

MEMORANDUM

DATE: 2/18/21

TO: City of Rochester Hills

FROM: Jacob Kleinhenz, PE; Spalding DeDecker

RE: Adams Road - Pedestrian Crossing

JOB NO.: RH21002

Summary

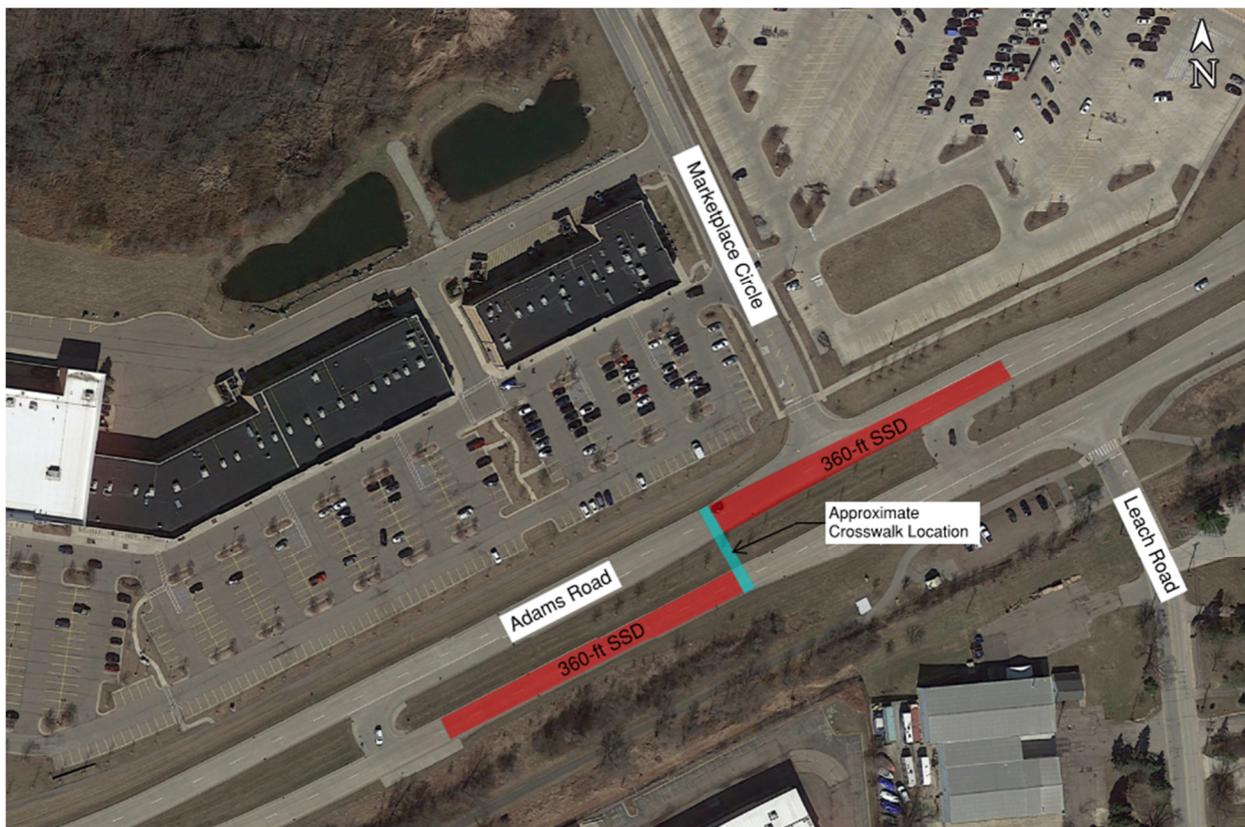
Initial research has been conducted regarding a pedestrian crossing on Adams Road near Marketplace Circle and Leach Road. Based on the *MDOT Guidance for Installation of Pedestrian Crosswalks on Michigan State Trunkline Highways* and the data available at this time, a Pedestrian Hybrid Beacon (HAWK) or grade separated crossing are the options that should be considered for a pedestrian crossing application at this location. A Rectangular Rapid Flashing Beacon (RRFB) is also an option; however, additional data is needed to determine the appropriateness of this application. Data collection will be required to fully determine the most appropriate application of the three options. It is recommended that the data collection includes average daily traffic (ADT) and hourly vehicular volumes, pedestrian gap study, and a speed study as these have been determined to be the biggest factors that are currently unknown.

Data Collection

Known data is highlighted within this memo, which was obtained from Google Maps observations and the SEMCOG traffic data website. This information assists in the determination of an appropriate pedestrian crossing facility per MDOT's guidance document.

- Number of Lanes – EB: 2; WB: 2
- Median – Yes; Raised
- Speed Limit – 45 mph
- Stopping Sight Distance – 360 ft
- Adams Road ADT – Obtained from SEMCOG Traffic Volume Map. Will need updated data.
 - EB Adams Road (2011) – 12,800
 - WB Adams Road (2015) – 9,800
- Nearest Marked/Protected Crossing - ≈2,800 ft (west at Forester Blvd)
- **Hourly Traffic Volumes** – TBD

- **Speed Study** – Obtain average vehicle speeds in each direction at the crossing to determine if the appropriate speed to use in determining sight distances and whether any traffic calming or interruptions will be needed for a pedestrian crossing.
- **Pedestrian Volumes** – Since this is for a new pedestrian crossing, this information is not available. The lack of this data drives the need for a pedestrian gap study in lieu of this data. The timing (winter) is not optimal for gathering this data currently.
- **Pedestrian Gap Data** – Measure the available gaps (in seconds) in traffic for each direction to determine the availability for pedestrians to cross the roadway at an uncontrolled location. These gaps can then be used to determine pedestrian delay and associate this delay to a level of service (LOS), which is a measurement of effectiveness in pedestrian movements. Determining a pedestrian LOS will assist in the decision process for the type of pedestrian crossing implemented.



Types of Crossings at Uncontrolled Locations

There are four identified pedestrian crossing applications in MDOT’s guidance document for uncontrolled locations that are mainly dependent on the roadway speed limit, lane configuration, and ADT. These crossing types are labeled ‘A’ through ‘D’ and start with basic crosswalk pavement markings and signage up to a signalized intersection. If the ADT data from SEMCOG is applicable to today’s traffic volumes, then crossing treatment ‘D’ is the recommended option for the potential pedestrian crossing

treatments on Adams Road. However, there is an approximate 40-ft median separating eastbound and westbound traffic, which allows pedestrians to cross each direction as one-way traffic. As such, for purposes of a pedestrian crossing facility, Adams Road could be evaluated as a 2 lane, one-way street for each direction of traffic. This reduces the ADT evaluation and suggests that Crossing Type B is an option for Adams Road, which introduces the Rectangular Rapid Flashing Beacon application.

Roadway configuration	# of lanes crossed to reach a refuge	# of multiple threat lanes* per crossing	Roadway ADT and Posted Speed															
			1,500 - 9,000 vpd				9,000 - 12,000 vpd				12,000 - 15,000 vpd				>15,000 vpd			
			≤ 30 mph	35 mph	40 mph	≥ 45 mph	≤ 30 mph	35 mph	40 mph	≥ 45 mph	≤ 30 mph	35 mph	40 mph	≥ 45 mph	≤ 30 mph	35 mph	40 mph	≥ 45 mph
2 Lanes (one way street)	2	1	A	A	A	B	A	A	B	B	A	A	B	B	A	A	B	B
2 Lanes (two way street with no median)	2	0	A	A	A	B	A	A	B	B	A	A	B	B	A	A	B	B
3 Lanes w/refuge island or 2 Lanes w/raised median	1	0	A	A	A	B	A	A	B	B	A	A	B	B	A	A	B	B
3 Lanes (center turn lane)	3	1	A	A	B	B	A	B	B	B	A	B	B	B	A	B	B	B
4 Lanes (two way street with no median)	4	2	A	B	B	C	A	B	C	C	A	B	C	D	B	B	C	D
5 Lanes w/ refuge island or 4 lanes w/raised median	2	2	A	A	B	B	A	B	B	C	A	B	C	C	B	B	C	D
5 Lanes (center turn lane)	5	2	A	B	C	C	B	B	C	C	C	C	C	D	C	C	C	D
6 lanes (two way street with or without median)	3 to 6	4	A	B	D	D	B	B	D	D	D	D	D	D	D	D	D	D

* Minimum pedestrian volumes (page 6) must be met before consideration of uncontrolled crossing treatments.

Table 1. Criteria for Types of Crossing Treatments at Uncontrolled Locations

Preliminary Analysis

Rectangular Rapid Flashing Beacon (RRFB)

Crossing Type B takes into consideration various basic pedestrian crossing items and roadway improvements such as special emphasis crosswalks, advance pedestrian warning signs, geometric improvements such as refuge islands, and most notably a pedestrian activated Rectangular Rapid Flashing Beacon. This application will need to consider the following:

- Adequate pedestrian gaps are available during peak hours. This will translate to the Pedestrian LOS mentioned (Pedestrian LOS table appended to this memo)
- The 85th percentile vehicle speeds are within in range of the posted speed limit. A speed study will verify this.
- The roadway configuration is analyzed as one-way traffic for each direction of Adams Road considering the 40-ft median/refuge area between the travel directions.
- Intersection roadway/driveway locations in the vicinity. Location of a RRFB will need to be adequately spaced from adjacent intersecting traveled ways to avoid any potential conflict with vehicles turning. This is particularly noted for right-turning vehicles from Marketplace Circle, as drivers often will only consider looking left for oncoming vehicles to determine their turning movement gap without considering a pedestrian crossing near them on the right prior to completing their movement and accelerating.

The RRFB should be the minimum application considered for a pedestrian crossing at this location that experiences relatively high vehicular speeds and volumes.

Pedestrian Hybrid Beacon (HAWK)

Focusing on the recommendations for Crossing Type D, the available options are a Pedestrian Hybrid Beacon (HAWK), pedestrian traffic signal, or grade separated pedestrian crossing. In addition to the three crossing types recommend in Crossing Type D, one must also consider the following

- Corridor signal progression

- This crossing will be bound by two signals separated by about 0.8 miles. There are various driveways between these two signals that serve many commercial and industrial businesses in the area where traffic is regularly entering and exiting Adams Road. A pedestrian gap study will give a clear indication whether signal and vehicle progression along the corridor is continuous or has adequate gaps for pedestrian movements. Traffic data for the corridor between the signalized intersections of Forester Boulevard to the eastbound M-59 off-ramp will be needed to review vehicle volumes entering Adams Road from commercial driveways and unsignalized intersections where signal progression cannot be controlled. If there are insufficient gaps for pedestrian crossings due to vehicles entering the system between signalized intersections, this data along with signal timing plans for the signalized intersections will help determine whether corridor signal progression is a viable option to consider as part of the pedestrian crossing implementation.
- Grades
 - The grades of Adams Road in the surrounding critical area for the pedestrian crossing are mostly flat and do not appear to pose a concern.
 - There is a horizontal curve west of the proposed crossing location. Although there appears to be plenty sight distance around the curve and the required stopping sight distance, based on the posted speed limit, does not encroach into the horizontal curve (See Figure 1 above), advanced warning signs would be highly recommended for eastbound vehicles traversing this horizontal curve.
 - A speed study is recommended to determine if additional stopping sight distance is required based on the actual vehicle speeds through this corridor. In addition, sight distance for pedestrians will also need to be considered with regard to the horizontal curve.
- Physical constraints
 - There is a Michigan left-turn storage and taper on Westbound Adams Road and a right turn lane storage and taper on Eastbound Adams road in the vicinity of the proposed crosswalk location. It will be crucial to place this crosswalk such that it does not encroach on these lanes. This not only will reduce the time and distance a pedestrian is exposed to oncoming traffic, but also ensures vehicles bound for these turn lanes are properly yielding to pedestrian cross traffic.
 - Considering the turn lanes above, if a HAWK signal is to be installed, the minimum required distance from an unsignalized intersection is 100-ft. Consideration to the proximity of Marketplace Circle and Leach Road must be given for this requirement should a HAWK signal be pursued.
 - If a grade separated pedestrian crossing is to be pursued, consideration will need to be given for the space required to construct ADA compliant ramps to attain the needed vertical clearances over the roadway on both sides of the roadway.
 - The median at the proposed location is approximately 40-ft wide, which is greater than the road width in either direction here. It would be prudent to review each direction of the roadway for a separate HAWK signal to reduce the stoppage time for vehicular

traffic on Adams Road in each direction. This also would increase driver compliance with the signal by reducing overall stop time. Drivers may not stay stopped at a pedestrian crosswalk where the pedestrian has already crossed their side of the road or a vehicle does not see any pedestrian crossing their side of the road at the time they are stopped. The large refuge area will provide a safe location for crossing pedestrians, but also gives increased delay to the mainline if a signal is not installed/timed properly. Because of the large refuge area, a RRFB may be the more viable option while considering Adams Road as one-way traffic analyzing eastbound and westbound separately, but additional data is needed to justify its support, and high visibility advanced warning signs would be recommended along the corridor. Speeds along this road will also play a factor in the recommendation of a RRFB versus a signalized crossing or grade separated crossing.

- Other engineering factors.
 - There is a signalized highway interchange east of the proposed crossing location where vehicles will be turning right onto Adams Road to head westbound toward the proposed pedestrian crossing location. Consideration to vehicles coming from a high speed facility should be evaluated to ensure drivers are given plenty of advanced warning that a pedestrian crossing facility is ahead and are prepared to stop, if needed.
 - Adams Road is signed for a 45-mph speed limit. However, this particular stretch of Adams Road has may have a tendency for vehicles traveling at higher speeds than that posted. A speed study should be considered here to better determine the appropriateness of a pedestrian crossing in this area based on the MDOT criteria, as well as determining additional improvements that may be needed to calm traffic speeds, reduce the speed limit, or enforce it.

In addition to Figure 1 and Table 1 provided above, the MDOT guidance document also provides a flow chart for determining a pedestrian crossing treatment as well as a graph identifying requirements for HAWK and RRFB signals. These have been appended to the end of the memo for reference.

Conclusions

A pedestrian gap study will be an important factor in determining the crossing application at this location. If there are adequate gaps in traffic along Adams Road a RRFB may be appropriate. If not, a HAWK signal will force the necessary pedestrian gaps along Adams Road to ensure safe pedestrian crossing movements. Although the most expensive option, a grade separated pedestrian crossing would eliminate all conflicts with vehicular traffic on Adams Road, significantly improve safety for all users, maintain existing vehicle progression along the corridor, and eliminate the need for pedestrian gaps in traffic. However, if the gap study does not produce a viable pedestrian crossing interval, a HAWK signal may be the most appropriate and feasible option available.

cc: SDA Job File
SDA Chronological File