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TECHNICAL MEMORANDUM

Pavement Marking Retroreflectivity Verification Program Report: FY 2020

TxDOT Interagency Cooperation Contract, No. 46-5PVIA013

Pavement Marking Retroreflectivity Verification Testing Support on TxDOT Projects

DATE: May 10, 2021

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OVERVIEW

This technical memorandum covers the sixth year (FY 2020, September 2019 – August 2020) interagency cooperation contract work on the pavement marking retroreflectivity verification testing support by the Texas A&M Transportation Institute (TTI). The sixth-year data collection evaluated 51 different pavement marking jobs from 13 different providers. The results were somewhat mixed, 59% good, 19% ok, and 22% poor comparison. For the majority of the markings evaluated on each job the provider and TTI data compared well, but in some cases not as well. In most cases the provider and TTI data had the same results when evaluating whether the markings met the initial retroreflectivity performance requirements. In total 76% of the markings evaluated met retroreflectivity requirements, 17% were close to requirements, and 7% failed to meet requirements.

UPDATE ON VERIFICATION PROGRAM OPERATIONS

This section provides an update on the status of provider certification, an update on how well the providers are submitting notifications to TTI, and an update on retroreflectivity training development. TTI cannot track if providers are submitting notifications to TxDOT. The specification updates made in 2018 require that both TTI and TxDOT are notified prior to collecting retroreflectivity data (see Figure 1 and Figure 2).

| | |
|------|---|
| 3.8. | Measurement Notification. Provide notification via email to Mobileretro@tamu.edu a minimum of 24 hours prior to mobile retroreflectivity data collection to allow for scheduling verification testing when needed. |
|------|---|

Figure 1. Special Specification 6291 Notification Language.

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|--|
| <p>Section 4.5., “Retroreflectivity Measurements.,” is voided and replaced by the following:</p> <p>Use a mobile retroreflectometer to measure retroreflectivity for Contracts totaling more than 50,000 ft. of pavement markings, unless otherwise shown on the plans. For Contracts with less than 50,000 ft. of pavement markings, mobile or portable retroreflectometers may be used at the Contractor’s discretion. Coordinate with and obtain authorization from the Engineer before starting any retroreflectivity data collection.</p> |
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Figure 2. Item 666 Notification Language.

FY2020 Certified Providers

Table 1 provides a list of all providers who were certified for some period of time during FY 2020. Unless noted all providers have maintained certification into FY 2021. Three providers (highlighted in red: Flat Line, L&L Company, and Pavement Markings Inc.) were removed from the certified list in FY 2020 for failure to comply with the notification requirements or lack of communication with TTI when notifications were requested. All three providers could regain certification if they come into compliance with the verification program requirements within a reasonable timeframe. One provider (Professional Traffic Control) was granted certification at the end of FY 2020 and was not evaluated as part of the verification program during FY 2020. This provider will be evaluated in early FY 2021. One other provider had been submitting notifications in previous fiscal years but stopped during the covid issue. Their communication improved and it was found that they had some equipment issues and were subbing out some of

their readings. They certified a new piece of equipment late in the fiscal year and got their other mobile retroreflectometer working a well. This provider was not evaluated in FY 2020. This will be evaluated in early FY 2021. All other providers have been evaluated at least once during the fiscal year.

Table 1. List of Providers Who Had Certification in FY 2020.

| Provider | Equipment (serial number) | Notifications | Notes |
|--------------------------------------|---|----------------------|--|
| Barricades Unlimited | LTL-M (223-M), Laserlux G7 (LZ 1050) | Good | |
| Batterson, LLP | Laserlux G7 (LZ 1077) | Ok | |
| Crabtree Barricade Systems, Inc. | LTL-M (220-M) | Good | |
| D.I.J. Construction, Inc. | LTL-M (222-M, 228-M) | Good | |
| Double A Contracting, L.P. | Laserlux G7 (LZ 1001) | Poor | |
| Flasher Equipment Company | LTL-M (102-M) | Ok | |
| Flat Line, Inc. | LTL-M (236-M) | None | Removed 8/1/2020, no notifications, no communication |
| Highway Barricades and Services, LLC | Laserlux (LRR 147) | Poor | |
| Highway Data Services, Inc. | Laserlux (LRR 121) | Ok | |
| L&L Company | Laserlux G7 (LZ 1008) | None | Removed 8/1/2020, no notifications, said they would be certifying a new operator later in the year |
| Mijelum LLC. | Laserlux G7 (LZ 1035) | None | Did not submit notifications during FY20. When asked they indicated they did not have nay jobs requiring mobile retro and that they would submit notifications when they had such jobs. |
| Pavement Marking, LLC | Laserlux G7 (LZ 1014), Laserlux G7 (LZ 1038) | Poor | Had equipment issues part of the year, indicated they would send notifications when they had their equipment back and jobs to read. Certified a second mobile retroreflectometer in August 2020. |
| Pavement Markings Inc. | Laserlux G7 (LZ 1007) | None | Removed 8/1/2020, no notifications, no communication |
| Professional Traffic Control | Laserlux G7 (LZ 1070) | New Provider | Certified in August 2020 |
| Stripe-A-Zone, Inc. | Retrotek-MU (1005) | Good | |
| Striping Technology L.P. | Laserlux G7 (LZ 1072) | Ok | |
| Total Highway Maintenance, LLC | Laserlux G7 (LZ 1078) | Poor | |
| TRP Construction Group, LLC | Laserlux G7 (LZ 1000) | Ok | |
| Vizcaino, L.P. | Laserlux G7 (LZ 1009) | Poor | |

Provider Notifications

TTI is developing a system for FY 2021 to log and track provider notifications. This system will log the notification date and projects that are provided in the notification. This will allow TTI to better track how many notifications each provider submits and if each let project has a notification associated with it. TTI does not know which provider is associated with each project based on the letting information received from TxDOT. For some projects TTI has the information but for others (where the striping contractor and mobile retroreflectivity provider are subs) TTI does not have the information.

As in the past the information that needs to be sent to TTI as part of the notification is the same. The contractors should be providing the notification without prompting from TTI. If a notification had not been received in a few months TTI will send a reminder email requesting the providers submit the following information with their notifications for each job that requires mobile pavement marking retroreflectivity:

CSJ# – TxDOT project number.

TxDOT Contact – Whoever the data is turned into.

Location – Road and limits.

Expected data collection date – When the data collection is expected to occur.

Not all providers provided all the information in the same form. Some send an email with the information requested in the email. Others send excel spreadsheets with the requested information. Others send project plan sheets with the dates they plan to evaluate specific sections within the plans. If the providers do not supply enough information, TTI requests additional information and asks that the additional information be provided in future notifications.

Some providers did a better job of providing notifications than others as noted in Table 1. Providers indicated as good tend to send notification throughout the year without needing prompting. Providers indicated as ok may have sent notifications regularly at one point or another during the year but were inconsistent. Providers indicated as poor mostly only provided notifications when prompted. Providers who provide no notifications were for the most part removed from the certified provider list. It seems that some providers were not providing as many notifications as they should be providing. Additional measures are being developed and discussed with TxDOT to ensure notifications are submitted. TTI does not have a direct way of determining if providers are conducting mobile retroreflectivity evaluations or not. This makes it difficult to know if notifications are not being sent when they should be. Providing guidance to districts concerning pavement marking retroreflectivity and the verification program will be beneficial. It will be easier to reach out to districts if more districts that are familiar with the requirements and are making sure the providers are certified and are providing the notifications.

Three Step Process for Evaluation of Certification Status

The three-step process for evaluation of certification status by committee review will be the means of revoking a provider's certification. A single failure of a field verification evaluation will not result in the loss of certification. If two or three consecutive field verification evaluations are failed, certification may be revoked. A multistep process that is based on the quality of the data collected will be used to determine the status of the mobile retroreflectivity provider.

A field verification evaluation with data exceeding the ± 20 percent accuracy requirements, but below 35 percent difference will result in increasing one step toward certification loss. A field verification evaluation with data exceeding ± 35 percent difference will result in increasing two steps toward certification loss. A successful field verification evaluation will result in moving one step away from certification loss.

Keep in mind that data that exceed 35 percent difference will result in skipping a step. This means that if the provider was previously on step one, that they would then lose certification. The goal of the steps is to increase the quality of the data collected by providers by reducing the quantity of very poor data collection, while providing incentive to conduct good high-quality data collection. A basic outline of the requirements at each step is listed below:

- **Step 1:** After the first failed field verification evaluation, the provider must review the mobile retroreflectivity measurement data, measurement procedures, and equipment to identify any possible causes for the difference in measurements and provide the information to TTI prior to taking further measurements. Take corrective actions if needed and provide documentation of corrective actions taken to TTI.
- **Step 2:** After a second consecutive failed field verification evaluation, the provider's certification will be put on probationary status. Probationary status indicates that certification could be revoked if the next field verification evaluation is failed. The requirements of step one shall be repeated at step two.
- **Step 3:** After a third consecutive failure with data between 20 and 35 percent different, or after two consecutive failures where one or both failures exceed 35 percent difference, the provider's certification will be considered for revocation. If certification is revoked, a full re-certification at the TTI facilities would be required to regain certification after corrective actions are identified and documentation provided to TTI.

The step status is not based on a specific operator; it is provider based. Each operator must maintain certification, but if one fails, in essence they all fail for verification purposes. Once step three is achieved, all operators for a provider could lose their certification.

If a provider is found to not be submitting notifications, they could move a step closer to losing certification. Tracking when notifications should be submitted is difficult. This means that this would only occur when TTI was made aware of a job, likely through TxDOT, in which a notification was not submitted. Based on discussions with TxDOT a committee will be formed to revoke provider certification. This committee will consider the quality of the data collected based on the three-step process and the consistency of the notifications provided prior to conducting their evaluations. The committee will consist of at least two members of TxDOT and one member of the TTI verification program.

Retroreflectivity Training Development

TTI developed a multiple part training presentation to provide TxDOT and providers with additional information on the verification program. The training is broken up into 6 parts and takes about 2 hours to go through. The training covers specifications, the certification and verification programs, retroreflectivity equipment, retroreflectivity data requirements and analysis, and questions and contacts for more information. The training and certification information can be found on the TTI webpage at the following links. The first link is about the

certification program and has a link to the list of certified providers that is regularly updated by TTI. The second link is to the webpage where the training information is posted. The training can be downloaded a single large file or as the individual parts.

<https://groups.tti.tamu.edu/visibility/programs-and-guidance/mobile-retro-certification/>

<https://groups.tti.tamu.edu/visibility/programs-and-guidance/mobile-pavement-marking-retroreflectivity-guidance/>

Outreach to TxDOT Districts and Area Offices concerning the verification program has been minimal. This outreach should improve with the development of the training and the planned presentation of the verification program and training material at the 2020 TxDOT Short Course. TTI will use this information to spread awareness of the program so that when TTI reaches out concerning the results of individual projects that the receiving Engineer will be more familiar with the program.

YEAR SIX FIELD VERIFICATION RESULTS

The results of the year six field verification program are provided in this section. A summary of the let projects, a summary of the projects selected, the verification results for each selected project, and a summary of the results are provided.

Let Projects

The TTI team monitored all projects let that had retroreflectivity requirements. These projects were monitored on a monthly basis, based on information received from TxDOT. The projects were logged by their individual project numbers and the total length of Item 666 striping included on the contract. The total length of the striping is important, because Item 666 has thresholds for project requirements based on the total length of striping. All projects over 20,000 feet of striping must meet the minimum retroreflectivity requirements. All projects over 50,000 feet of striping require a mobile retroreflectometer to collect the retroreflectivity data. Table 2 provides a summary of the projects let by month. The total number of projects exceeding the minimum total feet indicated are listed for each month.

From Table 2 the distribution of projects sizes is apparent. In total, 521 projects were let that contained Item 666 pavement markings with retroreflectivity requirements. There were 355 projects exceeding 20,000 lf, 281 projects exceeding 50,000 lf, and 132 projects exceeding 200,000 lf.

Table 2. FY 2020 Let Projects that had Striping with Retroreflectivity Requirements

| Minimum Total Feet | Sept | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Total Projects | Minimum Total Feet | % of Total projects |
|--------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------------|--------------------|---------------------|
| 0 | 28 | 32 | 42 | 51 | 43 | 43 | 45 | 53 | 50 | 39 | 50 | 45 | 521 | 0 | 100 |
| 10000 | 24 | 22 | 37 | 40 | 28 | 36 | 35 | 36 | 37 | 33 | 44 | 36 | 408 | 10000 | 78 |
| 20000 | 21 | 21 | 34 | 36 | 25 | 31 | 30 | 30 | 30 | 25 | 41 | 31 | 355 | 20000 | 68 |
| 30000 | 20 | 20 | 34 | 31 | 25 | 30 | 26 | 29 | 27 | 22 | 38 | 29 | 331 | 30000 | 64 |
| 40000 | 18 | 18 | 30 | 30 | 21 | 27 | 25 | 27 | 27 | 18 | 35 | 27 | 303 | 40000 | 58 |
| 50000 | 18 | 18 | 29 | 28 | 19 | 27 | 25 | 22 | 24 | 17 | 31 | 23 | 281 | 50000 | 54 |
| 60000 | 17 | 18 | 25 | 26 | 19 | 24 | 24 | 21 | 23 | 16 | 30 | 20 | 263 | 60000 | 50 |

| | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|-----|--------|----|
| 70000 | 17 | 18 | 23 | 23 | 17 | 24 | 22 | 21 | 21 | 16 | 27 | 17 | 246 | 70000 | 47 |
| 80000 | 17 | 17 | 22 | 21 | 15 | 20 | 20 | 19 | 18 | 15 | 22 | 14 | 220 | 80000 | 42 |
| 90000 | 17 | 17 | 21 | 19 | 13 | 16 | 18 | 18 | 15 | 13 | 20 | 13 | 200 | 90000 | 38 |
| 100000 | 17 | 17 | 21 | 18 | 13 | 15 | 18 | 17 | 15 | 11 | 20 | 12 | 194 | 100000 | 37 |
| 110000 | 15 | 14 | 21 | 18 | 13 | 14 | 15 | 16 | 14 | 11 | 19 | 12 | 182 | 110000 | 35 |
| 120000 | 15 | 14 | 20 | 16 | 12 | 14 | 14 | 15 | 14 | 11 | 19 | 12 | 176 | 120000 | 34 |
| 130000 | 14 | 14 | 20 | 15 | 12 | 14 | 14 | 15 | 13 | 11 | 18 | 11 | 171 | 130000 | 33 |
| 140000 | 14 | 14 | 20 | 14 | 10 | 13 | 14 | 15 | 13 | 11 | 16 | 9 | 163 | 140000 | 31 |
| 150000 | 14 | 13 | 20 | 14 | 9 | 13 | 14 | 14 | 13 | 9 | 16 | 8 | 157 | 150000 | 30 |
| 160000 | 14 | 13 | 19 | 13 | 8 | 12 | 14 | 14 | 13 | 9 | 16 | 7 | 152 | 160000 | 29 |
| 170000 | 12 | 13 | 18 | 13 | 8 | 10 | 14 | 14 | 13 | 9 | 16 | 7 | 147 | 170000 | 28 |
| 180000 | 12 | 13 | 18 | 12 | 7 | 9 | 13 | 13 | 12 | 8 | 16 | 7 | 140 | 180000 | 27 |
| 190000 | 12 | 13 | 18 | 12 | 7 | 8 | 13 | 13 | 12 | 8 | 15 | 7 | 138 | 190000 | 26 |
| 200000 | 12 | 12 | 18 | 10 | 7 | 8 | 13 | 11 | 11 | 8 | 15 | 7 | 132 | 200000 | 25 |

Projects Selected

The sixth-year data collection evaluated 51 different pavement marking jobs from 13 different providers. Projects were selected based on availability of the data collection team, provider conducting the evaluation, availability of information from the provider, geographic location, selection from the list of let projects, and favorable weather conditions. TTI needed to select projects that they could evaluate within a short period of time of when the provider evaluated the markings, preferably with no weather events between the evaluations. Ideally the projects would be randomly selected, but there are factors such as weather, availability, and unknown construction scheduling that make perfectly random selection unreasonable. TTI tried to evaluate each provider multiple times and select projects from different areas of the state. There was no planned bias in the selection of the projects. The projects were evaluated as they became available.

Data collection this year was greatly hindered by the COVID-19 pandemic. The data collection team was unable to travel to conduct evaluations for nearly three months (mid march through early June) due to institutional, state, and local travel restrictions. The data collection team increased data collection efforts once travel was allowed in an attempt to make up for lost time.

The information that TTI hoped to record for each job is listed below:

- Provider
- Project Number
- Reference Number (if part of a multiple roadway project)
- Roadway
- Marking Type
- Road Surface
- Installation Date
- Provider Measurement Date
- Verification Measurement Date
- Retroreflectivity values for each marking on the job

- Possible contributing factors for changes in retroreflectivity between provider and TTI measurements

TTI was able to log most information from the list for each project evaluated. The installation date was rarely provided by the provider. When evaluating the TTI data compared to the provider data, possible contributing factors were noted when the comparison of the data was not within 20 percent.

Figure 3 provides a map view of the location of each of the 51 evaluated jobs. The push pin locations are color coded based on the verification results (described in the next section).

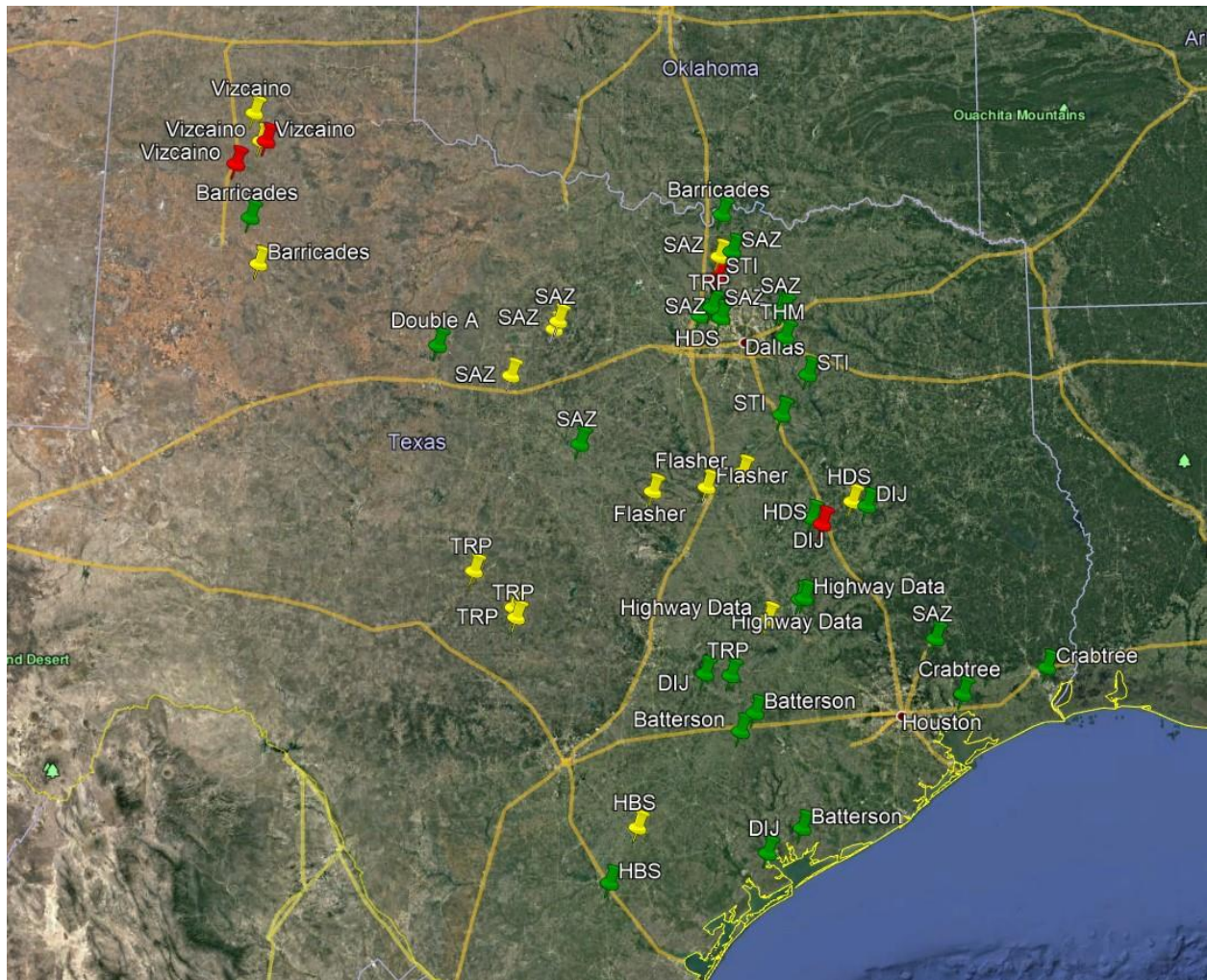


Figure 3. Locations and Verification Status for FY 2020 Evaluations.

Project Verification Results

The data collected were evaluated according to the accuracy requirements that were provided in the mobile pavement marking retroreflectivity certification guide. Provider and TTI readings needed to be within 20 percent of each other for the provider to pass. If the reading difference was greater than 20 percent, it would be a failure. If readings differed by more than 35 percent it

would be a significant failure and would result in a more significant impact on the provider's ability to remain certified, as outlined by the 3-step certification evaluation process for failed verification readings. Readings passing verification are considered verification level **green**, readings failing, but less than 35 percent difference are considered level **yellow**, and readings exceeding 35 percent difference are considered level **red**.

The data summary for the 13 providers on the 51 roadways evaluated are provided in Table 3 through Table 15. The tables include the providers name, month of data collection, project number (when provided/found), roadway name, marking type evaluated, TTI and Provider data, percent difference between the data sets for each marking evaluated, the verification level, whether the marking met the retroreflectivity requirements, and notes about the project. The tables are organized by provider. Each table may contain multiple jobs that were evaluated at the same time, or at different times. The results for meets marking retro requirements are Yes, No, or Maybe. Yes and no indicate TTI and the provider were in agreement that the retroreflectivity values were above or below the requirement. When the provider and TTI data are not in agreement on passing or failing the minimum retroreflectivity requirements, a Yes, No, or Maybe will result. The TTI data takes precedence, but the delay between provider and TTI readings needs to be considered, as well as how close the values are to the requirements. When data from both the provider and TTI are not available a judgement needs to be made on a single set of data to determine if the markings meet the requirements or not. This may result in a Yes, No, or Maybe. TTI intends to use past data to help determine a specific policy for results that are conflicting or lack both sets of data. This will be useful to determine if markings can be approved, must be restriped, or if referee testing needs to occur.

Data included in the tables but not considered in the overall comparison of the verification results are from projects when providers failed to submit retroreflectivity data, or when TTI measurements were taken well after the provider. The verification results were somewhat mixed, 59% green (good), 19% yellow (ok), and 22% red (poor) comparison. For the majority of the markings evaluated on each job the provider and TTI data compared well, but in some cases not as well. In most cases the provider and TTI data had the same results when evaluating whether the markings met the initial retroreflectivity performance requirements. In total, 76% of the markings evaluated met the retroreflectivity requirements, 17% were close to requirements, and 7% failed to meet requirements.

The comparison of the provider data with the TTI data was mixed as seen in the percentages above. Even within individual projects the results were often mixed. In total, 222 markings were included in the comparison evaluation. The associated accuracy levels were 131 green, 43 yellow, 48 red. This indicates the majority passed verification, but approximately 41 percent of the markings evaluated exceeded the verification accuracy requirements (20 percent). On a per project basis, 27 of the 51 projects had an average difference of all markings evaluated within the 20 percent threshold. The other 24 projects exceeded 20 percent difference between the provider and TTI data. The percent of projects meeting verification accuracy requirements were similar to previous years of the verification program.

A few things to note when looking at the data and some other general thoughts that may influence the program in the future. Many of these bullets are the same or similar to previous years:

- TTI readings were generally lower than the provider readings. Most TTI readings were taken after the provider readings. Even if some added degradation was accounted for the provider readings, especially on some yellow seal coat markings, were generally lower than TTI.
- The duration between the provider readings and the TTI readings may have some impact on the TTI readings being lower. Ideally TTI would evaluate on the same day, but that is often not possible unless multiple day advance notice is provided. The TTI readings being at a later time than the application would provide a better indication on the quality and durability of the marking. Large differences between the provider and TTI data mean the provider data is not highly accurate or the marking is wearing quickly.
- Yellow markings continue to be an issue, especially on seal coat roadways. Not only from a verification accuracy standpoint but from a meeting minimum retroreflectivity standpoint.
- Within an individual contractor the consistency of the verification accuracy is not always great between jobs and even within a single job. The difference across jobs may show some of the variability associated with mobile retro measurements and the impact of things like time, traffic volume, and installation quality. Differences within a job typically occur when changing stripe type, i.e. yellow vs white. This can show the variability associated with switching sides of the vehicle for measurement, the typical poorer quality of yellow striping, and the difficulty some contractors have in accurately measuring yellow, especially when the yellow is not performing well. The equipment used may also play a role in the repeatability of the accuracy of the measurements. The newer equipment seems to be easier to operate and calibrate than the older style equipment. This is an area that TTI will look into further. Potentially a requirement to phase out the older equipment may be useful in improving retroreflectivity measurement accuracy.
- TTI is frequently asked by providers about the need/requirement to evaluate profile pavement markings or rumble stripe pavement markings. TTI informs the providers that at the current time profile markings do not need to be evaluated unless stated to do so on the plans. Rumble stripe markings need to be evaluated as they are not a profile marking. Some contractors indicate that the District does not make them read rumble stripe markings.

Table 3. Barricades Unlimited, 4 Projects.

| | | | | | |
|---|-----------------------------|---------------------------|---------------------|---|---|
| Date: | 2/28/2020 | Construction | | New Thermoplastic on new asphalt | |
| Contractor: | Barricades Unlimited | Project Number: | 1357-01-026 | Roadway: | FM 2896 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Edge | 355 | 416 | 15.8 | Green | Yes |
| WB White Edge | 315 | 391 | 21.5 | Yellow | Yes |
| EB Yellow | 220 | 261 | 17.0 | Green | Yes |
| WB Yellow | 212 | 268 | 23.3 | Yellow | Yes |
| Notes: Yellow markings are on milled rumble, small section on white edge blocked by construction. | | | | | |
| Date: | 7/27/2020 | Maintenance | | Restripe | |
| Contractor: | Barricades Unlimited | Project Number: | 6348-21-001 | Roadway: | FM 2282 ref 34 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB Yellow | 131 | 84 | 43.7 | Red | No |
| WB Yellow | 177 | 125 | 34.4 | Yellow | Maybe |
| Notes: restripe on old sealcoat, sealcoat does not look that old | | | | | |
| Date: | 7/27/2020 | Maintenance | | Restripe | |
| Contractor: | Barricades Unlimited | Project Number: | 6348-21-001 | Roadway: | FM 2282 ref 21 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB Yellow | 170 | 156 | 8.6 | Green | No |
| WB Yellow | 176 | 142 | 21.4 | Yellow | Maybe |
| Notes: restripe on old sealcoat, sealcoat does not look that old. The contractors EB Yellow averages are left side 100, right side 212. | | | | | |
| Date: | 7/27/2020 | Maintenance | | Restripe | |
| Contractor: | Barricades Unlimited | Project Number: | 6348-21-001 | Roadway: | FM 789 ref 29 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB Yellow | 183 | 161 | 12.8 | Green | Maybe |
| SB Yellow | 225 | 235 | 4.3 | Green | Yes |
| Notes: restripe on old sealcoat, sealcoat does not look that old. The contractors SB Yellow averages are left side 208, right side 263. | | | | | |

Table 4. Batterson, 4 Projects.

| | | | | | | |
|-------------------------------------|--------------------|---------------------------|---------------------|--------------------------------|---|--|
| Date: | 8/28/2020 | Construction | | | | New thermoplastic on new sealcoat |
| Contractor: | Batterson | Project Number: | 1744-02-013 | Roadway: | FM 1862 | |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements | |
| EB White Edge | 444 | 480 | 7.8 | Green | Yes | |
| WB White Edge | 451 | 516 | 13.4 | Green | Yes | |
| EB Yellow | 231 | 243 | 5.1 | Green | Yes | |
| WB Yellow | 209 | 253 | 19.0 | Green | Yes | |
| Notes: Yellow marking are profiled. | | | | | | |
| Date: | 9/30/2019 | Maintenance | | Restripe on old asphalt | | |
| Contractor: | Batterson | Project Number: | 0913-00-104 | Roadway: | I 10 ref 3 | |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements | |
| EB White Edge | 863 | 733 | 16.3 | Green | Yes | |
| WB White Edge | 436 | 601 | 31.8 | Yellow | Yes | |
| EB White Skip | 650 | 711 | 9.0 | Green | Yes | |
| WB White Skip | 430 | 498 | 14.7 | Green | Yes | |
| EB Yellow | 319 | 364 | 13.2 | Green | Yes | |
| WB Yellow | 294 | 323 | 9.4 | Green | Yes | |
| Notes: | | | | | | |
| Date: | 9/30/2019 | Maintenance | | Restripe on old asphalt | | |
| Contractor: | Batterson | Project Number: | 0913-00-104 | Roadway: | I 10 ref 21 | |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements | |
| EB White Edge | 660 | 791 | 18.1 | Green | Yes | |
| WB White Edge | 556 | 671 | 18.7 | Green | Yes | |
| EB White Skip | 634 | 701 | 10.0 | Green | Yes | |
| WB White Skip | 532 | 632 | 17.2 | Green | Yes | |
| EB Yellow | 377 | 414 | 9.4 | Green | Yes | |
| WB Yellow | 361 | 353 | 2.2 | Green | Yes | |
| Notes: | | | | | | |

Table 4. Batterson, 4 Projects. (Continued)

| | | | | | |
|---------------------|--------------------|---------------------------|--------------------------------|---------------------------|---|
| Date: | 9/30/2019 | Maintenance | Restripe on old asphalt | | |
| Contractor: | Batterson | Project Number: | 0913-00-104 | Roadway: | US 77 ref 9 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 460 | 562 | 20.0 | Green | Yes |
| SB White Edge | 466 | 571 | 20.3 | Green | Yes |
| NB Yellow | 329 | 376 | 13.3 | Green | Yes |
| SB Yellow | 339 | 352 | 3.8 | Green | Yes |
| Notes: | | | | | |

Table 5. Crabtree, 2 Projects.

| | | | | | |
|---|--------------------|---------------------------|--|---------------------------|---|
| Date: | 8/4/2020 | Maintenance | Removal and restripe on old concrete | | |
| Contractor: | Crabtree | Project Number: | 6347-53-001 | Roadway: | US 69 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 444 | 467 | 5.0 | Green | Yes |
| Notes: | | | | | |
| Date: | 12/11/2019 | Maintenance | Restripe white on 4 month old asphalt | | |
| Contractor: | Crabtree | Project Number: | 1024-01-074 | Roadway: | FM 565 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Edge | 341 | 364 | 6.5 | Green | Yes |
| WB White Edge | 283 | 412 | 37.1 | Red | Yes |
| EB Yellow | 269 | 356 | 27.8 | Yellow | Yes |
| WB Yellow | 227 | 341 | 40.1 | Red | Yes |
| Notes: White markings were restriped after failing retro min. Restripe white on 4 month old asphalt. Yellow is from 4 months ago, however there were tire tracks that did not cross the markings so yellow may have been restriped in some spots. | | | | | |

Table 6. DIJ, 5 Projects.

| | | | | | |
|--|--------------------|---------------------------|---|---------------------------|---|
| Date: | 6/29/2020 | Maintenance | Restripe on old sealcoat | | |
| Contractor: | DIJ | Project Number: | 6356-31-001 | Roadway: | FM 2541 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Edge | 314 | 400 | 24.1 | Yellow | Yes |
| WB White Edge | 296 | 377 | 24.1 | Yellow | Yes |
| EB Yellow | 242 | 289 | 17.7 | Green | Yes |
| WB Yellow | 217 | 264 | 19.5 | Green | Yes |
| Notes: | | | | | |
| | | | | | |
| Date: | 6/29/2020 | Maintenance | Restripe on old asphalt | | |
| Contractor: | DIJ | Project Number: | 6356-31-001 | Roadway: | SL 463 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 478 | 529 | 10.1 | Green | Yes |
| SB White Edge | 447 | 509 | 13.0 | Green | Yes |
| NB White Skip | 488 | 559 | 13.6 | Green | Yes |
| SB White Skip | 474 | 547 | 14.3 | Green | Yes |
| NB Yellow | 292 | 325 | 10.7 | Green | Yes |
| SB Yellow | 295 | 329 | 10.9 | Green | Yes |
| Notes: | | | | | |
| | | | | | |
| Date: | 7/14/2020 | Construction | New thermoplastic on new black sealcoat. | | |
| Contractor: | DIJ | Project Number: | 2686-01-014 | Roadway: | FM 2571 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Edge | 324 | N/A | N/A | N/A | Yes |
| WB White Edge | 351 | N/A | N/A | N/A | Yes |
| EB Yellow | 250 | 256 | 2.4 | Green | Yes |
| WB Yellow | 248 | 241 | 2.9 | Green | Yes |
| Notes: Possible restripe over paint. Rumbles were on inside of double yellow on curves and over some of the broken yellow. White stripes are profiled. | | | | | |

Table 6. DIJ, 5 Projects. (Continued)

| Date: | 10/31/2019 | Maintenance | Restripe on old sealcoat | | | |
|---|-------------|--------------------|--------------------------|--------------------|----------------------------------|--|
| Contractor: | DIJ | Project Number: | 0335-01-031 | Roadway: | SH 7 W | |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements | |
| EB White Edge | 456 | 472 | 3.4 | Green | Yes | |
| WB White Edge | 475 | 474 | 0.2 | Green | Yes | |
| EB Yellow | 322 | 327 | 1.5 | Green | Yes | |
| WB Yellow | 308 | 340 | 9.9 | Green | Yes | |
| Notes: SH 7 E at mile 3.8 EB to end white markings were on milled rumble. Yellow middle line on rumble double yellow partially on rumble. | | | | | | |

| Date: | 10/31/2019 | Maintenance | Restripe on old sealcoat | | | |
|---|-------------|--------------------|--------------------------|--------------------|----------------------------------|--|
| Contractor: | DIJ | Project Number: | 0335-01-031 | Roadway: | SH 7 E | |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements | |
| EB White Edge | 469 | 431 | 8.4 | Green | Yes | |
| WB White Edge | 466 | 442 | 5.3 | Green | Yes | |
| EB Yellow | 350 | 344 | 1.7 | Green | Yes | |
| WB Yellow | 353 | 347 | 1.7 | Green | Yes | |
| Notes: SH 7 E at mile 3.8 EB to end white markings were on milled rumble. Yellow middle line on rumble double yellow partially on rumble. | | | | | | |

Table 7. Double A, 1 Project.

| Date: | 7/28/2020 | Construction | Yellow restripe, white new thermoplastic on new asphalt. | | | |
|---|-------------|--------------------|--|--------------------|----------------------------------|--|
| Contractor: | Double A | Project Number: | 1360-02-010 | Roadway: | FM 1226 | |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements | |
| NB White Edge | 459 | 429 | 6.8 | Green | Yes | |
| SB White Edge | 309 | 315 | 1.9 | Green | Yes | |
| NB Yellow | 212 | 241 | 12.8 | Green | Yes | |
| SB Yellow | 200 | 292 | 37.4 | Red | Yes | |
| Notes: Markings are profiled, contractor yellow max was in the 500s, at least one RPM was not filtered. | | | | | | |

Table 8. Flasher, 3 Projects.

| | | | | | |
|---|--------------------|---------------------------|---|---------------------------|---|
| Date: | 1/7/2020 | Construction | New thermoplastic on new asphalt | | |
| Contractor: | Flasher | Project Number: | 0055-08-119 | Roadway: | FM 84 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Edge | 338 | N/A | N/A | N/A | Yes |
| WB White Edge | 338 | 340 | 0.6 | Green | Yes |
| EB White Skip | 248 | 235 | 5.4 | Green | No |
| WB White Skip | 172 | 163 | 5.4 | Green | No |
| EB Yellow | 115 | 109 | 5.4 | Green | No |
| WB Yellow | 167 | 163 | 2.4 | Green | No |
| Notes: WB white edge had section with low bead coverage, most of yellow EB was blocked by road construction | | | | | |
| Date: | 3/3/2020 | Construction | New thermoplastic on new asphalt | | |
| Contractor: | Flasher | Project Number: | 1192-01-024 | Roadway: | FM 939 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Edge | 292 | 424 | 36.9 | Red | Yes |
| WB White Edge | 233 | 369 | 45.2 | Red | Maybe |
| EB Yellow | 177 | 229 | 25.6 | Yellow | Yes |
| WB Yellow | 194 | 238 | 20.4 | Yellow | Yes |
| Notes: Only half the section was striped, yellow lines on milled rumbles. | | | | | |
| Date: | 7/27/2020 | Construction | New thermoplastic on new asphalt | | |
| Contractor: | Flasher | Project Number: | 0183-04-053 | Roadway: | SH 36 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 397 | 452 | 13.0 | Green | Yes |
| SB White Edge | 407 | 426 | 4.6 | Green | Yes |
| NB Yellow | 140 | 177 | 23.3 | Yellow | Maybe |
| SB Yellow | 145 | 168 | 14.7 | Green | No |
| Notes: TTI started after bridge, it was closed off. Milled rumbles on yellow markings. | | | | | |

Table 9. Highway Barricades Services (HBS), 2 Project.

| | | | | | |
|---|--|---------------------------|--|---------------------------|---|
| Date: | 8/21/2020 | Construction | New thermoplastic on new sealcoat | | |
| Contractor: | Highway Barricades & Services | Project Number: | 0100-12-009 | Roadway: | FM 2509 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 297 | 372 | 22.4 | Yellow | Yes |
| SB White Edge | 346 | 362 | 4.5 | Green | Yes |
| NB Yellow | 126 | N/A | N/A | N/A | No |
| SB Yellow | 141 | 406 | 96.9 | Red | No |
| Notes: Yellow RRPMs not filtered. | | | | | |
| Date: | 8/21/2020 | Construction | New thermoplastic on new asphalt | | |
| Contractor: | Highway Barricades & Services | Project Number: | 6341-08-001 | Roadway: | US 59 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 460 | 351 | 26.9 | Yellow | Yes |
| SB White Edge | 457 | 728 | 45.7 | Red | Yes |
| NB White Skip | 445 | 553 | 21.6 | Yellow | Yes |
| SB White Skip | 474 | 537 | 12.5 | Green | Yes |
| NB Yellow | 263 | 384 | 37.4 | Red | Yes |
| SB Yellow | 278 | 348 | 22.4 | Yellow | Yes |
| Notes: String of sections around the existing concrete white skip RRPM not filtered | | | | | |

Table 10. Highway Data Services, 6 Projects.

| | | | | | |
|--|------------------------------|---------------------------|--|---------------------------|---|
| Date: | 9/27/2019 | Construction | New thermoplastic on new sealcoat | | |
| Contractor: | Highway Data Services | Project Number: | 0057-03-042 | Roadway: | SH 36 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 338 | 392 | 14.8 | Green | Yes |
| SB White Edge | 297 | 367 | 21.1 | Yellow | Yes |
| NB Yellow | 117 | 204 | 54.2 | Red | Maybe |
| SB Yellow | 117 | 203 | 53.8 | Red | Maybe |
| Notes: Tabs were present in yellow center line. The SB tabs seemed to have little impact however the NB tabs seem to affect the measurement making them about 20 lower. The clear sections still scanned below retro requirements. | | | | | |
| Date: | 9/27/2019 | Construction | Some new thermoplastic on new asphalt, some restripe on old concrete with patches | | |
| Contractor: | Highway Data Services | Project Number: | 0050-01-086 | Roadway: | BS 6R |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Skip 1 | 415 | 381 | 8.5 | Green | Yes |
| WB White Skip 1 | 473 | 406 | 15.2 | Green | Yes |
| EB White Skip 2 | 394 | 390 | 1.0 | Green | Yes |
| WB White Skip 2 | 448 | 403 | 10.6 | Green | Yes |
| Notes: Some of the old markings were visible and picked up by the unit. this may have lowered the average retro value. | | | | | |
| Date: | 9/27/2019 | Maintenance | Restripe on old concrete | | |
| Contractor: | Highway Data Services | Project Number: | 3138-01-031 | Roadway: | FM 2347 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Skip | 473 | 397 | 17.5 | Green | Yes |
| SB White Skip | 477 | 426 | 11.3 | Green | Yes |
| Notes: | | | | | |

Table 10. Highway Data Services, 6 Projects. (Continued)

| | | | | | |
|---------------------|------------------------------|---------------------------|---------------------|---|---|
| Date: | 10/31/2019 | Maintenance | | Restripe on sealcoat | |
| Contractor: | Highway Data Services | Project Number: | 6303-96-001 | Roadway: | FM 39 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 243 | 296 | 19.7 | Green | Maybe |
| SB White Edge | 245 | 283 | 14.4 | Green | Maybe |
| Notes: | | | | | |
| | | | | | |
| Date: | 10/31/2019 | Maintenance | | Restripe on sealcoat | |
| Contractor: | Highway Data Services | Project Number: | 6303-96-001 | Roadway: | FM 1511 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 247 | 294 | 17.4 | Green | Maybe |
| SB White Edge | 260 | 287 | 9.9 | Green | Yes |
| NB Yellow | 203 | 179 | 12.6 | Green | Yes |
| SB Yellow | 189 | 181 | 4.3 | Green | Yes |
| Notes: | | | | | |
| | | | | | |
| Date: | 8/31/2020 | Maintenance | | Removal and Restripe on concrete | |
| Contractor: | Highway Data Services | Project Number: | 6315-49-001 | Roadway: | US 377 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Edge | 361 | 445 | 20.8 | Yellow | Yes |
| WB White Edge | 414 | 470 | 12.7 | Green | Yes |
| EB White Skip 1 | 467 | 380 | 20.5 | Yellow | Yes |
| WB White Skip 1 | 440 | 399 | 9.8 | Green | Yes |
| EB White Skip 2 | 442 | 393 | 11.7 | Green | Yes |
| WB White Skip 2 | 481 | 375 | 24.8 | Yellow | Yes |
| EB Yellow | 253 | 266 | 5.0 | Green | Yes |
| WB Yellow | 263 | 265 | 0.8 | Green | Yes |
| Notes: | | | | | |

Table 11. Stripe A Zone, 10 Projects.

| | | | | | |
|--|----------------------|---------------------------|---|---------------------------|---|
| Date: | 1/9/2020 | Construction | New thermoplastic on new asphalt | | |
| Contractor: | Stripe-A-Zone | Project Number: | 1601-01-032 | Roadway: | FM 1010 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 417 | 408 | 2.2 | Green | Yes |
| SB White Edge | 406 | 424 | 4.3 | Green | Yes |
| NB Yellow Left | 210 | 236 | 11.7 | Green | Yes |
| NB Yellow Right | 171 | 228 | 28.6 | Yellow | Maybe |
| SB Yellow Left | 204 | 245 | 18.3 | Green | Yes |
| SB Yellow Right | 240 | 289 | 18.5 | Green | Yes |
| Notes: Curves had milled rumbles that are partially on double yellow lines, yellow skip are rumble. Some on the white markings where on rumbles. | | | | | |
| Date: | 2/14/2020 | Maintenance | Restripe on old sealcoat | | |
| Contractor: | Stripe-A-Zone | Project Number: | 0816-02-084 | Roadway: | FM 455 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Edge | 396 | 487 | 20.6 | Green | Yes |
| WB White Edge | 442 | 568 | 25.0 | Yellow | Yes |
| EB Yellow Left | 168 | 320 | 62.3 | Red | Maybe |
| EB Yellow Right | 164 | 318 | 63.9 | Red | Maybe |
| WB Yellow Left | 190 | 326 | 52.7 | Red | Yes |
| WB Yellow Right | 166 | 327 | 65.3 | Red | Maybe |
| Notes: yellow markings were on milled rumbles | | | | | |
| Date: | 2/14/2020 | Maintenance | Restripe on old sealcoat | | |
| Contractor: | Stripe-A-Zone | Project Number: | 0081-06-041 | Roadway: | US 377 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 378 | 463 | 20.2 | Green | Yes |
| SB White Edge | 358 | 437 | 19.9 | Green | Yes |
| NB Yellow Left | 197 | 285 | 36.5 | Red | Yes |
| NB Yellow Right | 192 | 320 | 50.0 | Red | Yes |
| SB Yellow Left | 217 | 289 | 28.5 | Yellow | Yes |
| SB Yellow Right | 223 | 353 | 45.1 | Red | Yes |
| Notes: | | | | | |

Table 11. Stripe A Zone, 10 Projects. (Continued)

| | | | | | |
|---|----------------------|---------------------------|---------------------|----------------------------------|---|
| Date: | 7/27/2020 | Construction | | New paint on new sealcoat | |
| Contractor: | Stripe-A-Zone | Project Number: | 0007-14-007 | Roadway: | FM 2945 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB Yellow Left | 67 | 127 | 61.9 | Red | Maybe |
| EB Yellow Right | 62 | 125 | 67.4 | Red | Maybe |
| WB Yellow Left | 120 | 187 | 43.6 | Red | Yes |
| WB Yellow Right | 135 | 227 | 50.8 | Red | Yes |
| Notes: Roadway was very bumpy, roads tabs were present but they did not block the double lines. | | | | | |
| Date: | 7/27/2020 | Construction | | New paint on new sealcoat | |
| Contractor: | Stripe-A-Zone | Project Number: | 0714-02-016 | Roadway: | PR 33 REF 21 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB Yellow Left | 132 | 170 | 25.2 | Yellow | Yes |
| NB Yellow Right | 137 | 194 | 34.4 | Yellow | Yes |
| SB Yellow Left | 55 | 140 | 87.2 | Red | Maybe |
| SB Yellow Right | 54 | 139 | 88.1 | Red | Maybe |
| Notes: | | | | | |
| Date: | 7/27/2020 | Construction | | New paint on new sealcoat | |
| Contractor: | Stripe-A-Zone | Project Number: | 0714-02-015 | Roadway: | PR 33 REF 20 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB Yellow Left | 100 | 222 | 75.8 | Red | Yes |
| NB Yellow Right | 105 | 254 | 83.0 | Red | Yes |
| SB Yellow Left | 70 | 151 | 73.3 | Red | Maybe |
| SB Yellow Right | 72 | 171 | 81.5 | Red | Maybe |
| Notes: | | | | | |

Table 11. Stripe A Zone, 10 Projects. (Continued)

| | | | | | |
|--|----------------------|---|---------------------|---------------------------|---|
| Date: | 8/31/2020 | Maintenance Restripe thermoplastic on old concrete | | | |
| Contractor: | Stripe-A-Zone | Project Number: | 2299-02-158 | Roadway: | SH 360 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Skip 1 | 466 | 386 | 18.8 | Green | Yes |
| WB White Skip 1 | 475 | 375 | 23.5 | Yellow | Yes |
| EB White Skip 2 | 490 | 456 | 7.2 | Green | Yes |
| WB White Skip 2 | 499 | 480 | 3.9 | Green | Yes |
| Notes: skips are contrast markings, the white edge and yellow edge are profiled. | | | | | |
| Date: | 9/13/2019 | Maintenance Restripe on old concrete | | | |
| Contractor: | Stripe-A-Zone | Project Number: | 1014-03-060 | Roadway: | FM 740 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 426 | 459 | 7.5 | Green | Yes |
| SB White Edge | 337 | 391 | 14.8 | Green | Yes |
| NB White Skip | 458 | 547 | 17.7 | Green | Yes |
| SB White Skip | 362 | 493 | 30.6 | Yellow | Yes |
| NB Yellow | 222 | 258 | 15.0 | Green | Yes |
| SB Yellow | 236 | 262 | 10.4 | Green | Yes |
| Notes: Most of the old markings were removed with waterblast. | | | | | |
| Date: | 9/13/2019 | Maintenance Restripe on old concrete | | | |
| Contractor: | Stripe-A-Zone | Project Number: | 0009-04-071 | Roadway: | SH 66 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Edge | 400 | 454 | 12.6 | Green | Yes |
| WB White Edge | 468 | 517 | 9.9 | Green | Yes |
| EB White Skip | 427 | 581 | 30.6 | Yellow | Yes |
| WB White Skip | 440 | 563 | 24.5 | Yellow | Yes |
| EB Yellow | 224 | 282 | 22.9 | Yellow | Yes |
| WB Yellow | 219 | 278 | 23.7 | Yellow | Yes |
| Notes: Most of the old markings were removed with waterblast. | | | | | |

Table 11. Stripe A Zone, 10 Projects. (Continued)

| | | | | | | |
|---|----------------------|---------------------------|---------------------|---------------------------|---|---|
| Date: | 10/22/2019 | Construction | | | | New thermoplastic on new asphalt |
| Contractor: | Stripe-A-Zone | Project Number: | 0183-01-045 | Roadway: | SH 36 | |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements | |
| EB White Edge | 460 | 473 | 2.8 | Green | Yes | |
| WB White Edge | 569 | 531 | 6.9 | Green | Yes | |
| EB Yellow Left | 261 | 265 | 1.5 | Green | Yes | |
| EB Yellow Right | 264 | 321 | 19.5 | Green | Yes | |
| WB Yellow Left | 273 | 287 | 5.0 | Green | Yes | |
| WB Yellow Right | 267 | 327 | 20.2 | Green | Yes | |
| Notes: Milled rumbles outside of Gustine and not on bridges, Yellow single line on rumbles and yellow double lines partially on rumble. | | | | | | |

Table 12. Striping Technology, 4 Projects.

| | | | | | | |
|---|----------------------------|---------------------------|---------------------|---------------------------|---|--|
| Date: | 1/13/2020 | Construction | | | | New thermoplastic on new asphalt. |
| Contractor: | Striping Technology | Project Number: | 0561-01-024 | Roadway: | SH 274 | |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements | |
| NB White Edge | 417 | 475 | 13.0 | Green | Yes | |
| SB White Edge | 432 | 461 | 6.5 | Green | Yes | |
| NB Yellow | 201 | 187 | 7.2 | Green | Yes | |
| SB Yellow | 213 | 189 | 11.9 | Green | Yes | |
| Notes: These measurements were taken from the north side of the section. The lines were put down in October and TTI read them in January. | | | | | | |

Table 12. Striping Technology, 4 Projects. (Continued)

| | | | | | |
|--|----------------------------|---------------------------|---|---------------------------|---|
| Date: | 1/13/2020 | Construction | New thermoplastic on new asphalt. | | |
| Contractor: | Striping Technology | Project Number: | 0561-01-024 | Roadway: | SH 274 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 456 | 322 | 34.4 | Yellow | Yes |
| SB White Edge | 472 | 353 | 28.8 | Yellow | Yes |
| NB Yellow | 202 | 283 | 33.4 | Yellow | Yes |
| SB Yellow | 209 | 235 | 11.7 | Green | Yes |
| Notes: Section is a short section where island was moved, TTI SB white is based off of a single point because the unit was paused in this section. | | | | | |
| Date: | 8/19/2020 | Maintenance | Restripe on old concrete and asphalt | | |
| Contractor: | Striping Technology | Project Number: | 0162-04-059 | Roadway: | SH 31 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Skip | 598 | 351 | 52.1 | Red | Yes |
| WB White Skip | 619 | 350 | 55.5 | Red | Yes |
| Notes: | | | | | |
| Date: | 10/22/2019 | Construction | New thermoplastic on new asphalt | | |
| Contractor: | Striping Technology | Project Number: | 0196-01-106 | Roadway: | I 35 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| SB White Edge | 220 | 255 | 14.7 | Green | Maybe |
| SB White Skip | 116 | 223 | 63.1 | Red | No |
| Notes: Skip markings had low retro, many of the measurements were below 100. | | | | | |

Table 13. Total Highway Maintenance, 1 Project.

| | | | | | |
|---------------------|----------------------------------|---|---------------------|---------------------------|---|
| Date: | 9/13/2019 | Construction New thermoplastic on new asphalt | | | |
| Contractor: | Total Highway Maintenance | Project Number: | 0095-13-043 | Roadway: | I 20 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| WB White Edge | 474 | 355 | 28.7 | Yellow | Yes |
| WB White Skip | 444 | 238 | 60.4 | Red | Maybe |
| WB Yellow | 199 | 229 | 14.0 | Green | Yes |
| Notes: | | | | | |

Table 14. TRP, 5 Projects.

| | | | | | |
|--|--------------------|---|---------------------|---------------------------|---|
| Date: | 2/13/2020 | Construction New thermoplastic on new asphalt | | | |
| Contractor: | TRP | Project Number: | 1603-03-039 | Roadway: | FM 1709 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Skip Inside | 523 | 396 | 27.6 | Yellow | Yes |
| WB White Skip Inside | 504 | 414 | 19.6 | Green | Yes |
| EB White Skip Outside | 534 | 397 | 29.4 | Yellow | Yes |
| WB White Skip Outside | 496 | 380 | 26.5 | Yellow | Yes |
| EB Yellow Edge | 178 | 201 | 12.1 | Green | Yes |
| WB Yellow Edge | 185 | 221 | 17.7 | Green | Yes |
| Notes: Some tabs were showing on white skips, they did not block the line. A few turn bays were not resurfaced and restriped. Yellow markings were wet and dirty around flower bed median. | | | | | |

Table 14. TRP, 5 Projects. (Continued)

| | | | | | |
|--|--------------------|---------------------------|---|---------------------------|---|
| Date: | 7/23/2020 | Construction | New thermoplastic on new asphalt | | |
| Contractor: | TRP | Project Number: | 0266-01-083 | Roadway: | SH 71 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Edge | 385 | 378 | 1.8 | Green | Yes |
| WB White Edge | 413 | 383 | 7.5 | Green | Yes |
| EB Yellow Left | 212 | 226 | 6.4 | Green | Yes |
| EB Yellow Right | 202 | 210 | 3.9 | Green | Yes |
| WB Yellow Left | 190 | 192 | 1.0 | Green | Yes |
| WB Yellow Right | 196 | 235 | 18.1 | Green | Yes |
| Notes: When TTI checked site the south side marking were not finished yet. Contractor measured data in two trips because of hardware issues. | | | | | |
| Date: | 9/24/2019 | Maintenance | Restripe on newer sealcoat | | |
| Contractor: | TRP | Project Number: | 0396-02-028 | Roadway: | SH 29 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Edge | 460 | 283 | 47.6 | Red | Yes |
| WB White Edge | 443 | 308 | 36.0 | Red | Yes |
| EB Yellow Left | 170 | 186 | 9.0 | Green | Maybe |
| EB Yellow Right | 173 | 191 | 9.9 | Green | Maybe |
| WB Yellow Left | 146 | 159 | 8.5 | Green | No |
| WB Yellow Right | 148 | 165 | 10.9 | Green | No |
| Notes: Had profiled center and edge lines. | | | | | |

Table 14. TRP, 5 Projects. (Continued)

| | | | | | |
|--|--------------------|---------------------------|---------------------|---------------------------------|---|
| Date: | 9/24/2019 | Maintenance | | Restripe on old sealcoat | |
| Contractor: | TRP | Project Number: | 0071-05-031 | Roadway: | US 87 M |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 523 | 361 | 36.7 | Red | Yes |
| SB White Edge | 507 | 421 | 18.5 | Green | Yes |
| NB Yellow Left | 217 | 171 | 23.7 | Yellow | Yes |
| NB Yellow Right | 224 | 182 | 20.7 | Yellow | Yes |
| SB Yellow Left | 147 | 139 | 5.6 | Green | No |
| SB Yellow Right | 156 | 140 | 10.8 | Green | No |
| Notes: Had profiled center and edge lines. | | | | | |
| Date: | 9/24/2019 | Maintenance | | Restripe on old sealcoat | |
| Contractor: | TRP | Project Number: | 0071-06-059 | Roadway: | US 87 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| NB White Edge | 475 | 337 | 34.0 | Yellow | Yes |
| SB White Edge | 454 | 465 | 2.4 | Green | Yes |
| NB Yellow Left | 219 | 179 | 20.1 | Green | Yes |
| NB Yellow Right | 220 | 181 | 19.5 | Green | Yes |
| SB Yellow Left | 156 | 143 | 8.7 | Green | No |
| SB Yellow Right | 149 | 143 | 4.1 | Green | No |
| Notes: Had profiled center and edge lines. | | | | | |

Table 15. Vizcaino, 4 Projects.

| | | | | | |
|---------------------|--------------------|---|---------------------|---------------------------|---|
| Date: | 7/28/2020 | Maintenance Restripe on old sealcoat | | | |
| Contractor: | Vizcaino | Project Number: | 0905-00-094 | Roadway: | SH 86 Ref 1 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Edge | 458 | 408 | 11.5 | Green | Yes |
| WB White Edge | 396 | 378 | 4.7 | Green | Yes |
| EB Yellow Left | 151 | 235 | 43.5 | Red | Maybe |
| EB Yellow Right | 150 | 265 | 55.4 | Red | Maybe |
| WB Yellow Left | 162 | 212 | 26.7 | Yellow | Maybe |
| WB Yellow Right | 179 | 220 | 20.6 | Yellow | Yes |
| Notes: | | | | | |
| | | | | | |
| Date: | 7/28/2020 | Maintenance Restripe on old sealcoat | | | |
| Contractor: | Vizcaino | Project Number: | 0905-00-094 | Roadway: | FM 1914 Ref 6 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB Yellow Left | 115 | 189 | 48.7 | Red | Maybe |
| EB Yellow Right | 144 | 204 | 34.5 | Yellow | Maybe |
| WB Yellow Left | 103 | 188 | 58.4 | Red | Maybe |
| WB Yellow Right | 98 | 190 | 63.9 | Red | Maybe |
| Notes: | | | | | |
| | | | | | |
| Date: | 7/28/2020 | Maintenance Restripe on old sealcoat | | | |
| Contractor: | Vizcaino | Project Number: | 0905-00-094 | Roadway: | FM 788 ref 3 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB White Edge | 317 | 264 | 18.2 | Green | Yes |
| WB White Edge | 359 | 345 | 4.0 | Green | Yes |
| EB Yellow Left | 125 | 205 | 48.5 | Red | Maybe |
| EB Yellow Right | 125 | 235 | 61.1 | Red | Maybe |
| WB Yellow Left | 152 | 231 | 41.3 | Red | Maybe |
| WB Yellow Right | 156 | 239 | 42.0 | Red | Maybe |
| Notes: | | | | | |

Table 15. Vizcaino, 4 Projects. (Continued)

| | | | | | |
|---------------------|--------------------|---------------------------|---------------------|---------------------------------|---|
| Date: | 7/28/2020 | Maintenance | | Restripe on old sealcoat | |
| Contractor: | Vizcaino | Project Number: | 0905-00-094 | Roadway: | Fm 788 ref 7 |
| Marking Type | TTI Average | Contractor Average | % Difference | Verification Level | Meets Marking Retro Requirements |
| EB Yellow Left | 117 | 193 | 49.0 | Red | Maybe |
| EB Yellow Right | 137 | 235 | 52.7 | Red | Maybe |
| WB Yellow Left | 111 | 187 | 51.0 | Red | Maybe |
| WB Yellow Right | 117 | 204 | 54.2 | Red | Maybe |
| Notes: | | | | | |

Providers whose results did not meet the accuracy requirements were provided possible reasons for the data differences and were instructed to make the necessary changes for future evaluations. Filtering out RRPMS properly (old and new Laserlux system issue), proper calibration (all systems), maintaining a clean retroreflectometer (especially with the new laserlux), and taking periodic checks against a portable retroreflectometer (a common technique to verify one’s own data) were suggestions to improve data accuracy. It is the verification program’s goal to reevaluate providers who had poor verification data within a short timeframe to ensure proper changes were implemented to improve data, or the loss of certification could result. This is dependent on the providers sending in notifications and responding to requests. TTI will try to more frequently monitor providers who have poor or marginal performance. If performance does not improve certification status will be evaluated by the review committee.

Verification Results Summary

In total, 521 projects were let that contained Item 666 pavement markings with retroreflectivity requirements. There were 355 projects exceeding 20,000 lf, 281 projects exceeding 50,000 lf, and 132 projects exceeding 200,000 lf. The sixth-year data collection evaluated 51 different pavement marking jobs from 13 different providers. Three providers were removed from the certification list for failure to provide any notifications or from no communication. From a quantity of jobs evaluated compared to quantity of projects let, TTI evaluated approximately 10 percent of the total projects let, 14 percent of projects exceeding 20,000 lf, 18 percent exceeding 50,000 lf, and 39 percent exceeding 200,000 lf. The goal for the evaluation percentage was between 10 and 15 percent of projects utilizing mobile retroreflectivity. TTI met the evaluation goal of approximately 15 percent of projects, if the total number of projects considered were those exceeding 20,000 lf. All projects larger than 50,000 lf require mobile retroreflectivity. Projects between 20,000 lf and 50,000 lf can use portable or mobile retroreflectometers.

The verification results were somewhat mixed, 59% good, 19% ok, and 22% poor comparison. For the majority of the markings evaluated on each job the provider and TTI data compared well, but in some cases not as well. In most cases the provider and TTI data had the same results when evaluating whether the markings met the initial retroreflectivity performance requirements. In total 76% of the markings evaluated met retroreflectivity requirements, 17% were close to requirements, and 7% failed to meet requirements. TTI is beginning the process of notifying

Districts of the results of the verification testing. It is a challenge to collect the data, get the provider data, analyze the two data sets, and generate the results in a timely fashion. This needs to be done in a timely fashion if the results are disputed, else the conditions would have changed between when the tests occurred and when the referee process could take place. TTI continues to notify the providers of the results and provides comments on corrective actions to improve future data collection efforts.

Several providers are on various stages of the 3-step certification evaluation process. At the end of FY 2020 there were sixteen certified providers. Six providers are at step zero due to good verification results. Three providers are at step one for poor results and/or lack of notifications resulting in few evaluations. Seven providers are at step two for bad results and or poor results with a lack of notifications. If these providers have poor or bad data during their next evaluation, they will be considered for certification status evaluation by the evaluation committee. Three providers lost their certification status for failure to provide notifications and lack of communication. Several providers are on the verge of having their certification status evaluated due to a combination of collected data and limited notifications.

Additional Verification Result Information

Table 3 to Table 15 provide the general results of each field verification evaluation. The data from those tables were used to generate the figures in this section to further explore the results. Figure 4 through Figure 15 provide overall project averages for each provider for each project evaluated. The figures provide the count of the number of stripes that meet the minimum retroreflectivity requirements. The figures then break down the results by roadway surface type (new seal coat, asphalt/concrete, and restripe). Restripe is included as its own category because the quality of stripe is typically different than the other categories. The restripe category could be on any roadway surface. The verification percent difference results for each stripe type on each surface for each job is also provided. The two sets of data for each job represent the opposite direction of travel for each marking section. The data provided in these figures is another way to look at the previously provided tables. These figures combined data across providers to show the impact of road surface and line type.

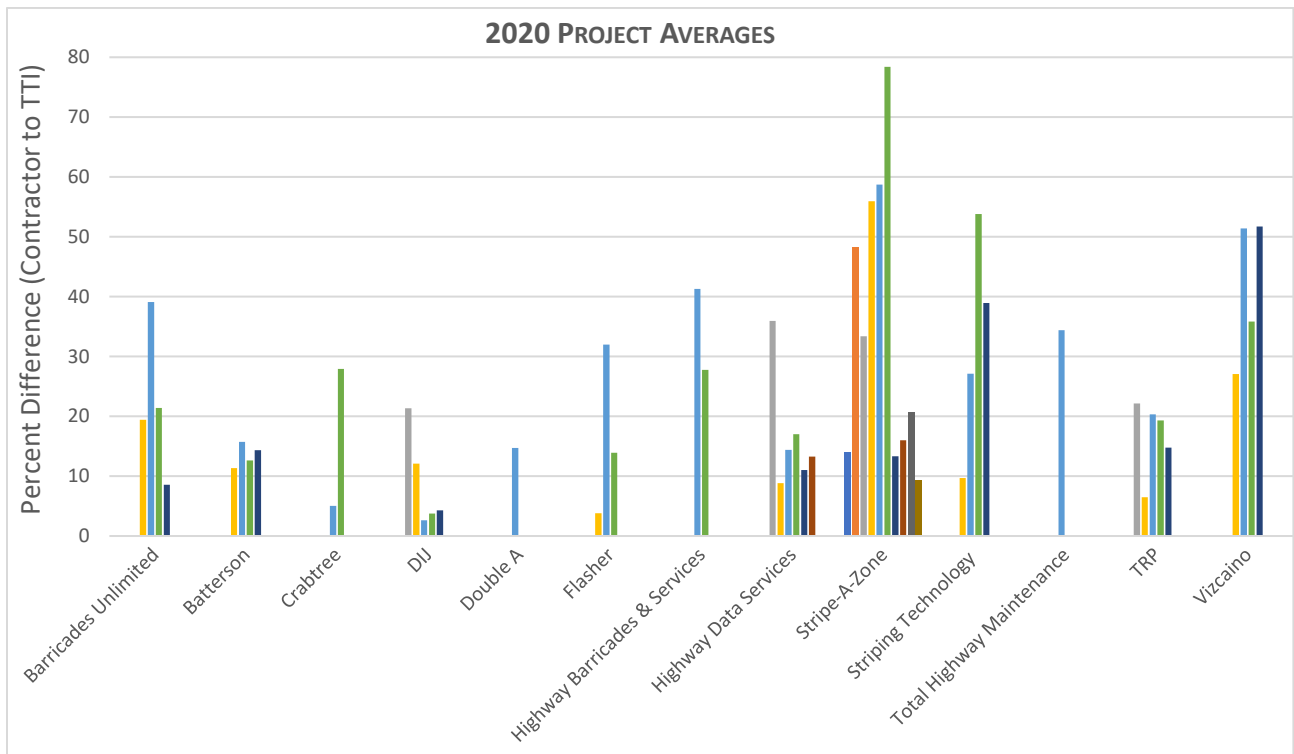


Figure 4. FY 2020, All Provider Verification Percent Difference Results.

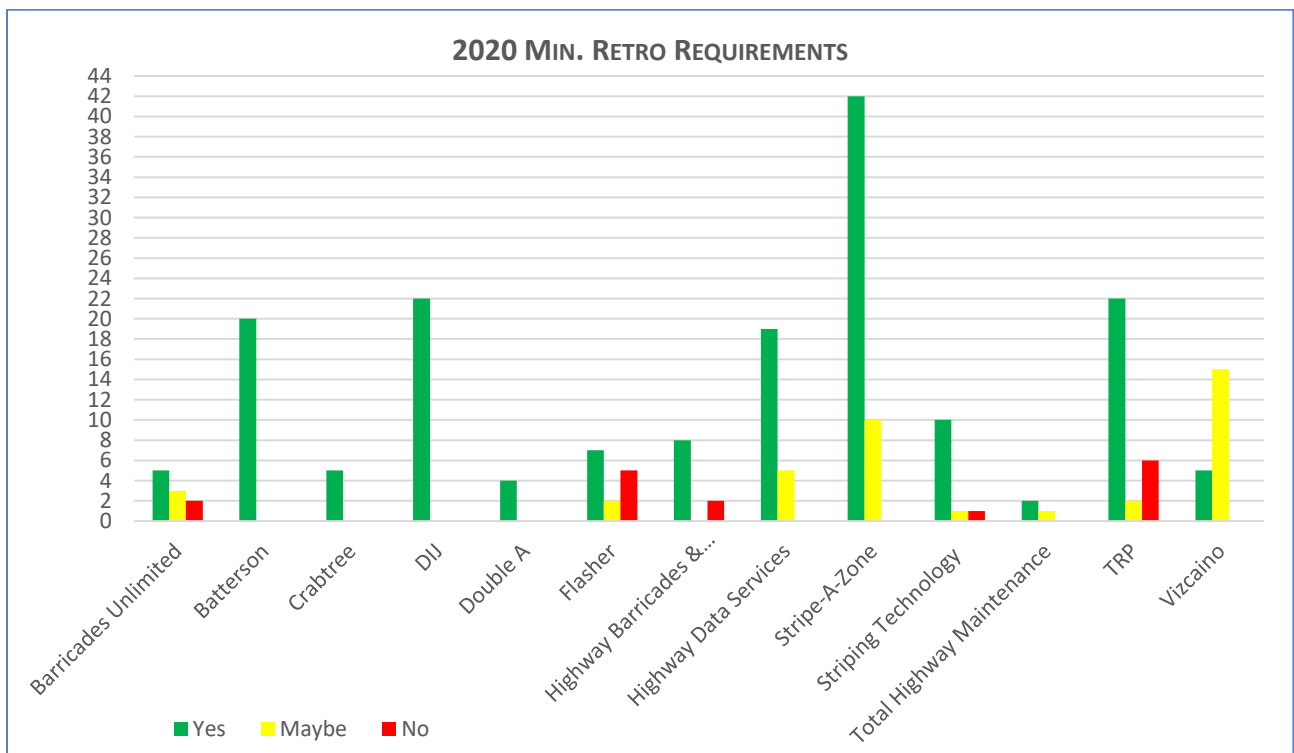


Figure 5. FY 2020, All Provider Verification Minimum Retroreflectivity Results.

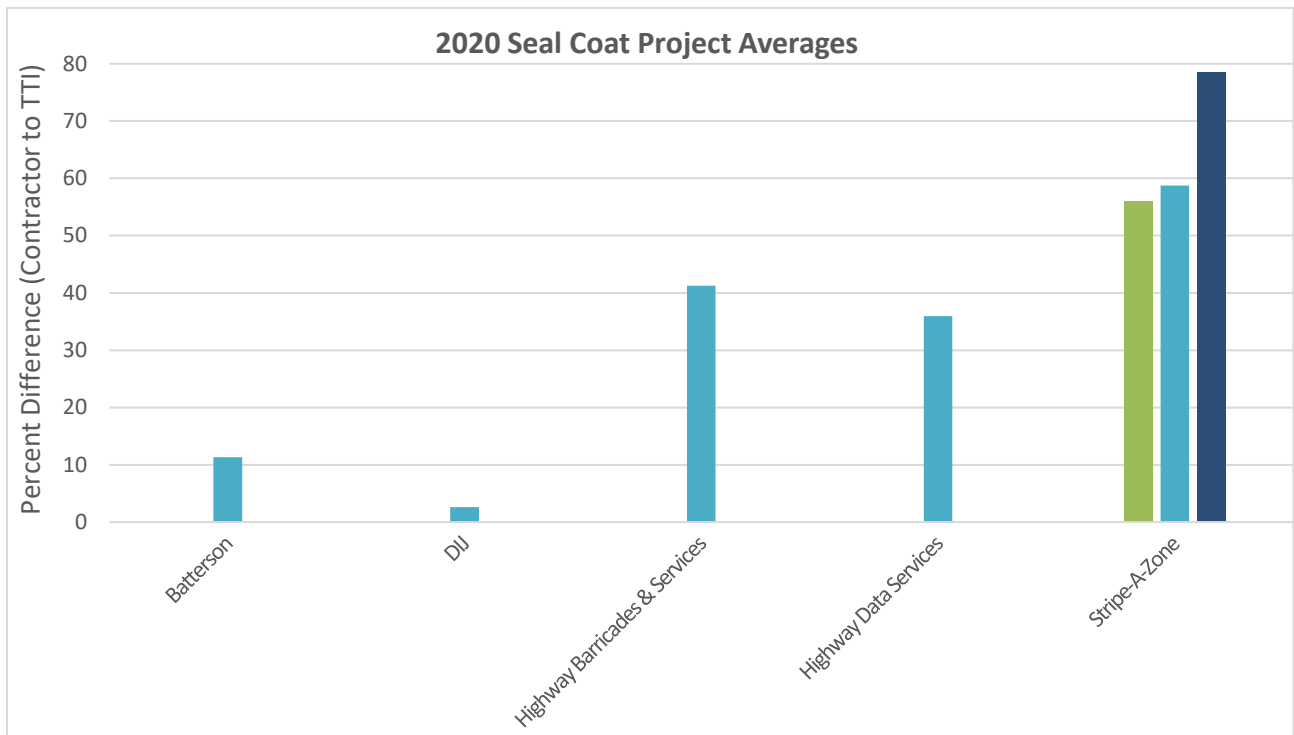


Figure 6. Verification Results on New Seal Coat Evaluations.

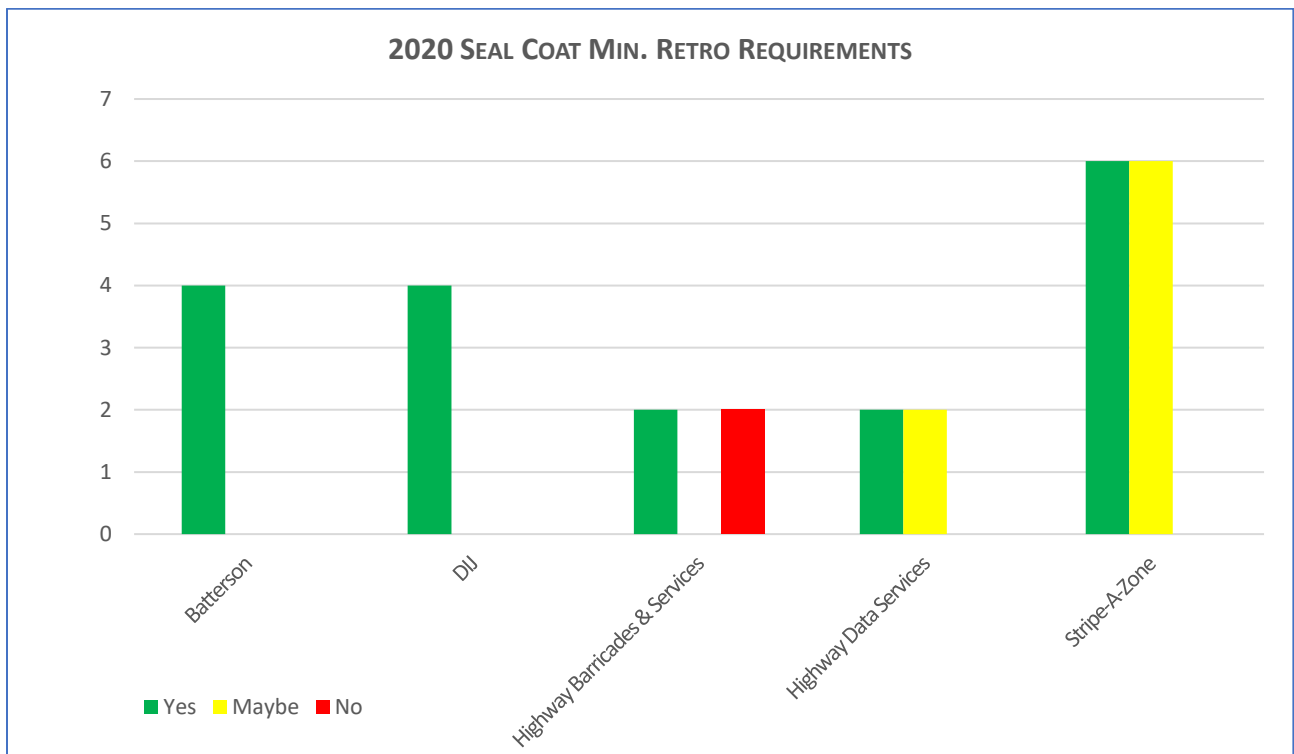


Figure 7. Count of Stripes Meeting Minimum Retroreflectivity Requirements on New Seal Coat Evaluations.

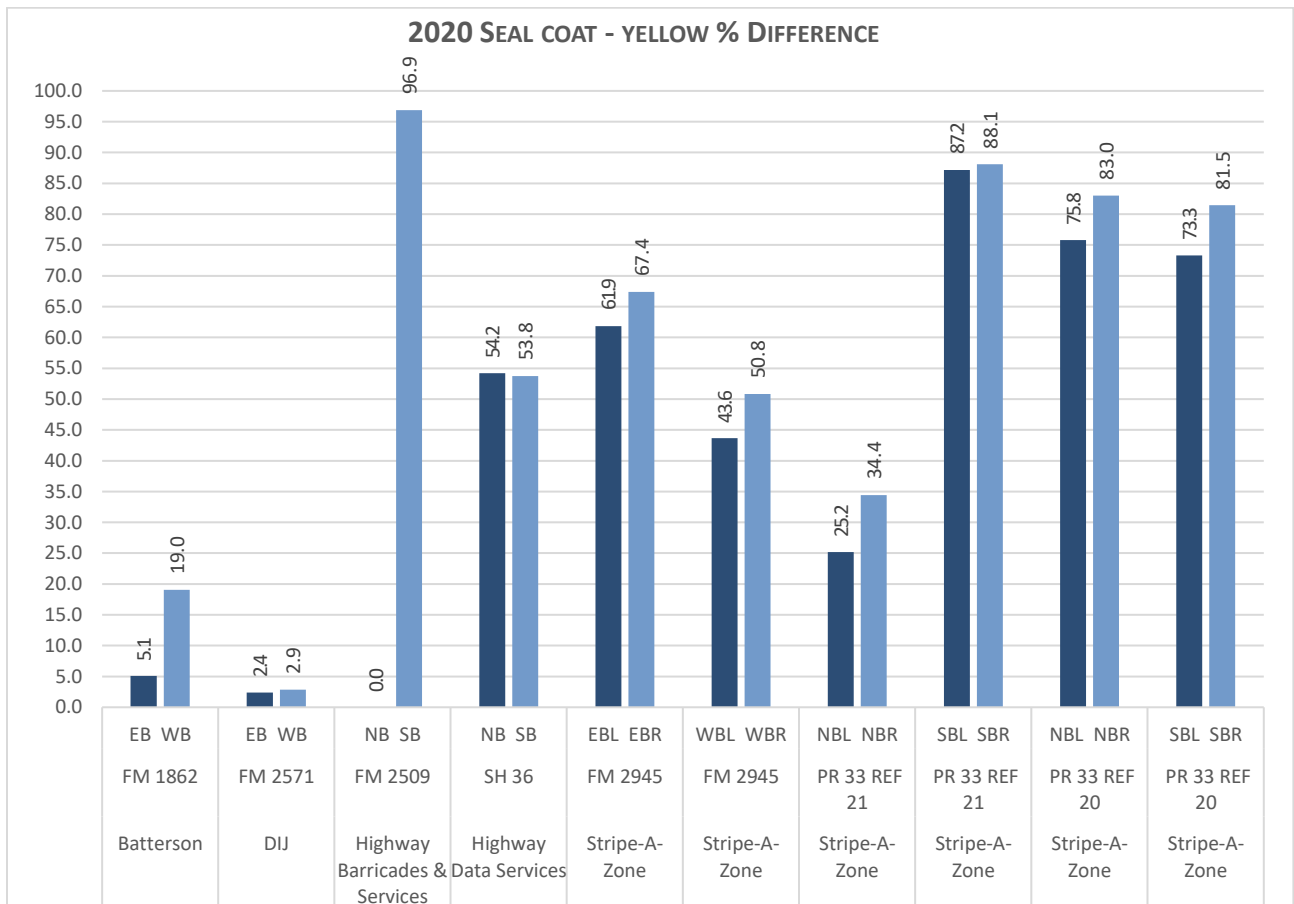
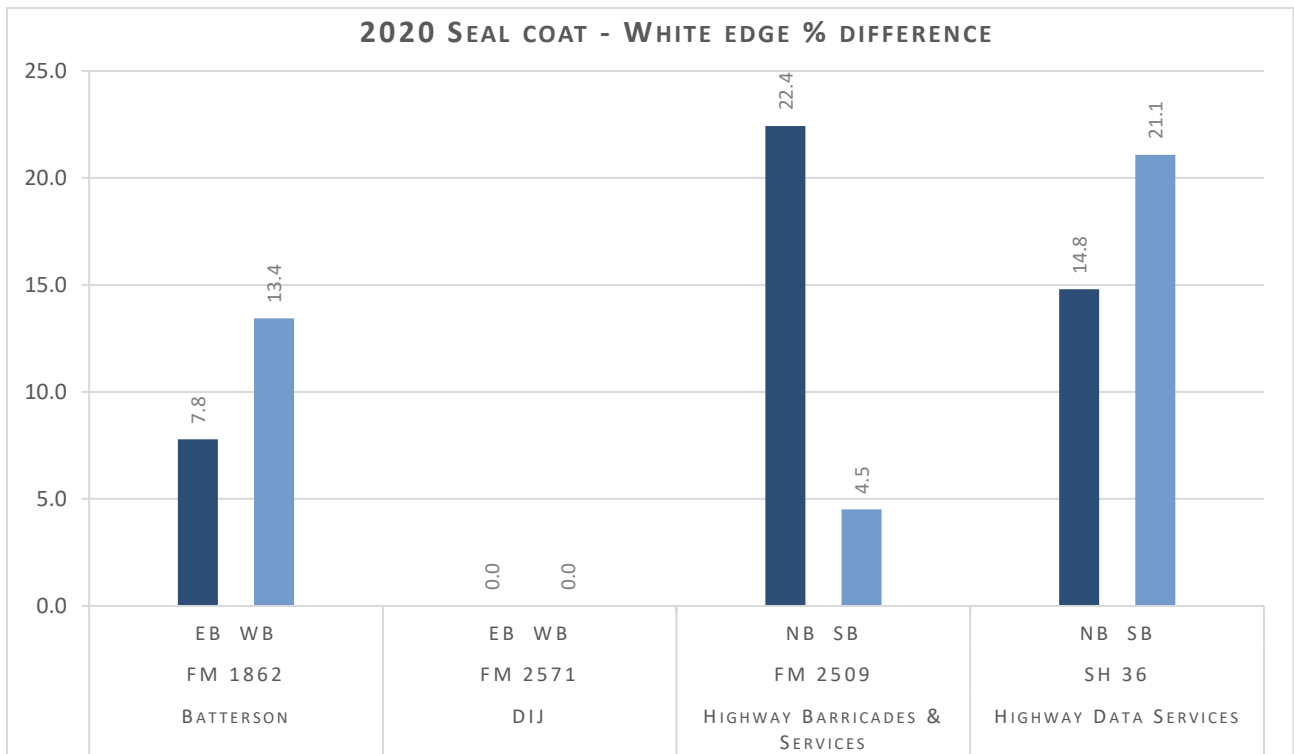


Figure 8. Verification Results on New Seal Coat by Line Type.

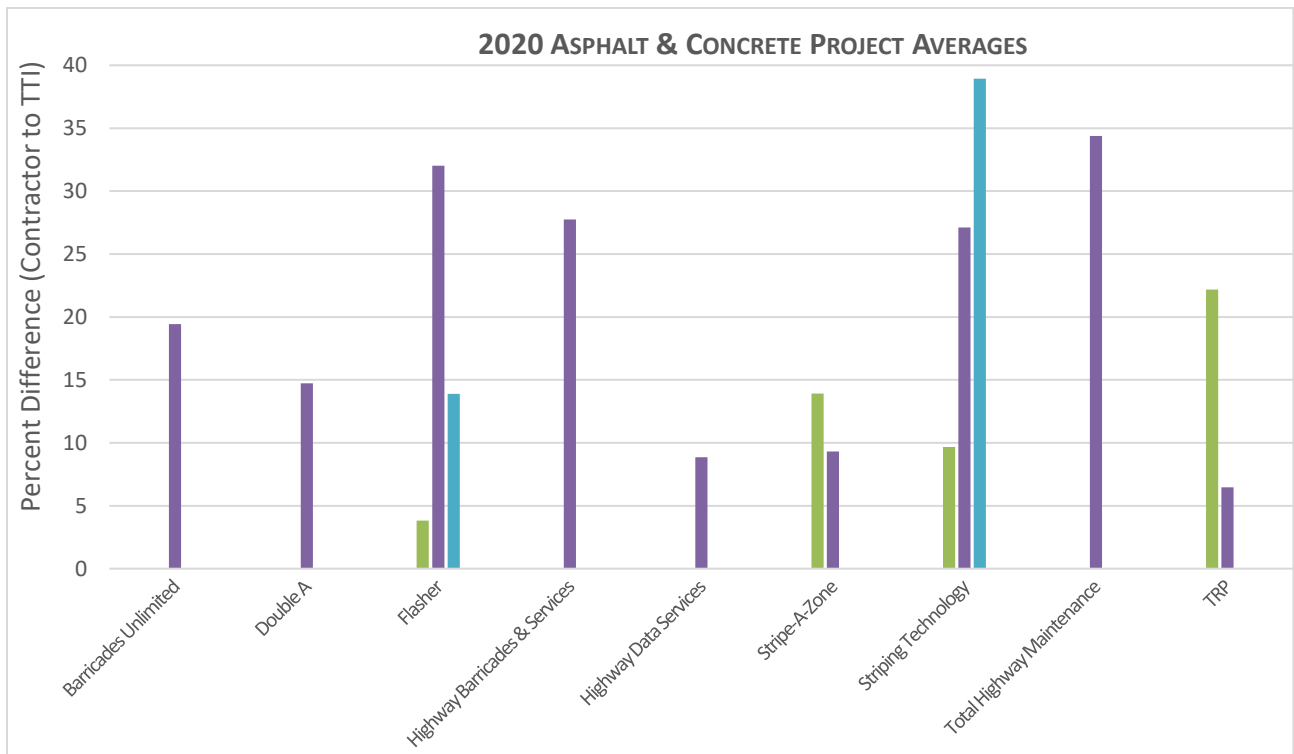


Figure 9. Verification Results on Asphalt and Concrete Evaluations.

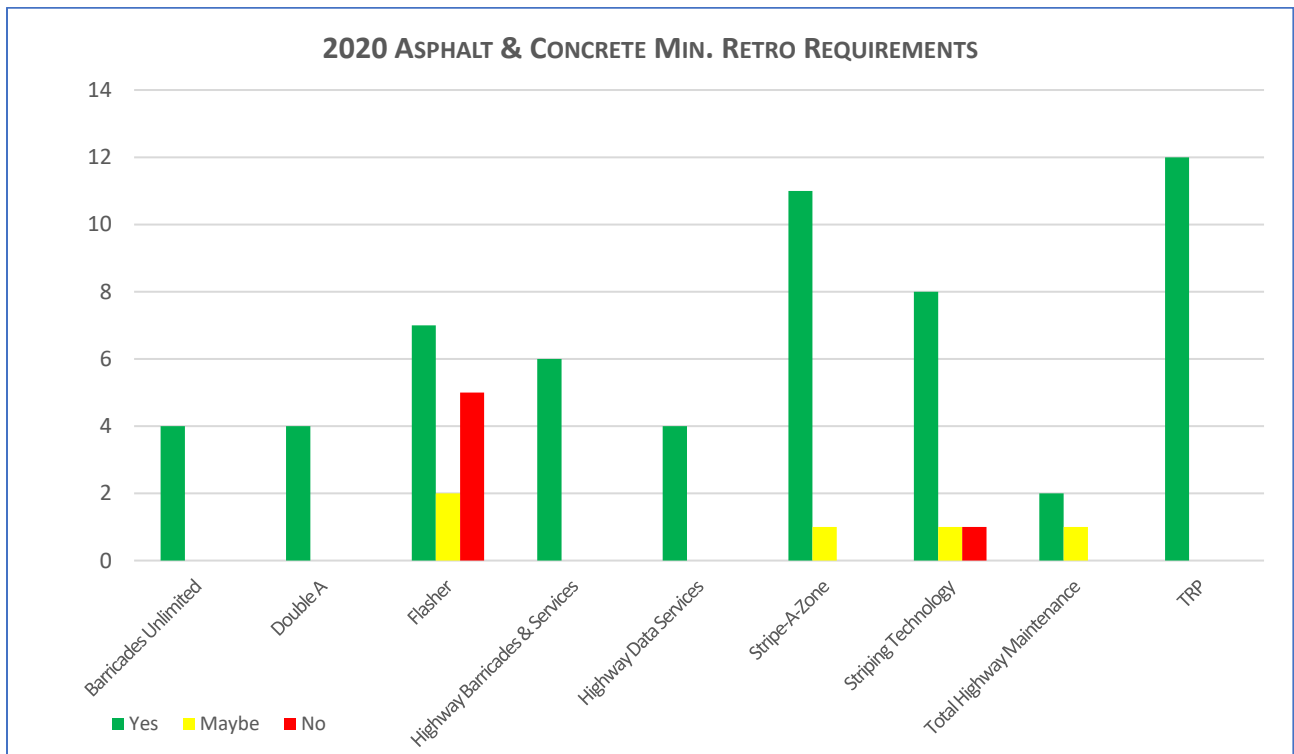


Figure 10. Count of Stripes Meeting Minimum Retroreflectivity Requirements on Asphalt and Concrete Evaluations.

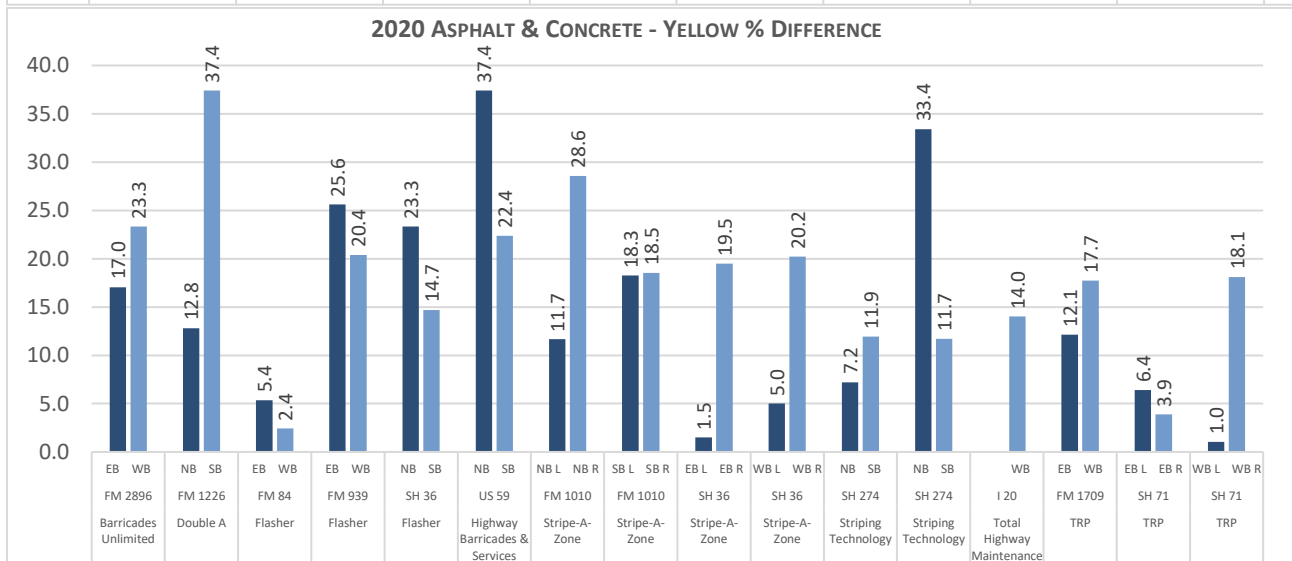
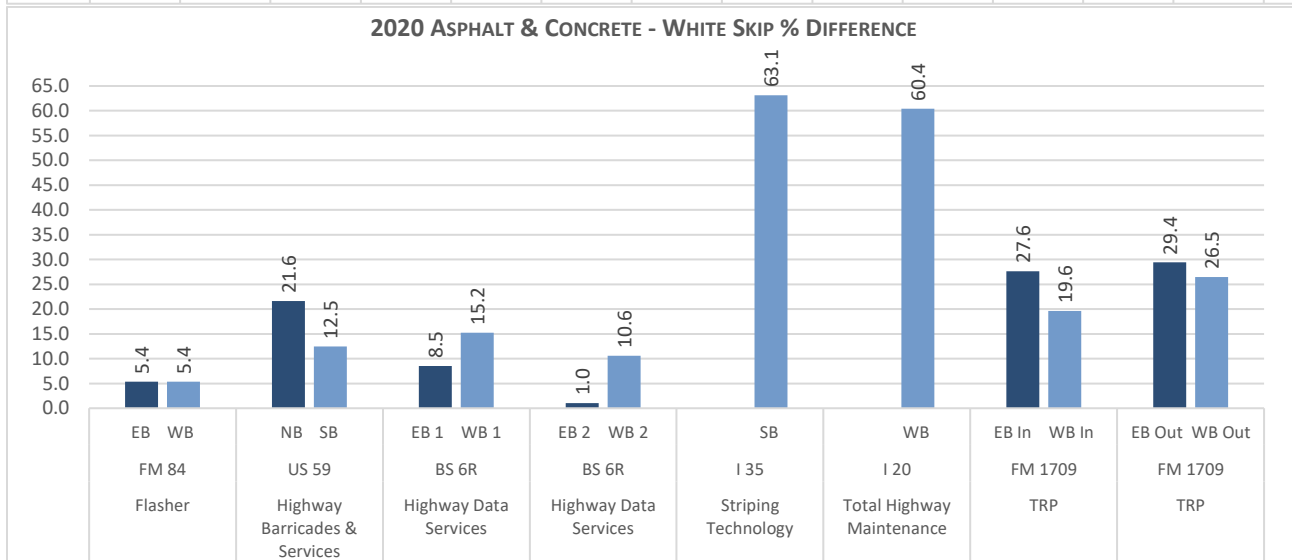
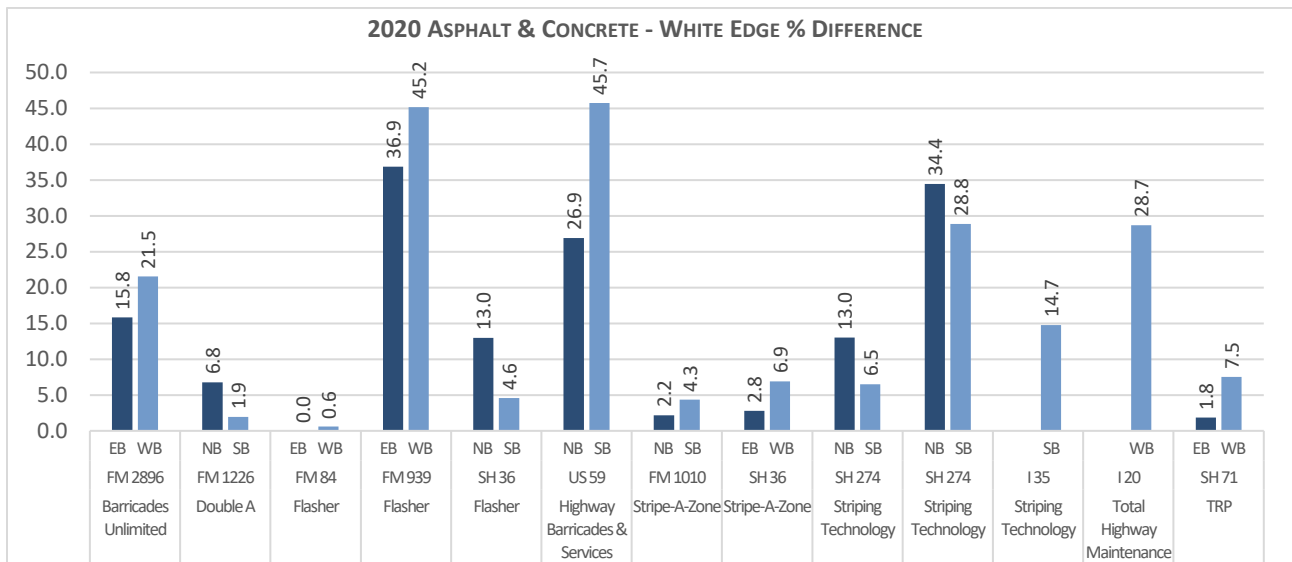


Figure 11. Verification Results on Asphalt and Concrete by Line Type.

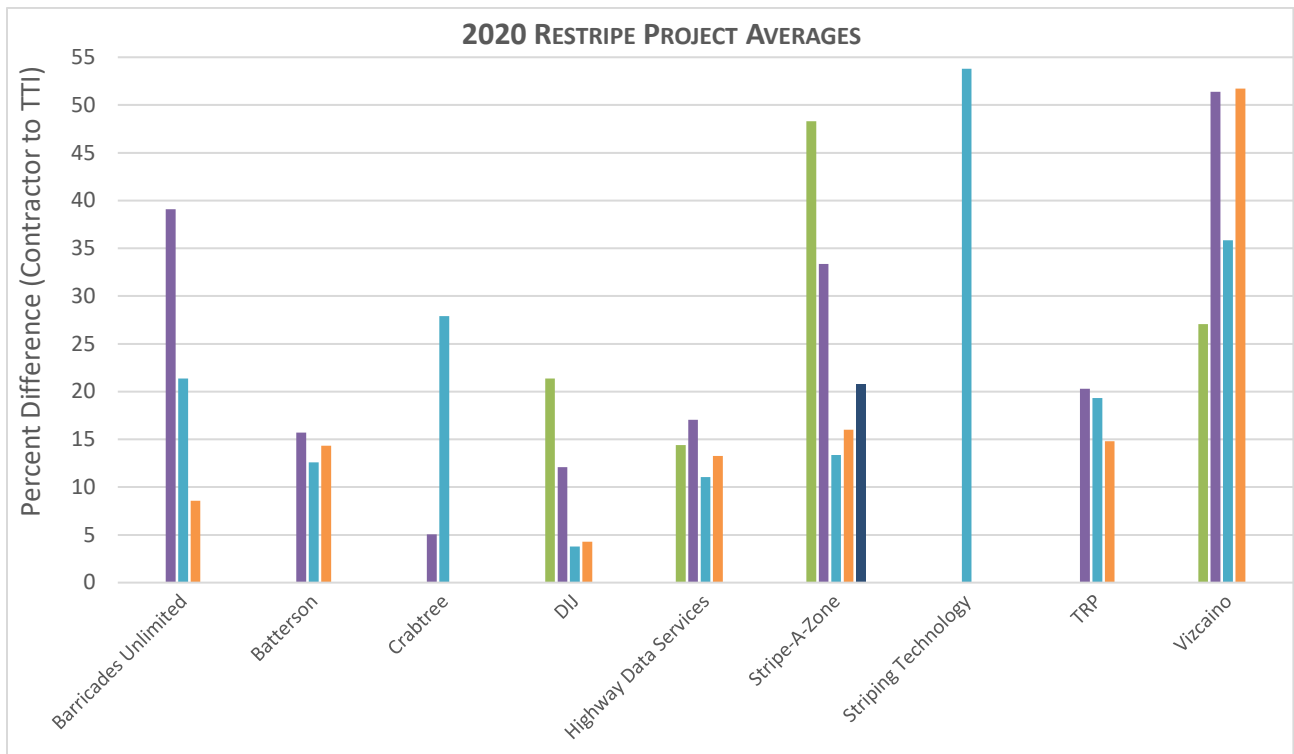


Figure 12. Verification Results on Restripe Evaluations.

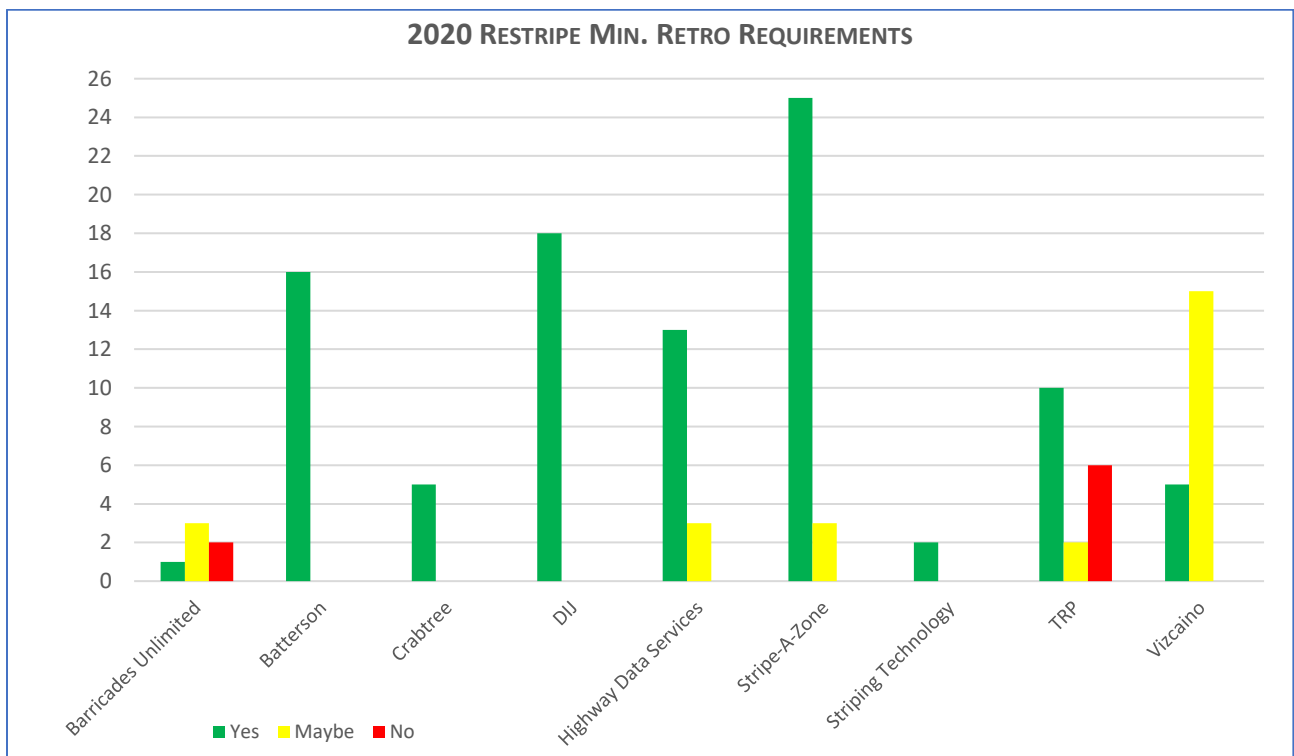


Figure 13. Count of Stripes Meeting Minimum Retroreflectivity Requirements on Restripe Evaluations.

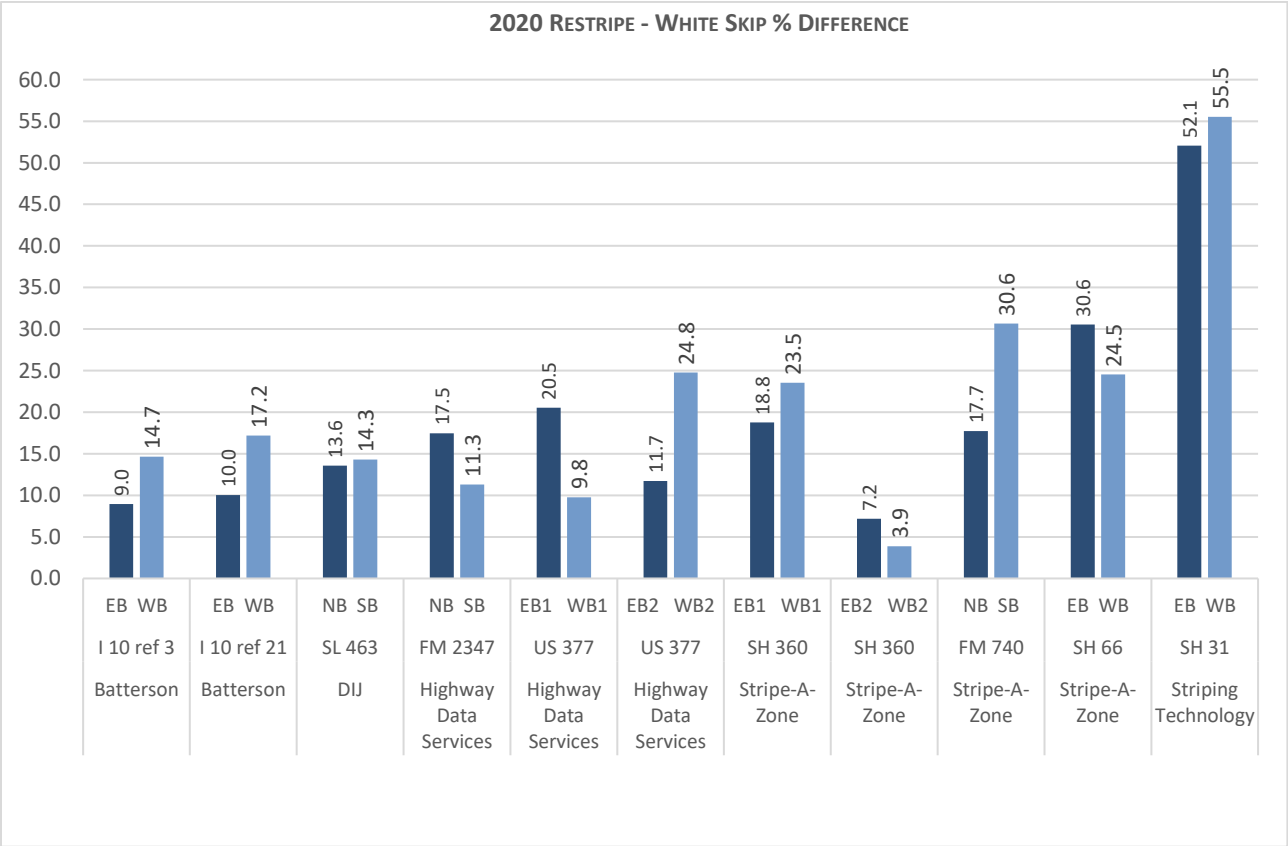
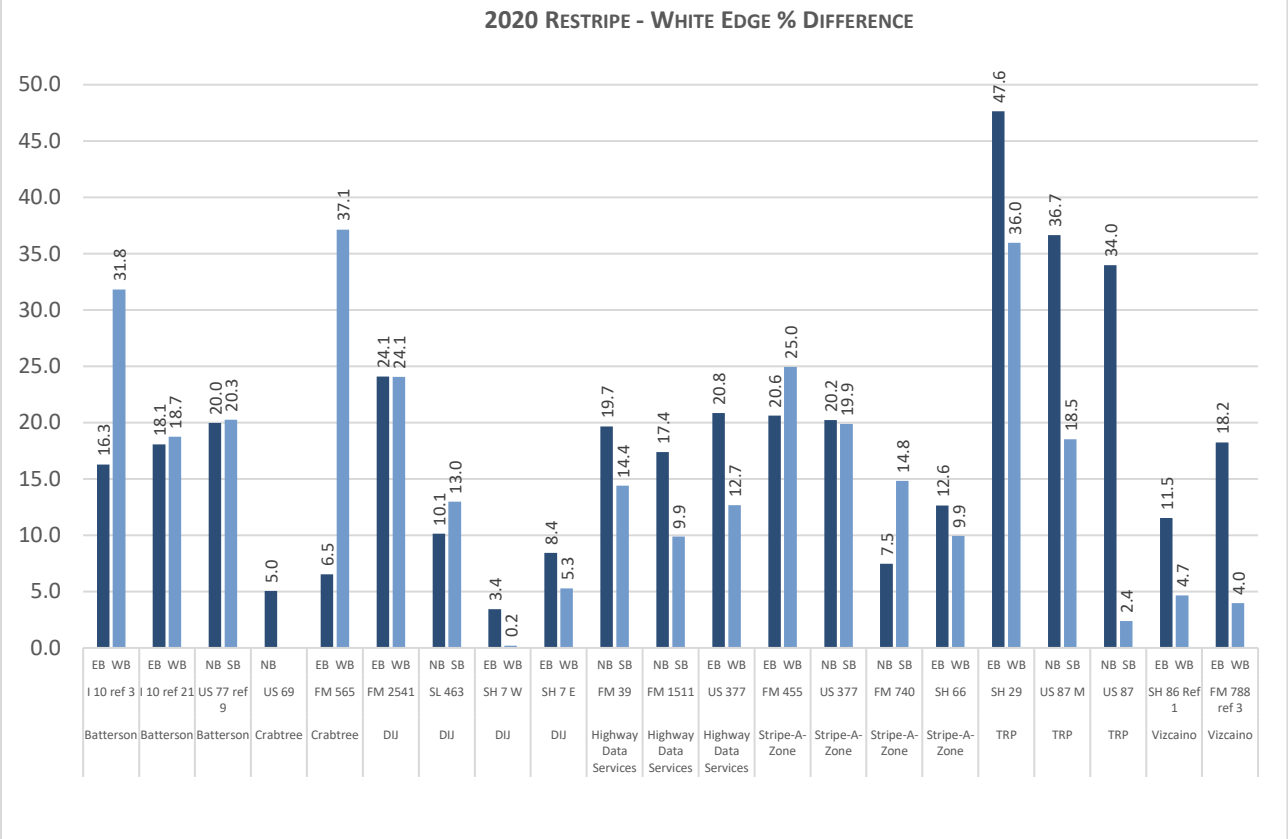


Figure 14. Verification Results on Restripe by Line Type.

2020 RESTRIPE - YELLOW % DIFFERENCE

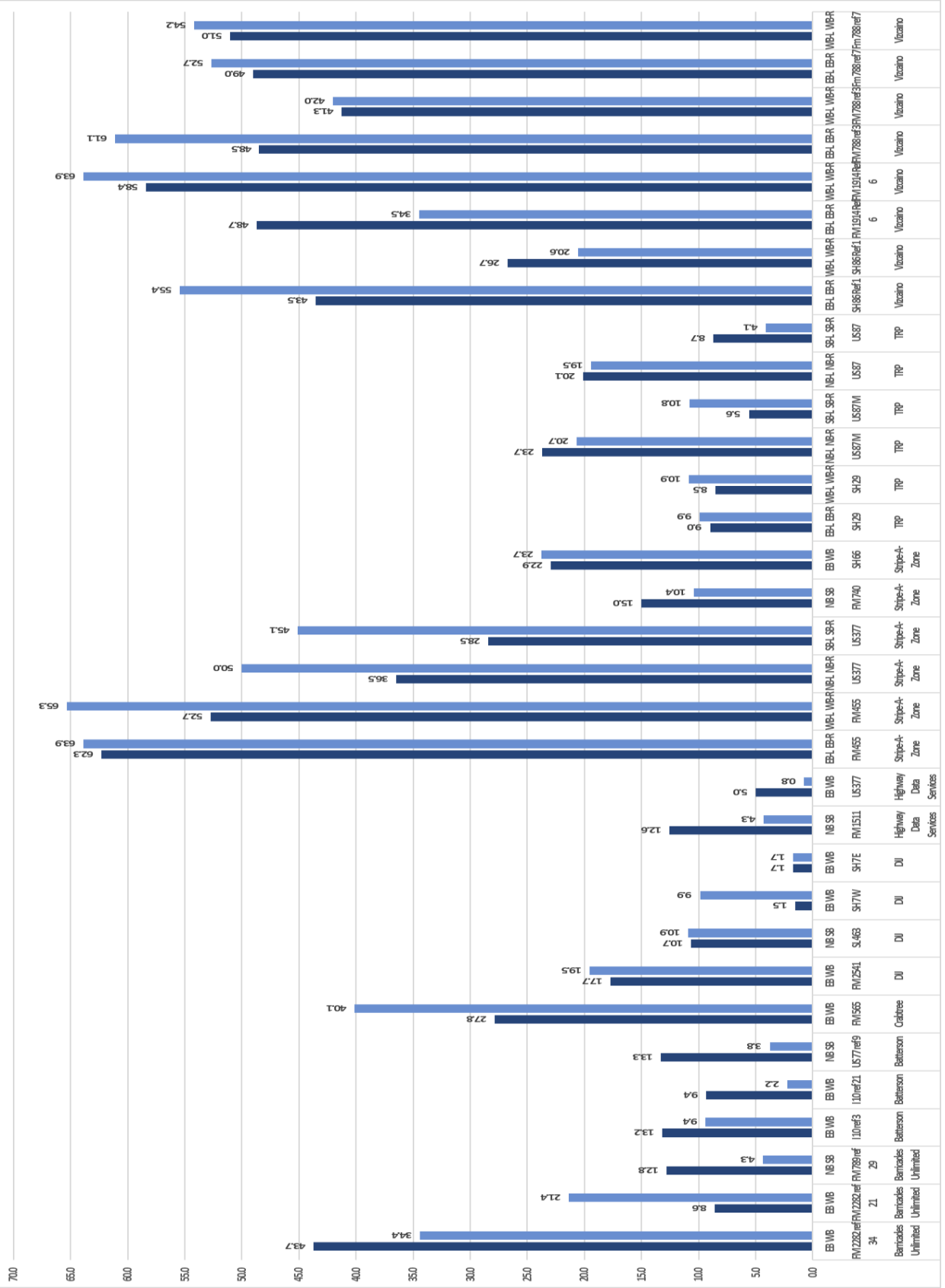


Figure 15. Verification Results on Restripe by Line Type. (Continued)

FY 2020 vs PREVIOUS YEARS RESULTS

The results from the year six (FY 2020) field verification program are provided in this report. To provide a sense of how pavement marking and retroreflectivity evaluations are progressing a comparison to previous results is provided in this section. A summary of the FY 2017 data are provided in Table 16 through Table 18. These tables cover the different road surfaces or restripe applications. Table 19 through Table 21 provide the FY 2018 results. Table 22 through Table 24 provide the FY 2019 results. Table 25 through Table 27 provide the FY 2020 results. The number of lines evaluated, the average retroreflectivity value, and the average standard deviation of those average values are provided for both the TTI data and the provider data. The two sets of data are compared, and the average percent difference (the percent difference between the average values for all jobs of that type evaluated) is provided. The data are provided for each different type of line, white edge, white skip, or yellow marking. Figure 16 through Figure 18 graphically represent the retroreflectivity and verification trend for the different line types on the different surfaces for the last five years. In subsequent years additional charts will be developed to develop longer term trends in the data. The hope is that verification quality will improve, pavement marking retroreflectivity levels will increase or at least a reduction in failing markings will occur, and overall pavement marking quality will improve.

Figure 16 through Figure 18 show that for the most part the retroreflectivity levels are good for both white and yellow stripes on asphalt and concrete and for restripes. The problem is that on seal coats only the white stripes have good retroreflectivity data. The yellow stripes often have poor retroreflectivity levels and the comparison of the TTI average and provider average values are by far the worst of any of the conditions the past two years. Greater inspection may be needed on yellow pavement marking applications on seal coat to ensure good markings are being applied. Potentially improved application practices or revisions to materials used need to be made to improve yellow thermoplastic performance on seal coat roads. The contractors also need to improve their retroreflectivity data collection on yellow seal coat markings so that the data verify with the TTI data.

Table 16. Seal Coat Project Summary for FY 2017.

| Seal Coat | TTI | | | Provider | | | Average % Difference |
|------------|-----------|-----------|---------|------------|-----------|---------|----------------------|
| | Line Type | Evaluated | Average | Stan. Dev. | Evaluated | Average | |
| White Edge | 24 | 356 | 120 | 24 | 337 | 86 | 5 |
| White Skip | 7 | 423 | 123 | 8 | 342 | 97 | 21 |
| Yellow | 27 | 181 | 67 | 30 | 170 | 57 | 6 |

Table 17. Asphalt & Concrete Project Summary for FY 2017.

| Asphalt & Concrete | TTI | | | Provider | | | Average % Difference |
|--------------------|-----------|-----------|---------|------------|-----------|---------|----------------------|
| | Line Type | Evaluated | Average | Stan. Dev. | Evaluated | Average | |
| White Edge | 8 | 391 | 93 | 8 | 353 | 99 | 10 |
| White Skip | 4 | 468 | 64 | 4 | 367 | 28 | 24 |
| Yellow | 8 | 205 | 39 | 8 | 206 | 40 | 0 |

Table 18. Restripe Project Summary for FY 2017.

| Restripe | TTI | | | Provider | | | Average % Difference |
|------------|-----------|-----------|---------|------------|-----------|---------|----------------------|
| | Line Type | Evaluated | Average | Stan. Dev. | Evaluated | Average | |
| White Edge | 19 | 419 | 112 | 16 | 468 | 108 | 11 |
| White Skip | 8 | 474 | 120 | 8 | 424 | 123 | 11 |
| Yellow | 13 | 227 | 75 | 12 | 307 | 135 | 30 |

Table 19. Seal Coat Project Summary for FY 2018.

| Seal Coat | TTI | | | Provider | | | Average % Difference |
|------------|-----------|-----------|---------|------------|-----------|---------|----------------------|
| | Line Type | Evaluated | Average | Stan. Dev. | Evaluated | Average | |
| White Edge | 4 | 320 | 36 | 4 | 303 | 40 | 5.2 |
| White Skip | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Yellow | 4 | 174 | 31 | 3 | 148 | 21 | 16.2 |

Table 20. Asphalt & Concrete Project Summary for FY 2018.

| Asphalt & Concrete | TTI | | | Provider | | | Average % Difference |
|--------------------|-----------|-----------|---------|------------|-----------|---------|----------------------|
| | Line Type | Evaluated | Average | Stan. Dev. | Evaluated | Average | |
| White Edge | 34 | 385 | 92 | 32 | 402 | 104 | 4.4 |
| White Skip | 23 | 388 | 87 | 24 | 346 | 124 | 11.6 |
| Yellow | 36 | 224 | 72 | 34 | 243 | 83 | 7.9 |

Table 21. Restripe Project Summary for FY 2018.

| Restripe | TTI | | | Provider | | | Average % Difference |
|------------|-----------|-----------|---------|------------|-----------|---------|----------------------|
| | Line Type | Evaluated | Average | Stan. Dev. | Evaluated | Average | |
| White Edge | 13 | 307 | 53 | 12 | 390 | 90 | 24.0 |
| White Skip | 4 | 338 | 35 | 4 | 413 | 30 | 20.0 |
| Yellow | 19 | 199 | 40 | 18 | 249 | 39 | 22.5 |

Table 22. Seal Coat Project Summary for FY 2019.

| Seal Coat | TTI | | | Provider | | | Average % Difference |
|------------|-----------|-----------|---------|------------|-----------|---------|----------------------|
| | Line Type | Evaluated | Average | Stan. Dev. | Evaluated | Average | |
| White Edge | 26 | 318 | 69 | 20 | 335 | 70 | 5.0 |
| White Skip | 2 | 470 | 17 | 2 | 426 | 26 | 9.7 |
| Yellow | 32 | 151 | 42 | 30 | 200 | 49 | 28.0 |

Table 23. Asphalt & Concrete Project Summary for FY 2019.

| Asphalt & Concrete | TTI | | | Provider | | | Average % Difference |
|--------------------|-----------|-----------|---------|------------|-----------|---------|----------------------|
| | Line Type | Evaluated | Average | Stan. Dev. | Evaluated | Average | |
| White Edge | 14 | 406 | 92 | 14 | 418 | 82 | 3.1 |
| White Skip | 10 | 390 | 60 | 10 | 479 | 93 | 20.6 |
| Yellow | 15 | 215 | 64 | 12 | 287 | 109 | 28.9 |

Table 24. Restripe Project Summary for FY 2019.

| Restripe | TTI | | | Provider | | | Average % Difference |
|------------|-----------|-----------|---------|------------|-----------|---------|----------------------|
| | Line Type | Evaluated | Average | Stan. Dev. | Evaluated | Average | |
| White Edge | 43 | 328 | 93 | 41 | 374 | 92 | 12.9 |
| White Skip | 20 | 411 | 69 | 19 | 427 | 75 | 3.7 |
| Yellow | 57 | 185 | 53 | 50 | 232 | 51 | 22.3 |

Table 25. Seal Coat Project Summary for FY 2020.

| Seal Coat | TTI | | | Provider | | | Average % Difference |
|------------|-----------|-----------|---------|------------|-----------|---------|----------------------|
| | Line Type | Evaluated | Average | Stan. Dev. | Evaluated | Average | |
| White Edge | 8 | 356 | 56 | 6 | 415 | 60 | 15.3 |
| Yellow | 20 | 127 | 61 | 19 | 206 | 64 | 47.1 |

Table 26. Asphalt & Concrete Project Summary for FY 2020.

| Asphalt & Concrete | TTI | | | Provider | | | Average % Difference |
|--------------------|-----------|-----------|---------|------------|-----------|---------|----------------------|
| | Line Type | Evaluated | Average | Stan. Dev. | Evaluated | Average | |
| White Edge | 24 | 395 | 80 | 23 | 411 | 91 | 4.0 |
| White Skip | 14 | 406 | 127 | 14 | 365 | 109 | 10.6 |
| Yellow | 31 | 206 | 39 | 31 | 241 | 57 | 15.6 |

Table 27. Restripe Project Summary for FY 2020.

| Restripe | TTI | | | Provider | | | Average % Difference |
|------------|-----------|-----------|---------|------------|-----------|---------|----------------------|
| | Line Type | Evaluated | Average | Stan. Dev. | Evaluated | Average | |
| White Edge | 41 | 421 | 113 | 41 | 445 | 118 | 5.4 |
| White Skip | 22 | 492 | 71 | 22 | 482 | 108 | 2.1 |
| Yellow | 66 | 205 | 71 | 66 | 246 | 77 | 18.2 |

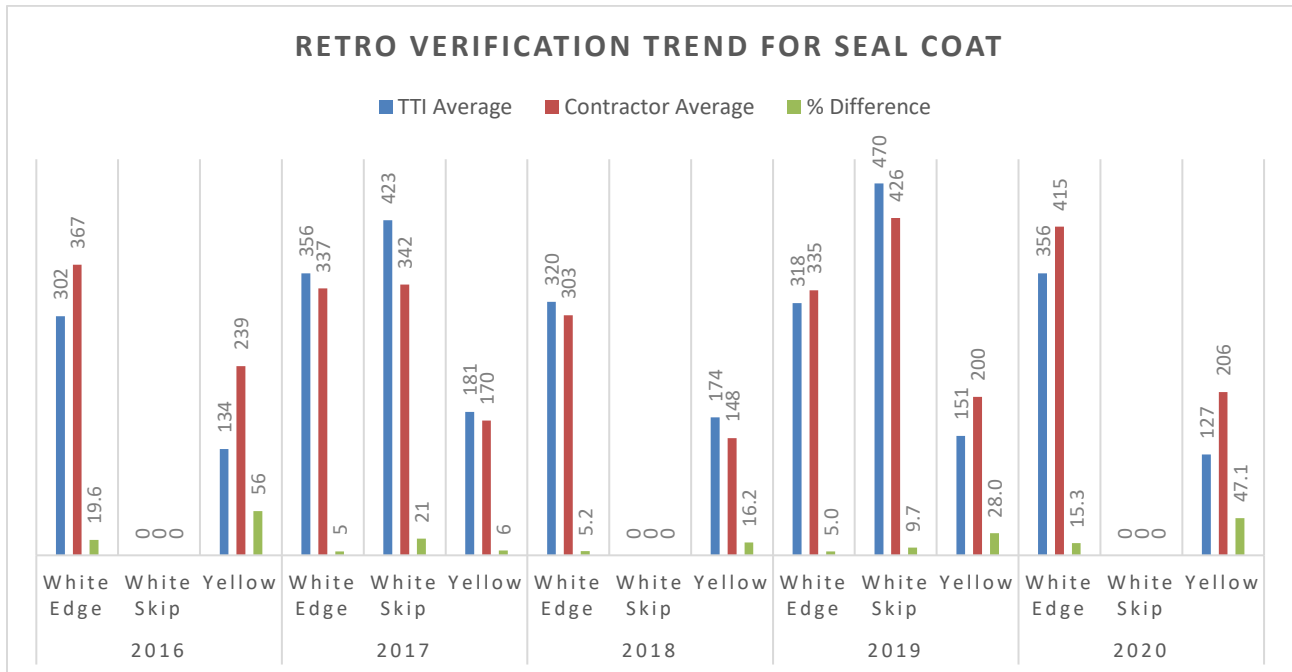


Figure 16. FY 2016 through FY 2020 Retroreflectivity and Verification Trend for New Seal Coat.

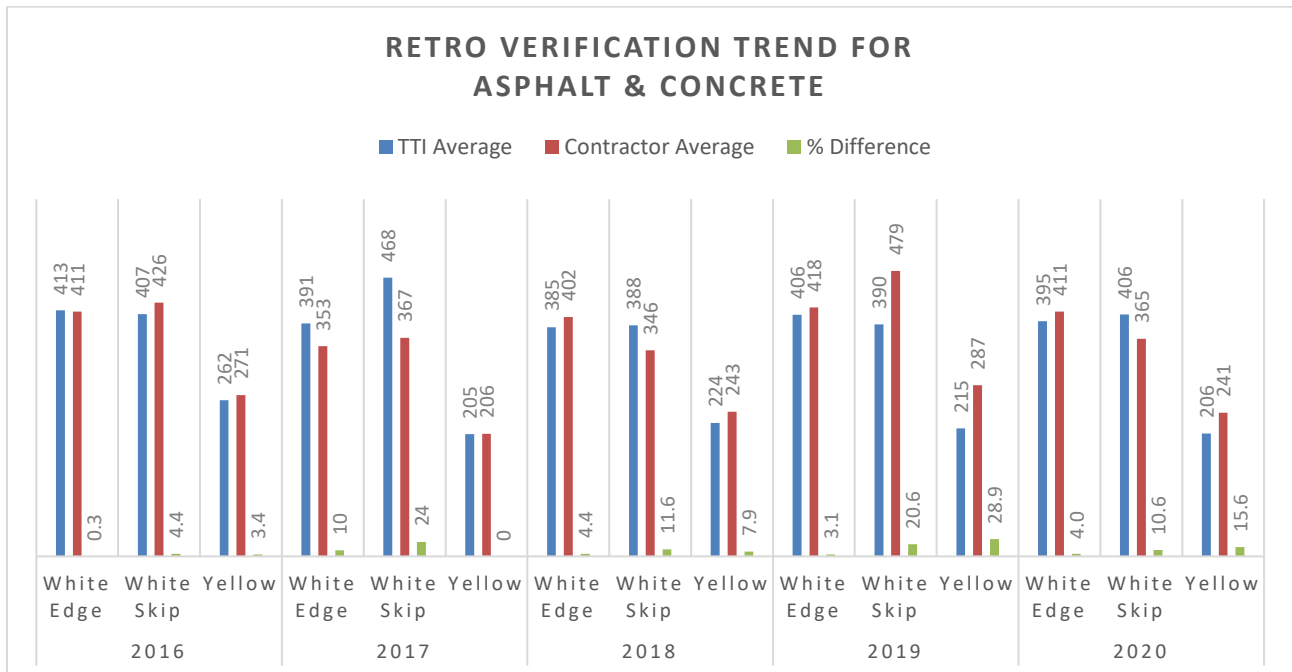


Figure 17. FY 2016 through FY 2020 Retroreflectivity and Verification Trend for Asphalt and Concrete.

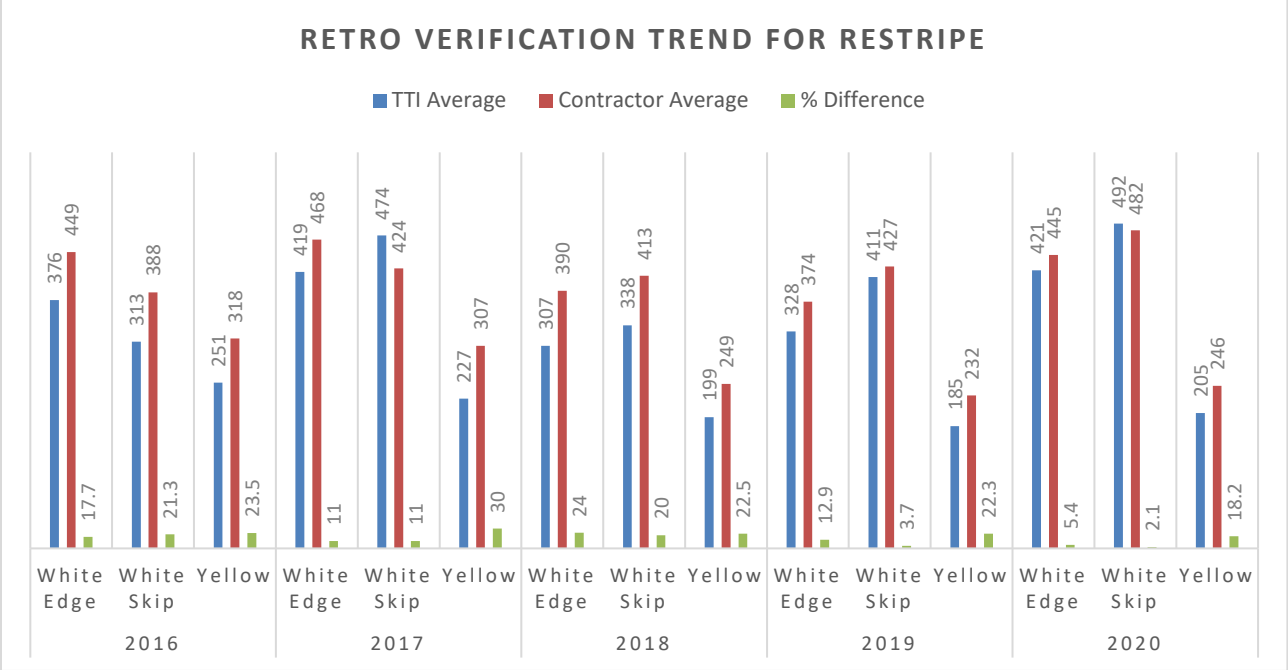


Figure 18. FY 2016 through FY 2020 Retroreflectivity and Verification Trend for Restripe.