Perimeter earthen berm calculations

AB – Tridem axle group vehicle

According to Alberta Regulation 315/2002 Part 2/Section 9(1)/(f) Subject to section 62 of the Act and section 12(1) of the Regulation, no person shall operate a commercial vehicle on a highway in the case of a vehicle having a tridem axle group with 12 or more tires on a primary highway or secondary road, the gross weight on the axle group exceeds 24,000 kilograms (52,911 lb).

We will base or calculation for a minimum of 12 wheels revolve with estimated wheel’s width of 12” or 305 mm (30.5 cm)

Assume that the length of the wheel in contact with the ground = 30.5 cm
Wheel-ground contact patch (area) = 30.5 x 30.5 = 930.25 cm².

a) For an earthen berm covered with 10 cm or 0.10 m of ¾” clear stone type aggregate (or equivalent) from wheel/ground contact point.

Projected area of wheel at top of berm = Area is projected at 45 degree angle from ground surface to top of berm.

Width at top of berm = 30.5 + (2 x 10) = 50.5 cm
Length at top of berm = 30.5 + (2 x 10) = 50.5 cm

Wheel Projected area at top of berm = width * length = 50.5 * 50.5 = 2,550.25 cm²

Total load is equally distributed amongst 12 wheels

“Load” = weight/Total area
“Load” = 24,000/(2,550.25 x 12) = 0.78 Kg/cm²

The expected maximum load of 0.78 Kg/cm² (77 kPa) corresponding to a maximum load of 24,000 kg/ tridem axle (min 12 tires/305 mm in width) as it crosses the top of the berm. This is below the typical bearing capacity of a granular material compacted to 100% SPMD in lifts no greater than 150mm, or cohesive material compacted to 98% SPMD in lifts no greater than 200mm. Albarrie recommend the use of a BIAxIAL GEOGRID to enhance top of berm protection.
b) For an earthen berm covered with 20 cm or 0.20 m of ¾” clear stone type aggregate (or equivalent) from wheel/ground contact point

Projected area of wheel at top of berm = Area is projected at 45 degree angle from ground surface to top of berm.

Width at top of berm = 30.5 + (2 x 20) = 70.5 cm  
Length at top of berm = 30.5 + (2 x 20) = 70.5 cm

Wheel Projected area at top of berm = width * length = 70.5 * 70.5 = 4,970.25 cm²

Total load is equally distributed amongst 12 wheels

“Load” = weight/Total area  
“Load” = 24,000/(4,970.25 x 12) = 0.40 Kg/cm²

The expected maximum load of 0.40 Kg/cm² (39 kPa) corresponding to a maximum load of 24,000 kg/ tridem axle (min 12 tires/305 mm in width) as it crosses the top of the berm. This is below the typical bearing capacity of a granular material compacted to 100% SPMDD in lifts no greater than 150mm, or cohesive material compacted to 98% SPMDD in lifts no greater than 200mm.

April 15  
June 3-15

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