MEA 2016 ANNUAL WORKSHOP AND GENERAL MEETING

Roadside Safety – MASH

MTO Design & Contract Standards Office
Highway Standards Branch

November 24, 2016
Roadside Safety - MASH

- Highway Safety in Ontario
- Crash Test Standards
- Implementation of MASH Products by MTO
  - Steel Beam Guide Rail
  - Steel Beam Energy Attenuating Terminals
  - Cable Guide Rail
- Ontario Provincial Standards for Roads and Public Works
Motor vehicle crashes inflict a tremendous toll on Canadian society

In 2013, Ontario’s fatality rate of 0.54 per 10,000 licensed drivers was the second lowest ever recorded in Ontario.

It was the second lowest in all of North America, behind only the District of Columbia.

Number of traffic fatalities in Ontario steadily declined over the past 23 years:
- 1,120 in 1990
- 518 in 2013 (second lowest since 1944)

Number of injuries has also decreased from 101,575 in 1990 to 59,570 in 2013.
Highway Safety in Ontario

Licensed Driver Population and Fatality Rate: 1975-2013

- 1976: Seatbelt use becomes mandatory
- 1982: Child car seats become mandatory
- 1977: Concrete median barriers
- 1980s: Temporary concrete barriers in construction zones
- 1988: Energy absorbing guide rail terminals
- 1991: Ontario Tall Wall concrete median barrier
- 1995: Shoulder rumble strips on rural freeways
- 1994: Graduated Licensing System (GLS) introduced
- 1996: Administrative Driver’s Licence Suspensions, dedicated R.I.D.E. program funding
- 1999: Vehicle Impoundment Program
- 2001: Ignition Interlock Program
- 2005: Mandatory Booster Seats
- 2006: One Person, One Seatbelt
- 2007: Street Racing Legislation
- 2009: Speed limiters for large trucks
  Warn range sanctions
  Ban on hand-held devices
- 2009: Modern Roundabouts
- 2010: Zero BAC for 21 & under
  New Ignition Interlock and Vehicle Impoundment Programs
- 2010: Centre line rumble strips
- 1982: Partially paved shoulder program
- 2001: Fully paved shoulders on 4-lane freeways
- 2006: One Person, One Seatbelt
- 1988: Energy absorbing guide rail terminals
- 1999: Vehicle Impoundment Program
- 2005: Mandatory Booster Seats
- 2007: Street Racing Legislation
- 2009: Speed limiters for large trucks
  Warn range sanctions
  Ban on hand-held devices
- 2009: Modern Roundabouts
- 2010: Zero BAC for 21 & under
  New Ignition Interlock and Vehicle Impoundment Programs
- 2010: Centre line rumble strips
Crash Test Standards: Evolving Acceptance Tests

1962: HRCS Circular 482
1973: NCHRP Report 153
1978: TR Circular 191
1980: NCHRP Report 230
1993: NCHRP Report 350
2009: Manual for Assessing Safety Hardware (MASH-09)
2016: MASH-16 (Second Edition published November 17, 2016)
### Crash Test Standards: Significant Changes

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>REPORT 230</th>
<th>REPORT 350</th>
<th>MASH-09</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vehicle</strong></td>
<td>816 kg Small Car 2041 kg Large Car</td>
<td>816 kg Small Car 2000 kg Pickup 8000 kg SU Truck 36000 kg Truck</td>
<td>1100 kg Small Car 2270 kg Pickup 10000 kg SU Truck 36000 kg Truck</td>
</tr>
<tr>
<td><strong>Speed</strong></td>
<td>32 km/h 97 km/h</td>
<td>50 km/h 70 km/h 80 km/h (trucks) 100 km/h</td>
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</tr>
<tr>
<td><strong>Test Level</strong></td>
<td>NA</td>
<td>TL-1 TL-2 TL-3 Pass Vehicle TL-4 SU Truck TL-5 Truck/Trailer TL-6 Tanker Trailer</td>
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</tr>
</tbody>
</table>
Crash Test Standards: Evolving Vehicle Fleet

2000 kg 2270 kg

816 kg 1100 kg

NCHRP 350 MASH

Highway Standards Branch
Crash Test Standards: MASH Implementation by MTO

Roadside safety hardware meeting MASH and applicable MTO standards (OPSS, SSP, OPSD, MTOD) have been implemented on new MTO contracts advertised after the following dates:

- May 27/16: Steel Beam Guide Rail (Type M SBGR)
- September 1, 2016: Steel Beam Energy Attenuating Terminals (SBEAT)
- December 31, 2016: Cable Guide Rail (High Tension Three Cable Guide Rail)
- TBA: Energy attenuators, bridge rails, transitions, all other longitudinal barriers (including temporary barriers installed permanently), all other terminals, sign supports, and all other breakaway hardware
- TBA: Temporary work zone devices, including temporary barriers

Implemented MTO standards available at: www.OPS.on.ca.
Crash Test Standards: MASH Implementation

 FHWA/AASHTO – Dec 22/15 Implementation Schedule

After the following dates, only safety hardware evaluated using the new edition of MASH will be allowed on the National Highway System in the US for new permanent installations and full replacements:

- Dec 31/17: w-beam barriers and cast-in-place concrete barrier
- June 30/18: w-beam terminals
- Dec 31/18: cable barriers, cable barrier terminals, and crash cushions
- Dec 31/19: bridge rails, transitions, all other longitudinal barriers (including portable barriers installed permanently), all other terminals, sign supports, and all other breakaway hardware
- Temporary work zone devices, including portable barriers, manufactured after December 31, 2019, must have been successfully tested to MASH. Such devices manufactured on or before this date, and successfully tested to NCHRP Report 350 or the 2009 edition of MASH, may continue to be used throughout their normal service lives.
Type M SBGR (MASH) vs SBGR (Report 350):
All MTO contracts advertised after May 27, 2016 that include new installations of SBGR shall specify Type M SBGR and associated Type M SBGR Energy Attenuating Terminals in the contract documents.

OPSD 912.130 (Nov/08)
OPSS.PROV 721 (Nov/15)
T/Rail: 685 to 735mm (28" +/- 1")

MTOD 912.185 (Apr/16)
OPSS.PROV 721 (Nov/15)
MTO SSP 721S05 (Apr/16)
T/Rail: 785mm (31") +/- 25mm
Type M SBGR (MASH-09):
Standard 1829mm (6’) long W150x13 (W6x9 or W6x8.5) steel post

Type M20 SBGR
Adjacent to 2H:1V Rail at Shoulder,
2438mm (8’) posts

Type M30 SBGR
Adjacent to Curb
1829mm (6’) posts

Type M30 SBGR
Adjacent to Sidewalk and Curb
1829mm (6’) posts

TL-3
MTOD 912.186 (Apr/16)
OPSS.PROV 721 (Nov/15)
MTO SSP 721S05

TL-3
MTOD 912.188 (Apr/16)
OPSS.PROV 721 (Nov/15)
MTO SSP 721S05

TL-2
MTOD 912.189 (Apr/16)
OPSS.PROV 721 (Nov/15)
MTO SSP 721S05
Steel Beam Energy Attenuating Terminal (SBEAT): Report 350 Terminals

ET-Plus (Extruder)  Sequential Kinking Terminal (SKT)  X-Lite
Steel Beam Energy Attenuating Terminal (SBEAT): All MTO contracts advertised after September 1, 2016 that include the tender item Steel Beam Energy Attenuating Terminals (SBEAT) shall only specify terminals that meet the crash test requirements of AASHTO MASH TL-3.

MASH SoftStop
MTOD 922.165 (Sept/16)

MASH Sequential Kinking Terminal (MSKT)
MTOD 922.186 (Sept/16)

OPSS.PROV 732 (Apr/16)
SSP No. 732S03 (Sep/16)
Cable Guide Rail: All MTO contracts advertised after December 31, 2016 that include new or replacement installations of Three Cable Guide Rail shall specify High Tension Three Cable Guide Rail and High Tension Cable Guide Rail Terminal Systems in the contract documents.

MASH TL-3 Safence System

MTOD 913.200 series (Dec/16)
SSP No. 799S15 (Dec/16)
Ontario Provincial Standards for Roads and Public Works:

- MTO continues to support OPS Traffic Safety Committee (TSC).
- MTO continues to share ministry standards specifying systems that meet MASH that the ministry implemented on provincial highways for TSC review, consideration and publishing as Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) for use by municipal road authorities across Ontario.
Design & Contract Standards Office:
Design Standards Section – Roadside Design Contacts
• Mike Pearsall, P.Eng., Section Head
  Mike.Pearsall@ontario.ca
  (905) 704-2284
• Mark Ayton, P. Eng., Senior Engineer, Highway Design
  Mark.Ayton@ontario.ca
  (905) 704-2295
• Justin White, P. Eng., Design & Contract Standards Engineer
  Justin.White@ontario.ca
  (905) 704-2256