

Axle Load Approximation for Tunnels

All information, calculations, etc. from Paul J. Ford Structural Engineers, Columbus, OH.
February 2003

In order to execute the following calculations, you will need to know two pieces of information about the vehicle in question: the gross vehicle weight (i.e., the weight of the vehicle plus the contents); and, the number of axles.

For vehicles with two axles: **Axle load = Gross Vehicle Weight x (0.40)**

For vehicles with more than two axles: **Axle Load = $\frac{\text{Gross Vehicle Weight}}{(\text{number of axles} - 1) \times (2)}$**

This approximation does not apply to vehicles on tracks such as dozers or certain mobile cranes. Those situations must be analyzed for the specific equipment and load.

The Paul J. Ford (PJF) analysis is based on the information provided on the tunnel cross-sections the university provided. PJF assumed a concrete compressive strength of 4,000 psi and a yield strength of 60,000 psi for the reinforcing steel. PJF also assumed that the tunnels lie approximately 12 inches beneath the roadways. Based upon structural analysis of the tunnel cross sections, PJF has concluded that:

- 1.) The tunnels at locations **#1, #2, #3, #4, #5, #6, and #7** can safely support a highway loading of “**HS-20**” as defined by **AASHTO**, with a maximum axle load of **16,000** lbs.
- 2.) The tunnel at location **#8** can safely support a highway load of “**HS-15**” as defined by **AASHTO**, with a maximum axle load of **12,000** lbs.
- 3.) The tunnel at location **#9** is the weakest of all locations. The tunnel can safely support a live load of only **100** pounds per square foot or a maximum axle load of only **3,000** lbs. (*As of Sept. 2003, this area has been posted with signs and blockaded with bumper blocks*)

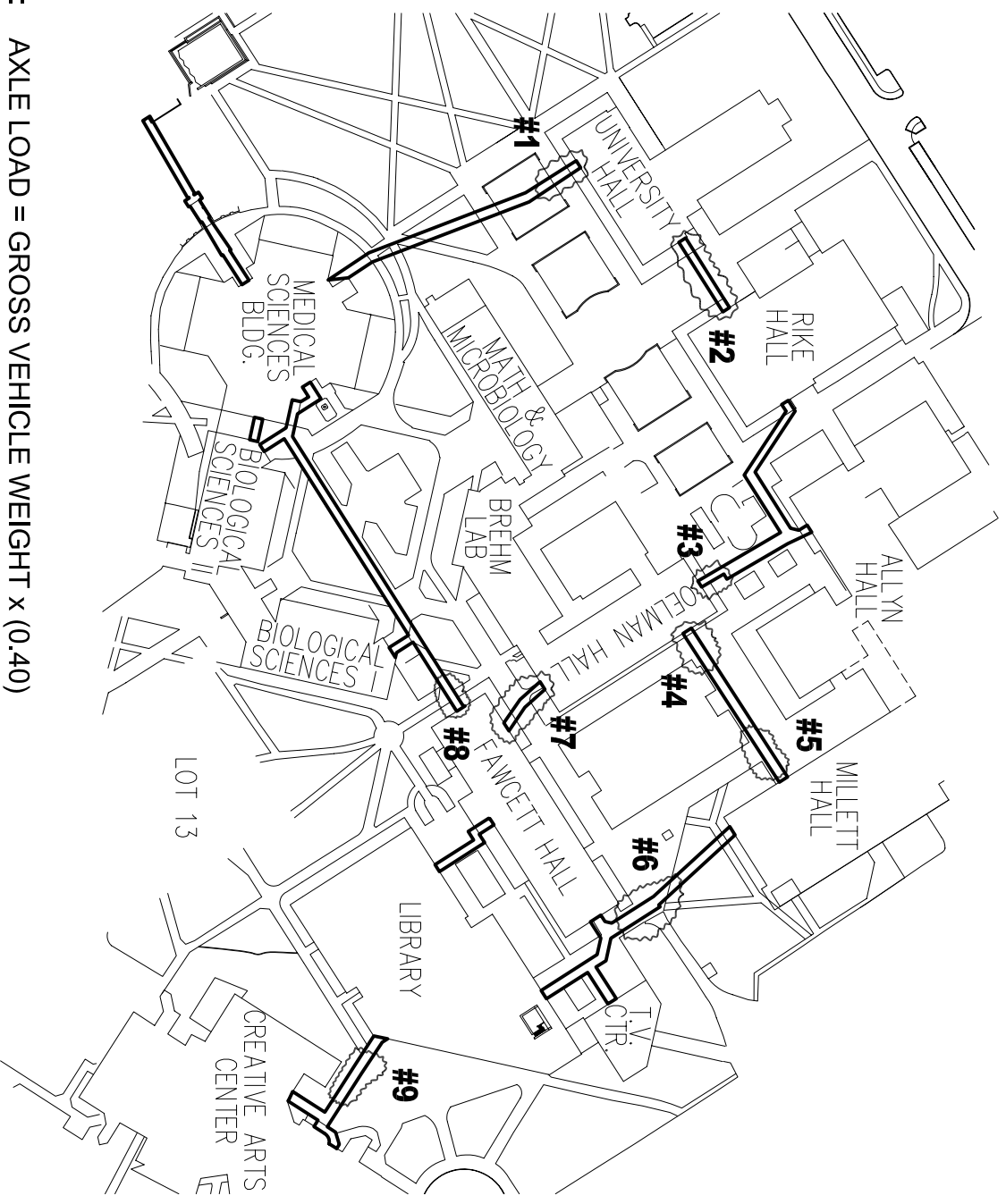
PJF conclusions are based upon the observation that the tunnels are in good physical condition and the assumption that they were built in accordance with the drawings.

WHEEL LOAD APPROXIMATIONS FOR TUNNELS

N.T.S.

LOCATIONS:

- #1, #2, #3, #4,
- #5, #6, #7 = 16,000 LBS.
- #8 = 12,000 LBS.
- #9 = 3,000 LBS.



FOR VEHICLES WITH TWO AXLES: AXLE LOAD = GROSS VEHICLE WEIGHT x (0.40)

FOR VEHICLES WITH MORE THAN TWO AXLES: AXE LOAD = $\frac{\text{GROSS VEHICLE WEIGHT}}{(\text{NUMBER OF AXLES} - 1) \times 2}$

FOR VEHICLES WITH TRACKS; CONTACT P.E.C. DEPT. FOR A DETERMINATION OF LOAD.

*SEE ALSO, "WHEEL LOAD APPROXIMATION FOR TUNNELS" DOCUMENT.