

## **Appendix G**

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### **Mavis Road / Sombrero Way Multi-Use Trail Design Alternatives**

To:	Dana Glofcheskie, City of Mississauga	Date:	October 17, 2016
From:	Stefan Sirianni, E.I.T., MMM Group	Job No.:	3215102 – Mavis Road EA
Subject:	Review of Alternative Design Options for Transit and AT Facilities in the Mavis Road / Sombrero Way NW Quadrant	CC:	Leslie Green, City of Mississauga; Neil Ahmed, MMM; Gillian Thompson, MMM

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### Problem Statement

The NW quadrant of the Mavis Road and Sombrero Way intersection is a highly constrained area with a relatively high level of pedestrians, transit users, and cyclists from the nearby high school during peak travel hours. Improvements to Mavis Road at this location as shown in the preliminary plan propose shifting the edge of pavement west by 2.0 m and the provision of a 3.50 m multi-use trail (MUT) to the west. The existing MiWay bus pad and transit shelter will be impacted as a result. The new design will need to accomplish the following:

- Reinstall existing transit features (i.e. shelter and bus pad) as close to intersection as possible
- Accommodate proposed active transportation (AT) facilities
- Minimize impacts to private property
- Provide safe, shared environment for pedestrians, cyclists, and transit users

The available space to accommodate the above at this location ranges from 4.5 m to 5.0 m. As per City of Mississauga Standard Drawing 2250.020 (attached), a typical concrete bus shelter pad and platform requires a minimum 4.0 m width. Therefore, the bus pad/shelter and MUT cannot both be provided to standard at this location without impacting property.

### Alternative Design Options

In consideration of the above constraints, MMM proposes the following design options:

1. Provision of a 3.50 m shared MUT / bus pad with boulevard and no transit shelter
2. Provision of narrower (3.00 m to 3.10 m) shared MUT / bus pad, with a narrow curbside transit shelter (bus stop shifted 10 m north)
- 3.1 Provision of 2.90 m to 3.15 m shared MUT / bus pad with narrow transit shelter located at back of sidewalk and no boulevard (original location of bus stop maintained)
- 3.2 Provision of 3.35 to 3.70 m shared MUT / bus pad with narrow transit shelter located at back of sidewalk and no boulevard (bus stop shifted 10 m north)
4. Shift bus stop 50-60 m north to less constrained area (adjacent to Brass Winds cul-de-sac) and provide for standard transit facilities and 3.50 m MUT.
5. Impact adjacent property and provide for standard transit facilities and 3.50 m MUT at existing location.

These design options are described and compared in **Table 1**. Partial plans illustrating design options 1, 2, 3.1, and 3.2 are appended to this memo.

### Conclusions

While all of the above options require a compromise to be made, Options 1, 2, and 3.2 are most preferred from a safety perspective. While Option 1 would not provide a transit shelter, it would maintain the existing stop location and full AT facilities (i.e. 3.50 m MUT with boulevard). Options 2 and 3.2 would maintain generally the same stop location with only minor reductions in MUT width, though they would both require a non-standard shelter. As a result, these three options are recommended for further consideration.

Table 1: Evaluation of Alternative Design Options for Transit and AT Facilities in the Mavis Road / Sombrero Way NW Quadrant

Option	Transit Features and Proximity to Intersection	Accommodation of AT Facilities	Private Property Impacts	Safety	Overall Assessment
<p>1. Provision of a 3.50 m shared MUT / bus pad with no transit shelter. <b>See attached partial plan for draft design concept.</b></p> <ul style="list-style-type: none"> <li>Design would include yield signs for cyclists approaching shared MUT / bus pad.</li> <li>Example shown in <b>Figure 1</b> below.</li> <li>Shelter design example: Variation of City of Mississauga Standard Drawing 2250.010 (attached)</li> </ul>	<ul style="list-style-type: none"> <li>No bus shelter.</li> <li>Maintains existing location near intersection.</li> </ul>	<p>Full-width (3.50 m) MUT accommodated with yield signs for cyclists at shared MUT/bus pad.</p>	<p>No property impacts.</p>	<ul style="list-style-type: none"> <li>Wider path provides users with more space to avoid collisions and has lower potential for congestion, resulting in greater safety for all users.</li> <li>Yield signs can encourage cyclists to slow down, but do not guarantee that they will.</li> <li>Standard boulevard (1.0 m) provides additional buffer between MUT and roadway.</li> </ul>	<ul style="list-style-type: none"> <li>Option maintains existing location without impacting property and results in the safest conditions for all users.</li> <li>Does not provide transit shelter.</li> <li><b>Carry forward for further consideration.</b></li> </ul>
<p>2. Provision of narrower (3.00 m to 3.10 m) shared MUT / bus pad, with a narrow curbside transit shelter (bus stop shifted 10 m north). <b>See attached partial plan for draft design concept.</b></p> <ul style="list-style-type: none"> <li>Design would include yield signs for cyclists approaching shared MUT / bus pad.</li> <li>Example shown in <b>Figure 2</b> below.</li> <li>Example of a narrow shelter design used in Mississauga shown in <b>Figure 3</b> below.</li> <li>Shelter design example: City of Toronto Standard Drawing F-1-1d (attached)</li> </ul>	<ul style="list-style-type: none"> <li>Curbside, narrower bus shelter does not meet City standard.</li> <li>Bus stop shifted 10 m north of existing location.</li> </ul>	<p>Reduced MUT trail width at shared MUT/bus pad (varies from 3.00 m to 3.10 m) with yield signs for cyclists.</p>	<p>No property impacts.</p>	<ul style="list-style-type: none"> <li>Narrower path provides users with less space to avoid collisions, though 4.30 m of trail plus buffer (or shy-space) is provided which meets AODA standards.</li> <li>Greater potential for congestion where trail bottlenecks compared to standard 3.50 m MUT width.</li> <li>Open-sided shelter improves visibility, and curbside location does not require transit users to cross over the MUT when boarding.</li> <li>Yield signs can encourage cyclists to slow down, but do not guarantee that they will.</li> <li>Standard boulevard (1.0 m) provides additional buffer between MUT and roadway.</li> </ul>	<ul style="list-style-type: none"> <li>Option generally maintains existing location (nominal 10 m shift north) and provides transit shelter without impacting property.</li> <li>Reduced MUT trail width results in higher potential for congestion, though 4.30 m of trail plus buffer space meets standards. Curbside location means transit users do not have to cross over the MUT to board.</li> <li><b>Carry forward for further consideration.</b></li> </ul>
<p>3.1. Provision of 2.90 m to 3.15 m shared MUT / bus pad with narrow transit shelter located at back of sidewalk and no boulevard (original location of bus stop maintained). <b>See attached partial</b></p>	<ul style="list-style-type: none"> <li>Narrower bus shelter does not meet City standard.</li> <li>Maintains existing</li> </ul>	<p>Reduced MUT trail width at shared MUT/bus pad (varies from 2.90 m to 3.15 m) with yield</p>	<p>No property impacts.</p> <p>Partially preserves</p>	<ul style="list-style-type: none"> <li>Narrower path provides users with less space to avoid collisions, though 3.50 m of trail plus buffer (or shy-space) is provided which meets AODA standards.</li> <li>Greater potential for congestion where</li> </ul>	<ul style="list-style-type: none"> <li>Option maintains existing location and provides transit shelter without impacting property.</li> <li>MUT trail width reduced by 0.60</li> </ul>

Option	Transit Features and Proximity to Intersection	Accommodation of AT Facilities	Private Property Impacts	Safety	Overall Assessment
<b>plan for draft design concept.</b> <ul style="list-style-type: none"> <li>Design would include yield signs for cyclists approaching shared MUT / bus pad.</li> <li>Example of narrow, back of sidewalk shelter design used in Mississauga shown in <b>Figure 3</b> below.</li> <li>Shelter design example: City of Toronto Standard Drawing F-1-1c (attached)</li> </ul>	location near intersection.	signs for cyclists.	existing treeline.	trail bottlenecks compared to standard 3.50 m MUT width. <ul style="list-style-type: none"> <li>Closed-sided shelter reduces visibility and back of sidewalk location requires transit users to cross sidewalk when boarding.</li> <li>Yield signs can encourage cyclists to slow down, but do not guarantee that they will.</li> <li>Standard boulevard removed at this location (i.e. path flush with curb) resulting in no additional buffer between MUT and roadway.</li> </ul>	m to 2.90 m and removal of boulevard between MUT and roadway creates a bottleneck condition and results in lower safety conditions for all users. <ul style="list-style-type: none"> <li><b>Set aside from further consideration.</b></li> </ul>
<b>3.2. Provision of 3.35 to 3.70 m shared MUT / bus pad with narrow transit shelter located at back of sidewalk and no boulevard (bus stop shifted 10 m north). See attached partial plan for draft design concept.</b> <ul style="list-style-type: none"> <li>Design would include yield signs for cyclists approaching shared MUT / bus pad.</li> <li>Example of narrow, back of sidewalk shelter design used in Mississauga shown in <b>Figure 3</b> below.</li> <li>Shelter design example: City of Toronto Standard Drawing F-1-1c (attached)</li> </ul>	<ul style="list-style-type: none"> <li>Narrower bus shelter does not meet City standard.</li> <li>Bus stop shifted 10 m north of existing location.</li> </ul>	MUT trail width reduced south of shared MUT/bus pad to 3.35 m (widened to 3.70 m north) with yield signs for cyclists.	No property impacts.  Partially preserves existing treeline.	<ul style="list-style-type: none"> <li>Narrower path to south provides users with less space to avoid collisions, though 4.00 m of trail plus buffer (or shy-space) is provided which meets AODA standards.</li> <li>Moderately higher potential for congestion where trail bottlenecks compared to standard 3.50 m MUT width.</li> <li>Closed-sided shelter reduces visibility and back of sidewalk location requires transit users to cross sidewalk when boarding.</li> <li>Yield signs can encourage cyclists to slow down, but do not guarantee that they will.</li> <li>Standard boulevard removed at this location (i.e. path flush with curb) resulting in no additional buffer between MUT and roadway.</li> </ul>	<ul style="list-style-type: none"> <li>Option generally maintains existing location (nominal 10 m shift north) and provides transit shelter without impacting property.</li> <li>Minor reduction in MUT trail width of 0.15 m to 3.35 m plus removal of boulevard reduces safety compared to a standard design; however 4.00 m of trail plus buffer is provided between the transit shelter and curb, which meets standards.</li> <li><b>Carry forward for further consideration.</b></li> </ul>
<b>4. Shift bus stop 50-60 m north to less constrained area (adjacent to Brass</b>	<ul style="list-style-type: none"> <li>Bus shelter meets City standard.</li> </ul>	Full-width MUT accommodated.	No property impacts.	<ul style="list-style-type: none"> <li>Optimal design for congestion, resulting in higher safety for all users where the</li> </ul>	<ul style="list-style-type: none"> <li>While this option provides optimal MUT and transit</li> </ul>

Option	Transit Features and Proximity to Intersection	Accommodation of AT Facilities	Private Property Impacts	Safety	Overall Assessment
<div>Winds cul-de-sac) and provide for standard transit facilities and 3.50 m MUT.<ul style="list-style-type: none"><li>Shelter design: City of Mississauga Standard Drawing 2250.020 (attached)</li></ul></div>	<ul style="list-style-type: none"><li>Stop shifted approximately 50-60 m north of existing location.</li></ul>			<div>MUT and transit stop intersect.<ul style="list-style-type: none"><li>Relocation of stop so far from intersection reduces accessibility and may encourage jaywalking, particularly among students travelling to and from St. Marcellinus Secondary School.</li></ul></div>	<div>facilities, the 50-60 m shift north from the existing location reduces accessibility and may encourage transit users to jaywalk.<ul style="list-style-type: none"><li><b>Set aside from further consideration.</b></li></ul></div>
<div>5. Impact adjacent property and provide for standard transit facilities and 3.50 m MUT at existing location.<ul style="list-style-type: none"><li>Shelter design: City of Mississauga Standard Drawing 2250.020 (attached)</li></ul></div>	<ul style="list-style-type: none"><li>Bus shelter meets City standard.</li><li>Maintains existing location near intersection.</li></ul>	Full-width MUT accommodated.	Impacts adjacent property.	<ul style="list-style-type: none"><li>Optimal design for congestion, resulting in higher safety for all users.</li></ul>	<ul style="list-style-type: none"><li>While this option provides optimal MUT and transit facilities, it requires the taking of property.</li><li><b>Set aside from further consideration unless Options 1, 2, or 3.2 are deemed unfeasible.</b></li></ul>



**Figure 1: Example of a MUT crossing a bus pad with no shelter (Woodlawn Road, Guelph)**



**Figure 2: Example of a narrow, curbside shelter on Yonge Street in Toronto**



**Figure 3: Example of a narrower, back of sidewalk shelter on Tomken Road in Mississauga**

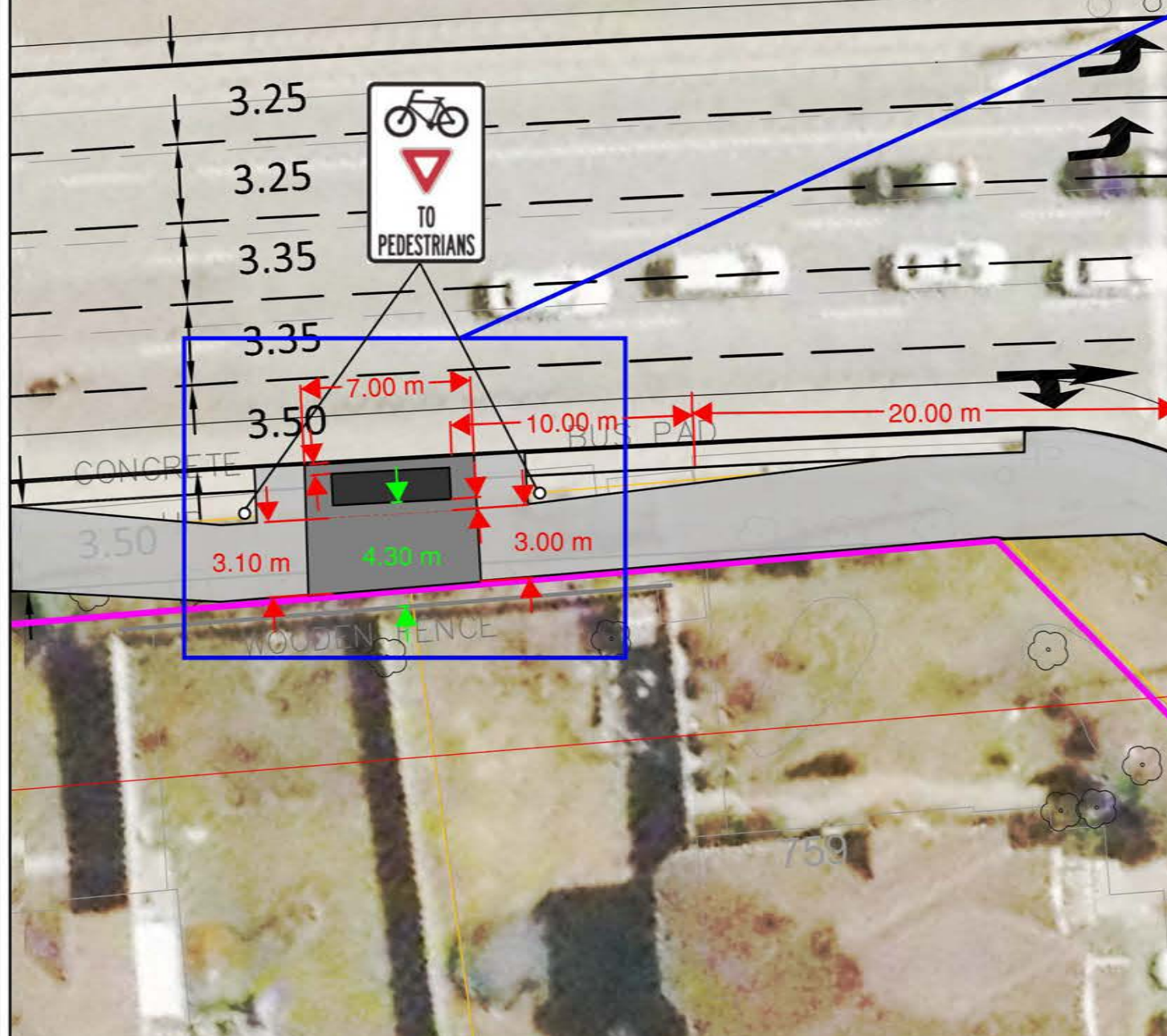
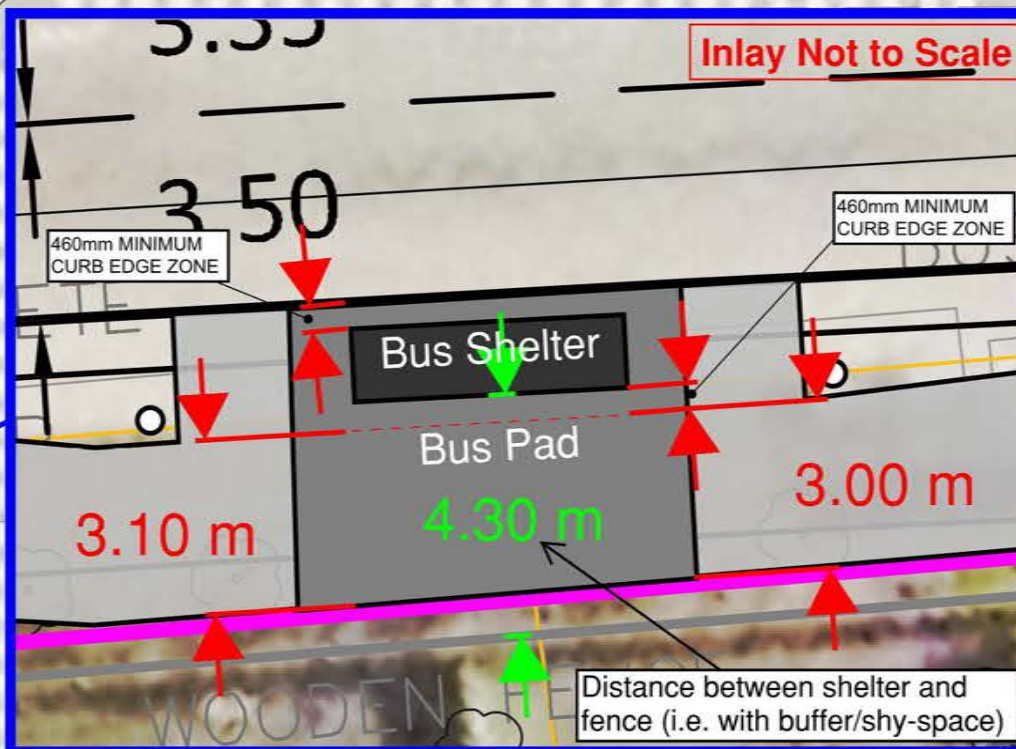




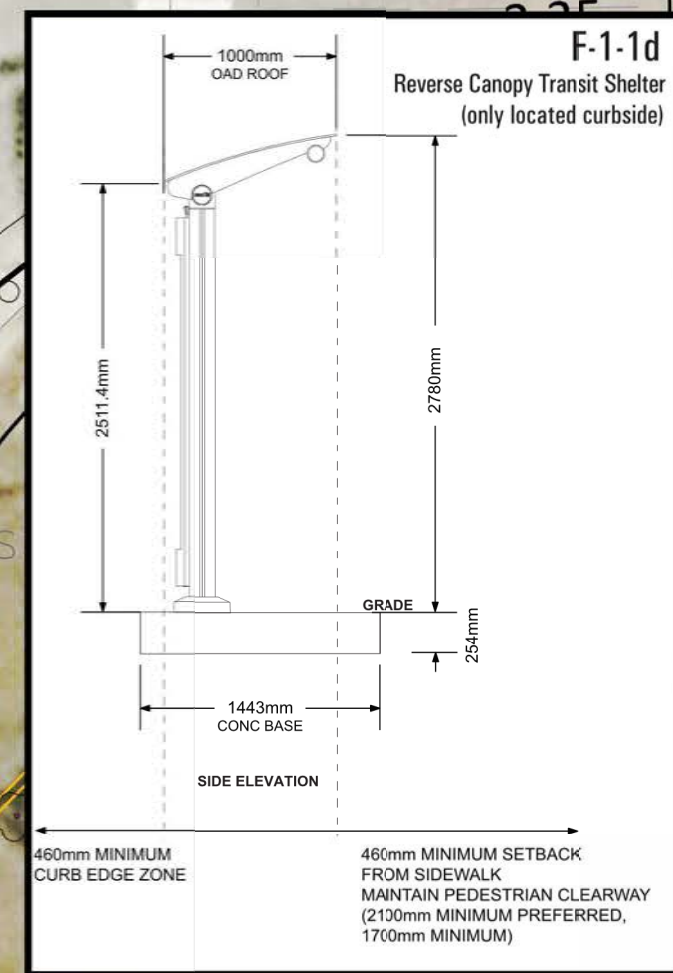


DRAFT

MAVIS ROAD



SOMBRERO WAY





**DRAFT**

MAVIS ROAD

460mm MINIMUM SETBACK  
FROM BACK OF SIDEWALK  
MAINTAIN PEDESTRIAN CLEARWAY  
(2100mm MINIMUM PREFERRED,  
1700mm MINIMUM)

Distance between shelter and  
curb (i.e. with buffer/shy-space)

3.15 m

Bus Shelter

5.0 m

Inlay Not to Scale

2.90 m

3.50 m

Bus Pad



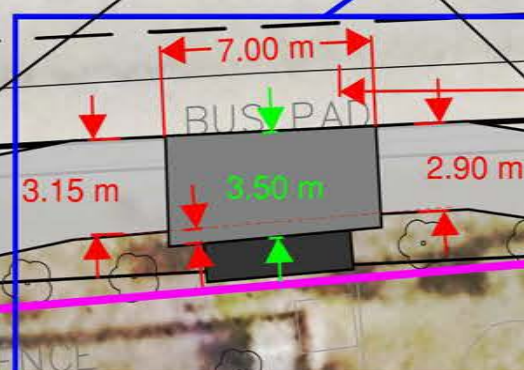
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3.25

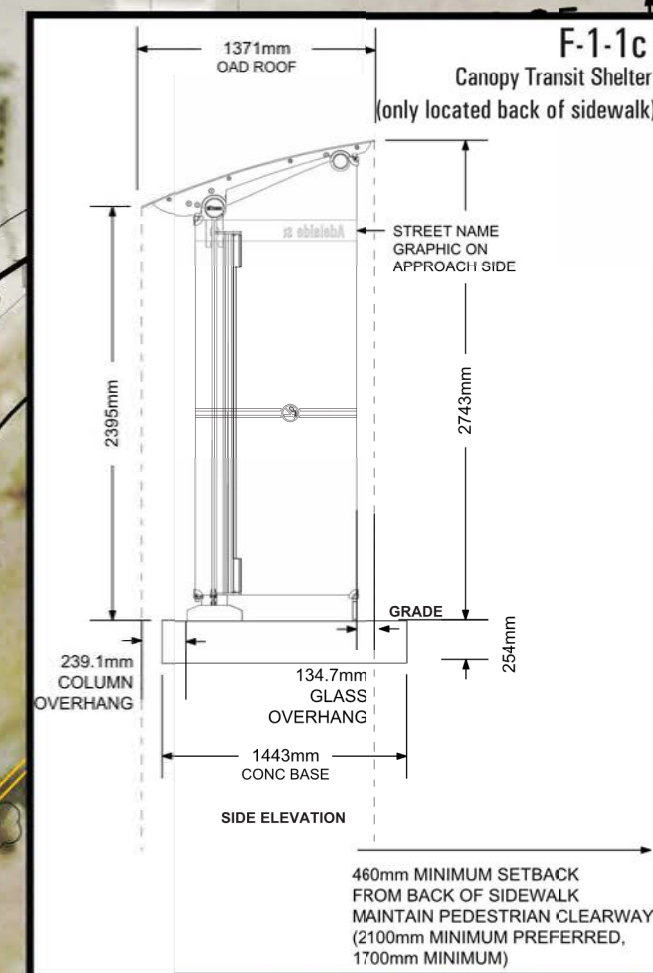
3.35

3.35

3.50



SOMBRERO WAY





DRAFT

MAVIS ROAD

Distance between shelter and curb (i.e. with buffer/shy-space)

3.50

460mm MINIMUM SETBACK FROM BACK OF SIDEWALK  
MAINTAIN PEDESTRIAN CLEARWAY (2100mm MINIMUM PREFERRED, 1700mm MINIMUM)

3.70 m

Bus Pad

3.35 m

Bus Shelter

5.0 m

Inlay Not to Scale

3.35



3.25

3.25

3.35

3.35

3.50

7.00 m

10.00 m

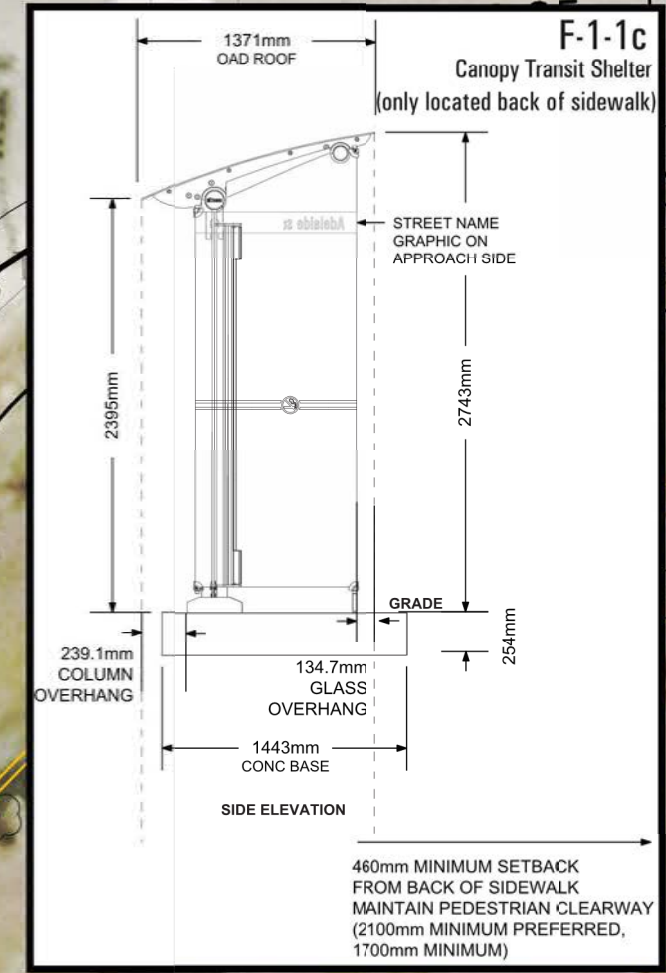
20.00 m

3.70 m

4.00 m

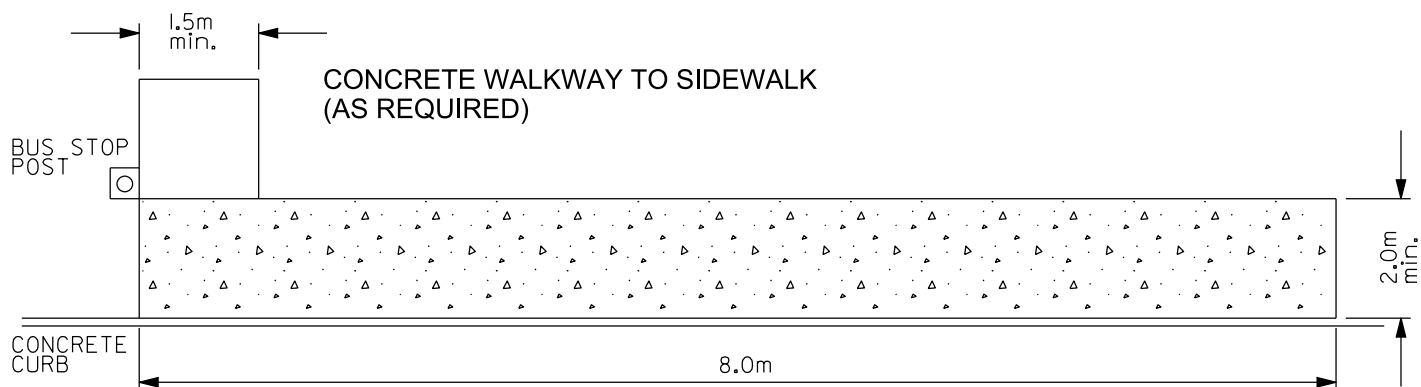
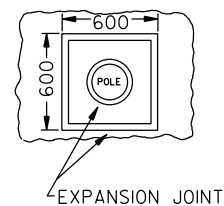
3.35 m

SOMBRERO WAY





DETAIL OF 'BOX OUT'  
FOR UTILITY STRUCTURE



STANDARD BUS PLATFORM (PLAN VIEW)

**NOTES:**

1. NOT TO SCALE.
2. FINAL PLATFORM MAY VARY. LOCATION TO BE APPROVED BY CITY OF MISSISSAUGA.
3. CONCRETE SHALL BE CSA C-2 AND IN ACCORDANCE WITH OPSS 351, OPSS 904 AND OPSS 1350
4. THIS STANDARD TO BE READ IN CONJUNCTION WITH CITY STANDARD SIDEWALK DWG. 2240.010, 2240.011 AND 2240.040
5. ALL PADS AND PLATFORMS TO BE SLOPED 2% TOWARDS THE ROAD OR AS OTHERWISE NOTED.
6. BUS STOP POST MUST BE A MINIMUM OF 0.60m FROM FACE OF CURB.
7. WHERE EDGES OF CONCRETE PLATFORM ARE ADJACENT TO CURB AND/OR SIDEWALK, EXPANSION JOINT MATERIAL MUST BE USED.
8. GRANULAR 'A' OR 19mm CRUSHED STONE SHALL BE PLACED AND COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY PRIOR TO POURING CONCRETE.
9. CONCRETE PLATFORM THICKNESS IS TO BE 180mm (min.)
10. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN.



**CONCRETE  
BUS STOP PLATFORM**

EFF. DATE: APRIL 2010

SCALE: N.T.S.

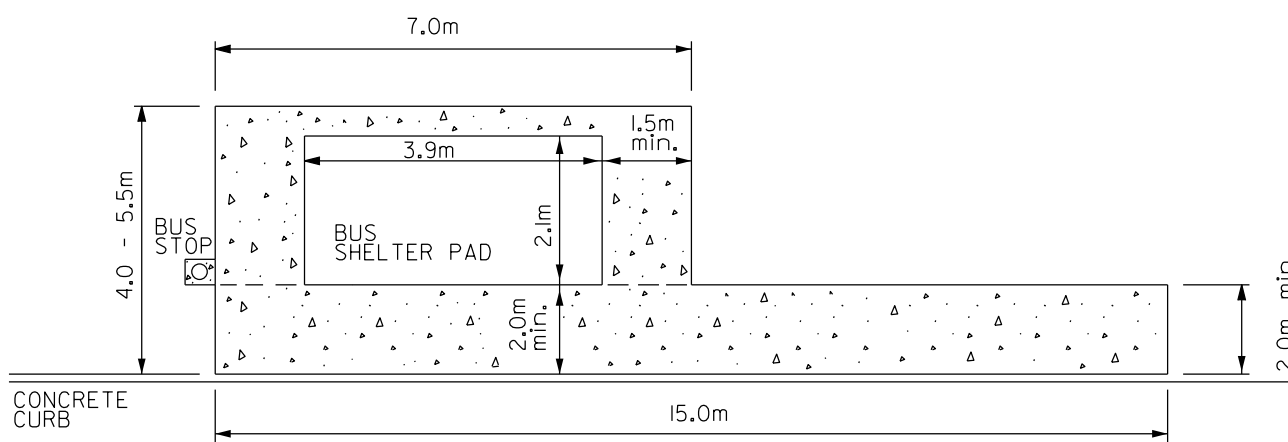
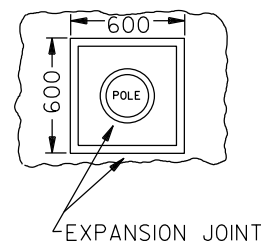
REV.

2

DRAWN: JFA

STANDARD No. 2250.010

### DETAIL OF 'BOX OUT' FOR UTILITY STRUCTURE



### STANDARD BUS PLATFORM WITH SHELTER CAPACITY (PLAN VIEW)

NOTES:

1. NOT TO SCALE.
2. FINAL PLATFORM MAY VARY. LOCATION AND SHELTER PLACEMENT TO BE APPROVED BY CITY OF MISSISSAUGA.
3. CONCRETE SHALL BE CSA C-2 AND IN ACCORDANCE WITH OPSS 351, OPSS 904 AND OPSS 1350
4. THIS STANDARD TO BE READ IN CONJUNCTION WITH CITY STANDARD SIDEWALK DWG. 2240.010, 2240.011 AND 2240.040
5. ALL PADS AND PLATFORMS TO BE SLOPED 2% TOWARDS THE ROAD OR AS OTHERWISE NOTED.
6. CONCRETE SIDEWALKS, PADS, CONNECTING WALKWAYS, AND CURBS/PLATFORMS MUST BE INTEGRATED AND HAVE SPACE TO ALLOW FOR UNHINDERED WHEELCHAIR ACCESS FROM THE SIDEWALK TO THE BUS STOP.
7. WHERE EDGES OF CONCRETE SHELTER PAD ARE ADJACENT TO CURB AND/OR SIDEWALK, EXPANSION JOINT MATERIAL MUST BE USED.
8. BUS STOP POST MUST BE A MINIMUM OF 0.60m FROM FACE OF CURB.
9. FOR BUS SHELTER PAD DESIGN AND COMPONENTS REFER TO STANDARD DWG. No. 2250.030
10. CONCRETE PLATFORM THICKNESS IS TO BE 180mm (min.)
11. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN.



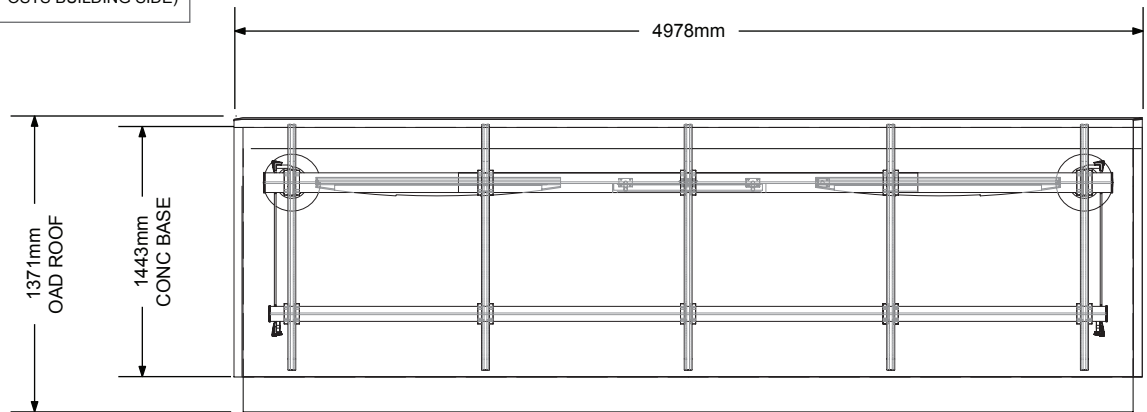
## CONCRETE BUS SHELTER PAD AND PLATFORM

EFF. DATE: APRIL 2010			SCALE: N.T.S.	
REV.	3	DRAWN: JFA	STANDARD No.	2250.020

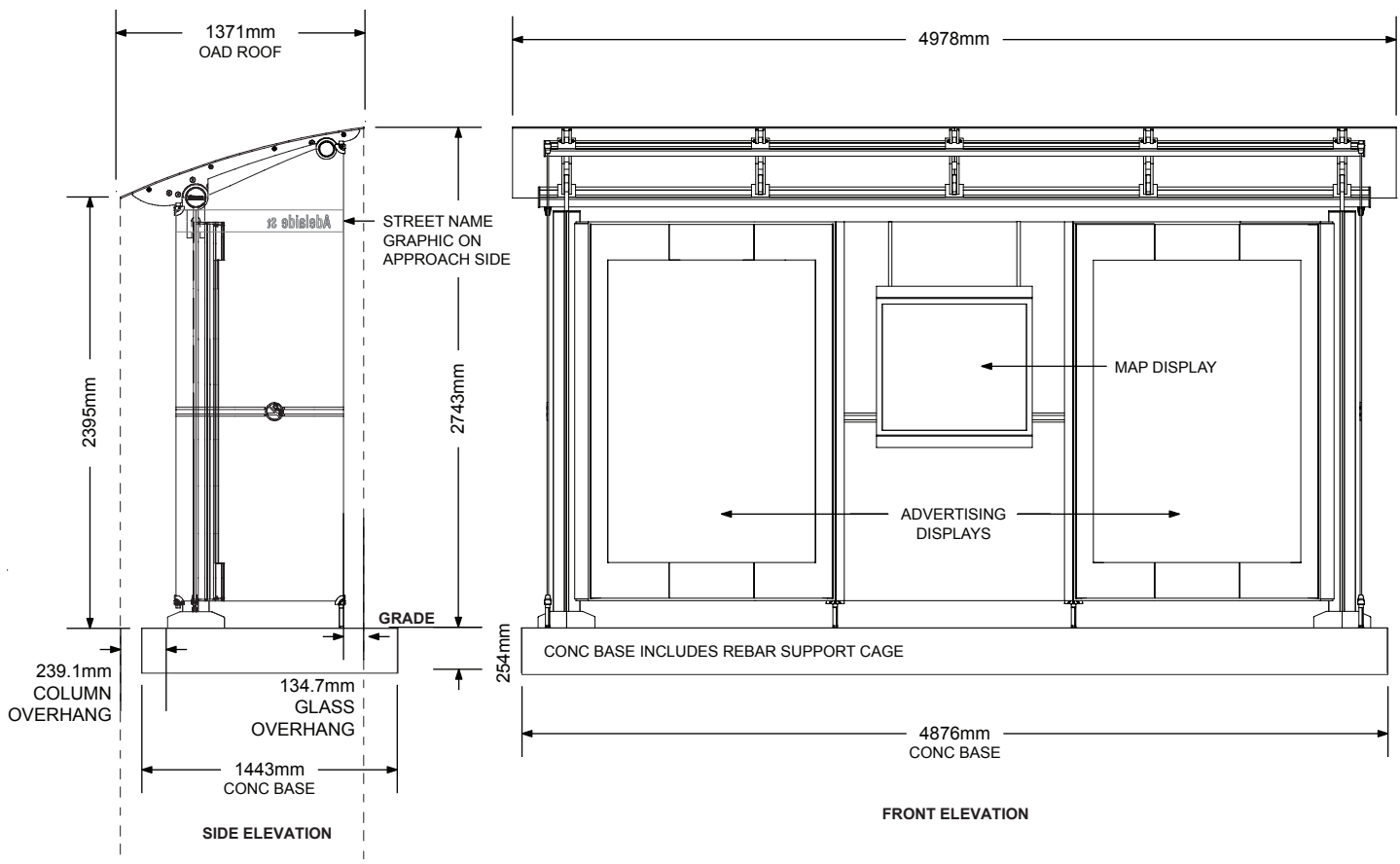
## • FURNITURE •

TRANSIT SHELTER AS SUPPLIED BY  
PROVINCIAL SIGN SYSTEMS: 905-837-1791

NOTE: SHELTER ROOF IS INTENDED TO VAULT  
TOWARDS THE ROADWAY (I.E. GLASS PANELS  
CURB SIDE AND SUPPORT POSTS BUILDING SIDE)



PLAN VIEW

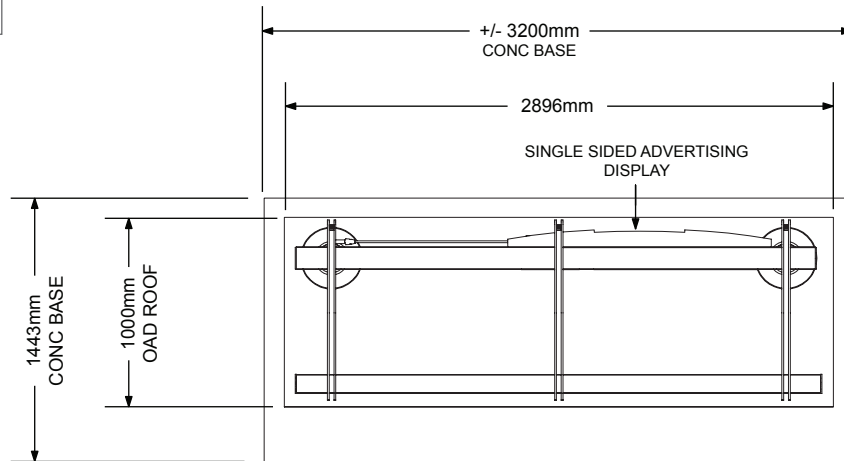


460mm MINIMUM SETBACK  
FROM BACK OF SIDEWALK  
MAINTAIN PEDESTRIAN CLEARWAY  
(2100mm MINIMUM PREFERRED,  
1700mm MINIMUM)

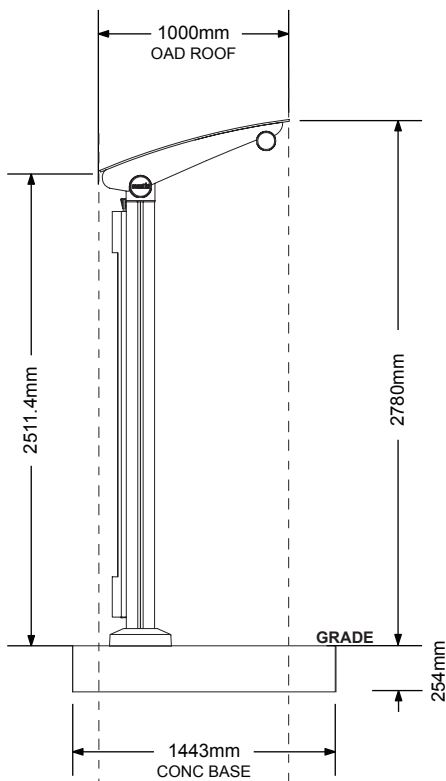


TRANSIT SHELTER AS SUPPLIED BY  
PROVINCIAL SIGN SYSTEMS: 905-837-1791

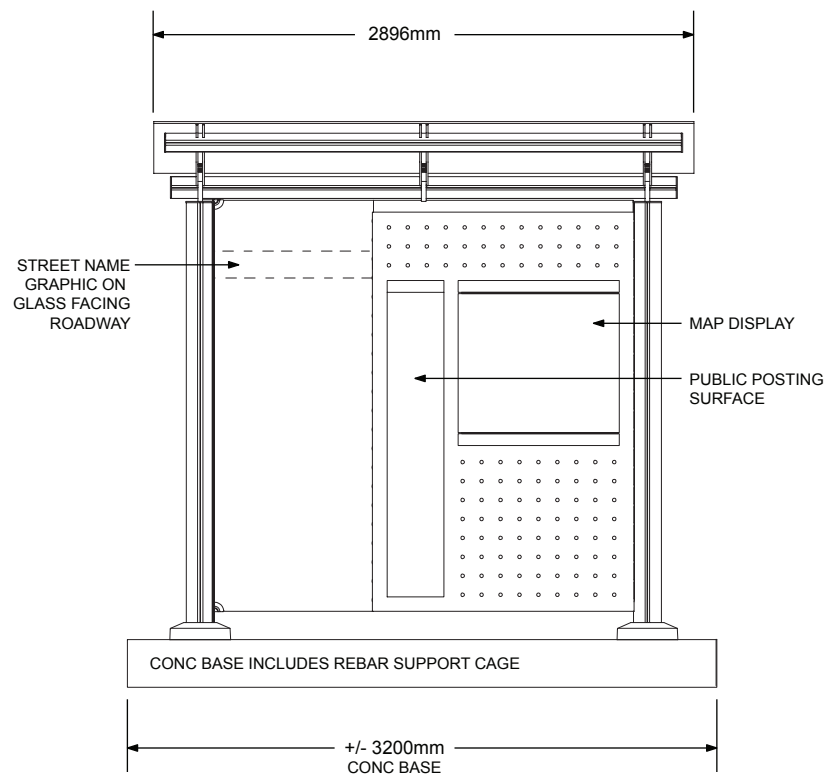
NOTE: SHELTER ROOF IS INTENDED TO VAULT  
AWAY FROM THE ROADWAY (I.E. SUPPORT POSTS  
ROAD SIDE)



PLAN VIEW



SIDE ELEVATION



FRONT ELEVATION

460mm MINIMUM  
CURB EDGE ZONE

460mm MINIMUM SETBACK  
FROM SIDEWALK  
MAINTAIN PEDESTRIAN CLEARWAY  
(2100mm MINIMUM PREFERRED,  
1700mm MINIMUM)