

BRIDGERLAND APPLIED TECHNOLOGY COLLEGE  
TECHNICAL SPECIFICATION

WATER BRAKE CHASSIS DYNAMOMETER

The following represents BATC's technical specifications for WATER BRAKE CHASSIS DYNAMOMETER

1.0 SCOPE

This specification covers the requirements made by the BATC for the supply of one complete chassis dynamometer and the associated operating hardware and software.

This specification is for the removal of existing equipment, fabrication and assembly and installation, training and warranty of one new chassis dynamometer covered in the section 2 titled General Requirements. This equipment will be used to dynamometer test vehicles and break-in of re-built heavy duty engines that operate on diesel, natural gas or other fuels.

2.0 GENERAL REQUIREMENTS

- 2.1 The equipment covered by this specification shall consist of a new chassis dynamometer and the required components and software to test various heavy duty engines, test and operate them, generate, print and store test reports.
- 2.2 The vendor shall include all components or accessories not mentioned in these specifications but are required for the operation of the dynamometer system including: tie-down restraints, controls, printer, computers, etc.
- 2.3 The vendor shall remove any existing dynamometer equipment hardware including the roll set, and make any necessary facilities modifications needed to install new equipment. It will be the vendor's responsibility to remove all un-necessary equipment from the test cell and remove the hardware from BATC property either as scrap or for re-use elsewhere.
- 2.4 All items of labor and material necessary for the manufacturing, delivery, preparation, installation and initial operation of the dynamometer shall be supplied by the vendor.
- 2.5 Delivery and installation of the dynamometer shall be at BATC's Central Facility, 1301 North 600 West, Logan, Utah 84321
- 2.6 The Vendor shall provide a minimum of 32 hours operator and test definition training. Date, time and location for training are to be mutually agreed upon. Costs associated with the training including travel, lodging, transportation and meals will be all inclusive of the contract.
- 2.7 Vendor shall furnish complete maintenance, parts and operation manuals with the dynamometer system.
- 2.8 Although sections of this specification are specified individually, a totally integrated system shall result in mutually compatible hardware, software and function. It is the intent of these specifications to provide the basis for such an integrated system.
- 2.9 Cutting of the concrete in the test cell and or dynamometer pit modifications may be required.

### 3.0 REQUIREMENTS

- 3.1 The chassis dynamometer shall be able to test single and tandem axle vehicles equipped with commonly found heavy duty engines such as: Cummins Caterpillar, Detroit Diesel, Mack, Volvo and others.
- 3.2 The chassis roll set shall meet the following specifications;
- Test single axle vehicles rated up to 550 HP continuously
  - Test tandem axle vehicles rated up to 1100 HP continuously.
  - Maximum test speed of 80 MPH, Maximum operating speed of 90 MPH.
  - Roll diameter of 36 inches,
  - Have absorbers positioned on the Left as viewed from operator's seat.
  - Roll set shall have minimum shaft diameter of 3.9375 inches
  - Roll set shall accept tandem axle spacing from 48 to 74 inches.
  - Roll set shall be rated up to 30,000 lbs. per axle.
  - Separate Load Control Valves for each axle.
  - Provide for a third control valve to operate future engine dynamometer.
- 3.3 Engines to be tested may use manual or ECM controls and the new test system shall be capable recording data from either such engines. BATC shall be able to Interface with the engine control modules to diagnose and review engine parameters through or separately from the Dynamometer controls by the use of a laptop and the Engine manufacturers software.
- 3.4 The system shall incorporate an emergency button in at least two locations; one in the test cell with easy access and one at the control console or work station.
- 3.5 The data and acquisition and control system shall have at a minimum those items listed in the instrument schedule below.
- 3.6 The system software shall allow the user to define the tests in plain language without the use of a specialized computer language. The inputs and outputs shall be assigned to a parameters table using plain language. Through the use of the parameters table, inputs can be assigned to the operating screen to monitor the engine under test.
- 3.8 Operating controls shall display actual values such as intake pressures, speed, torque, exhaust temperatures etc. for monitoring actual engine performance as shown in the attached picture labeled "display".

### 4.0 WARRANTY

- 4.1 The entire system shall have a one year warranty which starts at the time of acceptance of the system.
- 4.2 Warranty provisions and process shall be supplied at the time of presentation of bid to BATC.
- 4.3 Warranty repairs shall be acknowledged within 48 hours of notice by BATC and commence within 10 days of notice.

## INSTRUMENT SCHEDULE

A Data Acquisition & Control System that is highly customizable, yet easy to use shall include:

- Wireless hand held controller, the visual display used by the test cell technician shall be capable Of showing the various operating parameters listed below and shall have the ranges listed.
- Sophisticated graphical and numerical data analysis tools
- Centralized management of all test data, notes, documents and other information
- Fully configurable, with built-in, full-featured programmable language

System Channel list Engine Sensor Box;

- Eight (8), Pressure input channels with dual LCD display
  - 1 ea: 0-30 psia (-14.7 – 15.3)
  - 1 ea: 0-75 psia
  - 4 ea: 0-150 psia
  - 1 ea: 0-200 psia
  - 1 ea: 0-500 psia
- Sixteen (16), Thermocouple input channels (Type K) with dual LCD display
- Barometric Pressure Sensor
- Connections for Engine Dyno, (1 torque, 1 speed)
- Speed (Frequency encoder, Optical Tach)
- 1 Digital output, 1 DAC (0-10Vdc/4-20mA)
- 1 DAC Digital input
- 2 Analog input (0-10vdc)
- 1 Fuel Measurement
- 1 Blow-by
- 1 Weather Station
- 1 Opacity (0-10vdc)

Network/Peripheral Connections

- Wireless Router
- 4 port USB extender
- 1 ECU, 1-Serial, 1-RJ45 Programming, 1-USB, 1-USB Programming

Dynamometer Connection

- 4 Torque inputs, 4 Frequency inputs, 5 Voltage inputs, 4 Type K Temperature inputs.
- 4 DAC Closed Loop Outputs (0-10Vdc/4-20mA), 4 PWM Outputs
- 8 Digital Inputs, 8 Low side Drive relays (Max. 8 Amps)

System provides electronic engine communications protocols;

- SAE 1708/J1587
- SAE J1939
- SAE J1850 VPW
- SAE J1850 PWM
- SAE J2284 / ISO 15765(CAN)
- ISO 9141-2
- ISO 14230-4 (KPW2000)

Provide a 25ft (7.6m) connecting cable

## Specifications

Units	Fuel Measurement Unit	Model
		1,000
Capacities - hp (kW)		1,000 (746)
Burn rate capacity - gpm (lpm)		1.66 (6.3)
Burn rate capacity - lb/hr (kg/hr)		700 (318)
Total fuel flow - gpm (lpm)		5.81 (22)
Total fuel flow - lb/h (kg/hr)		2,450 (1,100)
Fuel pressure drop - psi (kPa)		0.4 (2.8)
Fuel supply temperature - °F (°C)		100 (38)
Supply fuel pipe diameter - in. (mm)		5/8 (16)
Return fuel pipe diameter - in. (mm)		1/2 (13)
Make-up fuel pipe diameter - in. (mm)		1 (25)
Water flow - gpm (lpm)		6.51 (25)
Water supply pressure - psi (kPa)		40 (276)
Water supply and return pipe diameters - in. (mm)		1 (25)
Amp requirements - 110 w/230 v		20/15
Fuel flow accuracy		±1%
Fuel density accuracy		0.1° API
Fuel temperature accuracy		±2°
Voltage		115 or 230
Shut off valve		Yes
Prime pump		Optional
Head pressure isolation		Yes
Casters		Yes

# SAMPLE SCREEN DISPLAYS



Sample test screen