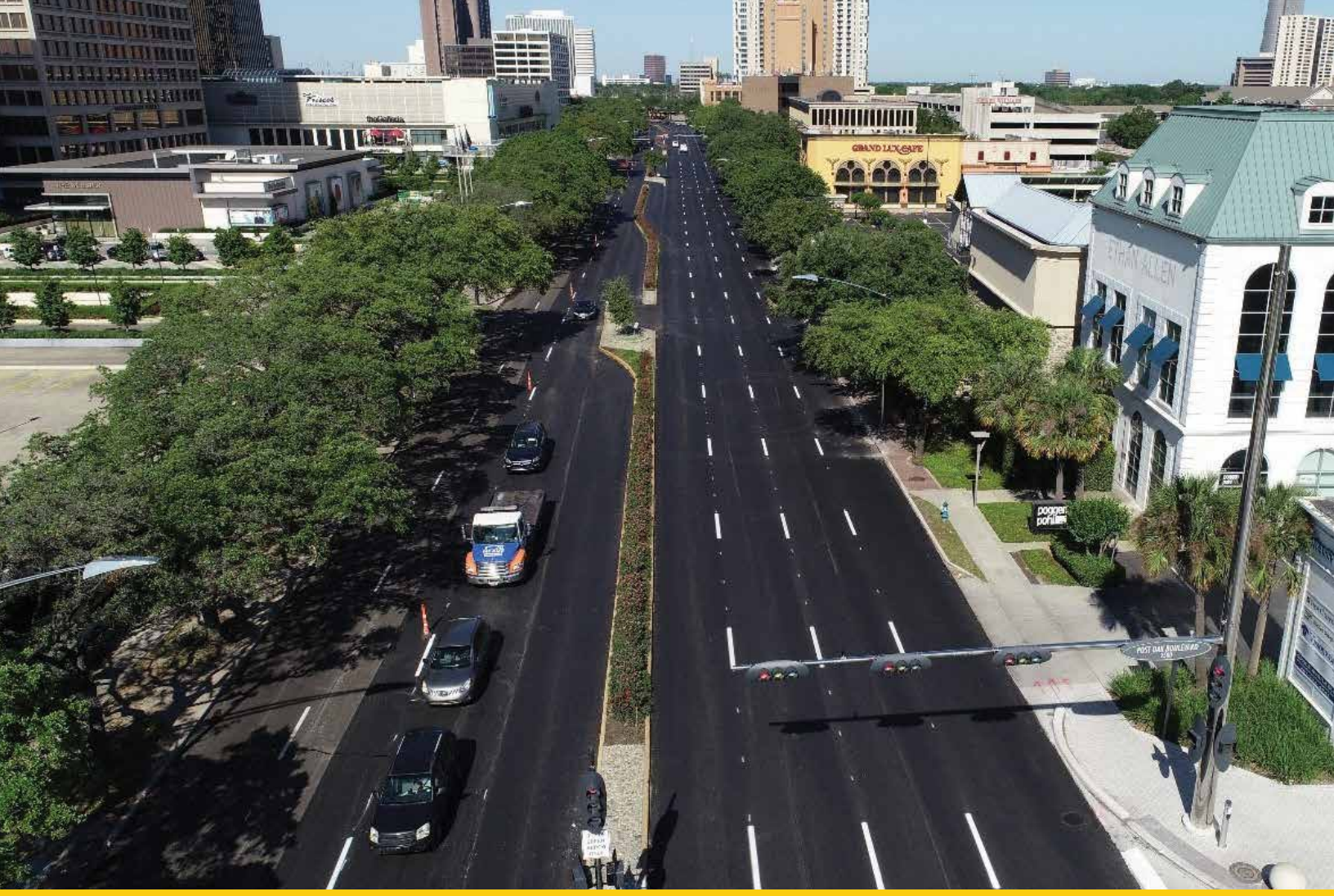
TXAPA
Texas Asphalt Pavement Association

2024
ASPHALT PAVEMENT DESIGN AND CONSTRUCTION GUIDE

CONTENTS

TXAPA



WHY ASPHALT

Asphalt pavements are well-known for their durability, versatility, and cost-effectiveness. From city streets to county roads, parking lots, small airport runways, bike paths, and so much more, Asphalt is the preferred choice for municipal paving projects.

1

DRIVABILITY, SMOOTHNESS, AND SAFETY FEATURES

Asphalt pavements provide superior drivability, smoothness, and safety features, enhancing the driver experience and reducing accident risks:

- **Smooth Riding Surface:** Asphalt pavements offer exceptional smoothness and ride quality, enhancing vehicle control and reducing driver fatigue. The uniform surface reduces tire wear and improves fuel efficiency, improving overall transportation efficiency and driver satisfaction.
- **Skid Resistance:** Asphalt pavements can be engineered with specialized mix designs and surface treatments to enhance skid resistance and traction, reducing the likelihood of accidents, especially in wet or slippery conditions. Asphalt's dark color provides better contrast and visibility, improving road markings and signage effectiveness for enhanced safety.

EASY TO MAINTAIN, REPAIR, AND ADD UTILITIES

Asphalt pavements are designed for ease of maintenance, repair, and utility installations, ensuring long-term functionality and cost savings:

- **Routine Maintenance:** Asphalt pavements require minimal routine maintenance, typically limited to periodic inspections, crack sealing, and surface treatments. These maintenance activities are relatively simple and cost-effective, extending the pavement's lifespan and preserving its performance.
- **Efficient Repairs:** Repairs to Asphalt pavement damage or deterioration can be performed simply and quickly using cost-effective methods such as patching, milling, and overlays. These repair techniques minimize disruptions to traffic flow and extend the pavement's service life.
- **Utility Accessibility:** Asphalt pavements offer flexibility for adding or upgrading utilities beneath the surface, thanks to their relatively shallow construction depth and ease of excavation. They also provide convenient access to underground cables, pipes, or conduits for utility maintenance and upgrades, reducing the risk of service interruptions and associated costs.

SPEED AND EASE OF CONSTRUCTION

Asphalt pavements are renowned for speed of construction and ease of installation, offering several advantages:

- **Rapid Construction:** Asphalt pavements can be constructed and opened to traffic much faster than alternatives. The shorter construction durations minimize traffic disruptions, reduce construction-related inconveniences, and accelerate project completion, resulting in significant time and cost savings.
- **Minimal Curing Time:** Asphalt pavements do not require extended curing periods before opening to traffic. Once compacted and cooled, asphalt surfaces can accommodate vehicular loads immediately, allowing for seamless, uninterrupted traffic flow.
- **Stage Construction:** The method of laying asphalt in stages, typically starting with a base layer, followed by intermediate layers, and finishing with a wearing course allows for better compaction, durability, and smoothness of the road surface. Benefits to communities include improved road longevity, reduced maintenance costs, and enhanced driving comfort, ultimately promoting safer and more efficient transportation networks.

SUSTAINABILITY

Asphalt pavements can play a vital role in achieving sustainability goals:

- **Recyclability:** Asphalt pavements are highly recyclable, utilizing reclaimed asphalt pavement (RAP) as a raw material source in new mixes. This conserves natural resources, reduces waste sent to landfills, and fosters a sustainable, circular economy.
- **Lower Emissions:** Asphalt production and construction boast significantly lower emissions compared to alternative paving materials. Modern asphalt plants employ advanced technologies to minimize energy consumption and emissions, reducing environmental impact. Warm-mix asphalt technologies further lower energy requirements, curbing greenhouse gas emissions and air pollutants.
- **Stormwater Management:** Asphalt pavements aid stormwater management by allowing water infiltration, reducing runoff, and preventing flooding. Permeable designs facilitate ground infiltration, while open-graded friction course designs minimize runoff and replenish groundwater, improving stormwater management.

VALUE

Asphalt pavements offer significant economic advantages, making them a preferred choice for infrastructure projects:

- **Cost-Effectiveness:** Asphalt pavements typically have lower initial costs than alternative materials. The shorter construction timelines and ease of installation contribute to overall savings. Asphalt's smooth surface reduces vehicle wear and tear, leading to lower maintenance costs and fuel consumption over the pavement's lifespan.
- **Competitive Pricing:** The asphalt pavement industry's competitive landscape drives innovation, quality improvements, and cost efficiencies, ultimately benefiting project owners and taxpayers. Whether selecting the best mix design or negotiating favorable pricing, project stakeholders have ample opportunities to optimize value and achieve their goals within budget.

BID DEVELOPMENT AND PROCESS

As an owner, you want assurance that you get the desired outcome when seeking bids for asphalt pavement, parking lot, maintenance treatment, etc. This can easily be accomplished by putting together a comprehensive bid package. This document is intended to provide guidance to develop a bidding process and specification for the owner.

2

There are 5 key components to every bid package. They are as follows:

- Well Defined Scope of Work
- Current Specifications
- Accurate Plans
- Established Budget
- Itemized Proposal

1. WELL DEFINED SCOPE OF WORK

When seeking bids for a project, a well-defined scope of work in the bid advertisement will attract multiple bidders/contractors to supply a bid for the project.

Take for example the project scopes:

The Scope of Work includes an asphalt mill and overlay.

vs

The Scope of Work includes cold milling 64,234 S.Y. of asphalt pavement and placing 10,280 tons of Dense Graded C Mix at a compacted depth of 2 inches on Main Street.

The latter example is much more appealing for a contractor to look at as they can quickly determine if they are suited to build this scope of work.

2. CURRENT SPECIFICATIONS

The use of a current and uniform specification is extremely important for several reasons. Asphalt is an engineered product with technology and design parameters constantly evolving. As technology evolves, design parameters mix designations change. Therefore, using the most current specification is critical when specifying a pavement. It is also important to utilize local specifications and products to assure product availability. As such, it is recommended to utilize the currently version of the TXAPA Spec for Municipalities (341M).

3. ACCURATE PLANS

Accurate and detailed plans help to assure the owner that they will get what is specified and reduce risk not only for the owner but also for the bidder. Reduced risk equals better pricing. Consider the following detail on a set of plans:

2 inches asphalt mix vs 2 inches of compacted Dense Graded C Mix (341M)

Again, the more accurate and detailed the plans, the less room there is for interpretation by the bidder, which leads to less risk and accurate pricing.

4. ESTABLISHED BUDGET

As an owner it is important to know your budget and the scope of the project that you can afford to build. This can easily be achieved by estimating a project as the plans and specifications are developed. Working with local contractors can help you understand anticipated project costs.

5. ITEMIZED PROPOSAL

An itemized proposal is very similar to an accurate set of plans. It helps the bidder understand exactly what the owner is wanting. Items of work should be broken out and specified in correct units. When items are lumped together, it increases risk on the part of the bidder. Also, during construction, it is much easier to administer a contract especially when changes in work happen in the field due to differing site conditions. The following is an example of an itemized bid proposal:

EXAMPLE BID PROPOSAL/FORM

Description	UM	Units	Price	Total
Mobilization/Demobilization	LS	0	$0.00	$0.00
Maintenance of Traffic (Barricades)	MO	0	$0.00	$0.00
Milling - Mainline	SY	0	$0.00	$0.00
Milling - Approaches	SY	0	$0.00	$0.00
Tack	GAL	0	$0.00	$0.00
Dense Graded Asphalt Mix	TON	0	$0.00	$0.00

DESIGNING ASPHALT PAVEMENTS

3

ASPHALT PAVEMENT DESIGN SIMPLIFIED

Design of the pavement structure should be performed by a knowledgeable pavement engineer or through the assistance of pavement design software such as PAVEXpress®, a free web-based tool available to local agencies, engineers and architects to quickly determine the necessary pavement thickness for a roadway. A free instruction program, PAVEInstruct® is also available.

PAVEMENT EVALUATION

Pavement maintenance and rehabilitation begins with evaluation of the road's condition. Matching the type of treatment to the roadway usage and condition are key to determining the most economically feasible solution. Evaluation includes consideration of geometry, surface condition and structural adequacy for current and future use, including:

- The geometry of the roadway will take into consideration the profile, crown, cross-slope and drainage.
- Profile correction may need to be implemented for excessive roughness, dips, or bumps in the existing surface.
- Occasionally the crown of the roadway may need to be reestablished if the roadway has become a trough or the crown is excessive.
- Cold milling or leveling may need to be employed prior to the treatment to maintain curb reveals, match gutter lines, correct rutting or otherwise maintain a drainable cross-slope.
- Maintaining drainage of the pavement is one of the most important aspects of producing a long-lasting pavement. Ensure that the pavement and subgrade can drain to pavement drainage features. (Ditch line, inlet, etc.)

Surface Condition Provides Clues

Surface condition is not only an indicator of existing surface but provides clues as to the adequacy of underlying materials that may need addressing. A visual rating guide such as the Distress Identification Manual (https://highways.dot.gov/media/4421) may be used. This can be followed up by coring and other forensic methods to determine the full extent of pavement deterioration.

SCOPE OF WORK

The scope of work should be clearly defined in the contract documents and plans.

Scope of Work Punch List

- a description of the work to be performed,
- terminal points and special conditions or instructions to the contractor.
- Transition into abutting side roads and terminal points with cold milled butt joints.
- The geometry of the roadway will take into consideration the profile, crown, cross-slope and drainage.
- Where shoulders do not exist, gutter line milling should taper to the center of the roadway or edge of shoulder to avoid thin areas at the center of the mat that are susceptible to low density and cracking.
- Use spot patching for areas of high distress. This may be either partial or full depth repairs.

Methods and materials not covered by the specifications.

Methods and materials not covered by the specifications should be contained in special provisions (SP) that detail the work. Use caution with SPs that specify proprietary products and methods or a single source as they may limit competitive bidding or have unexpected costs associated with them.

Utilities

Utilities can affect the final look and ride of a project. Time the project to be constructed after any planned utility work on the roadway is completed. Coordinate with the utility companies to avoid open cuts of the new project and allow time for trenches and pits to settle. When the surface is to be milled, consider lowering utility covers and appurtenances prior to the work, and adjust to the finished surface after paving is completed. Utility adjustments to be completed by the contractor should be described in an SP and paid as a separate item from the paving.

Tack Coat Application

Aggregate base to be paved over should have a prime coat applied. All existing surfaces to be overlayed should be tacked as shown in the table below:

Tack Coat Application Rates	
Surface Type	**Minimum Target Rate: Undiluted (gal/yd2)**
New Asphalt	0.05
Existing or Concrete	0.08
Milled	0.10

To control tracking of tack onto adjacent streets or other unwanted locations, less-tracking tack may be specified.

MIX TYPES

4

MIX TYPE SELECTION

TXAPA Recommends the use of 341M. This specification meets the TxDOT Item 341 Material Specification without all the additional administrative and testing requirements.

- Superpave mixtures meeting TxDOT Item 344 may be used in lieu of 341M.
- For Arterial Streets, the binder grades are recommended minimums and are not to be reduced. The binder grade may be bumped to a PG 70-22 or PG 76-22, when deemed necessary, to accommodate actual or anticipated traffic conditions.
- Typically, the grade should be bumped one increment when traffic speeds are expected to be in the range of 12 to 45 mph and bumped two increments for extremely slow traffic of < 12 mph. Typical candidates for these grade bumps are roadways with AADT greater than 3500 that are in a highly congested, urbanized area, have frequent stop and go traffic, or have steep grades with significantly slow traffic speeds.
- If the surface thickness is less than 2 inches and requires a higher-grade PG asphalt binder, it should be used in both the surface mixture and the first layer of the underlying mixture.
- Surface Leveling may be a cost-effective strategy to hold the roadway until more adequate funding is available.
- Alternate mix types such as PFC, SMA, TOM mixes, etc. may be considered in response to various roadway design objectives like improved skid, noise reduction, rut resistance, or enhancing the roadway to withstand heavy truck traffic. Please reach out to TXAPA for further guidance.

Recommended Mix Types

Mix Type	Description
Dense Graded Hot Mix Asphalt (341M)	Dense-graded mixture that serves as the workhorse mix for the bulk of municipal applications. Designed with Superpave Gyratory Compactor.
Superpave Mixtures	The Superpave Dense-graded mixture shares similarities with the 341M specification but offers enhanced resistance to rutting and cracking to effectively handle heavier traffic loads and higher traffic volumes. Designed with Superpave Gyratory Compactor.
Permeable Friction Course	Open-graded mixture used to provide friction, reduce noise and splash and spray. Typically applied in relatively thin lifts. Designed with Superpave Gyratory Compactor.

Alternate Mix Types

Mix Type	Description
Stone Matrix Asphalt	Gap-graded mixture with high asphalt binder content, improved durability, and friction. Designed with Superpave Gyratory Compactor.
Thin Overlay Mixtures	A dense-graded mixture, composed of small maximum size aggregate and typically applied in lifts of 1 inch or less, designed to improve skid resistance and reduce accidents in wet weather conditions. It's also useful for maintenance tasks. Can be designed using either the Texas Gyratory Compactor or Superpave Gyratory Compactor.
Thin Bonded Friction Courses	Open-graded mixture immediately placed over a spray applied polymer modified asphalt emulsion membrane. Designed with Superpave Gyratory Compactor.

TXAPA has developed a special specification 341M for Texas cities and counties. This specification was designed to meet the bulk of municipality needs and allow for statewide adoption of uniform standards and testing. Uniformity saves time and money, and leads to better, longer lasting asphalt pavements.

SAMPLE BIDDING DOCUMENTS AND SPECIFICATIONS

5

TABLE OF CONTENTS

1.0 ADVERTISEMENT FOR BIDS

1.1 The (insert entity seeking procurement) will receive bids for (insert project name), (insert entity), all in accordance with the contract documents and specifications. Bids will be received (insert bid date and time, location of bid opening). Bids will be publicly opened at (insert bid time), at (insert location of bid opening). Bids received after that time will be returned unopened.

1.2 The work will consist of (insert scope of project).

1.3 Contract documents may be examined at (insert project viewing location) or may be purchased at (insert location plans can be purchased).

1.4 A pre-bid meeting will be held at (insert pre-bid meeting date and time, location of pre-bid opening).

1.5 All project questions shall be submitted (insert project contact information) by (insert last date to submit bid question prior to bid opening).

1.6 All project question responses will be posted for review (insert reviewing location) by (insert date for bid question responses prior to bid opening).

2.0 INTRODUCTION AND GENERAL CONDITIONS OF BIDDING

2.1 Inspection of Plans, Specifications, and Site of Work

The bidder is required to carefully examine the site of the proposed work, the proposal, plans, specifications, supplemental specifications, special provisions, and contract forms before submitting a proposal.

2.2 Qualifications of Bidders

The (insert entity) may make such investigations as deemed necessary to determine the ability of the bidder to perform the work and the bidder shall furnish to the (insert entity) all such information and data for this purpose as the (insert entity) may request. The (insert entity) reserves the right to reject any bid if the evidence submitted by the bidder or investigation of such bidder fails to satisfy the (insert entity) that such bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein.

2.3 Bid Security

Each bid must be accompanied by a certified check or bid bond made payable to (insert entity) for five percent (5%) of the amount of the bid. Bid securities will be returned after award of contract except to the successful bidder.

Should the successful bidder or bidders fail or refuse to execute the bond and the contract required within ten (10) days after he has received Notice of Acceptance of his bid, he shall forfeit to the (insert entity) as liquidated damages for such failure or refusal, the security deposited with his bid.

2.4 Preparation of Bids

Bid must be made upon prescribed forms attached at the back of these Specifications. Only sealed bids will be considered, all bids otherwise submitted will be rejected as irregular.

All blank spaces in the bid must be filled in and no change shall be made in the phraseology of the bid or addition to the items mentioned therein. Any conditions, limitations, or provisions attached to bids will render them informal and may be considered cause for their rejection.

2.5 Addendum

Addendums may be issued on this project at any time up to (insert number of days) prior to the bid date and time. Occasionally an addendum may contain information that could affect a contractor's bid. It shall be the responsibility of the contractor to verify if any addendum has been issued prior to submitting their bid. The (insert entity) assumes no liability if a contractor fails to incorporate addenda into their bid.

2.6 Submission of Bids

The Bid and the Bid Security guaranteeing the same shall be placed in a sealed opaque envelope and marked with the project name, project number, and the bidder's name and address.

2.7 Withdrawal of Bids

If a bidder wishes to withdraw his bid, he may do so before the time fixed for the opening, without prejudice to himself.

2.8 Right to Reject Bids

The (insert entity) reserves the right to reject any or all bids, to waive any informality in the bids received, or to accept the bid or bids that in its judgment will be for the best interest of the (insert entity).

2.9 Award of Contract

If within ten (10) days after he has received Notice of Acceptance of his bid, the successful bidder or bidders shall refuse or neglect to come to the office (insert entity) and to execute the Contract and to furnish the required Contractor's Bond, properly signed by the Contractor and the Surety or Sureties satisfactory to the (insert entity) as hereinafter provided, the bidder or bidders shall be deemed to be in default and shall forfeit the deposit.

2.10 Performance Bond

A Performance Bond in an amount equivalent to one hundred percent (100%) of the Contract price, must be furnished and executed by the successful bidder or bidders, this bond to be in the form contained in this Contract.

The Surety shall be a corporate Surety Company or companies of recognized standing licensed to do business in the state of Missouri and acceptable to the (insert entity).

2.11 Insurance

The Contractor shall be required to provide the (insert entity) with a "Certificate of Insurance."

2.12 Prevailing Wage Law

(Insert language about prevailing wage is required)

2.13 Notice to Proceed

The contractor's notice to proceed for each road will be as follows (insert date of notice to proceed)

2.14 Work Schedule

To ensure that the work will proceed continuously through the succeeding operations to its completion with the least possible interference to traffic and inconvenience to the public, the Contractor shall submit for approval a complete schedule of his proposed construction procedure, stating the sequence in which various operations of work are to be performed. The Contractor may not change the work sequence without the prior approval of the Engineer.

2.15 Contract Time

This contract shall be a completion date contract. The contract shall be completed by no later than (insert completion date)

2.16 Liquidated Damages

Liquidated damages shall be assessed at the rate of (insert liquidate damage dollar amount) per calendar day until the project is complete, should the project not be completed within the specified time.

2.17 DBE Participation

(Insert language about DBE participation if required)

3.0 DEFINITIONS

(Insert contract specific designations as needed)

4.0 PRIMARY SPECIFICATIONS

(Insert Link to TXAPA Specifications)

5.0 ITEMIZED PROPOSAL

Item/Spec	Description	Unit	Quantity	Price	Total
341M	Dense Graded Asphalt	TON	5,000	X	5000x

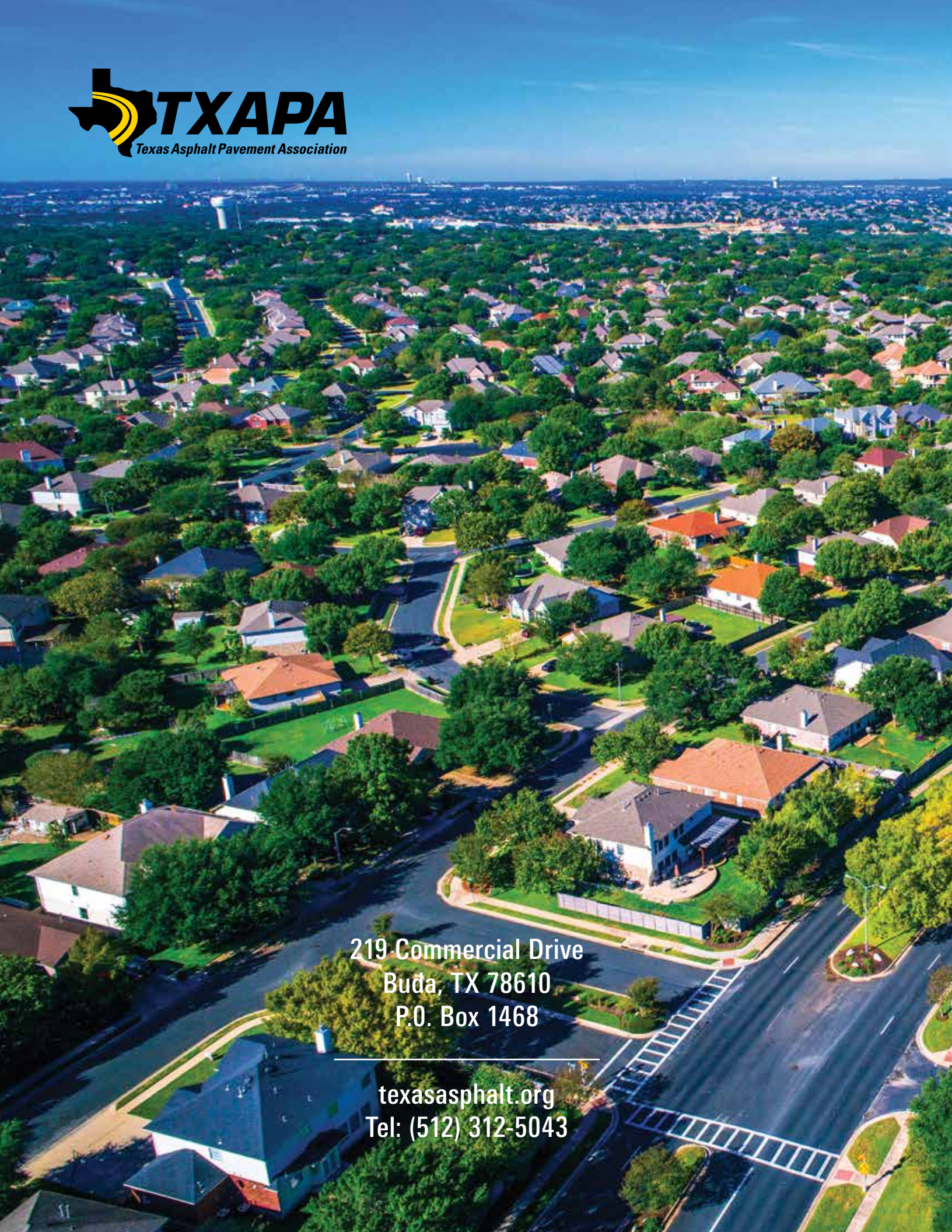
BASE BID

ROADWAY

ITEM NO.	DESCRIPTION	UNIT	QTY
100.1	MOBILIZATION	LS	1
100.2	INSURANCE & BOND	LS	1
101.1	PREPARING RIGHT-OF-WAY	LS	1
110 6001	EXCAVATION (ROADWAY)	CY	26,980
132 6001	EMBANKMENT (FINAL) (ORD COMP) (TY A)	CY	5,509
209.2	REINFORCED CONCRETE BUS PAD	SY	3,376
260 6012	LIME (HYD, COM OR QK) (SLRY) OR QK (DRY)	TON	225
260 6079	LIME TRT (SUBGRADE) (6")	SY	21,345
316 6405	ASPH (AC-20-5TR OR AC-20XP)	GAL	13,506
0316 6431	AGGR (TY-PB GR-4)	CY	450
354 6024	PLANE ASPH CONC PAV (2" TO 4")	SY	18,025
360 6020	CONC PVMT (JOINTED - CPCD) (10")	SY	367
400 6008	CUT & RESTORE ASPH PAVING	SY	1,193
432 6002	RIPRAP (CONC) (5 IN)	CY	183
450 6052	RAIL (HANDRAIL) (TY F)	LF	91
465 6233	INLET (COMP) (TY SIDEWALK BRIDGE)	EA	18
465 6338	INLET (COMP) (ARMOR CURB SLOT)	EA	4
502.3	SIDEWALK DRAIN	EA	1
507.1	CHAIN LINK WIRE FENCE (4' HIGH)	LF	1,557
507.4	GATES-PEDESTRIAN	EA	2
507.5	GATES- VEHICULAR	EA	17
522.1	SIDEWALK PIPE RAILING	LF	86.0
524.1	CONCRETE STEPS (< 10 CY)	CY	1.3
529 6002	CONC CURB (TY II)	LF	6,394
529 6008	CONC CURB & GUTTER (TY II)	LF	21,286
529 6015	CONC CURB (TY C1)	LF	366
529 6016	CONC CURB (TY F1)	LF	128
529 6018	CONC CURB (TY F3)	LF	92
529 6027	CONC CURB (TY C2)	LF	50
530 6004	DRIVEWAYS (CONC)	SY	7,065
531 6001	CONC SIDEWALKS (4")	SY	11,630
531 6003	CONC SIDEWALKS (6")	SY	280
531 6004	CURB RAMPS (TY 1)	EA	12
531 6005	CURB RAMPS (TY 2)	EA	64
531 6006	CURB RAMPS (TY 3)	EA	13
531 6008	CURB RAMPS (TY 5)	EA	6
531 6010	CURB RAMPS (TY 7)	EA	8
531 6013	CURB RAMPS (TY 10)	EA	8
532 6054	CURB RAMPS (Z-CROSSING))	EA	1
536 6002	CONC MEDIAN	SY	85
3076 6006	D-GR HMA TY-B PG70-22	TON	26,278
3076 6040	D-GR HMA TY-D PG70-22	TON	8,539

EXAMPLE BID PROPOSAL/FORM

Description	UM	Units	Price	Total
Mobilization/Demobilization	LS			$0.00
Maintenance Of Traffic(Barricade Maintenance)	MO			$0.00
Milling - Mainlane	SY			$0.00
Milling - Approaches to Structures	SY			$0.00
Tack	GAL			$0.00
341M DG-B - PG 64-22	TON			$0.00
341M DG-C - PG 64-22	TON			$0.00
341M DG-D - PG 64-22	TON			$0.00
341M DG-F - PG 64-22	TON			$0.00
Flexible Base 8"	SY			$0.00
Stabilized Subgrade 6"	SY			$0.00
White Edge Line, Paint 6"	LF			$0.00
Solid Yellow Line, Paint 6"	LF			$0.00
Broken Yellow Line, Paint 6"	LF			$0.00
Pavement Marking Arrows, Paint	EACH			$0.00
Pavement Marking Words, Paint	EACH			$0.00
Stop Bars, Paint	LF			$0.00
Adjust Castings to Grade	EACH			$0.00
Adjust Water Valve Boxes to Grade	EACH			$0.00
				$0.00


TXAPA
Texas Asphalt Pavement Association
219 Commercial Drive
Buda, TX 78610
P.O. Box 1468
texasasphalt.org
Tel: (512) 312-5043