



# Snow Removal Equipment Visibility

2015 Winter Maintenance Peer Exchange  
September 2015

# Winter Equipment Visibility – the issue

- Snow removal equipment often operates under the most adverse conditions when conspicuity is most important



- Changes in delivery methods and equipment types have affected previous “brand identity” (yellow and black)
- Drivers are not always aware that they are approaching snow plows
- Inappropriate driver reactions can lead to collisions

# Understanding - Loss of “brand identity”



# Literature Review Conclusions

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## What we need to do:

- Grab the driver's attention (Detection)
- Allow the driver to locate the source (Recognition)
- Relay a message to the driver (Decision)
- Obtain the appropriate response (Response)

# Literature Review Conclusions

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- Detection
  - LEDs recommended
    - brighter
    - need more frequent cleaning
  - Increasing intensity
    - does not always improve detection
    - can result in glare
  - Optimum detection requires different levels of intensity for day vs. night
  - **Blue most conspicuous colour day and night, and needs least intensity, thereby reducing glare**

# Literature Review Conclusions

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- Detection
  - Short, intense flash (i.e. strobes)
    - good detection
    - fail to convey closure rate
  - Second set of elevated stop-tail-turn and backup lights beneficial
  - Reflective tape to outline back of the snow plow box

# Literature Review Conclusions

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- Recognition: hazard comprehension
  - Stronger perception of hazard with **combinations of yellow, blue and red**, than with yellow alone.
  - Suggested responses to red alone (78% indicated braking) were more dramatic than to yellow (42%) and blue (42%)
  - **Connecting dots** is important (lights + outline)
  - **Brand** (distinctive pattern) is helpful
- Recognition: perception of closing speed
  - **Widely separated lights** will give strongest cue
  - **Retro-reflective contour markings** assist at night
  - **Longer duration lights** (steady or incandescent) are better than short duration lights (strobe)

# Literature Review Conclusions

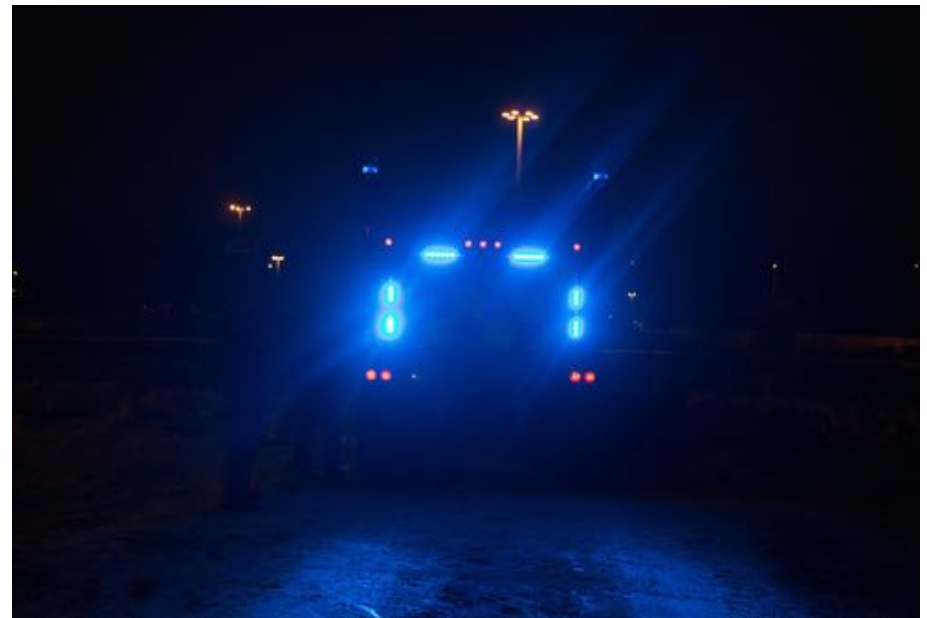
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- Decision
  - Slow/pass – dependent on driver awareness
- Response: speed, lane choice, lane changes
  - Some evidence that:
    - speed slower for yellow/blue combination than for yellow alone
    - yellow/blue/red is associated with greater brake activations than yellow alone
  - Light bar with 6 sequential flashers more effective than 4-way flashers with regard to closing speed assessment
  - 4-way flashers and rotating single beacon also effective
  - Double flash strobes not effective



# Testing

- Daytime and Nighttime using volunteer test subjects
- Testing Included:
  - Rear panel colour and pattern
  - Light patterns and configuration
  - On-road monitored closing velocity



# Results

- Conspicuity panel should be fluorescent yellow-green and black
- Optimal light pattern amber solid and blue 1Hz flash. Also unique conspicuity compared to common emergency vehicles on highway
- Conspicuity is improved in both urban and rural conditions.
- Perception of closing velocity is improved in order of 10%.

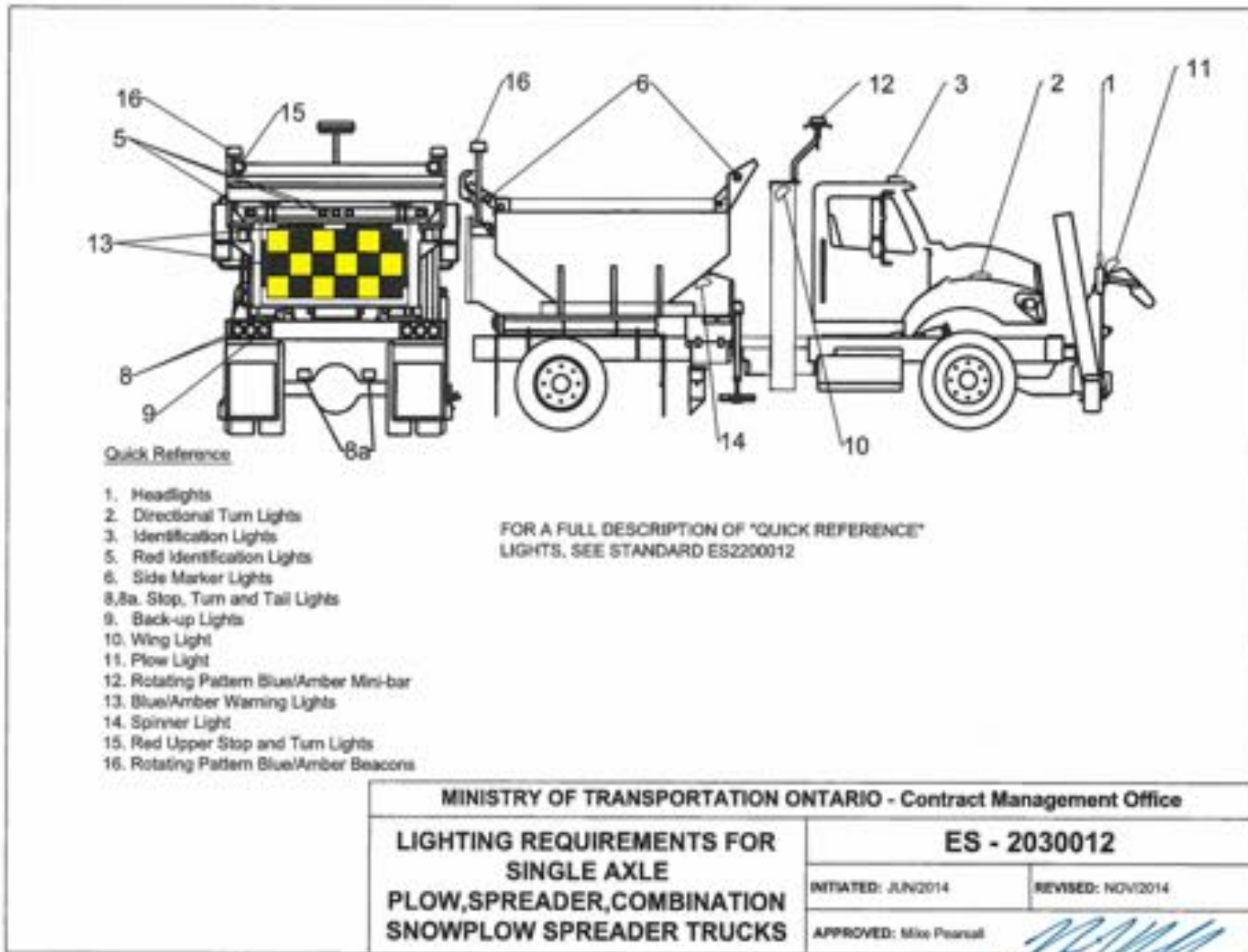


# Additional Findings

- Need automatic light dimmers (day, night)
- Supplier differences: visibility and durability
- Air foils worked well – Alberta model
- Strobe lights worst
- Amber / green reviewed
  - Conflicts with Highway Traffic Act, volunteer firefighters and traffic signals
  - Visibility less than amber / blue



# New Equipment Standards Issued in 2014



# Canadian National Guideline



- **Snow Removal Equipment Visibility Guide**

- PTM-SREVG-E  
\$39 TAC Members  
\$49 Non-Members

- **Available in print and ebook format**

The *Snow Removal Equipment Visibility Guide*, now [available in the TAC Bookstore](#), provides information, analysis and testing to assist road authorities and winter maintenance service providers to make their snow removal equipment as visible as possible. It is hoped that establishing guidelines for this purpose will provide increased consistency in the appearance of snowplows and other snow removal equipment across Canada. Increased visibility of and consistency in the appearance of this equipment will enhance motorists' ability to detect, recognize and respond to snowplows which will, in turn, increase road safety.