



[What is Acceptable Risk in Cycling Infrastructure?]

What we should learn from legal actions

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**Gerry Forbes, Intus Road Safety Engineering Inc.
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Abstract

Cycling collisions tend to be less frequent, or at least less frequently reported, than motor vehicle collisions, and as such the safety of cycling infrastructure is more difficult to measure than motor vehicle safety. Nonetheless, there is much that can be learned from an examination of individual cycling collisions. One of the most significant sources of information on the acceptability of cycling infrastructure can be gleaned from examining the outcomes of legal actions involving cycling collisions and falls. The legal system is one way of determining acceptable risk in cycling, and can serve as an important input to cycling infrastructure design, operation, and maintenance. This paper examines the claims, facts, arguments, and outcomes from several legal actions surrounding bicycle collisions and falls in Canada, and determines the lessons to be learned by designers and operators of cycling facilities.

Introduction

As sustainable transportation continues to permeate the mainstream of highway planning, design, and maintenance, it behooves transportation practitioners to reconsider their programs and practices in light of cyclist safety.

Studies of cycling injuries show that as much as 70% of reported bicycle injury events do not involve a motor vehicle. In addition, 31% of bicyclists are injured in non-roadway locations such as sidewalks, parking lots, or off-road trails [Stutts and Hunter, 1999]. This being the case, it is perhaps not surprising to find that the majority of legal actions brought against Canadian municipalities involve falls and other incidents and not bicycle-vehicle crashes. This paper presents the facts, arguments, and decisions from several Canadian trials concerning cycling accidents in which municipal negligence was alleged. Additionally, the author interprets the decision as it relates to good practice in the provision and maintenance of safe cycling infrastructure.

Disclaimer

This document provides information about the law as it pertains to bicycle facilities in Canada. This information is for educational purposes respecting bicycle planning and design matters, and is directed to Transportation Association of Canada members. The reader is cautioned that the legal information presented herein is not the same as legal advice, which is the application of law to an individual's specific circumstances. To the best of the author's knowledge, this information is accurate and complete. However, it is recommended that readers consult with their Legal Counsel to obtain professional assurance that this information, and the interpretation of it, is appropriate to the reader's particular situation.

The author of this document is not a lawyer and the material presented herein is not, nor is it intended to be, a legal opinion or advice.

The interpretations presented herein are those of the author. They are not intended to suggest that the cited road authorities are any better or worse than their contemporaries; they are cited simply because they have legal actions that proceeded to trial, which resulted in publicly-available decisions.

A (Very) Brief Introduction to Tort Law

Tort comes from the Latin word "tortus" which means "wrong", and is generally defined as a civil wrongdoing. The Supreme Court of Canada defines tort law as a "means whereby compensation, usually in the form of damages, may be paid for injuries suffered by a party as a result of the wrongful conduct of others" [Hall v Hebert, 1993]. Tort law is a compensator.

There are four elements to a tort, all of which must be satisfied in order for a case to succeed:

1. **Duty:** The defendant must owe a legal duty to the victim. A duty is a legally enforceable obligation to conform to a particular standard of conduct. For road authorities and those responsible for public cycling facilities, the various provincial statutes establish the duty. Moreover, the duty is what a "reasonable man of ordinary prudence" would have done.
2. **Injury:** There must be an injury. In most cases, there must be a physical or financial injury to the victim.
3. **Breach of the duty:** The defendant had to have breached the duty of care.
4. **Causation:** The breach was the cause of the injury/loss to the victim. The causation does not need to be direct; the defendant's actions or inactions could begin a continuous sequence of events that ended in plaintiff's injury, a so-called "proximate cause".

In most instances concerning the safety of cycling infrastructure, the duty of the defendant and the injury/loss sustained by the plaintiff are easily established. The majority of the arguments being made in courts concern whether a breach of duty occurred, and/or if the breach was a cause of the loss. For the purposes of this paper, the focus will be on what the judicial system constitutes a breach of duty in the individual cases.

Wong v. Vancouver, City of (2001)

The Wong accident occurred in the early morning (at about 0430h) on a weekday in February of 2000 on a City designated bicycle route. At the time and location of the Wong accident, the City had commissioned two pavement cuts that extended laterally across the roadway for sewer work. The cuts were about 15 metres apart, with each cut being 1.2 metres wide. The cuts had been backfilled with gravel but remained several inches below the pavement; ready to accept a lift of asphalt that was placed two days after the Wong accident.

While riding her bicycle Ms. Wong struck the first cut she encountered, was thrown over the handlebars, and her head and face impacted the pavement. She was wearing a bicycle helmet at the time. Ms. Wong was in good health and using a bicycle that was familiar to her and in good working order. She was an accomplished rider and was also familiar with the bicycle route having ridden it many times

prior to the subject ride. At trial, another cyclist testified that he too had fallen from striking the same surface discontinuity but had not brought an action against the City having only damaged his bicycle.

Backfilling of the trenches was completed on the day before the Wong accident. A sign indicating that the road was closed was posted upstream of the backfilled trenches, and Ms. Wong admits to seeing and passing the road closed sign. While the pavement cut that Ms. Wong eventually struck extended almost across the whole width of the road, a sawhorse barricade and traffic cones were only placed across half of the road. The City contends that when their staff left the site, after backfilling the trench, a sawhorse barricade was placed across one half of the road, and traffic cones blocked the other half of the road. It is the City's position that the sawhorse barricade was moved by unknown person(s) after they left the site the day before the accident.

The City's usual procedure in delineating pavement cuts that extend across the entire road was to place two sawhorses side-by-side, and they could not explain why this procedure was not followed in this case. However, the City did not feel that delineation of the surface discontinuity by traffic cones was insufficient. The City work crews noticed cyclists using the sidewalk or proceeding slowly through the backfilled areas during their time on site, and candidly admit that they did not take any additional precautionary measures because this was a bicycle route. In fact, all of the witnesses from the City consistently testified that it is "*not uncommon*" for warning devices such as barricades and cones to be moved by those who wish to proceed through a construction site. Moreover, City staff acknowledge that road closed signs are routinely ignored by motorists, pedestrians, and cyclists.

In the judge's opinion the City's admission that it is commonplace for people to enter the work zone and to move barricades made the risk of someone entering the site and moving the barricades foreseeable. Also, while the condition of the pavement cut did not pose any significant threat to motor vehicle traffic, it did pose a threat to the cyclists. The site being on a bicycle route, this is a significant factor. Since the risks were foreseeable the remaining question is whether the City's precautionary measures were adequate for the circumstances.

The judgment in this case very clearly stated that it is not the City's responsibility, nor could they provide absolute protection or complete security from the dangers posed by the backfilled trenches. This level of safety would come at a cost to the municipality which would not be commensurate with the threat posed. However, the judge was critical of the City not employing more effective measures that were not costly or time consuming. Specifically, the City sometimes employed measures such as snow fencing to cordon off streets and work zones which afforded a greater level of protection, and was not as readily moved by the public.

Ms. Wong also came under the judge's critical eye, in that she admitted to passing the road closed sign, and proceeded through a work zone without keeping proper lookout for potential hazards. By all accounts several other cyclists had noticed the backfilled trenches in time to either slow down and traverse the trenches or move to the sidewalk and by-pass them. The judge found liability split 75/25, with the City assuming the lion's share of the fault.

There is a very clear message for road authorities in the decision; even though practices and devices may be in accordance with accepted guidelines and service standards, if the practices and devices are known to be ineffective then the risks are foreseeable and actionable. The fact that the public routinely moved work zone traffic control devices and the City knew of this created the situation of foreseeable risk. This means that the City was obligated to either curtail the unauthorized movement of the traffic control devices (e.g., police enforcement), or to employ methods that minimized this activity. This last point assumes that there are other reasonable measures available.

Talbot v. Gan (2003)

This action was not a trial, but a motion for summary judgment whereby the Regional Municipality of Niagara attempted to prohibit a legal action from being brought against them (and Gan General Insurance) by arguing that provincial legislation is a bar to such an action.

The particulars of this case are that the plaintiff was cycling along a municipal road when the careless conduct of a motor vehicle driver brought his vehicle within inches of striking the plaintiff/cyclist. This situation of imminent danger caused the plaintiff/cyclist to take evasive action in order to extricate himself from the perilous condition created by the offending vehicle. Whereupon, the cyclist lost control of his bicycle and collided with a guard rail at the right side of the street. The injuries sustained by the cyclist were aggravated because the guard rail was not in good repair – i.e., the guardrail was damaged pre-crash.

The defendant argued that the action brought against them is prohibited by law, since Section 284(3) of the Ontario Municipal Act states:

No action shall be brought against a corporation for the recovery of damages caused by the presence or absence or insufficiency of any wall, fence, guard rail, railing or barrier, or caused by or on account of any construction, obstruction or erection or any situation, arrangement, or disposition of any earth, rock, tree or other material or object adjacent to or in, along or upon any highway or any part thereof not within the travelled portion of such highway.

Given the applicable legislation, all sides consented that the presence of the guardrail was not actionable, and that only the damaged condition of the guard rail was debated. Therefore, the central argument focused on the word “insufficiency” as used in the legislation. As there is no definition for this term in the Ontario Municipal Act, the court referred to the common English usage of the word which means “not enough”. Hence, the court maintains that the clear meaning of the word insufficient is the adequacy of the guardrail and not the state of repair. In other words, if the guardrail was not long enough, or too low, or presented a more serious hazard than the obstacles it is shielding, the action would have been barred. However, the condition of the guardrail was actionable as this was a maintenance issue and not one of design or placement.

The obvious implication for road authorities is that maintenance of their infrastructure, especially as it may affect bicycle travel is a safety issue. Moreover, despite the protection that may be provided by provincial legislation (in this case concerning the placement of guardrails), the legislation likely does not exculpate municipalities from maintaining their infrastructure in a state of good repair once it has been erected.

Lauricella v. Hamilton, City of (2003)

This action arose from a cyclist fall at 0130h on a Sunday morning in July that resulted in personal injury to the defendant.

The defendant was an 18 year old female, riding her mountain bike along a street and approaching the downgrade towards a bridge. As she approached the downgrade, the defendant left the road and entered the sidewalk because she could see that the road across the bridge was narrow, and she felt uncomfortable riding in the street. The cyclist's speed was unknown, but what is known is that her bike picked up speed on the downgrade, she was not pedaling, and she used the brakes to slow down. On the descent, something made the defendant lose control and as she tried to regain control, her bike hit something which caused her to fall from her bicycle, and sustain an injury. The defendant was preceded by two friends who also used the sidewalk but without incident.

The plaintiff had ridden the bicycle prior to the night of the accident, and was comfortable riding it that evening. The bike had reflectors but no light. The plaintiff was familiar with the road, but could not recall if she had cycled it prior to the night of the accident.

The plaintiff claims negligence in maintaining the sidewalk on which she was riding.

In the direction the defendant was traveling, the road narrows from two lanes to one lane, and descends a hill toward a narrow two-lane bridge. Streetlights were located on the left side of the road. There are no shoulders on the bridge, and a steel guiderail separates the road from the sidewalk. The guiderail starts at the top of the hill where the lane drop occurs. Additionally, there is a chain link fence on the right side of the sidewalk which is offset from the sidewalk, but becomes closer to the sidewalk as one approaches the bridge.

Subsequent to the accident, the City of Hamilton's insurance adjuster makes note of two sidewalk cracks. The first crack is about 4.3 metres upstream of the bridge deck, runs approximately 45° across the sidewalk, and has a maximum difference in elevation of 37.5 mm (with the downstream walk being lower than the upstream walk). The second crack is about 2.7 metres from the bridge deck, runs perpendicular to the sidewalk, has a maximum difference in elevation of about 25 mm, and has the downstream slab higher than the upstream slab. Finally, the sidewalk slab that abuts to the bridge deck is about 50 mm lower than the bridge deck.

The evidence suggested, and the court concluded, that the initial loss of control was not due to the surface defects in the sidewalk, as the loss appeared to occur upstream of the surface discontinuities.

However, the defendant's inability to regain control of her bicycle, and the proximate cause of her fall was determined to be the elevation differences in the sidewalk vicinal to the bridge deck. Therefore, the court found that the initial loss of control, and the surface defects equally contributed to or caused the accident.

Counsel for the City posited that no duty of care was owed to sidewalk cyclists because there was a by-law prohibiting the use of bicycles on any sidewalk. The wording of the by-law is:

No person shall drive any animal or vehicle over or upon a sidewalk save at a properly constructed crossing, but this prohibition shall not apply to baby carriages, children's tricycles or other such vehicles appropriate to sidewalks.

The City undertook no substantive public education campaigns supporting the "no cycling on sidewalks" by-law, and that there were no signs around the City publicizing the provisions of the by-law. In addition, the City's fact witness conceded that the by-law was not enforced, that people in the City of Hamilton regularly cycle on sidewalks, and that the municipal bicycle committee file contained the statement "novices will stay off most streets".

On the basis of the facts, the judge concluded that "*it was reasonable and foreseeable that a cyclist ... would access the walkway*" to cross the narrow bridge and the defendants "*decision to use the walkway, and her use of it were reasonable under the circumstances*". To that end, there is a duty of care established, including keeping the sidewalk in a reasonable state of repair for novice cyclists.

The City attempted to demonstrate that even though a condition of non-repair existed, all reasonable efforts were exercised to anticipate and remedy the condition (i.e., annual sidewalk inspections). This attempt failed at trial.

This case may be particularly disturbing for municipalities, since the municipality is partially at fault even though the cyclist suffered an injury in a place (i.e., on the sidewalk) where they are legally prohibited. The passing of a by-law prohibiting an action or making a location legally inaccessible to a user group might be considered reasonable and sufficient protection by many road authorities. One of the lessons to be learned from this action is that by-laws that are ineffective, and/or are not paired with commensurate education and enforcement are not reasonable solutions. The other more pertinent lesson for designers is that the designer is responsible for anticipating the perceived threat of a situation, and assessing the (novice) cyclist's likely course of action. This underscores the importance of integrating human factors into the design of cycling infrastructure, as cyclists' behaviour may be different from driver behaviour and requires careful consideration.

Johnson v. Milton, Town of (2008)

On a Sunday afternoon in September of 1992, Mr. Johnson (a 51 year old male) was riding on a tandem bicycle with his wife positioned in the rear seat, when they lost control of the bicycle and fell.

Mr. Johnson was fatally injured in the fall, his wife alleged that the road was in a state of disrepair, and brought an action against the Town of Oakville¹.

The subject road is a scenic two-lane rural road with a tar-and-chip surface that is routinely closed for the winter. In the area where the Johnson accident occurred, the roadway traverses challenging terrain. As one travels in the direction the Johnson's were riding the road descends into a valley on a grade with a maximum slope of 18%. As is typical for roads of this type, the alignment is curvilinear but there are no "small" radius curves. The road crosses the creek on a single lane bridge, and on the far-side of the bridge is a sharp curve to the right, with a rock embankment on the outside of the curve. Washboarding had occurred on the approach to the bridge – the exact extent of the washboarding is unknown.

There was a myriad of signs passed by Mr. Johnson as he approached the one-lane bridge. Starting at approximately 560 metres from the bridge there is a 50 km/h speed limit sign, followed by a "Winding Road Ahead" sign, a curve to the right sign, a steep hill sign (without a tab), and at approximately 42 metres from the bridge is a sign indicating "One Lane Bridge". There was no specific sign warning traffic traveling in Mr. Johnson's direction concerning the sharp right turn immediately downstream of the bridge, but there was a checkerboard sign placed on the rock face itself.

On the day of the accident the weather was sunny and clear with no impediments to visibility. An independent witness who was standing proximate to the collision site heard someone exclaim "yahoo" or something similar, turned in the direction of the noise, and saw the tandem bicycle descending the road at a high rate of speed. Just previous to crossing the bridge, the cyclist uttered an expletive, locked the brakes, and started to skid. On the far side of the bridge the cyclist lost control, and struck the rock face, sustaining fatal injuries.

The collision history of this site indicates that 14 motor vehicle collisions were reported at the subject bridge in the previous 6.5 years. Of the 14 accidents, nine involved northbound vehicles striking the same rock embankment. The Town dismissed the cluster of collisions as resulting from driver error (including drinking and driving, and novice drivers).

In delivering the judgment the Court found the collision record as a particularly compelling piece of evidence. The clear pattern of accidents that exactly mimic the subject accident, and the fact that the road was closed during the winter (when these types of accidents are most likely to occur) were weighed heavily by the judge.

The judge was also critical of, and influenced by, the steep grade, the lack of warning for the sharp horizontal curve, and the washboarding on the road. At the time of the Johnson accident, the subject section of road was scheduled to be closed permanently subsequent to the opening of a proximate freeway. The judge concluded from the assembled evidence, and by the demeanor of the municipal staff who appeared as witnesses, that the Town was only interested in investing minimal amounts of

¹ The Town of Milton was the first named defendant in the original Statement of Claim but Milton was subsequently dropped from the action and the case proceeded against the Town of Oakville.

effort and resources in maintaining the road. Furthermore, the collision record was warning of a hazard that was unaddressed by the Town. The judge found that the Town knew or ought to have known about the hazard presented by the condition of the road, and failed to provide appropriate measures to protect reasonable road users, and thus assumed some of the liability for this accident.

The testimony by the independent witness, that the cyclist shouted “yahoo” was not deemed to be sufficient evidence to suggest that the cyclist was travelling too fast for the conditions (particularly when no advance warning of the washboarding or the sharp curve existed). The judge concluded that there was no contributory negligence on the part of the cyclist.

Interestingly, the case was appealed by the Town on the grounds that the finding of no negligence on the part of the cyclist was erroneous, and that the plaintiffs expert witness (who as an accident reconstructionist) provided critical testimony in areas that were outside of his area of expertise. The appellate court decided that the expert witness did provide evidence that was outside of his expertise, but that this testimony did not prejudice the ultimate decision by the court. However, on the point of contributory negligence, the appellate court agreed with the Town that the cyclist was travelling too fast for conditions, and did not keep a proper lookout. In coming to that conclusion the court noted that the cyclist had a clear view of curve and the rock embankment some distance prior to encountering it, and the cyclist had traversed this road previously (just hours before in fact) in a motor vehicle, and must have been aware of the condition of the road. The appellate court summarily apportioned liability as 60% municipal and 40% road user.

Perhaps the most obvious message to grasp from this decision is that infrastructure must be maintained until it is no longer in-service. The evidence indicated that the Town’s maintenance efforts had diminished because of the imminent closure of the road, and that the lack of attention to surface maintenance allowed the washboard condition to exist which was a proximate cause of the collision.

Another, less obvious but important lesson from this case is the relative importance of collision information. The obvious pattern of collisions at this location resonated with the judge, and was a particularly strong piece of evidence in his decision-making. Collision histories inevitably surface during a post-collision forensic investigation and that makes it critical for road authorities to be aware of collision-prone locations. Regular conduct of network screening according to an industry-approved method might have mitigated the culpability of the Town.

Kennedy v. London, City of (2009)

In September 2004 Mr. Kennedy was riding his bicycle on a multiuse path in the City of London, Ontario when he struck a bollard positioned in the middle of the path and fell to the ground. The bicycle Mr. Kennedy was riding was purchased the week before, and he had ridden it two times prior to the eventful ride. On the day of the accident, he had ridden past the bollard earlier in the day, and struck it upon the return trip. The weather was favourable, Mr. Kennedy was in good health, and he was travelling about 10 to 12 km/h.

The bollard was located in the middle of the 3.0 metre wide path, and at a point where the path begins a descent and a curve to the left, as the path passes under a bridge. A fence was to the right of the path, protecting path users from a slope down to the Thames River. The portion of the path at issue was designed and constructed in 1995 as part of the bridge construction, and modified in 1999 in accordance with other engineering drawings. According to the initial engineering drawings the bollard was to be 1.2 metres high and painted yellow. On site measurements and observations subsequent to the subject accident revealed that the bollard was only 0.92 metres high and required repainting. Maintenance crews that had inspected the path four months earlier noted the condition of the bollard as “fair”.

The plaintiff acknowledges that there is plenty of room to stay right of the bollard, but contends that the bollard was difficult to see because of the path geometry. Also, while the maintenance of the path (i.e., clearing the path of debris, and surface maintenance) was not an issue, the rusty condition of the bollard caused it to blend in with the fall foliage, making it difficult to see.

It was clear that the bollard was used to prevent motorized vehicular access to the path from a nearby street. However, rather than placing the bollard at the entrance to the path from the street (as was the City’s practice) the bollard at issue was placed about 45 metres from the street. This placement permitted vehicular access to a billboard that was erected adjacent to the path.

Because the multiuse path is a recreational facility rather than a public road allowance, the duty of care that extended to the City is a reduced burden of “reckless disregard”. Nevertheless, the judge found that the City acted with reckless disregard by its placement of the bollard. The judge was critical of the following factors:

- The bollard was in an unexpected location. Because the City had elected to place the bollard 45 metres from the public street access to the path instead of at the access, as was their practice, the placement created an expectancy violation for path users;
- The bollard was located proximate to a curve and a grade that made the bollard difficult to see, and in combination with the trailside fence presented a visual narrowing that may confuse trail users;
- The height of the bollard was less than the design height making it more difficult to see because of the grade;
- The paint had been weathered to a point where the bollard blended in with the surrounding foliage, making it more difficult to see; and
- There were no advance warning signs, or pavement markings used to highlight the bollard or guide users around this obstruction in the path.

In addition to the finding of reckless disregard on behalf of the City, the judge also found that Mr. Kennedy was the architect of his own demise by failing to take proper precautions for his own safety. Mr. Kennedy’s contributory negligence was founded on two facts:

- Mr. Kennedy rode past the bollard in the other direction early that day, so he should have expected it on the return trip; and

- At a stated speed of 10 to 12 km/h a reasonably alert cyclist should have been able to see at react to the bollard in a controlled and appropriate manner.

On this last point, it was noted that the available stopping sight distance was about 33 metres, and Mr. Kennedy only required about 14 metres of stopping sight distance at his stated speed. Moreover, the bollard was not an obstruction that required a complete stop, merely a change of speed and path, which further reduces the preview distance required for a successful avoidance manoeuvre.

In the end, the City was apportioned 40% of the fault with damages awarded accordingly.

The lessons for bicycle path designers are found in the judge's reason for apportioning liability to the City, and touch upon several aspects of path design. In the first place, the concept of path user familiarity will likely mitigate the liability of a municipality, but it will not absolve the municipality of poor design and signing. In this case, the plaintiff was somewhat familiar with the path and knew of the bollard. This *a priori* knowledge was a factor in the decision, but did not shift the entire burden of responsibility to the path user. Secondly, the path designer must consider the performance capabilities and limitations of path users. In this regard, cyclist expectation (from an unusual bollard location), a perceptual narrowing (from combination of horizontal and vertical alignment), and object conspicuity (the colour and height of the bollard) were all cited by the judge as design shortcomings that were proximate causes of the accident. Furthermore, the judge considered the bollard as a fixed object hazard in the path and the municipality failed to provide adequate warning of the hazard.

Conclusions

Cycling infrastructure places a similar duty of care on road authorities as motorized transport systems. And like motorized transport systems, society expects managers and operators of cycling infrastructure to take reasonable actions to protect the safety of facility users. Industry-approved standards and guidelines are typical starting points for "safe" infrastructure, but acceptable risk in cycling infrastructure must consider more than conformance. The legal system is in essence society communicating their view of acceptable risk. In those legal actions that have been reviewed in this paper, the following principles must also be followed in order to provide safe cycling infrastructure:

- Maintenance of cycling facilities is of great importance. Cyclists are generally more susceptible to the perils of poorly maintained facilities than motor vehicles because of their narrow tires, lower lateral stability, and lack of protection equipment (i.e., crumple zones, seat belts, collapsible steering columns, etc.). Maintenance issues that may matter little to motorized transport such as washboarding or a dented guardrail, matter a great deal to cyclist who are less stable and more exposed.
- There is an obligation on the part of the road authority to collect and review collision data to determine collision-prone locations for remedial action. A pattern of collisions or a high incidence of collisions at a particular location will be viewed as "notice" of a hazard, and is considered a "foreseeable risk" that needs to be addressed.

- The road authority must anticipate and understand the consequences of their design decisions. In instances when a design provides minimum or below minimum dimensions, it is necessary for the designer to understand how (novice and accomplished) cyclists will react to this design and ensure that the resulting behaviour is compatible with the design. If the behaviour is not compatible then education and enforcement campaigns must be implemented.
- Policies and practices that are known to be ineffective cannot be justified as “safe” practices when reasonable alternatives exist. The courts do not hold it to be reasonable for a road authority to employ ineffective methods when they know them to be ineffective.

References

Hall v. Hebert (1993) 2 S.C.R. 159, Date: April 29, 1993, Docket: 22399, located at <http://csc.lexum.umontreal.ca/en/1993/1993rcs2-159/1993rcs2-159.html>, accessed on April 20, 2009.

Stutts JC, and Hunter WW (1999) “Motor vehicle and roadway factors in pedestrian and bicyclist injuries: an examination based on emergency department data”, Accident Analysis and Prevention 31, 505–514.

Author Contact 411:

Gerry Forbes
President & Chief Engineer
Intus Road Safety Engineering Inc.
Milton, Ontario, Canada
gerry@intus.ca t: 905.332.9470 f: 905.332.9777

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