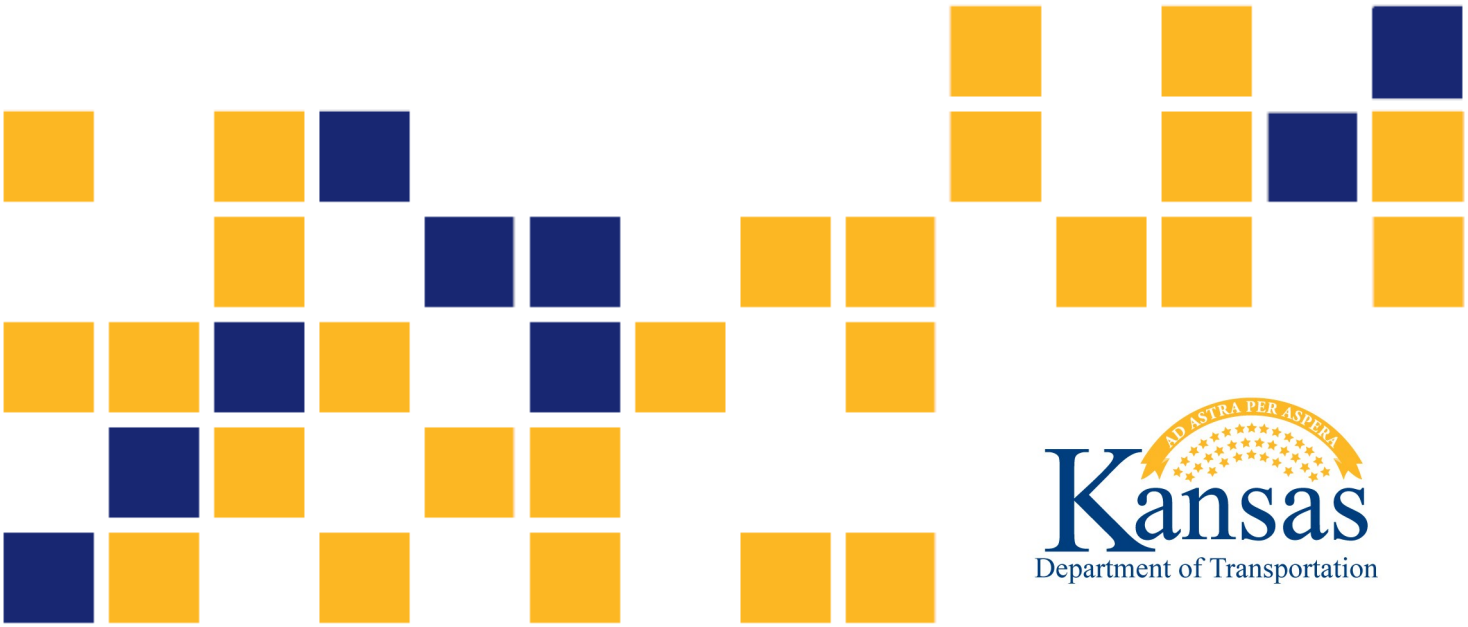
**Report No. KS-24-04** ▪ FINAL REPORT ▪ September 2024

# Effectiveness of Automated Pavement Restriping Systems, Phase I: Cost Comparison Between Manual and Automated Systems

Steven D. Schrock, Ph.D., P.E., F.ITE
Lanxi Liu

*The University of Kansas*



Kansas
Department of Transportation

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| **1 Report No.**<br>KS-24-04 | **2 Government Accession No.** | **3 Recipient Catalog No.** |
| **4 Title and Subtitle**<br>Effectiveness of Automated Pavement Restriping Systems, Phase I: Cost Comparison Between Manual and Automated Systems | | **5 Report Date**<br>September 2024<br>**6 Performing Organization Code** |
| **7 Author(s)**<br>Steven D. Schrock, Ph.D., P.E., F.ITE; Lanxi Liu | | **8 Performing Organization Report No.** |
| **9 Performing Organization Name and Address**<br>The University of Kansas<br>Department of Civil, Environmental & Architectural Engineering<br>1530 West 15th St<br>Lawrence, Kansas 66045-7609 | | **10 Work Unit No. (TRAIS)**<br>**11 Contract or Grant No.**<br>C2201 |
| **12 Sponsoring Agency Name and Address**<br>Kansas Department of Transportation<br>Bureau of Research<br>2300 SW Van Buren<br>Topeka, Kansas 66611-1195 | | **13 Type of Report and Period Covered**<br>Final Report<br>January 2022 – December 2022<br>**14 Sponsoring Agency Code**<br>RE-0852-01 |
| **15 Supplementary Notes**<br>For more information write to address in block 9. | | |

**16 Abstract**

The Kansas Department of Transportation (KDOT) is interested in finding a more efficient and accurate restriping system than the current system in use in order to save costs and/or accomplish the same work using fewer field personnel. Therefore, this report details the potential financial advantages for KDOT to deploy an automated pavement restriping system such as the LifeMark®-300 system or the LifeMark®-100 system, which are both equipped with industrial cameras, control systems, and GPS systems. Although the benefits of an automated restriping system include savings of labor cost and preparation work, these automated systems require significant initial financial investment to buy and maintain. Study results identified a benefit-cost ratio of 0.81 for the application of an automated pavement restriping system over a 30-year period. However, potential benefits such as increased worker safety and flexibility were evident with the automated pavement striping systems.

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| **17 Key Words**<br>Striping, Road markings, Automation, Benefit cost analysis, Occupational safety | | **18 Distribution Statement**<br>No restrictions. This document is available to the public through the National Technical Information Service www.ntis.gov. | |
| **19 Security Classification (of this report)**<br>Unclassified | **20 Security Classification (of this page)**<br>Unclassified | **21 No. of pages**<br>27 | **22 Price** |

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Final Report

Prepared by

Steven D. Schrock, Ph.D., P.E., F.ITE
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A Report on Research Sponsored by

THE KANSAS DEPARTMENT OF TRANSPORTATION
TOPEKA, KANSAS

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THE UNIVERSITY OF KANSAS
LAWRENCE, KANSAS

September 2024

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# Abstract

The Kansas Department of Transportation (KDOT) is interested in finding a more efficient and accurate restriping system than the current system in use in order to save costs and/or accomplish the same work using fewer field personnel. Therefore, this report details the potential financial advantages for KDOT to deploy an automated pavement restriping system such as the LifeMark®-300 system or the LifeMark®-100 system, which are both equipped with industrial cameras, control systems, and GPS systems. Although the benefits of an automated restriping system include savings of labor cost and preparation work, these automated systems require significant initial financial investment to buy and maintain. Study results identified a benefit-cost ratio of 0.81 for the application of an automated pavement restriping system over a 30-year period. However, potential benefits such as increased worker safety and flexibility were evident with the automated pavement striping systems.

# Acknowledgments

The authors would like to express their gratitude to Mr. Tim Cunningham, Mr. Chris Collins, and Mr. Chris Craig of the Kansas Department of Transportation for providing data, support, and an on-site perspective.

# Table of Contents

# List of Tables



# List of Figures

# Chapter 1: Introduction

Pavement markings are a critical component of highways because they provide beneficial navigational and roadway information to drivers, especially at night and in inclement weather. Poor quality pavement markings have been shown to negatively impact traffic operations on highways, whereas visible pavement markings increase roadway safety (Carlson et al., 2009; Lertworawanich & Karoonsoontawong, 2012). Pavement markings continually alert drivers to roadway alignment, vehicle location, and other crucial driving-related activities.

A study by the American Association of State Highway and Transportation Officials (AASHTO) found that a highway fatality occurs every 21 minutes in the United States due to a lane departure, accounting for approximately 60 percent of roadway fatalities (more than 25,000) in the country every year (AASHTO, 2008). Therefore, AASHTO has devised a Strategic Highway Safety Plan (SHSP) to minimize these fatalities by preventing lane departures (Neuman et al., 2003). Pavement markings are a vital component of this plan to enhance highway safety.

Reflective road markings are necessary for nighttime driving safety because they aid drivers in low-visibility conditions. Retroreflectivity is the attribute that qualifies the capacity of a marker to reflect light from a headlight back to a driver's eyes. Sprinkling glass beads into the marking materials has been shown to increase retroreflectivity and subsequent visibility, and effective quality control in painting operations, including the proper combination of painting ingredients and glass beads, has been shown to produce highly retroreflective and durable pavement markings. However, because retroreflectivity and durability degrade over time due to traffic and the environment, pavement markings must be restriped regularly to preserve performance for these parameters.

In 2007, the installation and maintenance of pavement markings were estimated to have cost state departments of transportation (DOTs) approximately $2 billion in the United States (Carlson et al., 2009). Comparatively, the Kansas Department of Transportation (KDOT) spent nearly $5 million on pavement marking development and maintenance in 2021 (Federal Highway Administration, 2022). State DOTs continue to face funding constraints for transportation demands, meaning decision makers must find ways to provide high-quality roadway services at

reduced costs, including the implementation of cost-effective pavement restriping systems. KDOT is seeking an efficient and accurate restriping system, such as an automated pavement restriping system, that can provide expected quality and accuracy but require less manpower to implement than manual striping systems.

This research examined potential financial advantages for KDOT to deploy an automated pavement restriping system instead of a non-automated, manual approach. This report utilizes a benefit-cost ratio investigation to determine whether KDOT should continue to add these technologies to its maintenance fleet. Accuracy and field performance were not included in this study, but they could be investigated in future research once KDOT has at least one automated restriping truck in its fleet.

# Chapter 2: Methodology

## 2.1 Manual Restriping Process

KDOT currently utilizes a striping truck, a control truck, and a bead truck (supply truck or crash truck), as shown in Figure 2.1, for the restriping process. The striping truck (Figure 2.2), which is the first vehicle in the restriping convoy, typically contains two painters and one driver. One painter paints yellow lines for the centerline, while another painter paints white lines for the edge lines. The driver of the control truck (Figure 2.3), or middle truck in the convey, monitors the entire operation and communicates with the other workers. This driver also measures the width of each lane to ensure that the lane widths stay consistent, as shown in Figure 2.4. Finally, one driver operates the bead truck (Figure 2.5) that is equipped with supply materials, such as paint and glass beads, and also includes traffic control to warn approaching motorists about the restriping convoy.

Operators initially load yellow and white paint into designated tanks on the striping truck, and they load glass beads into the bead tank. Before restriping begins, the striping crew inspects the restriping truck and conducts a test painting. When restriping a two-lane highway, the striping truck typically first paints the yellow centerline and the white edge line for the entire daily paint miles and then returns to paint the opposite white edge line. The truck driver pays close attention to the screen to ensure that the purple line is aligned with the centerline, as shown in Figure 2.6, while restriping at 8 miles per hour. The materials often need to be reloaded into the striping truck two or three times each day, and each load takes 45 minutes to 1.5 hours. The crew can typically restripe 10–17 miles, or 30–50 line-miles per day of operation. The driver of the control truck must exit the vehicle and run a measuring tape across the road to verify that the white edge line is six inches wide and the yellow centerline is four inches wide. The bead truck and the striping truck both have an electronic board with warning indicators (Figure 2.7).

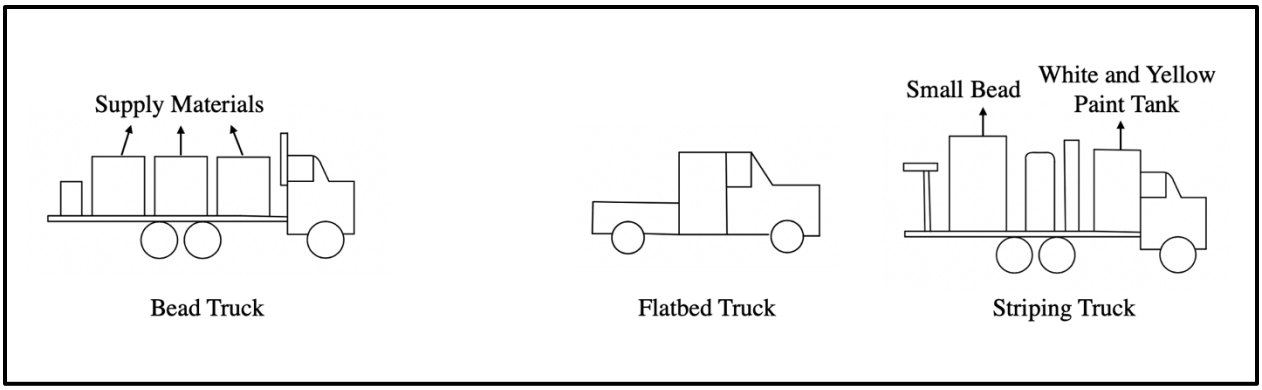


**Figure 2.1: KDOT Trucks Involved in the Striping Process**

**Figure 2.2: KDOT Striping Truck**

**Figure 2.3: KDOT Control Truck**

**Figure 2.4: Confirmation of Lane Width During Manual Painting**


**Figure 2.5: Bead Truck**


**Figure 2.6: Monitoring Screen to Align Centerline**


**Figure 2.7: Electronic Board Monitor**

In Kansas, the painting season lasts approximately eight months, from early April to approximately December 15. Visual inspections conducted annually during the off-striping season help set the restriping plan for the next restriping season.

## 2.2 Automated Pavement Restriping System

The LifeMark®-300 system can operate the carriage, paint, and glass bead guns automatically using industrial cameras to target the roadway markings and an additional control system to precisely position the paint carriage and nozzle array over the original roadway marking. The device automatically records footage of worn and repainted areas. Location data of the paint carriage is determined in real time, and all control algorithms can be processed immediately. No offline computer calculation is necessary for carriage control. Similarly, the LifeMark®-100 system is also comprised of an industrial camera system and control system. In addition, a GPS locating system employs real-time kinematic technology and an industrial computer to identify the original roadway striping path locations.

The implementation of an automated pavement restriping system reduces the paint crew size by one crew member because it automatically changes the paint mode and adjusts the carriage and nozzle array positions. The operations panel for this process is shown in Figure 2.8. The painting crew may not need to change the materials and operation mode, and the driver of the striping truck may not need to align the centerline since the carriage position is altered automatically. In addition, the driver of the control truck may not need to measure the width of the restriped pavement markings, which reduces crew labor.


**Figure 2.8: Operations Panel**

## 2.3 Life-Cycle Cost Analysis

The purpose of this study was to estimate the cost effectiveness of an automated restriping system. The following sections present the data used to evaluate the system's cost effectiveness. At the time of this report, the first system was expected to be delivered to KDOT and installed on the District 5 paint crew vehicles in time for the 2023 restriping season.

### *2.3.1 Cost of the Proposed Automated Restriping System*

The striping truck was equipped with the Lifemark-300 Automated Restriping System and the Lifemark-100 Dual Carriage Recording and Layout System, which cost $141,000 and $126,000 and have 15-year and 10-year life cycles, respectively. Additional anticipated maintenance costs include $720 per year for cell data service for the Lifemark-300 Automated Restriping System and annual costs of $4,200 for data maintenance, $720 for cell data service, and $3,000 for RTK subscription service (GPS correction service for accuracy) for the Lifemark-100 Dual Carriage Recording and Layout System.

### *2.3.2 Cost of the Current Restriping System*

Two-year costs for the preparation and striping procedure are summarized in Table 2.1. Due to changes of the cost data recording method in 2020 to "accomplishments per mile" and abnormal costs and accomplishments in 2020 due to the pandemic, 2021 was chosen as the typical year in this study. KDOT staff and researchers considered the cost and accomplishments data to be reasonable estimates of costs for future years.

**Table 2.1: Summary of Restriping Costs**

| Year | Purpose | Actual Accomplish-ments (miles) | Actual Labor Cost ($) | Actual Equipment Cost ($) | Actual Materials Cost ($) | Contract Services Cost ($) | Total cost ($) | Cost / Accomplish-ment ($) |
|---|---|---|---|---|---|---|---|---|
| 2020 | Striping Preparation | 7 | 3,416 | 2,116 | 1,256 | 0 | 6,788 | 970 |
| 2020 | Striping | 891 | 99,027 | 145,545 | 293,567 | 12,946 | 551,084 | 619 |
| 2021 | Striping Preparation | 28 | 7,111 | 3,155 | 0 | 0 | 10,266 | 367 |
| 2021 | Striping | 1,069 | 111,682 | 129,202 | 423,396 | 7,897 | 672,178 | 629 |

Based on accomplishment data from the year 2021, this study assumed that typical total paint accomplishments per year are 1,069 miles and restriping preparation work accomplishments per year are 28 miles. The benefit-cost ratio, which is commonly used to evaluate projects, was utilized in this analysis to compare costs of the current manual restriping system and the proposed

automated restriping system. In the benefit-cost analysis, the cost of purchasing the automated restriping equipment and maintenance fees over the ensuing 30 years was calculated as the overall cost. However, because the automated pavement restriping technology can eliminate the need for one crew member, the cost savings of one worker over the 30 years is a benefit.

To prepare for striping using the manual restriping system, the striping convoy must be ready in the morning, and the bead truck must be loaded with paint and glass beads. In addition, the striping truck must be loaded with supplies, and the roads must be marked before the paint when the previous markings are no longer visible. In contrast, the automated pavement restriping system does not require the manual marking of roadways. The only requirement is that the layout truck must drive the road prior to the actual restriping process to record information to allow the system to recognize the road via its GPS location system, but the layout truck can advantageously travel at the same speed as the flow of traffic. According to LimnTech estimates, the automated restriping system can decrease labor requirements by 30%–40% for the preparation work of marking out the roads before painting in the manual system, thereby increasing the benefits of the automated restriping system.

# Chapter 3: Benefit-Cost Analysis Results

The total cost for buying an automated restriping system and maintenances fees for the next 30 years was calculated below.

Total costs accrued over 30 years:

$$c = \$141{,}000 \times 2 + \$126{,}000 \times 3 + \$720 \times 30 + \$4200 \times 27 + \$720 \times 30 + \$3{,}000 \times 30$$
$$= \$\mathbf{906,600}$$

Labor savings per year (i.e., one crew member):

$$l = actual\ labor\ cost\ for\ restriping\ preparation \div 5 + actual\ labor\ cost\ for\ restriping\ preparation \div 5$$
$$= \$7{,}111.14 \div 5 + \$111{,}682.4 \div 5$$
$$= \$1{,}422.2 + \$22{,}336.5$$
$$= \$\mathbf{23,758.7}$$

As mentioned, the automated restriping system can save 30–40 percent of the labor required to mark roads before painting. If road marking requires 20 percent of the total restriping preparation work and the automated restriping system can save 40 percent of this work, then a savings of 8 percent of the restriping preparation work can be obtained.

Restriping preparation savings per year:

$$p = (total\ cost\ for\ restriping\ preparation - one\ labor\ cost\ for\ restriping\ preparation) \times 8\%$$
$$= (\$10{,}266.49 - \$1{,}422.2) \times 8\%$$
$$= \$\mathbf{707.5}$$

The total benefit that accumulates over 30 years is estimated to be:

$$b = (labor\ saving\ per\ year + restriping\ preparation\ saving\ per\ year)) \times 30$$
$$= (\$23{,}758.7 + \$707.5\ ) \times 30$$
$$= \$\mathbf{733,986}$$

Benefit-cost ratio

$$= \text{Total benefit that accumulates over 30 years} / \text{total costs that accrue over 30 years}$$

$$= \$733{,}986 / \$906{,}600$$

$$= \mathbf{0.81}$$

The estimated results show a benefit-cost ratio of less than 1 for the application of an automated pavement restriping system over a 30-year period, indicating that this transition is not justified on a cost basis alone. However, approximately 81 percent of the cost of the system elements can be covered by the decrease of labor cost and savings from preparation work. Additional discussion of these findings is provided in the next chapter.

# Chapter 4: Discussion

Although the cost analysis provided in Chapter 3 revealed a benefit-cost ratio less than 1, the implementation of this automated restriping system or a similar system could still be beneficial in Kansas. First, in actual practice, the cost savings may be more than estimated if the preparation savings are greater than anticipated. Second, the automated system may paint with greater accuracy than the current manual process, especially in challenging scenarios such as dash lines near intersections and gore areas. This could result in a higher quality application with fewer errors. Third, the need to manually measure the width of the restriped pavement markings would be eliminated or significantly decreased due to the enhanced accuracy of the automated system, thereby boosting crew safety by decreasing the times crew members must leave their vehicles. This new system also boosts manpower flexibility because the automated approach employs a smaller workforce and requires less training to operate the striping convoy. This means that fewer field personnel will be required to operate the convoy, and because less training is required a wider pool of manpower could be more easily assigned to the striping convoy on a short-term basis. In addition, in the automated system, the layout truck can move as quickly as the flow of traffic, thereby increasing the effectiveness of the restriping preparation, and even in inclement weather conditions, the layout truck can utilize the GPS location system to collect road data, thereby extending working hours.

If desired by KDOT, when the District 5 restriping equipment has been upgraded to the automated system, the accuracy of the field performance of the new automated system could be compared to the current manual process, and the estimated cost savings developed in this study could be further refined.

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# Appendix A

**State of Kansas - Department of Transportation - Bureau of Construction and Maintenance**

Date 5/13/2022
Time 10:12:36AM

DTMNS024 - Maintenance Activity Analysis For Fiscal Year 2020

Page 21

* - Cost per accomplishment does not include Contract Service Costs

Activity Number: 515 - Stripep - Associated tasks in the preparation of highways  Unit of Measure: EACH

| | Accomplishments | | | Labor | | | | | Equip. | Matrls. | Other | Recap | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Proj Numb | Avg/ Year Acomp | Actual Acomp | % Avg Acomp | Avg/ Year Hrs | Actual Hrs | Hrs/ Acomp | % of Avg | Actual Cost | Actual Cost | Actual Cost | Contract Services Cost | Total Cost | * Cost / Accomp |
| R-5001-20 | 20.0 | 6.0 | 30 | 269 | 90.0 | 15.00 | 33 | 2,447.40 | 808.16 | 0.00 | 0.00 | 3,255.56 | 542.59 |
| R-5110-20 | 0.0 | 1.0 | 0 | 0 | 38.8 | 38.75 | 0 | 968.71 | 1,201.15 | 1,255.68 | 0.00 | 3,425.54 | 3,425.54 |
| R-5140-20 | 66.0 | 0.0 | 0 | 12 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5150-20 | 0.0 | 0.0 | 0 | 0 | 0.0 | 0.00 | 0 | 0.00 | 106.60 | 0.00 | 0.00 | 106.60 | 0.00 |
| R-5310-20 | 78.0 | 0.0 | 0 | 18 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5330-20 | 0.0 | 0.0 | 0 | 6 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5420-20 | 0.0 | 0.0 | 0 | 4 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| District 05 Totals for Activity Number: 515 Stripep | | | | Unit of Measure: EACH | | | | | | | | | |
| | 164.0 | 7.0 | 4 | 309 | 128.8 | 18.39 | 42 | 3,416.11 | 2,115.91 | 1,255.68 | 0.00 | 6,787.70 | 969.67 |

**Figure A.1: Screenshot of KDOT Restriping Preparation Cost for 2020**

**State of Kansas - Department of Transportation - Bureau of Construction and Maintenance**

Date 5/13/2022
Time 10:12:36AM

DTMNS024 - Maintenance Activity Analysis For Fiscal Year 2020

Page 19

* - Cost per accomplishment does not include Contract Service Costs

Activity Number: 512 - Striping - Striping using paint truck  Unit of Measure: LINEM

| | Accomplishments | | | Labor | | | | | Equip. | Matrls. | Other | Recap | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Proj Numb | Avg/ Year Acomp | Actual Acomp | % Avg Acomp | Avg/ Year Hrs | Actual Hrs | Hrs/ Acomp | % of Avg | Actual Cost | Actual Cost | Actual Cost | Contract Services Cost | Total Cost | * Cost / Accomp |
| R-5000-20 | 0.0 | 0.0 | 0 | 2 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 17.95 | 8,924.89 | 8,942.84 | 0.00 |
| R-5001-20 | 13,804.0 | 865.5 | 6 | 2,634 | 3,537.0 | 4.09 | 134 | 95,000.05 | 144,930.57 | 293,548.87 | 0.00 | 533,479.49 | 616.38 |
| R-5002-20 | 919.0 | 0.0 | 0 | 692 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5110-20 | 0.0 | 0.0 | 0 | 0 | 9.8 | 0.00 | 0 | 217.15 | 0.00 | 0.00 | 1,736.56 | 1,953.71 | 0.00 |
| R-5130-20 | 2.0 | 0.0 | 0 | 3 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5140-20 | 0.0 | 0.0 | 0 | 0 | 10.0 | 0.00 | 0 | 306.77 | 75.84 | 0.00 | 0.00 | 382.61 | 0.00 |
| R-5150-20 | 20.0 | 0.0 | 0 | 2 | 9.0 | 0.00 | 450 | 275.34 | 0.00 | 0.00 | 0.00 | 275.34 | 0.00 |
| R-5160-20 | 0.0 | 0.0 | 0 | 0 | 10.0 | 0.00 | 0 | 306.77 | 196.80 | 0.00 | 0.00 | 503.57 | 0.00 |
| R-5210-20 | 1.0 | 0.0 | 0 | 4 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5230-20 | 2.0 | 4.0 | 200 | 10 | 31.0 | 7.75 | 310 | 857.17 | 309.80 | 0.00 | 0.00 | 1,166.97 | 291.74 |
| R-5310-20 | 0.0 | 0.0 | 0 | 5 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5320-20 | 0.0 | 21.5 | 0 | 0 | 28.0 | 1.30 | 0 | 652.45 | 32.00 | 0.00 | 0.00 | 684.45 | 31.83 |
| R-5330-20 | 0.0 | 0.0 | 0 | 0 | 36.3 | 0.00 | 0 | 1,280.19 | 0.00 | 0.00 | 2,284.25 | 3,564.44 | 0.00 |
| R-5420-20 | 0.0 | 0.0 | 0 | 6 | 5.0 | 0.00 | 83 | 130.84 | 0.00 | 0.00 | 0.00 | 130.84 | 0.00 |
| R-5430-20 | 0.0 | 0.0 | 0 | 4 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5510-20 | 0.0 | 0.0 | 0 | 2 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| District 05 Totals for Activity Number: 512 Striping | | | | Unit of Measure: LINEM | | | | | | | | | |
| | 14,748.0 | 891.0 | 6 | 3,364 | 3,676.0 | 4.13 | 109 | 99,026.73 | 145,545.01 | 293,566.82 | 12,945.70 | 551,084.26 | 603.97 |

**Figure A.2: Screenshot of KDOT Restriping Cost for 2020**

**State of Kansas - Department of Transportation - Bureau of Construction and Maintenance**

Date 4/29/2022
Time 9:54:17AM

DTMNS024 - Maintenance Activity Analysis For Fiscal Year 2021

Page 22

* - Cost per accomplishment does not include Contract Service Costs

Activity Number: 515 - Stripep - Associated tasks in the preparation of highway s  Unit of Measure: EACH

| | Accomplishments | | | Labor | | | | | Equip. | Matrls. | Other | Recap | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Proj Numb | Avg/ Year Acomp | Actual Acomp | % Avg Acomp | Avg/ Year Hrs | Actual Hrs | Hrs/ Acomp | % of Avg | Actual Cost | Actual Cost | Actual Cost | Contract Services Cost | Total Cost | * Cost / Accomp |
| R-5001-21 | 17.0 | 27.0 | 159 | 298 | 213.5 | 7.91 | 72 | 6,654.56 | 3,124.80 | 0.00 | 0.00 | 9,779.36 | 362.20 |
| R-5140-21 | 66.0 | 0.0 | 0 | 12 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5310-21 | 78.0 | 0.0 | 0 | 18 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5330-21 | 0.0 | 0.0 | 0 | 6 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5420-21 | 0.0 | 0.0 | 0 | 4 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5530-21 | 0.0 | 1.0 | 0 | 0 | 16.0 | 16.00 | 0 | 456.58 | 30.55 | 0.00 | 0.00 | 487.13 | 487.13 |
| District 05 Totals for Activity Number: 515 Stripep  Unit of Measure: EACH | | | | | | | | | | | | | |
| | 161.0 | 28.0 | 17 | 338 | 229.5 | 8.20 | 68 | 7,111.14 | 3,155.35 | 0.00 | 0.00 | 10,266.49 | 366.66 |

**Figure A.3: Screenshot of KDOT Restriping Preparation Cost for 2021**

**State of Kansas - Department of Transportation - Bureau of Construction and Maintenance**

Date 4/29/2022
Time 9:54:17AM

DTMNS024 - Maintenance Activity Analysis For Fiscal Year 2021

Page 20

* - Cost per accomplishment does not include Contract Service Costs

Activity Number: 512 - Striping - Striping using paint truck  Unit of Measure: LINEM

| | Accomplishments | | | Labor | | | | | Equip. | Matrls. | Other | Recap | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Proj Numb | Avg/ Year Acomp | Actual Acomp | % Avg Acomp | Avg/ Year Hrs | Actual Hrs | Hrs/ Acomp | % of Avg | Actual Cost | Actual Cost | Actual Cost | Contract Services Cost | Total Cost | * Cost / Accomp |
| R-5000-21 | 0.0 | 0.0 | 0 | 2 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 11,859.86 | 7,896.85 | 19,756.71 | 0.00 |
| R-5001-21 | 10,576.0 | 1,069.0 | 10 | 3,483 | 3,831.5 | 3.58 | 110 | 110,062.89 | 128,221.19 | 410,904.53 | 0.00 | 649,188.61 | 607.29 |
| R-5002-21 | 0.0 | 0.0 | 0 | 4 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5003-21 | 0.0 | 0.0 | 0 | 0 | 3.0 | 0.00 | 0 | 101.66 | 0.00 | 0.00 | 0.00 | 101.66 | 0.00 |
| R-5110-21 | 0.0 | 0.0 | 0 | 5 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5130-21 | 2.0 | 0.0 | 0 | 7 | 0.0 | 0.00 | 0 | 0.00 | 99.90 | 0.00 | 0.00 | 99.90 | 0.00 |
| R-5230-21 | 3.0 | 0.0 | 0 | 13 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5320-21 | 22.0 | 0.0 | 0 | 2 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5330-21 | 0.0 | 0.0 | 0 | 9 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5400-21 | 0.0 | 0.0 | 0 | 0 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 632.00 | 0.00 | 632.00 | 0.00 |
| R-5410-21 | 0.0 | 0.0 | 0 | 0 | 50.0 | 0.00 | 0 | 1,517.85 | 880.90 | 0.00 | 0.00 | 2,398.75 | 0.00 |
| R-5420-21 | 0.0 | 0.0 | 0 | 1 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| R-5430-21 | 0.0 | 0.0 | 0 | 4 | 0.0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| District 05 Totals for Activity Number: 512 Striping  Unit of Measure: LINEM | | | | | | | | | | | | | |
| | 10,603.0 | 1,069.0 | 10 | 3,530 | 3,884.5 | 3.63 | 110 | 111,682.40 | 129,201.99 | 423,396.39 | 7,896.85 | 672,177.63 | 621.40 |

**Figure A.4: Screenshot of KDOT Restriping Cost for 2021**



AD ASTRA PER ASPERA

# Kansas

Department of Transportation