= Federal Bridge Gross Weight Formula =

The Federal Bridge Gross Weight Formula (also known as Bridge Formula B and the Federal Bridge Formula) is a mathematical formula in use in the United States by truck drivers and Department of Transportation (DOT) officials to determine the appropriate maximum gross weight for a commercial motor vehicle (CMV) based on axle number and spacing . The formula is part of federal weight and size regulations regarding interstate commercial traffic (intrastate traffic is subject to state limits) . The formula is necessary to prevent heavy vehicles from damaging roads and bridges . CMVs are most often tractor @-@ trailers or buses , but the formula is of most interest to truck drivers due to the heavy loads their vehicles often carry .

Early 20th @-@ century weight limits were enacted to protect dirt and gravel roads from damage caused by the solid wheels of heavy trucks . As time passed , truck weight limits focused primarily on gross weight limits (which had no prescribed limits on length) . By 1974 , bridges received special protection from increasing truck weight limits . The bridge formula law was enacted by the U.S. Congress to limit the weight @-@ to @-@ length ratio of heavy trucks , and to protect roads and bridges from the damage caused by the concentrated weight of shorter trucks . The formula effectively lowers the legal weight limit for shorter trucks , preventing them from causing premature deterioration of bridges and highway infrastructure .

Compliance with the law is checked when vehicles pass through a weigh station , often located at the borders between states or on the outskirts of major cities , where the vehicle may be weighed and measured . The one exception to the formula allows a standard five @-@ axle semi @-@ truck configuration to weigh the maximum legal gross weight . This exception was specifically requested by the American Trucking Associations to allow tank trucks to reach the maximum legal gross weight without violating the bridge formula law .

= = History = =

The first truck weight limits were enacted by four states in 1913 , ranging from 18 @,@ 000 pounds (8 @,@ 200 kg) in Maine to 28 @,@ 000 pounds (13 @,@ 000 kg) in Massachusetts . These laws were passed to protect earth and gravel @-@ surfaced roads from damage caused by the steel and solid rubber wheels of early heavy trucks . By 1933 , all states had some form of truck weight regulation . The Federal @-@ Aid Highway Act of 1956 instituted the first federal truck weight regulation (set at 73 @,@ 280 pounds or 33 @,@ 240 kilograms) and authorized the construction of the Interstate Highway System .

In the late 1950s , the American Association of State Highway and Transportation Officials (AASHTO) conducted a series of extensive field tests of roads and bridges to determine how traffic contributed to the deterioration of pavement materials . In 1964 , the AASHTO recommended to Congress that a bridge formula table be used instead of a single gross weight limit for trucks . The Federal @-@ Aid Highway Act Amendments of 1974 established the bridge formula as law , along with the gross weight limit of 80 @,@ 000 pounds (36 @,@ 000 kg) . Current applications of the formula allow for up to 7 axles and 86 feet or more length between axle sets , and a maximum load of 105 @,@ 500 lbs .

= = Usage = =

The formula was enacted as law to limit the weight @-@ to @-@ length ratio of a commercial motor vehicle (CMV) . The formula is necessary to prevent the concentrated weight on a truck 's axle from producing stress on bridge members (possibly causing a bridge collapse) . In simplified form , this is analogous to a person walking on thin ice . When standing upright , a person 's weight is concentrated at the bottom of their feet , funneling all of their weight into a small area . When lying down , a person 's weight is distributed over a much larger area . This difference in weight distribution would allow a person to cross an area of ice while crawling that might otherwise collapse under their body weight while standing up . For an overweight truck to comply with the formula ,

more axles must be added , the distance between axles must be increased , or weight must be removed .

A division of the DOT , the Federal Motor Carrier Safety Administration (FMCSA) , regulates safety for the U.S. trucking industry . The FMCSA enforces the length , width , and weight limits of CMVs set by the Federal Highway Administration (FHWA) for interstate commercial traffic . Interstate commercial traffic is generally limited to a network of Interstate Highways , U.S. Highways , and state highways known as the National Network (NN) . Provided the truck remains on the NN , it is not subject to state limits . These limits (which can be lower or higher than federal limits) come into effect for intrastate commercial traffic , provided the vehicle is not on the NN .

CMVs are defined by the FMCSA as vehicles engaged in interstate commerce that are used to transport passengers or property : vehicles with a gross vehicle weight of 10 @,@ 001 pounds (4 @,@ 536 kg) or more ; those designed or used to transport more than 8 passengers (including the driver) for compensation ; vehicles designed or used to transport more than 15 passengers (including the driver) without compensation ; or those used to transport hazardous materials in quantities requiring the vehicle to be marked or placarded under hazardous materials regulations .

The weight and size of CMVs are restricted for practical and safety reasons . CMVs are restricted by gross weight (total weight of vehicle and cargo) , and by axle weight (i.e. , the weight carried by each tire) . The federal weight limits for CMVs are 80 @,@ 000 pounds (36 @,@ 000 kg) for gross weight (unless the bridge formula dictates a lower limit) , 34 @,@ 000 pounds (15 @,@ 000 kg) for a tandem axle , and 20 @,@ 000 pounds (9 @,@ 100 kg) for a single axle . A tandem axle is defined as two or more consecutive axles whose centers are spaced more than 40 inches (102 cm) but not more than 96 inches (244 cm) apart . Axles spaced less than 40 inches (102 cm) apart are considered a single axle .

In effect , the formula reduces the legal weight limit for shorter trucks with fewer axles (see table below) . For example , a 25 @-@ foot (7 @.@ 6 m) three @-@ axle dump truck would have a gross weight limit of 54 @,@ 500 pounds (24 @,@ 700 kg) , instead of 80 @,@ 000 pounds (36 @,@ 000 kg) , which is the standard weight limit for 63 @-@ foot (19 @.@ 2 m) five @-@ axle tractor @-@ trailer . FHWA regulation § 658 @.@ 17 states : " The maximum gross vehicle weight shall be 80 @,@ 000 pounds (36 @,@ 000 kg) except where lower gross vehicle weight is dictated by the bridge formula . "

= = Bridge collapse = =

The August 2007 collapse of the Interstate 35W Mississippi River bridge in Minneapolis brought renewed attention to the issue of truck weights and their relation to bridge stress . In November 2008 , the National Transportation Safety Board determined there had been several reasons for the bridge 's collapse , including (but not limited to) : faulty gusset plates , inadequate inspections , and the extra weight of heavy construction equipment combined with the weight of rush hour traffic . The I @-@ 35 Trade Corridor Study reported that the Federal Highway Administration (FHWA) expressed concern over bridges on the I @-@ 35 corridor due to an expected increase of international truck traffic from Canada and Mexico , with the FHWA listing it as " high @-@ priority " in 2005 .

As of 2007 , federal estimates suggest truck traffic increased 216 % since 1970 , shortly before the federal gross weight limit for trucks was increased by 30 @,@ 000 pounds (14 @,@ 000 kg) . This is also the period during which many of the existing interstate bridges were built . Research shows that increased truck traffic (and therefore , increased stress) shortens the life of bridges . National Pavement Cost Model (NAPCOM) estimates indicate that one 80 @,@ 000 @-@ pound (36 @,@ 000 kg) truck does as much damage to roads as 750 3 @,@ 800 @-@ pound (1 @,@ 700 kg) cars .

Some smaller bridges have a weight limit (or gross weight load rating) indicated by a sign posted in a visible position in front of the bridge (hence the reference to a " posted bridge ") . These are necessary when the weight limit of the bridge is lower than the federal or state gross weight limit for trucks . Driving a truck over a bridge that is too weak to support it usually does not result in an

immediate collapse . The bridge may develop cracks , which over time can weaken the bridge and cause it to collapse . Most of these cracks are discovered during mandated inspections of bridges . Most bridge collapses occur in rural areas , result in few injuries or deaths , and receive relatively little media attention . While the number varies from year to year , as many as 150 bridges can collapse in a year . About 1 @,@ 500 bridges collapsed between 1966 and 2007 , and most of those were the result of soil erosion around bridge supports . In 1987 , the Schoharie Creek Bridge collapsed in upstate New York , due to erosion of soil around the foundation , which sparked renewed interest in bridge design in inspection procedures .

In special cases involving unusually overweight trucks (which require special permits) , not observing a bridge weight limit can lead to disastrous consequences . Fifteen days after the collapse of the Minneapolis bridge , a heavy truck collapsed a small bridge in Oakville , Washington .

= = Formula law = =

CMVs are required to pass through weigh stations at the borders of most states and some large cities . These weigh stations are run by state DOTs , and CMV weight and size enforcement is overseen by the FHWA . Weigh stations check each vehicle 's gross weight and axle weight using a set of in @-@ ground truck scales , and are usually where a truck 's compliance with the formula is checked .

FMCSA regulation § 658 @.@ 17 states :

No vehicle or combination of vehicles shall be moved or operated on any interstate highway when the gross weight on two or more consecutive axles exceeds the limitations prescribed by the following formula :

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