

- Passenger Train Load Case 3 - Glancing Blow: eight cars weighing 74 tons (67120 kg) each impacting the wall at an angle, θ_G . The angle of impact will be a function of track curvature, and for tangent track may be taken as 3.5 degrees.
- Passenger Train Load Case 4 - Single Car Impact: single car weighing 74 tons (67120 kg) impacting the wall as it undergoes rotation about its center. The angle of rotation at impact is:

$$\theta_f = \text{asin}\left(\frac{d_{CL}}{13}\right) \quad [2]$$

Where d_{CL} is greater than 13 m, this load case need not be considered.

d_G is the deformation of the consist in the direction of the applied force, and $d_G = 3.048 \sin \theta_G$, in m

- For the single car impact

$$F_A = \frac{\frac{1}{2}m(v_A \cos \theta_f)^2}{d_A} \quad [8]$$

And the load is considered to act along the length l_A in m:

$$l_A = \frac{.3048}{\sin \theta_f} \quad [9]$$

Where m is the mass of the derailed cars in kg.

v_A is the impact speed in m/s, defined in [4] or [5]

θ_f is the angle of rotation at impact defined in [1] or [2]

d_A is the deformation of the consist in the direction of the applied force, and $d_A = .3048 \cos \theta_f$, in m

Where the influence areas of two sequential cars in an accordion style of derailment overlap, the wall must be designed for the simultaneous impact of both cars.

- Regardless of the method selected, the following guidelines must be followed:
 - The minimum thickness for walls up to 25 feet (7.6 m) from the centerline of track shall be 2'-6" (.760 m); minimum thickness for walls farther than 25 feet (7.6 m) from the centerline of track shall be 18 inches (.45 m).
 - Crash walls less than 12 feet (3.6 m) from the centerline of track shall be a minimum of 12 feet (3.6 m) above the top of rail. Crash walls between 12 feet (3.6 m) and 25 feet (7.6 m) from the centerline of track shall be a minimum of 7 feet (2.135 m) above the top of rail. **Crash walls greater than 25 feet (7.6 m) from the centerline of track shall be a minimum of 7 feet (2.135 m) above the adjacent groundline.**
 - The face of the crash wall shall be smooth and continuous, and shall extend a minimum of 6 inches (0.15 m) beyond the face of the structure (such as a building column or bridge pier) parallel to the track.
 - The design must incorporate horizontal and vertical continuity to distribute the loads from the derailed train.
 - The wall must be of solid, heavy construction, and separate precast blocks or stones will not be permitted.

4. Drawings - (2 hard copies as well as .pdf format)

- Site plan clearly showing property line, location of wall structure, centerline and elevation of nearest rail track,
- Layout and structural details of proposed structure, including all material notes and specs and construction procedures/phasing. All drawings signed and sealed by a professional engineer registered in the province having jurisdiction at the project location.
- Extent and treatment of any temporary excavations on railway property.

5. Cheque

- A cheque payable to AECOM will be required for the cost of this review. Please contact AECOM for current pricing. Cost will take into consideration number of submissions, site visits, meetings, and alternative or unusually complex designs.

6. Post-Construction Certificate - (1 copy)

- Engineer's certificate of completion describing actual construction, and certifying that the structure was built as per approved drawings,
- Copy of as-built drawings, as part of the engineer's certification of completion.

Access to Railway Operating Rights-of-Way

Permits **MUST** be obtained before entering into any Railway Operating right-of-way.

Some or all of the following may also be required: - proper railway flagging protection, cable locates, liability insurance, release of liability, safety training.

AECOM Canada Ltd. will provide guidance as to the proper process to be followed in this regard. Fees will be established based on the nature and extent of the work being proposed.

Communication for Submissions

All correspondence during the review process should be directed to AECOM Canada Ltd.

Upon completion of our review, a confidential report on our findings will be made to the railway company, who will subsequently contact the applicant.

The applicant will be notified when the report has been submitted to the railway.

Liability and Responsibility

The review will be undertaken with the understanding that neither the railway nor AECOM Canada Ltd. shall have any responsibility nor liability whatsoever for the design or adequacy of the crash wall, notwithstanding that any plans or specifications may have been reviewed by the railway nor AECOM Canada Ltd. No such review shall be deemed to limit the applicant's full responsibility for the design and construction adequacy of the works.

AECOM Canada Ltd.

Mississauga, Ont.

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