

Memorandum

City of Lawrence

Public Works Department

TO: Charles Soules, Director of Public Works

FROM: David Woosley, City Traffic Engineer
Shoeb Uddin, City Engineer

Date: 27 January 2012

RE: Pavement Markings

Introduction

Pavement markings are integral part of the streetscape and play a very important role in channelizing and guiding the road users, including motorists, bicyclists and pedestrians. It is important to maintain the visibility and retro-reflectivity of pavement markings (especially on highly traveled and higher speed arterial streets and intersections) in order to insure traffic flow and safety.

Over the years, it has been a challenging task to provide adequate maintenance of pavement markings due to budget constraints and the rising cost of materials, particularly paint. The current budget of \$15,000 for pavement marking is inadequate. To put this in perspective, the material (semi-permanent heat-fused preformed thermoplastic) alone to remark the crosswalks at a typical intersection can easily exceed \$3,500. With this level of funding, we have been able to maintain all 62 official school cross walks in Lawrence – school cross-walks have always been our top priority. After taking care of the school cross-walks, the current budget only allows us to take care of 2 or 3 intersections per year and some minor maintenance works as needed. As a result, we currently have a considerable amount of faded/disappearing “Long Line” and “Intersection” markings that are in need of attention.

In order to keep up with the increasing maintenance needs, a substantial increase in the Pavement Marking Maintenance Budget is needed for Lawrence.

Pavement Marking Needs

Long Lines

A recent inventory of all long-line pavement markings on “arterial” and “collector” streets found the following:

Material	Arterial	Collector
Approximate miles of white lane lines	34	13
Approximate miles of yellow lane lines	61	15

A field review estimates that approximately 40% of the long-line pavement markings are in "poor" condition and need immediate attention.

The following chart shows arterial street segments and the amount of long-lines in need of immediate attention on each (see attached map):

Arterial Segment	Miles of Long-Line Markings
6 th Street; Folks to George Williams	1.5 miles
19 th Street; Iowa to Harper	5.0 miles
31 st Street; Kasold to Louisiana	5.0 miles
Bob Billings; Iowa to George Williams	3.5 miles
Clinton; Iowa to West City Limits	2.0 miles
Haskell; 11 th Street to 31 st Street	5.0 miles
Kasold; Bob Billings to Trail	1.0 miles
Massachusetts; 11 th St to 23 rd St	3.5 miles
Wakarusa; Clinton to Queens	4.5 miles
Total	31.0 miles
Note: Higher volume streets should be marked in the spring and the fall.	

Intersections

Intersection pavement markings (crosswalks and stop lines), although not as critical as long-lines, present a greater maintenance challenge. This is due to vehicles accelerating, stopping and turning, creating shear on the markings that does not occur on long-lines. As a result, they usually wear-out much sooner, making them poor candidates for painting on arterial streets, but good candidates for properly installed preformed thermoplastic. The city's arterial street pavement maintenance program has helped to keep intersection markings in good shape at approximately 10 intersections each year; however, about half of the city's 85 signalized intersections are currently in need of significant pavement marking repair. Some of the most critical intersections currently needing repairs include (map attached):

6 th & Wakarusa*	19 th & Iowa
19 th & Naismith	31 st & Iowa*
33 rd & Iowa*	34 th & Iowa
Bob Billings & Kasold	Clinton & Crestline*
Clinton & Crossgate	Clinton & Hartford*
Clinton & Kasold	Clinton & Wakarusa

Materials to mark the intersections cost approximately \$3500 per intersection and contractor installation is approximately \$7,000 per intersection. City staff, at current levels, typically re-mark 2-3 intersections per year. Therefore, intersection pavement marking needs cannot be met without additional funding.

* scheduled for 2012 if funded

School Crosswalks

Official School Crosswalks are established in accordance with the City's *School Crossing Control Policy* (copy attached), first adopted in 1996 and amended in 2005 and twice in 2008. The Policy provides criteria to determine where school crosswalks are

marked. Currently, there are 62 Official School Crosswalks throughout the city. These crosswalks are the highest maintenance priority; they are evaluated each July and remarked or patched by current staff within the current annual pavement marking budget of \$15,000, before the beginning of school each year in August. Requests for additional crosswalks are received throughout the year and evaluated in accordance with the City Policy and added to the program as needed. Requests are received from citizens, school site councils, school PTOs, school principals and school district administrators. Currently, there are no pending requests for additional crosswalks. Attached is a map showing the approximate location of each crosswalk.

Staff Recommendations

It is important to note that the pavement marking condition in Lawrence cannot be improved without substantial increase in funding. Staff evaluated a couple of options to enhance the current pavement marking program in Lawrence – details of our analysis are available in Exhibit A.

Staff recommends purchasing a paint machine/striper so all “Long Lines” can be maintained in-house by city’s Pavement Marking and Sign Technicians. This will require \$80,000 (\$55,000 for equipment at government contract price - quote attached, \$5,000 for yearly maintenance plus \$20,000 for materials) in 2012. In 2013 and onward, approximately \$25,000 (\$20,000 for materials and \$5,000 for yearly maintenance of the paint machine) per year will be needed to continue the maintenance efforts for “Long Line” markings – “Long Line” markings have to be re-painted at least once a year.

While the Long Lines are a higher priority, it is also important to maintain intersection pavement markings in good condition. Due to frequent stopping and turning, intersection markings require more durable materials such as pre-formed thermoplastic. Paint is simply not a feasible solution for intersection markings. We are recommending an additional \$35,000 per year for the next 5 years to improve the pavement marking at major/critical intersections. This work has to be contracted out as we do not have adequate staff to complete this work in-house. It is likely that the funding need for intersection pavement marking will decrease after 5 years. We will need to continue to re-assess funding allocation for this work.

In summary, staff recommends allocating additional funding (on top of the current funding of \$15,000 per year) as outlined below.

1. Allocate an additional \$80,000.00 in 2012 to purchase a Paint machine and jump-start a new Pavement Marking Program. Allocate an additional \$25,000 per year thereafter to continue this program. If this recommendation is implemented, we will be able to keep Long Line markings (along arterial streets, see attached map) in good condition. This is a higher priority need, and if funded, can be completed this spring/summer and each spring/summer thereafter.
2. In addition to the additional funding for long line markings, further allocate an additional \$35,000 per year for the next 5 years for the maintenance of intersection pavement markings (see attached map for proposed 2012 program). This is also a high priority item, and if funded, this work can also be completed this spring/summer and each spring/summer thereafter

Action Request

1. If appropriate, approve funding in the amount of \$80,000 from the Infrastructure Sales Tax Fund to purchase a paint machine/striper, provide for equipment maintenance and purchase pavement marking material supplies.
2. If appropriate, approve funding in the amount of \$35,000 from the Infrastructure Sales Tax Fund to contract pavement marking maintenance at major/critical intersections.

EXHIBIT A

Program Alternatives

In-House PLUS

This Alternative includes in-house maintenance of long-lines, minor intersection maintenance by current city personnel, and an option of contracting-out intersection maintenance at five (5) intersections per year.

In order to maintain long-lines in-house, a long-line paint striper would need to be purchased, together with materials (paint & glass beads) for use by current city personnel. The striper can be mounted on a pickup truck (desirable) or a flatbed truck. An existing city vehicle can be used. Using this equipment, current signs & markings personnel can re-mark deteriorated pavement markings along arterial streets. The addition of all long-lines in critical need to their workload should be able to be accomplished within four (4) weeks during good weather without seriously affecting the current maintenance program including school crosswalks and traffic control signs (stop, yield, no parking, etc). It is anticipated that the striper would have a useful life of approximately ten years.

A suitable paint striper is available at a government contract price of \$55,000 (see attached quote) and the material cost for a 6"-wide line is approximately \$400 per mile. At this rate, a budget of \$20,000 would provide funding to address all long-line critical needs on arterial streets identified in previous section. In addition, funding should be provided each year for maintenance of the striper. Attached is a map showing the portions of arterial streets that would be included; other portions of arterial streets have been repaved and remarked within the past two years and have acceptable markings, or are scheduled for maintenance in 2012.

As mentioned before, city staff is currently able to re-mark 2-3 intersections per year. Maintenance of additional intersections cannot be completed in-house without hiring additional personnel. Our recommendation is to contract-out this work. Estimated annual cost is \$35,000.

Estimated Costs:

Purchase truck-mounted striper (government contract price)	\$ 55,000
Striper maintenance	5,000
Purchase paint and glass beads	20,000
Intersections (in-house, 2-3 per year, current budget)	0
Total	\$80,000
Optional:	
Intersections (contract, 5 per year)	\$35,000

Since paint will only last for one year or less, it should be noted that funding for equipment maintenance and materials, including increases for inflation, should be budgeted each year in order to keep up with the pavement marking needs.

Contract-Out

This Alternative would contract the painting of long-line markings and an option of contracting-out intersection maintenance at five (5) intersections per year. It is estimated that contract work would cost anywhere from \$1,000 to \$1,500 per mile.

Estimated Costs:

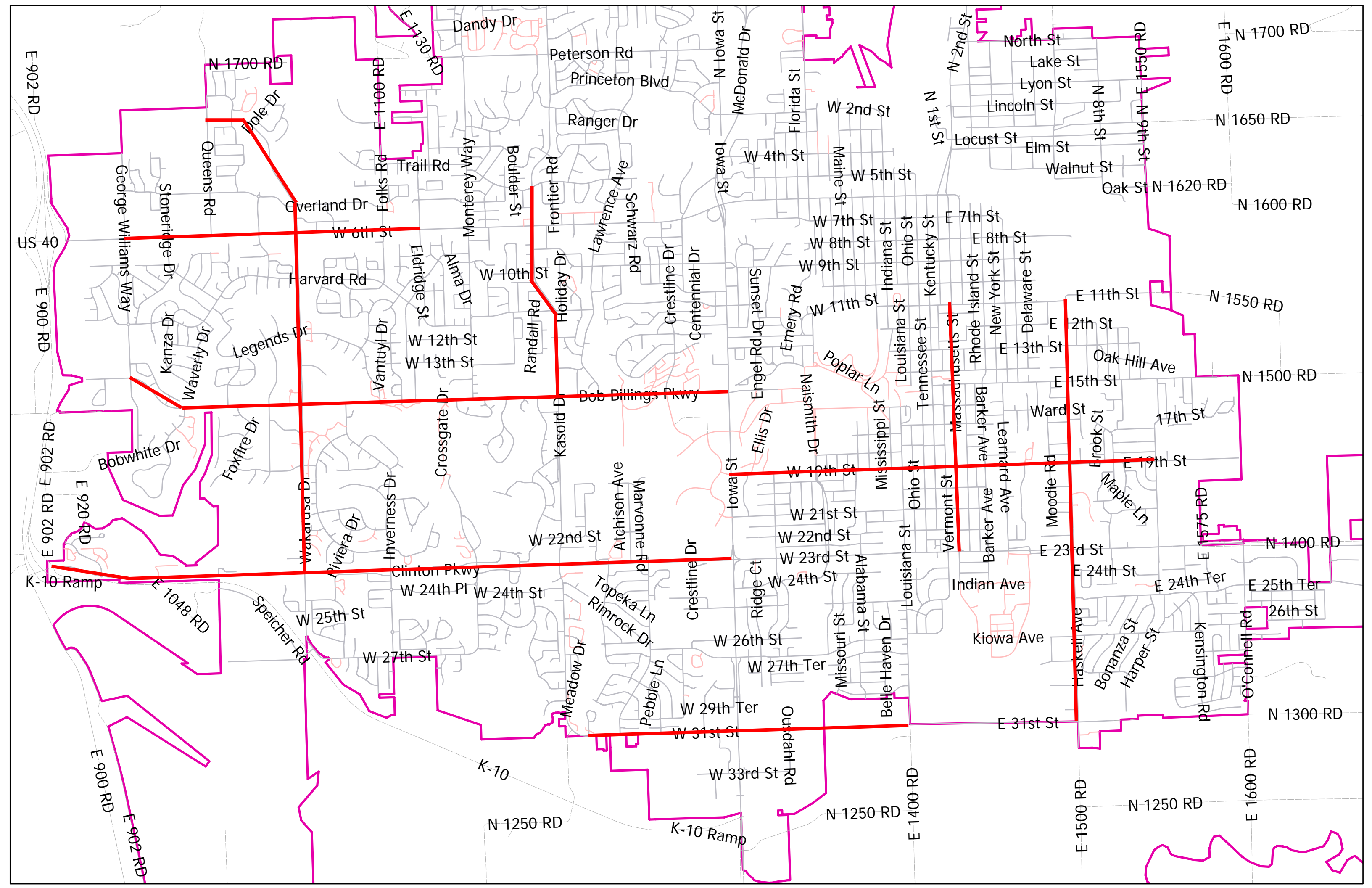
Long lines (contract)	\$62,500
Intersections (in-house, 2-3 per year, current budget)	0
Total	\$62,500
Optional:	
Intersections (contract, 5 per year)	\$35,000

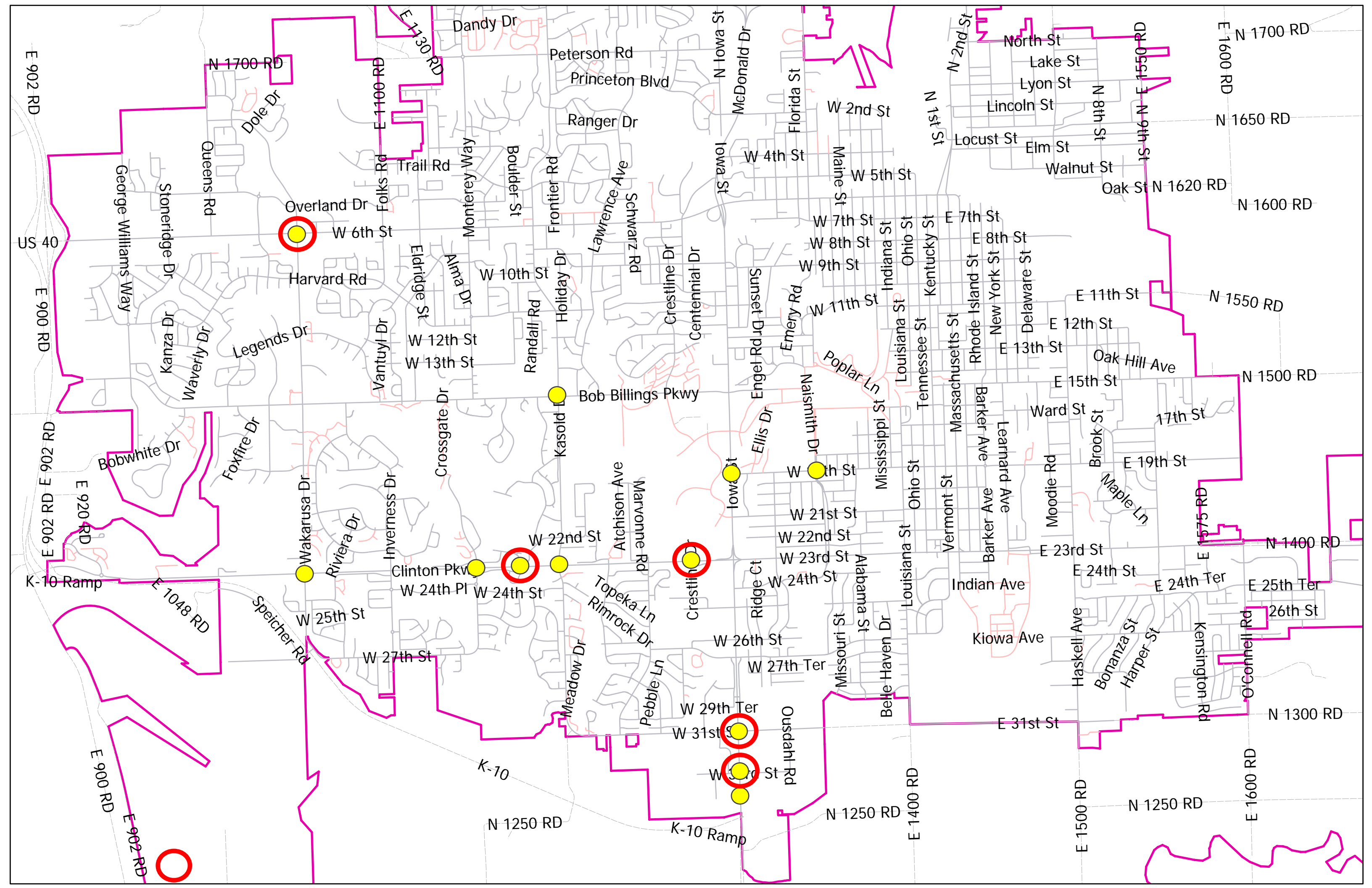
Since paint will only last for one year or less, it should be noted that funding, including increases for inflation should be budgeted each year in order to keep up with the pavement marking needs.

Cost Comparison

The following table compares the annual and total costs of maintaining long-lines In-House vs. Contract-Out, together with contracting intersection markings for a five-year period (details are attached). Although the first year cost of the In-House PLUS option is higher, the overall five-year total is substantially lower.

Annual & Total Costs - Long-Line Maintenance for 5-Years						
	2012	2013	2014	2015	2016	Total
In-Hour PLUS	\$80,000	\$25,000	\$25,000	\$25,000	\$25,000	\$180,000
Contract-Out	\$62,500	\$62,500	\$62,500	\$62,500	\$62,500	\$312,500
Option for both Alternatives:						
Intersections	\$35,000	\$35,000	\$35,000	\$35,000	\$35,000	\$175,000







CITY OF LAWRENCE, KANSAS
SCHOOL CROSSING CONTROL POLICY

Resolution No. 5777, March 19, 1996

Resolution No. 6604, August 16, 2005

Resolution No. 6748, January 22, 2008

Resolution No. 6777, July 22, 2008

- Premises:
1. Traffic control signs, markings, and signals (other than School Advance and School Crossing signs, and Marked Crosswalks) will be provided for elementary students only. Junior and senior high students are capable of walking to-and-from school without special assistance from adults or traffic control devices.
 2. In order to consider an adult guard or other traffic control device, the number of children using a crossing during the crossing period must average at least 10 during either the morning or afternoon crossing period. The crossing periods to be studied shall be the 45 minutes prior to the beginning of school and the 30 minutes after school dismissal, in 5-minute increments. A minimum of 3 morning and/or 3 afternoon studies will be conducted to determine the average number of children.

SCHOOL ADVANCE SIGN

A School Advance Sign may be provided on each approach of each street adjacent to a school and in advance of every marked school crosswalk that is not adjacent to a school.

MARKED CROSSWALKS

A marked crosswalk may be provided at crossings adjacent to school property, and at other locations where the following minimum requirements are met: vehicles enter the crosswalk (without being required to stop) at a rate exceeding 150 vehicles per hour during any 5-minute increment of the morning or afternoon crossing period. Marked crosswalks shall be limited to one per street per school when practical. Unprotected crosswalks (absence of stop sign, traffic signal or adult crossing guard) may be marked if required by a school route plan or, if a school route plan does not exist, it is not practical for children to use a protected crosswalk.

REDUCED SPEED ZONE (20 MPH)

A reduced speed zone may be provided for each marked school crosswalk that is not protected by a stop sign, traffic signal or adult crossing guard. The reduced speed zone shall begin approximately 150-200 feet in advance of the crosswalk and shall end approximately 50-100 feet beyond the crosswalk. The reduced speed zone shall be in effect at times provided in the *Code of the City of Lawrence*.

REDUCED SPEED ZONE (20 MPH) WITH FLASHING BEACON

A reduced speed zone with flashing beacon may be provided for each marked school crosswalk that is not protected by a stop sign or traffic signal, if the following minimum requirements are met: the average number of students exceeds 40 and the available safe gaps in the traffic is greater than 1.5 per minute; or if the average number of students is 10 or greater and the available safe gaps in the traffic is 1.0-1.5 per minute. The reduced speed zone shall begin approximately 150-200 feet in advance of the crosswalk and shall end approximately 50-100 feet beyond the crosswalk. The reduced speed zone shall be in effect for 45 minutes prior to the beginning of school and for 30 minutes after the end of school. Any beacons installed under this provision will be removed upon installation of a stop sign or traffic signal under other provisions of this policy.

STOP SIGN AND TRAFFIC SIGNAL

A Stop Sign or Traffic Signal will only be provided in accordance with criteria established in the *Manual on Uniform Traffic Control Devices*, as published by the Federal Highway Administration, and adopted by the State of Kansas and the City of Lawrence.

ADULT CROSSING GUARD

An Adult Crossing Guard may be provided if any of the following minimum conditions are met:

1. At an unprotected crosswalk if:
 - (a) the average number of students exceeds 40 and the available safe gaps in the traffic is 1.0-1.5 per minute; or
 - (b) if the average number of students is 10 or greater and
 - (1) the speed limit on the street is over 35mph, or
 - (2) the street is marked for more than 3 lanes of traffic, or
 - (3) the product of the crossing time (in seconds) and the speed limit for approaching traffic (in feet per second) is equal to or larger than the measured sight distance, or
 - (4) the available safe gaps in the traffic is less than 1.0 per minute.
2. At a crosswalk protected by a Stop Sign (not an all-way stop) or a Traffic Signal, if the average number of students is 30 or greater; and
 - (a) the street is marked for 4 lanes or more lanes of traffic and vehicles enter the crosswalk without being required to stop at a rate exceeding 150 vehicles per hour during any 5-minute increment of the morning or afternoon crossing period; or
 - (b) the street is marked for less than 4 lanes of traffic and vehicles enter the crosswalk without being required to stop at a rate exceeding 300 vehicles per hour during any 5-minute increment of the morning or afternoon crossing period.
3. At a crosswalk at an All-Way Stop if the average number of students is 10 or greater and the all-way stop is warranted during the crossing period.

David Woosley

From: Tom.Schuur@ezliner.com
Sent: Monday, January 09, 2012 3:18 PM
To: Shoeb Uddin
Cc: Mark Thiel; David Woosley
Subject: RE: Revised quote for EZ Liner AI120
Importance: High
Attachments: al120ss.pdf; Lawrence-KS-Continuation Sheet HGAC Contract-01-09-12.doc; Lawrence-Ks-HGAC-EZ AL120-Contract Pricing-01-09-12.pdf; Lawrence-KS - AL120-3 gun-specs- 01-12.doc

Shoeb:

Per your request, please see attached "revised date" HGAC Quotation, Literature and specifications for new AL120 EZ-Liner Striper.

Delivery: Approximately 30 days after receipt of order.

We will, of course, wait until you are ready to put the Striper into service in the Spring before performing the required Technical Training Service of the Striper on site in Lawrence.

Warranty: One Year.

We are happy to quote/perform "Annual Maintenance/Re-furbishment" based on your desired specific "scope of work" at the end of the Striping Seasons.

Please contact us at anytime, we are anxious to work with you on new Paint Striper Unit.

Respectfully submitted,

Tom Schuur
Regional Sales Manager
EZ Liner Industries
Cell Ph: 402-677-9457
E-mail: tom.schuur@ezliner.com

From: Shoeb Uddin [<mailto:suddin@lawrenceks.org>]
Sent: Monday, January 09, 2012 9:14 AM
To: Tom Schuur
Cc: Mark Thiel; David Woosley
Subject: !!SPAM!!: Revised quote for EZ Liner AI120
Importance: Low

Tom,

As we discussed on the phone, we are in the process of developing a new pavement marking program in Lawrence. You sent a quote for this equipment to Mark Thiel at our office on June 10, 2011. If you would respond to this email with a revised/updated quote for this equipment along with relevant attachments and brochure, that would be greatly appreciated.

Please let me know if you need more information or clarifications.

Thank you.

Shoeb M Uddin, MS, P.E., PTOE
City Engineer, Public Works Department
PO Box 708, Lawrence, KS 66044
Office: (785) 832-3130, Fax: (785) 832-3398
Email: suddin@ci.lawrence.ks.us
Website: [City of Lawrence, KS](#)

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PO Box 140, Orange City, IA 51041
Ph: 712-737-4016 Fax: 712-737-4148

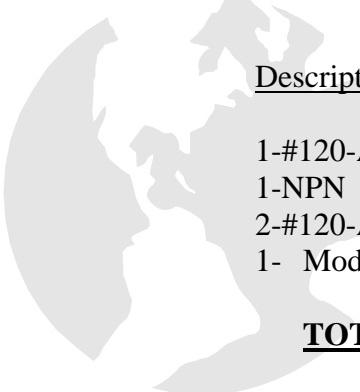
01-09-12

Contract No.: **SM10-10** Product Code: **P201**

H-GAC Contract Pricing Worksheet-Continuation Sheet for Unpublished Options

Buying Agency: Lawrence, City of, KS
Contact Person: Mark Thiel

Contractor: EZ-Liner Industries
Prepared By: Tom Schuur



<u>Description</u>	<u>Cost</u>
1-#120-A372-00 3 rd HP Filter (instead of 2 in base price)	\$409.00
1-NPN Air System Lubricator/Oiler	\$146.00
2-#120-A102-00 Drum mounted agitator assemblies (940.each)	\$1,410.00
1- Model AL120-EZ Training Video (CD)	<u>no charge</u>
<u>TOTAL CONTINUED UNPUBLISHED OPTIONS:</u>	\$1,965.00

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EZ-LINER



MODEL AL120 **Pickup Mounted Striper**



FEATURES

- Palletized construction fits in pickup bed
- (2) 60-gallon vented paint tanks with sloped bottom and bolted removable top for ease of cleanup
- 500# ASME certified pressurized bead tank
- Trailing reversible rigid gun carriage design
- Self-contained power pack
- Set up for one or two operators
- Deluxe operators seat with seat belt
- Smooth carriage steering from operators station
- Two stage filtration of paint
- Honda 20hp engine standard
- Pressure compensated hydraulic system
- 8.6 gpm hydraulic powered paint pump
- Convenient precision controls

1920 Albany Place S.E. • P.O. Box 140 • Orange City, Iowa 51041
Phone: (712) 737-4016 or 800-373-4016 • Fax: (712) 737-4148

Also see us on the internet at www.ezliner.com

the Quality is In our Line.

EZ-LINER MODEL AL120



Optional Equipment



Solid state electronic skip timer or microprocessor based controller, your choice.



Apply paint and beads simultaneously with this pole gun attachment and its 25' hoses.



Additional paint pump option for quicker and easier color transitions.



Various paint and bead guns to choose from.



Hydraulic carriage steering.



Drum tie-down in lieu of (2) 60 gallon tanks, allows painting directly from drums.

EZ-Liner Service Features



Shipped from in-stock inventory or custom designed to meet your specifications.



We deliver domestically and worldwide with training on-site by the most qualified technicians in the industry.



Over 50 years of combined experience in our customer service department.

Details

Options Available: (factory installed)

- Skipline controller (specify # of lines)
- Footage and gallon counters
- Carriage lift with controls
- (2) Stainless steel tanks (in lieu of carbon steel)
- Stainless steel wetted plumbing package
- (2) Hydraulic mounted agitators
- Hydraulic controlled steering (in lieu of manual)

- Additional paint pump option (for 2 colors)
- Drum tie-down (in lieu of paint tanks)
- Vacuum bead loading system
- 750 lb. glass bead tank upgrade
- 120 gallon per color paint tank upgrade
- Strobe light
- Video and laser guidance systems
- Electronic digital speedometer

Accessories Available:

- Hand spray kit with 25' high-pressure hose
- Pole gun with 2 wheel carriage, and 25' high-pressure hose
- Hand gun spraying paint and beads, with 25' hoses
- Lift bar for loading/unloading
- Flatbed mounting hardware
- Storage stand with casters

- Hose reels (paint, bead or air)
- Intercom system
- Air system lubricator
- Airport spray tip package
- Umbrella option for operator station
- Recommended spare parts kit
- Trailer
- Other options and accessories

EZ-Liner's continuing quest for improvement makes equipment, specifications and components subject to change without notice.

Detailed specifications are available on request.
Call for a price quote, and a free demo.

the Quality ^{is In} our Line.



EZ-Liner Industries
 Box 140 Orange City, Iowa 51041
 Ph 712-737-4016 Tf 800-373-4016
 Fx 712-737-4148
 www.ezliner.com

**GENERAL SPECIFICATIONS
 SELF-CONTAINED, PALLETIZED ROAD STRIPING UNIT
 WATERBASE CAPABLE
 City of Lawrence, Ks**

1. SCOPE

It is the intent of these specifications to describe a self-contained palletized road striping unit in sufficient detail to assure that product reliability, technical soundness, design and striping performance is provided. All parts not specifically mentioned, which are necessary to provide a complete striping unit, shall be included in the bid and shall conform in strength, quality, and durability, of material and workmanship to what is normally provided to the trade in general.

The unit is to have its own power source and be capable of painting from the right or left rear side of the truck. The striping unit shall be removable by an overhead crane, for this function permanently balanced lift points shall be installed on the unit by the vendor. The unit provided shall be new, of current model year or less than one year old with a maximum of 5 hours on motor. The unit shall be delivered completely assembled, serviced and ready to operate.

The bidder shall indicate compliance with either a “Yes” or a “No” for each item specification. Blank spaces shall be considered non-compliance. Any deviation from the specification or where submitted literature does not fully support the meaning of specifications, must be clearly cited in writing by the bidder. No deviation below “minimum” specifications shall be accepted.

2. GENERAL REQUIREMENTS

A. <u>GENERAL</u>	<u>Comply</u>
	<u>Yes</u> <u>No</u>
1. Unit shall be capable of applying reflectorized lines Not less than 4” wide and 12 mil thickness from both the left or right sides of the machine, skip or solid lines at a speed of 5 to 10 m.p.h.	_X_ ____
2. Unit shall be equipped with an airless spray system for paint and a pressurized tank for glass beads.	_X_ ____
3. Unit shall be a two-man operation (one truck driver and an operator on the rear of the unit). Due to the desire for a quality line and for safety reasons, one-man operations will not be acceptable.	__X_ ____
4. Alternating operator stations must be provided on the rear of the unit, one on the left side for centerline operations and one on the right for edgeline operations.	__X_ ____

Comply
Yes No

- | | | |
|----|--|-----------|
| 5. | Completed striper shall be palletized and of legal size
And weight to be compliant with all rules and
regulations pertaining to a heavy duty ¾ ton pickup. | _X_ ___ |
| 6. | All valves are to be labeled for function and operation. | _X_ ___ |
| 7. | Eartec Intercom System to be provided. | _X_ ___ |
| 8. | Safety Lighting System to be provided. | _X_ ___ |

B. Frame

- | | | |
|----|---|-----------|
| 1. | Unit shall be installed on a palletized skid mount and
extend the length of the bed. | _X_ ___ |
| 2. | Frame rail shall be constructed of formed steel
channel, five inch members with cross members for
support. | _X_ ___ |
| 3. | Unit shall be so constructed to evenly distribute the
weight and have hooks located on the front and rear
crossmember to facilitate the lifting of the unit on and
off of the truck chassis. | _X_ ___ |
| 4. | Bead tank to be mounted on right side on the frame
and crossmemberX | _X_ ___ |
| 5. | Unit shall be held in truck bed by means of a zinc
plated, tiedown bracket with trunbuckles on rear
bumper. | _X_ ___ |
| 6. | Operator's platform shall be constructed of 1/8" steel
with non-skid design. Frames without an operator's
platform will not be accepted. | _X_ ___ |

C. Paint Supply

- | | | |
|----|---|-----------|
| 1. | Unit shall have two (2) 60-gallon capacity zero-pressure
10 gauge or heavier stainless steel sloped bottom paint
tanks, vented, with square stainless steel quick-latch
openings and a removable bolt-on lid for ease of clean-up. | _X_ ___ |
|----|---|-----------|

- | | | <u>Comply</u> | |
|----|--|---------------|-----------|
| | | <u>Yes</u> | <u>No</u> |
| 2. | Lid latches shall be heavy duty cast, positive lock adjustable cam levers as used on a pressure vessel. | _X_ | ___ |
| 3. | Each tank is valved at pump inlet, allowing tanks to be used separately or simultaneously. | _X_ | ___ |
| 4. | Hydraulic Paint Tank Agitators shall be provided. | _X_ | ___ |
| D. | <u>Stand Tube</u> | | |
| 1. | A 4" diameter x 43" water-tight, leak proof tube to hold the suction hose and bleeder line tube shall be mounted in a way that it can be removed from the frame for ease of cleaning | _X_ | ___ |
| E. | <u>Safety Guards</u> | | |
| 1. | All moving belts and pulleys shall be enshrouded by expanded metal guards. | _X_ | ___ |
| F. | <u>Motor Mount</u> | | |
| 1. | Shall be constructed of 3/16" steel and attached to frame by seven gauge, five inch channel supports. | _X_ | ___ |
| 2. | Hydraulic pump and air compressor shall have adjustable mounts for tightening of the drive belts. | _X_ | ___ |
| G. | <u>Gun Carriage</u> | | |
| 1. | Gun carriage shall be single center wheeled, trailing from left rear or right rear of pickup. Forward mounted, vertical mounted, or push-style carriages will not be acceptable. | _X_ | ___ |
| 2. | Equipped with reversible outrigger to paint lines on either side of the unit. | _X_ | ___ |
| 3. | Wheel shall be 4.10/3.50 6" pneumatic tire with sealed roller bearings and a swivel caster. A pneumatic cylinder shall lift the carriage for transport and apply down pressure while striping. | _X_ | ___ |

- | | | <u>Comply</u> | |
|-----|--|---------------|-----------|
| | | <u>Yes</u> | <u>No</u> |
| 4. | Four carriage arms each to be constructed of 1" x 1 1/4" square bar. Pivot points on carriage shall have pressure lubrication fittings for cart flexibility and maintenance. | _X_ | ___ |
| 5. | Carriage shall be attached to the slide mechanism by a heavy duty rigid mounting bracket and swivel post. | _X_ | ___ |
| 6. | An extension bracket for the carriage mounting is to be available for units that will be mounted on a flatbed type chassis which stands higher than a standard heavy duty 3/4 ton pick up. | _X_ | ___ |
| 7. | Gun mounts shall be adjustable to allow painting 2" to 12" lines with each gun. All adjustable gun mount components as well as the gun carriage shall be zinc plated. | _X_ | ___ |
| 8. | Carriage shall fully adjust from left or right side of truck for retracing existing lines. | _X_ | ___ |
| 9. | Shall be movable by pulling a pin to release and move to either side of pickup by means of center bearing pivot. | _X_ | ___ |
| 10. | Pivot shall be attached to frame by means of two 1 1/8" pillow block bearings with pressure lubrication fittings. | _X_ | ___ |
| 11. | Carriage to be steerable with rack and pinion steering wheel which is hydraulically controlled, operated from left side operators station for centerline operations or right side operators station for edgeline operation. | _X_ | ___ |
| 12. | Steering shaft to be attached to slide mechanism by two 1 1/8" pillow block bearings with pressure lubrication fittings. | _X_ | ___ |
| 13. | A pneumatically operated lift shall be provided to raise the carriage in and out of the transport position, and to provide up to 30 psi of down pressure. The pneumatic lift shall be controlled by a lever located convenient to the operator. A regulator will be provided to control the amount of down pressure being applied in the striping position. (Hydraulic lifts will not be allowed.) | _X_ | ___ |

- | | | <u>Comply</u> |
|----|---|----------------------|
| | | <u>Yes</u> <u>No</u> |
| H. | <u>Seat Support Bracket</u> | |
| 1. | Seat shall be easily moved from left side to right side of unit when switching from centerline to edgeline striping. | _X_ ___ |
| 2. | Operator must be able to swivel seat 360°. | _X_ ___ |
| 3. | Deluxe operators seat shall be provided with cushion back rest and padded armrests with safety belt, weatherproof covering, and umbrella attached to pedestal. | _X_ ___ |
| I. | <u>Line Guide</u> | |
| 1. | Unit shall have mechanically adjustable line guide attached to front bumper of pickup, for use as a guidance tool by driver. | _X_ ___ |
| 2. | The bumper brackets must be adjustable to fit different style of pick up bumpers. The brackets on the line guide and that attach to the pick up bumper are to be zinc plated. | _X_ ___ |
| 3. | Main tube must be at least 9' long with orange safety guide on end. | _X_ ___ |
| 4. | Line guide must be easily removable by removing two pins with snap rings. | _X_ ___ |
| 5. | Line guide shall be capable of being lifted to a 35° angle and secured in this position during transport to be fully visible to driver of vehicle. | _X_ ___ |
| J. | <u>Battery Tray</u> | |
| 1. | Shall be located beneath engine. 8" x 11" battery tray with 1" lip constructed of 1/8" steel welded to main frame. | _X_ ___ |
| 2. | Battery to be housed in a heavy duty polypropylene case, totally enclosed to be protected from weather. | _X_ ___ |

Comply
Yes No

K. Engine System

1. Unit shall have a 23 HP industrial/commercial grade Honda engine with electric start. __X__ ____
2. It shall have a 12 volt electric power supply with 16 amp alternator. __X__ ____
3. The engine shall be of overhead valve design. __X__ ____
4. The engine shall be pressure lubricated. __X__ ____
5. Fuel tank shall have a 12 gallon capacity with a 1 ½” threaded and plugged outlet available in the top to add a fuel level gauge. The fuel tank is to be bolted to the main frame of the unit so it is an integral component of the frame. __X__ ____
6. Engine shall be equipped with an hour meter to facilitate servicing. __X__ ____
7. Pipe extension shall be provided on the drain out to allow oil to be easily drained. __X__ ____

L. Air Supply System

1. Unit shall be equipped with a two cylinder single stage, minimum of 17 CFM displacement, air compressor with 2 gallon reservoir, air filter system, and unloader assembly.
A Laman Air Dryer with moisture trap will be included __X__ ____
2. Compressor to unload when there is no demand for air. __X__ ____
3. Safety valve set at 110 PSI and stamped with official ASME modified four-leaf clover symbol. __X__ ____
4. There shall be an air manifold at the compressor and on the gun carriage. __X__ ____
5. Manifold at the air compressor shall have a 0-300 PSI liquid filled pressure gauge, 2 ½” minimum and shall be visible from either operators position. __X__ ____
6. Compressor shall have a pipe extension on the drain
Comply
Yes No

- out for oil to be easily drained. X
7. Air supply hose to gun carriage is to be a nylon tube with solvent resistant neoprene cover. X
8. Air lines on gun carriage shall be solvent resistant nylon tubing to keep lines upright, and equipped with rugged corrosion resistant brass body pushlock fittings to allow for easy replacement of air lines. X
9. 12 volt DC, 7.6 watt air solenoids shall be installed to activate each set of paint and bead guns. A separate air solenoid shall be supplied for each individual gun. X
10. Each set of solenoids to be independently controlled from the control box and shall open one paint and bead gun. X
11. Solenoids provided are to be designed for rugged duty and rapid cycling, full ported, large capacity and rated at 75 CFM at 125 PSI with a pressure range of 30-125 PSI and temperature range 0 to 125 degree Fahrenheit. Rated for continuous duty and Viton seal for solvent resistance. X

M. Bead Supply System

1. Unit shall be equipped with (1) 500 pound capacity ASME approved tank for storage of reflectorized glass beads. X
2. The chemical and physical properties of all parts shall meet requirements for the specifications of the ASME Boiler and Pressure Vessel Code and certified by an authorized inspector of The National Board of Boiler and Pressure Vessel Inspectors. X
3. Tank must be permanently labeled with modified four-leaf clover symbol of the ASME for 110 PSI maximum working pressure. X
- Comply
Yes No
4. Tank must be steel with gasketed head, safety pressure-release valve and the modified four-leaf clover symbol of the ASME, set to 110 PSI, and have

- a concave bottom for clean draining. __X__ ____
- 5. It shall be complete with air regulator to adjust bead flow from 5 to 60 PSI. __X__ ____
- 6. Tank also shall have a 2" minimum dial size air gauge with glass window, a 75 PSI brass toggle lift safety valve, and a manual relief valve shall be provided to release pressure when refilling. __X__ ____
- 7. A low pressure ball valve shall be installed on air supply hose at pressure regulator. __X__ ____
- 8. 1" bronze ball valve shall be installed at bottom of bead tank to stop bead flow from tank. __X__ ____
- 9. Bead manifold to divert flow of beads to individual bead supply hoses for each bead gun, shall be located at the bottom outlet of the bead tank. __X__ ____
- 10. 3/4" ID bead supply hoses shall be clear PVC for visual flow, reinforced with a spring wire to be anti-collapsible, but with glass smooth interior to prevent material buildup. Hoses shall be rated at 70 PSI maximum at 70 degrees Fahrenheit and shall be nontoxic. __X__ ____
- 11. Three (3) Graco automatic glass bead dispensing guns deliver glass beads at a rate of 20 pounds per minute are air activated with assorted nozzle inserts to adjust bead flow. The nozzle inserts shall come standard with each head gun. __X__ ____

N. Hydraulic System

- 1. The hydraulic pump shall be a 10 GPM at 1800 RPM (min.) rotary piston, pressure-compensating pump with a swash plate for positive pressure control. Gear type pumps will not be acceptable. __X__ ____
- Comply
Yes No
- 2. Hydraulic hoses shall have a -40 to 200 degrees Fahrenheit temperature range with 4 to 1 safety factor, be oil/weather resistant, and have a minimum working pressure of 3000 PSI. __X__ ____

- 3. Hydraulic reservoir is to have a minimum 12 gallon capacity, suction screen, temperature and level gauge, filter indicator, and color coded fill cap. _X_ ____
- 4. A 2 ½” minimum sized, liquid filled, 0-3000 PSI, pressure gauge shall be provided at the high pressure paint pump. _X_ ____
- 5. A hydraulic oil supply valve at the paint pump shall be rated at 2000 PSI WOG. _X_ ____
- 6. Hydraulic system is to contain a hydraulic oil return filter containing a 10 micron element with a spin-on/throw away type cartridge. _X_ ____
- 7. The ratio of hydraulic system to paint system shall be 1:1 allowing pressure to be equal in the hydraulic lines and the paint lines. Other ratios will not be acceptable. _X_ ____

O. Paint Supply System

- 1. The paint supply system shall be constructed to allow for the application of waterbase paint. All fluid wetted plumbing shall be stainless steel unless specified otherwise in this specification. _X_ ____
- 2. There shall be one (1) high-pressure airless double ball piston paint pump rated at 2000 PSI at seven cycles per gallon with a 60 cycle per minute recommended pump speed for continuous operation for a minimum delivery of 8.6 gallons per minute. ASME Certified Pump Surge Chamber is required. _X_ ____
- 3. All wetted parts of the high pressure paint pump shall be waterbase compatible. _X_ ____

Comply
Yes No

- 4. Pump is to have hard chrome plating on rod and cylinder parts for abrasion resistance. An 8 oz bottle of special pump lubricant shall be provided with the unit. _X_ ____
- 5. Valve seats to be carbide tungsten. _X_ ____

6. Packings to be spring loaded and self adjusting. Pumps that have packings that are adjusted manually will not be accepted. X ___
7. Pressure and volume is fully adjustable. X ___
8. A foot valve at inlet, and shut-off valve on the outlet side of each paint pump. X ___
9. Pump shall have capability to recirculate the paint and be equipped with a pressure bleed valve. X ___
10. There shall be a 1 ½" x 10' suction hose with a 40" suction tube. The suction hose shall have a nylon tube core with solvent resistant neoprene cover. X ___
11. All hose fittings on the low pressure paint supply hoses and suction hose are to be grade 304 stainless steel. X ___
12. 1 ½" Supply hoses to be valved at the pump inlet with 316 grade stainless steel, ball valve. X ___
13. A high-pressure, spring-loaded check valve shall be installed at the outlet side of the pump. Check valve is to be stainless steel with stainless steel spring and metal to metal seat. X ___
14. Each high-pressure paint line is to have a 316 grade stainless steel, full port ball valve at the pump outlet and at the high pressure paint filter. X ___
15. All high pressure ball valves to be rated at 2,000 PSI WOG working pressure or higher. X ___
16. All stainless steel nipples shall be 316 grade with all other fittings to be grade 304. X ___
17. All high pressure paint hoses which shall be waterbase compatible shall have a nylon core with thermoplastic cover reinforced with one braided layer brass plated steel wire of high tensile with NPT couplings without spring guards. X ___
18. ½" hoses from paint pump to gun carriage are to have
- Comply
Yes No

- a 3000 PSI working pressure with a burst pressure of 12,000 PSI. _X_ ____
19. High pressure hoses are to be certified that hose was tested for electrostatic conductivity and hydrostatic resistance to a pressure of 1.5 times the working pressure stated on the hose. _X_ ____
20. There shall be three (3) 6" high-capacity, high pressure, 50 mesh, in-line filters which shall be waterbase compatible. One for each paint gun. _X_ ____
21. Stainless steel elements shall be accessible by removing hand-tight fine-threaded cap and lifting out for quick cleanup. _X_ ____
22. Assembly is to seal with Teflon washer with O'ring. _X_ ____
23. Filters are to be located on rear frame cross member behind the cart steering mechanism for accessibility for cleaning and so paint will not drip onto striper or carrier vehicle. _X_ ____
- ____
24. Unit shall be equipped with three (3) Graco automatic airless paint spray guns. _X_ ____
25. Each Paint Gun shall be equipped with an electric Actuator controlled from the operator's seated position. Each Actuator shall change the elevation of the paint gun in relation to the pavement. The Actuators will adjust for paint viscosity changes and produce a wider or narrower line on the pavement without having to stop operations and readjust the gun height on the carriage. _X_ ____
26. RAC IV Reverse-A-Clean carbide tips shall be inter-changeable for variable sized spray patterns and flow rates. _X_ ____

Comply
Yes No

27. Guns shall allow flow rate of 3.3 + gallons per minute. ___
28. There shall be one (1) 2" low pressure, 30 mesh in-line filter which shall be stainless steel for waterbased compatibility on the pump. ___
29. LP filter shall be easy to access located right before the inlet to the high pressure pump. ___
30. One (1) Paint Handgun with 25' of hose shall be supplied. ___

P. Electrical System

1. Power for the electrical system to be provided by a 12 volt battery housed in a protective, heavy duty polypropylene case with tie-down strap. ___
2. Power switch to be a two pole fused push-pull switch. ___
3. Wiring harness for electrical system to follow standardized cable color coding. ___
4. Junction blocks at control box and on gun carriage shall be protected from the weather. ___
5. Junction blocks are to be UL Listed rated at 30 amps. ___
6. Wiring harness between junction blocks is to be protected by a polyethylene corrugated loom wire covering. ___
7. Shrink tubing shall be used as a protective covering on wiring from cart junction box to the air solenoids. ___
8. Cable connectors for control box shall be a rugged military type, 19 pin quick-connect-disconnect plugs and receptacles designed for quick removal. ___
9. Pins in the connections shall be the correct gauge, rated to withstand current needed to operated guns and control box. ___

Comply
Yes No

10. Standardized cable color codes and connector pin assignments shall be used for interchangeability.
11. A logic magnetic pickup sensor mounted on the gun carriage wheel shall be provided to allow 1/10 foot of travel per signal for use by the Traffic Paint Line Controller.
12. Sensor shall be epoxy encapsulated in a stainless steel case for oil, dirt and moisture resistance.
13. Shall have a stainless steel sensing pole with an operating range of 0 to 140 degrees Fahrenheit.
14. Operating frequency shall be a maximum 10 KHZ and the supply voltage shall be 9 to 176 VDC.
15. Output cable must be integrally potted PVC jacketed with a neoprene strain relief boot with stranded shield and 100% foil shield coverage.
16. Sensor is to be installed in a protective housing that is permanently attached to the gun carriage, so that sensor can be accurately positioned on the target disk.
17. 8 1/2" diameter disk to be made of 1/4" steel and to be zinc plated for ease of clean up of any paint overspray.
18. 5th wheel type sensors or sensors that require a mechanical relay from applying pressure on a carriage wheel will not be accepted.

Q. Timer

1. The skipsetting mechanism shall be all electronic and shall utilize solid state components for all active internal functions. It must process electrical pulses derived from the vehicle motion sensor and must drive 12 volt 2 ampere solenoid valves. A means of inductive arc suppression shall be included. It shall require little or no maintenance. Clutches, cams, gears, or devices that require adjustment will not be allowed.

Comply
Yes No

2. All guns shall be operated by applying a ground signal to activate them. _X_ ___
3. The skipsetting mechanism must generate the selected repetitive pattern without utilizing any internal or external moving parts, except operator adjusted heavy duty military standard sealed toggle switches for establishing pattern size, placement and calibration. Switches shall be of the three position, self-centering, center off type, and there shall be long life sealed membrane switch type push buttons for the CYCLE LENGTH adjustment, and the STRIPE LENGTH adjustment. Switches with thumb wheels or that have engraved digits shall not be acceptable. ___X_ ___
4. An alphanumeric display shall be provided to display advisory and warning messages, as well as stripe and cycle settings. ___X_ ___
5. Said display must be capable of concurrently displaying at least 36 characters of text or digits. The display must be liquid crystal type, with industrial temperature range fluid, and must be compatible with electro-luminescent back lighting devices. ___X_ ___
6. All indicator lamps must be solid state light-emitting diode types without filament which may burn out. ___X_ ___
7. The skipsetting system shall not use or require use of internal or external electromechanical relays. ___X_ ___
-
8. To conserve power the skipsetter must draw less than ½ ampere at 12 volts for internal circuits. ___X_ ___
9. For ease of operation the skipsetter must have LCD display and must provide pattern capability from 1 to 999.9 ft., adjustable by 0.1 ft. increments at any time whether at rest or in motion, without generating spurious patterns. When changing patterns, simple dial changes must suffice without resorting to “data complete” or “enter date” type controls. Also, “start” indexing (reset to zero) must be instantaneous. Shall be capable of switching

Comply
Yes No

from English to Metric readings on the fly.

 X

10. To aid in registration of new paint with previously paint pattern, the "ADVANCE" or "RETARD" (phase correction) system must alter the pattern length no more than plus or minus 20% while activated (not more than every fifth motion sensor) MUST be provided with a means of AUTOMATICALLY adjusting the cycle length by 0.1 foot increments if the advance or retard control is invoked three consecutive times. X
11. Basic electrical (*) accuracy of the skipsetter shall be within 0.2 ft. for any combination of the following factors: X
- a. Speed from one to fifty miles per hour.
 - b. Supply voltage from eleven to eighteen volts DC.
 - c. Temperature variations from -20 C to +75 C (0 F to 170 F)
 - d. Accidental power surges caused by strobes, flashers, RPM change, solenoid or other equipment operations, etc.
 - e. Operation of 2-way radio transmitters whether on board or nearby shall not cause generation of spurious painting patterns.
12. Calibration must be provided to ensure that control dials agree with actual electrical output patterns. To reduce glare skipsetter shall be finished in flat black with a black front panel. X
13. The skipsetter must provide a means to compensate for registration errors commonly found in application of paint and beads. Time delay controls must be provided on master control panel of skipsetter to independently activate "paint" and "beads" so that they may be applied in registration with each other. Separate controls must be provided to individually register leading and tailing

ends of the pattern.

14. Controller shall be repairable. A loaner controller will be available for use free of charge in the event the controller must be returned for repairs during the warranty period.

R. Finish

1. Unit and all components, including tanks, frame, compressor, etc., shall have the following minimum protective coatings applied:
- * One prime coat
 - * One finish coat of paint, chrome or zinc plating or galvanizing
2. Finish coat color-Minion high performance acrylic enamel MCM-0-0004-16 IH-off-white.
3. A clean IPDI Urethane Hardener is to be added to the finish coat to improve hardness and increase chemical resistance.

S. Manuals

1. Two sets of the following manuals shall be provided:
- a. Operating Manual,
 - b. Service Manual, and;
 - c. Parts Manual.
2. Included shall be:
- a. Wiring diagram,
 - b. Valve and gauge schematic,
 - c. A section on general guidelines for striping,
 - d. General operating ranges,
 - e. Maintenance schedule,
 - f. Flushing guidelines,
 - g. Maintenance record chart,
 - h. Storage guidelines,
 - i. Troubleshooting guide.

Comply
Yes No

T. Delivery

1. Delivery shall be made F.O.B. within 30-45 days A.R.O. X
2. A two (2) day training seminar will be conducted by an experienced factory technician upon delivery and shall cover operation, maintenance, and safety. X

U. Warranty

1. All items furnished to meet these specifications shall be covered by the manufacturer's and/or supplier's standard warranty/guarantee on new equipment for one year. X
2. Copy of warranty shall be included with the bid. X

V. Experience

1. Equipment to be furnished shall be the product of a qualified firm that is regularly engaged in the manufacture and supply of this equipment. X
2. A qualified firm shall be defined to mean one which has manufactured or sold ten (10) airless pickup mounted units during the past 12 months. X
3. Seller shall supply a list of twenty (20) users; showing date delivered, contact person, and phone number. Failure to comply may result in rejection of bidders offer. X
4. Manufacturer must have provided a detailed, descriptive brochure on airless pickup stripers with general specifications with bid to assure quality and eliminate prototypes. Failure to comply may result in rejection of bidders offer. This brochure is only a reference and need not reflect the actual specifications herein. X

W. Material and Workmanship

1. All equipment, materials and workmanship shall be the highest grade in accordance with industry standards. X

2. Equipment supplied will be new and unused except for the necessary testing, calibration and transportation.