

APPENDIX A

PHOTOGRAPHS OF THE PBBT ROUND ROBIN

VRTC Testing Grounds



Figure A1. VRTC bay where testing was conducted.

Test Vehicles



Figure A2. Test vehicles: 3-S2 tractor trailer combination (top) and 2-axle straight truck (middle), equipped with a fifth wheel. Loading and unloading with concrete blocks was facilitated by the use of flatbed trailers (bottom).

Portable Certified Scales



Figure A3. Axle and vehicle weights were measured using in-ground and portable certified scales. The use of portable scales increases accuracy as the vehicle is level with respect to the ground and all wheels are weighted simultaneously.

Instrumented Torque Wheel



Figure A4. Wheel 5 of the 3-S2 was fitted with an instrumented torque wheel.

B&G Breakaway Torque Tester



Figure A5. The B&G breakaway torque tester, BTT: general view.

B&G Breakaway Torque Tester (continued)



Figure A6. Principle of operation of the B&G breakaway torque tester. The friction pads (yellow and black striped) grab the tire (top) and, while the brakes are applied, the machine determines the force required to turn the wheel (bottom).

Hunter Flat Plates



Figure A7. Hunter flat plate brake tester: overview (top) showing the two parallel sets of plates, installed in the testing ground permanently. The test vehicle stops on the plates (bottom) and several axles can be tested in one test.

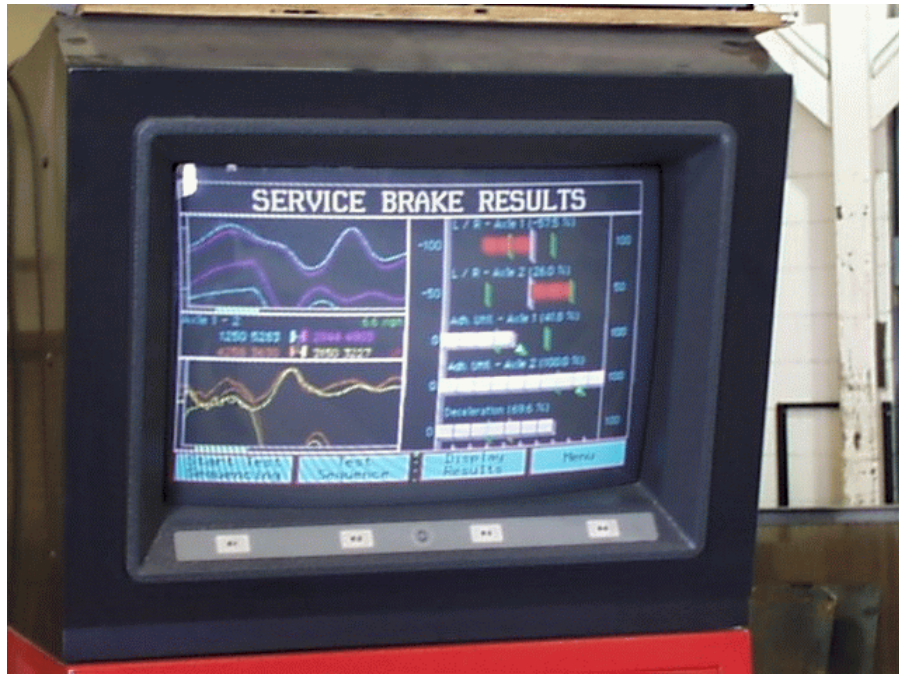
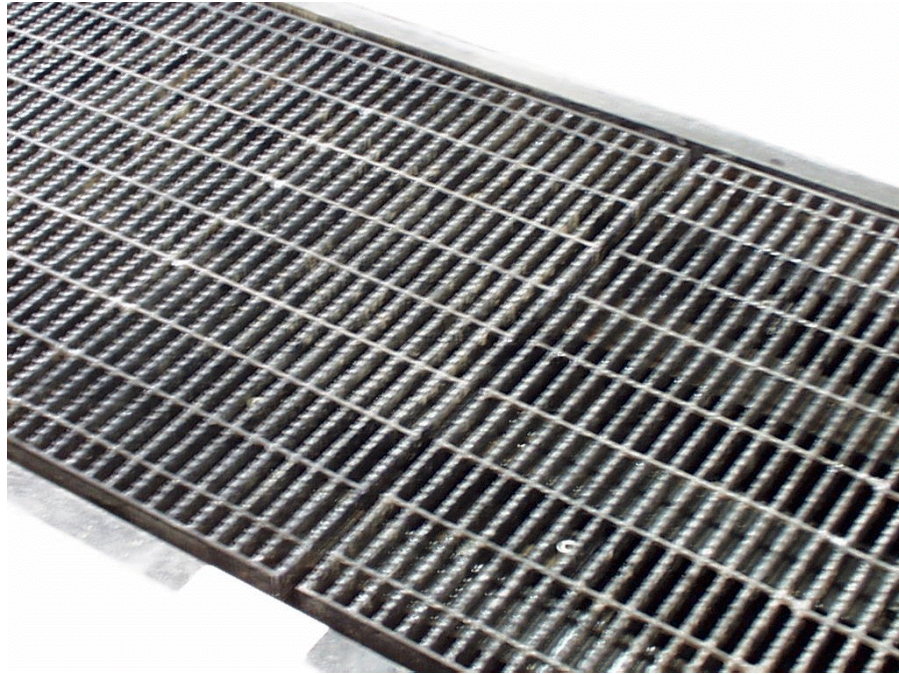


Figure A8. Hunter flat plate brake tester: test surface (top) and display of results (bottom).

HEKA Flat Plates



Figure A9. HEKA flat plate brake tester: overview (top) and display of results (bottom). The HEKA plates are short and a limited number of axles can be tested at a time.

HEKA Flat Plates (continued)

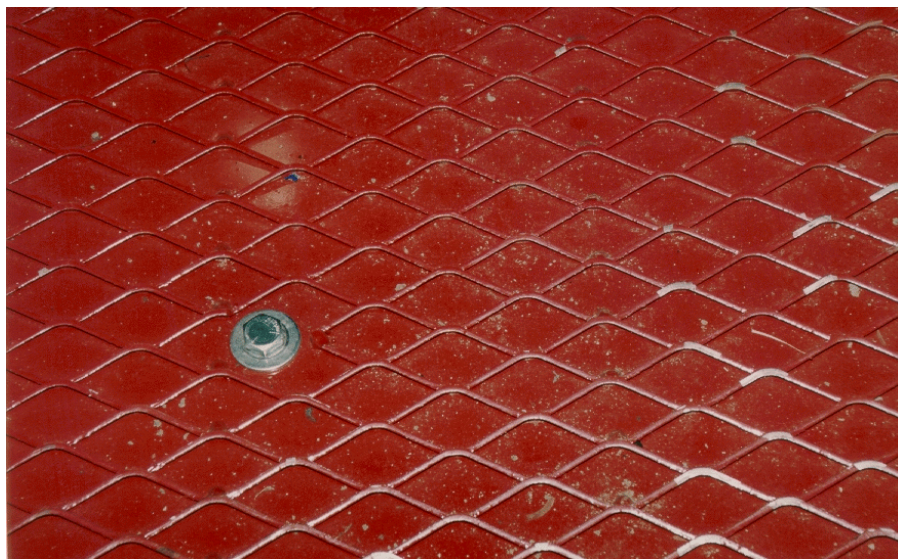


Figure A10. The HEKA flat plate brake tester is a portable device where the test surface is nearly leveled with the ground (top). Detail of the test surface (bottom).

VRTC In-Ground Roller Dynamometer



Figure A11. VRTC/BM in-ground roller dynamometer: overview (top) and detail (bottom) showing the sets of two driving rollers as well as the third smaller roller which monitors the wheel speed and the presence of a vehicle axle.

VRTC In-Ground Roller Dynamometer (continued)



Figure A12. VRTC/BM in ground roller dynamometer: test surface (top) and display of measurements for driver and operator (bottom).

RAI In-Ground Roller Dynamometer

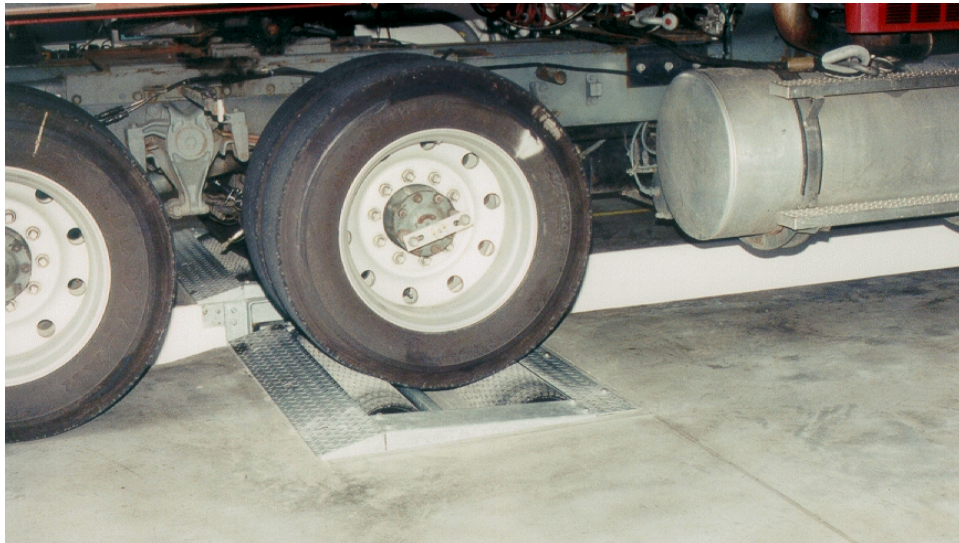


Figure A13. Radlinski and Associates, Inc. (RAI)/BM in-ground roller dynamometer: overview (top) and detail (bottom) showing that the back roller is slightly elevated with respect to the front roller.

RAI In-Ground Roller Dynamometer (continued)

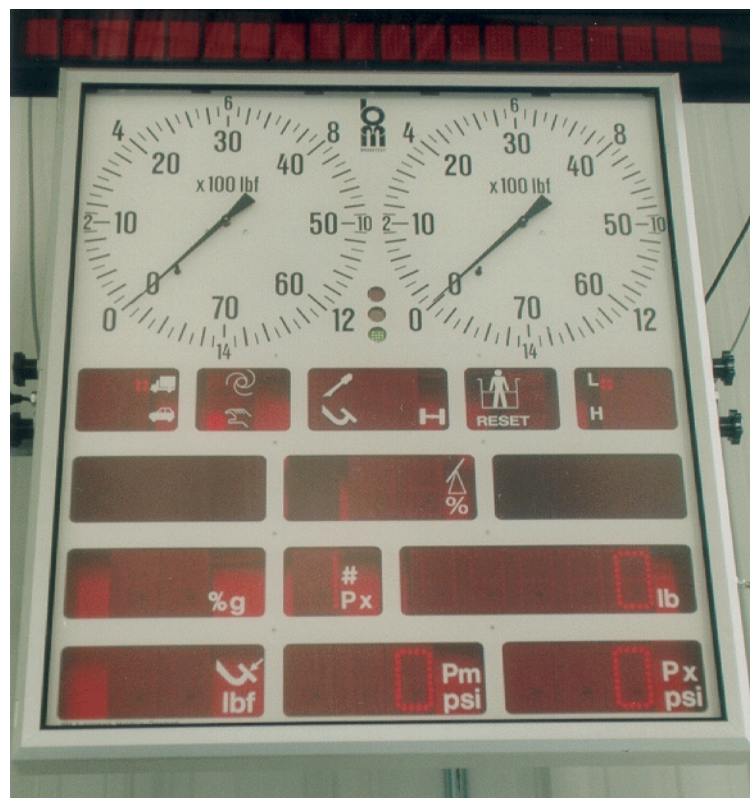


Figure A14. Radlinski and Associates, Inc. (RAI)/BM in ground roller dynamometer: test surface (top) and display panel (bottom).

RAI Portable Roller Dynamometer



Figure A15. Radlinski and Associates, Inc. (RAI)/BM portable roller dynamometer: side view while testing the 3-S2 steer axle (top) and detail (bottom) showing the positioning of the wheel on the right side roller.

RAI Portable Roller Dynamometer (continued)

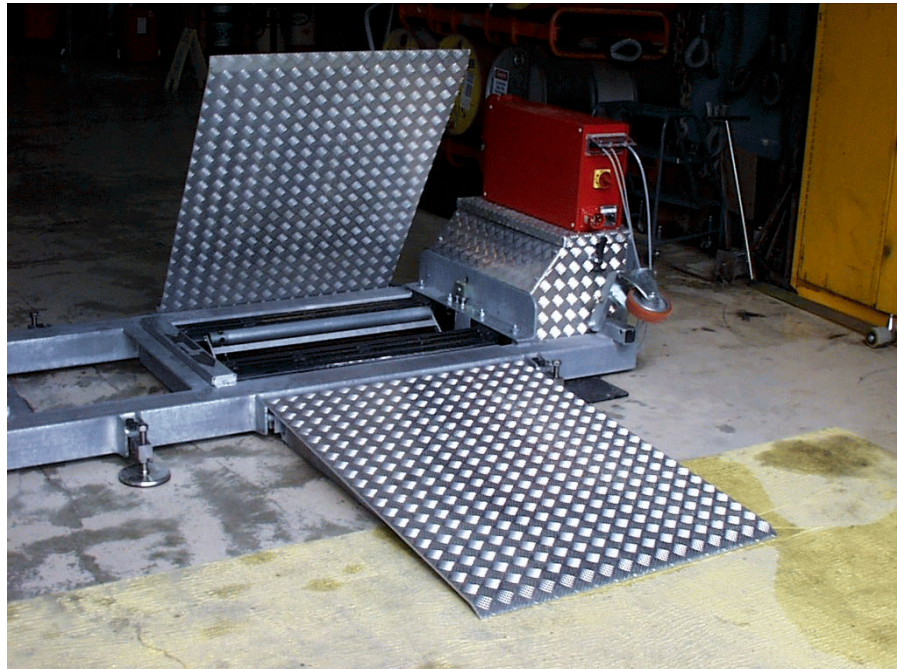
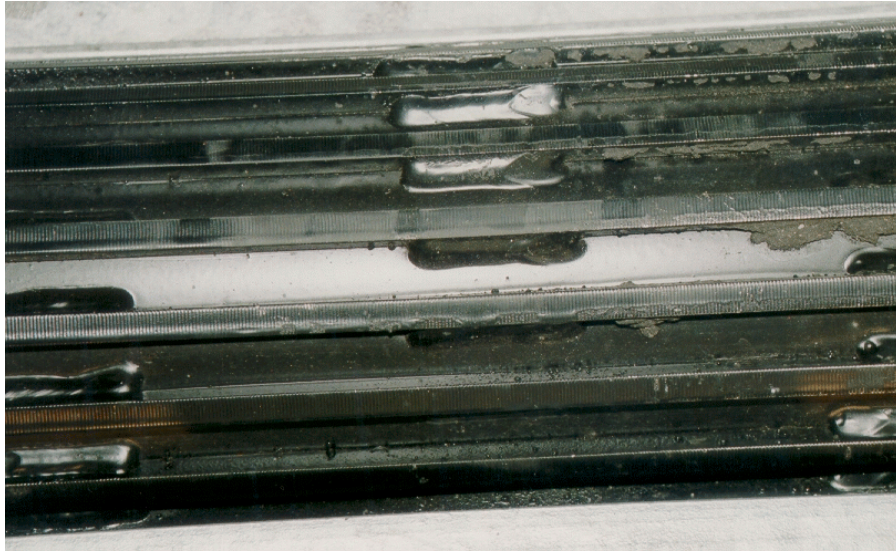


Figure A16. Radlinski and Associates, Inc. (RAI)/BM portable roller dynamometer: test surface (top) and brake tester frame (bottom).

VIS Portable Roller Dynamometer

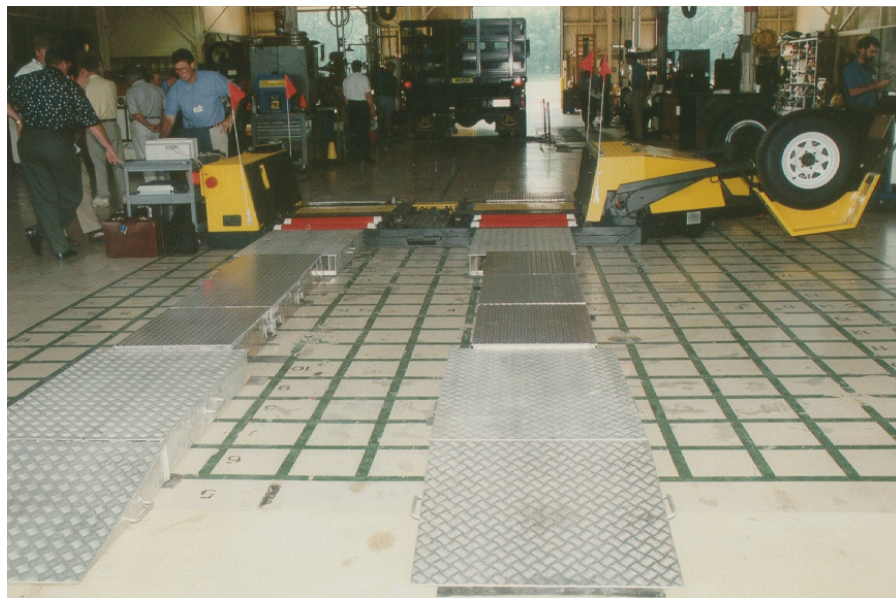


Figure A17. Vehicle Inspection Systems (VIS) portable roller dynamometer: showing the PBBT testing the steer axle of the 3-S2 vehicle (top) and showing the implementation of long ramps to reduce the problems associated with the elevation of the tested axle with respect to the axles on the ground (bottom).

VIS Portable Roller Dynamometer (continued)



Figure A18. Vehicle Inspection Systems (VIS) portable roller dynamometer showing the two drive rollers and the smaller speed sensing and vehicle position roller (top) and detail of the test surface (bottom).

HEI Portable Roller Dynamometers



Figure A19. Hicklin Engineering, Inc. (HEI) portable roller dynamometer: overview (top) showing the ramps, the rollers and the operating console. The bottom picture details the two drive rollers and the smaller speed and vehicle position sensing roller on one side of the tester.

HEI Portable Roller Dynamometer (continued)

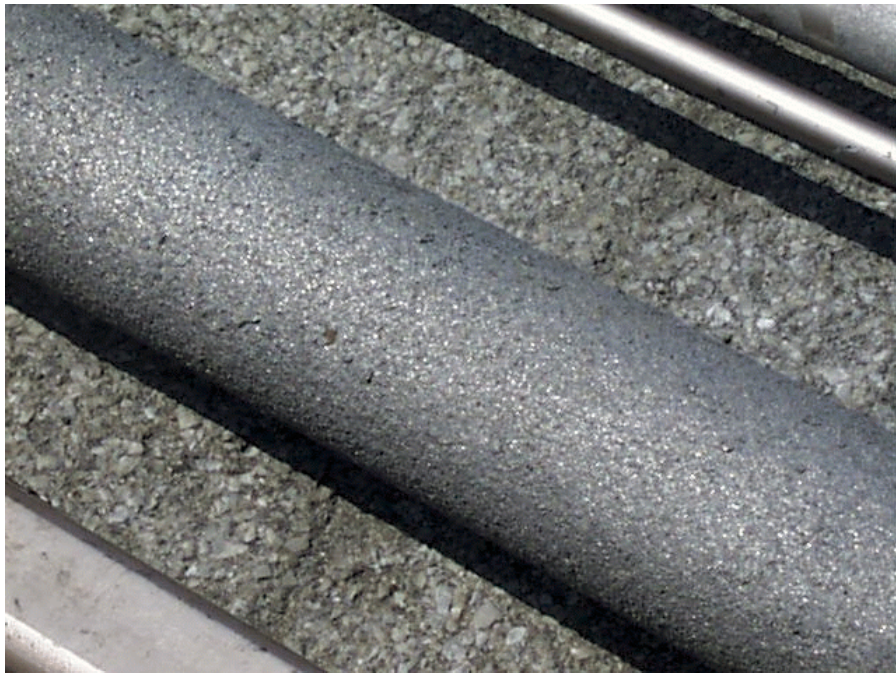
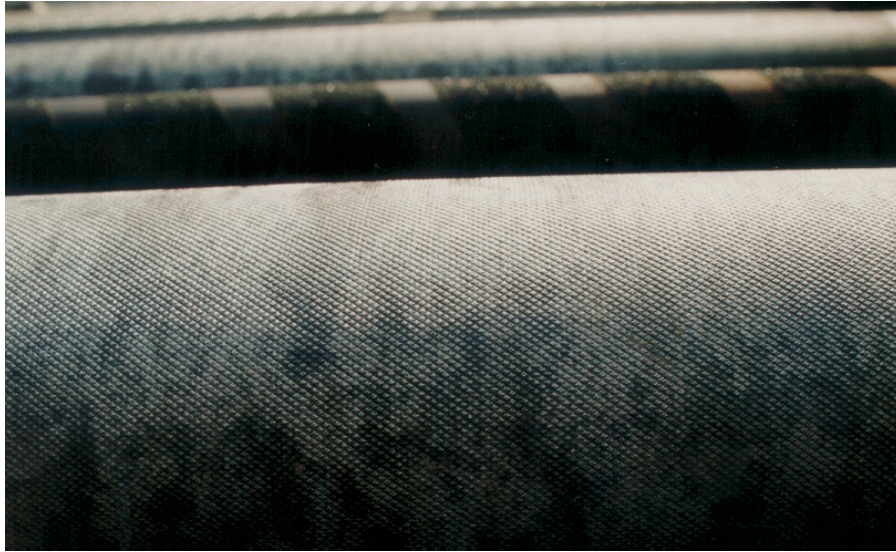


Figure A20. Hicklin Engineering, Inc. (HEI) portable roller dynamometer: original roller surface finish (top) and experimental high coefficient of friction (bottom) test surface.

Wet Testing



Figure A21. The effect of wetting the test surface on the maximum brake force measurements.

Calibrations

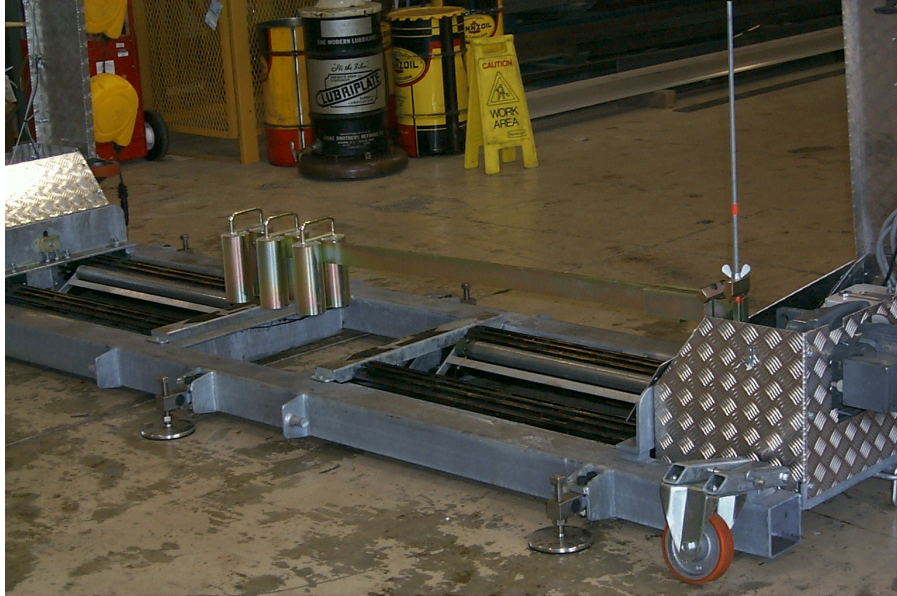


Figure A22. Brake force calibration of the Radlinski and Associates, Inc. (RAI)/BM portable roller dynamometer and the B&G portable breakaway torque tester.

Calibrations (continued)



Figure 23. Weight calibration of the HEKA flat plate brake tester: Concrete blocks are stacked on each side of the tester, allowing independent calibration of the weight measurements.

Calibrations (continued)



Figure 24. Weight calibration of the Radlinski and Associates, Inc. (RAI)/BM portable roller dynamometer.