

## Heavy Vehicle Simulator (Mark IV)

The **Heavy Vehicle Simulator (HVS)** is a mobile machine used to subject roads to accelerated trafficking. It can simulate 20 years of road deterioration within three months, thus helping engineers to understand the mechanisms of road failure caused by traffic and, to some extent, by environmental factors.

### History

Since 1978, more than 400 test sections have been tested with the South African fleet of four HVSs (one prototype Mark II and three Mark IIIs). This work has had a major impact on road engineering in South Africa, yielding significant cost savings. The modernized HVS Mark IV and HVS-A Mark V is marketed by **Dynatest**.

Three HVS Mark IIIs are still operational and highly productive: one in South Africa, belonging to the Gauteng Department of Transportation (Gautrans) and operated by CSIR, and two in California, operated for the California Department of Transportation (Caltrans), as part of the Partnered Pavement Research Center (PPRC - formerly CAL/APT) project at the University of California, Berkeley (UCB). Three of the new, fully automated HVS Mark IVs are now operational, one at the Cold Regions Research & Engineering Laboratory (CRREL) of the U.S. Army Corps of Engineers, one at VTT in Finland and VTI in Sweden (joint project), and the third at the Florida Department of Transportation's (FDOT) new pavement testing and research center. A new HVS Mark IV+ with dynamic loading capability is operated by CSIR in South Africa. A heavy loading airfield version of the HVS (the HVS-A Mark V) is being operated by the Waterways Experiment Station (U.S. Army Corps of Engineers), which is capable of simulating aircraft wheel loads of up to 440 kN (100 kips).

### Mobility

The HVS Mark IV and HVS-A Mark V are highly mobile - it can be moved between test sites by being towed by a prime mover. On a specific test site, it can be moved between test sections under its own power.

### Hydraulic Loading

The HVS's are hydraulically operated. The test beam loads either a single or a dual test wheel, which is driven backwards and forwards over a 20ft (6m) length of pavement (track width up to 5ft or 1.5m, depending on wheels used). The test section can be trafficked bi-directionally to maximize productivity or uni-directionally when appropriate. The HVS can apply wheel loads between 30 kN and 200 kN (7-45 kips) at speeds of up to 8 mph (12 km/h). This allows the HVS to accelerate load-associated distress and simulate overloading effectively. The HVS-A Mark V tests a 40ft (12m) pavement section with loads of up to 440 kN (100 kips).



### Associated Equipment

**Road Surface Deflectometer (RSD)**

**Multi-Depth Deflectometer (MDD)**

**HVS Laser Profiler**

**Crack Activity Meter (CAM)**

**3D Stress Sensor**

**Pavement Strain Transducer (PAST)**

**Soil Pressure Transducer (SOPT)**

### Ability to Simulate Environmental Influences

Environmental influences, such as temperature and moisture variation in the pavement structure, can be simulated through a set of special add-on facilities including a temperature control chamber. This capacity allows researchers to interpret HVS data relative to the performance of pavements under actual traffic and environmental conditions.