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GATE SKIRTS RESEARCH AT A HIGHWAY-RAIL GRADE CROSSING IN RAMSEY, NJ

SUMMARY

Pedestrian violations of grade crossing warning devices are a leading cause of rail-related deaths. Nationally, pedestrians were involved in 191 grade crossing incidents that resulted in 169 fatalities and 214 injuries in 2019 [1]. Many occur at gated crossings, where pedestrians intentionally violate audible and physical warnings.

The U.S. Department of Transportation's John A. Volpe National Transportation Systems Center (Volpe Center), under the direction of the Federal Railroad Administration (FRA) Office of Research, Development and Technology (RD&T), evaluated the effectiveness of a pedestrian gate enhancement, commonly known as a gate skirt, to deter pedestrians from violating active grade crossing warnings at the E. Main St. crossing in Ramsey, New Jersey. Figure 1 shows one of the skirts installed at the crossing. The goal of the added secondary gates is to reduce the number of pedestrians and cyclists who violate the grade crossing while the gates are active, thus reducing the possibility of an incident between a non-motorized violator and a train.

Results indicate that the addition of the gate skirts provided a positive pedestrian safety benefit.

BACKGROUND

This work builds on an initial study of gate skirts conducted in 2012 with New Jersey Transit (NJT) and documented in an FRA Technical

Figure 1. Gate Skirts Installed at E. Main St. Crossing in Ramsey, NJ

Report [2]. The research team in that study found that the total number of pedestrian violations decreased while the gates were descending (78 percent reduction) and horizontal (55 percent reduction), but increased while the gates were ascending (12 percent increase) after the gate skirts were added to pedestrian gates at a crossing in Matawan, New Jersey.

A follow-on study conducted in 2016–2017 continued research into the design of the gate skirt and resulted in the implementation and evaluation of the addition of channelization and emergency exit gates at Robert Loughery Way (Elm St., Crossing ID 500950A) in New Britain, Connecticut. The research team found that descending gate violations decreased by 31 percent, and horizontal gate violations decreased by 29 percent.

Following the strong positive safety benefits in those studies, the Federal Highway Administration developed a noteworthy practice document on these installations [3].

OBJECTIVES

The objective of the current study is to continue research into gate skirt design and effectiveness, including channelization, and provide FRA and stakeholders with safety benefit information.

METHODS

The Volpe Center partnered with the New Jersey Department of Transportation (NJ DOT) to identify a suitable grade crossing for implementation, collect before-and-after data, and evaluate the results.

NJ DOT selected the highway-rail grade crossing at E. Main St. (Crossing ID 263186S) in Ramsey, New Jersey. The crossing, as shown in Figure 2, experiences about 110 activations per day, mostly for NJT service on the Main and Bergen County Lines and about 4–5 freight movements. The Ramsey station is adjacent to the crossing.

Figure 2. E. Main St. Crossing in Ramsey, NJ

The gate skirts were installed in September 2017. Fencing along the right-of-way (ROW) leading up to the pedestrian gate on the northeast corner of the crossing was installed in March 2018 to reduce the number of grade crossing violations originating in that corner of the crossing. This is shown in Figure 3.

The conditions present at the crossing before and after the installation of the gate skirts and fencing were documented. The clearances between the gates and ground ranged from 37½ to 43 inches between all four original pedestrian gates. After the installation of the gate skirts, the clearances between the lower gates and ground ranged from 26 to 28½ inches. Delineator posts were added to the 34–42-inch horizontal gaps remaining between the lower gates and gate posts. Sidewalk tactile pads were also added to all four approaches to the crossing. These additional improvements are shown in Figure 3.

Figure 3. Gate Skirts and Fencing at Northeast Quadrant of E. Main St. Crossing in Ramsey, NJ

RESULTS

Through the successful partnership between the Volpe Center, NJ DOT, and NJT, data on pedestrian and cyclist crossing violations before and after both installations (gate skirts and fencing) was collected and analyzed as follows:

Data Collection and Analysis

Data was collected via a video camera mounted to a utility post next to the signal box on the northwest corner of the crossing, and connected to a digital video recorder in a box attached to the pole. An electrical connection was provided by NJT. Data collection started on May 3, 2017.

Researchers divided the approaches to the crossing into zones for the purposes of coding pedestrian and cyclist movements. Each sidewalk and street approach was coded as a different zone. The path (which zones travelled through) for each pedestrian and cyclist violator was recorded. Additionally, grade crossing violations were classified into two types:

- Type I: Violator traversed a crossing while gates were descending.

- Type II: Violator traversed a crossing while gates were fully horizontal.

Pre-Installation (Baseline)
For the pre-installation period, pedestrian movements at the crossing were analyzed for 7 consecutive days from 5/4/17 to 5/10/17. This was about 3 months before the pedestrian gates were upgraded to gate skirts. There were a total of 438 grade crossing activations with pedestrians present. A total of 27 pedestrians committed a Type I violation and 63 pedestrians and cyclists committed a Type II violation. A Type II violation example is shown in Figure 4.

Figure 4. Baseline Type II Violation Example

Post-Skirts Installation (Post I)
For the post-skirts installation period, pedestrian movements at the crossing were again analyzed for 7 consecutive days, from 9/24/17 to 9/30/17. This was about 3 weeks after the pedestrian gates were upgraded to gate skirts. There were a total of 433 grade crossing activations with pedestrians present. A total of 23 pedestrians committed a Type I violation and 56 pedestrians and cyclists committed a Type II violation.

Post-Fencing Installation (Post II)
NJT installed fencing along the ROW leading up to the northeast quadrant pedestrian gate in March 2018. The main objective of this fencing was to reduce the number of grade crossing violations originating in this part of the crossing. Data was again analyzed for 7 consecutive days, from 4/19/18 to 4/25/18. There were a total of 410 grade crossing activations with pedestrians present. A total of 11 pedestrians committed a Type I violation and 48 pedestrians and cyclists committed a Type II violation.

Comparative Analysis
Researchers compared crossing violation rates (violations per crossing activation) between the three periods. Type I violations decreased by approximately 56 percent between the baseline and Post II periods, from 0.062 to 0.027 violations per crossing activation, as shown in Figure 5. Type II violations decreased by approximately 19 percent.

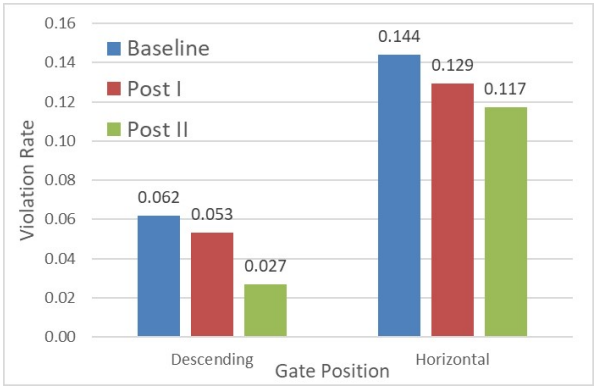

Figure 5. Violation Rates (number of violations per crossing activation) during Study Period

The violation data specific to the northeast sidewalk, where the installation of the fencing was located, is shown in Table 1. The number of violations in that area decreased from 28.5 percent of the total violations in the baseline period to zero after the fencing installation.

Table 1. Type II Violation Frequency for Northeast Sidewalk per Evaluation Period

Period	Type II Violations at Northeast Sidewalk
Baseline	28.5% (18/63)
Post I	19.6% (11/56)
Post II	0% (0/48)

CONCLUSIONS

Results of the gate skirts design tested during this study, along with ROW fencing, indicate a positive safety benefit of this improvement. Type II violations, where the gates are horizontal,

decreased by approximately 19 percent over the study period. Additionally, those violations were completely eliminated on the crossing's northeast quadrant after the fencing addition.

Approximately 71 percent of the total number of violations in the Post II period occurred in two roadway zones. The results support the recommendation for adding channelization treatments to the sidewalk approaches to the crossing, especially to the sidewalk approach at the southeast corner of the crossing.

FUTURE ACTION

The research team recommended to NJ DOT and the Borough of Ramsey that pedestrian channelization along the sidewalks, along with additional barrier treatments at the back of the pedestrian gate assemblies, be added to limit pedestrian movements around the gate skirts.

The research team will continue to collect data and will re-assess the effectiveness of the treatments if channelization is installed at the crossing.

REFERENCES

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