



Public Works Operations & Engineering Divisions

Escarpment Crossings - Rock Slope Assessment

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Providing services that bring our City to life !

Background

- Community
- People
- Processes
- Finance



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- Many roadways within the City of Hamilton located in close proximity to natural slopes or steep rock cuts
- Potential risk for traffic due to rockfall hazards
- Examples for rockfalls in past years:
 - Claremont Access
 - Sydenham Road
 - Kenilworth Access
 - Sherman Access East



Rock Slope Stability

Factors Influencing Stability

- Structure within the Rock
 - Occurrence of discontinuities (joints, bedding planes) in the rock mass
 - Spacing, orientation and continuity of these discontinuities
- Weathering of Rock
 - Degradation / breakdown of rock due to various factors of influence like water, temperature, etc.
 - Typical weathering processes observed in Hamilton are freeze-thaw actions, differential weathering, vegetation, water
- Groundwater

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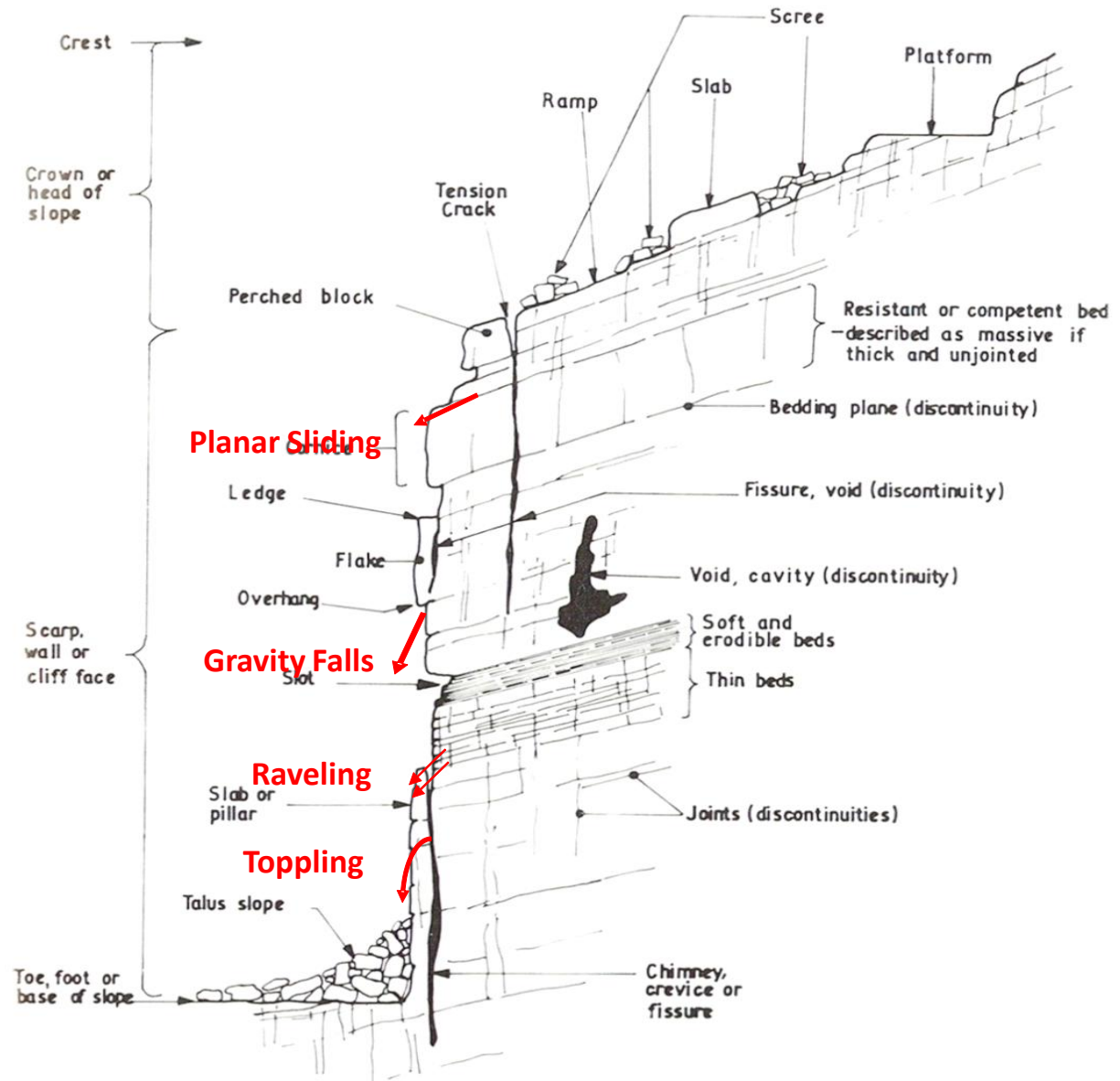
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Rock Failure Mechanisms

- Community
- People
- Processes
- Finance



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Roadway Escarpment Crossings - Maintenance

- Past maintenance activities generally based on reacting to rockfall events and observed hazards
- Assessment of rock slopes required to develop a pro-active maintenance program
- Study commissioned in 2015 – Golder Associates retained
- Study finalized early in 2016

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Rock Slope Assessment

Tasks carried out in the 2015 Rock Slope Assessment

- Visual inspection of the slopes
- Identification of rockfall hazards
- Assessment of risk to the public
- Recommendation on required maintenance and/or remedial measures
- Prioritization of maintenance work

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Rock Slope Assessment

Locations assessed

- Fifty Road Mountain Access
- McNeilly Road Mountain Access
- Dewitt Road
- New Mountain Road
- Centennial Parkway
- Kenilworth Access
- Sherman Cut
- Sherman Access East
- Sherman Access West
- Claremont Access
- Jolly Cut
- James Street Hill (James Mountain Road)
- Queens Street Hill / Beckett Drive
- Wilson Street (Ancaster)
- Old Dundas Road (Ancaster)
- Highway 8 (Dundas)
- Sydenham Road

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Rock Slope Assessment

Prioritization of maintenance work

Rock Hazard Rating System for Ontario (RHRON)
(developed by Ministry of Transportation)

Rating factors are:

Magnitude: estimated amount of rock that might come down

Instability: estimated frequency of rockfalls

Reach: estimated reach of rock debris

Consequences: estimated consequences of a rockfall event

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Typical Maintenance / Remedial Work

Scaling of rock faces (removal of loose rock) to minimize rockfalls:

- To be carried out typically every 2 to 5 years
- Frequency depends on weathering rate of the rock

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Typical Maintenance / Remedial Work

Regular ditch maintenance

(removal of rock debris to provide space for falling rock)

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Kenilworth Access



Typical Maintenance / Remedial Work

Installation of draped rockfall protection mesh

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Mesh Anchor



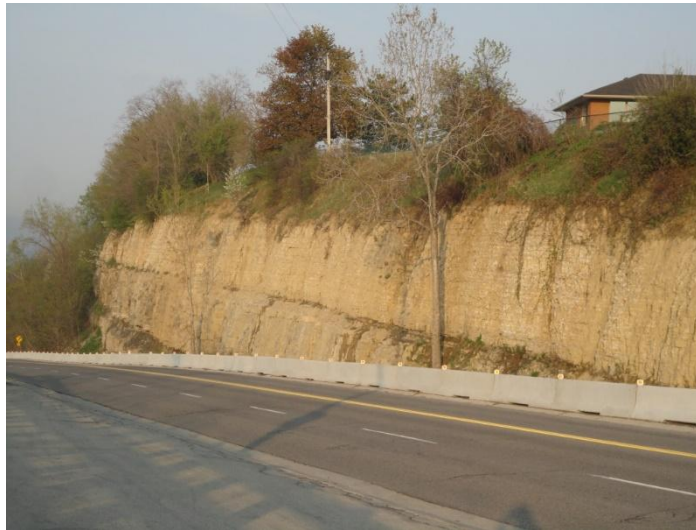
Steel Mesh

Sherman Cut

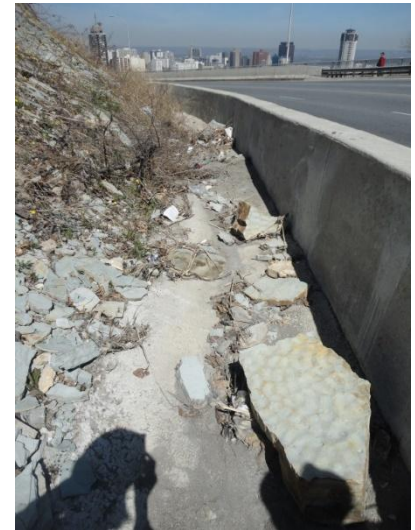
Typical Maintenance / Remedial Work

Installation of rockfall barriers

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Sydenham Rd



Jolley Cut



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Roadway Escarpment Crossings - Maintenance

Operations Division Work Plan:

- Annual budget for escarpment maintenance - \$300,000
 - sufficient for annual rock scaling activity
- Recent maintenance activity:
 - Sherman Cut mesh installation
 - Rock scaling on Kenilworth
 - Rock scaling on Sherman Access
- 2016 / 2017 Work Program:
 - Additional mesh installation on Sherman Access East
 - Rock scaling on priority locations identified in rock slope assessment study

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Roadway Escarpment Crossings

Engineering Services

- Community
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- Finance



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Roadway Escarpment Crossings

Engineering Services

City Owns and maintains a complex network of structures and retaining wall systems along escarpment crossings.

- Community
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Roadway Escarpment Crossings

Engineering Services

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Structures and Wall Systems are utilized:

- To separate the grades and effectively channel traffic flow
- For support of elevated adjacent roads
- Where the natural slope of the escarpment is not feasible to accommodate road width

City Wall Systems:

- City owns and maintains over 3000m of wall systems



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Roadway Escarpment Crossings

Engineering Services

Managing Escarpment Crossings:

- Every two years the city will inspect each structure using Provincially mandated structural rating system
- Every 5 years the city will inspect the wall systems
- Every 5 years the city will inspect the road pavements using standardized surface condition rating system

Escarpment Crossings Rehabilitation:

- Based on the results of each of the inspections, city staff will identify works to be included in the capital budget
- Rehabilitation work will maintain the infrastructure in good working order

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Roadway Escarpment Crossings

Engineering Services

Future Work:

- Sherman Access wall systems assessment and design in 2016 with rehabilitation works in 2017 (\$800,000)
- Fifty Road Escarpment Access rehabilitation (\$1.3 million)
- Continue updating assessments of structures every 2 years and identify rehabilitation works
- Update assessments for other accesses in 2016 and 2017 and identify short, medium and long-term rehabilitation works along with functional requirement
- Utilize the 2015 pavement condition assessment to identify road rehabilitation works
- Update capital and operating budgets accordingly

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