c) Transverse, Cross Slope and Grade:

(1) Transverse Surface Tolerance: The contractor shall control the transverse surface finish. The Department will test the surface of the binder and wearing courses at selected locations in the transverse direction for conformance to the surface tolerance requirements of Table 502-3, which shall not be exceeded. The contractor shall make corrections as directed in accordance with Heading (e) "Correction of Deficient Areas."

(2) Cross Slope: When the plans require the section to be constructed to a specified cross slope, the contractor shall take measurements at selected locations, using a stringline, slope board or other comparable method. The contractor shall control the cross slope so that the values shown in Table 502-3 are not exceeded. Cross slope variations allowed in Table 502-3 shall apply to each lane constructed.

(3) Grade: When the plans require the pavement to be constructed to a grade, the contractor shall perform tests for conformance at selected locations, using a stringline or other comparable method. The contractor shall control grade variations so that the tolerances shown in Table 502-3 are not exceeded. Grade tolerances shall apply to only one longitudinal line, such as the centerline or outside edge of pavement. The contractor shall make corrections in accordance with Heading (e) of this subsection.

(d) Longitudinal Surface Tolerance:

(1) Quality Assurance:

a. Contractor Responsibilities: The contractor shall report an average IRI number in inches per mile (mm per km) and shall measure and report the average IRI value for each wheelpath on every 0.05-mile (0.08 km) segment of highway. The IRI values for the inside and outside wheelpaths shall be averaged and reported as the segment average and the mean of each segment average shall be reported as the sublot average. The contractor shall measure the top two lifts of the roadway travel lanes. Final acceptance will be based on the last measurement taken on the final wearing course of the travel lanes (the top or last lift placed). Measurement of the center two lanes will be required for airports.

b. Reporting: The average sublot values and individual IRI values shall conform to the requirements listed in Tables 502-7A and 502-7B. The contractor shall provide the engineer a copy of the IRI report. The contractor shall test the pavement during the first work day following placement, but in no case any later than 7 calendar days. The measurement of "short"segments, less than 264 feet (80 m) in length, shall be included in adjacent sublots. Isolated rough areas will not be allowed. Any 0.05-mile (0.08 km) segment and all individual wheelpath measurements of the binder and wearing courses shall meet the requirements of Table 502-7B. The contractor shall make corrections in accordance with Subsection 502.10(e). A DOTD inspector will be present for the final test run and will immediately receive a copy of the results.

(2) Acceptance: The Department will review each sublot report provided by the contractor. Acceptance of each sublot will be in accordance with Tables 502-7A and 502-7B, based on the IRI profile report provided by the contractor. The Department may elect to perform and utilize independent ride quality test results for acceptance at any time.

(e) Correction of Deficient Areas: The contractor shall correct areas not meeting Table 502-7B requirements for individual wheelpath measurements in a 0.05-mile (0.08 km) segment.

(1) Deficiencies in Wearing Course: The contractor shall correct deficiencies in the final wearing course by diamond grinding and applying a light tack coat, removing and replacing, or furnishing and placing a supplemental layer of wearing course mixture at least 1 1/2 inches (40 mm) compacted thickness for the full width of the roadway meeting specification requirements at no direct pay. If the supplemental layer does not meet specification requirements to the satisfaction of the engineer, the contractor shall remove and replace or correct it by other methods approved by the engineer.

(2) Deficiencies in Binder Courses: The contractor shall correct deficiencies in binder course, transverse, cross slope, and grade measurements to meet specification requirements at no direct pay. Corrections shall be made before subsequent courses are constructed.

(3) Deficiencies in Shoulder Transverse, Cross Slope and Grade: The contractor shall correct deficiencies in these areas by grinding at the project engineer's direction.

(f) Exceptions and Exclusions:

(1) Excluded Areas: The Department will review the profile report obtained for each binder and wearing course on a sublot basis. In special cases or extenuating circumstances, the engineer may isolate or exclude sections of the profile. These special cases or extenuating circumstances may be curb and gutter sections that require the adjustment of cross-slope in order to maintain adequate drainage, manholes, catch basins, valve and junction boxes, street intersections, or other structures located in the roadway which cause abrupt deviations in the profile. This specification exclusion will not be used to simply isolate sections of road that are in poor condition when the project is let.

(2) Areas Outside Travel Lanes: Ramps less than 1500 feet (460 m), tapers, shoulders and medians, or sections of pavement surfaces as directed by the engineer such as 300 feet (90 m) from bridge ends, will not be included in the ride quality index for payment purposes, but shall have a maximum IRI average of 110 or less in a sublot.

502.11 DIMENSIONAL REQUIREMENTS. Mixtures that are specified for payment on a cubic yard (cu m) or square yard (sq m) basis shall conform to the following dimensional requirements. Overthickness and overwidth will be waived at no direct pay.

(a) Thickness: Thickness of mixtures will be determined in accordance with DOTD TR 602. Underthickness shall not exceed 1/4 inch (6 mm).

When grade adjustments are permitted for all mixtures except the final wearing course, areas with underthickness in excess of 1/4 inch (6 mm) shall be corrected to plan thickness at no direct pay by furnishing and placing additional mixture in accordance with Subsection 502.10(e). For the final wearing course, areas with underthickness in excess of the 1/4 inch (6 mm) shall be

corrected to plan thickness at no direct pay by furnishing and placing a supplemental layer of wearing course mixture meeting specification requirements in accordance with Subsection 502.10(e) over the entire area for the full width of the roadway when grade adjustments are permitted.

When grade adjustments do not permit, the deficient underthickness area shall be removed and replaced at no direct pay.

(b) Width: The width of completed courses will be determined in accordance with DOTD TR 602. Underwidths shall be corrected by furnishing and placing additional mixture to a minimum width of 1 foot (0.3 m) and plan thickness at no direct pay.

502.12 QUALITY CONTROL AND ACCEPTANCE.

(a) Quality Control Requirements: For quality control purposes, the contractor shall obtain a minimum of two (2) samples of mixture from each sublot using a stratified random sampling approach. Test results for theoretical maximum specific gravity (G_{mm}) and measured bulk specific gravity (G_{mb}) at N_{max} and percent G_{mm} at $N_{initial}$, on samples of each sublot shall be reported. Control charts may be requested by the engineer if mixture problems develop. Quality control gyratory samples may be aged or unaged at the contractor's option, but the method chosen shall be used consistently throughout the project. If aged samples are used, report the measured G_{mb} @ N_{max}. If unaged samples are used, report the estimated G_{mb} @ N_{max}. One loose mix sample shall be taken from each sublot after placement of the mix in the truck. The mix shall be tested by the contractor at the plant for aggregate gradation, asphalt content and percent crushed aggregate. The mix shall be tested in accordance with DOTD TR 309, TR 323 and TR 306. The lot average and standard deviation shall be determined for aggregate gradation and asphalt content. The percent within limits (PWL) shall be determined on the Nos. 8 and 200 (2.36 mm and 75 μm) sieves and for G_{mm}. Corrective action shall be taken if these parameters fall below 90 PWL. For each lot, the contractor shall report all quality control data to the DOTD Certified Plant Technician. The full range of gradation mix tolerances will be allowed even if they fall outside the control points. The percent moisture in loose mix shall be reported once per lot. The District Laboratory Engineer may require re-validation of the mix when the average of the Quality Control data indicates non-compliance with the specified limits or tolerances.

(b) Acceptance Requirements: All Department inspection procedures, including sampling and testing, form the basis for acceptance of the asphaltic concrete. Any section of pavement that is obviously deficient shall be satisfactorily corrected or replaced. Sampling and testing shall be accomplished following a stratified sampling plan in accordance with the Materials Sampling Manual and specified test procedures. Times and locations shall be established by the engineer.

Acceptance testing for air voids will be conducted on the total lot quantity. Acceptance testing for pavement density, surface tolerance and dimensional tolerances will be conducted on that portion of the lot placed on each contract.

Pavement density and surface tolerance requirements will not be applied for short irregular sections, such as drives, aprons and turnouts; however, hot mix shall be placed to provide a neat, uniform appearance and shall be compacted by satisfactory methods. If placed in a separate lot, mixtures used for shoulders which are less than 10 feet (3.0 m) wide, curbs,

driveways, turnouts, crossovers, joint repair, leveling, guardrail widening, islands, bike paths, patching, widening, and miscellaneous handwork will be paid in accordance with Section 502.12(c) and Table 502-8 as a small quantity lot. If placed at the same time and in the same lot as roadway travel lanes, then these items will be considered incidental to the roadway work and will be included in the roadway pay.

Shoulders that are 10 feet (3.0 m) wide or greater shall be placed in a lot separate from the roadway travel lanes and will be paid in accordance with Tables 502-4 and 502-6.

A standard lot is 5,000 tons (5000 Mg), of consecutive production of asphaltic concrete mix from the same job mix formula produced for the Department at an individual plant. A standard sublot is 1,000 tons (1000 Mg). Additional adjustments may be made to the standard lot size as specified in this subsection. The final sublot, at the end of a project lot, may be increased up to 150 percent to accommodate hauling unit capacity.

With good historical performance, and when agreed upon by the engineer and contractor, the sublot size may be increased to 2000 tons (2000 Mg). Twenty-four hour per day plant production usually necessitates such an increase.

(c) Small Quantity Lots: The engineer or contractor may decrease the size of an individual lot for any of the following conditions:

(1) The interval between continuous production exceeds 2 days.
(2) A new job mix formula is accepted.
(3) The final lot is less than 5,000 tons (5000 Mg).
(4) The total project quantity is less than 5000 tons (5000 Mg).

Only standard 1000 ton (1000 Mg) sublots will be allowed when determining pay for small quantity lots. For lots with less than 3000 tons (3000 Mg) of mix, each sublot will be paid individually in accordance with Table 502-8. For lots with 3 or 4 sublots, PWL calculations will be required in accordance with Table 502-6.

For projects, or separate locations within a project, requiring less than 250 tons (250 Mg), the job mix formula, materials, and plant and paving operations shall be satisfactory to the engineer. Sampling and testing requirements may be modified by the engineer and the payment adjustment for deviations waived.

(d) Inspection: Hot mix exhibiting deficiencies before placement such as segregation, contamination, lumps, nonuniform coating, excessive temperature variations or other deficiencies, apparent on visual inspection, shall not be placed.

Hot mix exhibiting deficiencies during placement, such as segregation, contamination, alignment deviations, variations in surface texture and appearance or other deficiencies, apparent on visual inspection, will not be accepted. Poor construction practices such as handwork, improper truck exchanges, improper joint construction, or other deficiencies, apparent on visual inspection, will not be accepted.

Deficiencies revealed by visual inspection after placement and before final acceptance shall be corrected at no direct pay.

(e) Sampling and Testing for Acceptance: The Department will take samples or perform tests as outlined in these specifications, to ensure that the asphaltic concrete conforms to Department standards, which include job mix limits, typical sections, material properties, and

surface deviations. Plant acceptance tests will be performed for VFA and air voids in the specimen compacted to N_{design} to determine the acceptability of the asphaltic concrete at the plant unless directed otherwise by the engineer. If the average VFA for 5 samples is outside the specifications limits, satisfactory adjustments must be made or production shall be discontinued. The plant acceptance tests for air voids shall be subject to payment adjustments and sampling and testing in accordance with the requirements of Heading (f) below.

(f) Payment Adjustments: When the mix does not meet requirements in the areas listed in this section, the Payment Adjustment Schedule shown in Tables 502-6, 502-7 or 502-8 will be applied. Production of mix that is not eligible for 100 percent payment will not be allowed on a continuous basis. When test results demonstrate that payment adjustments are necessary, satisfactory adjustments shall be made, or production shall be discontinued.

The Department will pay the contractor at an adjusted rate as specified in Tables 502-6 or 502-8 for tests conducted by the Department on samples obtained from each lot of material, in accordance with the following Headings.

(1) Volumetric Properties: Testing for percent air voids will be conducted by the Department. Test results of mixture specimens compacted to N_{design} shall comply with Table 502-4 when tested in accordance with AASHTO TP 4 and DOTD TR 304. One sample will be taken from each of five (5) sublots. The data will be used to determine if the lot is outside acceptance limits shown in Table 502-4. If the lot is outside the acceptance limits, an adjustment in unit price for the lot will be made in accordance with Tables 502-6 or 502-8.

(2) Pavement Density: Acceptance testing for pavement density will be conducted by the Department. Three pavement samples for each mix use shall be obtained from each sublot within 24 hours after placement. Sampling shall be performed using the random number tables shown in DOTD S605. When this falls on a day the contractor is not working, sampling shall be done within 3 calendar days. The density requirement for each lot will be as shown in Table 502-3 determined in accordance with DOTD TR 304. Payment will be made in accordance with Table 502-6 using the total number of cores for the lot in accordance with Subsection 502.12(g). Payment for small quantity lots will be made in accordance with Table 502-8.

When the sampling location determined by random sampling falls within areas that are to be replaced or within 1 foot (0.3 m) of the unsupported pavement edge, another random sampling location will be used.

(g) Quality Level Analysis: The Quality Level Analysis is a statistical quality control/quality acceptance (QC/QA) method for validating Job Mix Formulas (JMF), contractors quality control, project acceptance and payment for all Superpave asphaltic concrete.

The mean $(\overline{X})$ is the average of a set of numbers. To determine the mean add the numbers (X_i) in the set and divide by the number of numbers (n) in the set.

$$\text{Mean} = \overline{X} = \frac{X_1 + X_2 + X_3 + \ldots + X_n}{n} = \frac{\sum_{i=1}^{n} X_i}{n}$$

The standard deviation of a set of numbers measures the spread of the numbers in the set or the deviation from the mean. Calculate the standard deviation according to the following formula:

$$\text{Standard Deviation} = s = \sqrt{\frac{(X_1 - \overline{X})^2 + (X_2 - \overline{X})^2 + \ldots + (X_i - \overline{X})^2}{n-1}}$$

$$= \sqrt{\frac{\sum_{i=1}^{n} (X_i - \overline{X})^2}{n-1}}$$

A Quality Index is calculated using both the upper and lower specification limits (if applicable). The Quality Index calculated using the upper or higher specification limit is called the Upper Quality Index (Q_U). The Quality Index calculated using the lower specification limit is called the Lower Quality Index (Q_L).

To determine each Quality Index, the specification limits are added or subtracted from the mean of the test results and the result is divided by the standard deviation as shown below.

$$\text{Upper Quality Index} = Q_U = \frac{USL - \overline{X}}{s} \qquad \text{Lower Quality Index} = Q_L = \frac{\overline{X} - LSL}{s}$$

Where: USL = upper specification limit
LSL = lower specification limit

Table 502-5 is used to convert the Quality Index into the PWL value. A PWL is calculated for each Quality Index (upper and lower) and combined for a total PWL calculated in accordance with the formula:

$$PWL = PWL_L + PWL_U - 100$$

where: PWL_L = lower percent within limits
PWL_U = upper percent within limits

In using Table 502-5, the appropriate columns corresponding to the number of test results must be used.

If a specification requirement does not have both an upper and lower limit only one Quality Index and PWL, upper or lower as appropriate, is calculated and the other PWL is equal to 100 in the total PWL calculation.

502.13 MEASUREMENT. Asphalt tack coat, prime coat or curing membrane will not be measured for payment.

(a) Weight Measurement: Asphaltic concrete will be measured by the ton of 2,000 pounds (Mg (1000 kg)) from printed weights as provided in Section 503. Stamped printer tickets will be issued for each truckload of material delivered. Material lost, wasted, rejected or applied contrary to specifications will not be measured for payment.

Estimated quantities of asphaltic concrete shown on the plans are based on 115 lb/sq yd/inch (2.46 kg/sq m/mm) thickness. The measured quantity of asphaltic mixtures will be multiplied by the following adjustment factor to obtain the pay quantity.

Theoretical Maximum Specific Gravity, (G_{mm}) (DOTD TR 327)	Adjustment Factor
2.340 - 2.360	1.02
2.361 - 2.399	1.01
2.400 - 2.540	1.00
2.541 - 2.570	0.99
2.571 - 2.590	0.98

The adjustment factor for mixtures with theoretical maximum specific gravities less than 2.340 or more than 2.590 will be determined by the following formulas:

Theoretical maximum specific gravity less than 2.340:

$$F = \frac{2.400}{S}$$

Theoretical maximum specific gravity more than 2.590:

$$F = \frac{2.540}{S}$$

where,
F = quantity adjustment factor
S = theoretical maximum specific gravity of mixture from approved job mix formula

(b) Volume or Area Measurement: The quantities for payment will be the design quantities specified in the plans and adjustments thereto. Design quantities will be adjusted when the engineer makes changes to adjust to field conditions or when design changes are

necessary. Design quantities are based on the horizontal dimensions and compacted thickness of the completed course shown on the plans.

(c) Surface Tolerance Incentive Measurement: At the completion of construction of the wearing course travel lanes, the contractor, in the presence of a DOTD representative, shall measure a continuous profile from the start station to the end station of the construction project for the purpose of determining qualification for incentive pay under Subsection 502.14(e). Bridges and 300 feet (90 m) on each end of the bridge will be excluded from measurements for surface tolerance incentive pay.

502.14 PAYMENT. Payment for asphaltic concrete will be made at the contract unit price on a lot basis. When the mix does not conform to acceptance requirements, payment will be made at an adjusted price per unit of measurement in accordance with Subsection 502.12(f) and Tables 502-6 and 502-8 for both plant and roadway acceptance.

(a) General: Payment for asphaltic concrete will include furnishing all required materials, producing the mixtures, preparing the surfaces on which the mixtures are placed, hauling the mixtures to the work site, and placing and compacting the mixtures.

(b) Wearing Course Mixes: For wearing course travel lanes, adjustments in contract price for plant and roadway deficiencies or incentives will be based on the average of the percent payments for plant air voids, roadway density, and surface tolerance. For all other wearing course applications, payment adjustment will be based on the average of the percent payments for plant air voids and roadway density.

(c) Base, Binder and Shoulder Mixes: For base and binder courses for travel lanes and all shoulder mixes, adjustments in contract price for plant and roadway deficiencies or incentives will be based on the average of the percent payments for plant air voids and roadway density.

Final adjustments in unit price will be as described in Tables 502-6 and 502-8.

(d) Erected Stringline: When the use of an erected stringline is not specified, but directed by the engineer, an additional payment of $500 per contract plus $0.25 per linear foot ($0.75 per lin m) will be made for mixtures placed by the erected stringline method. When the use of an erected stringline is specified, no additional payment will be made.

(e) Incentive Pay: A surface tolerance incentive payment equal to 5 percent of the contract unit price for the theoretical travel lane quantity of the wearing course item will be paid if the contractor achieves a project average IRI of 45 or less as measured at the completion of the project. No lot of wearing course on the project shall be less than 100 percent for surface tolerance. Only projects that have no areas of grinding are eligible for incentive pay.

Payment will be made under:

Item No.	Pay Item	Pay Unit
502-01	Superpave Asphaltic Concrete	Ton (Mg)
502-02	Superpave Asphaltic Concrete	Cubic Yard (Cu m)
502-03	Superpave Asphaltic Concrete, (in (mm) Thick)	Square Yard (Sq m)

FOR INFORMATION ONLY

Table 502-3
Superpave Requirements

A. REQUIREMENTS FOR EXTRACTED ASPHALT CEMENT AND AGGREGATE GRADATION					
U.S. (Metric) Sieve % Passing	1/2 inch (12.5 mm) Nominal	3/4 inch (19 mm) Nominal	1 inch (25 mm) Nominal	1.5 inch (37.5 mm) Nominal	Mix Tolerance[1]
2 inch (50 mm)	---	---	---	100	±4
1 1/2 inch (37.5 mm)	---	---	100	90-100	±4
1 inch (25 mm)	---	100	90-100	89 Max.	±4
3/4 inch (19 mm)	100	90-100	89 Max	---	±4
1/2 inch (12.5 mm)	90-100	89 Max	---	---	±4
3/8 inch (9.5 mm)	89 Max.	---	---	---	±4
No. 4 (4.75 mm)	---	---	---	---	±4
No. 8 (2.36 mm)	34-58	29-49	23-45	19-41	±3
No. 16 (1.18 mm)	---	---	---	---	±2
No. 30 (600 µm)	---	---	---	---	±2
No. 50 (300 µm)	---	---	---	---	±2
No 100 (150 µm)	---	---	---	---	±2
No. 200 (75 µm)	4.0-10.0	3.0-8.0	2.0-7.0	1.0-6.0	±0.7
Extracted Asphalt, %	---	---	---	---	±0.2
Mix Temperature	---	---	---	---	±25°F (±14°C)

B. PAVEMENT REQUIREMENTS			
Density, Min. 92.0 (% of Theoretical Maximum Specific Gravity, DOTD TR 327) Travel Lane Wearing, Binder and Base Courses			
Density, Min. 89.0 (% of Theoretical Maximum Specific Gravity, DOTD TR 327) Shoulders			
Surface Tolerance Variation, inches (mm)[2]	Transverse[3]	Cross Slope[3]	Grade[4]
Roadway Travel Lane Wearing Courses	1/8 (3)	3/8 (10)	1/2 (15)
Binder Courses	1/4 (6)	1/2 (15)	1/2 (15)
Shoulder Wearing Course	3/16 (5)	3/4 (20)	3/4 (20)

[1] Job Mix Formula based on validated mix design.
[2] For longitudinal surface tolerance requirements, see Subsection 502.10(d).
[3] Based on 10 feet (3.0 mm).
[4] Applicable only when grade is specified.

Table 502-4
Superpave Design, Control and Acceptance Limits

Nominal Max., Size Agg.	0.5 inch[1] (12.5 mm)	0.5 inch (12.5 mm)			0.75 inch (19 mm)			1.0 inch (25 mm)			1.5 inch (37.5 mm)		
Type of Mix	Incidental Paving	Wearing Course			Wearing or Binder Course			Binder or Base Course			Base Course		
Level[2,3] (10^6 ESAL)	A <0.3	1[4] <3	2 3-30	3 >30	1[4] <3	2 3-30	3 >30	1 <3	2 3-30	3 >30	1 <3	2 3-30	3 >30
Asphalt Binder	Table 502-1												
Coarse Agg. Friction Rating[2]	I,II,III	I,II,III			I,II,III			I,II,III,IV			I,II,III,IV		
Coarse Agg. Angularity, % Crushed, (Double Faced) + No. 4 (4.75 mm)	55	75	95	98	75	95	98	75	95	98	60	75	98
Fine Agg. Angularity, Min. % - No. 8 (2.36 mm)	40	40	45	45	40	45	45	40	45	45	40	40	45
Flat and Elongated Particles, % Max. (5:1)	10	10			10			10			10		
Sand Equivalent, Min. % (Fine Agg.) - No. 4 (4.75 mm)	40	40	45	50	40	45	50	40	45	50	40	45	50
Natural Sand - Max. %	NA	15			15			15			25		
RAP, Max. %[5, 9]	15	15			15			20,30			30		
Compacted Mix Design													
VMA, Min. %[6]	13	13			12			11			10		
Air Voids, %[6, 10]	2.5-4.5	2.5-4.5			2.5-4.5			2.5-4.5			2.5-4.5		
VFA, %[6]	68-78	68-78			68-78			68-78			68-78		
$N_{initial}$ 89 % max.[7] (Gyrations)	7	7	8[8]	9	7	8[8]	9	7	8[8]	9	7	8[8]	9
N_{design} 96±1 % (Gyrations)	75	75	100[8]	125	75	100[8]	125	75	100[8]	125	75	100[8]	125
N_{max} 98 % max. (Gyrations)	115	115	160[8]	205	115	160[8]	205	115	160[8]	205	115	160[8]	205
Moisture Sensitivity, TSR Min.	80	80			80			80			80		
Dust/Effective Asphalt Ratio, %	0.6 - 1.6	0.6 - 1.6			0.6 - 1.6			0.6 - 1.6			0.6 - 1.6		
Lift Thickness, inch (mm)	1.0-2.0 (25-50)	1.5-2.0 (40-50)			1.5-2.0 (40-50)			2.0-4.0[11] (50-100)			4.0+ (100+)		

[1]May be used for airports, joint repair, leveling, driveways, shoulders, curbs, guardrail widening, islands, bike paths, parking lots, turnouts, crossovers, detour roads, and other incidental items approved by the engineer.
[2]Mixtures designated as Level 1F, 2F, and 3F must meet the requirements for Level 1, 2, and 3 respectively. Additionally, Level 1F, 2F, and 3F must meet the friction rating requirements in Table 502-2 for travel lane wearing courses with ADT > 7000.
[3]Design ESALs are the anticipated project traffic level expected on the design lane over a 20 year design period. Regardless of the actual design life of the roadway, determine the design ESALs for 20 years and choose the appropriate N_{design} level.
[4]When Level 1 wearing course is specified, 1/2 inch (12.5 mm) nominal maximum size aggregate shall be used.
[5]Maximum 20 % Rap shall be allowed in all shoulder wearing course mixtures. RAP shall not be allowed for airports.
[6]Air voids, VMA and VFA are determined on samples compacted to N_{design}.
[7]For Level 1 mixtures, $N_{initial}$ will be 90.5 % max. For Level A mixes, $N_{initial}$ will be 91.5 % max.
[8]For 20 year ESAL counts from 3 to 10 million use 7, 75 and 115 gyrations for $N_{initial}$, N_{design} and $N_{maximum}$ respectively.
[9]For 1.0 inch (25 mm) nominal maximum size aggregate the maximum percent RAP for binder course is 20 percent and the maximum percent RAP for base course is 30 percent.
[10]Air voids design target is 3.5%.
[11] For 1.0 inch (25 mm) nominal maximum size aggregate the maximum lift thickness for base course is 4+ inches (100+ mm).

Table 502-5
Quality Index Values for Estimating Percent Within Limits

PWL	n = 3	n = 4	n = 5 - 6	n = 7 - 9	n = 10 - 12	n = 13 - 15
99	1.16	1.47	1.68	1.89	2.04	2.14
98	1.15	1.44	1.61	1.77	1.86	1.93
97	1.15	1.41	1.55	1.67	1.74	1.80
96	1.15	1.38	1.49	1.59	1.64	1.69
95	1.14	1.35	1.45	1.52	1.56	1.59
94	1.13	1.32	1.40	1.46	1.49	1.51
93	1.12	1.29	1.36	1.40	1.43	1.44
92	1.11	1.26	1.31	1.35	1.37	1.38
91	1.10	1.23	1.27	1.30	1.32	1.32
90	1.09	1.20	1.23	1.25	1.26	1.27
89	1.08	1.17	1.20	1.21	1.21	1.22
88	1.07	1.14	1.16	1.17	1.17	1.17
87	1.06	1.11	1.12	1.12	1.13	1.13
86	1.05	1.08	1.08	1.08	1.08	1.08
85	1.03	1.05	1.05	1.05	1.04	1.04
84	1.02	1.02	1.02	1.01	1.00	1.00
83	1.00	0.99	0.98	0.97	0.96	0.96
82	0.98	0.96	0.95	0.94	0.93	0.92
81	0.96	0.93	0.92	0.90	0.89	0.89
80	0.94	0.90	0.88	0.87	0.85	0.85
79	0.92	0.87	0.85	0.83	0.82	0.82
78	0.89	0.84	0.82	0.80	0.79	0.78
77	0.87	0.81	0.79	0.77	0.76	0.75
76	0.84	0.78	0.76	0.74	0.72	0.72
75	0.82	0.75	0.73	0.71	0.69	0.69
74	0.79	0.72	0.70	0.67	0.66	0.66
73	0.77	0.69	0.67	0.64	0.63	0.62
72	0.74	0.66	0.64	0.61	0.60	0.59
71	0.71	0.63	0.60	0.58	0.57	0.56
70	0.68	0.60	0.58	0.55	0.54	0.54
69	0.65	0.57	0.55	0.53	0.51	0.51
68	0.62	0.54	0.52	0.50	0.48	0.48
67	0.59	0.51	0.49	0.47	0.46	0.45
66	0.56	0.48	0.46	0.44	0.43	0.42
65	0.53	0.45	0.43	0.41	0.40	0.40
64	0.49	0.42	0.40	0.38	0.37	0.37
63	0.46	0.39	0.37	0.35	0.35	0.34
62	0.43	0.36	0.34	0.33	0.32	0.31
61	0.39	0.33	0.31	0.30	0.30	0.29
60	0.36	0.30	0.28	0.27	0.26	0.26
59	0.32	0.27	0.25	0.24	0.24	0.23
58	0.29	0.24	0.23	0.21	0.21	0.21
57	0.25	0.21	0.20	0.19	0.18	0.18
56	0.22	0.18	0.17	0.16	0.16	0.15
55	0.18	0.15	0.14	0.13	0.13	0.13
54	0.14	0.12	0.11	0.11	0.10	0.10
53	0.11	0.09	0.08	0.08	0.08	0.08
52	0.07	0.06	0.06	0.05	0.05	0.05
51	0.03	0.03	0.03	0.03	0.03	0.03
50	0.00	0.00	0.00	0.00	0.00	0.00

Note 1: For negative values of Q_u or Q_L. PWL_U or PWL_L is equal to 100 minus the tabular PWL_U or PWL_L.
Note 2: If the value of Q_U or Q_L does not correspond exactly to a value in the table, use the next higher value.

Table 502-6
Payment Adjustments for Superpave

Payment adjustments will be based on specification limits.

A) PLANT ACCEPTANCE

Air Voids: The percent within limits (PWL) will be calculated for air voids for each lot and reported to the nearest whole number. Payment for plant acceptance will be in accordance with Table 502-6A.

Table 502-6A
Payment Adjustment Schedule for Plant Acceptance

Air Voids PWL	Percent Payment
100	103
88-99	100
71-87	98
51-70	90
21-50	80
≤20	50 or Remove[1]

[1]At the option of the Department after investigation.

B) ROADWAY DENSITY

The percent within limits (PWL) will be calculated for pavement density for each lot and reported to the nearest whole number. Payment for roadway density will be in accordance with Table 502-6B.

Table 502-6B
Payment Adjustment Schedule for Roadway Density

Roadway Density PWL	Percent Payment
98-100	105
89-97	100
79-88	98
61-78	90
31-60	80
≤30	50 or Remove[1]

[1]At the option of the Department after investigation.

C) SURFACE TOLERANCE (Final Wearing Course Travel Lanes Only)

Payment adjustments for surface tolerance for the final wearing course travel lanes will be based on the International Roughness Index (IRI) in accordance with Table 502-7 and Subsections 502.13 and 502.14. Percent payments will be determined for each sublot and averaged to determine payment for the lot.

D) TOTAL PAYMENT

The percent payment for the wearing course travel lanes will be the average of the percent payments for plant acceptance, roadway density, and surface tolerance for each lot. Incentive payment for surface tolerance will be in accordance with Subsection 502.14(e) and paid separately.

The percent payment for all other mix types will be the average percent payments for plant acceptance and roadway density for each lot.

All calculations for percent payment will be rounded to the nearest 1 percent.

Table 502-7A
Payment Adjustment Schedules for Longitudinal
Surface Tolerance, Maximum International Roughness Index,
inches per mile (mm per km)

Percent of Contract Unit Price (by Sublot)[1]	103%[2]	100%	90%	80%	50% or Remove[3]
Category A Multi-Lift New Construction and Overlays of More than two Lifts and all Interstates	<55 (<870)	<65 (<1030)	65-75 (1030-1180)	NA	>75 (>1180)
Category B One or Two Lift Overlays Over Cold Planed Surfaces, and Two-Lift Overlays Over Existing Surfaces[4]	<65 (1030)	<75 (<1180)	75-89 (1180-1400)	NA	>89 (>1400)
Category C Single-Lift Overlays Over Existing Surfaces	<75 (<1180)	<85 (<1340)	85-95 (1340-1500)	>95-110 (>1500-1740)	>110 (>1740)
Incentive Pay, Final Completion, Average of All Travel Lanes[5]	≤45 (≤710)				

[1]or portion of sublot placed on the project.
[2]Maximum payment for sublots with exception areas, exclusions or grinding is 100 percent.
[3]At the option of the engineer.
[4]Also applies to two-lift overlays on reconstructed bases without profile grade control.
[5]Only Category A projects with no grinding are eligible for incentive.

Table 502-7B
Individual Wheelpath Deficient Area Limits
Maximum International Roughness Index, inches per mile (mm per km)

Any 0.05 Mile (0.08 km) Segment	Wearing Course	Binder Course
Category A	89 (1400)	105 (1660)
Category B	99 (1560)	110 (1740)
Category C	110 (1740)	N/A

Table 502-8
Payment Adjustment Schedule for Small Quantities of Superpave[1]

Parameter[2]	Percent of Contract Unit Price/Sublot		
	100	95	50 or Remove[3]
% Air Voids	2.5-4.5	1.5-2.4 or 4.6-5.5	<1.5 or >5.5
Average Roadway Density, % G_{mm}	≥ Lower limit	-0.1 to -0.9 below lower limit	-1.0 below Lower limit

[1]See Subsection 502.12(c), Small Quantity Lots.
[2]For plant acceptance, use one sample for percent air voids to determine pay. For roadway acceptance, use the average of three cores to determine density and pay. Determine surface tolerance in accordance with Table 502-7. The total percent payment for small quantities of Superpave mixtures will be the average of the percent payments for plant acceptance (air voids), roadway acceptance (density) and surface tolerance.
[3]At the option of the engineer.

LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
SUPPLEMENTAL SPECIFICATIONS

SECTION 744
TRAFFIC CONTROL MANAGEMENT

The 2000 Standard Specifications are amended to include this Section 744.

744.01 DESCRIPTION: This work consists of providing traffic control management in compliance with the contract documents and the Manual on Uniform Traffic Control Devices (MUTCD), including the installation, inspection, maintenance, and removal of all traffic control devices on the project.

744.02 REQUIREMENTS: The contractor shall assign one or more authorized Traffic Control Supervisors (TCS) to provide traffic control management for the project. If the contractor assigns more than one TCS to provide traffic control management, then a weekly schedule identifying who will be in charge of providing traffic control management on a daily basis shall be submitted to the engineer by the contractor. The TCS shall have a set of all contract documents relating to traffic control or traffic staging and a current copy of the MUTCD and a current copy of Louisiana Work Zone Traffic Control Details readily available at all times.

Should the contractor utilize a subcontractor to provide traffic control management, the subcontractor's TCS shall meet all the requirements set forth herein.

The contractor may assign one or more Traffic Control Technicians (TCT) to assist the TCS in inspection and maintenance of Traffic Control Devices.

744.03 AUTHORIZATION: Prior to commencing work requiring traffic control management, the contractor shall submit to the engineer a copy of the TCS's and TCT's current authorization.

The Department will accept the TCS authorization of other approved agencies or firms only if all of the following minimum TCS requirements are met:

(a) Successful completion of a work zone traffic control supervisor course approved by the Department.

(b) Passing a written examination on the work zone traffic control supervisor course.

(c) After October 1, 2004, a minimum of one year full-time field experience, verified by the agency or firm, in work zone traffic control. This experience may be verified by the Department, at its discretion.

The Department will accept the TCT authorization of other approved agencies or firms only if all or the following minimum requirements are met.

(a) Successful completion of a work zone traffic control technician course approved by the Department.

(b) Passing a written examination on the work zone traffic control technician course.

744.04 DUTIES: The TCS's responsibility shall be traffic control management, and the TCS shall be available to the engineer to address traffic control management issues as needed. The following is a listing of the TCS's primary duties:

(a) The TCS shall personally provide traffic control management and supervision services at the project site. The TCS may have other assigned duties, but must be readily available at all times to perform TCS duties as required in the contract. A minimum of one TCT shall be required on site during working hours.

(b) The TCS shall be responsible for observing and evaluating both the day and night time performance of all traffic control devices installed on the project, in accordance with the Traffic Control Plan (TCP), to ensure that the devices are performing effectively as planned for both safety and traffic operations. This shall be done at the initial installation of the devices and when any modifications and/or changes are made, in addition to the inspection of traffic control required in Subsection 744.06.

(c) The TCS shall be responsible for revisions requested by the contractor to the traffic control plan established in the contract and shall submit the new traffic control plan as follows:

Requests for revision in the traffic control plan must be made in writing to the engineer a minimum of 14 calendar days in advance of the needed revision. If in the opinion of the engineer, the requested revision falls within the scope of the existing contract drawings, the engineer may approve the revision. If the engineer determines that the requested revision is outside the scope of the existing contract drawings, the contractor will be required to submit plan change drawings to incorporate into the contract drawings. The plan change drawings must conform to the DOTD standards described below.

(1) Letter size original contract drawings --The plan change drawings must be submitted on high quality white 8 1/2 x 11 inch letter size paper. The drawings may be hand drafted or computer drafted and arranged in landscape format on the page. The text and drawings must be legible after reproduction on standard reproduction equipment. Left, bottom and right hand margins shall be at least 1/2 inch and the top margin shall be 1 inch.

(2) Full size original contract drawings -- The plan change drawings must be submitted on high-quality, 4-mil, double-matte film using a plotting or reproduction process that fuses the graphics to ensure durability. Repeated handling and friction due to stacking of plans shall not smear, flake or rub off the graphics. Improper plotter settings and plotter wear may cause inconsistent durability of the drawings. The contractor shall test samples of the submitted drawings for durability. Advance samples of matte films may be submitted for approval; however, the contract plans will be tested separately. Failures will result in rejection of the submittal. Drawing sizes shall be in accordance with Subsection 801.03(a).

Lettering on plan change drawings shall be of adequate size to facilitate a 50 percent reduction of plans. Additions or changes shall be made with a permanent type of waterproof ink made for this purpose. If revised cross sections are required, the cross-sections shall be plotted on standard plate cross-section sheets. The ground line, centerline elevation, and station numbers, as a minimum, shall be drawn in ink; the remaining information may be in pencil.

Regardless of size, all plan change drawings and documents required shall be identified with the DOTD project title and project number. All plans and calculations shall be signed and sealed by a professional civil engineer currently registered to practice in Louisiana.

All plans submitted by the contractor shall conform to the quality standards adopted by DOTD, and the DOTD Chief Engineer may reject any plans not conforming to these standards.

Revisions to the TCP that are determined to be outside the scope of the original contract drawings must be approved by the DOTD District Traffic Engineering Division prior to implementation of the requested revision. In some cases on high traffic routes or high priority projects, the revisions must be approved by the HQ Traffic Operations Engineer.

(d) The TCS shall be responsible for the training of flagging personnel. This training will ensure that all flagging done on the project is in compliance with the MUTCD Part VI and Louisiana Work Zone Traffic Control Details.

(e) The TCS shall coordinate all traffic control operations for the duration of the contract, including those of subcontractors, utility companies, and suppliers, to ensure that all traffic control is in place and fully operational prior to the commencement of any work. The Department recognizes that the contractor does not have direct control over the traffic control operations of the utility companies. The coordination provided by the TCS when dealing with utility companies is specifically for the purpose of coordinating concurrent utility traffic control with any other construction traffic control to avoid conflicts.

(f)The TCS shall coordinate, in writing, all project activities with the appropriate law enforcement, fire control agencies, and other appropriate public agencies as determined at the pre-construction conference by the engineer. The TCS shall also invite the above agencies to the pre-construction conference.

(g) The TCS shall prepare and submit statements concerning road closures, delays, and other project activities to the news media on a weekly basis or more often as needed. News releases shall be submitted to the engineer for review and approval prior to the contractor's submittal to the news media.

(h) The TCS shall be responsible for notifying the engineer, or designee, immediately of all vehicular accidents and/or incidents related to the project traffic control. The time and date of notification shall be documented in the traffic control diary. The TCS shall also monitor and document queues that occur as necessary.

(i) The TCS assigned to the project shall attend the pre-construction conference and all project meetings.

(j) The TCS shall be responsible for the maintenance, cleanliness, replacement and removal of traffic control devices of the existing traffic control plan during working and non-working hours.

744.05 TRAFFIC CONTROL DIARY: The TCS shall maintain a project traffic control diary in a bound book. The contractor shall obtain a sufficient number of the diaries from the Louisiana Associated General Contractors (LAGC). The TCS shall keep the traffic control diary current on a daily basis, and shall sign each daily entry. Entries shall be made in ink in a standard format furnished by the engineer, and there shall be no erasures or white-outs. Incorrect entries shall be struck out and then replaced with the correct entry. Photographs and videotapes may be used to supplement the written text.

The traffic control diary shall be available at all times for inspection by the engineer; and the diary shall be reviewed with the engineer on a weekly basis and a copy submitted to the engineer on a monthly basis. Failure to submit the monthly copy of the diary to the engineer shall result in the withholding of the next partial payment until the past due copies of the diary are submitted. The traffic control diary shall become the property of the Department at the completion of the project.

744.06 INSPECTION OF TRAFFIC CONTROL: The TCS shall be responsible for the inspection of all traffic control devices every calendar day that traffic control devices are in use. This inspection may be delegated to the TCT. The "Quality Guidelines for Work Zone Traffic Control Devices" standard by the American Traffic Safety Services Association (ATSSA) shall be used to evaluate the condition of the traffic control devices to determine if acceptable for use. The TCS shall provide for the immediate repair, cleaning, or replacement of any traffic control devices not functioning as required to ensure the safety of the motorist and construction personnel and/or not meeting the ATSSA standard.

Inspection of the traffic control devices shall be conducted by the TCS at the beginning and end of each workday, and as scheduled or directed by the engineer during the workday. The traffic control devices shall be inspected by the TCS on weekends, holidays, or other non-work days at least once per day. Traffic control devices shall be inspected by the TCS at least once a week during nighttime periods and the same night after any modifications or changes have been made in the traffic control devices.

744.07 FAILURE TO COMPLY: The engineer may suspend all or part of the contractor's operation(s) for failure to comply with the approved "Traffic Control Plan" or failure to correct unsafe traffic conditions within a reasonable period of time after such notification is given to the contractor in writing.

In the event that the contractor does not take appropriate action to bring the deficient traffic control into compliance with the approved traffic control plan or to correct the unsafe traffic conditions, the Department may proceed with the corrective action using its own forces, and such costs will be deducted from payments owed to the contractor.

If the contractor's operations are suspended, the normal assessment of contract time will not cease for the period required to correct these unsafe conditions and traffic control deficiencies. The contractor shall not be relieved of the responsibility to provide traffic control safety to the traveling public when a project is under full or partial project suspension. When a project is under suspension due to the contractor's failure to comply with this section, or when the contract is under stipulated damages, the contractor shall continue to provide traffic control management and no additional measurement or payment will be made. If suspensions or partial suspensions are requested by the contractor, the additional traffic control management costs will be at the contractor's expense.

744.08 ENGINEER MODIFICATIONS: The provisions included in the plans and specifications for handling and controlling traffic during construction may be changed by the

engineer, with the approval of the DOTD District Traffic Operations Engineer, due to actual field conditions encountered. Such changes will be made by written instruction to the contractor and shall be considered an amendment to the plans and specifications as of the date of change.

744.09 MEASUREMENT: Traffic control management will be measured by the lump sum.

744.10 PAYMENT: Payment for traffic control management will be made at the lump sum contract price in accordance with the payment schedule of Table 744-1.

Table 744-1
Payment Schedule for Traffic Control Management

Percent of Total Contract Amount Earned	Allowable Percent of Lump Sum Price for Traffic Control Management
Initial Installation	20
25	40
50	60
75	80
100	100

Traffic control diaries will be incidental to traffic control management, and no separate measurement or payment will be made therefore.

Payment will be made under:

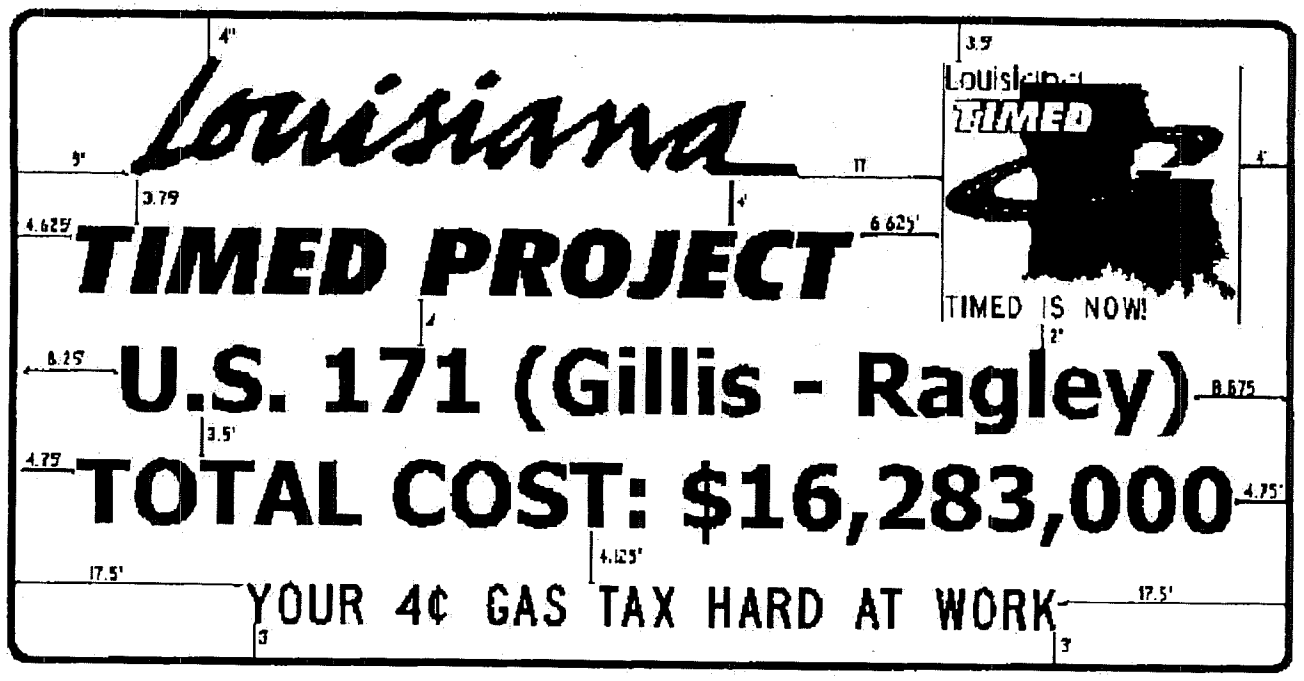
Item No.	Pay Item	Pay Unit
744-01	Traffic Control Management	Lump Sum

48" X 96"
BACKGROUND BLUE
BORDER SILVER

LOUISIANA
9" YELLOW

4 3/4" Tahoma Bold
SILVER

3" Highway C
SILVER



LOUISIANA
1.75 Tahoma Bold
BLACK

TIMED
2.5 Futura Extra
Black Italic Bt
ORANGE WITH
BLACK AROUND IT

Program
1.75 ABD-BOC
BLACK

TIME IS NOW
1.5' D Compacta Bt
BLACK

La Shield
High 15 3/8
Wide 15 13/16
GREEN

TIMED
ORANGE
5" FUTURE EXTRA BLACK
CONDENSED ITALIC

SILVER SQUARE
22"X19"

ARROW
H 7.423
W 20.678

FOR INFORMATION ONLY

CONTRACTOR'S RIGHT OF ENTRY AGREEMENT
AND
UNION PACIFIC RAILROAD MINIMUM REQUIREMENTS
(EXHIBIT C)

FOR INFORMATION ONLY

CONTRACTOR'S
RIGHT OF ENTRY AGREEMENT

THIS AGREEMENT is made and entered into as of the _____ day of _____, 20_____, by and between **UNION PACIFIC RAILROAD COMPANY**, a Delaware corporation ("Railroad"); and _____ _____, a _____ corporation ("Contractor").

RECITALS:

Contractor has been hired by _____ to perform work relating to _____ _____ _____ _____ (the "work"), with all or a portion of such work to be performed on property of Railroad in the vicinity of Railroad's Milepost _____ on Railroad's _____ [Subdivision] [Branch] [at or near DOT No. _____] located at or near _____, in _____ County, State of _____. [which work is the subject of a contract dated _____ between Railroad and _____]. [as such location is also shown on the print dated _____, marked **Exhibit D**, attached hereto and hereby made a part hereof.]

Railroad is willing to permit Contractor to perform the work described above at the location described above subject to the terms and conditions contained in this Agreement

AGREEMENT:

NOW, THEREFORE, it is mutually agreed by and between Railroad and Contractor, as follows:

ARTICLE 1 - DEFINITION OF CONTRACTOR.

For purposes of this Agreement, all references in this agreement to Contractor shall include Contractor's contractors, subcontractors, officers, agents and employees, and others acting under its or their authority.

ARTICLE 2 - RIGHT GRANTED; PURPOSE.

Railroad hereby grants to Contractor the right, during the term hereinafter stated and upon and subject to each and all of the terms, provisions and conditions herein contained, to enter upon and have ingress to and egress from the property described in the Recitals for the purpose of performing any work described in the Recitals above. The right herein granted to Contractor is limited to those portions of Railroad's property specifically described herein, or as designated by the Railroad Representative named in Article 4.

ARTICLE 3 - TERMS AND CONDITIONS CONTAINED IN EXHIBITS A, B AND C.

The terms and conditions contained in **Exhibit A, Exhibit B** and **Exhibit C**, attached hereto, are hereby made a part of this Agreement.

ARTICLE 4 - ALL EXPENSES TO BE BORNE BY CONTRACTOR; RAILROAD REPRESENTATIVE.

A. Contractor shall bear any and all costs and expenses associated with any work performed by Contractor, or any costs or expenses incurred by Railroad relating to this Agreement.

B. Contractor shall coordinate all of its work with the following Railroad representative or his or her duly authorized representative (the "Railroad Representative"):

_____
_____
_____
_____

C. Contractor, at its own expense, shall adequately police and supervise all work to be performed by Contractor and shall ensure that such work is performed in a safe manner as set forth in Section 7 of **Exhibit A**. The responsibility of Contractor for safe conduct and adequate policing and supervision of Contractor's work shall not be lessened or otherwise affected by Railroad's approval of plans and specifications involving the work, or by Railroad's collaboration in performance of any work, or by the presence at the work site of a Railroad Representative, or by compliance by Contractor with any requests or recommendations made by Railroad Representative.

ARTICLE 5 - TERM; TERMINATION.

A. The grant of right herein made to Contractor shall commence on the date of this Agreement, and continue until _____, unless sooner terminated as herein provided, or at such time as Contractor has completed its work on Railroad's property, whichever is earlier. Contractor agrees to notify the Railroad Representative in writing when it has completed its work on Railroad's property.

B. This Agreement may be terminated by either party on ten (10) days written notice to the other party.

ARTICLE 6 - CERTIFICATE OF INSURANCE.

A. Before commencing any work, Contractor will provide Railroad with the insurance binders, policies, certificates and/or endorsements set forth in **Exhibit B** of this Agreement.

B. All insurance correspondence, binders, policies, certificates and/or endorsements shall be sent to:

Union Pacific Railroad Company
_____
[Insert mailing address]
_____
_____
Attn:_____

ARTICLE 7 - DISMISSAL OF CONTRACTOR's EMPLOYEE.

At the request of Railroad, Contractor shall remove from Railroad's property any employee of Contractor who fails to conform to the instructions of the Railroad Representative in connection with the

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work on Railroad's property, and any right of Contractor shall be suspended until such removal has occurred. Contractor shall indemnify Railroad against any claims arising from the removal of any such employee from Railroad's property.

ARTICLE 8 - ADMINISTRATIVE FEE.

Upon the execution and delivery of this Agreement, Contractor shall pay to Railroad _____ Dollars ($_____) as reimbursement for clerical, administrative and handling expenses in connection with the processing of this Agreement.

ARTICLE 9 - CROSSINGS.

No additional vehicular crossings (including temporary haul roads) or pedestrian crossings over Railroad's trackage shall be installed or used by Contractor without the prior written permission of Railroad.

ARTICLE 10.- EXPLOSIVES.

Explosives or other highly flammable substances shall not be stored on Railroad's property without the prior written approval of Railroad.

IN WITNESS WHEREOF, the parties hereto have duly executed this agreement in duplicate as of the date first herein written.

UNION PACIFIC RAILROAD COMPANY

By:_____
Title:_____

_____
(Name of Contractor)

By:_____
Title:_____

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EXHIBIT A
TO
CONTRACTOR'S RIGHT OF ENTRY AGREEMENT

Section 1. **NOTICE OF COMMENCEMENT OF WORK - FLAGGING.**

A. Contractor agrees to notify the Railroad Representative at least ten (10) working days in advance of Contractor commencing its work and at least ten (10) working days in advance of proposed performance of any work by Contractor in which any person or equipment will be within twenty-five (25) feet of any track, or will be near enough to any track that any equipment extension (such as, but not limited to, a crane boom) will reach to within twenty-five (25) feet of any track. No work of any kind shall be performed, and no person, equipment, machinery, tool(s), material(s), vehicle(s), or thing(s) shall be located, operated, placed, or stored within twenty-five (25) feet of any of Railroad's track(s) at any time, for any reason, unless and until a Railroad flagman is provided to watch for trains. Upon receipt of such ten (10)-day notice, the Railroad Representative will determine and inform Contractor whether a flagman need be present and whether Contractor needs to implement any special protective or safety measures. If flagging or other special protective or safety measures are performed by Railroad, Railroad will bill Contractor for such expenses incurred by Railroad, unless Railroad and a federal, state or local governmental entity have agreed that Railroad is to bill such expenses to the federal, state or local governmental entity. If Railroad will be sending the bills to Contractor, Contractor shall pay such bills within thirty (30) days of Contractor's receipt of billing. If Railroad performs any flagging, or other special protective or safety measures are performed by Railroad, Contractor agrees that Contractor is not relieved of any of its responsibilities or liabilities set forth in this Agreement.

B. The rate of pay per hour for each flagman will be the prevailing hourly rate in effect for an eight-hour day for the class of flagmen used during regularly assigned hours and overtime in accordance with Labor Agreements and Schedules in effect at the time the work is performed. In addition to the cost of such labor, a composite charge for vacation, holiday, health and welfare, supplemental sickness, Railroad Retirement and unemployment compensation, supplemental pension, Employees Liability and Property Damage and Administration will be included, computed on actual payroll. The composite charge will be the prevailing composite charge in effect at the time the work is performed. One and one-half times the current hourly rate is paid for overtime, Saturdays and Sundays, and two and one-half times current hourly rate for holidays. Wage rates are subject to change, at any time, by law or by agreement between Railroad and its employees, and may be retroactive as a result of negotiations or a ruling of an authorized governmental agency. Additional charges on labor are also subject to change. If the wage rate or additional charges are changed, Contractor (or the governmental entity, as applicable) shall pay on the basis of the new rates and charges.

C. Reimbursement to Railroad will be required covering the full eight-hour day during which any flagman is furnished, unless the flagman can be assigned to other Railroad work during a portion of such day, in which event reimbursement will not be required for the portion of the day during which the flagman is engaged in other Railroad work. Reimbursement will also be required for any day not actually worked by the flagman following the flagman's assignment to work on the project for which Railroad is required to pay the flagman and which could not reasonably be avoided by Railroad by assignment of such flagman to other work , even though Contractor may not be working during such time. When it becomes necessary for Railroad to bulletin and assign an employee to a flagging position in compliance with union collective bargaining agreements, Contractor must provide Railroad a minimum of five (5) days notice prior to the cessation of the need for a flagman. If five (5) days notice of cessation is not given, Contractor will still be required to pay flagging charges for the five (5) day notice period required by union agreement to be given to the employee, even though flagging is not required for that period. An additional ten (10) days notice must then be given to Railroad if flagging services are needed again after such five day cessation notice has been given to Railroad.

Section 2. **LIMITATION AND SUBORDINATION OF RIGHTS GRANTED**

A. The foregoing grant of right is subject and subordinate to the prior and continuing right and obligation of the Railroad to use and maintain its entire property including the right and power of Railroad to construct, maintain, repair, renew, use, operate, change, modify or relocate railroad tracks, roadways, signal, communication, fiber optics, or other wirelines, pipelines and other facilities upon, along or across any or all parts of its property, all or any of which may be

freely done at any time or times by Railroad without liability to Contractor or to any other party for compensation or damages.

B. The foregoing grant is also subject to all outstanding superior rights (including those in favor of licensees and lessees of Railroad's property, and others) and the right of Railroad to renew and extend the same, and is made without covenant of title or for quiet enjoyment.

Section 3. NO INTERFERENCE WITH OPERATIONS OF RAILROAD AND ITS TENANTS.

A. Contractor shall conduct its operations so as not to interfere with the continuous and uninterrupted use and operation of the railroad tracks and property of Railroad, including without limitation, the operations of Railroad's lessees, licensees or others, unless specifically authorized in advance by the Railroad Representative. Nothing shall be done or permitted to be done by Contractor at any time that would in any manner impair the safety of such operations. When not in use, Contractor's machinery and materials shall be kept at least fifty (50) feet from the centerline of Railroad's nearest track, and there shall be no vehicular crossings of Railroads tracks except at existing open public crossings.

B. Operations of Railroad and work performed by Railroad personnel and delays in the work to be performed by Contractor caused by such railroad operations and work are expected by Contractor, and Contractor agrees that Railroad shall have no liability to Contractor, or any other person or entity for any such delays. The Contractor shall coordinate its activities with those of Railroad and third parties so as to avoid interference with railroad operations. The safe operation of Railroad train movements and other activities by Railroad takes precedence over any work to be performed by Contractor.

Section 4. LIENS.

Contractor shall pay in full all persons who perform labor or provide materials for the work to be performed by Contractor. Contractor shall not create, permit or suffer any mechanic's or materialmen's liens of any kind or nature to be created or enforced against any property of Railroad for any such work performed. Contractor shall indemnify and hold harmless Railroad from and against any and all liens, claims, demands, costs or expenses of whatsoever nature in any way connected with or growing out of such work done, labor performed, or materials furnished. If Contractor fails to promptly cause any lien to be released of record, Railroad may, at its election, discharge the lien or claim of lien at Contractor's expense.

Section 5. PROTECTION OF FIBER OPTIC CABLE SYSTEMS.

A. Fiber optic cable systems may be buried on Railroad's property. Protection of the fiber optic cable systems is of extreme importance since any break could disrupt service to users resulting in business interruption and loss of revenue and profits. Contractor shall telephone Railroad during normal business hours (7:00 a.m. to 9:00 p.m. Central Time, Monday through Friday, except holidays) at 1-800-336-9193 (also a 24-hour, 7-day number for emergency calls) to determine if fiber optic cable is buried anywhere on Railroad's property to be used by Contractor. If it is, Contractor will telephone the telecommunications company(ies) involved, make arrangements for a cable locator and, if applicable, for relocation or other protection of the fiber optic cable. Contractor shall not commence any work until all such protection or relocation (if applicable) has been accomplished.

b. In addition to other indemnity provisions in this Agreement, Contractor shall indemnify, defend and hold Railroad harmless from and against all costs, liability and expense whatsoever (including, without limitation, attorneys' fees, court costs and expenses) arising out of any act or omission of Contractor, its agents and/or employees, that causes or contributes to (1) any damage to or destruction of any telecommunications system on Railroad's property, and/or (2) any injury to or death of any person employed by or on behalf of any telecommunications company, and/or its contractor, agents and/or employees, on Railroad's property. Contractor shall not have or seek recourse against Railroad for any claim or cause of action for alleged loss of profits or revenue or loss of service or other consequential damage to a telecommunication company using Railroad's property or a customer or user of services of the fiber optic cable on Railroad's property.

Section 6. **PERMITS - COMPLIANCE WITH LAWS.**

In the prosecution of the work covered by this Agreement, Contractor shall secure any and all necessary permits and shall comply with all applicable federal, state and local laws, regulations and enactments affecting the work including, without limitation, all applicable Federal Railroad Administration regulations.

Section 7. **SAFETY.**

A. Safety of personnel, property, rail operations and the public is of paramount importance in the prosecution of the work performed by Contractor. Contractor shall be responsible for initiating, maintaining and supervising all safety, operations and programs in connection with the work. Contractor shall at a minimum comply with Railroad's safety standards listed in **Exhibit C**, hereto attached, to ensure uniformity with the safety standards followed by Railroad's own forces. As a part of Contractor's safety responsibilities, Contractor shall notify Railroad if Contractor determines that any of Railroad's safety standards are contrary to good safety practices. Contractor shall furnish copies of **Exhibit C** to each of its employees before they enter the job site.

B. Without limitation of the provisions of paragraph A above, Contractor shall keep the job site free from safety and health hazards and ensure that its employees are competent and adequately trained in all safety and health aspects of the job.

C. Contractor shall have proper first aid supplies available on the job site so that prompt first aid services may be provided to any person injured on the job site. Contractor shall promptly notify Railroad of any U.S. Occupational Safety and Health Administration reportable injuries. Contractor shall have a nondelegable duty to control its employees while they are on the job site or any other property of Railroad, and to be certain they do not use, be under the influence of, or have in their possession any alcoholic beverage, drug or other substance that may inhibit the safe performance of any work.

D. If and when requested by Railroad, Contractor shall deliver to Railroad a copy of Contractor's safety plan for conducting the work (the "Safety Plan"). Railroad shall have the right, but not the obligation, to require Contractor to correct any deficiencies in the Safety Plan. The terms of this Agreement shall control if there are any inconsistencies between this Agreement and the Safety Plan.

Section 8. **INDEMNITY.**

A. To the extent not prohibited by applicable statute, Contractor shall indemnify, defend and hold harmless Railroad, its affiliates, and its and their officers, agents and employees ("Indemnified Parties") from and against any and all loss, damage, injury, liability, claim, demand, cost or expense (including, without limitation, attorney's, consultant's and expert's fees, and court costs), fine or penalty (collectively, "loss") incurred by any person (including, without limitation, any indemnified party, contractor, or any employee of contractor or of any indemnified party) arising out of or in any manner connected with (i) any work performed by Contractor, or (ii) any act or omission of Contractor, its officers, agents or employees, or (iii) any breach of this Agreement by Contractor.

b. The right to indemnity under this Section 8 shall accrue upon occurrence of the event giving rise to the loss, and shall apply regardless of any negligence or strict liability of any indemnified party, except where the loss is caused by the sole active negligence of an indemnified party as established by the final judgment of a court of competent jurisdiction. The sole active negligence of any indemnified party shall not bar the recovery of any other indemnified party.

c. Contractor expressly and specifically assumes potential liability under this Section 8 for claims or actions brought by Contractor's own employees. Contractor waives any immunity it may have under worker's compensation or industrial insurance acts to indemnify Railroad under this Section 8. Contractor acknowledges that this waiver was mutually negotiated by the parties hereto.

d. No court or jury findings in any employee's suit pursuant to any worker's compensation act or the federal employers' liability act against a party to this Agreement may be relied upon or used by Contractor in any attempt to assert liability against Railroad.

e. The provisions of this Section 8 shall survive the completion of any work performed by Contractor or the termination or expiration of this Agreement. In no event shall this Section 8 or any other provision of this Agreement be deemed to limit any liability Contractor may have to any indemnified party by statute or under common law.

Section 9. RESTORATION OF PROPERTY.

In the event Railroad authorizes Contractor to take down any fence of Railroad or in any manner move or disturb any of the other property of Railroad in connection with the work to be performed by Contractor, then in that event Contractor shall, as soon as possible and at Contractor's sole expense, restore such fence and other property to the same condition as the same were in before such fence was taken down or such other property was moved or disturbed. Contractor shall remove all of Contractor's tools, equipment, rubbish and other materials from Railroad's property promptly upon completion of the work, restoring Railroad's property to the same state and condition as when Contractor entered thereon.

Section 10. WAIVER OF DEFAULT.

Waiver by Railroad of any breach or default of any condition, covenant or agreement herein contained to be kept, observed and performed by Contractor shall in no way impair the right of Railroad to avail itself of any remedy for any subsequent breach or default.

Section 11. MODIFICATION - ENTIRE AGREEMENT.

No modification of this Agreement shall be effective unless made in writing and signed by Contractor and Railroad. This Agreement and the exhibits attached hereto and made a part hereof constitute the entire understanding between Contractor and Railroad and cancel and supersede any prior negotiations, understandings or agreements, whether written or oral, with respect to the work to be performed by Contractor.

Section 12. ASSIGNMENT - SUBCONTRACTING.

Contractor shall not assign or subcontract this Agreement, or any interest therein, without the written consent of the Railroad. Contractor shall be responsible for the acts and omissions of all subcontractors, and shall require all subcontractors to maintain the insurance coverage required to be maintained by Contractor as provided in this Agreement, and to indemnify Contractor and Railroad to the same extent as Railroad is indemnified by Contractor under this Agreement.

EXHIBIT B
TO
CONTRACTOR'S
RIGHT OF ENTRY AGREEMENT

Union Pacific Railroad Company
Insurance Provisions For
Contractor's Right of Entry Agreement

Contractor shall, at its sole cost and expense, procure and maintain during the course of the Project and until all Project work on Railroad's property has been completed and the Contractor has removed all equipment and materials from Railroad's property and has cleaned and restored Railroad's property to Railroad's satisfaction, the following insurance coverage:

A. **Commercial General Liability** insurance. Commercial general liability (CGL) with a limit of not less than $5,000,000 each occurrence and an aggregate limit of not less than $10,000,000. CGL insurance must be written on ISO occurrence form CG 00 01 12 04 (or a substitute form providing equivalent coverage).

The policy must also contain the following endorsement, which must be stated on the certificate of insurance:

- Contractual Liability Railroads ISO form CG 24 17 10 01 (or a substitute form providing equivalent coverage) showing "Union Pacific Railroad Company Property" as the Designated Job Site.

B. **Business Automobile Coverage** insurance. Business auto coverage written on ISO form CA 00 01 (or a substitute form providing equivalent liability coverage) with a combined single limit of not less $5,000,000 for each accident.

The policy must contain the following endorsements, which must be stated on the certificate of insurance:

- Coverage For Certain Operations In Connection With Railroads ISO form CA 20 70 10 01 (or a substitute form providing equivalent coverage) showing "Union Pacific Property" as the Designated Job Site.
- Motor Carrier Act Endorsement - Hazardous materials clean up (MCS-90) if required by law.

C. **Workers' Compensation and Employers' Liability** insurance. Coverage must include but not be limited to:

- Contractor's statutory liability under the workers' compensation laws of the state where the work is being performed.
- Employers' Liability (Part B) with limits of at least $500,000 each accident, $500,000 disease policy limit $500,000 each employee.

If Contractor is self-insured, evidence of state approval and excess workers compensation coverage must be provided. Coverage must include liability arising out of the U. S. Longshoremen's and Harbor Workers' Act, the Jones Act, and the Outer Continental Shelf Land Act, if applicable.

The policy must contain the following endorsement, which must be stated on the certificate of insurance:

- Alternate Employer endorsement ISO form WC 00 03 01 A (or a substitute form providing equivalent coverage) showing Railroad in the schedule as the alternate employer (or a substitute form providing equivalent coverage).

D. **Railroad Protective Liability** insurance. Contractor must maintain Railroad Protective Liability insurance written on ISO occurrence form CG 00 35 12 04 (or a substitute form providing equivalent coverage) on behalf of Railroad as named insured, with a limit of not less than $2,000,000 per occurrence and an aggregate of $6,000,000. A binder stating the policy is in place must be submitted to Railroad before the work may be commenced and until the original policy is forwarded to Railroad.

E. **Umbrella or Excess** insurance. If Contractor utilizes umbrella or excess policies, these policies must "follow form" and afford no less coverage than the primary policy.

F. **Pollution Liability** insurance. Pollution liability coverage must be written on ISO form Pollution Liability Coverage Form Designated Sites CG 00 39 12 04 (or a substitute form providing equivalent liability coverage), with limits of at least $5,000,000 per occurrence and an aggregate limit of $10,000,000.

If the scope of work as defined in this Agreement includes the disposal of any hazardous or non-hazardous materials from the job site, Contractor must furnish to Railroad evidence of pollution legal liability insurance maintained by the disposal site operator for losses arising from the insured facility accepting the materials, with coverage in minimum amounts of $1,000,000 per loss, and an annual aggregate of $2,000,000.

Other Requirements

G. All policy(ies) required above (except worker's compensation and employers liability) must include Railroad as "Additional Insured" using ISO Additional Insured Endorsements CG 20 26, and CA 20 48 (or substitute forms providing equivalent coverage). The coverage provided to Railroad as additional insured shall, to the extent provided under ISO Additional Insured Endorsement CG 20 26, and CA 20 48 provide coverage for Railroad's negligence whether sole or partial, active or passive, and shall not be limited by Contractor's liability under the indemnity provisions of this Agreement.

H. Punitive damages exclusion, if any, must be deleted (and the deletion indicated on the certificate of insurance), unless the law governing this Agreement prohibits all punitive damages that might arise under this Agreement.

I. Contractor waives all rights of recovery, and its insurers also waive all rights of subrogation of damages against Railroad and its agents, officers, directors and employees. This waiver must be stated on the certificate of insurance.

J. Prior to commencing the work, Contractor shall furnish Railroad with a certificate(s) of insurance, executed by a duly authorized representative of each insurer, showing compliance with the insurance requirements in this Agreement.

K. All insurance policies must be written by a reputable insurance company acceptable to Railroad or with a current Best's Insurance Guide Rating of A- and Class VII or better, and authorized to do business in the state where the work is being performed.

L. The fact that insurance is obtained by Contractor or by Railroad on behalf of Contractor will not be deemed to release or diminish the liability of Contractor, including, without limitation, liability under the indemnity provisions of this Agreement. Damages recoverable by Railroad from Contractor or any third party will not be limited by the amount of the required insurance coverage.

EXHIBIT C
TO
CONTRACTOR'S RIGHT OF ENTRY AGREEMENT

MINIMUM SAFETY REQUIREMENTS

The term "employees" as used herein refer to all employees of Contractor as well as all employees of any subcontractor or agent of Contractor.

I. Clothing

A. All employees of Contractor will be suitably dressed to perform their duties safely and in a manner that will not interfere with their vision, hearing, or free use of their hands or feet.

Specifically, Contractor's employees must wear:

(i) Waist-length shirts with sleeves.

(ii) Trousers that cover the entire leg. If flare-legged trousers are worn, the trouser bottoms must be tied to prevent catching.

(iii) Footwear that covers their ankles and has a defined heel. Employees working on bridges are required to wear safety-toed footwear that conforms to the American National Standards Institute (ANSI) and FRA footwear requirements.

B. Employees shall not wear boots (other than work boots), sandals, canvas-type shoes, or other shoes that have thin soles or heels that are higher than normal.

C. Employees must not wear loose or ragged clothing, neckties, finger rings, or other loose jewelry while operating or working on machinery.

II. Personal Protective Equipment

Contractor shall require its employees to wear personal protective equipment as specified by Railroad rules, regulations, or recommended or requested by the Railroad Representative.

(i) Hard hat that meets the American National Standard (ANSI) Z89.1 – latest revision. Hard hats should be affixed with Contractor's company logo or name.

(ii) Eye protection that meets American National Standard (ANSI) for occupational and educational eye and face protection, Z87.1 – latest revision. Additional eye protection must be provided to meet specific job situations such as welding, grinding, etc.

(iii) Hearing protection, which affords enough attenuation to give protection from noise levels that will be occurring on the job site. Hearing protection, in the form of plugs or muffs, must be worn when employees are within 100 feet of a locomotive or roadway/work equipment

- 15 feet of power operated tools
- 150 feet of jet blowers or pile drivers
- 150 feet of retarders in use (when within 10 feet, employees must wear dual ear protection – plugs and muffs)

(iv) Other types of personal protective equipment, such as respirators, fall protection equipment, and face shields, must be worn as recommended or requested by the Railroad Representative.

III. On Track Safety

Contractor is responsible for compliance with the Federal Railroad Administration's Roadway Worker Protection regulations – 49CFR214, Subpart C and Railroad's On-Track Safety rules. Under 49CFR214, Subpart C, railroad contractors are responsible for the training of their employees on such regulations. In addition to the instructions contained in Roadway Worker Protection regulations, all employees must:

(i) Maintain a distance of twenty-five (25) feet to any track unless the Railroad Representative is present to authorize movements.

(ii) Wear an orange, reflectorized workwear approved by the Railroad Representative.

(iii) Participate in a job briefing that will specify the type of On-Track Safety for the type of work being performed. Contractor must take special note of limits of track authority, which tracks may or may not be fouled, and clearing the track. Contractor will also receive special instructions relating to the work zone around machines and minimum distances between machines while working or traveling.

IV. Equipment

A. It is the responsibility of Contractor to ensure that all equipment is in a safe condition to operate. If, in the opinion of the Railroad Representative, any of Contractor's equipment is unsafe for use, Contractor shall remove such equipment from Railroad's property. In addition, Contractor must ensure that the operators of all equipment are properly trained and competent in the safe operation of the equipment. In addition, operators must be:

- Familiar and comply with Railroad's rules on lockout/tagout of equipment.
- Trained in and comply with the applicable operating rules if operating any hy-rail equipment on-track.
- Trained in and comply with the applicable air brake rules if operating any equipment that moves rail cars or any other railbound equipment.

B. All self-propelled equipment must be equipped with a first-aid kit, fire extinguisher, and audible back-up warning device.

C. Unless otherwise authorized by the Railroad Representative, all equipment must be parked a minimum of twenty-five (25) feet from any track. Before leaving any equipment unattended, the operator must stop the engine and properly secure the equipment against movement.

D. Cranes must be equipped with three orange cones that will be used to mark the working area of the crane and the minimum clearances to overhead powerlines.

V. General Safety Requirements

A. Contractor shall ensure that all waste is properly disposed of in accordance with applicable federal and state regulations.

B. Contractor shall ensure that all employees participate in and comply with a job briefing conducted by the Railroad Representative, if applicable. During this briefing, the Railroad Representative will specify safe work procedures, (including On-Track Safety) and the potential hazards of the job. If any employee has any questions or concerns about the work, the employee must voice them during the job briefing. Additional job briefings will be conducted during the work as conditions, work procedures, or personnel change.

C. All track work performed by Contractor meets the minimum safety requirements established by the Federal Railroad Administration's Track Safety Standards 49CFR213.

D. All employees comply with the following safety procedures when working around any railroad track:

(i) Always be on the alert for moving equipment. Employees must always expect movement on any track, at any time, in either direction.

(ii) Do not step or walk on the top of the rail, frog, switches, guard rails, or other track components.

(iii) In passing around the ends of standing cars, engines, roadway machines or work equipment, leave at least 20 feet between yourself and the end of the equipment. Do not go between pieces of equipment of the opening is less than one car length (50 feet).

(iv) Avoid walking or standing on a track unless so authorized by the employee in charge.

(v) Before stepping over or crossing tracks, look in both directions first.

(vi) Do not sit on, lie under, or cross between cars except as required in the performance of your duties and only when track and equipment have been protected against movement.

E. All employees must comply with all federal and state regulations concerning workplace safety.

EXHIBIT D

TO

CONTRACTORS RIGHT OF ENTRY AGREEMENT

If a print of the right of entry area to be used by Contractor is available, it should be marked **Exhibit D** and attached here as part of the Agreement.

EXHIBIT C

UNION PACIFIC RAILROAD MINIMUM REQUIREMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

This project includes construction work within the Right-of-Way and/or properties of the Union Pacific Railroad Company ("UPRR") and adjacent to tracks, wire lines and other facilities. This section describes the special requirements for coordination with UPRR when work by Contractor will be performed upon, over or under UPRR Right-of-Way or may impact current or future UPRR operations. Contractor will coordinate with UPRR while performing the work outlined in this Contract, and shall afford the same cooperation with UPRR as it does with the Agency. All submittals and work shall be completed in accordance with UPRR Guidelines and AREMA recommendations as modified by these minimum special requirements or as directed in writing by the UPRR Designated Representative.

For purposes of this project, the UPRR Designated Representative shall be the person or persons designated by the UPRR Manager of Industry and Public Projects to handle specific tasks related to the project.

1.02 DEFINITION OF AGENCY AND CONTRACTOR

As used in these UPRR requirements, the term "Agency" shall mean the State of Louisiana, Department of Transportation and Development.

As used in these UPRR requirements, the term "Contractor" shall mean the contractor or contractors hired by the Agency to perform any project work on any portion of UPRR's property and shall also include contractor's subcontractors and contractor's and subcontractor's respective officer, agents and employees, and others acting under its or their authority.

1.03 UPRR CONTACTS

The primary UPRR point of contact for this project is:

Paul Rathgeber
Manager Industry and Public Projects
Union Pacific Railroad Company
Engineering, Room 280N
24125 Aldine Westfield
Spring, Texas 77373
Phone: (281) 350-7637
Fax: (281) 350-7671

For UPRR flagging services and track work, contact:

Name_____
Manager Track Maintenance
Union Pacific Railroad Company
Address_____
Phone_____
Fax_____

1.04 REQUEST FOR INFORMATION / CLARIFICATION

All Requests for Information ("RFI") involving work within any UPRR Right-Of-Way shall be in accordance with the procedures listed elsewhere in these bid documents. All RFI's shall be submitted to the Engineer of Record. The Engineer of Record will submit the RFI to the UPRR Designated Representative for review and approval for corresponding to work within the UPRR Right-Of-Way. Contractor shall allow four (4) weeks for the review and approval process by UPRR.

1.05 PLANS / SPECIFICATIONS

The plans and specifications for this Project, affecting UPRR, are subject to the written approval by UPRR and changes in the plans may be required after award of the Contract. Such changes are subject to the approval of the Agency and UPRR.

PART 2 – UTILITIES AND FIBER OPTIC

All installations shall be constructed in accordance with current AREMA recommendations and UPRR specifications and requirements. UPRR general guidelines and the required application forms for utility installations can be found on the UPRR website at www.uprr.com.

3.01 GENERAL

A. Contractor shall perform all work in compliance with all applicable UPRR and FRA rules and regulations. Contractor shall arrange and conduct all work in such manner and at such times as shall not endanger or interfere with the safe operation of the tracks and property of UPRR and the traffic moving on such tracks, or the wires, signals and other property of UPRR, its tenants or licensees, at or in the vicinity of the work. UPRR shall be reimbursed by Contractor or Agency for train delay costs and lost revenue claims due to any delays or interruption of train operations resulting from Contractor's construction work or other activities.

B. Construction activities will be permitted within 12 feet of the centerline of operational tracks only if absolutely necessary and UPRR's Designated Representative grants approval. Construction activities within 12 feet of the operational track(s) must allow the tracks to stay operational.

C. Track protection is required for all work equipment (including rubber tired equipment) operating within 25 feet from nearest rail.

D. Contractor is also advised that new railroad facilities within the Project may be built by UPRR and that certain Contractor's activities cannot proceed until that work is completed. Contractor shall be aware of the limits of responsibilities and allow sufficient time in the schedule for that work to be accomplished and shall coordinate its efforts with UPRR.

3.02 RAILROAD OPERATIONS

A. Contractor shall be advised that trains and/or equipment are expected on any track, at any time, in either direction. Contractor shall become familiar with the train schedules in this location and structure its bid assuming intermittent track windows in this period, as defined in Paragraph B below.

B. All railroad tracks within and adjacent to the Contract Site are active, and rail traffic over these facilities shall be maintained throughout the Project. Activities may include both through moves and switching moves to local customers. Railroad traffic and operations will occur continuously throughout the day and night on these tracks and shall be maintained at all times as defined herein. Contractor shall coordinate and schedule the work so that construction activities do not interfere with railroad operations.

C. Work windows for this Contract shall be coordinated with Agency's and UPRR's Designated Representatives. Types of work windows include Conditional Work Windows and Absolute Work Windows, as defined below:

1. Conditional Work Window: A Conditional Work Window is a period of time that railroad operations have priority over construction activities. When construction activities may occur on and adjacent to the railroad tracks within 25 feet of the nearest track, a UPRR flag person will be required. At the direction of the UPRR flag person, upon approach of a train, and when trains are present on the tracks, the tracks must be cleared (i.e., no construction equipment, materials or personnel within 25 feet, or as directed by the UPRR Designated Representative, from the tracks). Conditional Work Windows are available for the Project.

2. Absolute Work Window: An Absolute Work Window is a period of time that construction activities are given priority over railroad operations. During this time frame the designated railroad track(s) will be inactive for train movements and may be fouled by the Contractor. At the end of an Absolute Work Window the railroad tracks and/or signals must be completely operational for train operations and all UPRR, Public Utilities Commission (PUC) and Federal Railroad Administration (FRA) requirements, codes and regulations for

operational tracks must be complied with. In the situation where the operating tracks and/or signals have been affected, UPRR will perform inspections of the work prior to placing that track back into service. UPRR flag persons will be required for construction activities requiring an Absolute Work Window. **Absolute Work Windows will not generally be granted. Any request will require a detailed explanation for UPRR review.**

3.03 RIGHT OF ENTRY, ADVANCE NOTICE AND WORK STOPPAGES

A. Prior to beginning any work on or over the property of, or affecting the facilities of, UPRR, Contractor shall enter into an agreement with UPRR in the form of the "Contractor's Right of Entry Agreement", attached or latest version thereof provided by UPRR. There is a fee for processing of the agreement. This cost shall be borne by Contractor. Contractor shall submit a copy of the executed agreement and the insurance policies, binders, certificates and endorsements set forth therein to Agency prior to commencing work on UPRR property. The right of entry agreement shall specify working time frames, flagging and inspection requirements, and any other items specified by UPRR.

B. Contractor shall give the advance notice to UPRR as required in "Contractor's Right of Entry Agreement" before commencing work in connection with construction upon or over UPRR's Right-of-Way and shall observe UPRR's rules and regulations with respect thereto.

C. All work upon UPRR's Right-of-Way shall be done at such times and in such manner so as not to interfere with or endanger the operations of UPRR. Whenever work may affect the operations or safety of trains, the method of doing such work shall first be submitted to UPRR's Designated Representative for approval, but such approval shall not relieve Contractor from liability. Any work to be performed by Contractor, which requires flagging and/or inspection service, shall be deferred until the flagging protection required by UPRR is available at the job site. See Section 3.18 for railroad flagging requirements.

D. Contractor shall make requests in writing for both Absolute and Conditional Work Windows, at least two weeks in advance of any work. The written request must include:

1. Exactly what the work entails.
2. The days and hours that work will be performed.
3. The exact location of work, and proximity to the tracks.
4. The type of window requested and the amount of time requested.
5. The designated contact person.

Contractor shall provide a written confirmation notice to UPRR at least 48 hours before commencing work in connection with approved work windows when work

will be performed within **25 feet of any track center line.** All work shall be performed in accordance with previously approved work plans.

E. Should a condition arising from, or in connection with the work, require that immediate and unusual provisions be made to protect operations and property of UPRR, Contractor shall make such provisions. If in the judgment of UPRR's Designated Representative such provisions are insufficient, UPRR's Designated Representative may require or provide such provisions as deemed necessary. In any event, such provisions shall be at Contractor's expense and without cost to UPRR. UPRR or Agency shall have the right to order Contractor to temporarily cease operations in the event of an emergency or, if in the opinion of UPRR's Designated Representative, Contractor's operations could endanger UPRR's operations. In the event such an order is given, Contractor shall immediately notify Agency of the order.

3.04 INSURANCE

Contractor shall not begin work upon or over UPRR's Right-of-Way until UPRR has been furnished the insurance policies, binders, certificates and endorsements required by the "Contractor's Right-of-Entry Agreement" and UPRR's Designated Representative has advised Agency that such insurance is in accordance with the Agreement. The required insurance shall be kept in full force and effect during the performance of work and thereafter until Contractor removes all tools, equipment, and material from UPRR's property and cleans the premises in a manner reasonably satisfactory to UPRR. For the benefit of Contractor and the Insurer(s), the current railroad traffic in the project area is estimated at eleven (11) train movements per day at a maximum speed of sixty (60) MPH.

3.05 RAILROAD SAFETY ORIENTATION

All personnel employed by Contractor and all subcontractors must complete the UPRR course "Orientation for Contractor's Safety", and be registered prior to working on UPRR property. This orientation is available at www.contractororientation.com. This course is required to be completed annually.

3.06 COOPERATION

UPRR will cooperate with Contractor so that work may be conducted in an efficient manner, and will cooperate with Contractor in enabling use of UPRR's right-of-way in performing the work.

3.07 MINIMUM CONSTRUCTION CLEARANCES FOR FALSEWORK AND OTHER TEMPORARY STRUCTURES

Contractor shall abide by the following minimum temporary clearances during the course of construction:

A. 12' – 0" horizontal from centerline of track
B. 21' – 0" vertically above top of rail.

For construction clearance less than listed above, local Operating Unit review and approval is required.

3.08 APPROVAL OF REDUCED CLEARANCES

A. The minimum track clearances to be maintained by Contractor during construction are specified in Section 3.07 herein.

B. Any proposed infringement on the specified minimum clearances due to Contractor's operations shall be submitted to UPRR's Designated Representative through Agency at least thirty (30) days in advance of the work and shall not be undertaken until approved in writing by UPRR's Designated Representative.

C. No work shall commence until Contractor receives in writing assurance from UPRR's Designated Representative that arrangements have been made for flagging service, as may be necessary and receives permission from UPRR's Designated Representative to proceed with the work.

3.09 CONSTRUCTION AND AS-BUILT SUBMITTALS

A. Submittals are required for construction materials and procedures as outlined below. The submittals shall include all review comments from Agency and the Engineer of Record. All design submittals shall be stamped and signed by a Professional Engineer registered in the State of Louisiana.

B. The tables below provide UPRR's minimum submittal requirements for the construction items noted. Submittal requirements are in addition to those specified elsewhere in these bid documents. The minimum review times indicated below represent UPRR's requirements only. Contractor shall allow additional time for Agency's review time as stated elsewhere in these bid documents.

C. Submittals shall be made by Agency to UPRR Manager of Industry and Public Projects unless otherwise directed by Railroad. Items in Table 1 shall be submitted for both railroad overpass and underpass projects, as applicable. Items in Table 2 shall be submitted for railroad underpass projects only.

TABLE 1

ITEM	DESCRIPTION	SETS REQD.	UPRR's Minimum Review Time
1	Shoring design and details	4	4 weeks
2	Falsework design and details	4	4 weeks
3	Drainage design provisions	4	4 weeks
4	Erection diagrams and sequence	4	4 weeks
5	Demolition diagram and sequence	4	4 weeks

Prior to or during construction of railroad underpass structures, UPRR requires the review of drawings, reports, test data and material data sheets to determine compliance with the specifications. Product information for items noted in Table 2 be submitted to UPRR's Designated Representative through Agency for their own review and approval of the material. The signed submittal and Agency's review comments will be reviewed by UPRR or their consultant. If a consultant performs the reviews, the consultant may reply directly to Agency or its Designated Representative after consultation with UPRR. Review of the submittals will not be conducted until after review by Agency or its Designated Representative. Review of the submittal items will require a minimum of four (4) weeks after receipt from Agency.

TABLE 2

ITEM	DESCRIPTION	SETS REQD.	NOTES
1	Shop drawings	4	Steel and Concrete members
2	Bearings	4	For entire structures
3	Concrete Mix Designs	4	For entire structures
4	Rebar & Strand certifications	4	For superstructure only
5	28 day concrete strength	4	For superstructure only
6	Waterproofing material certifications and installation procedure	4	Waterproofing & protective boards
7	Structural steel certifications	4	All fracture critical members & other members requiring improved notch toughness
8	Fabrication and Test reports	4	All fracture critical members & other members requiring improved notch toughness
9	Welding Procedures and Welder Certification	4	AWS requirements
10	Foundation Construction Reports	4	Pile driving, drilled shaft construction, bearing pressure test reports for spread footings
11	Compaction testing reports for backfill at abutments	4	Must meet 95% maximum dry density, Modified Proctor ASTM D1557

D. As-Built Records shall be submitted to UPRR within sixty (60) days of completion of the Structure. These records shall consist of the following items:

Overpass Projects

1. Electronic files of all Structure design drawings with as-constructed modifications shown, in Microstation J or Acrobat .PDF format.
2. Hard copies of all Structure design drawings with as-constructed modifications shown.

Underpass Projects

1. Electronic files of all Structure design drawings with as-constructed modifications shown, in Microstation J or Acrobat .PDF format.
2. Hard copies of all Structure design drawings with as-constructed modifications shown.
3. Final approved copies of shop drawings for concrete and steel members.
4. Foundation Construction Reports
5. Compaction testing reports for backfill at abutments

3.10 APPROVAL OF DETAILS

The details of the construction affecting UPRR tracks and property not already included in the Contract Plans shall be submitted to UPRR's Designated Representative through Agency for UPRR's review and written approval before such work is undertaken. Review and approval of these submittals will require a minimum of four (4) weeks in addition to Agency's review time as stated elsewhere in these bid documents.

3.11 MAINTENANCE OF RAILROAD FACILITIES

A. Contractor shall be required to maintain all ditches and drainage structures free of silt or other obstructions which may result from Contractor's operations; to promptly repair eroded areas within UPRR's right of way and to repair any other damage to the property of UPRR, or its tenants.

B. All such maintenance and repair of damages due to Contractor's operations shall be done at Contractor's expense.

C. Contractor must submit a proposed method of erosion control and have the method reviewed by UPRR prior to beginning any grading on the Project Site. Erosion control methods must comply with all applicable local, state and federal regulations.

3.12 SITE INSPECTIONS BY UPRR's DESIGNATED REPRESENTATIVE

A. In addition to the office reviews of construction submittals, site inspections may be performed by UPRR's Designated Representative at significant points during construction, including but not limited to the following:

1. Preconstruction meetings.

2. Pile driving, drilling of caissons or drilled shafts.

3. Reinforcement and concrete placement for railroad bridge substructure and/or superstructure.

4. Erection of precast concrete or steel bridge superstructure.

5. Placement of waterproofing (prior to placing ballast on bridge deck).

6. Completion of the bridge structure.

B. Site inspection is not limited to the milestone events listed above. Site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by UPRR.

C. A detailed construction schedule, including the proposed temporary horizontal and vertical clearances and construction sequence for all work to be performed, shall be provided to Agency for submittal to UPRR's Designated Representative for review prior to commencement of work. his schedule shall also include the anticipated dates when the above listed events will occur. This schedule shall be updated for the above listed events as necessary, but at least monthly so that site visits may be scheduled.

3.13 UPRR REPRESENTATIVES

A. UPRR representatives, conductors, flag person or watch person will be provided by UPRR at expense of Agency or Contractor (as stated elsewhere in these bid documents) to protect UPRR facilities, property and movements of its trains or engines. In general, UPRR will furnish such personnel or other protective services as follows:

1. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from centerline of any track on which trains may operate, or when any object is off the ground and any dimension thereof could extend inside the 25 foot limit, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.

2. For any excavation below elevation of track subgrade if, in the opinion of UPRR's Designated Representative, track or other UPRR facilities may be subject to settlement or movement.

3. During any clearing, grubbing, excavation or grading in proximity to UPRR facilities, which, in the opinion of UPRR's Designated Representative, may endanger UPRR facilities or operations.

4. During any contractor's operations when, in the opinion of UPRR's Designated Representative, UPRR facilities, including, but not limited to, tracks, buildings, signals, wire lines, or pipe lines, may be endangered.

5. Contractor shall arrange with UPRR Designated Representative to provide the adequate number of flag persons to accomplish the work.

3.14 WALKWAYS REQUIRED

Along the outer side of each exterior track of multiple operated track, and on each side of single operated track, an unobstructed continuous space suitable for trainman's use in walking along trains, extending to a line not less than twelve feet (12') from centerline of track, shall be maintained. Any temporary impediments to

walkways and track drainage encroachments or obstructions allowed during work hours while UPRR's flagman service is provided shall be removed before the close of each work day. Walkways with railings shall be constructed by Contractor over open excavation areas when in close proximity of track, and railings shall not be closer than 8' – 6" horizontally from center line of tangent track or 9' – 6" horizontally from centerline of curved track.

3.15 COMMUNICATIONS AND SIGNAL LINES

If required, UPRR will rearrange its communications and signal lines, its grade crossing warning devices, train signals and tracks, and facilities that are in use and maintained by UPRR's forces in connection with its operation at expense of Agency. This work by UPRR will be done by its own forces and it is not a part of the Work under this Contract.

3.16 TRAFFIC CONTROL

Contractor's operations that control traffic across or around UPRR facilities shall be coordinated with and approved by UPRR's Designated Representative.

3.17 CONSTRUCTION EXCAVATIONS

A. Contractor shall be required to take special precaution and care in connection with excavating and shoring. Excavations for construction of footings, piers, columns, walls or other facilities that require shoring shall comply with requirements of OSHA, AREMA and UPRR "Guidelines for Temporary Shoring".

B. Contractor shall contact UPRR's "Call Before Your Dig" at least 48 hours prior to commencing work at 1-800-336-9193 during normal business hours (6:30 a.m. to 8:00 p.m. central time, Monday through Friday, except holidays - also a 24 hour, 7 day a week number for emergency calls) to determine location of fiber optics. If a telecommunications system is buried anywhere on or near UPRR property, Contractor will co-ordinate with UPRR and the Telecommunication Company(ies) to arrange for relocation or other protection of the system prior to beginning any work on or near UPRR property.

3.18 RAILROAD FLAGGING

Performance of any work by Contractor in which person(s) or equipment will be within twenty-five (25) feet of any track, or will be near enough to any track that any equipment extension (such as, but not limited to, a crane boom) will reach within twenty-five (25) feet of any track, may require railroad flagging services or other protective measures. Contractor shall give the advance notice to UPRR as required in the "Contractor's Right of Entry Agreement" before commencing any such work, so that UPRR may determine the need for flagging or other protective measures to ensure the safety of Railroad's operations. Contractor shall comply

with all other requirements regarding flagging services covered by the "Contractor's Right of Entry Agreement". Any costs associated with failure to abide by these requirements will be borne by Contractor.

The estimated pay rate for each flag person is Seven Hundred Dollars ($700.00) per day for an 8 hour work day with time and one-half for overtime, Saturdays, Sundays; double time and one-half for holidays. Flagging rates are set by UPRR and are subject to change.

3.19 CLEANING OF RIGHT-OF-WAY

Contractor shall, upon completion of the work to be performed by Contractor upon the premises, over or beneath the tracks of UPRR, promptly remove from the Right-of-Way of UPRR all of Contractor's tools, implements, and other materials whether brought upon the Right-of-Way by Contractor or any subcontractors, employee or agent of Contractor or of any subcontractor, and leave the Right-of-Way in a clean and presentable condition to satisfaction of UPRR.

Louisiana

Department of Transportation And Development

Traffic Control Standard

Number 18A

Revised
April 10, 2003

FOR INFORMATION ONLY

Traffic Control Standard #18A
TRAFFIC SIGNAL CONTROL SYSTEM
Revised April 10, 2003

1.0 INTRODUCTION

This specification sets forth the minimum requirements for a shelf-mounted, digital, solid-state traffic control system including and to be furnished with time-based coordination, closed-loop system communication/coordination, multiple railroad/fire preemption sequences, and hardwired/telemetry interconnect capable of operating as both a master and secondary. All components needed to operate as both a master and secondary shall be provided for in each assembly. The system design shall be based on the requirements of NEMA Standards Publication No. TS-2, 1998. Controller sequencing referenced in this standard for diamond intersections emulates the design and standards from the Texas Department of Highways and the Texas Transportation Institute. The controller should have a database that conforms to section 3.5 of the current NEMA NTCIP specifications

All components and accessories shall comply with the NEMA testing requirements and a certification of compliance shall be presented with each bid for that equipment being offered. The operational requirements herein extend the requirement of NEMA controllers and supersede NEMA TS-2 where differences occur.

All equipment and operational characteristics specified herein shall be provided, except where noted.

2.0 CLOSED-LOOP COMPUTER OPERATING SYSTEM

The closed-loop central operating system shall be a traffic management program for hard-disk supported IBM personal computers and compatible equipment which creates a system network using the principle system components. The software shall operate using Microsoft's Windows operating system. The software shall be programmed resident for the operating system.

2.1 SOFTWARE DESCRIPTION

The software shall be loaded into the specified personal computer and operationally verified by the supplier. Back-up software shall be supplied on a compact disk.

The software shall be licensed to the agency for its use on a single computer or each computer specified in the system. Software improvements and enhancements to the supplied version shall be furnished to this agency at no additional cost. Software is supplied when indicated on the plans for a state job and will be specific to a highway district.

Programming displays, on the PC screen, shall aid the operator in entering data from the PC keyboard. These displays shall be arranged in using a tool bar format. The main tool bar shall allow the user to select a major function. A sub-tool bar shall be allowed for selection of a specific area within that function when it exists.

The central computer software shall provide rapid movement through menus, sub-menus and data base pages and limited only by the operating speed of the computer. Returning to the main menu or sub-menu shall be selected by pressing a single key.

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Menus and sub-menus shall not contain mnemonics or codes for descriptions. Additional screens shall be provided where necessary to explain keyboard procedure. All icons that are defined within a tool bar shall be described in a help line as the cursor is placed over that icon.

Traffic engineering terminology shall be used throughout the programming displays. Display organization and data entry approach shall allow system operators to program the central computer without using reference cards or manuals.

2.2 SOFTWARE FEATURES

Once the computer power-up routine is complete, the system shall be in monitor mode. It shall be possible for the operator to exit this mode and enter the user mode, and vice-versa.

In monitor mode, central computer shall continue to monitor events even if the printer is off-line. Upon restoration of the printer, it shall print a hard-copy of events occurring prior to and during printer off-line.

Central computer software shall provide:

a. Dynamic Displays
b. System Printouts
c. Data Base Management
d. Security
e. Directories
f. Data Back-up

2.3 DYNAMIC DISPLAYS

Central computer shall display the following in real-time color graphics selected from the menus:

a. Intersection Display
b. System Map Display

All text data shall be displayed in traffic engineering terms. Mnemonics shall be acceptable; however, the need for reference guides and manuals shall not be acceptable. All information shall be simultaneously and continuously displayed until canceled by the operator. Displays shall not affect system on-street operation. The displays shall have a minimum one second resolution.

2.3.1 Intersection Display

The central computer shall display the operation of any selected intersection controller within any selected system.

Each display shall be user-created to indicate the intersection configuration, including any "T" and standard diamonds, on a single screen display. The intersection display shall show as a minimum:

a. Intersection configuration layout for all possible phasing of intersection controllers including overlaps.
b. All vehicle signal indications, (R,Y,G) for each active phase.
c. All pedestrian signal indications: walk, flashing and solid don't walk, for all 16 active phases.

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d. Vehicle and pedestrian detector actuation for each displayed phase.
e. Cycle, offset, split or plan in effect.
f. Arterial master and intersection controller identifier numbers, including intersection street names.
g. Central computer and local intersection controller TOD clocks.

The display shall include dynamic statuses of the arterial master and the intersection controller. Arterial master status shall consist of operational status, cycle, offset, split, plan in effect, cycle length, cycle countdown, and status of special functions. System control mode status shall include manual, external, time-of-day, or traffic responsive operation. This status shall indicate whether the system is operating under plan, time-base coordination, or time-base backup.

Intersection controller dynamic data shall consist of operational status; non-interconnected coordination, coordination offset value, or free/plan indicator; split values based on cycle and split in effect; preemption status; and diagnostic indications. Operational status shall include on-line, off-line, failed, or disabled. If the intersection controller is off-line or failed, the conditions causing that failure shall be also displayed. All diagnostic indications having alarm status shall be shown flashing. Alarms, preempt call numbers, and preemptor in effect shall also be shown. If preempt is in a flashing operation, it shall be displayed as flashing.

2.3.2 System Map Display

System Map Display shall provide geometric layout of the system for a minimum of 32 intersections simultaneously and show real time display. The display shall also indicate the relative placements for a minimum of sixteen system detectors. Any intersection shall be selected to present a full screen display as stated the section 2.3.1.

A map editor shall permit the user to lay-out the intersections in their relative physical relationship to each other, place the system detectors anywhere along the approaches, and number the intersections appropriately. Five-legged intersections, central business district layouts (CBD), and angled approaches shall be possible.

A text editor shall permit the user to create a minimum of 50 20-character strings and place them on the display. This feature shall allow labeling streets, detector identification, or other points-of-interest. All text would preferably be placed at any angle on the screen. For instance, street names shall follow the angle of the drawn street (horizontal, vertical, or diagonally), if desired.

Display data shall include current system operating parameters, special function status, cycle countdown, zone control mode of operation, and consolidated intersection status.

Consolidated intersection status shall indicate if an intersection is on-line, free, has a coordination fault, is in preemption or flash, or has a communication failure.

2.4 SYSTEM PRINTOUTS

System printouts present system readiness and operational status and are used for analyzing system performance. The printouts shall be divided into four categories: Computer Events, Event Reports, Status Reports, and Logs, as detailed in this specification.

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2.4.1 Computer Events

The central computer shall provide a monitor mode of operation to receive status change and operating failure event reports from any arterial master or isolated controllers.

Events shall be switchable for display on the central computer terminal or printed as a hard copy when they are received. Events shall consist of system identification, time and date of event occurrence, device identification (if device diagnostic event), and event description.

The central computer shall store events in a hard disk file to produce event reports, as needed. It shall be possible to transfer event files to a storage diskette for historical record keeping. Event files shall be removed from hard disk after file transfer to storage diskette to prevent overflowing the hard disk.

2.4.2 Event Reports

Event report capability shall be provided for events occurring on one day or group of days from central computer files on the hard disk or storage diskette.

A directory search capability shall be provided that lists all event files for any system by date, on the selected disk drive. If one day is selected, the date shall be entered directly or by directory search. Directory search shall be used to select dates for event reports for a group of days.

It shall be possible to display and print events as received or sorted by event type. If event type selected is for a system device, it shall be possible to specify all devices or a single device.

Menus shall be provided to facilitate event type selection. Program operation shall allow interactive operation for preparing an event report for any combination of event type and system device.

2.4.3 Status Reports

Status reports shall be generated by the arterial master controller in response to a manual command by the operator at the central computer. These reports shall present an immediate record of system operational status on the central computer display. Provision shall be made for hard copy printout.

2.4.4 Logs

Detector data shall be processed by the central computer. Real-time logs shall be printed as received by the central computer while in the monitor mode. System detector logs shall be scheduled, formatted, and sent from the arterial master.

2.5 DATA BASE MANAGEMENT

2.5.1 Programming Displays

A data base management program shall exchange and update data with arterial master and intersection controller. Each arterial master and intersection controller shall have separate data base programming pages. These pages shall contain all the programming options unique to each controller type.

Once data base management is selected from the main menu, a sub-menu shall be presented listing the data base pages available for programming. It shall be possible for the user to scroll through the data

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pages of a sub-menu or enter and exit a data page without waiting for data to fill the page. For example, page up and page down functions shall permit the operator to go from page 1 to 30, within 5 seconds.

All programming entries shall primarily consist of numerical values, YES/NO or ON/OFF entries. During program entry, the new data shall over-write the old data. If the data is in error, changes shall not be permitted and the user shall be alerted by either an error message on the display or a warning tone.

2.5.2 Upload/Download

All devices shall use upload/download techniques for data base programming. The arterial master shall employ an additional data base programming method through direct data entry.

Upload/download shall transfer the entire programmable data base from/to the arterial master or any intersection controller via the arterial master, with the exception of intersection controller preemptor and overlap configuration.

All upload/download data shall use block transfer techniques, and shall be verified by block check-sum and word parity. Non-verified data shall cause termination of the upload/download with no data transfer taking place. It shall not be possible to load erroneous interval and configuration information to the controller.

Upload techniques shall not cause the system or intersection controller to go off-line. Traffic control operation shall remain intact in all respects.

The program shall compare the database of any arterial master or intersection controller to the database on file following an upload. The compare function shall be executed by simple keyboard technique and shall identify any differences between loaded and file data. The system operator shall be able to correct, use, or substitute data values, and proceed with further comparison.

2.5.3 Backup Data Base

Data from the backup files shall be read and verified for programming EEPROMs to be installed in intersection controllers and arterial masters.

2.5.4 Auto Print

Selection to automatically print any or all arterial master or intersection controller data bases that are stored in the central computer shall be provided.

Selection eliminating intersection controllers which are not in service when all intersection controllers are selected for printing shall be provided.

The system shall print only pages within a data base that contain data. Pages with no user-entered data shall be skipped. If a data base is selected for printing, but is not found on the central computer hard disk, it shall be noted on a separate sheet of the printout.

2.6 SECURITY

System security at the central computer shall be ensured through three levels of access. The levels shall be as follows:

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a. Supervisor
b. Data change
c. Viewer

The supervisor and data change levels shall have separate access codes that must be entered prior to making data base changes.

The supervisor level shall permit access code number assignments and data base changes. Data change level shall permit data base changes. If an incorrect code is entered, data base changes are denied. Viewer level shall not permit any data base changes.

2.7 DIRECTORIES

System and intersection directories shall include location of arterial masters and associated intersection controllers by name or number.

System directory text shall describe each of the systems. A system name may be entered and shall identify the system in menus, report titles, and arterial master data base pages.

Intersection directory text shall list intersection names and telephone numbers for each associated arterial master. An intersection name may be entered and shall identify the intersection in menus, intersection displays, and intersection data base pages.

The user shall assign names to the intersection controller alarm inputs. These names shall identify alarms in event reports. Each alarm name shall be twenty characters.

2.8 DATA BASE BACKUP AND RESTORE

The system shall include an option for making backup copies on diskettes of the data base files contained in the central computer. All files required to restore the system to operation without the need to re-enter data shall be included on the backup diskette.

The central computer's files containing records of event and buffeted data shall be saved on hard disk when received from the arterial master. Provision for transferring computer files to storage diskettes shall be included. After transfer to storage diskette, monitor files shall be removed from the hard disk by a user selected command. Storage diskette files shall allow for data analysis by the same report programs used for files on hard disk.

2.9 SOFTWARE MAINTENANCE AGREEMENTS

The software agreement for licensing to the Department shall be in force upon the acceptance by the vendor to supply equipment and software to the Department either by purchase order or construction project.

2.9.1 Performance

The vendor shall warrant that the software will perform according to the specifications.

2.9.2 CPU Limitations

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The vendor shall agree that it will be the Department's option to use the software on upgraded equipment at any time and use the software on backup equipment for a limited time. The limits of use shall be as previously stated.

2.9.3 Backup Provisions

The vendor shall agree that the Department will utilize off-site storage for the software and backup files. Copies of these files shall be made by the Department as needed within the operational guidelines previously stated.

2.9.4 Operational Restrictions

The vendor shall agree that the Department will utilize the software to monitor any system within the Department's responsibility.

2.9.5 Maintenance Standards

The vendor shall agree to supply the Department with updates to the software. If the updates require upgrading of the Department's equipment, the vendor will provide the source codes to the Department for the version of software provided to the Department.

2.9.6 Source Code

The vendor shall deliver the source code and documentation to the Department to be used in the event of failure to provide support to the software. A viable holding arrangement will be considered as an alternate method for source code to be delivered to the Department at no cost to the Department. This option shall be stated on the order, plans, or other purchase agreements for the controllers, otherwise will not be required.

3.0 SYSTEM COMMUNICATIONS

The controller unit shall communicate with a system master controller, central computer (for isolated intersections), or portable computer connected directly to the controller. Internal settings, including coordination, shall be accessible via an external Hayes compatible modem through the RS-232 interface. The controller unit shall receive system master commands and data transmissions. In addition, it shall transmit the controller unit status, database, and system detector information to the system master. All alarms provided shall be accessible through the RS-232 port by remote interrogation and by automatic dialing initiated by the controller unit.

3.1 SYSTEM COMMANDS

The communication shall allow the controller unit to receive, as a minimum, the following commands:

a. The coordination pattern (selects the Cycle, offset, and split)
b. Time of day and date
c. Special function commands (minimum of four)
d. Free and flash mode command patterns
e. Control of the local system on a specified master controller
f. Request for local status

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3.2 STATUS DATA

The status of each of the following functions shall be transmitted from each controller in response to a status request from any monitoring device:

a. Green and yellow status for all phases and overlaps
b. Walk and pedestrian clearance status for all phases
c. Vehicle and pedestrian detector status (8 pedestrian and 64 vehicle detectors)
d. Phase termination status
e. Local Cycle time
f. Coordination status
g. Conflict flash status
h. Local flash status
i. Preempt activity and calls
j. Volume and occupancy data from a minimum of 16 system detectors
k. Status of four user-defined alarms
l. Zone map display data

3.3 UPLOAD/DOWNLOAD

The communication shall provide the capability to upload/download the entire intersection data base to/from a monitoring personal computer. When desired, only a single screen of data can be sent and received from the intersection

3.4 OPERATION

Communication shall operate from communication ports on the front of the controller. The controller unit shall communicate with a system master/secondary controller, central computer, portable computer and/or the conflict monitor with RS-232 serial ports accessible through DB-25S connectors. The reserve connector pin assignments shall be as follows:

Pin #	Designation
1	Frame Ground
2	Transmit Data
3	Receive Data
4	Request to Send
5	Clear to Send
6	Data Set Ready
7	Signal Ground
8	Data Carrier Detect
20	Data Terminal Ready
22	Ring Indicator

The baud rate of each port shall be keyboard selectable for any one of the following rates: 600, 1200, 2400, 4800, 9600, 14.4K, 19.2K, 28.8K, 33K, and 57.6K. The port shall be configured for an eight (8) bit word, one (1) start, one (1) stop bit and no parity.

The communication path shall use a twisted pair of wires. These may be leased lines (Type 3002, voice grade, unconditioned), radio modem, or dedicated cable.

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Communication timers shall be programmable from 0 to 9.9 seconds.

The controller unit shall be programmable via keyboard with a user assigned, unique address identifying the master and intersection.

3.5 INTRA-SYSTEM COMMUNICATIONS

Intra-system communication shall be achieved through one of the four RS-232 serial ports defined herein and an external modem. The modem shall not be provided with order unless specified elsewhere.

3.6 RADIO SYSTEM COMMUNICATION (Inter-system) - (WHEN SPECIFIED)

The data radio modem system is for microprocessor based control equipment. The modem is external to any other equipment in the controller cabinet and at the terminus and shall be provided for data transmission and indicated on the plans. The modem shall provide half or full duplex communications. The modem shall connect directly to the controller in accordance with these standards for the auto dial modem stated above.

The Department will provide the necessary management to obtain a study for interference on the above mentioned radio frequencies, coordinate the frequency to be used, and apply for licensing to use the frequency. The equipment shall operate at the assigned frequency and the supplier/contractor shall make the necessary adjustments for correct operation.

3.6.1 Radio Modem

The modem shall meet the environmental requirements of NEMA TS-2 TYPE 2 and be a maximum dimension of four inches high by twelve inches wide by twelve inches deep. Indicators shall be provided on the front of the modem indicating carrier detect, transmit data, and receive data. The following shall be the operating characteristic of the modem:

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FUNCTION	CHARACTERISTIC
Frequency Range:	173 MHz or 940 MHz range (Capable of: 138-174 MHz, 406-430 MHz, 450-475 MHz, 928-960 MHz).
Temperature Range:	-30° to +60° C.
Operating Voltage:	120/240 VAC
Transmission Mode:	16F3, 16F9, 15F2
Modulation: (Receive and Transmit)	FSK, Frequencies, 2100 Hz - mark, 1300 Hz - space.
RF connector:	Type N Female
Data connector:	RS-232-C, 9-pin
Sensitivity:	-107 dbm (1.0μV) for BER_1x10^{-3} over the voltage and temperature range.
Decoder type:	PLL FSK Demodulator
Carrier Attack Time:	_ 10mS
Turn Around Time:	10mS Maximum
Power Output:	2 watts extendable to 20 watts, 100% duty cycle.
Frequency Stability:	±5 ppm on all frequencies.
Harmonic Distortion:	5 % Maximum
Compliances:	FCC Part 15, EIA RS-316B, and RS-232-C, as applicable.

TABLE 18A-2
RADIO MODEM CHARACTERISTICS

3.6.2 Antenna

The antenna shall be connected to the modem by transmission cable meeting the Department standards. The antenna shall be a directional Yagi with a minimum of 9 Db gain and five elements. The mounting shall adapt to a one and one-half or two inch mount.

3.6.3 Antenna Tower

The contractor (for projects) shall provide a tower for mounting the antenna at the site as shown on the plans. The height of the tower shall be determined from the frequency coordination study. The tower shall be erected in accordance with the AASHTO standards.

3.6.4 Central Office Radio Terminal

Additional labor shall be provided by the project contractor to install the antenna on the Department's tower, the cable from the antenna to the modem, and the necessary hardware to complete the installation as designated on the plans and in accordance with good engineering practices. The radio modem and auto-dial modem shall be installed in a single 19 inch rack mounting system or on a wall mountable shelf.

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Mounting equipment and hardware shall be provided by the contractor. The Department will supply one RJ-11C jack for the dial modem and the necessary 120 VAC outlet for the equipment adjacent to the installation as designated by the Department.

The installation shall include lightning protection on the incoming RF cable in accordance with good engineering practices.

3.6.5 Telephone Terminal Boards (For information purposes only)

The following equipment will be installed into the existing PBX equipment for telephone lines needed to implement the system communication. All other equipment specified shall work with this equipment to complete the system's communications. This equipment will be installed in and manufactured by Rolm Telecommunication Company.

TYPE EQUIPMENT	MODEL
16-channel coder	#8551E
16-channel decoder	#8552A
8 channel line interface	#85540A

TABLE 18A-3
TELEPHONE TERMINAL EQUIPMENT

This equipment will be installed by the Department and made ready for the completion of the system.

4.0 SYSTEM MASTER CAPABILITIES

4.1 DESIGN REQUIREMENTS

The system master shall be a microcomputer device that shall control and supervise a minimum system of twenty intersection controllers. It shall provide the communications link between the central computer and each of the intersection controllers within the system. The system master shall be assigned a unique identification number for communications on the same link with other system masters. An optional method for providing system master operation is to include the master operation as part of the software within the secondary controller. This option shall require the operation of the traffic signal control and system master without interference between them. Priority shall be given to the traffic signal control and operation as defined in this section.

Each master shall generate system commands to its associated intersection controllers, either in response to prevailing traffic conditions analyzed by system master using detectors information or by time-of-day scheduling, external command inputs, or manual inputs.

The central plans shall be constructed with the following minimum options:

a. 48 Patterns with a unique cycle length per pattern
b. From one to four offsets per pattern
c. Selection of one split per pattern from a table of 24 programmable splits
d. Selection of one sequence per pattern from a table of 16 programmable sequences.

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e. Pattern 254 (NTCIP) causes the intersection to operate in free.
f. Pattern 255 (NTCIP) causes the intersection to flash as programmed internally

The reference point for all cycles shall be programmable by the user. Normally it is initialized to midnight.

A minimum of forty-eight patterns will be provided. Each pattern can make all the selections as defined as in section of 3.5 of the NTCIP NEMA protocol.

The system master shall monitor the operation of all the associated intersection controllers, communication paths, local detectors, and system detectors. User programmable reporting alarms shall initiate failure reports to the designated terminals from a list of user identification numbers. A minimum of four terminals shall be assignable.

System master shall provide:

a. Traffic Plan Selection
b. Crossing Arterial Synchronization
c. Diagnostics
d. Events
e. Logs
f. Reports
g. Data Entry

Alternative crossing arterial synchronization shall be accomplished by using the master synchronization reference point. The operating cycles having the same cycle length will be referenced to the same point. An additional interface method shall be used to operate both arteries on the same cycle length. Associated system control shall also be included for mutual coordination.

4.2 TRAFFIC PLAN SELECTION

The traffic plan shall be selected on a priority basis. The priority order shall begin with the highest being:

a. Manual commands
b. Central System commands
c. Time-of-day/day-of-week/week-of-year scheduled commands
d. Traffic responsive commands.

4.2.1 Traffic Responsive Operation

Traffic plans shall be automatically selected in response to real-time system detector input data. These commands shall be transmitted to, received and implemented by the intersection controllers within the master's system.

A minimum of forty-eight system detector inputs shall be provided and each, if selected, shall be processed into scaled values used for volume, density, and occupancy data. The volume and occupancy scale factors shall be user-specified and programmable through the keyboard into the master for each detector; otherwise a default value of zero shall be entered. Each detector shall be user-programmable as one of two directions or crossing direction.

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Detector data shall be processed to provide a value representing traffic conditions for each function. The process shall include:

a. Data computations resulting in values accurately representing vehicle volume (vehicle/hour), occupancy (time detected), and density (vehicle/mile).

b. Comparison of computed values determining the relative volume and density for traffic conditions detected and assigned to directions as stated above.

c. Accumulation of detection values over a user programmable time interval, evenly divided into a minimum of ten sampling periods, shall provide smooth transitions into selected programs designed by the Department to progress traffic through the system. Functional requirement for this process is to select a cycle, offset, and split from user specified values of detector data.

d. User-specified adjustment factors for each function shall be used to make the detector data be within 50 to 100 percent of selected vehicle density characteristic.

Function values shall be compared to user-specified threshold values for traffic plan selection. Plan selections shall not oscillate between plans which have numerically close values. A method of hysteresis shall be used to prevent oscillation.

Ranges for six traffic volume and occupancy levels shall be programmable and used for comparing the master's computed volume and occupancy level from the overall detector data. Level one shall be associated with light traffic with no coordination and level six shall be associated with heavy traffic. Twelve programmable thresholds shall be provided for the master's comparison values to implement plan selection based upon its computed values.

Arterial directional preference shall be determined by computing directional detector data. The magnitude of the difference and directional preference shall be compared to user programmed threshold values to select and implement directional or average offsets.

Split selection shall be based on user assigned system or phase detector data. Programmable weighing of each detector data, as stated above, shall be used by the master for computing each detector adjusted data. The master shall implement the appropriate split by comparing the main street and cross street data. Programmable values shall be used for selecting four levels of increasing values and four levels of decreasing values. If an error condition is detected, the selection shall default to average or user specified value.

Based on the master's computed detector data levels, a user-specified traffic plan shall be selected as the traffic responsive plan. If computed level or computed offset cannot be determined because of detector failures, a default plan shall be implemented from TOD plan or from TBC.

Each traffic plan contains a programmed split command for that plan. Alternately, it shall be possible to select splits and special function commands for user-specified plans based on split demand function values. Four split/special function combinations shall be available.

4.2.2 Time-Of-Day/Day-Of-Week/Week-Of-Year Schedule

Time-of-day scheduling shall be controlled by an internal clock, accurate to the power line frequency. In the event of a power failure, the clock shall be maintained for a minimum of 72 hours. Leap year shall be automatically compensated for and daylight savings time shall be programmable for date of occurrence. A minimum of 24 user-defined programs shall operate on a daily, weekly, and yearly basis.

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TOD programming shall follow section 3.5 of the NEMA NTCIP specifications.

Programmable entries shall include:

a. Day-program assignment
b. Start time
c. Traffic pattern (cycle, offset, split, special functions, free, plan command)
d. Traffic responsive plan enable
e. Traffic responsive plan override of TOD
f. Sample period interval
g. Sample period log interval
h. Detector log interval

The arterial master shall update time and date in all intersection controllers in a system a minimum of once every hour.

The arterial master shall include a time comparison feature. This feature shall indicate the need to update the master clock after being compared with the reference clock in the central personal computer. It would be preferred to enable a clock reset from the central computer to update the master clock with the time from the central computer.

4.2.3 External Commands

External commands shall be received from a remote source such as another arterial master. These control signals shall be used to initiate an external plan. Alternatively, the external command inputs shall be used for crossing arterial synchronization. External commands shall override TOD and traffic responsive operation.

4.2.4 Manual Entry

Manual entry from the front panel keyboard or a remote source shall provide the highest priority of plan selection. It shall be the default program if traffic responsive operation fails and a TOD plan is not specified.

4.2.5 Pattern Mode Entry (Test Command)

Mode commands shall allow selection of any defined pattern. Intersection controllers may contain the same or different programs which shall allow sub-system coordination or independent operation under time-base control.

4.3 DIAGNOSTICS

Diagnostic tests shall be continuous checks performed on system detector data, communications, and communication connected devices. Detected faults shall produce event failures at the arterial master and the central computer.

Failures shall be displayed on the arterial master. A fault isolation routine, selected from the front panel keyboard, shall identify the failed device. The operator shall have the ability to display all fault conditions on command.

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4.3.1 Power Fail Restart

Following a power interruption, the arterial master shall update the clock and bring itself on-line automatically and gain control of the system.

4.3.2 Device Event Reports

If operating in a system, diagnostic failures shall be reported to the central computer as events. The following devices shall be monitored:

a. Communication
b. Local intersection controllers
c. System detectors
d. Local detectors

Report events shall verify system master and local intersection controller responses. Communication tests can be a specific test or results from normal evaluation during operation and shall be as follows:

a. System Master Test - A system master test failure shall occur when the master does not respond to central computer commands. If a response is received within three seconds following a failure, the failure condition shall automatically clear, restoring system master/computer service.

b. Local Intersection Controller Communication Test - A local intersection controller communication failure shall occur when valid data is not received by the master for five seconds. If data is received within five seconds following a local intersection controller communication failure, the failure condition shall automatically clear, restoring local intersection controller communications.

Local intersection controller events shall indicate CMU flash, local and commanded flash, cycle fail, coordination alarm, local and commanded free, coordination error, preempt, and user-designated events:

a. CMU flash - If intersection controller status indicates CMU flash for a period in excess of a user-programmable period of 0-30 seconds, the intersection controller shall fail and a CMU flash event shall be recorded.

b. Local Flash - If intersection controller status indicates CMU flash is OFF and flash is not commanded from the arterial master, the intersection controller shall be considered off-line and a local flash event shall be recorded.

c. Commanded Flash - If intersection controller status indicates flash, CMU flash is OFF, and flash is commanded from the arterial master, the intersection controller shall be considered off-line and a commanded flash event shall be recorded.

d. Cycle Fail - If intersection controller status remains in the same phase with opposing phase calls for two cycles during coordination or three minutes if the system is free, the intersection controller shall be failed and a cycle fail event shall be recorded.

e. Coordination Event - If intersection controller status indicates a coordination alarm condition, the intersection controller shall be failed and a coordination event condition shall be recorded.

f. Local Free - If intersection controller status indicates a free condition and free is not commanded from the arterial master, the intersection controller shall be considered off-line and a local free event shall be recorded.

g. Commanded Free - If intersection controller status indicates a free condition and free is commanded from the arterial master, the intersection controller shall be considered off-line and a commanded free event shall be recorded.

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h. Coordination Error - If intersection controller status indicates a coordination error condition, the intersection controller shall be considered off-line and a coordination error event shall be recorded.

i. Preempt - If intersection controller status indicates a preempt condition, the intersection controller shall be considered off-line and a preempt event shall be recorded.

j. Event 1/Event 2 - If intersection controller status indicates an event 1 or event 2 condition, the intersection controller shall feed back user-designated alarm information and an event 1 or event 2 shall be recorded.

4.3.3 Detector Diagnostics

System detector diagnostics shall check for maximum presence, minimum presence, excessive counts, and no activity. If a system detector is diagnosed as failed or in error, then data supplied by that device shall be automatically eliminated from system computations.

Local detectors shall be checked for maximum presence and no activity only.

Detector diagnostics shall be performed each minute. Diagnostic periods shall vary depending on the diagnostic test.

Maximum presence events shall be generated by a continuous detector call during a user-specified diagnostic period. The diagnostic period shall be user-selected from 0-30 minutes.

Excessive count events shall be generated if a detector volume count is greater than or equal to a user-specified excessive count threshold. The diagnostic period shall be user-selected from 0-30 minutes.

No activity events shall be generated if vehicle counts are not received during a user-specified diagnostic period. The diagnostic period shall be user-selected from 0-255 minutes.

Detectors shall be failed when its operation is not within the specified criteria. A detector that begins functioning within the specified limits shall be returned to a non-failed status and its input used by the controller.

4.4 MONITOR EVENTS

Status changes and operating failure events at any intersection controller or arterial master shall be recorded by the arterial master at the time of failure or event occurrence. Events shall be reported to the central computer on a priority basis.

Reporting priority shall be selected by event or failure. It shall be programmable as: immediate, report with higher priority, or not at all.

Two telephone number entries shall be programmable from the central computer for reporting events to central computer and for reporting device failures to another maintenance computer or terminal. Device failure reports shall be transmitted to the designated computer or terminal only when scheduled by a TOD entry.

If the central computer is busy or off-line, a reporting arterial master shall repeatedly attempt to call at a preset retry interval in the range of three to fifteen minutes.

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Reporting shall be selected for directing all events to a central computer and maintenance computer or terminal when this capability is selected. Printed events shall consist of the following categories:

a. Program and TOD changes
b. System events
c. Device diagnostics

4.4.1 Program and TOD Changes

Program and mode changes shall occur automatically as a result of traffic responsive plan computations, TOD scheduling, external, and manual commands. Program and mode event changes shall include the following:

a. In-effect program change
b. Traffic responsive program change
c. Special function change
d. Time-of-day interval change
e. Controller command TOD change

4.4.2 System Events

System events shall be arterial master self diagnostics. The diagnostic messages shall include:

a. Power-off (Comm-failure)
b. Power-on (Comm-failure)
c. Power interrupt
d. Clock error
e. Backup

Power-off event shall be stored in memory and reported when power is restored.

Power-on event shall report the time and date that power is restored. Time and date information shall be accurate if power is off less than 72 hours.

Power interrupt event shall report when power was off for less than one second.

Clock error event shall report when time and date information is different from the central computer reference. This event shall automatically occur whenever power was off greater than 72 hours. A clock error event shall inhibit TOD operation and scheduled reports until the clock has been reset and is functioning correctly.

Backup event shall indicate a data change in the arterial master memory. All memory shall be automatically re-initialized with a backup data base to allow continued operation.

4.4.3 Device Diagnostics

All device diagnostic failures shall be reported as events. Refer to Section 4.3 for diagnostic descriptions.

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4.5 REAL-TIME DETECTOR LOGS

Real-time logs shall provide the operator with a permanent record of system detector data. Real-time logs shall consist of the following categories:

a. System detector log
b. Sample period log

4.5.1 System Detector Log

System detector logs shall show actual volume, and occupancy for user-specified system detectors. Volume shall be the number of vehicle counts accumulated, while occupancy shall be the actual percentage of time that vehicle presence was detected during a 15-minute log period.

Detector data intervals shall be user-specified by TOD scheduling. The user shall be capable of enabling and disabling the real-time log without affecting previous entries. At the end of the interval, the arterial master reports the log to the central computer for printing. The log shall not be stored on hard disk.

4.5.2 Sample Period Log

Sample period logs shall show computed parameters used in determining the traffic responsive plan selection. The sample period log interval shall be user-specified as a multiple from 1-6 sample periods by TOD scheduling.

If the default log period is programmed to be zero, the sample period log shall be reported when there is a change in the computed traffic responsive program. The user shall be capable of enabling and disabling sample period logs without affecting previous entries. The sample period log is reported to the central computer for printing. The log shall not be stored on hard disk. The sample period log shall consist of the following:

a. Scaled volume and occupancy for enabled system detectors
b. Scaled volume and occupancy for detector groups with assigned detectors
c. Current value of each program selection function
d. Smoothed value of each program selection function
e. Computed program selection values
f. Selected traffic responsive plan program
g. In-effect program and cycle length

Additionally, the printout shall identify groups that have not been assigned and parameters containing errors.

4.6 STATUS REPORTS

Manually commanded status reports shall be provided to allow the operator at the central computer an immediate record of system operations. Reports shall consist of the following categories:

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a. System status
b. Controller failure summary
c. System detector failure summary
d. Current 15-minute system detector log

4.6.1 System Status

System status report shall describe the system operating conditions. The report shall be a concise printout including the following:

a. Traffic responsive program (computed values)
b. Traffic responsive plan
c. Program-in-effect and source
d. Special function status
e. Communication status:
    1. System master communication failure
    2. Local intersection controller communication failure
f. Intersection controller status:
    1. On-line
    2. Off-line
    3. Failed
g. System detector status:
    1. On-line
    2. Failed
h. Local detector status:
    1. Failed

Local detectors shall be identified by intersection controller number and assigned phase. Intersection controller off-line shall indicate a disabled intersection controller or a non-coordinated intersection controller due to the following conditions: preemption, coordination error, local free, commanded flash, or local flash.

4.6.2 Intersection Controller Failure Summary

Intersection controller failure summary shall identify failed intersection controller(s) and probable cause(s). Probable failure causes shall be as follows:

a. Communication
b. Cycle failure
c. CMU flash
d. Coordination alarm

4.6.3 System Detector Failure Summary

System detector failure summary shall identify failed system detector(s) and probable cause(s). The possible failure causes shall be as follows:

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a. Communication
b. No activity
c. Maximum presence
d. Excessive counts

4.6.4 Current Detector Log

Current detector log shall show actual volume and occupancy recorded during the last log period. Volume shall be the number of vehicle counts accumulated while occupancy shall be the actual percentage of time a vehicle presence was detected. This data shall be indicated per detector.

4.6.5 Stored Events

Stored events shall be a report of the last events stored in the arterial master (up to 255). These events shall be printed in the order recorded. If the event storage memory becomes full, the newest event over-writes the oldest event.

5.0 COORDINATION/SYSTEM OPERATION COMMANDS

The controller unit shall provide coordination functions to control intersection cycle lengths, system offset relationships, and phase split timing. The coordinator shall perform these functions by internally manipulating the appropriate controller unit inputs. The controller unit shall be programmable for selecting these functions as output during all modes of coordination, controller unit designated as master, secondary or isolated.

Coordination functions shall be provided as a standard controller unit feature. These functions shall be included in the equipment and software provided. Hardwired inputs and outputs for coordination functions shall be through isolation relays, specified elsewhere, and shall be binaurally encoded on the respective cycle and split input lines. The voltage on the hardwired interconnect shall be 120VAC. The input lines shall have no active inputs for cycle one and split one. Cycle four and split four shall be activated by both the cycle two and three or splits two and three inputs being active respectively. Offsets one through three shall be only activated one at a time by the synchronization pulse being superimposed upon active line. The offset line shall operate by using a continuous high (120VAC) interrupted by a low for three seconds at the coordination point. Only one offset line shall be operated at a time. The remainder of the required system operations are not required to operate within a hardwired system.

Alternate methods to the cycle-split concept of coordination shall be evaluated based upon providing programmable time distribution to control vehicle movements within system parameters for traffic progression. A minimum of sixteen "programs" of the alternate method shall be provided and controlled by the inputs specified and shall meet the requirements for coordination.

5.1 TRANSITION CYCLES

The controller unit shall provide a smooth and orderly transition during operational changes in both free and coordinated operations. No skipping of thought movement phases shall be allowed when changing a sequence from a lead-lag to a lag-lead.

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5.1.1 Free to Coordinated Transition

During the free to coordinated transition, the controller unit shall complete a pick-up cycle before entering the coordinated mode. The pick-up cycle shall begin upon receipt of a sync pulse and a valid coordination command. During the pick-up cycle, the coordinator shall service all non-coordinated phase calls in normal sequence until entering the coordinated phase(s).

5.1.2 Coordination Command Transfer

The coordination command shall contain the system cycle, offset, and split. Command changes shall be implemented concurrent with a sync pulse. The cycle and split command shall take effect when the local zero point of the existing cycle is reached. Command transfers shall not stop the sequencing of the phases during the change except as noted elsewhere in this standard.

5.2 CYCLE

The coordinator shall provide five cycles. Each cycle shall have a minimum programmable cycle length from 10-255 seconds, in 1-second increments.

5.2.1 Synchronization

Coordination timing shall be synchronized to the leading edge of the system sync pulse (master zero). This point shall serve as the reference for all offset timing.

5.2.2 Sync Monitor

The coordinator shall check for the proper occurrence of the system sync pulse, once each cycle. If a sync pulse does not occur, then the coordinator shall self-sync and continue to operate with the last set of coordination commands.

Self-synchronization shall continue for a minimum of two cycles. If a sync pulse does not occur within the self sync period, the coordinator shall revert to the non-interconnected coordination mode.

5.2.3 Hardwired Interconnect

The controller shall provide for external inputs to be used for coordination. These inputs shall be connected to the wiring for the special connector described elsewhere in this standard. The functions shall meet the requirements as defined in this section.

5.3 OFFSET

The coordinator shall provide a minimum of one offset per pattern. Each offset shall be programmable within the cycle in 1-second increments from 30 to 254 seconds.

The offset shall be defined as seconds from the beginning of the master cycle counter to the beginning of the local cycle counter. When entering splits according to the NTCIP format, it shall be possible to select that the coordinated phase begins with the local zero point or ends with the local zero point. Time of day will be used to Sync the master cycle counter within the local controller. The master cycle count shall be seconds past the programmed reference, modulo of the current selected cycle length.

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5.3.1 Offset Correction

The coordinator shall provide offset correction through the following methods:

a. Shortway offset seeking
b. Dwell

5.3.2 Shortway Offset Seeking

Shortway seeking shall establish an offset within the shortest number of cycles by either lengthening or shortening the cycle length. The method provided by the manufacturer shall continue sequencing the phases until the programmed offset is established and shall be limited to a maximum of four cycle lengths. Any method that causes the controller to lose coordination or force to dwell and require the coordination to begin a second re-sync routine will not be acceptable.

Offset changes shall be accomplished by lengthening only if the reduction of the current cycle length is shorter than the sum of the controller unit's minimum vehicle interval lengths. In addition, all offset corrections shall be programmable to be lengthened only.

5.3.3 Dwell

The controller shall dwell in the coordinated phase if this method of offset seeking is selected. The sequence will begin in the first cycle after the offset is established and within the programmed permissive and force-off parameters for that cycle.

5.4 SPLIT

The controller unit shall provide three splits for each cycle. Each split shall provide a split interval for each phase of the controller unit. Each split interval shall be programmable in seconds within the cycle length timing in 1 second increments.

5.4.1 Split Intervals

Split interval settings shall determine the maximum time, including vehicle clearance (yellow and red) for a non-coordinated phase, or minimum time for a coordinated phase during the cycle. These times shall be controlled by establishing a force-off point for each phase within the cycle. Force-off points shall be determined from the phase timing values and split interval settings. Force-offs shall meet NEMA requirements and continue to be applied until the phase is terminated.

5.4.2 Coordinated Phase Split Extension

During coordination, an option shall be programmable to operate the coordinated phase(s) as actuated or non-actuated. If the coordinated phase is actuated, vehicle detections shall permit the coordinator to extend a phase beyond the normal yield point. Extended coordinated phase green shall be selected in seconds or terminated by a force-off setting for that phase. Selection of the CNA I and/or II operation per cycle will meet the non-actuated operation with the selected phase remaining green until the programmed force-off for that phase is reached.

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5.5 PERMISSIVE PERIODS

Permissive periods shall be timed in seconds within the cycle length and provided for each cycle or program to control the time period when the coordinated phase is released to service calls on the non-coordinated phases.

5.5.1 Yield Point

The yield point shall be defined as the point within the cycle when the hold input is released on the coordinated phase and the controller unit is allowed to service calls on non-coordinated phases. A force-off point shall be applied at the time the hold is released, unless a force-off has been programmed for this phase.

The yield point shall begin from the coordinated phase split interval and pedestrian clearance plus vehicle clearance time. The coordinated phase pedestrian clearance period shall always begin at the yield point regardless of calls on the non-coordinated phases.

5.5.2 Permissive Periods

All permissive period timing shall begin at the yield point. A minimum of three programmable permissive periods shall be provided. The vehicle portion of each permissive period shall be a programmable timed interval within the cycle length. An automatic pedestrian permissive period shall be allowed for phases following the coordinated phase(s). Each permissive period shall be programmable for selecting phases that would operate during this period. This function shall operate as follows:

a. During the <u>first permissive period</u>, the controller unit shall answer only vehicle or pedestrian calls on the phase(s) following the coordinated phase in the programmed sequence. If the controller unit yields to a call during this period and the all remaining phases are allowed during this period, then other permissive periods shall be inhibited. All remaining calls shall be served in programmed sequence.

b. The <u>second and third permissive periods</u> shall be programmable for beginning and ending after the yield point. During each permissive period the controller unit shall answer calls on each period's programmed phase(s).

c. An <u>alternate method</u> for the permissive period operation described above will be considered. The principle guidelines for controlling phase time shall be followed.

5.5.3 Single Permissive Period

Single permissive period shall become operational by eliminating the second and third permissive periods as described above. This single permissive period shall be similar to the first permissive period, except that the controller unit shall answer calls on any phase in order of the programmed sequence during the permissive period.

5.6 CYCLE PROGRAMMING

In addition to cycle length, offsets and splits, the following functions shall be programmable on a per cycle basis. Alternate methods of function selection shall be controlled by cycle, split, and offset inputs.

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5.6.1 Coordinated Phases

Coordinated phases shall be selected for each cycle. If the coordinated phase assignments are changed when transferring between cycles, the coordinator may operate in the free mode until completing a pick-up cycle.

The coordinated phases shall normally operate in the non-actuated mode during coordination. However, it shall be possible to select the coordinated phases to remain in the actuated mode (see paragraph 5.4.2).

5.6.2 Phase Sequence

The controller unit shall normally use a standard quad phase sequence. The controller shall be programmable to select the phase sequence by selecting cycle and split. The phase sequencing shall be selected from the sequences specified previously. The free mode phase sequence shall be programmable from the keyboard and not restricted to be one of the coordinated sequences.

5.6.3 Phase Omit

Phase omit(s) shall be selected during each cycle or program. Additionally, a phase shall be omitted if its split interval value, for the current split, is zero.

5.7 CROSSING ARTERY CONTROL

The coordinator shall be programmable for crossing artery synchronization by implementing dual coordinated phases at an intersection(s). The coordinator shall be programmable for two coordinated phases in a ring assignable to primary or secondary coordination. Phase(s) shall assigned to a secondary coordinator shall time the green of the phase until the force off occurs or shall be controlled by call to non-actuated operation.

In addition, the coordinator shall output a crossing artery sync pulse indicating the beginning of the crossing artery phase split interval. This signal shall be used to establish the master zero for the crossing artery system master.

Dual coordination shall also force a selected crossing artery split to be used. This feature shall optimize a particular split in each cycle for dual coordination.

See section 5.0 for alternate coordination methods and additional artery control.

5.8 FREE

The coordinator shall provide a free mode of operation. During this mode, all coordination control shall be removed from the controller unit.

Free mode shall be selected by coordination commands, external input, or keyboard entry. Additionally, the coordinator shall revert to free mode when active controller unit inputs, or functions, would interfere with coordination. These inputs or functions shall include the following:

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a. Manual Control Enable
b. Stop Time
c. Automatic Flash
d. Preemption

5.9 MANUAL CONTROL

The controller unit shall allow entry of manual override commands from the keyboard. Manual commands shall permit individual selection of any cycle, any offset, any split or selection of the complete coordination command. When a manual cycle is selected, the sync pulse shall be generated by the time based control section of the controller unit.

5.10 PROGRAM CONTROL

The alternate method of coordination shall provide manual control that shall select 1 of 16 programs (see section 6.2.3).

5.11 MODES OF INTERCONNECT

The coordinator shall be capable of operating with any of the following interconnect types:

a. Internal Time Based Coordination
b. Telemetry
c. Hardwired

The non-interconnected coordination mode shall also serve as a backup mode to communication or hardwired interconnect (see paragraph 5.1.2).

The coordinator shall be compatible with electromechanical pre-timed interconnect which provides the sync pulse superimposed on the offset lines.

5.12 MASTER COORDINATOR

The coordinator shall output the coordination commands, including sync. This feature shall permit the controller unit to be used as a time-of-day master in a hardwired electromechanical pre-timed interconnected system. This feature shall be included in all controllers and shall not have restricted use.

6.0 TIME-BASED CONTROL/NON-INTERCONNECTED COORDINATION

The controller unit shall include time-based control. This capability shall be a standard feature and shall include the additional modules and/or software.

6.1 CLOCK/CALENDAR

The controller unit shall provide a time-of-day (TOD)/99 year clock. The clock shall be programmed for current time (hour, minute, and second), date (month, day, and year), day of week, and week of year. This clock shall be used for all time based control functions.

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6.1.1 Clock Accuracy

The TOD clock shall use the power line frequency as a time base. When power is removed, the time shall be maintained by a crystal oscillator.

The oscillator shall maintain the time to within $\pm$ 0.005%, as compared to the Universal Mean Coordinated Time Standard. This accuracy shall be maintained over the NEMA Standard temperature range regardless of the number or rate of power failures.

The controller unit shall maintain the TOD clock during power outages for a minimum of forty-eight hours.

6.1.2 Time and Date Entry

Time and date information shall be entered in the controller unit through the following methods:

a. The controller unit keyboard
b. Computer via RS-232 port
c. Updated via system communications

6.1.3 Leap Year and Daylight Savings Time

The TOD clock shall automatically compensate for leap year changes. Daylight savings time changes shall be programmable to occur on a selected week or be omitted if not programmed.

6.2 TIME BASED CONTROL

6.2.1 Program Format

Time based control shall utilize a yearly program format. The program shall select from a minimum of sixty programs with cycle, offset, and split operations assignable to a day, days of the week, weekend or any one of, selection of more than one or all 52 weeks in the year.

6.2.2 Holidays

There shall be a minimum of 35 holiday or exception-day programs. Each holiday-program shall be assignable to occur on a specific month and day. Holiday-programs shall override the current day-program.

Each holiday-program shall be selected to repeat the following year.

6.2.3 Program Selection

Each program shall permit selection of the following functions:

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a. Day program assignment, (Month/Week/Day)
b. Start time, (Hour/Min/Sec)
c. Program, (Cycle/Offset/Split)
d. Control of a minimum of four Special Function outputs
e. Flash
f. Max 1 or 2
g. Free
h. Phase sequence

The cycle/offset/split/sequence or free commands, selected by a program step, shall serve as the coordination program only when the controller unit is operating as a TOD master or operating with time based coordination.

Remaining program step functions shall take effect immediately when the program step becomes active.

6.2.4 Manual Program Selection

It shall be possible to manually force any of the program steps to override the current program step. The forced step shall be entered from the keyboard and shall remain in effect until removed or until the next programmed step.

6.3 NON-INTERCONNECTED COORDINATION

6.3.1 Re-sync Time

When operating in the non-interconnected coordination mode, a programmable synchronization time shall be used as the beginning time for all cycles. All cycles shall be reset to zero, each day, at this time.

6.3.2 Synchronization Point

The synchronization point will be calculated as defined in the NTCIP standard. Computing this point was described in the coordination section. Computing the synchronization point based on event changes or similar methods will not be accepted.

7.0 CONTROLLER UNIT FEATURES

7.1 DESIGN REQUIREMENTS

This specifications set forth the minimum requirements for a shelf-mounted sixteen (16) phase full-actuated solid state controller unit with internal Time-Based Coordination (TBC), railroad / fire (emergency vehicle) preemption, diamond intersection operation, and closed loop master/secondary operation in a traffic signal controller assembly and cabinet assembly.

The controller unit shall meet the requirements of NEMA Standards Publication TS 2 1998 (TS 2), latest edition. Where a difference occurs, these requirements shall govern. The purchase document shall identify either a TS 2 Type 1 interface or TS 2 Type 2 interface.

The controller unit shall be microprocessor based with additional solid state electronics components for memory and data entry of all timing and traffic control functions described herein. The hardware

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provided shall meet the NEMA temperature requirements certified by an independent laboratory. A resident program shall start the controller operating when power is first applied, without a failure, providing the functionality described herein. The controller unit shall begin using each programmed data for the first occurrence of the event requiring the data and after data is loaded into memory. All units shall be capable of both master and secondary operations as described by these specifications.

The controller unit shall be shelf mountable enclosure containing electronics and hardware for processor/display, input/output interface, system communications, and power supply functions. The enclosure shall be constructed of sheet aluminum and a maximum of fifteen inches wide by ten and one-half inches high by ten inches deep. All exterior surfaces shall be finished with a durable protective coating or anodized. Model and serial number shall be permanently attached and/or displayed on the frame of the enclosure.

The controller unit shall provide electronic circuitry to monitor the operation of the microprocessor. Processor and circuitry faults shall be detected and shall set the voltage monitor output FALSE then indicate an error message on the front panel display.

The controller unit power supply shall provide for isolation and protection against power surges, generate all regulated voltages for internal and external use, and provide power monitoring control signals. The minimum power output shall be 24 watts @ 24 VDC. Additional protection shall be designed into the power supply for radio-frequency interference filtration including a differential and common mode noise filter. Fuse protection shall be provided for the 115 VAC input and 24 VDC power output. These fuses shall be mounted on or accessible from the front of the controller without removing the panel held by fasteners requiring tools for removal.

All timing shall be referenced to the 60 Hertz input power. This reference shall control all timing of the controller unit.

A power retaining component, "super cap", shall be provided for maintaining the time-of-day clock and temporary data storage during a primary power outage. The component shall provide sufficient voltage supply for a power interruption of forty-eight hours. Lead-acid and Ni-Cad batteries are not acceptable.

7.2 KEYBOARD

The programming of the controller shall be accomplished using a keyboard and shall include vehicle, pedestrian, and preemptor calls during test. The keyboard shall be located on the front panel of the controller unit. The keyboard shall be socket mounted for easy maintenance.

The keyboard contacts shall be constructed to be environmentally sealed, highly resistive to oil, dust, water, and most harsh environments and have a minimum rated lifetime of one million operations per key. All keys shall provide positive tactile feel and/or sound to the user.

All keys shall be clearly labeled indicating their function. Numerical keys shall be arranged in a standard telephone pattern. Keys used for YES/NO or ON/OFF entries shall be appropriately labeled. Additionally, data entry control and cursor keys shall clearly indicate their function.

Cursor keys shall provide directional movement of the cursor to any data entry position desired. The cursor keys shall auto-repeat if depressed for longer than one second, to facilitate locating a data entry.

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7.3 EEPROM DATA MODULE

User programmed settings and intersection configuration data shall be stored in an electrically erasable programmable read only memory (EEPROM). The device shall have the ability to be reprogrammed a minimum of 1500 times. Sectional programming of the EEPROM for each data entry shall be acceptable only if the Manufacture guarantees the life of the EEPROM under normal use for a period of 10 years and will be at the discretion of the Department. Designs using a battery to maintain user data entries shall not be acceptable. Additional requirements concerning data references are found in section 8.5.

7.3.1 Data Module

To facilitate data transfer from one controller unit to another, the EEPROM device shall be mounted on a sub-module (Data Module). The Data Module shall connect to the processor/display module via a DIN type printed circuit connector.

7.3.2 Firmware

The firmware shall be stored in a Flash ROM. The firmware (proprietary software) updates shall be accomplished by using upload/download unit connected to the controller's RS - 232 port (storage in Flash ROM). It shall not necessary to physically replace hardware components to update the firmware. Connecting the upload/download unit to a communications port on the controller and transferring the new firmware from files on the PC to the controller's PROM memory shall accomplish the update procedure. The components shall accept a minimum of one thousand (1000) firmware updates. The following components shall be supplied to accomplish the firmware update:

1. PC compatible software program to accomplish the transfer with a verification routine.
2. One (1) copy of instruction manual for the entire process.

The update process shall be accomplished at a transfer rate of ninety six hundred (9600) baud.

If the requirements of this section conflict with any provision of this specification (TCS 18A), the requirements of this section shall rule. No provision of this specification shall relieve the Vendor of supplying a controller that meets the requirements of section 7.3.2.

7.4 DISPLAY

A liquid crystal display (LCD) shall be provided on the front panel of the controller unit to display programming and operational status information. The display shall be clearly readable in bright sunlight or dim artificial light without shading the display. The contrast of the display shall be adjustable. If after the Department's evaluation that this requirement is not met then backlighting shall be provided. It shall contain a minimum of four lines with forty alphanumeric characters per line. The display shall have an expected continuous life cycle of ten years while operating in the NEMA temperature range.

7.5 OPERATING DISPLAYS

The display shall have two modes of operation, dynamic and programming. The dynamic mode shall display operational status information, while the programming mode shall display user-programmable information. The normal display shall be either blank or a dynamic display as stated below.

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7.5.1 Dynamic Displays

The dynamic displays shall provide a visual status of the real-time controller unit operations. Data entry shall be prevented without a display indicating the location for the data and the data that will be entered in this mode. Data entry during this display is acceptable only as an extra method, not as the primary data entry method.

The dynamic displays shall be accessible via the front panel keyboard. The following status displays shall be specific to each of the major functions of the controller unit.

7.5.2 Controller Timing Displays

The controller timing displays shall be a dynamic display that indicates ring, phase, and coordination status information. Ring status shall include phase timing, current interval and time remaining for both rings, simultaneously. Status messages shall include current vehicle and pedestrian intervals, reasons for phase termination, and Max timer in effect.

Phase status shall indicate the current phase(s) timing and which phase(s) is next to time, vehicle/pedestrian call/recall information and preemptor calls.

The coordinator status display shall indicate the command source, current cycle/offset/split, local/system cycle count, commanded/actual offset, and offset correction. This display shall provide co-ordination relationship to phase operation in real time and be a single display.

The preemptor status display shall indicate calls, preemptor active, and delay period timing. Also indicated shall be preemptor timing, the phase(s) timing while in preemption, interval, and time remaining on the interval.

The detector status display shall indicate activity for all detectors. The display shall indicate detector calls as they are processed by the controller unit.

7.5.3 Programming Displays

The programming displays shall aid the operator to enter data from the keyboard. These displays shall be arranged in a menu format. The main menu shall allow the user to select one of the major functions of the controller unit. A sub-menu is permissible to display selection of a specific area within that function. Cursor keys shall allow the user to move up, down, left, or right through the data of the menu. Multiple data entries shall be shown at the same time to facilitate programming. It shall be possible to return to the main menu or sub-menu by *a* maximum of two key strokes.

English language and traffic engineering terminology shall be used throughout the programming displays. Display organization and data entry method shall allow traffic engineers or technicians to program the controller unit without using reference cards or manuals. Mnemonic usage shall be minimized and limited to recognized traffic engineering terms.

All programming entries shall consist of numerical values, YES/NO, ON/OFF, TRUE/FALSE, logical 1's/0's entries. During program entry, the new data shall be displayed as it is entered from the keyboard. For quick entry of data, a repeating or copy function shall be provided. If the data is in error, then the user shall be alerted by an error message on the display. Previously programmed entries shall remain until valid data is entered.

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7.6 PROGRAMMING

The programming methods shall not affect normal operation of the controller unit.

Download flexibility shall permit individual transfer of each major programmable category or the entire data base at one time.

Controller unit programming shall be accomplished by the following methods:

a. Front panel keyboard through menu access.
b. Downloading data from a LA DOTD computer with Windows software system (including lap-top) running the appropriate software and using the controller unit terminal interface directly or via a dial-up modem.
c. Data module transfer from one controller unit to another as specified in section 7.3.

7.7 PROGRAMMING SECURITY

A four digit code shall be user selected, and stored in EEPROM, for one level of programming security. Display features shall be available without the need to employ the access code. The controller unit shall be supplied with the codes preset to all zeros (0000).

If the access code has not been entered and a data entry attempt is made, then a prompt, requesting the access code, shall appear. Once entering the code, the screen shall revert to the previous display and data entry shall be permitted. The code shall not appear on the screen at any time. No further access code entries shall be required.

When the access code is required for data entry, the controller unit shall automatically set the locked access mode following a period of keyboard inactivity for eight minutes.

The access code shall be changeable only if the previous access code has been entered. Additionally, it shall be possible to prevent changing the access code from the keyboard.

7.8 MEMORY CLEAR

A memory clear function from the keyboard shall not be permitted for the user to clear data entries. Default values shall be entered by the user to supersede previously programmed data.

7.9 INTERFACE CONNECTORS

All interface connectors shall be accessible on the front of the controller unit and rigidly secured to the controller by the shell of the connector. Three MS-type connectors (A, B, C), meeting the pin assignment and interface requirements of the NEMA Standard shall be provided. A fourth connector, identified as the D connector shall be provided for auxiliary inputs and outputs as specified within this standard.

Four (4) RS232 ports shall be provided for communications with the system software, portable download/upload unit, conflict monitor and intra-system communications. These four (4) ports shall be keyboard-assignable for any of the communications functions. All four (4) ports shall be RS-232 serial port accessible through DB-25, twenty-five pin, subminiature, dual-inline connectors. Additional ports required for closed loop secondary operation shall be supplied, if necessary to support the Vendor's

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standard closed-loop application software. Each unit shall support all necessary communication ports for both master and secondary operation.

One SDLC port shall be provided per unit in compliance with NEMA TS-2, 1998 specifications.

All connectors shall be mounted a minimum one and one-half inches apart providing hand working room for comfortable installing and removing of the mating connectors.

All inputs and outputs to the controller unit shall conform to the applicable interface and environmental requirements of the NEMA Standard.

7.10 PRINTED CIRCUIT BOARDS

All printed circuit boards shall meet, as a minimum, the requirements of the NEMA Standard. In addition, they shall also meet the following requirements:

a. All plated-through holes and circuit traces shall be plated with solder to protect exposed copper. Any wire jumpers included on circuit boards shall be placed in plated-through-holes that are specifically designed to contain them. Circuit track corrections by track cuts and jumpers that are tack soldered to circuit tracks are not acceptable.
b. Both sides of the printed circuit board shall be covered with a solder mask material.
c. The circuit reference designation for all components shall be clearly marked adjacent to the component. Pin 1 for all integrated circuit packages shall be designated on all printed circuit boards.
d. All electrical mating surfaces shall be gold-flashed.
e. All ICs 14 pin and up shall be installed in machine tooled grade sockets meeting these requirements. All sockets shall be AUGAT-8XX-AG11D or approved equal, meet UL specification 94V-0, be constructed with two-piece, machined contacts and close-ended to eliminate solder wicking. The outer sleeve shall be brass with tin or gold plating and tapered to allow easy IC insertion. The inner contact shall be beryllium copper sub-plated with nickel and plated with gold.

7.11 SERVICEABILITY

The controller unit design shall use printed circuit boards that plug into an internal harness array and/or connector plug within the unit. All circuit boards shall be mounted vertically. Transformers, capacitors, and transient suppressor components are exempt from the above requirement.

The controller unit design shall allow easy removal or replacement of a circuit board. All printed circuit boards shall be keyed to prevent improper installation.

The controller unit enclosure shall be constructed to allow complete disassembly using hand or standard screwdriver operated fasteners. The unit shall be designed for adequate accessibility to troubleshoot and test one side of any circuit board while the unit is still in operation. If testing cannot be accomplished with boards in their assigned position then extender boards or cables may be used. Only one board at a time shall be required to be moved during testing.

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7.12 SERVICE EQUIPMENT (to be provided when stated on order)

One set of cables and/or extender boards shall be provided with each order of ten controllers, two sets for twenty controllers, with a maximum of three sets of cable or extender boards.

One portable controller testing facility shall be provided with each order of ten controllers, two for twenty controllers, and a maximum of three for more than thirty controllers.

The testing facility shall provide switches for testing all NEMA inputs and LED's for all NEMA outputs. In addition, indicators and switches shall be provided for testing all the requirements within this standard except for the communication ports and/or RS-232 connectors.

The facility shall be contained within a weather proof enclosure, with quick release closure latches, and have a carrying handle. All harnesses shall be provided with the standard A, B, and C harnesses permanently wired within the enclosure. The additional harnesses shall be connected within the enclosure with a circular plastic connector meeting the requirements for type and pin assignment for the fourth connector installed in the cabinet. All standard NEMA functions shall be permanently labeled for each indication and switch. All additional inputs and outputs shall be identified with overlays which can be labeled identifying the function.

All servicing equipment shall be identified and documentation shall be provided which includes wiring diagrams and schematics.

8.0 ACTUATED CONTROL

The controller unit shall provide the actuated control functions and operations required by Sections 2, 13 and 14 of the NEMA Standard. In addition, it shall provide the features described in the following paragraphs.

8.1 PHASE SEQUENCE

The phase sequence of the controller unit shall be programmable in any combination of sixteen phases to achieve phase reversal individually or by pairs, one to four independent or concurrent timing rings, multiple rings allowing selection of four phase operated as a concurrent group, or coordination of two rings and one sequential ring divided by one barrier. Sequencing shall be selected by cycle program or timing plan. Selection of the required sequences shall be programmable from any of the following:

a. Full NEMA and NTCIP operation
b. Select a program number for an established phase sequence
c. Select one to four timing rings, with concurrent or sequential phase assignment
d. Select three or four phase diamond

Specific sequences required by the Department shall be selected from the above operation. Program for selecting phases shall include provisions to disable phases with each program, (phase on - off). Alternate sequences may be used to satisfy the above requirements however mutual coordination of the separate rings will be required. All controller units shall provide these sequences.

Diamond sequences shall include two operational sequences for interstate ramp interchanges. The operation of the controller unit as a 4 phase, and 3 phase diamond shall be keyboard selected and the standard timing function required by NEMA TS1 shall be provided for each phase. The configuration

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shall operate as two independent four phase rings. There shall be two mutually exclusive inputs as defined in Appendix (pins 12 and 13) that will force the controller unit into 3 phase or 4 phase operation. Additional circuits in this harness shall be for controller and cabinet interlock. Pin 35 listed in Appendix shall be a ground true controller interlock output. The controller shall assert this output when it is present and powered on. Pin 42 listed in Appendix shall be a ground true cabinet interlock input. This input shall be internally pulled up to 24VDC and the controller shall sense this input and operate only when it is present. Special clearance intervals shall be pre-timed programmable and shall be activated within the sequence shown. This shall be overridden while under computer control, TBC control, or by the inputs defined below. Figure 18A-3 illustrates the assignment of phase numbers to the traffic movements. The additional detector inputs shall be provided with these controllers as stated in the pin assignment for the connector.

8.1.1 Four Phase Diamond Operation

The normal sequence of operation shall be phase 2/5 → 4/5 → 1/6 → 1/8.

The point at which operation may be switched from 4 phase to 3 phase operation shall occur by forcing the sequence into concurrent left turns (inside clearance during ∅ 1 and ∅ 5).

The loop detector layout for 4 phase diamond operation shall be as defined in Figure 18A-4. Each detector input shall be to the phase shown and provide the normal phase timing required by NEMA TS1. The controller unit software shall provide the additional logic for Detector Circuit operation in the following description:

a. Detector Circuit #1 -
   1. Shall extend phase 1/6 if phase 1/8 is called.
   2. Shall call phase 2/5 if phase B overlap is not green and phase 4/5 is not called.
   3. Extend intervals inside left turn clearance interval.

b. Detector Circuit #2 -
   1. Shall extend phase 2/5 if phase 4/5 is called.
   2. Shall call phase 1/6 if phase A overlap is not green and phase 1/8 is not called.
   3. Extend intervals inside left turn clearance interval.

c. Detector Circuit #3 (45P) and #4 (45S) -
   During the phase 4/5 red condition the 45P detector shall always be active and the phase 45S detector shall always be inactive. A phase 4/5 green plus a phase 1/6 call plus a 0.2 second gap in 45P detection shall disable the 45P detector and enable the 45S detector until the phase 4/5 signal changes to yellow. The circuits then switch back to normal - 18P active and 18S inactive until the condition is repeated.

d. Detector Circuits #5 (18P) and #6 (18S) -
   During the phase 1/8 red condition the 18P detector shall always be active and the phase 18S detector shall always be inactive. A phase 1/8 green plus a phase 2/5 call plus a 0.2 second gap in 18P detection shall disable the 18P detector and enable the 18S detector until the phase 1/8 signal changes to yellow. The circuits then switch back to normal - 18P active and 18S inactive until the condition is repeated.

e. Detector Circuits #7 (25S) and #8 (16S) -
   The phase 2/5 detector circuit shall always be active during phase 2/5 red. A phase 25 green plus a 0.2 second gap in detector 25S shall disable this circuit until loss of phase 2/5 green.

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The phase 1/6 detector circuit shall always be active during phase 1/6 red. A phase 1/6 green plus a 0.2 second gap in detector 16S shall disable this circuit until loss of phase 1/6 green.

The 0.2 second gaps mentioned above shall be keyboard programmable from 0 to 3.0 seconds in 0.10 second increments or smaller.

The phase 45P detector shall always extend phase 4 during phase 4/6 interval.

The phase 45P detector shall always extend phase 8 during phase 8/2 interval.

An indication shall be provided for both the 45P detector circuit and the 18P detector circuit to indicate when they are active. When a circuit becomes inactive, the indication shall go out and stay out until it again becomes active.

f. Concurrent Timing Requirements -

Refer to Figures 18A-3 for the following descriptions.

The clearance interval phase 4/6 when sequencing from phase 4/5 to 1/6 shall time concurrently with phase 6, however phase 6 may not terminate green until phase 4 yellow interval has timed out.

The clearance interval phase 2/8 when sequencing from phase 1/8 to phase 2/5 shall time concurrently with phase 2, however phase 2 may not terminate green until phase 8 yellow interval has timed out.

All left to right internal clearance (Ø1/Ø5) times from phase 4/5 to phase 1/8 shall use the same timing settings for minimum green, extension, max green, yellow clearance, and red clearance.

All right to left internal clearance (Ø5/Ø1) times from phase 1/8 to phase 4/5 shall use the same timing settings for minimum green, extension, max green, yellow clearance, and red clearance.

Separate timing settings for minimum green, extension, max green, yellow clearance and red clearance shall be provided for each of the two external clearance intervals (Ø2/Ø8 and Ø4/Ø6 from Ø1/Ø8 to Ø2/Ø5 and Ø4/Ø5 to Ø1/Ø6).

8.1.2 Three Phase Diamond Operation

a. Sequence

The controller unit shall be keyboard selected for 3 phase diamond operation.

The normal sequence of operation shall be, except as modified below, 4/8 → 2/6 → 1/5.

The point at which operation may be switched from 3 phase to 4 phase operation shall be from phase 1/5 to 4 phase inside clearance interval phase 1/5.

The path from 4/8 to 2/6 shall be keyboard selected and selected by the TBC (on a time of day basis) for one of the five possible phase combinations of lead/lag left turn clearance movements. These possible phase combinations shall be permitted when individual phase gap time expires.

4/8 → 4/6 → 2/6
4/8 → 4/5 → 2/6
4/8 → 2/6
4/8 → 2/8 → 2/6
4/8 → 1/8 → 2/6

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The path from 2/6 to 1/5 shall be keyboard selected and selected by the TBC (on a time of day basis) for either 2/6 → 1/6 → 1/5 or 2/6 → 2/5 → 1/5.

The path from 2/6 to 4/8 shall always be through 1/5 and terminated simultaneously. The sequencing shall be flexible and phases shall be terminated bases on traffic actuation and gaps programmed for the phase.

b. Detector Operation

The loop detector layout for 3-phase diamond operation shall be as defined in Figure 18A-4.

The 1P detector shall function as a phase 2 calling detector during phase 4 and as a phase 1 extending detector during phase 2.

The 5P detector shall function as a phase 6 calling detector during phase 8 and as a phase 5 extending detector during phase 5.

8.2 TIMING INTERVALS - ALL SEQUENCES

The controller shall be programmable for the following timing parameters and any of the selected sequences. Each phase shall be timed independently and special clearance phasing described in the diamond sequence may be timed by group.

The following timed intervals shall be programmable in the minimum range for each interval

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INTERVAL	RANGE (SEC.)	INCREMENT (SEC.)
Vehicle passage	0-25.5	0.1
Yellow clearance	3-25.5	0.1
Red clearance	0-25.5	0.1
Added initial min. green	0-25.5	0.1
Red revert	0-25.5	0.1
Minimum gap	0-25.5	0.1
Delay/extend detector timing	0-25.5	0.1
Walk	0-255	1.0
Pedestrian clearance	0-255	1.0
Time before gap reduction	0-255	1
Time to reduce gap	0-255	1
Min initial green	0-255	1
Maximum added initial green	0-255	1
Overlap timing	0-25.5	.1
Maximum green I, II & III	0-255	1
Maximum green extension interval	0-255	1

TABLE 18A-4
TIMING INTERVALS

8.2.1 Guaranteed Interval

Guaranteed minimum time shall be provided for each phase, overlap, and preempt yellow. Minimum values shall not be changeable or overridden from the programming sources listed in this specification. Guaranteed minimum interval value shall be three seconds.

8.2.2 Maximum Green Intervals

The controller unit shall provide two maximum green intervals per phase, however three are preferable. Maximum intervals shall be selected by either time-of-day or external input.

8.2.3 Maximum Green Extension

The controller unit shall be capable of extending a phase maximum green time by continuous vehicle demand. If the phase terminates by expiration of the maximum time for one successive cycles, then its maximum green time in effect (Max 1 or Max 2) shall automatically be extended by a maximum green extension interval. The maximum green time shall be increased, until it equals Max 3, on each successive

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cycle that the phase green is terminated by the Max 1 or 2. If the phase gaps out for one successive cycles then the maximum green time shall return to the original Max 1 or 2 value.

An alternate method for providing active traffic responsive timing shall use the volume/occupancy system detectors capability assignment to the phase detector. A preprogrammed cycle plan shall be initiated for providing timing modification to meet the traffic demand.

8.2.4 Volume Density Intervals

Each phase shall have volume density intervals conforming to NEMA standards.

8.3 OVERLAPS

The controller unit shall provide sixteen internally generated overlaps: Each overlap may be programmable as standard or protected/permissive. The capability shall be provided for reassignments of a minimum of four phase outputs to overlap operation shall be in the software for implementing special sequencing requirements and shall not require rewiring the controller signal outputs on the back-panel.

8.3.1 Overlap Timing

Green, yellow and red timing intervals shall be provided for each overlap. These intervals shall permit the overlap to remain green after terminating the parent phase in addition to providing separate yellow and red clearance intervals for the overlap. A programmable feature shall provide a selection of sequencing that would hold all phases red or advance to the next serviceable phase green after the parent phase has terminated and the overlap timing is in effect. In either selection the next serviceable phase interval shall not begin timing until the overlap times have expired. Overlaps shall be controlled by the parent phase if the overlap timing intervals are not programmed. The overlap sequence shall never violate the conventional green, yellow, red sequence under any circumstance. This timing operation shall be provided during all operational requirement herein specified. Any conflicting operation with this timing requirement shall supersede the timing extensions.

Overlap programming flexibility shall permit the user to assign the timed overlap to follow any parent phase(s).

8.3.2 Multi-Overlap Operation

The controller unit shall be capable of eight overlaps including the standard four and assigning four phase outputs as overlaps. If a phase output is assigned as an overlap then it shall function as a standard overlap and programmed in the EEPROM. Changing these overlap assignments shall be programmed from the keyboard of the controller unit and provide warning of the impending sequence change.

8.4 RECALL FUNCTIONS

The controller unit shall provide the following programmable features for each phase.

a. Locking/Non-locking detector memory
b. Vehicle recall
c. Pedestrian recall
d. Maximum recall
e. Soft recall - Locking/Non-locking memory

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Soft recall shall return the controller unit to the programmed phases in the absence of all other calls.

8.5 INITIALIZATION

The controller unit shall permit power start and external start to be individually programmed by phase and interval. Start intervals shall be green, yellow, red, all red or flash. During a power start condition, the controller unit shall be programmable for a timed display of an all red or flash interval before the selected start phase(s) and intervals are displayed. Data reference shall be made to the data in the EEPROM. An error shall keep the controller non-operational until the error is corrected. Resets shall be initiated to correct data integrity and begin the controller operating.

8.6 ADDITIONAL FEATURES

8.6.1 Last Car Passage

The controller unit shall provide guaranteed passage operation on a per phase basis. When selected, this feature shall provide a full passage (vehicle extension) interval when a phase gaps out with a gap in effect less than the passage time. The phase shall terminate after the passage interval expires.

8.6.2 Dual Entry

The controller unit shall provide both single and dual entry operation. When selected, dual entry shall cause the controller unit to insure that one program selected phase is timing in each ring. If calls do not exist in a ring when a barrier is crossed, the controller shall select a programmed compatible phase and operate it concurrently with the phase or phases that have calls. When the selected controller sequence is non-NEMA, then an acceptable method of calling a compatible phase is the use of vehicle detector switching.

8.6.3 Conditional Service

The controller unit shall provide a programmable conditional service feature when the controller is operated in the standard NEMA sequence. When selected, the controller unit shall service only one odd numbered phase during a sequence, once normal service to that phase has been completed and enough time for additional service exists on the concurrent even phase. The odd phase (left turn) shall be serviced if the vehicle clearance time of the terminating even phase plus a conditional service minimum green is less than or equal to the time remaining on the maximum green timer of the even phase which is still timing.

A conditional service, minimum green time shall be programmable for each phase. This interval shall insure a minimum green if the phase is conditionally served.

The controller shall be programmable to re-service the even phase after conditionally serving an odd phase following the same guidelines stated above. Once an even phase has been conditionally re-serviced, the odd phase shall not be conditionally served again until returning to the concurrent group that is timing.

8.6.4 Pedestrian Functions

The controller unit shall provide the following additional pedestrian functions:

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a. Actuated phase rest in walk
b. Pedestrian clearance protection during manual control
c. Exclusive pedestrian occurring once at a programmable point within each of the previously required sequences.

8.6.5 Backup Protection

Programming shall be provided to inhibit re-service of odd phases within the same concurrent group. When programmed, backup protection shall take priority before conditional service.

8.6.6 Simultaneous Gap Termination

The controller unit shall provide a programmable simultaneous gap termination feature. When programmed, phases in both rings must gap out together in order to terminate the green interval and cross the barrier.

9.0 DETECTOR INPUT FUNCTIONS

9.1 DESIGN REQUIREMENTS

The controller unit shall provide a minimum of sixteen vehicle detector inputs. Each input shall be assignable to any single phase or group of phases and be programmable for type of function (detector switching).

Detectors 1 through 8 shall meet the NEMA standards for vehicle detector inputs into phases 1 through 8. Remaining detectors shall utilize inputs assigned to the auxiliary functions in the D connector as specified in the appendix.

9.2 DETECTOR INPUT PROGRAMMING

All vehicle detector input shall be user-programmable for vehicle calls to any or all of the eight phases in the controller. Each shall be selected for multiple applications identified in the following descriptions in addition to the vehicle call inputs. The controller shall include a minimum of three programming plans selected by TOD or cycle/split/offset for assignment of the programmable feature of each detector input.

9.2.1 Standard Detector Input

All inputs shall default to standard operation, providing one call per actuation and shall be assigned to each phase, (i.e. det 1 to phase 1, det 2 to phase 2, etc.).

9.2.2 Delay and Extend Detector Input Timing

A minimum of sixty-four detector inputs shall be programmable to delay a vehicle call to the assigned phase(s). The delay timer shall have a range from 0 to 25.5 seconds. The timing shall begin upon activation of the input to the controller. If the input remains when the time has expired then the input shall be directed to the phase(s). The timing shall be reset when the input is removed. The delay timing function shall be inhibited during the selected phase green interval.

A minimum of sixty-four detector inputs shall be programmable for extending the vehicle call to the assigned phase. The extend timer shall have a range from 0 to 25.5 seconds. The extending time shall

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begin upon removal of the input to the controller and will extend the call to the phase until the expiration of the programmed time.

9.2.3 Phase Extending Detector Input

All inputs shall be programmable to extend assigned phase or phases green interval timing and once programmed this input will not call the phase for service. All input shall be programmable to switch assigned phases during a programmed red interval and begin extending the assigned phase green interval.

9.2.4 Call Detector Programming

All inputs shall be programmable to call assigned phase or phases during its red interval and not extend the green time from any actuation.

10.0 PREEMPTION

The controller unit shall provide a minimum of five priority/non-priority preemption sequences. This capability shall be a standard controller unit feature and shall be provided within the modules and software. All required features specified above shall be available and programmable within the preemption operation.

10.1 PRIORITY/NON-PRIORITY PREEMPTOR DESIGN REQUIREMENTS

Each of the five priority/non-priority preemptor shall be capable of railroad, fire lane, or emergency vehicle preemption sequences. Any one of the following conditions shall be selected to occur during preemption.

a. Hold phase green
b. Limited phase service, following track clearance
c. All red
d. Flash

10.1.1 Preemptor Call Priority

Preemptor shall be selected as priority or non-priority. Lowest numbered priority preemptor shall have highest priority and will override a higher numbered priority preemptor calls. A minimum of two preemption phases shall be give equal priority and override higher numbered preempts. Additionally, priority preemptor calls shall override all non-priority preemptor calls. Non-priority preemptor calls shall be serviced in the order received.

10.1.2 Preemptor Call Memory

Each preemptor shall provide a programmable locking memory feature for preemptor calls. The preemptor in the non-locking mode shall not service a call when it is received and dropped during the delay time.

10.2 PRIORITY/NON-PRIORITY PREEMPTOR TIMING

The following preemptor timing features shall be provided for each of the priority/non-priority preemptor inputs.

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10.2.1 Preemptor Timing Intervals

All preemptor timing intervals shall be programmable from 0-60 minutes in 1 minute increments, 0-255 seconds in 1-second increments or 0-25.5 seconds in 0.1-second increments as indicated for each of the following.

10.2.2 Delay Time

The delay time interval shall inhibit the start of the preemption sequence for a specified duration. This interval shall begin timing immediately after receiving a preemption call. (0-255 sec., 1 sec increments)

10.2.3 Duration Time

Each preemptor shall provide a programmable minimum and maximum duration time that a preemptor shall be active, (Min: 0-255 sec., 1 sec. increments, Max: 0-60 mins, 1 min. increments).

10.2.4 Minimum Times

Phase timing at the beginning of a preemption sequence shall be controlled by the programmable minimum times before advancing to the next sequential interval. Preemptor minimum times shall be programmable for the following intervals:

a. Green/Pedestrian Clearance (0-255 sec., 1 sec. increments)
b. Yellow (3-25.5 sec, 0.1 sec. increments)
c. Red (0-25.5 sec. 0.1 sec. increments)

10.2.5 Pedestrian Timing

If a phase is timing a walk interval at the beginning of a preemption sequence, then the phase shall advance immediately to the preemption pedestrian clearance. A selectable timing interval shall be provided to time the minimum pedestrian clearance through the vehicular yellow interval, or alternately advance immediately to vehicular yellow.

During preemption, pedestrian indicators shall be user selected to be solid don't walk, blank, or operational during preemption.

10.2.6 Overlap Timing

Overlaps shall be programmed to operate with the phase(s) or to clear to red then remain red during preemption. Overlaps terminating or forced to terminate when a preemption sequence begins, shall be selectable to time the preemptor minimum yellow and red clearance times or to time programmed overlap timing specified in section 8.3.

10.2.7 Track Clearance

Each preemptor sequence shall provide user-programmable green, yellow and red track clearance intervals. Track clearance shall begin timing immediately after the preemptor minimum red interval, (section 10.2.4).

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A minimum of two phases shall be selected as track clearance phases. During the track clearance period, the selected phases shall time the track clearance green, yellow and red intervals once, and then advance to the next programmed interval (section 10.2.8).

If track clearance phases are not selected, the track clearance intervals shall be omitted from the preemption sequence.

10.2.8 Limited Sequence

The limited sequence program shall be user selected and begin immediately after track clearance. It shall remain in effect until preemptor duration time, phase minimum times has elapsed, or preemptor call has been removed.

10.2.9 Limited Sequence Phases

Any active phase, except a track clearance phase(s), shall be selected for operating during limited sequence operation. Those phases not selected shall remain red during preemption. The controller unit shall remain in all red interval during the limited sequence interval when no phases are selected for operation during limited sequence.

If flash is selected for the limited sequence interval, up to two permissive phases shall be selected to flash yellow. The remaining phases shall flash red. Overlaps associated with the phases flashing yellow shall also flash yellow unless they have been forced to terminate in which case they shall remain dark. Flashing shall occur by controlling the appropriate load switch driver outputs.

10.2.10 Limited Sequence Timing

During the limited sequence interval, the selected phase(s) shall operate normally (as outside of preemption). When preemption is exited, the current phase shall terminate after minimum green time is expired.

If any limited sequence intervals are programmed with zero timing, the equivalent interval time of the controller unit shall be used.

10.2.11 Exit Phases

Two permissive exit phases shall be selected to time after the preemption sequence has been completed. These phases shall serve as transition phases to return the controller unit to normal operation. Exit phases shall time their normal programmed interval times.

Additionally, it shall be possible to program exit calls on any of the phases used in normal operation. Phases programmed as exit phases shall be served first, while exit calls on the remaining phases shall be served in normal sequence.

10.3 PREEMPTOR ACTIVE OUTPUT

A preemptor active output shall be provided for the five priority/non-priority preemptor. The output shall be set to ON when the preemption sequence begins and shall remain ON for the duration of the sequence.

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10.4 POWER INTERRUPTION

If a preemptor call is active when power is restored to a controller unit, the voltage monitor output shall be set to FALSE, placing the intersection into the flashing mode of operation. Additionally, if external start is applied during a preemption sequence, the intersection shall be placed into the flashing mode of operation. The flashing mode of operation shall remain in effect until the preemptor call has been removed or the preemptor maximum duration time has elapsed. The controller shall begin operating as described by NEMA during power interruption.

10.5 PREEMPTOR STOP TIME

A stop time input shall stop the timing of the current active preemptor. The stop time input shall normally be controlled by the conflict monitor unit.

11.0 AUTOMATIC FLASH

The controller unit shall provide automatic flash selection per the requirements of the Manual on Uniform Traffic Control Devices. The flash phases shall be programmable through the keyboard and flashing shall be controlled by changing the controller outputs to the load cells from the normal sequencing of three outputs to a flashing output to one selected output. The controller shall be programmable for selecting the indication which will flash. Automatic flash shall be selected by external input, system command, or time-of-day from the internal time base clock. Two flashing controls shall be provided that alternate and shall be program selected for assignment as needed to each phase that will prevent a yellow/yellow conflict.

12.0 CONFLICT MONITOR

The conflict monitor shall conform to NEMA TS-1, SECTION 6, in addition to the requirements of this specification. A six or twelve channel monitor shall be provided with the controller as required on the order or plans.

Each conflict monitor shall utilize and be provided with a programming card specified in the above mentioned NEMA standards.

12.1 MECHANICAL DESIGN

The frame shall be completely enclosed within sheet aluminum housing with a durable protective finish. The housing shall be removable for service to the internal circuitry.

The programming card shall be inserted through the front panel of the conflict monitor. Card guides should be provided for aligning the edge connector of the card with the mating jack. The cards shall be removable without use of tools or disassembling of the housing.

All printed circuit boards shall meet, as a minimum, the requirements of the NEMA Standard. In addition, they shall also meet the following requirements:

a. All plated-through holes and circuit traces shall be plated with solder to protect exposed copper. Any wire jumpers included on circuit boards shall be placed in plated-through-holes that are specifically designed to contain them. Circuit track corrections by track cuts and jumpers that are tack soldered to circuit tracks are not acceptable.

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b. Both sides of the printed circuit board shall be covered with a solder mask material.
c. The circuit reference designation for all components shall be clearly marked adjacent to the component. Pin 1 for all integrated circuit packages shall be designated on all printed circuit boards.
d. All electrical mating surfaces shall be gold-flashed.
e. All ICs 14 pin and up shall be installed in machine tooled grade sockets meeting these requirements. All sockets shall be AUGAT-8XX-AG11D or approved equal, meet UL specification 94V-0, be constructed with two-piece, machined contacts and close-ended to eliminate solder wicking. The outer sleeve shall be brass with tin or gold plating and tapered to allow easy IC insertion. The inner contact shall be beryllium copper sub-plated with nickel and plated with gold.

12.2 ELECTRICAL DESIGN

Liquid crystal displays shall be provided for displaying load cell outputs during normal operation, operations selected from a menu, and fault sensed. When a fault is detected, the display shall present two displays, sequentially, one showing all load cell outputs at the time of the fault detection, and one showing the specific fault and date/time detected.

Circuitry shall be provided to detect sequential failure and indicate the channel on which the failure occurred. This feature shall be programmable to select either enable or disable for each channel. The following shall be failure indicated as sequential failures:

a. Yellow indication on for less than 2.5 seconds.
b. No yellow indication after green.
c. Simultaneous display of two or more indications within the same signal head, except as allowed by the MUTCD.
d. Combinations of any above.

All solid state components shall be mounted on printed circuit boards. The electronic components and printed circuit board(s) shall comply with the requirements outlined for the controller in section 7.10 of this standard.

The conflict monitor shall be capable of recording and holding in memory (logs) the last ten conflicts detected and the last ten power failures. The time and date shall be indicated for each conflict and power failure. The memory shall be non-volatile during power loss and meet the requirements for the controller in section 7.3, excluding Section 7.3.1. A log of the sequence of 20 events prior to a fault detection shall be retrievable prior to resetting the monitor and accessible through the communication port.

Each conflict monitor will be supplied with a 4-foot RS-232 cable with male connectors on each end. The monitor shall have a 9 pin communication port on the front of the monitor. The communication port shall be as defined herein, compatible with EIA-RS-232 standards for connection to a portable computer, printer, or other electronic devices. Communications shall be full or half duplex using FSK transmissions. The data transmission rate shall be selected baud. Control of the port shall be selected in menu form on the monitor display or request through the communication port. Data transfer to other electronic devices shall be provided with download commands from the device.

The monitor display shall present a selection menu for various data and programs available. This shall include, but not limited to, date and time set, review of programmed permissive phases, various logs, and other operational.

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12.3 COMMUNICATIONS

The conflict monitor shall generate a report to the controller each time a change in status occurs. The report shall include the following as a minimum:

a) The configuration of the programming card.
b) The channels which have the NEMA plus features enabled.
c) A listing of the phases which are monitored for short yellow times.

Additionally, the conflict monitor shall store and report at least five (5) failures containing the information listed above when interrogated directly via the portable download/upload unit.

The report shall list at least the last five (5) failures from the monitor which contain the following:

a) Time of the occurrence of the failure.
b) The channels (Green, Yellow, Red and Walk) that were active at the time of the failures.
c) The status of the CVM input and the +24 V 1 and 2 inputs.
d) The type of failure (conflict, switch failure, red failure, etc.)

The conflict monitor will be capable of transmitting (via RS-232 port) an ASCII report to the controller unit.

The conflict monitor shall provide three (3) reports for interrogation. The first is an ASCII record of all data entries and programming card configurations. The second is an ASCII formatted record of all failures and each power on/off cycle. The last ten of these failure records will be available in report form. The third report will be a sampling report and will contain the twenty (20) samples of all of the inputs to the conflict monitor. Each sample will be taken at 0.1 second intervals so that the last two (2) seconds of real-time outputs of the load switches can be viewed.

Each of the reports will have the appropriate headings and will consist of ASCII lines of not greater than eighty (80) characters so that a clear presentation of the data can be viewed from the screen of a notebook computer using the standard ASCII character codes.

The monitor port shall be programmed in the following format:

a) Standard EIA-232 convention
b) Each word shall be eleven (11) bits long: eight (8) data bits, one (1) start bit, one (1) stop bit, no parity.
c) 2400 to 9600 baud
d) The notebook or traffic controller unit will send a message of one byte to the monitor requesting each of the reports. After the one-byte message, the controller will issue an XON command to start the data flow. The data flow can be stopped with an XOFF command at any time.
The data sent to the notebook or controller unit in response to the request message will be the ASCII report requested. The last byte sent by the monitor will be an EOT (End Of Text- 04H)

If the controller issues an XOFF during a reporting request, the monitor will stop the data flow. If an XON is not issued within 30 seconds, the monitor will time out and set its pointer to the beginning of the report. The next XON will then start at the beginning of the requested report. A report will also perform the XOFF function to the conflict monitor.

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Definitions of the requests are as follows:

Request report 1: 31H
Request report 2: 32H
Request report 3: 33H
XON (DC1) 11H
XOFF (DC3) 13H

13.0 SOLID STATE SIGNAL LOAD CELLS

The load cells shall follow those standards previously set forth. In addition to those, each load cell shall have indicators on the front showing the input state of operation with the indicators vertically aligned and the red input on top, yellow in the middle, and green below.

14.0 SIGNAL FLASH TRANSFER RELAY

The transfer relays shall be electro-mechanical and shall be energized during normal sequential operation of the traffic signals with the operational switch in the normal position. This relay shall be de-energized when the indications are to be flashing. The relay shall transfer the field signal circuits to the flashing circuits and energize the flasher.

14.1 PHYSICAL DESIGN

The relay shall be enclosed in a transparent case for protection against dust, dirt and other foreign objects. The case shall be a maximum of 2.671 inches high, 2.375 inches wide and 1.75 inches deep. The insulated base shall extend 0.625 inch from the case and shall be 1.990 inches wide and 1.120 inches deep. The contacts of the plug shall be flat blades arranged in two (2) parallel rows, 0.475 inch apart with the flat side of the blades in line with the row. The contacts of the plug shall be 0.250 inch wide, 0.060 inch thick, and extend past the insulated base 0.520 inch. Each row shall have four (4) contacts. The base shall be keyed with a pin that has a diameter of 0.156 inch and extend past the insulated base 0.685 inch. The pin shall be centered between the row of contacts and centered in line with contacts 5 and 6 of the plug. The contacts of the plug shall be numbered for wiring purposes, from 1 through 8. The top row shall be consecutively numbered from left to right using the odd numbers and the bottom row shall be consecutively numbered from left to right using even numbers.

14.2 ELECTRICAL DESIGN

The relay coil shall be rigidly supported by the insulated base. The contacts shall be 2 Form C, rated at 20 Amps, and shall be 3/8 inch diameter, silver cadmium-oxide. The relay's life shall be 5 million mechanical operations and 100,000 electrical operations. Each contact shall be rated for power bus control and 1 KW tungsten at 120 VAC. The coil shall be 110 VAC and shall pick up at 80% of nominal voltage. Maximum power requirement of the coil shall be 10 VA. The relay shall be wired and the socket pin assignments arranged according to the following table:

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PIN	FUNCTION	PIN	FUNCTION
1	Relay Coil	5	Common Circuit #1
2	Relay Coil	6	Common Circuit #2
3	NC Circuit #1	7	NO Circuit #1
4	NC Circuit #2	8	NO Circuit #2

TABLE 18A-5
TRANSFER RELAY WIRING

The base, relay, and enclosure shall have a minimum rating of 1500 volts.

15.0 SOLID STATE FLASHER

The flasher shall comply with NEMA TS-1, Section 8 and Section 7.2.3.2. The flasher shall be a two circuit flasher rated at 15 amps per circuit (Type 3).

16.0 VEHICLE AND PEDESTRIAN DETECTORS

Vehicle detectors shall be fully digital, microprocessor designed, auto-tune, card rack mounted and have four channels of detection per card, type 8. Unless otherwise noted the detectors shall be provided with the order for controller in type 3, 5, 6, and 7 cabinets. Detector units shall conform to applicable environmental, functional, dimensional, and design required in NEMA TS 1, Section 15. The amplifier shall not consume more than 385 ma of current at the rated voltage. Delay and extension timings shall meet this standard when the order or plans require the detector to have such timing. Each channel shall have an erasable, write-on surface for channel identification.

Pedestrian detectors shall be of an approved model accepted by the Department under the appropriate Traffic Control Standard. Each order or plans shall identify the type and quantity of detectors in each cabinet.

16.1 SENSITIVITY AND ACCURACY

Detector units shall conform to NEMA TS1, Section 15. Each detector shall be accurate for detecting all vehicles from motorcycles to tractor-trailer combinations which ordinarily travel public streets and highways and are comprised of sufficient conductive material, suitably located to permit recognition and response by the detector system. There shall be a minimum of sixteen selected sensitivity ranges located on the front of the unit for each channel. The range of sensitivity shall be, nominally, between 0.00 % - 1.250% change in total loop inductance.

16.2 OPERATING MODES

Each channel shall be self-tuning in accordance with the NEMA standards. Response time for compensation from extended detection, re-tuning to track the changing electrical characteristics of the loop and recovery from power interruption shall be accomplished within 50 milliseconds. Each channel shall have a on and off switch. Each detector card shall have a momentary push switch to reset all channels.

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16.3 FAIL SAFE

The detector shall operate when sensor loop shorted to ground or not in good condition. The unit shall generate a continuous call when re-tuning failed sensor loop or failed detector unit.

16.4 CONTROL VOLTAGE

All controls shall be DC voltage in accordance with the NEMA standards. The control circuit from the delay/extension feature shall follow this requirement.

16.5 CONTROL SWITCHES

All switches, connectors, and fuses shall be located on the front of the card. Each switch shall be permanently labeled to identify its function. Each position shall be labeled to identify its mode of operation. Each mode of operation shall be simple to program with one switch position assigned to one function.

16.6 PRINTED CIRCUIT BOARD DESIGN

The PC board shall be in accordance with NEMA TS1 Section 15. All pressure contracts shall be gold flashed. All components mounted and soldered to the PC board shall be easily removed and replaced without causing damage to the board or traces. Each individual PC board shall be identified by manufacturer and a serial number or part number clearly stamped or etched on the board. All PC boards shall be coated with an epoxy or approved equal type material to prevent erratic performance due to high humidity, condensation and growth of fungus and mildew. This coating will not cover the component on the board, but once the components are in place, they and the soldered joints shall be covered with a moisture and fungus proof, clear type of acrylic lacquer. This coating shall not be injurious to the board or components and shall not interfere with the repair of the circuitry or the replacement of components.

16.7 PEDESTRIAN DETECTOR ISOLATION

Two - two channel pedestrian isolation circuit boards shall be provided. There shall be two circuits using optical and transformer isolation designed and tested for a minimum of 2500 volts D.C. between the inputs and outputs. Each circuit shall recognize a minimum 5 millisecond switch closure between conductor pairs from the pedestrian push button operated on a maximum of 5 volts and 20 milliamps. Transient protection shall be on the input and shall withstand a 10 microfarad capacitor charged to 2,000 volts to be discharged between input pins or between input pin and chassis ground. When the input switch closure occurs, the circuitry shall close the pedestrian call circuit between the controller input and logic ground and remain closed for a minimum of 100 milliseconds or the time the pedestrian push button is closed, whichever is larger. Additional circuits shall be provided to maintain isolation, lock the pedestrian actuation, and reset when an input from the DC level from the controller activates the walk and raises the potential of the field circuit from five volts to 24 volts. Each board shall have a fused power supply. Output status indicators shall be located on the front panel for each channel. A three position switch shall be provided on the front of the unit for each input circuit and provide "on", "off", and momentary "on". Alternate designs will be reviewed at the time of bid for pedestrian actuation and annunciator located at the pedestrian push button.

The card shall fit into the vehicle detector card rack. The dimension characteristics shall follow the Type 7 card detectors standards Section 15 in NEMA TS1 1989.

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16.8 PEDESTRIAN ISOLATION CARD CONNECTOR

The isolation card shall be designed with an edge connector. The connector shall be 22 position, dual inline type connector with the following position assignments:

PIN	FUNCTION	PIN	FUNCTION
2A/1	SPARE/CH 1 ØWALK	N	AC(+) 120 V
B/2	SPARE/CH 2 ØWALK	P	SPARE
C	SPARE	R	SPARE
D	INPUT #1	S	SPARE
E	INPUT COMMON	T	SPARE
F	OUTPUT #1 (COLLECTOR)	U	SPARE
H	OUTPUT #1 (EMITTER)	V	SPARE
J	INPUT #2	W	OUTPUT #2 (COLLECTOR)
K	INPUT COMMON	X	OUTPUT #2 (EMITTER)
L	CHASSIS GROUND	Y	SPARE
M	AC (-) 120 V	Z	SPARE

TABLE 18A-6
PEDESTRIAN ISOLATION CARD CONNECTOR ASSIGNMENT

16.9 CARD RACK

Card racks shall be designed with top and bottom card guides for four-four channel detector cards mentioned above, two-two channel isolation cards, and a power supply installed in type 6 cabinets and two-four channel detector cards mention above, two-two channel isolation cards, and a power supply in type 3 and 5 cabinets.

The housing shall be constructed of 5052 aluminum alloy of a minimum thickness 0.062 inch with a protective coating (painted or anodized). Removable covers shall be provided on top, bottom, and back allowing access to the internal hardware and circuitry. Each cover shall be easily removable with the use of conventional hand tools.

The dimension of the rack in type 3 and 5 cabinets shall be approximately 10 inches wide, 6 inches high and 9 inches deep and in type 6 cabinets shall be approximately 14 inches wide, 6 inches high and 9 inches deep. The rack shall be mounted on the inside of the door of type 3 cabinets as shown in drawing 18-A and attached to the bottom shelf in type 5 and 6 cabinets, hinged to swing out to provide access to the rear assembly without removing the shelf(s).

The card rack for type 3 cabinet shall be as above except: the top shall be rain proof with a drip edge to prevent water from running across the lower side of the top and into the rack and shall have a power supply, two - four channel detector cards positions, and two - two channel isolation cards. These shall be wired as follows: first card detector to vehicle call input 1 through 4, second card detector to special

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detector inputs 1 through 4, first isolator card to pedestrian detector inputs phases 2 and 4, and second isolator to preemptions 1 and 2.

The power supply shall meet the dimensional requirement of a four channel card rack detector type 8, operate on 120 VAC, 60 Hz, and the AC+ into the power supply shall be fused. The fuse shall be located on the supply card, permanently labeled indicating the fuse and size. The supply shall meet NEMA specifications and provide 24 VDC, 385 ma, regulated as specified in NEMA TS-2-1989, Section 15.2.6.2. A power indicator and a fuse shall be provided on the front of the supply for each output. A pull handle shall be on the front of the unit. The power supply shall be located on the left side of the rack when viewed from the front. DC voltage from the power supply shall not be supplied to the isolator positions.

The rack shall be wired with a separate power cord and individual wires to each card position. The power cord shall have each wire identified with a sleeve marked, DR-AC+, DR-AC-, and DR-Gr, and terminated with a spade terminal connected to the terminal for the controller power. Each module slot shall be wired directly to the card edge connector with color coded harness. The harness shall meet the requirements for wiring elsewhere in this standard. Each detector lead in from the field wiring shall be a twisted pair. A sufficient amount of slack in the wiring harness shall allow the rack to be moved for visual inspection and mechanical repairs. The wiring shall be cabled together into a harness, attached to the back right side (viewed from the front) with an approved cable clamp, and routed to the back and detector panel.

The cards in the rack shall be numbered from left to right viewed from the front in order to identify the position function. For type 6 cabinets the first position will be the power supply; the second, a four channel detector for phases 1, 2, 3, and 4; the third, a four channel detector for phases 5, 6, 7, and 8; the fourth, a four channel detector for special detectors 1, 2, 3, and 4; the fifth, a four channel detector for special detectors 5, 6, 7, and 8 ; and the sixth and seventh, each a two channel isolation card for pedestrian detection to phase 2, 4, 6, and 8 respectively. For type 3 and 5 cabinets the first position will be the power supply; the second, a four channel detector for phases 1, 2, 3, and 4; the third position, a four channel detector for special detectors 1, 2, 3, and 4; the fourth and fifth position each a two channel isolation card for pedestrian detection to phase 2 and 4, and preemption input to 1 and 2.

Wiring from each detector and isolator output shall be directly to and terminated to the front of the back panel at their associated terminals of the controller. The control circuit wiring for each detector and isolator input shall be made directly from the associated terminals of the controller. The wiring for the field input to the card rack shall be terminated with the associated terminal on the detector panel. Each wire from the card rack to the back panel shall be terminated using a spade type compression terminal and an identification sleeve identifying each as follows: Detector position one, VD-1-1, VD-1-2, VD-1-3, and VD-1-4; the input to these card positions shall be identified as: VD-1-1G, VD-1-2G, VD-1-3G, and VD-1-4G. The remainder of the detector wiring shall be identified in a similar manner. The pedestrian detector isolator cards outputs shall be identified as: Isolator position nine: PD-1-1 and PD-1-2, the inputs: PD-1-1W and PD-1-2W. The other isolator shall be identified similarly using PD-2-,etc.

17.0 MECHANICAL CONSTRUCTION OF ENCLOSURES

The cabinet shall be constructed of sheet or cast aluminum alloy.

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17.1 SHEET ALUMINUM

The sheet aluminum alloy shall be ASTM No. 5052-H32 or equivalent, and shall have a minimum sheet material thickness of approximately 1/8 inch.

17.2 CAST ALUMINUM

The cast aluminum alloy shall be ASTM No. 356-75 or equivalent. Flat cast surfaces exceeding 12 inches in both directions shall be a minimum of 1/4 inch (0.25 inches) in thickness. Flat cast surfaces not exceeding 12 inches in both dimensions shall be a minimum 3/16 inch (0.1875 inches) in thickness.

17.3 OUTLINE DIMENSIONS

Outline dimensions shall be as shown in Table 18A-7. All dimensions are outside of cabinet and in inches exclusive of hinges, handles, overhang(s), vent housing and adapters. Cabinet heights are measured to the lowest point of the top surface of the cabinet. The combined overhangs of the top of the cabinet shall not exceed four inches. Type 4 cabinets will be a combination of an empty type 2 cabinet or a meter base cabinet on bottom and a type 2 or 3 cabinet on top.

CABINET TYPE	WIDTH	HEIGHT	DEPTH
2	22 (-0 + 15%)	***45 (-0 + 10%)***	15 (-0 + 15%)
3	22 (-0 + 15%)	***45 (-0 + 10%)***	15 (-0 + 15%)
4	22 (-0 + 15%)	60 (-0 + 20%)	15 (-0 + 15%)
5	30 (-0 + 10%)	46 (-0 + 18%)	16 (-0 + 15%)
6	38 (-0 + 10%)	52 (-0 + 15%)	24 (-0 + 15%)
7	38 (-0 + 10%)	72 (-0 + 15%)	24 (-0 + 15%)

TABLE 18A-7
CABINET DIMENSIONS

17.4 FINISH AND SURFACE PREPARATION

17.4.1 Painted Aluminum Cabinets (When specified)

The color shall be medium green, OAAA #144. The surfaces of the cabinet shall be suitably prepared prior to priming. Unpainted interior surfaces shall be permissible in aluminum cabinets. Exterior surfaces shall be primed and painted to provide a durable exterior finish. If the primed surfaces are scratched or damaged, the affected area shall be re-primed prior to painting.

17.4.2 Unpainted Aluminum Cabinets (Shall be provided unless otherwise noted).

Unpainted aluminum cabinets shall be fabricated from mill finished material and shall be cleaned with appropriate methods that will remove oil film, weld black, mill ink marks and render the surface clean, bright, smooth and non-sticky to the touch.

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17.5 SHELVES

Cabinets shall be provided with a minimum of one shelf in type 2 and 3, two shelves in type 5 and 6, and three shelves for type 7 to support control equipment. Type 2 and 3 cabinets shall have provisions for positioning the shelf between 10 inches from the bottom and within 8 inches from the top. Type 5, 6, and 7 cabinets shall have provisions for positioning shelves between 24 inches of the bottom of the cabinet and to within 8 inches of the top of the cabinet in increments of not more than 2 inches. The adjustment of the shelves shall be accomplished by using small hand tools. Rivets are not acceptable. All shelves shall have a raised back edge to stop equipment from passing the back edge of the shelf. This edge shall be a minimum of 1/2 inch from the rear wall of the cabinet and be constructed from one continuous piece of metal.

All cabinets shall have a 1 ½ inch drawer, mounted directly beneath the lowest shelf. This drawer shall have a hinged top cover and shall be capable of storing documents and miscellaneous equipment. The drawer shall open and close smoothly. Drawer dimensions shall make maximum use of the available depth offered by the cabinet and controller shelf, and shall have approximately the same width as the corresponding back panel. The bottom of the drawer shall have drain holes sufficient to drain any amount of accumulated water in the drawer.

17.6 TOP SURFACE CONSTRUCTION

Cabinets shall be manufactured to prevent the accumulation of water on its top surface and slope in a manner to drain water to the back side of the cabinet. The highest point of the top surface shall be limited to a maximum of six (6) inches added to the overall height of the cabinet.

17.7 DOORS

17.7.1 Main Cabinet Door

Cabinets shall have a single hinged main door which permits access to all equipment within the cabinet and visual inspection of all indicators and controls. Unless otherwise specified, the door shall be hinged on the right side of the cabinet as viewed from the outside facing the cabinet door opening. Type four (4) cabinets shall have two main doors equally dividing the height of the cabinet front with clearances at top, middle, and bottom.

17.7.2 Hinges

All cabinet doors shall incorporate suitable hinges utilizing stainless steel hinge pins. Hinges shall be protected to prevent being removed or dismantled when cabinet door is closed. Attachment to the cabinet shall produce a smooth finish, protruding fasteners are not acceptable.

17.7.3 Door Stop

Each cabinet shall be provided with a door stop which holds the door open at positions of 90° ± 10° and 170° ± 10°. A means shall be provided to minimize accidental release of the door stop. Type seven (7) cabinets shall have the door stop located at the bottom of the door and all other cabinets shall have the stop located at the top of the door.

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17.7.4 Locking Mechanism

All cabinets shall incorporate a main door lock constructed of nonferrous or stainless steel materials, which shall operate with a traffic industry conventional #2 key. A minimum of one key shall be included with each main cabinet door lock.

A three - point lock on the strike edge of the door shall be provided with all types of cabinets except when specified to be different on the order or plans. The three (3) points of the lock shall be located at the top, bottom, and middle of the strike edge of the door.

The lock shall prevent operation of the mechanism when in the locked position.

The door handle shall rotate inward from the locked position so that the handle does not extend beyond the perimeter of the door at any time. The operation of the handle shall not interfere with the key, police door or any other cabinet mechanism or projection. The handle shall have the mechanical strength to operate the mechanism and shall be made from non-corrosive material.

Cabinets with three point lock shall be provided with a means of externally padlocking the mechanism. A minimum 3/8 inch diameter lock shackle shall be accommodated. The lock shaft shall be 5/8 inches in diameter.

17.7.5 Door Opening

The main door opening of all cabinets shall open on and be centered within the front side having the width dimensions listed in the previous table and shall be at least 69% of the area of the side. Necessary clearances shall be provided allowing unrestricted movement of the door from closed position to open position. The door shall seal against a minimum of one inch wide neoprene sponge gasket with tight seams. The top gasket shall be the width of the door, the side gaskets shall begin below the top gasket and the bottom gasket shall be within the side gaskets. A gasket retaining ring shall be installed on the inside of the gasket.

17.7.6 Police Compartment

A hinged police compartment door shall be mounted on the outside of the main cabinet door. The door shall permit access to a police panel compartment for operation of switches defined elsewhere in these standards. The compartment shall be constructed to restrict access to exposed electrical terminals or other equipment within the cabinet. The door shall seal against a neoprene sponge gasket in the same manner as stated above for the main door.

Space shall be allowed for the switch controls and storing of the manual control cord in the police panel compartment with the door closed. The minimum internal dimensions shall be 3-1/2 inches high, 6-3/4 inches wide and 2 inches deep. Additionally, the volume shall be not less than seventy (70) cubic inches.

Police doors shall be equipped with a lock which can be operated by a police key, Corbin Type Blank 04266, or equivalent. A minimum of one key shall be included for the police compartment of each cabinet.

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The police compartment shall be located above the bottom of the main door as shown in the following table:

CABINET TYPE	LOCATION
2 and 3	2.5" ± 10% from bottom and left of center, see Drawing #18A
5	30" ± 10%
6 and 7	39" ± 10%

TABLE 18A-8
POLICE COMPARTMENT LOCATION

17.8 CABINET MOUNTING

17.8.1 Pole Mounted Cabinets Type 2 and 3

The cabinets shall be provided with provisions to attach a pole bracket to a reinforcement plate permanently mounted to the back, top, and center of the cabinet. The reinforcement to the cabinet shall be designed to support the weight of the cabinet and the equipment intended to be contained within and the structural loads referred to in this specification. The minimum width of the adapter shall be six (6) inches wide and three (3) inches high, tolerance of both -0 inch, +6 inches. Two 3/8 inch holes shall be drilled through the cabinet, within the reinforced area, two inches from center line of the width of the cabinet. Countersink each hole on the outside of the cabinet for flat head screws. Install two 5/16" flathead screws in the mounting holes with the top of the screw heads to be flush with the surface of the cabinet wall.

The cabinet shall be pre-drilled for two (2), 3" wire entrance holes, one in the top and one in the bottom, both at the back edge and centered on the width of the cabinet and one (1) 2" entrance hole adjacent to the three inch hole on the bottom as shown in the attached drawing. Three hubs shall be provided with type 2 and 3 cabinets. The hubs shall centered on the entrance holes and attached to the cabinet using four (4) 5/16 inch-18-tpi by 1-1/2 inch long hex head bolts, with lock washers and hex nuts. The hubs and cabinet shall be pre-drilled for mounting the hubs to the cabinet with the above mentioned bolts using a bolt pattern of 2-1/8 inches centered on a line perpendicular to the back of the cabinet, by 3-3/4 inches parallel to the back of the cabinet. The centers of the bolt pattern on the hub and the wire entrance hole shall coincide. The location of the hubs shall allow minimum clearance for box end wrenches to fit onto the nuts within the cabinet.

17.8.2 Pedestal mounted cabinets Type 2 or 3

When specified on the order or plans the requirement for a pedestal mounted cabinet shall meet the following requirements. The specified cabinet shall be provided and equipped with a reinforced bottom, 1/4" aluminum plate, and a slip fit adapter for attachment to a standard four inch inside diameter pipe. The bottom of the cabinet shall be provided with an access hole for cable (min. 4 inches) and mounting holes for the adapter located in the center of the bottom. The adapter shall be bolted to the cabinet with 5/8" bolts and fitted on a 6-1/2" bolt circle. The attachment to the standard four inch pipe shall be secured with four square headed set screws. The holes drilled for pole mounting hardware and wiring shall be covered with gaskets and blank hubs.

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17.8.3 Base mounted cabinet Type 4

The type 4 cabinet shall consist of two separate upper and lower cabinets. Both shall have doors specified above and shall be constructed without interference when opening or closing. A base adapter shall be provided for mounting the lower cabinet to the foundation specified in the signal plan detail sheets and within this standard. The order or plans will specify the type cabinet to be the top cabinet, type 2 or type 3. The drilled center hole specified for a pedestal mount shall be provided for wire-way between the cabinets. All other holes will be covered with a blank hub and gasket as specified above. A terminal panel shall be provided with the signal circuits, interconnect, communications, and power individually terminated and labeled. When a type 3 cabinet is required, additional terminals shall be provided for the loop and pedestrian lead-in terminations.

The base adapter shall separate the lower cabinet from the foundation a minimum of 4" and a maximum of 6". The cabinet shall be sized to provide the correct dimension of the completely assembled unit to meet the dimension requirements stated above. The adapter shall be constructed for mounting on the foundation shown in Figure 18A-1. The complete unit shall be securely connected with removable fasteners and meet the requirements for security in this standard.

The interior anchor brackets shall transverse the cabinet. Each bracket shall attach to one edge adjacent to the bracket. The strength of the bracket shall prevent the cabinet from being lifted from the concrete base with a load of fifty pounds acting at the top, front or back of the cabinet. An alternate method of cabinet support can be a 1/4" aluminum reinforcement plate meeting the requirements shown in Figure 18A-1.

17.8.4 Base mounted cabinets Types 5, 6, and 7 (Types as specified on order or plans)

The cabinet or its base adapter shall be so constructed that it can be mounted on the foundation shown in Figure 18A-2.

The interior anchor brackets shall transverse the cabinet. Each bracket shall attach to one edge adjacent to the bracket. The strength of the bracket shall prevent the cabinet from being lifted from the concrete base with a load of fifty pounds acting at the top, front or back of the cabinet.

17.8.5 Anchor bolts

Anchor bolts for base mounted cabinets shall be 3/4 inch diameter and 16 inches long. A 90° bend with a 2 inch leg on one end and a minimum of 3 inches with a UNC-10 thread shall be provided. Anchor bolts shall be steel with hot dipped galvanized finish. Each anchor bolt shall be furnished with one 3/4 inch UNC-10 HDG steel nut and one 3/4 inch HDG flat steel washer. Two anchor bolts shall be provided with each cabinet.

17.9 CABINET STRUCTURAL TESTS (mounting shall withstand the following:)

17.9.1 Hinges and Door

The hinge and door assembly shall be of sufficient strength to withstand a load of 30-pound-per-vertical-foot of door height. This load shall be applied vertically to the outer edge of the door when it is opened to the 90 degree position. There shall be no permanent deformation or impairment of the door, locking mechanism, or door seal function after the load is removed. A stiffener shall be installed the width and at mid height of the door. The door panel shall be flat after fabrication.

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17.9.2 Door Stop

Both the door and door stop mechanisms shall be of sufficient strength to withstand a simulated wind load of 5 pounds per square foot of door area applied independently to the inside and outside surfaces without failure, permanent deformation, or any major movement of the door positions. For test purposes, a test load shall be applied to the vertical midpoint of the outer edge of the door at a right angle to the plane of the door. The test load shall equal one half of the calculated wind load. The force shall be applied first on the inside edge, then on the outside edge. These tests shall be performed with the door at 90° and 170° positions.

17.9.3 Lock

The door handle and associated cabinet locking mechanism shall withstand a torque of 100-foot lbs. applied in a plane parallel with the door to the handle in the locked position. The door handle and the external padlock mechanism shall meet the same requirement without the internal locking mechanism securing the handle.

17.9.4 Shelves and Drawer

Shelves shall support a load equivalent to 2 pounds per inch of length without deforming more than 1%. The test load shall be applied at two points, 6 inches to each side of the shelf's center, with the shelf installed in the cabinet. The drawer shall support up to 50 pounds in weight when fully extended.

17.10 EQUIPMENT PROTECTION

Cabinets are intended to provide protection for the housed equipment. Prying open or dismantling the doors, walls, or tops, shall be prevented with the cabinet securely closed.

When completely and properly installed, cabinets shall have provision for rain water drainage. The cabinet shall not permit water to enter the equipment cavity above any live part, insulation, or wiring.

17.11 RAIN TEST

All cabinets shall be designed to meet the requirements of the following tests. To insure realistic testing, the enclosure and enclosed equipment shall be mounted as intended for use.

A continuous water spray, using as many nozzles as required, shall be applied against the entire top and all exposed sides of the enclosure for 10 minutes at a minimum rate of 18 inches per hour of equivalent rain at an operating pressure of 4 to 5 pounds per square inch. The distance of the nozzles to the cabinet shall be a minimum of 36 inches and a maximum of 48 inches and located above the top edge of the cabinet.

The enclosure is considered to have met the requirement of this test if there is no significant accumulation of water within the enclosure and no water is visible on the live parts, insulation materials, or mechanism parts.

A rain test which is performed in accordance with Underwriters Laboratories, Inc., "Rain Tests of Electrical Equipment, Bulletin of Research #23, September, 1941", is considered to be equivalent to this test.

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17.12 AUXILIARY EQUIPMENT

17.12.1 Fan and cooling system

All cabinets shall be equipped with a cooling system of sufficient capability to pass the test described in NEMA TS1-2.2.04. The fan shall be capable of operating continuously for a minimum of 6000 hours in a 122°F (50°C) environment without need for after-installation maintenance and deliver 100 CFM in free air. The fan shall be thermostatically controlled by switching the 120 VAC supply to the fan. The thermostat shall be field adjustable to switch on and off at any temperature between 70° and 160°F.

The exhaust shall be vented through the upper portion of the cabinet. All ventilation shall be rain-tight and shall prevent any water from dripping into the cabinet.

The cooling system shall be constructed to allow cleaning of the vents, screens and fan. Fasteners for removing panels to gain access to perform the above requirement of cleaning shall be removable with the use of simple hand tools, except as noted in Section 17.12.2.

An additional duplex receptacle (for use with communications modems) shall be mounted and wired in the upper left side of the cabinet assembly. This receptacle shall be wired on the load side of the 20 Amp circuit breaker.

17.12.2 Air Filter

The cabinet shall be equipped with a secured, replaceable filter for the incoming ventilation air. The air filter shall be removable without the use of tools. The filter size shall be: 7-1/2 inches high x 7 inches wide x 1 inch deep for the Type 2 and 3 cabinets, 10 inches high x 20 inches wide x 1 inch deep for the Type 5 cabinets, and 14 inches high x 25 inches wide x 1 inch deep for Type 6 and 7 cabinets. The filter shall have clearly indicated on it the size and direction of air flow. A metal grid shall be on both sides of the filter. The filter shall meet ASHRAE standard 52-76 for disposable, Type II, glass fiber air filters. The air resistance shall be 0.08 inch WC, measured on 24 inches x 24 inches sample at 300 FPM. The efficiency of the filter shall be a minimum of 75%.

17.12.3 Plan Holder (DELETED)

17.12.4 Cable Hanger (DELETED)

17.12.5 Cabinet Light

A fluorescent bulb and fixture shall be installed in cabinet types 2 and 3. The fixture shall be mounted against the cabinet top and the strike edge for the door. The fixture shall not extend beyond the strike edge at the top of the cabinet and shall not restrict the opening of the door. Mounting supports shall be on the front of the cabinet. The fixture shall have an on/off switch mounted on the side of the fixture. The fluorescent bulb shall be a *F8T5WW*.

A fluorescent bulb and fixture shall be installed in cabinet Types 5, 6, and 7; and when specified in other cabinets. The fixture shall be within the upper 3 inches from the top and toward the door side of the cabinet. It shall illuminate the interior of the cabinet without hampering the vision of service personnel while inspecting the cabinet. The fluorescent bulb shall be a 15 watt, T-12, 18 inches in length. The fixture shall be of a sturdy construction to hold and operate the above mentioned bulb. For Types 5, 6,

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and 7, the cabinet light shall be turned on when the cabinet door is opened and turned off when the cabinet door is closed.

17.12.6 Cabinet Hubs

The hubs for the cabinets shall be cast aluminum, ASTM B-108 and those standard specifications referenced there in. The bolt pattern shall be as details in the drawings 18-A. The blank shall be a flat plate, 1/4 inch thick. All other hubs shall have a conduit threaded collar that shall be a minimum of 2 inches from the base of the hub. The threaded opening shall be centered within the 3-3/4 inches dimensions of the hub with outside edge of the threaded collar in line with the base of the hub. All hubs shall be provided with stainless steel bolts casted into the hub. The outside of the hub shall provide a smooth design that will shed water. On the hubs with larger threaded collar(s), the bolting pattern shall be maintained. The following table are the designations and type of hubs that will be specified on the order or plans.

TYPE	OPENING(S) SIZE	OPENING DESCRIPTION
Blank	-0-	no opening, flat plate, 1/4" minimum thickness
Single	3/4 in.	one opening, 3/4" conduit thread
Single	1 in.	one opening, 1" conduit thread
Single	1-1/2 in.	one opening, 1-1/2" conduit thread
Single	2 in.	one opening, 2" conduit thread
Single	2-1/2 in.	one opening, 2-1/2" conduit thread
Single	3 in.	one opening, 3" conduit thread
Double	3/4 in.	two openings, 3/4" each conduit thread
Double	1 in.	two openings, 1" each conduit thread

TABLE 18A-9
CABINET HUB DESCRIPTION

17.12.7 Clamp Pole Mounted Cabinet

A pole clamp shall be provided with the controller cabinet types number 2 and 3 for mounting the cabinet to the pole. The clamp shall be cast aluminum meeting the requirements for the cabinets and designed to hold the weight of the mentioned cabinets and the equipment contained within. The design shall provide four contact points with the pole and shall be adjustable for pole diameters from 10 inches to 12 inches. The clamp shall be divided into two parts, one half to be attached to the cabinet and the other half to be installed on the "back" side of the pole. The clamp shall have a slotted opening for coupling the clamp together using 5/8 inch galvanized all thread bolts and nuts. The clamp shall have a flat surface area, 4-1/2 inches x 2 inches minimum that attaches to the cabinet. Two 5/16 inch - 18 tpi, drilled and tapped holes spaced 4 inch center to center shall be centered within the flat area. The flat area shall space the back of the cabinet a minimum of two inches from the pole.

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17.12.8 Adapter Pole Mounted Cabinet

When specified, an adapter shall be provided, excluding lag bolts or steel bands. The adapter shall be conformable for mounting to round poles with a 4-1/2 inches or larger diameter. Material for the adapter shall be comparable with aluminum alloy 6061 and have the mechanical strength to hold the weight and loading requirements for the cabinet. The adapter shall accommodate lag bolts up to ½ inch and steel banding up to 1 inch wide. The adapter shall have the same mounting bolt pattern and wire way requirement as the hubs stated in 17.12.6. The adapter shall be mounted to the cabinet using the same mounting bolts as the hubs, and additional gaskets shall be used between the cabinet, hub, and adapter.

17.12.9 Adapter Slip-fit Four Inch Pipe

The adapter shall slip-fit to a standard four inch pipe and shall secure to the pipe with four square headed set screws. The adapter shall be made of cast aluminum or steel designed to hold the weight of the cabinet and the loading characteristics required for the cabinet. The length of the adapter shall be approximately eight inches long. The adapter shall be attached to the cabinet with 5/8" bolts and fitted on a 6-1/2" bolt circle.

18.0 CABINET INTERIOR PANELS

18.1 GENERAL REQUIREMENTS

All panels shall be made from structural grade sheet aluminum equal to 2024 or 5052 aluminum alloy. Approval from the Department is needed if different material than listed above is used for the panels. The panels shall be attached to the cabinet walls with bolts, nuts, and washers specified elsewhere in this standard. Each panel shall be completely removable or capable of folding down from the cabinet wall without the need to remove any other panel or shelf so that inspections and repairs may be made behind each panel. All panels shall be grounded to the cabinet using a braided copper conductor equaling #6 AWG. All panels shall be sized to fit within the minimum dimension of the cabinet it is specified for as listed in Table 18A-7.

18.2 GENERAL WIRING DESIGN REQUIREMENTS

The inspection and repair of any panel shall not require disconnecting or removing wires. When multiple panels are required in the cabinet then the cable shall follow a single route and shall be from the detector/auxiliary panel to back panel to power panel to police panel. Cabling shall conform to the previously stated requirements for servicing each panel. Cable(s) shall be secured to the panels at the point where it leaves and/or enters each panel. The cable shall be secured to the cabinet wall with a cable clamp at two (2) points equally spaced between the panels on the above stated route. Wiring requirements for ventilation, temperature monitoring, and cabinet lighting shall be from the power panel to each device and shall be neat and in accordance with good wiring practices. A separate, parallel cable route shall be used from the field terminal to the back panel solid state load relay outputs.

18.3 IDENTIFICATION OF COMPONENTS, TERMINALS, AND CONNECTORS

Each terminal position, sockets, switches, filters, relays, and fuses shall be permanently labeled by painting, printing or engraving directly onto the panel or terminal strip identifying the position number

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and/or function of the terminal or device (paper labels of any type will not be accepted). Each harness shall be permanently labeled to identify function or connector with only the following:

HARNESS	LABEL	HARNESS	LABEL
NEMA Connector A	"A"	Conflict Monitor	"CMA"
NEMA Connector B	"B"	Conflict Monitor	"CMB"
NEMA Connector C	"C"	All Harnesses	Labeled with function
Controller Connector D	"D"	Additional harnesses may be identified later.	

TABLE 18A-10
HARNESS LABELS

18.4 IMPLEMENTATION OF EQUIPMENT CAPABILITIES

The wiring between the panels shall connect the functional inputs and outputs needed to implement the operational capabilities of the equipment and requirements of this standard. Input circuits to the controller for external controls shall not be wired: i.e.; hold, omit, force off, CNA I&II, control status bids, phase next, phase on, phase check, red omit, pedestrian recycle, max I&II, max inh. There shall be no discrete circuit, components or active devices attached to any panel or cabinet wall except as specified. Printed circuit boards are not allowed on any panel.

18.5 BACK PANEL

The back panel shall be located on the lower half of the back cabinet wall. The controller and conflict monitor harnesses shall be terminated on the upper portion and shall be secured to the top left corner of this panel with non-chafing cable clamps as described elsewhere in this standard. All wires shall be installed for the D and E connector functions listed in the appendix, between terminal positions and a receptacle on the back panel. The receptacles shall be square flange, with sockets connector, permanently mounted on the back panel, D receptacle - AMP206438-1, E receptacle - AMP2064038-1. The D connector on the harness shall be an AMP 206437-1 or an exact equivalent. A E harness connected to the Emergency Vehicle Detection System shall be provided with the EVDS equipment. The E connector on the harness shall be an AMP 206039-1 or an exact equivalent. The pins and sockets shall be gold finished. (Engineering note: EVDS equipment is specified in a separate document. All cabinets provided to DOTD shall be equipment to receive the EVDS equipment and provide the required functions as stated elsewhere in this standards.)

The wires from the controller harnesses, panel mounted receptacle, and other required devices shall be grouped by associated functions and terminated individually at a position on a terminal strip, (example - all inputs, by cycle, offset ... etc.). The terminal blocks and cabling for each harness shall be separate and have no wires crossing others from a different harness. Each terminal position shall be permanently identified with the associated function in the connecting equipment. Wiring to this panel from other equipment specified elsewhere in this specification shall be given extra lengths to allow movement between controller terminal positions for field changes.

All harnesses shall be five feet long from the point that is held by the cable clamp to the connector on the free end. The connector on the free end of the harnesses shall be a designated connector by the

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manufacturer. Any additional connectors and harnesses necessary to implement the controller and system operations specified herein shall be supplied by the manufacture meeting this standard.

For type 2 and 3 cabinets the panels shall be constructed in accordance with LA DOTD drawings #18A-1. The harnesses for type 2 and 3 cabinets shall be three feet long from the point that is held by the cable clamp to the connector free end.

18.5.1 Connectors

Controller and monitor harnesses shall utilize Mil-C-26482 Series 1 and AMP CPC type series 2 connectors. The controller harness connectors shall be as described elsewhere in this standard. The monitor harness connectors shall be as follows:

MONITOR Number of Channels	CONNECTOR
6	MS 3116F-22-55SY
12 Connector A	MS 3116F-22-55SZ
12 Connector B	MS 3116F-16-26S

TABLE 18A-11
MONITOR CONNECTORS

18.5.2 Harness Wire Termination

The monitor's signal input channels and voltage monitoring circuits shall be terminated on the appropriate terminals. The following shall be terminated at one position in all cabinets: harness wiring listed in NEMA-TS-1 Section 13 except as noted above, each input and output of the load cells, input and output of the controller, and the output of the flash transfer relays. The terminal blocks shall be either single row feed-through or double row type (electrical requirements described elsewhere in this standard). Exceptions to the requirement for single position termination for each wire are AC-, chassis ground, logic ground and flashing outputs. Listed below are the minimum terminals required for each:

a. Logic Ground - Three (3) adjacent positions
b. AC- - a separate copper or brass multi-terminal bus bar shall be mounted near the lowest portion of the panel, adjacent to and horizontally aligned with the signal field terminals. It shall be insulated from the cabinet and connected to AC- on the power panel with a single #6 AWG insulated wire. The bus bar shall be sized to accept 5 - #14 AWG solid wires at each terminal and shall have a minimum of 12 positions. This bus shall be used to terminate all the neutral circuits from cable wired to the signal heads.
c. Flashing outputs - each circuit of the transfer relay shall have different flashing circuits.

All terminations shall be grouped by function as listed in NEMA TS-1 standards, Section 13, Tables 13-1 and 13-2. The signal load cell inputs shall be terminated below all other controller and monitor harness termination.

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Panels for cabinet types 2 and 3 shall only have terminations of all voltage, monitoring, and coordinator circuits of the controller. The controller load cell controls shall be wired to the load cell receptacle and other requirements shown in drawings #18A. A single harness shall contain the circuits for A and B connectors. The connectors shall be offset along the end of the harness by six inches. Load cells shall be provided as follows: eight cells, four phase, two overlaps, two pedestrians (Additional details shown on drawing #18A).

Panels for cabinet type 5 shall have the phase overlap outputs "A" and "B" shall be wired respectively to load cells 5 and 6. Pedestrian outputs for phase 2 and 4 shall be wired to load cells 7 and 8 respectively.

Type 6 cabinets shall have overlap outputs "A" through "D" wired respectively to load cells 9 through 12. Wiring shall be arranged on the back panel to facilitate connecting the pedestrian outputs to the load cell inputs by moving wires, without adding wire, connectors, or terminal blocks.

(Engineering Note: The only controller outputs and load cell inputs circuits that are to be terminated on terminal strips are those circuits used for overlap and pedestrian indications. In accordance with the specification these circuits shall be provided to change the inputs of these load cells from either overlap or pedestrian outputs. In addition this will allow the reset circuit for pedestrian isolator cards to be terminated with the correct controller output. This requirement shall be for both the type 5 and 6 cabinets. In reference to logic ground within the cabinets this notation shall apply to all circuits. All reference to logic ground shall be through connector "A" of the controller. In cases where specific controls are used in connector "D", then logic ground of this harness may be used. In all cases logic ground through any connector shall be the same reference within the controller.)

When specified on order or plans, overlaps shall be terminated at different positions than specified above.

18.5.3 Load Cells and Flash Transfer Relays

Signal load cells shall be provided, one for each phase and each overlap. When specified, additional positions and load cells shall be provided for four pedestrian signals in line with the load cells previously specified. All flash transfer relays shall be located on the back panel, adjacent to the load cells. A solid state flasher shall be provided and located as stated below.

The position of the load cells, flashers, and transfer relays shall be between the terminals for the load cell inputs and outputs. In type 2 and 3 cabinets the position of the load cells, flashers, and transfer relays shall be in accordance with drawings #18A. The area above the load cells and flasher shall be open to allow the ventilation to flow freely away from the load cells.

The AC+ for the signal load cells shall be terminated as previously specified and be capable of carrying 60 amps, equally distributed to each signal load switch from a terminal strip on the back panel.

The transfer relays shall be operated directly by the voltage to transfer the signal operation from sequential to flashing. No intermediate relay shall be used between the transfer relays and signal operate/flash circuit. The transfer relays shall be energized during normal operation to connect the signal load cells to the field terminals.

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18.5.4 Signal Field Circuits

The output from the load cells shall be located on the lowest terminal strip at the bottom of the back panel. Wiring from the signal heads shall be terminated separately for each indication and there shall be no internal cabinet wiring terminated on the same terminal. The inputs and outputs of the flash transfer relay shall be terminated above and adjacent to the load switch outputs. The arrangement of these terminal strips shall allow the selection of either red or yellow signal indications to flash without needing to un-solder or solder connections. The number of signal circuits which will be transferred to flashing circuits shall equal the maximum number of load switch positions specified. No wiring shall be installed on the terminal for the field wiring.

18.6 POWER PANEL

The power panel shall be mounted on the lower right inside of the cabinet. It shall receive a single phase, 120 VAC, 60 Hz electrical service and shall have three (3) separate terminals for terminating the wires from the service source. This panel shall provide the power required and necessary functions, including cabinet ground, to each panel. The service terminals shall be a mechanical compression type, sized to accept a wire range from #8 to #2 AWG, stranded wire. A ground bus bar shall be located on the lower portion of this panel and terminate all ground circuit within the cabinet. All ground circuits shall be designed for a single path to the ground bar and no ground loops shall be created. The ground bus bar shall be a separate copper or brass multi-terminal bus bar. It shall be mounted directly to the panel and connected to chassis ground input terminal with a single #6 AWG green insulated wire. The bus bar shall be sized to accept 5 - #14 AWG solid wires at each terminal and shall have a minimum of 12 positions. This bus shall be used to terminate all the ground circuits from cable wired to the signal heads. All internal ground wiring to this bar shall be on one end using a maximum of 4 positions.

The power panel components for type 2 and 3 cabinets shall be incorporated on the back panel. Both neutral and ground bus bars shall be located conveniently for installing field wiring. All other requirement mentioned above shall be adhered to. Switches shall be located for easy reach and away from energized parts. (Details shown on drawing #18A-1.)

18.6.1 Control Switches

The following switches shall be located on the power panel and shall perform the functions listed below and labeled as shown:

a. Cabinet light - ON/OFF - this switch shall control the AC+ to the cabinet light specified elsewhere in this standard. For type 2, 3, and 4 cabinets the switch shall be part of the fixture.
b. Test - FLASH/AUTO - The "flash position" of this switch shall allow the signal indications to flash and the control equipment to cycle in its normal manner. The "auto" position will not affect the normal operation of the equipment.

18.6.2 Breakers

Breakers shall be provided in each type of cabinet. The AC+ power shall have one input and shall be bussed to three (3) separate circuits. The breakers shall be a single pole, molded case, screw mounted on this panel with two #10 screws on a four and one/half inch pattern. Each breaker shall indicate visually that the breaker has been tripped. The following are the functions and labels for each breaker:

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a. Controller power - ON/OFF - this shall be rated for ten amps and control the AC+ power to the controller and conflict monitor. (filtered and suppressed)

b. Main Power - ON/OFF - this shall be rated for sixty amps and control the AC+ power into the cabinet for all equipment. The power for the auxiliary circuits shall not be controlled by this switch.

c. Detector Panel Power - ON/OFF - this shall be rated for ten amps and control the AC+ power to the detector panel used for interconnect relay outputs. This circuit shall not be used for detector card rack and shall not be connected to the suppressor on the power panel.

d. Auxiliary Power - ON/OFF - this shall be rated for twenty amps and control the AC+ power to the ventilation fan, cabinet light, and convenience outlet (filtered).

18.6.3 Surge Protection and Filtration

The power for the control equipment shall be protected by a RFI line filter and high voltage surge arresters. The line filter shall be rated at sixty amps on each AC+ and AC- line. Terminals on the filter shall be for suppression on the main power, neutral, and ground; and separate terminals for line in and out, neutral out supplying the controller and detector panel power to the breakers. The filter shall attenuate signals both from line to load and load to line. The attenuation in both directions shall be a minimum of 50 decibels over the frequency range of 200 KHz to 75 MHz. The impulse life of the protector shall be capable of operating 20 times at peak current. The clamp voltage shall be 340 volts at 20 Kamps and shall respond to over voltage conditions within 300 nanoseconds. The minimal capability of the protector shall be to discharge a single impulse with a wave shape of 8/20 and current to be 20 Kamps on each side to ground. The insulation resistance between line to ground shall be 100 megohms.

18.6.4 Signal Bus Operation

The signal bus power shall be switched individually by normally opened solid state relays rated a minimum of 60 amps, control voltage 120 VAC (Crydon series 1 - A2475 or equal). The solid state relay shall operate within the NEMA temperature range by derating the device and using necessary heat sinks. All switches are specified elsewhere and the circuit design shall limit the switched current to ten amps max.

18.6.5 Convenience Outlet

The receptacle shall be a feed through, ground fault interrupter type, 20 amps, duplex receptacle. The receptacle shall have three (3) wires from the device to the appropriate terminal on the power panel, (Ground, AC-, and AC+). The feed through shall supply power to the fan and light.

The convenience outlet installed in type 2 and 3 cabinets shall be mounted on the door. The electrical details shall meet the following requirements and details in drawing 18A-1. The convenience outlet in type 5 and above cabinets shall be mounted on the power panel.

18.6.6 Power Panel Isolation

A clear, non-breakable, 1/4" Lexan insulating cover shall be used to shield all open connections and not cover any switch, breaker levers, terminals blocks, bus bars, or convenience outlet. The cover shall be secured in place with screw fasteners and be removable by hand or simple hand tools.

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18.7 DETECTOR AND AUXILIARY CONTROL PANELS

A detector panel shall be provided in cabinet types 3, 5, 6, and 7, and located on the left inside wall of the cabinet, except as noted for type 3 cabinet in section 18.7.2. The terminals and wires for detector card inputs, controller vehicle detector input test switches, remote communications, and additional functional inputs/outputs specified shall be on this panel. The upper portion of this panel shall be used for mounting any required terminal blocks. The middle of the panel shall be for vehicle/pedestrian test button and control circuit and field wiring terminals. A six position terminal block with suppressor shall be positioned on the bottom of the panel for communications. There shall be no splices in the wiring.

A separate panel shall be provided for the auxiliary controls including relay bases for interconnection controls, isolating the field circuits and the controller inputs.

18.7.1 Auxiliary Control Function (supplied with all Type 2 cabinets and when specified with any other cabinet.)

This panel shall be located on the left lower inside wall of all cabinets, below the detector panel when present, and shall be separate from other panels. Relay bases shall be mounted at the top of this panel and the quantity of bases shall be supplied that will provide the functions required or as indicated on the order. The relays bases shall be wired isolating the field wiring and the controller inputs/outputs for hardwired interconnect. Field wiring will be terminated at fuse blocks, specified elsewhere in this standard. Additional wiring requirements are given below. The relay bases shall be for two-pole octal relays and have screw terminals for all relay pins. The required functions for hardwired interconnect are; resets, cycles, splits, free, flash, and remote common. Wiring from the interconnect terminations described above shall not be included with any wiring or harnesses on the detector panel.

A terminal block shall be provided below the relay bases where the following are to be terminated. Power for this panel shall be supplied by a separate breaker on the power panel. A minimum of three adjacent positions shall be provided for each AC+, AC-, and ground. This power shall be used for supplying master interconnect power and providing power to external equipment. This power shall not be used for equipment power within the cabinet. Logic common from the controller shall also be terminated on a terminal strip. Controller system operations for dials 2, 3, and 4, split 2, 3, and 4, and offset 1, 2, 3, and 4, shall be terminated on the back panel as stated within this standard. Each system operation terminal shall be wired to the front side of the terminal blocks on the back panel and terminated using a compression spade lug to the inputs of the controller. Each wire shall be identified with a sleeve marked, D-2, D-3, D-4, SP-2, SP-3, SP-4, O-1, O-2, O-3, and O-4 respectively. Two terminal positions shall be provided for free in and out, and two positions for flash in and out. Wiring shall be provided for each, one for free and one for flash, from these terminals to the terminals on the front of back panel, terminated using compression spade lugs. Each identified with a sleeve, free marked FR and flash marked FL. This panel shall conform to drawing 18A of this standard.

(Engineering Note: For railroad preemption inputs, we intended to use the pedestrian isolator cards between field and controller inputs. For hardwired interconnect controls, we will move the wiring on the back panel for master or secondary operation. Similar methods of moving wires will be used to implement other required functions as needed.)

18.7.2 Detector Panel for Type 3 and 5 Cabinets

The detector panel shall be located on the inside right wall of type 3 cabinets and the left wall of type 5 cabinets. The panel shall have terminal positions for the specified field input circuits. The wiring

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requirements stated above shall be followed. Terminals shall be provided for eight vehicle and four pedestrian detector input circuits.

The card rack shall follow the specified requirements elsewhere stated, however positions shall be provided for one power supply, two-four channel vehicle detector cards, and two pedestrian isolators cards. The wiring for the rack shall be formed to follow the hinge of the door without damage to the wiring.

18.7.3 Detector Panel Test Switches

Detector test switches shall be provided on all detector panels. These switches shall be positioned in between the terminal blocks for the field wiring and adjacent to the input of the channel that the switch is for. Access to the switches shall not be interfered with wires or suppressor. Each switch shall be a momentary push button, normally open switch. There shall be a switch for each detector channel supplied in the cabinet and for each pedestrian call circuit (2 for 4-phase, and 4 for 8-phase), as per this specification, order, plans, or any addendum. Each switch shall be permanently labeled with the nomenclature of the function it provides (∅ # or ∅ ##). The function of the switches shall be to place a logic ground on the controller vehicle, pedestrian, and system detector inputs. The wiring shall be terminated on the front of the back panel at the associated controller input terminal. A compression type spade lug shall be use and each wire marked with a identification sleeve as follows: VB-∅1, VB-∅2, . . . VB-∅8, PB-∅2, PB-∅4, etc.

18.7.4 Field Wiring - Detector and Auxiliary Panels

The loop lead-in, pedestrian field push button shall be terminated on the sides of the detector panel, the communications shall be terminated on the bottom of the detector panel, and the interconnect and field inputs/outputs shall be terminated on the bottom of the auxiliary panel. Each channel, vehicle and pedestrian, shall be terminated at two adjacent positions for inputs. On the auxiliary panel six NON type fuse holders and one remote common terminal shall be positioned on the bottom of the panel for hardwired interconnect.

The specified lightning protection shall be connected to the designated field terminals.

18.7.5 Communication Harnesses

All additional harnesses required for connecting the modem, line drivers, controller, master, and system hardware in addition to the specified connectors shall be provided and terminated in a fashion required by the manufacturer. Additional harnesses shall not negate any harness specific by this standard. Approval of these harnesses shall be obtained from the Department.

18.7.6 Lightning Protection

All detector and data field wiring shall be terminated on the required terminal block. Minimum voltage clamping shall be 30 volts for both differential and common mode. Current carrying capabilities shall be 400 amps in differential mode and 1000 amps in common mode. Response time for detector protection shall be 40ns and for data lines shall be 1 to 5 ns. The devices shall be mounted to the panel and the leads terminated on each field terminal.

All 120 volt field circuits shall be protected on the equipment side of the fuse by a surge protector. Operating line voltage shall be 120VAC, peak surge trip point for 600 volts/microsecond impulse shall be less than 890 volts. Response time shall be less the 200 nanosecond at 10KV/microsecond. Surge

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handling ability shall be 20 Kamps. The device shall be mounted on the grounding stud adjacent to the protected terminal.

18.8 POLICE PANEL

The police panel shall be located in the police compartment previously specified and provide switches which are accessible when the police compartment door is opened. The following list of switches shall be located on this panel and be wired to their appropriate circuits to provide the functions identified below:

a. Flash Control Switch - Flash/Normal - this switch shall control the signal output from the controller to cause them to flash in the "Flash" position and to initialize the controller to the start-up phase unless the conflict monitor has detected a conflict. If the monitor has placed the equipment on flash, then this switch shall be inactive. The "Normal" position of the switch shall cause no effect to the signal circuits and shall allow the control equipment to function in its prescribed manner.

b. Signal Shut-Down - On/Off - the "On" position of this switch shall allow the signals to operate in normal manner. The "Off" position of the switch shall cause the signal indications to become dark, regardless of whether the signals were flashing or operating normally and to initialize the controller to the start up phase unless the conflict monitor has detected a conflict.

c. Manual Control - Auto/Manual - All necessary wiring, (manual control enable, interval advance, logic ground) shall be routed to the panel and terminated. A switch shall be provided only when specified and switch the function of the controller from normal operation in the "Auto" position to a manual advance operation in the "Manual" position by a manual push button to advance the controller in accordance with the NEMA standards. In addition to the switch, a manual control shall be provided. The cord shall be terminated on a terminal strip attached to the back of the police panel. The cord shall be weatherproof and coiled, having a maximum retracted length of eight inches and a minimum extended length of five feet. The cord shall be attached to the panel with a cable clamp, and fitted with strain relief bushing at the point it is routed through a five-eighths inch hole in the panel. The manual control shall be on the free end of the cord. The manual control and the connection to the cord shall be weatherproof. A hand grip shall be constructed for normal use by being held in one hand and a momentary contact switch can be activated with the thumb. This control shall be operable between the above mentioned lengths.

d. Emergency Vehicle Detection System Enable - On/Off - All necessary wiring shall be routed to the panel and terminated. A switch shall be provided to activate the EVDS when it is in the on position and the EVDS equipment is installed in the cabinet. In the off position the EVDS equipment shall be disabled and all functions connected to the Traffic Control System Equipment shall be disable allowing the control equipment to operate as programmed. When the EVDS equipment is not installed in the cabinet then this switch shall not effect the operation of the Traffic Control System Equipment.

The back of the panel shall have an aluminum shield to prevent personnel from accidentally coming in contact with the terminals of the switches or terminal strip. With the cover in place, it shall provide visual inspection of the back of the panel and shall not interfere with any equipment when the main door is closed.

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19.0 CABINET WIRES AND WIRING

The wiring in the cabinet shall withstand the environmental temperature range as stated in NEMA TS-1. The insulation shall remain flexible over the temperature range and will not begin melting, causing the insulation to reduce in thickness. The insulation shall meet Specification MIL-W-16878D, 105 degrees, 600V, (MIL), heat resistant, polyvinylchloride or approved equal. The wire shall be 600 volts and color coded according to the following list:

HARNESS	COLOR
Controller harness and wiring	Blue
Conflict monitor Harness and wiring	Red
Detector, preemptor, and interconnect wiring	Yellow
All AC+	Black
All AC-	White
All Controller Logic Ground	White/Black Stripe or White/Green Stripe
All Chassis Ground	Green

TABLE 18A-12
WIRING COLOR CODE

The wire shall be stranded copper and sized to carry 125% of the design current and a minimum #22AWG. All signal circuit wiring shall meet the above stated size and be a minimum of #16AWG. All circuits shall be wired using a single conductor; therefore, parallel wiring is not an acceptable method of meeting wire size requirements as stated above. The wires shall be terminated individually by a solder less compression type spade lug appropriately sized or by soldering. All wiring shall be installed having a zero tension after installation.

Wire bundles shall be held in cable form by lacing tape, spiral wrap, or plastic sheathing. The lacing tape shall be flat, braided nylon and 0.090 inch wide, equal to ICO-Rally type LTN-2. The spiral wrap shall be correctly sized to fit the wire bundle and be a weather-resistant polyethylene equal to Panduit spiral wrapping. The insulating tubing shall be clear colored and sized to fit the wire bundle, equal to Alpha PVC-105 plastic tubing. Cable ties are restricted from use on cable bundles between panels and equipment harnesses. Cable ties may be used to bundle wire on panels only. Cable ties shall be self-locking and have properly applied tension according to the manufacturer's specifications. The ties shall be weather resistant nylon equal to T & B ties (MX series).

20.0 CABINET MECHANICAL AND ELECTRICAL HARDWARE

All hardware shall meet the environmental requirements of the controller.. All fastening devices, (bolts, washers, screws, etc.), shall not rust when exposed to weather. These shall be hot dipped galvanized, stainless steel or brass. All electrical hardware shall be sealed and electrical contacts protected against moisture and corrosion.

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20.1 TERMINAL BLOCKS

Terminal blocks shall be multiple terminal, one piece, rated at a minimum of 300 VDC for all 24 VDC control circuit terminations and a minimum of 600 VDC for all 120 VAC circuits. All field terminal blocks shall be multiple terminal, one piece, rated a 600 VDC and 20 amps. Exceptions to the above requirement for 600 VDC terminal blocks used with the 120 VAC terminations are the 120 VAC terminations of the controller, monitor, and detectors, which are permitted to be terminated on a 300 VDC terminal block. Another exception is where intermixing terminal blocks would result from the above requirement then the block to be used shall be determined by the voltage of the largest number of terminations on that block. The minimum current rating of all terminal blocks shall be 15 amps unless otherwise specified. The minimum amperage for the 120 VAC termination on the power panel shall be 60 amps. Any contradiction between circuit description and hardware restriction shall be resolved by using the larger requirement specified.

In addition to the above requirements for voltage terminations a minimum size screw shall be used. The terminal blocks shall have a minimum screw of #6 for low voltage circuits for the electronic equipment and #8 for all field termination. The power terminal shall be a barrel type screw tightened lug.

20.2 WIRING TERMINALS

All compression terminals shall be constructed with a base material of fine grade high conductive copper per QQ-C-576 and tin plated per MIL-T-10727 plating process for durable corrosion resistance against salt spray and most chemical fumes. The insulation shall be made of vinyl. The terminal shall be installed with tooling recommended by the manufacturer to meet the performance requirements of MIL-T-7928. The use of ring or spade terminals are not being precluded by the above requirement. Each terminal shall be correctly sized to fit the wire and terminal screw.

All soldered connections shall be made using the designed temperature for the solder being used and the location of the connection. The connection shall be made preventing a cold solder joint and excessive winking of the solder into the wire. The insulation of the wire shall not be damaged by excessive overheating at any point on the wire.

20.3 MULTIPLE PIN CONNECTORS

All multiple pin connectors shall be wired in accordance with the connector manufacturer's recommendations or applicable MIL specifications. The type of connector shall be in accordance with this standard, NEMA TS-2 TYPE 2, and as listed below.

Unused sockets and pins shall not be installed in the D connector. A cable clamp designed for each connector shall be installed securely to prevent excessive strain on the wires from being transmitted to the contacts inside the connector housing.

20.4 SWITCHES

All switches, except the detector push button test switches, shall be heavy duty toggle switches and meet the MIL-MS-35059 Series Standards, rated at 20 Amps/125 VAC. The level shall have a seal for sand, dust, and fifteen foot water submersion. The terminals shall be threaded for screws and have a tinned finish. Mounting shall be by two hex nuts and two internal-tooth, lock washers on a ½ inch shank through which the toggle lever is mounted. The number of poles and lever positions shall be determined by the applications previously stated.

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20.5 LOAD CELL AND RELAY BASES

The load cell and the flash transfer relay sockets shall be rigidly mounted on the back panel. The insulating ridge on the front of the socket shall be reinforced with a metal mounting ring designed by the manufacturer of the socket. This ring shall be secured to the socket with a minimum of two screws and the ring fastened to the panel. Both sockets shall a minimum current rating of 15 amps, individual contacts, voltage rating of 1750 volts rms, pre-grounded, or grounding pin connected to chassis ground.

All relay bases used for special circuits specified previously, and not otherwise specified, shall be rated a 300 VDC and 10 Amps. Bases shall be front-panel mounted and shall have a closed back for insulation from the panel. The socket shall be octal and wired to barrier type terminals permanently numbered. Terminal screws shall be tinplated, #6-32 with captive nuts, and shall accept #20 to #12 AWG wire.

20.6 CABLE CLAMPS

All cable clamps shall have a metal loop and cushion made with a general purpose neoprene. The metal shall be aluminum 20204-T4 or stainless steel per Specification MIL-S-6721, annealed (321 or 347). The neoprene shall meet AMS Specification 3209. The clamp shall be sized to grip the cable it is being used on without damaging any insulation.

20.7 FUSES AND HOLDERS

All fuses located on the all removable electronic equipment shall be a 1/4 inch by 1-1/4 inch glass tube fuse rated at a minimum of 125 VAC. All panel mounted fuses shall be U.L. Class "H" fuses rated at 250 VAC, fast acting. Fuses shall be provided and equal to Type NON 0-30 Amps.

The fuse holder shall be constructed of a general purpose phenolic material U.L. listed for 250 VAC. The fuse holders shall have barriers on each side of the fuse and shall have a screw type terminal.

20.8 RELAY AND MOTOR SUPPRESSOR

A suppressor shall be installed on all AC relay coils and motor inputs. The suppressor shall be a series resistor-capacitor, 100 ohms-0.1 microfarad, and rated for 600 volts.

20.9 IDENTIFICATION SLEEVES

Identification sleeves shall be supplied on specified wires. The sleeve shall have the required identification printed or typed with a minimum size of pica-pitch 10. The sleeve shall be installed on the sire providing a self-laminating protective shield over the legend. Acceptable material shall be transparent 3.5 mil. vinyl film with acrylic pressure sensitive adhesive. The operating temperature range shall be -40° C to 80° C. The size of the label shall provide sufficient area for the printed identification.

Application of the sleeve onto the wire shall be neat and smooth completely protecting the identification label.

21.0 TESTING

A test(s) shall be performed on the cabinet containing the completely assembled equipment and control equipment by the manufacturer prior to shipment. Malfunctions or defects shall be corrected and

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the equipment retested. The complete log beginning with the first test, showing the results of the all tests, shall be delivered with the equipment. The manufacturer shall furnish certification with the documentation required in section 24, stating that the results of the test are true and accurate and stating the name and title of the person conducting the test. The test shall require the operation of the equipment with each signal circuit connected to an incandescent load of at least six-hundred watts. The equipment shall operate sequentially and continuously for at least forty-eight hours, as stated above, in an environment having a minimum temperature of one-hundred-forty degrees Fahrenheit.

The complete system, including all local controllers, cabinets, on-street master controller, and modems shall be assembled and interconnected at the point of manufacture.

The system shall be completely performance tested and a written test report submitted in the documentation required in Section 24. The Engineer reserves the right to an on-site system inspection at the point of manufacture to witness the system operation and the performance test of the system.

After installation and debugging of all central control equipment, local controllers, detectors, communications, and other system hardware and software elements, the system shall be required to complete a 30 day period of acceptable operation. The system test shall fully and successfully demonstrate all system functions using live detector data and controlling all system-controlled intersections.

22.0 TRAINING

Formal classroom training and "hands-on" operations training shall be provided for personnel designated by this agency. The engineering, operations and maintenance training shall take place at locations within the state of Louisiana designated by this agency. The technician training shall take place at the manufacturer's facility. Classroom training shall be given for the engineering, operations and maintenance sessions.

Five training sessions are required during the contract period. Three maintenance sessions, one engineering session and one technician session shall be given. The engineering session shall provide for a maximum of twenty-five people. Each maintenance session shall provide for a maximum of fifteen people. The technician session shall provide for a maximum of four people. Copies of course materials shall be supplied to and retained by each attendant. Training shall occur after delivery of initial order, but before one year after date of final acceptance of initial order. The Manufacturer shall submit for each type of session, syllabuses to the Traffic Signal Engineer for approval before classes are scheduled.

22.1 OPERATIONAL TRAINING

Training for the operation of the system shall include analyzing system performance and revision of system operating parameters based on the analysis. The session shall be a minimum of two days and presented at an engineering level.

The training topics shall include as a minimum:

a. How to enter commands (, System software, utilities, and disk management)
b. Operation of all devices
c. Generation and editing of arterial master and intersection controller databases
d. Uploading/downloading of arterial master and intersection controller databases

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e. Procedure for enabling dynamic displays
f. Explanation of the communication system

22.2 MAINTENANCE TRAINING

Training for maintenance personnel shall include detailed, field level troubleshooting and basic interrogation of the controller unit. The training shall consist of three sessions. Two sessions shall be remedial and one session shall cover more advanced material. Each session shall be three days in length. Course content shall emphasize information required to successfully pass the below specified tests.

Maintenance personnel shall be tested by the Vendor as to their ability to repair and/or diagnose simulated failures, and to gather basic information about a particular controller unit (i.e., min time, conflicting and non-conflicting phases, etc.). There shall be at least ten (10) controller/cabinet configurations per session type. Cabinets, controllers and miscellaneous materials shall be supplied by the Department. Wiring and programming necessary to conduct the tests shall be performed by the Vendor. The Vendor shall recommend at least ten (10) simulated failures, timing schemes and other configurations to be used for each type of test. The Department shall supply the Vendor with the final, approved test configurations, however, the Vendor shall not be required to perform more than six (6) hours of wiring or programming in development of the test configurations.

Final test questions shall be supplied by the Department. A Department representative will be present at all time to assist the Vendor in administering the test.

22.3 TECHNICIAN TRAINING

The manufacturer shall provide a minimum of two, four-day sessions at their facility for a maximum of three Department employees per session. The manufacturer shall be responsible for all costs associated with such training except for the cost of travel.

Training sessions shall be highly technical and include as a minimum the following topics:

a. Architecture of controller unit.
b. Controller troubleshooting to component level.
c. Cabinet wiring and troubleshooting
d. Advanced controller programming including diamond sequencing.

22.3 ENGINEERING TRAINING

Training for engineering personnel shall focus on implementing traffic engineering data with the controller. The manufacturer shall provide one two-day session for a maximum of 25 participants.

The first day of the session shall emphasize basic operation and interrogation of the controller. The second day of the session shall emphasize implementing traffic engineering data and include, at a minimum the following:

a. Programming an actuated, coordinated controller based on intersections provided by the Department.
b. Theory and operation of volume density operation and associated programming methods.
c. Theory and operation of three- and four-phase diamond sequencing and associated programming methods.

FOR INFORMATION ONLY

23.0 WARRANTY

The system equipment shall be warranted for a minimum of one year. All warranty periods shall begin at the date of acceptance by the Department.

24.0 DOCUMENTATION

Detailed technical information on material being offered shall be supplied with the bids for equipment directly shipped to the Department and with the material submittal for equipment being installed on projects. Information shall be for all items required by this specification and on the order or in the plans.

Manuals shall be supplied for all equipment and components of the system. The manuals supplied for software, peripherals, and modems shall be from the original source. The manual shall be comprehensive, easy to use and understand, and completely descriptive of the product.

24.1 CLOSED LOOP SYSTEM OPERATION MANUAL

a. Step-by-step system installation procedures
b. Operating instructions
c. System set-up procedures
d. Explanations and descriptions of data entry procedures
e. Menu item descriptions

24.2 EQUIPMENT MANUALS

a. Technical descriptions
b. Operating instructions
c. Theory of operation
d. Detailed schematic diagrams
e. Assembly drawings
f. Wiring diagram
g. Troubleshooting procedures to assist the maintenance staff in the identification and isolation of malfunctions
h. Parts list

24.3 CABINET WIRING

Complete wiring details shall be shown on the drawings. The drawings shall use the same nomenclature to identify the various components as referred to in this standard. If no name was mentioned in this standard then a reasonable nomenclature shall be used. A legend shall be provided on all drawings identifying acronyms and symbols. Two drawings shall be provided with each cabinet. The DOTD specification shall be followed when supplying documentation for projects.

FOR INFORMATION ONLY

FIGURES

FOR INFORMATION ONLY

FOR INFORMATION ONLY

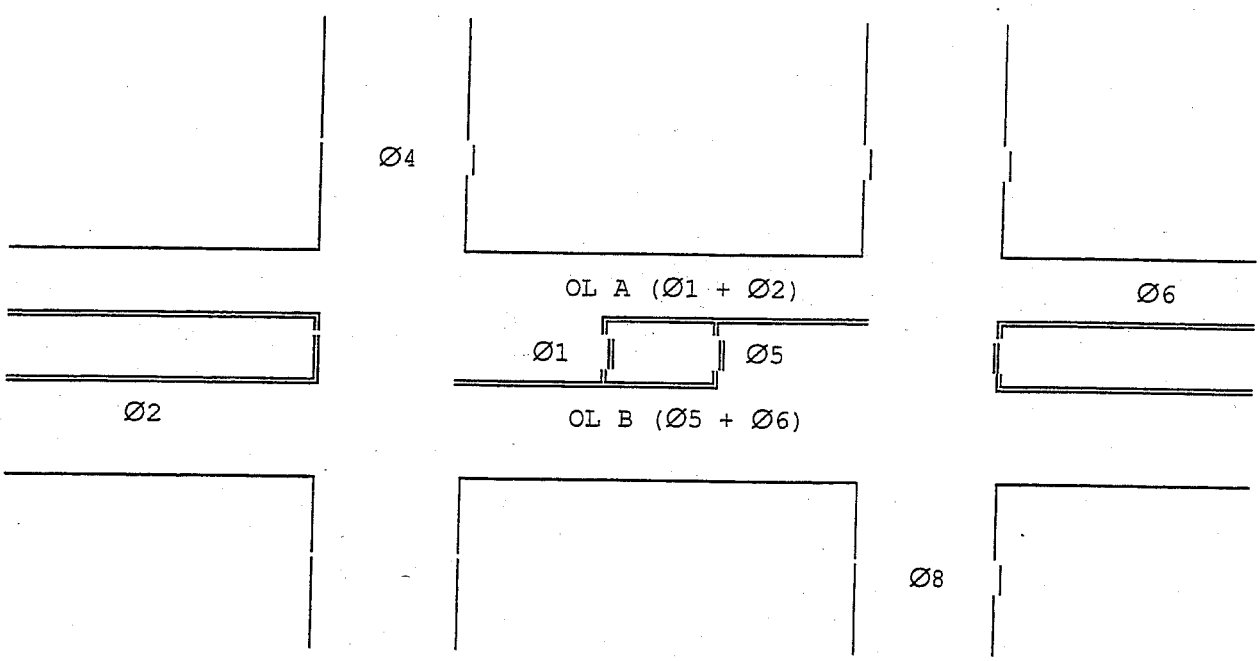

FIGURE 18A-3
DIAMOND INTERSECTION PHASE ASSIGNMENT

FOR INFORMATION ONLY

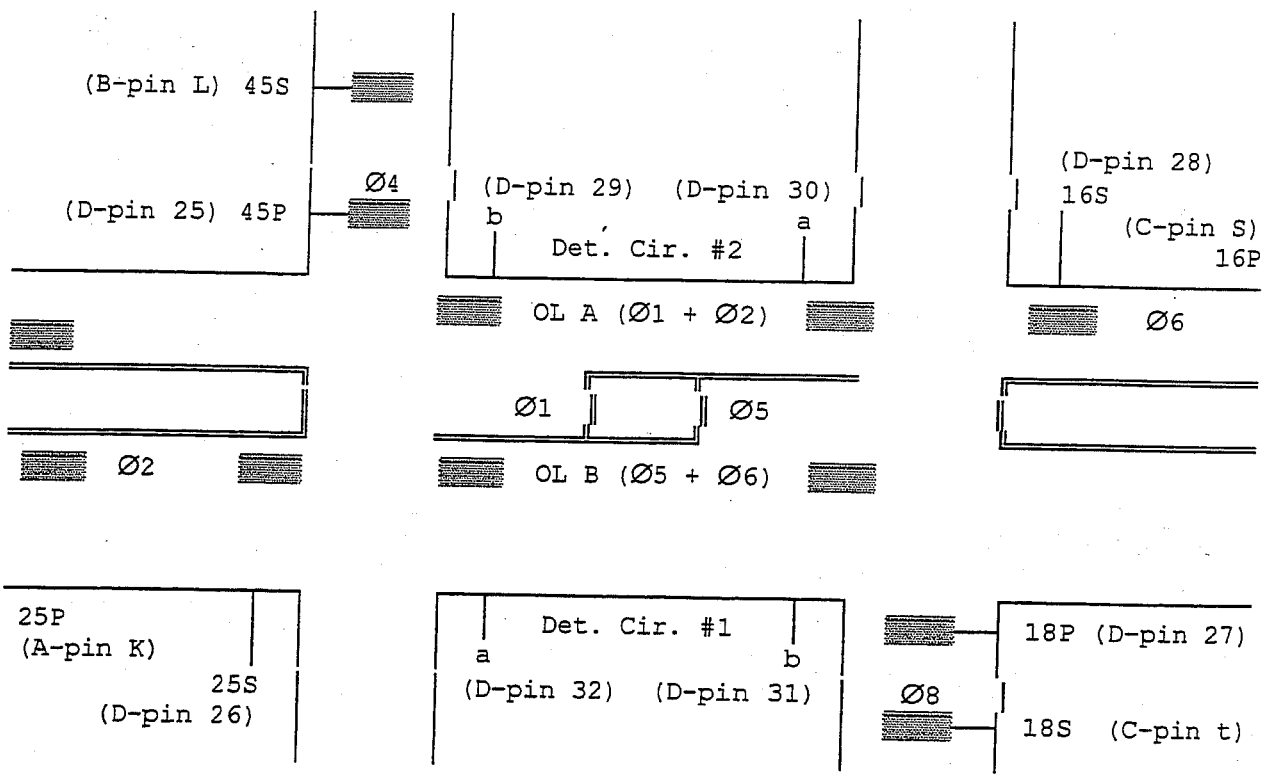

FIGURE 18A-4
VEHICLE DETECTOR ASSIGNMENT - 4 PHASE DIAMOND

FOR INFORMATION ONLY

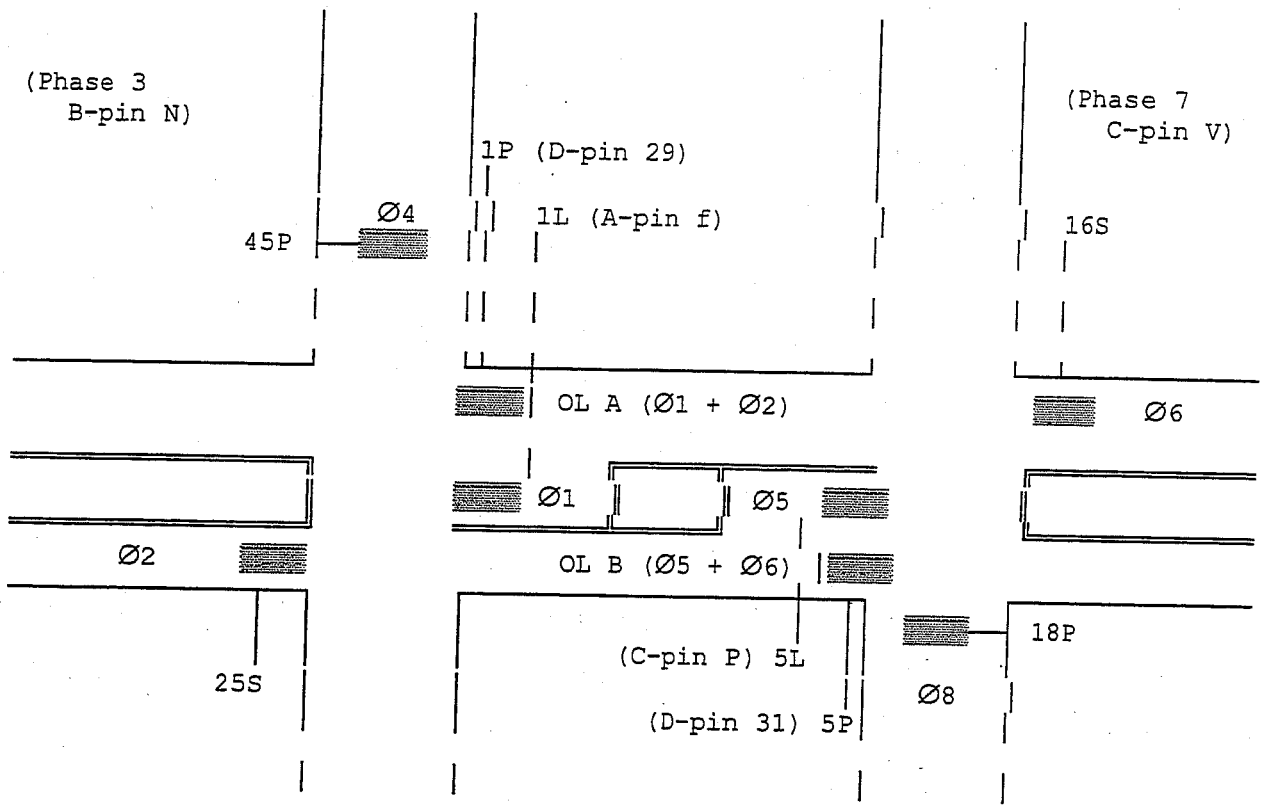

FIGURE 18A-5
VEHICLE DETECTOR ASSIGNMENT - 3 PHASE DIAMOND

FOR INFORMATION ONLY

APPENDIX

PIN/SOCKET ASSIGNMENTS FOR D CONNECTOR ON BACK PANEL

PIN	FUNCTION
1	OFFSET 1 IN
2	CYCLE 2 IN
3	CYCLE 3 IN
4	FLASH IN
5	OFFSET 2 IN
6	OFFSET 3 IN
7	INTERCONNECT FREE
8	SPLIT 2 IN
9	SPLIT 3 IN
10	SPL FUNCTION 2 OUT (TBC)
11	COMPUTER ON-LINE
12	THREE PHASE DIAMOND SELECT
13	FOUR PHASE DIAMOND SELECT
14	RESERVED
15	RESERVED
16	EXT RESYNC INPUT
17	MASTER SELECT
18	SYNC INPUT
19	PREEMPT 1 IN
20	PREEMPT 2 IN
21	PREEMPT 3 IN
22	PREEMPT 4 IN
23	PREEMPT 5 IN
24	PREEMPT INTERLOCK
25	SYSTEM DET. 1/DETECTOR 45P INPUT
26	SYSTEM DET. 2/DETECTOR 25S INPUT
27	SYSTEM DET. 3/DETECTOR 18P INPUT
28	SYSTEM DET. 4/DETECTOR 16S INPUT
29	SYSTEM DET. 5/DET. #2b-1P INPUT
30	SYSTEM DET. 6/DET. #2a INPUT
31	SYSTEM DET. 7/DET. #1b-5P INPUT
32	SYSTEM DET. 8/DET. #1a INPUT
33-34	SPARE
35	CONTROLLER INTERLOCK DIAMOND
36	COMP. SEL 1
37	COMP. SEL 2
38	COMP. SEL 3
39-41	SPARE (DO NOT USE)
42	CABINET INTERLOCK DIAMOND
43	SPL FUNCTION 1 OUT (TBC)
44	SPLIT 3 OUT
45	SPLIT 2 OUT
46	INTERCONNECT FREE OUT
47	OFFSET 3 OUT
48	OFFSET 2 OUT
49	FLASH OUT
50	CYCLE 3 OUT
51	CYCLE 2 OUT
52	OFFSET 1 OUT
53	+24 VDC
54	LOGIC GROUND
55	CHASSIS GND
56	RESERVED
57	RESERVED

PIN/SOCKET ASSIGNMENTS FOR E CONNECTOR ON BACK PANEL

PIN	FUNCTION
1	AC +
2	AC-
3	CHASSIS GROUND
9	PREEMPT 1
10	PREEMPT 2
11	PREEMPT 3
12	PREEMPT 4
13	PREEMPT 5
15	LOGIC GROUND

FOR INFORMATION ONLY

18A DRAWINGS

FOR INFORMATION ONLY

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

CONSTRUCTION PROPOSAL RETURNABLES FOR

STATE PROJECT NOS. 015-04-0039, 015-05-0034 AND 022-04-0036
GEORGETOWN – TULLOS
ROUTE US 165
GRANT AND LASALLE PARISHES

FOR INFORMATION ONLY

CONTRACT TIME FORM
COST-PLUS-TIME PLUS LIFE CYCLE COST BIDDING PROCEDURE
(A + B + C) METHOD

STATE PROJECT NO(S).	**015-04-0039, 015-05-0034 AND 022-04-0036**
FEDERAL AID PROJECT NO(S).	**N/A**
NAME OF PROJECT	**GEORGETOWN - TULLOS**
ROUTE	**US 165**
PARISHES	**GRANT AND LASALLE**

CONTRACT TIME

The bidder shall determine the number of calendar days required for completion and final acceptance of the project and shall state this required time, in words, in the space provided below. The maximum allowable contract time for this project is **seven hundred seventy-five (775) calendar days**. The purposed completion time will be a factor used in considering bids for award of contract in accordance with the special provision, **COST-PLUS-TIME PLUS LIFE CYCLE COST BIDDING PROCEDURE (A+B+C METHOD)**. The stated number of calendar days required for completion will be the contract time for this project should the bidder be successful. Bids not including a contract time, or showing time to completion in excess or the maximum amount will be considered irregular and will be rejected.

CONTRACT TIME (Calendar Days To Completion, In Words)
_____ Calendar Days

Form CS-04
A + B + C
12/04

BID BOND

A Proposal/Bid Guaranty is only required when the bidder's total bid amount as calculated by the Department in accordance with Subsection 103.01 is greater than $250,000. *(See Section 102 of the Project Specifications.)*

_____, as Principal
(Bidder)
and
_____, as Surety,
are bound unto the State of Louisiana, Department of Transportation and Development, (hereinafter called the Department) in the sum of five percent (5%) of the bidder's total bid amount as calculated by the Department for payment, of which the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, as solidary obligors.

Signed and sealed this _____ day of _____, 20_____.

The condition of this obligation is such that, whereas the Principal has submitted a bid to the Department on a contract for the construction of **STATE PROJECT NOS. 015-04-0039, 015-05-0034 AND 022-04-0036, GEORGETOWN – TULLOS, located in GRANT AND LASALLE PARISHES, ROUTE US 165,** if the bid is accepted and the Principal, within the specified time, enters into the contract in writing and gives bond with Surety acceptable to the Department for payment and performance of said contract, this obligation shall be void; otherwise to remain in effect.

_____
Principal (Bidder or First Partner to Joint Venture)
By _____
Authorized Officer-Owner-Partner
_____
Typed or Printed Name

_____
If a Joint Venture, Second Partner
By _____
Authorized Officer-Owner-Partner
_____
Typed or Printed Name

_____
Surety
By _____ (Seal)
Agent or Attorney-in-Fact
_____
Typed or Printed Name

To receive a copy of the contract and subsequent correspondence / communication from LA DOTD, with respect to the bid bonds, the following information must be provided:

_____
Bonding Agency or Company Name

_____
Address

_____
Agent or Representative

_____
Phone Number / Fax Number

LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
SCHEDULE OF ITEMS

LEAD PROJECT: 015-04-0039
OTHER PROJECTS: 015-05-0034, 022-04-0036

DATE: 03/15/07 09:42 PAGE: 1

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
201-01	LUMP	LUMP SUM	CLEARING AND GRUBBING _____ DOLLARS _____ CENTS
202-01	LUMP	LUMP SUM	REMOVAL OF STRUCTURES & OBSTRUCTIONS _____ DOLLARS _____ CENTS
202-02-B-01	1	EACH	REMOVAL OF CONCRETE BOX CULVERTS (STA. 13+339.40; 1524 m x 1219 m x 26.78 m) _____ DOLLARS _____ CENTS
202-02-B-02	1	EACH	REMOVAL OF CONCRETE BOX CULVERTS (STA. 14+772.41; 1829 m x 1829 m x 27.34 m) _____ DOLLARS _____ CENTS
202-02-B-03	1	EACH	REMOVAL OF CONCRETE BOX CULVERTS (STA. 17+669.95; 1219 m x 1219 m x 36.98 m) _____ DOLLARS _____ CENTS
202-02-B-04	1	EACH	REMOVAL OF CONCRETE BOX CULVERTS (STA. 19+339.61; 1219 m x 1219 m x 228.2 m) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
202-02-B-05	1	EACH	REMOVAL OF CONCRETE BOX CULVERTS (STA. 19+496.63; 1524 m x 1524 m x 29.70 m) _____ DOLLARS _____ CENTS
202-02-C	23,060	SQ. METER	REMOVAL OF PORTLAND CEMENT CONCRETE PAVEMENT _____ DOLLARS _____ CENTS
202-02-D	875	SQ. METER	REMOVAL OF CONCRETE WALKS & DRIVES _____ DOLLARS _____ CENTS
202-02-G	30,904.3	SQ. METER	REMOVAL OF SURFACING & STABILIZED BASE _____ DOLLARS _____ CENTS
202-02-H	259	LIN. METER	REMOVAL OF GUARD RAIL _____ DOLLARS _____ CENTS
202-02-I	1,420	SQ. METER	REMOVAL OF PAVED DRAINS _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
202-02-01	1	EACH	REMOVAL OF 6.4 m x 13.8 m CONCRETE SLAB (RT. OF STA. 10+883 ON US 165) _____ DOLLARS _____ CENTS
202-02-02	1	EACH	REMOVAL OF 5.0 m x 16.8 m WOOD FRAME CHURCH (LT. OF STA. 11+320 ON US 165) (CONTAINS NON-FRIABLE ASBESTOS) _____ DOLLARS _____ CENTS
202-02-03	1	EACH	REMOVAL OF 11.1 m x 13.4 m WOOD FRAME RESIDENCE (RT. OF STA. 11+706 ON US 165) _____ DOLLARS _____ CENTS
202-02-04	1	EACH	REMOVAL OF 8.9 m x 16.5 m WOOD FRAME RESIDENCE (RT. OF STA. 11+760 ON US 165) _____ DOLLARS _____ CENTS
202-02-05	1	EACH	REMOVAL OF 3.0 m x 6.1 m WOOD FRAME GARAGE (RT. OF STA. 11+764 ON US 165) _____ DOLLARS _____ CENTS
202-02-06	1	EACH	REMOVAL OF 10.5 m x 18.6 m METAL SHED (RT. OF STA. 11+876 ON US 165) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
202-02-07	1	EACH	REMOVAL OF 9.3 m x 9.5 m WOOD SHED (RT. OF STA. 11+900 ON US 165) _____ DOLLARS _____ CENTS
202-02-08	1	EACH	REMOVAL OF 7.3 m x 7.4 m CONCRETE BLOCK COMMERCIAL BUILDING (RT. OF STA. 12+780 ON US 165) _____ DOLLARS _____ CENTS
202-02-09	1	EACH	REMOVAL OF 14.8 m x 9.3 m WOOD FRAME RESIDENCE ON BLOCKS (RT. OF STA. 12+790 ON US 165)(CONT. NON-FRIABLE ASBESTOS) _____ DOLLARS _____ CENTS
202-02-10	1	EACH	REMOVAL OF 6.3 m x 2.5 m WOOD AND METAL STORAGE SHED (RT. OF STA. 12+790 ON US 165) _____ DOLLARS _____ CENTS
202-02-11	1	EACH	REMOVAL OF 3.8 m x 8.5 m WOOD AND METAL SHOP (RT. OF STA. 12+940 ON US 165) _____ DOLLARS _____ CENTS
202-02-12	1	EACH	REMOVAL OF 8.7 m x 9.2 m WOOD FRAME RESIDENCE (RT. OF STA. 12+940 ON US 165)(CONTAINS NON-FRIABLE ASBESTOS) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
202-02-13	1	EACH	REMOVAL OF 10.0 m x 21.4 m METAL OFFICE BUILDING (RT. OF STA. 12+965 ON US 165) _____ DOLLARS _____ CENTS
202-02-14	1	EACH	REMOVAL OF 3.9 m x 3.1 m METAL SHED ON SLAB (RT. OF STA. 12+970 ON US 165) _____ DOLLARS _____ CENTS
202-02-15	1	EACH	REMOVAL OF 13.6 m x 8.7 m WOOD FRAME RESIDENCE (RT. OF STA. 12+970 ON US 165) _____ DOLLARS _____ CENTS
202-02-16	1	EACH	REMOVAL OF 4.8 m x 6.7 m METAL SHED (RT. OF STA. 13+000 ON US 165) _____ DOLLARS _____ CENTS
202-02-17	1	EACH	REMOVAL OF 8.5 m x 9.3 m METAL COMMERCIAL BUILDING (RT. OF STA. 13+325 ON US 165) _____ DOLLARS _____ CENTS
202-02-18	1	EACH	REMOVAL OF 10.3 m x 16.6 m BRICK BUILDING ON SLAB (LT. OF STA. 39+270 ON US 165) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
202-02-19	1	EACH	REMOVAL OF 10.0 m x 13.2 m WOOD FRAME BUILDING ON SLAB (LT. OF STA. 39+380 ON US 165) _____ DOLLARS _____ CENTS
202-02-20	1	EACH	REMOVAL OF 3.1 m x 10.4 m METAL BUILDING ON SLAB (LT. OF STA. 39+420 ON US 165) _____ DOLLARS _____ CENTS
202-02-21	1	EACH	REMOVAL OF 9.3 m x 18.3 m METAL BUILDING ON SLAB (LT. OF STA. 39+450 ON US 165) _____ DOLLARS _____ CENTS
202-02-22	1	EACH	REMOVAL OF 6.1 m x 35.0 m BRICK BUILDING ON CONCRETE SLAB (LT. OF STA. 39+470 ON US 165) _____ DOLLARS _____ CENTS
202-02-23	1	EACH	REMOVAL OF 11.7 m x 11.6 m BRICK BUILDING ON SLAB (LT. OF STA. 39+590 ON US 165) _____ DOLLARS _____ CENTS
202-02-24	1	EACH	REMOVAL OF 13.5 m x 17.8 m BRICK BUILDING ON SLAB (LT. OF STA. 39+625 ON US 165) (CONTAINS NON-FRIABLE ASBESTOS) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
202-02-25	1	EACH	REMOVAL OF 4.5 m x 6.2 m COMMERCIAL BUILDING (RT. OF STA. 4+720 ON LA 500) _____ DOLLARS _____ CENTS
202-02-26	1	EACH	REMOVAL OF 4.5 m x 6.2 m CONCRETE SLAB (RT. OF STA. 4+770 ON LA 500) _____ DOLLARS _____ CENTS
202-02-27	1	EACH	REMOVAL OF 5.0 m x 15.2 m WOOD FRAME RESIDENCE (LT. OF STA. 4+910 ON LA 500) _____ DOLLARS _____ CENTS
202-02-28	1	EACH	REMOVAL OF 9.0 m x 14.9 m WOOD FRAME RESIDENCE ON CONCRETE PIERS (LT. OF STA. 5+210 ON FIFTH STREET) _____ DOLLARS _____ CENTS
202-02-29	1	EACH	REMOVAL OF 10.5 m x 11.5 m WOOD FRAME RESIDENCE ON PIERS (RT. OF STA. 5+180 ON JONES STREET) _____ DOLLARS _____ CENTS
202-02-30	1	EACH	REMOVAL OF 3.7 m x 3.0 m WOOD FRAME SHED ON SLAB (RT. OF STA. 5+180 ON JONES STREET) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
202-02-31	1	EACH	REMOVAL OF 3.0 m x 3.7 m METAL SHED (LT. OF STA. 5+190 ON JONES STREET) _____ DOLLARS _____ CENTS
202-02-32	1	EACH	REMOVAL OF 3.0 m x 3.0 m WOOD FRAME GREENHOUSE (LT. OF STA. 5+190 ON JONES STREET) _____ DOLLARS _____ CENTS
202-02-33	1	EACH	REMOVAL OF 7.9 m x 6.6 m WOOD FRAME RESIDENCE ON PIERS (LT. OF STA. 5+190 ON JONES STREET) _____ DOLLARS _____ CENTS
202-02-34	1	EACH	REMOVAL OF 7.9 m x 9.4 m WOOD FRAME SHED ON SLAB (LT. OF STA. 5+218 ON JONES STREET) _____ DOLLARS _____ CENTS
202-02-35	1	EACH	REMOVAL OF 16.8 m x 11.7 m WOOD FRAME RESIDENCE ON PIERS (RT. OF STA. 5+266 ON JONES STREET) _____ DOLLARS _____ CENTS
202-02-36	1	EACH	REMOVAL OF 9.5 m x 17.7 m WOOD FRAME RESIDENCE ON PIERS (RT. OF STA. 5+075 ON LA 500) (CONTAINS NON-FRIABLE ASBESTOS) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
203-01	243,840	CU. METER	GENERAL EXCAVATION _____ DOLLARS _____ CENTS
203-03	957	CU. METER	MUCK EXCAVATION _____ DOLLARS _____ CENTS
203-04	650,743	CU. METER	EMBANKMENT _____ DOLLARS _____ CENTS
203-05	8,241	CU. METER	NONPLASTIC EMBANKMENT _____ DOLLARS _____ CENTS
204-02	240	EACH	TEMPORARY HAY OR STRAW BALES _____ DOLLARS _____ CENTS
204-05-A	326	EACH	TEMPORARY SEDIMENT CHECK DAMS (HAY) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
204-05-B	5	EACH	TEMPORARY SEDIMENT CHECK DAMS (STONE) _____ DOLLARS _____ CENTS
204-06	23,575	LIN. METER	TEMPORARY SILT FENCING _____ DOLLARS _____ CENTS
204-07	3	EACH	TEMPORARY STONE CONSTRUCTION ENTRANCE _____ DOLLARS _____ CENTS
302-01-01	2,964.7	CU. METER	CLASS II BASE COURSE (STONE OR RECYCLED PCCP) _____ DOLLARS _____ CENTS
304-01	1,385.22	MEGAGRAM	LIME _____ DOLLARS _____ CENTS
304-03-D	91,615	SQ. METER	LIME TREATMENT (TYPE C) (300 mm THICK) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
305-01-D	183,232	SQ. METER	SUBGRADE LAYER (300 mm THICK) _____ DOLLARS _____ CENTS
401-02	1,010	CU. METER	AGGREGATE SURFACE COURSE (ADJUSTED VEHICULAR MEASUREMENT) _____ DOLLARS _____ CENTS
402-01	1,100.0	CU. METER	TRAFFIC MAINTENANCE AGGREGATE (VEHICULAR MEASUREMENT) _____ DOLLARS _____ CENTS
502-01-A-01	573.0	MEGAGRAM	SUPERPAVE ASPHALTIC CONCRETE DRIVES, TURNOUTS AND MISCELLANEOUS (SIDE ROADS) _____ DOLLARS _____ CENTS
502-01-01	2,298.9	MEGAGRAM	SUPERPAVE ASPHALTIC CONCRETE (SIDE ROADS) _____ DOLLARS _____ CENTS
701-01-I	101.3	LIN. METER	CROSS DRAIN PIPE (600 mm RCP/PCP) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
701-01-K	53.7	LIN. METER	CROSS DRAIN PIPE (750 mm RCP/PCP) DOLLARS CENTS
701-01-M	118.4	LIN. METER	CROSS DRAIN PIPE (900 mm RCP/PCP) DOLLARS CENTS
701-01-O	214.1	LIN. METER	CROSS DRAIN PIPE (1200 mm RCP/PCP) DOLLARS CENTS
701-02-D	43.0	LIN. METER	CROSS DRAIN PIPE ARCH (600 mm EQUIV. RCPA) DOLLARS CENTS
701-03-G	1,000.5	LIN. METER	STORM DRAIN PIPE (450 mm RCP/PCP) DOLLARS CENTS
701-04-B	58.6	LIN. METER	STORM DRAIN PIPE ARCH (450 mm EQUIV. RCPA) DOLLARS CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
701-05-G	777.1	LIN. METER	SIDE DRAIN PIPE (450 mm) _____ DOLLARS _____ CENTS
701-05-I	210.8	LIN. METER	SIDE DRAIN PIPE (600 mm) _____ DOLLARS _____ CENTS
701-05-K	19.5	LIN. METER	SIDE DRAIN PIPE (750 mm) _____ DOLLARS _____ CENTS
701-10-I	15.5	LIN. METER	REINFORCED CONCRETE PIPE (EXTENSION) (600 mm) _____ DOLLARS _____ CENTS
701-10-K	37.0	LIN. METER	REINFORCED CONCRETE PIPE (EXTENSION) (750 mm) _____ DOLLARS _____ CENTS
702-02-A	1	EACH	MANHOLES (MH-06) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
702-02-B	1	EACH	MANHOLES (R-CB-11) _____ DOLLARS _____ CENTS
702-03-A	41	EACH	CATCH BASINS (CB-01M) _____ DOLLARS _____ CENTS
702-03-B	2	EACH	CATCH BASINS (CB-02M) _____ DOLLARS _____ CENTS
702-04-A	4	EACH	ADJUSTING MANHOLES _____ DOLLARS _____ CENTS
702-07-A	3	EACH	CROSS DRAIN SAFETY END (TYPE 1) _____ DOLLARS _____ CENTS
702-08-A	18	EACH	SIDE DRAIN SAFETY END (TYPE 1) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
704-01-A	297.18	LIN. METER	GUARD RAIL (SINGLE THRIE BEAM)(950 mm POST SPACING) _____ DOLLARS _____ CENTS
704-03	1,383.04	LIN. METER	BLOCKED OUT GUARD RAIL _____ DOLLARS _____ CENTS
704-08-A	228.58	LIN. METER	GUARD RAIL TRANSITIONS (SINGLE THRIE BEAM) _____ DOLLARS _____ CENTS
704-11-A	33	EACH	GUARD RAIL END TREATMENT (FLARED) _____ DOLLARS _____ CENTS
705-01	5,952	LIN. METER	BARBED WIRE FENCE _____ DOLLARS _____ CENTS
705-02	2,199	LIN. METER	COMBINATION MESH & BARBED WIRE FENCE _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
705-04	10	EACH	SINGLE SWINGING DRIVEWAY GATES _____ DOLLARS _____ CENTS
705-05	1	DOUBLE GATE	DOUBLE SWINGING DRIVEWAY GATES _____ DOLLARS _____ CENTS
705-06-A	94	LIN. METER	CHAIN LINK FENCE (1200 mm HEIGHT) _____ DOLLARS _____ CENTS
705-07-A	1	EACH	4.0-METER SINGLE GATES FOR CHAIN LINK FENCE (1200mm HEIGHT) _____ DOLLARS _____ CENTS
705-08-A	1	DOUBLE GATE	4.0-METER DOUBLE GATES FOR CHAIN LINK FENCE (1200mm HEIGHT) _____ DOLLARS _____ CENTS
706-02-C	1,145.6	SQ. METER	CONCRETE DRIVE (150 mm THICK) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
706-03-A	9,865.0	SQ. METER	INCIDENTAL CONCRETE PAVING (100 mm THICK) _____ DOLLARS _____ CENTS
706-03-C	499.0	SQ. METER	INCIDENTAL CONCRETE PAVING (150 mm THICK) _____ DOLLARS _____ CENTS
708-01	187	EACH	RIGHT-OF-WAY MONUMENT _____ DOLLARS _____ CENTS
708-02	187	EACH	RIGHT-OF-WAY MONUMENT WITNESS POST _____ DOLLARS _____ CENTS
711-01-D	4,256	SQ. METER	RIPRAP (25 kg, 675 mm THICK) _____ DOLLARS _____ CENTS
711-01-H	700	SQ. METER	RIPRAP (455 kg,1200 mm THICK) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
711-04	8,426	SQ. METER	GEOTEXTILE FABRIC _____ DOLLARS _____ CENTS
712-01-A	3,500	SQ. METER	CONCRETE CAST-IN-PLACE REVETMENT (100 mm THICK) _____ DOLLARS _____ CENTS
713-01	LUMP	LUMP SUM	TEMPORARY SIGNS & BARRICADES _____ DOLLARS _____ CENTS
713-03-A	20,820	LIN. METER	TEMPORARY PAVEMENT MARKINGS (100 mm WIDTH) _____ DOLLARS _____ CENTS
716-01-A	16.2	HECTARE	MULCH (VEGETATIVE) _____ DOLLARS _____ CENTS
720-01-A	127,929	SQ. METER	EROSION CONTROL SYSTEM, SLOPE PROTECTION (TYPE A) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
720-01-C	6,170	SQ. METER	EROSION CONTROL SYSTEM, FLEXIBLE CHANNEL LINER (TYPE C) _____ DOLLARS _____ CENTS
720-01-D	3,627	SQ. METER	EROSION CONTROL SYSTEM, FLEXIBLE CHANNEL LINER (TYPE D) _____ DOLLARS _____ CENTS
720-01-E	150	SQ. METER	EROSION CONTROL SYSTEM, FLEXIBLE CHANNEL LINER (TYPE E) _____ DOLLARS _____ CENTS
722-02	2	EACH	PROJECT SITE LABORATORY (EQUIPPED) _____ DOLLARS _____ CENTS
724-01-B	825	SQ. METER	PAVEMENT PATCHING (300 mm MINIMUM THICKNESS) _____ DOLLARS _____ CENTS
725-01	885.8	LIN. METER	TEMPORARY DETOUR ROADS _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
726-01	454.3	CU. METER	BEDDING MATERIAL _____ DOLLARS _____ CENTS
727-01	LUMP	LUMP SUM	MOBILIZATION _____ DOLLARS _____ CENTS
729-01-A	1.16	SQ. METER	SIGN (TYPE A)(R1-1)(0.762 m x 0.762 m) _____ DOLLARS _____ CENTS
729-16-C	30	EACH	OBJECT MARKER ASSEMBLY (TYPE 3) _____ DOLLARS _____ CENTS
729-21	2	EACH	U-CHANNEL POST (12-FOOT) _____ DOLLARS _____ CENTS
731-01	3,277	EACH	NONREFLECTORIZED RAISED PAVEMENT MARKERS _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
731-02	4,075	EACH	REFLECTORIZED RAISED PAVEMENT MARKERS _____ DOLLARS _____ CENTS
732-02-A	58.438	KILOMETER	PLASTIC PAVEMENT STRIPING (SOLID LINE)(100 mm WIDTH) _____ DOLLARS _____ CENTS
732-02-C	0.491	KILOMETER	PLASTIC PAVEMENT STRIPING (SOLID LINE)(200 mm WIDTH) _____ DOLLARS _____ CENTS
732-04-A	13	EACH	PLASTIC PAVEMENT LEGENDS & SYMBOLS (ARROW) _____ DOLLARS _____ CENTS
732-04-C	13	EACH	PLASTIC PAVEMENT LEGENDS & SYMBOLS (ONLY) _____ DOLLARS _____ CENTS
732-05	9.077	KILOMETER	REMOVAL OF EXISTING MARKINGS _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
735-01	46	EACH	MAILBOXES _____ DOLLARS _____ CENTS
735-02	46	EACH	MAILBOX SUPPORTS (SINGLE) _____ DOLLARS _____ CENTS
736-01	10	LIN. METER	TRENCHING AND BACKFILLING _____ DOLLARS _____ CENTS
736-04-B	4	EACH	SIGNAL SUPPORT (9.1 m STRAIN POLE) _____ DOLLARS _____ CENTS
736-05-B	4	EACH	SIGNAL HEAD (1-SECTION Y)(LED) _____ DOLLARS _____ CENTS
736-05-C	4	EACH	SIGNAL HEAD (1-SECTION R)(LED) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
736-06-A	1	EACH	SIGNAL SERVICE (POLE MOUNTED FOR FLASHER SWITCH ASSEMBLY) _____ DOLLARS _____ CENTS
736-11-A	10	LIN. METER	CONDUIT (76.2 mm SCH. 80) _____ DOLLARS _____ CENTS
736-12-A	10	LIN. METER	CONDUCTOR, 3C (POWER) _____ DOLLARS _____ CENTS
739-01	89.6	HECTARE	HYDRO-SEEDING _____ DOLLARS _____ CENTS
740-01	LUMP	LUMP SUM	CONSTRUCTION LAYOUT _____ DOLLARS _____ CENTS
740-02	LUMP	LUMP SUM	UTILITY OVERSIGHT AND COORDINATION _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
744-01	LUMP	LUMP SUM	TRAFFIC CONTROL MANAGEMENT _____ DOLLARS _____ CENTS
804-01-B	368.0	LIN. METER	PRECAST CONCRETE PILES (350 mm) _____ DOLLARS _____ CENTS
804-01-C	2,264.0	LIN. METER	PRECAST CONCRETE PILES (400 mm) _____ DOLLARS _____ CENTS
804-01-D	660.0	LIN. METER	PRECAST CONCRETE PILES (450 mm) _____ DOLLARS _____ CENTS
804-01-F	4,213.2	LIN. METER	PRECAST CONCRETE PILES (600 mm) _____ DOLLARS _____ CENTS
804-01-H	624.0	LIN. METER	PRECAST CONCRETE PILES (900 mm) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
804-05	7	EACH	PRECAST CONCRETE TEST PILES _____ DOLLARS _____ CENTS
804-09	7	EACH	LOADING TEST PILES _____ DOLLARS _____ CENTS
804-10	7	EACH	RELOADING TEST PILES _____ DOLLARS _____ CENTS
804-11	7	EACH	REDRIVING TEST PILES _____ DOLLARS _____ CENTS
804-12	7	EACH	LOADING PERMANENT PILES _____ DOLLARS _____ CENTS
804-17	7	EACH	DYNAMIC MONITORING _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
805-01-B	588.94	CU. METER	CLASS A CONCRETE (BOX CULVERT HEADWALLS) _____ DOLLARS _____ CENTS
805-01-F	1,115.95	CU. METER	CLASS A CONCRETE (BENTS) _____ DOLLARS _____ CENTS
805-03	3,759.36	CU. METER	CLASS AA CONCRETE _____ DOLLARS _____ CENTS
805-08-C	4,366.75	LIN. METER	PRECAST-PRESTRESSED CONCRETE GIRDERS (TYPE III) _____ DOLLARS _____ CENTS
805-08-D	1,399.42	LIN. METER	PRECAST-PRESTRESSED CONCRETE GIRDERS (TYPE IV) _____ DOLLARS _____ CENTS
805-11	216.00	LIN. METER	STRIP SEAL JOINTS _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
805-12-E	91.97	LIN. METER	REINFORCED CONCRETE BOX CULVERTS (1200 mm x 1200 mm) _____ DOLLARS _____ CENTS
805-12-F	85.00	LIN. METER	REINFORCED CONCRETE BOX CULVERTS (1500 mm x 1200 mm) _____ DOLLARS _____ CENTS
805-12-I	158.00	LIN. METER	REINFORCED CONCRETE BOX CULVERTS (1500 mm x 1500 mm) _____ DOLLARS _____ CENTS
805-12-J	67.00	LIN. METER	REINFORCED CONCRETE BOX CULVERTS (1800 mm x 1500 mm) _____ DOLLARS _____ CENTS
805-12-L	31.40	LIN. METER	REINFORCED CONCRETE BOX CULVERTS (2400 mm x 1500 mm) _____ DOLLARS _____ CENTS
805-12-M	60.30	LIN. METER	REINFORCED CONCRETE BOX CULVERTS (1800 mm x 1800 mm) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
805-12-O	41.00	LIN. METER	REINFORCED CONCRETE BOX CULVERTS (2400 mm x 1800 mm) _____ DOLLARS _____ CENTS
805-12-S	110.00	LIN. METER	REINFORCED CONCRETE BOX CULVERTS (2400 mm x 2400 mm) _____ DOLLARS _____ CENTS
806-01	603,795	KILOGRAM	DEFORMED REINFORCING STEEL _____ DOLLARS _____ CENTS
807-06	LUMP	LUMP SUM	STRUCTURAL METALWORK _____ DOLLARS _____ CENTS
810-01	2,487.94	LIN. METER	CONCRETE RAILING (BARRIER) _____ DOLLARS _____ CENTS
813-01	1,742.40	SQ. METER	CONCRETE APPROACH SLABS _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
814-04	9	EACH	CROSSHOLE SONIC LOGGING (1650 mm) _____ DOLLARS _____ CENTS
S-001	24.2	KILOMETER	RUMBLE STRIPS (GROUND-IN) _____ DOLLARS _____ CENTS
S-002	LUMP	LUMP SUM	REMOVAL OF 015-04-0038 TRANSITION ROAD (STA. 110+600.000 TO STA. 111+125.880) _____ DOLLARS _____ CENTS
S-003	LUMP	LUMP SUM	REMOVAL OF 015-04-0035 TRANSITION ROAD (STA. 40+727.600 TO STA. 41+260.000) _____ DOLLARS _____ CENTS
S-004	1	EACH	FLASHER SWITCH (FLASHER ASSEMBLY, 2 CIRCUIT, POLE MOUNTED CABINET) _____ DOLLARS _____ CENTS
S-005	LUMP	LUMP SUM	SPECIAL PRECAUTIONS REGARDING WATER SUPPLY _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

GENERAL ITEMS

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
S-101	LUMP	LUMP SUM	RETROREFLECTIVE SHEETING PANELS _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

PAVEMENT ALTERNATES

ALTERNATE A1 ITEMS SUPERPAVE ASPHALTIC CONCRETE PAVEMENT

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
302-02-A-01	59,884.0	SQ. METER	CLASS II BASE COURSE (150 mm THICK) (STONE OR RECYCLED PCCP) _____ DOLLARS _____ CENTS
302-02-C-01	123,928.3	SQ. METER	CLASS II BASE COURSE (250 mm THICK) (STONE OR RECYCLED PCCP) _____ DOLLARS _____ CENTS
502-01	48,410.8	MEGAGRAM	SUPERPAVE ASPHALTIC CONCRETE _____ DOLLARS _____ CENTS
502-01-A	6,057.1	MEGAGRAM	SUPERPAVE ASPHALTIC CONCRETE DRIVES, TURNOUTS AND MISCELLANEOUS _____ DOLLARS _____ CENTS
732-03-A	25.051	KILOMETER	PLASTIC PAVEMENT STRIPING (BROKEN LINE) (100 mm WIDTH) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

PAVEMENT ALTERNATES

ALTERNATE A2 ITEMS PORTLAND CEMENT CONCRETE PAVEMENT

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
302-02-A-01	59,884.0	SQ. METER	CLASS II BASE COURSE (150 mm THICK)(STONE OR RECYCLED PCCP) _____ DOLLARS _____ CENTS
302-02-C-01	123,928.3	SQ. METER	CLASS II BASE COURSE (250 mm THICK)(STONE OR RECYCLED PCCP) _____ DOLLARS _____ CENTS
502-01	13,450.8	MEGAGRAM	SUPERPAVE ASPHALTIC CONCRETE _____ DOLLARS _____ CENTS
601-01-G	92,519.3	SQ. METER	PORTLAND CEMENT CONCRETE PAVEMENT (200 mm THICK) _____ DOLLARS _____ CENTS
601-02-G	22,398.7	SQ. METER	PORTLAND CEMENT CONCRETE PAVEMENT (200 mm THICK)(CROSSOVERS & TURNOUTS) _____ DOLLARS _____ CENTS
601-04	143	EACH	PORTLAND CEMENT CONCRETE PAVEMENT CORING _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

PAVEMENT ALTERNATES

ALTERNATE A2 ITEMS PORTLAND CEMENT CONCRETE PAVEMENT

ITEM NUMBER	APPROXIMATE QUANTITY	UNIT OF MEASURE	PAY ITEM UNIT PRICE (IN WORDS, INK OR TYPED)
732-03-A-01	25.051	KILOMETER	PLASTIC PVMT STRIPING(BROKEN LINE)(100mmWIDTH)PREFORMED MARKING TAPE (TYPE V) _____ DOLLARS _____ CENTS

FOR INFORMATION ONLY

CONSTRUCTION PROPOSAL SIGNATURE AND EXECUTION FORM

THIS FORM, THE SCHEDULE OF ITEMS, AND THE PROPOSAL GUARANTY MUST BE COMPLETED AS INDICATED AND SUBMITTED TO THE LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT (DOTD) TO CONSTITUTE A VALID BID

STATE PROJECT NOS. **015-04-0039, 015-05-0034 AND 022-04-0036**

FEDERAL AID PROJECT NO(S). **N/A**

NAME OF PROJECT **GEORGETOWN - TULLOS**

I (WE) HEREBY CERTIFY THAT I (WE) HAVE CAREFULLY EXAMINED THE PROPOSAL, PLANS AND SPECIFICATIONS, INCLUDING ANY AND ALL ADDENDA, AND THE SITE OF THE ABOVE PROJECT AND AM (ARE) FULLY COGNIZANT OF ALL PROPOSAL DOCUMENTS, THE MASTER COPY OF WHICH IS ON FILE AT DOTD HEADQUARTERS IN BATON ROUGE, LA., AND ALL WORK, MATERIALS AND LABOR REQUIRED THEREIN, AND AGREE TO PERFORM ALL WORK, AND SUPPLY ALL NECESSARY MATERIALS AND LABOR REQUIRED FOR SUCCESSFUL AND TIMELY COMPLETION OF THE ABOVE PROJECT AND TO ACCEPT THE SUMMATION OF THE PRODUCTS OF THE UNIT PRICES BID ON THE SCHEDULE OF ITEMS ATTACHED HERETO AND MADE A PART HEREOF MULTIPLIED BY THE ACTUAL QUANTITY OF UNIT OF MEASURE PERFORMED FOR EACH ITEM, AS AUDITED BY DOTD, AS FULL AND FINAL PAYMENT FOR ALL WORK, LABOR AND MATERIALS NECESSARY TO COMPLETE THE ABOVE PROJECT, SUBJECT TO INCREASE ONLY FOR PLAN CHANGES (CHANGE ORDERS) APPROVED BY THE DOTD CHIEF ENGINEER OR HIS DESIGNEE. THIS BID IS SUBMITTED IN ACCORDANCE WITH THE GENERAL BIDDING REQUIREMENTS IN THE CONSTRUCTION PROPOSAL AND ALL SPECIAL PROVISIONS, PLANS, SUPPLEMENTAL SPECIFICATIONS, AND THE LOUISIANA STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES (2000 EDITION). I (WE) UNDERSTAND THAT THE SUMMATION OF THE PRODUCTS OF THE UNIT PRICES BID ON THE SCHEDULE OF ITEMS MULTIPLIED BY THE ESTIMATED QUANTITY OF UNIT OF MEASURE FOR EACH ITEM, ALONG WITH ANY OTHER FACTORS SPECIFIED TO BE APPLICABLE SUCH AS CONSTRUCTION TIME AND/OR LANE RENTAL, SHALL BE THE BASIS FOR THE COMPARISON OF BIDS. I (WE) UNDERSTAND THAT THE SCHEDULE OF ITEMS MUST CONTAIN UNIT PRICES WRITTEN OUT IN WORDS AND THAT THE SCHEDULE OF ITEMS SUBMITTED AS PART OF THIS BID IS ON THE FORM SUPPLIED BY DOTD IN THE BID PROPOSAL. MY (OUR) PROPOSAL GUARANTY IN THE AMOUNT SPECIFIED FOR THE PROJECT IS ATTACHED HERETO AS EVIDENCE OF MY (OUR) GOOD FAITH TO BE FORFEITED IF THIS BID IS ACCEPTED BY DOTD AND I (WE) FAIL TO COMPLY WITH ANY REQUIREMENT NECESSARY FOR AWARD AND EXECUTION OF THE CONTRACT, AS WELL AS, SIGN AND DELIVER THE CONTRACT AND PAYMENT/PERFORMANCE/RETAINAGE BOND AS REQUIRED IN THE SPECIFICATIONS.

NONCOLLUSION DECLARATION (APPLICABLE TO FEDERAL-AID PROJECTS)

I (WE) DECLARE UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE UNITED STATES AND THE STATE OF LOUISIANA THAT I (WE) HAVE NOT DIRECTLY OR INDIRECTLY, ENTERED INTO ANY AGREEMENT, PARTICIPATED IN ANY COLLUSION, OR OTHERWISE TAKEN ANY ACTION IN RESTRAINT OF FREE COMPETITIVE BIDDING IN CONNECTION WITH THE CONTRACT FOR THIS PROJECT NOR VIOLATED LA. R.S. 48:254.

BIDDER'S DBE GOAL STATEMENT (APPLICABLE TO DBE GOAL PROJECTS)

IF THIS PROJECT IS DESIGNATED BY SPECIAL PROVISION AS A DISADVANTAGED BUSINESS ENTERPRISE (DBE) GOAL PROJECT IN ACCORDANCE WITH THE DBE PROVISIONS OF THIS CONTRACT, THE BIDDER ASSURES DOTD THAT HE/SHE WILL MEET OR EXCEED THE DBE CONTRACT GOAL, OR IF THE BIDDER CANNOT MEET THE REQUIRED DBE GOAL, THE BIDDER ASSURES DOTD THAT HE/SHE HAS MADE AND CAN DOCUMENT GOOD FAITH EFFORTS MADE TOWARDS MEETING THE GOAL REQUIREMENT IN ACCORDANCE WITH THE CONTRACT AND DBE PROGRAM MANUAL INCORPORATED HEREIN BY REFERENCE.

THE APPARENT LOW BIDDER SHALL COMPLETE AND SUBMIT TO THE DOTD COMPLIANCE PROGRAMS OFFICE, FORM CS-6AAA AND ATTACHMENT(S) AND, IF NECESSARY, DOCUMENTATION OF GOOD FAITH EFFORTS MADE BY THE BIDDER TOWARD MEETING THE GOAL, WITHIN TEN BUSINESS DAYS AFTER THE OPENING OF BIDS FOR THIS PROJECT. RESPONSIVENESS OF INFORMATION SUPPLIED IN THIS SECTION OF THIS CONSTRUCTION PROPOSAL SIGNATURE AND EXECUTION FORM IS GOVERNED BY THE DBE REQUIREMENTS INCLUDED WITHIN THE SPECIFICATIONS AND DBE PROGRAM MANUAL.

CERTIFICATION OF EMPLOYMENT OF LOUISIANA RESIDENTS TRANSPORTATION INFRASTRUCTURE MODEL FOR ECONOMIC DEVELOPMENT (TIME) PROJECTS (APPLICABLE TO TIME PROJECTS)

IF THIS PROJECT IS DESIGNATED BY SPECIAL PROVISION AS A TRANSPORTATION INFRASTRUCTURE MODEL FOR ECONOMIC DEVELOPMENT (TIME) PROJECT AS DEFINED IN ACT NO. 16 OF THE 1989 FIRST EXTRAORDINARY SESSION OF THE LEGISLATURE WHICH ENACTED PART V OF CHAPTER 7 OF SUBTITLE II OF TITLE 47 OF THE LOUISIANA REVISED STATUTES OF 1950, COMPRISED OF R.S. 47:820.1 THROUGH 820.6.

THE BIDDER CERTIFIES THAT AT LEAST 80 PERCENT OF THE EMPLOYEES EMPLOYED ON THIS TIME PROJECT WILL BE LOUISIANA RESIDENTS IN ACCORDANCE WITH LOUISIANA R.S. 47:820.3.

NON PARTICIPATION IN PAYMENT ADJUSTMENT (ASPHALT CEMENT AND FUELS) STATEMENT

IF THIS PROJECT IS DESIGNATED BY SPECIAL PROVISION AS BEING SUBJECT TO PAYMENT ADJUSTMENT FOR ASPHALT CEMENT AND/OR FUELS, THE BIDDER HAS THE OPTION OF REQUESTING EXCLUSION FROM SAID PAYMENT ADJUSTMENT PROVISIONS THAT ARE ESTABLISHED BY SPECIAL PROVISION ELSEWHERE HEREIN.

IF THE BIDDER DESIRES TO BE EXCLUDED FROM THESE PAYMENT ADJUSTMENT PROVISIONS,

THE BIDDER IS REQUIRED TO MARK HERE ☐

FAILURE TO MARK THIS BOX PRIOR TO BID OPENING WILL CONSTITUTE FORFEITURE OF THE BIDDER'S OPTION TO REQUEST EXCLUSION.

CS-14A
04/01

STATE PROJECT NOS. **015-04-0039, 015-05-0034, AND 022-04-0036**

BIDDER SIGNATURE REQUIREMENTS (APPLICABLE TO ALL PROJECTS)

THIS BID FOR THE CAPTIONED PROJECT IS SUBMITTED BY:

Name of Principal (Individual, Firm, Corporation, or Joint Venture)

If Joint Venture, Name of First Partner

(Louisiana Contractor's License Number of Bidder or First Partner to Joint Venture)

(Business Street Address)

(Business Mailing Address, if different)

(Area Code and Telephone Number of Business)

(Telephone Number and Name of Contact Person)

(Telecopier Number, if any)

If Joint Venture, Name of Second Partner

(Louisiana Contractor's License Number of Second Partner to Joint Venture)

(Business Street Address)

(Business Mailing Address, if different)

(Area Code and Telephone Number of Business)

(Telephone Number and Name of Contact Person)

(Telecopier Number, if any)

ACTING ON BEHALF OF THE BIDDER, THIS IS TO ATTEST THAT THE UNDERSIGNED DULY AUTHORIZED REPRESENTATIVE OF THE ABOVE CAPTIONED FIRM, CORPORATION OR BUSINESS, BY SUBMISSION OF THIS BID, AGREES AND CERTIFIES THE TRUTH AND ACCURACY OF ALL PROVISIONS OF THIS PROPOSAL, INCLUSIVE OF THE REQUIREMENTS, STATEMENTS, DECLARATIONS AND CERTIFICATIONS ABOVE AND IN THE SCHEDULE OF ITEMS AND PROPOSAL GUARANTY. EXECUTION AND SIGNATURE OF THIS FORM AND SUBMISSION OF THE SCHEDULE OF ITEMS AND PROPOSAL GUARANTY SHALL CONSTITUTE AN IRREVOCABLE AND LEGALLY BINDING OFFER BY THE BIDDER.

(Signature)

(Printed Name)

(Title)

(Date of Signature)

(Signature)

(Printed Name)

(Title)

(Date of Signature)

CONTRACTOR'S INFORMATIONAL BID

It is agreed that the total bid(s) shown below, determined by the bidder, are for informational purposes only and that the low bidder for this project will be determined in accordance with the special provision entitled **COST-PLUS-TIME-PLUS LIFE CYCLE COST BIDDING PROCEDURE (A+B+C METHOD)**, as determined by the Department.

A_1=Summation of products of the quantities shown in the Schedule of Items (BASE BID plus Superpave Asphaltic Concrete Pavement) (ALTERNATE A1) multiplied by the unit prices.

A_1=

B_1= Bidders proposed contract time for Base Bid and Alternate A1 items multiplied by the Daily User Cost ($3,200).

B_1=

B_1= Calendar Days x $3,200.

C_1=Life Cycle Cost Adjustment Factor for Superpave Asphaltic Concrete Pavement, determined by the Department.

C_1= $1,643,900.

Contractors Total Bid (A_1+B_1+C_1) =

OR

A_2=Summation of products of the quantities shown in the Schedule of Items (BASE BID plus Portland Cement Concrete Pavement) (ALTERNATE A2) multiplied by the unit prices.

A_2=

B_2=Bidders proposed contract time for Base Bid and Alternate A2 items multiplied by the Daily User Cost ($3,200).

B_2 =

B_2= Calendar Days x $3,200.

C_2=Life Cycle Cost Adjustment Factor for Portland Cement Concrete Pavement, determined by the Department.

C_2= $688,300.

Contractor's Total Bid (A_2 + B_2+ C_2) =