dead-weight or the transfer technique. You may use other techniques if you show they are equally accurate. The NIST "true value" torque is defined as the torque calculated by taking the product of an NIST traceable weight or force and a sufficiently accurate horizontal distance along a lever arm, corrected for the lever arm's hanging torque.

(a) The lever-arm dead-weight technique involves placing known weights at a known horizontal distance from the torque-measuring device's center of rotation. You need two types of equipment:

(1) *Calibration weights.* This technique requires at least six calibration weights for each range of torque-measuring device used. Equally space the weights and make sure each one is traceable to NIST weights. You also may use weights certified by a U.S. state government's bureau of weights and measures. If your laboratory is outside the U.S., see §1065.305 for information about using non-NIST standards. You may account for effects of changes in gravitational constant at the test site.

(2) *Lever arm.* This technique also requires a lever arm at least 20 inches long. Make sure the horizontal distance from the torque-measurement device's centerline to the point where you apply the weight is accurate to within ±0.10 inches. You must balance the arm or know its hanging torque to within ±0.1 ft-lbs.

(b) The transfer technique involves calibrating a master load cell (dynamometer case load cell). You may calibrate the master load cell with known calibration weights at known horizontal distances. Or you may use a hydraulically actuated, precalibrated, master load cell and then transfer this calibration to the device that measures the flywheel torque. The transfer technique involves three main steps:

(1) Precalibrate a master load cell or calibrate it following paragraph (a)(1) of this section. Use known weights traceable to NIST with the lever arms specified in paragraph (b)(2) of this section. Run or vibrate the dynamometer during this calibration to reduce static hysteresis.

(2) Use lever arms at least 20 inches long. The horizontal distances from the master load cell's centerline to the dynamometer's centerline and to the point where you apply weight or force must be accurate to within ±0.10 inches. Balance the arms or know their net hanging torque to within ±0.1 ft-lbs.

(3) Transfer calibration from the case or master load cell to the torque-measuring device with the dynamometer operating at a constant speed. Calibrate the torque-measurement device's readout to the master load cell's torque readout at a minimum of six loads spaced about equally across the full useful ranges of both measurement devices. (Good engineering practice requires that both devices have about the same useful ranges of torque measurement.) Transfer the calibration so it meets the accuracy requirements in §1065.105(a)(2) for readouts from the torque-measurement device.

Subpart E—Engine Selection, Preparation, and Service Accumulation

§1065.401 Selecting a test engine.

While all engine configurations within a certified engine family must comply with the applicable standards in the standard-setting part, you are not required to test each configuration for certification.

(a) Select for testing according to the following guidance the engine configuration within the engine family that is most likely to exceed an emission standard:

(1) Test the engine that we specify, whether we do this through general guidance or give you specific instructions.

(2) If we do not tell you which engine to test, follow any instructions in the standard-setting part.

(3) If we do not tell you which engine to test and the standard-setting part does not include specifications for selecting test engines, use good engineering judgment to select the engine configuration within the engine family that is most likely to exceed an emission standard.

(b) In the absence of other information, the following characteristics are

appropriate to consider when selecting the engine to test:

(1) Maximum fueling rates.

(2) Maximum in-use engine speed (governed or ungoverned, as applicable).

(3) Highest sales volume.

(c) We may select any engine configuration within the engine family for our testing.

§ 1065.405 Preparing and servicing a test engine.

(a) If you are testing an emission-data engine for certification, make sure you have built it to represent production engines.

(b) Run the test engine, with all emission-control systems operating, long enough to stabilize emission levels. If you accumulate 50 hours of operation, you may consider emission levels stable without measurement.

(c) Do not service the test engine before you stabilize emission levels, unless we approve other maintenance in advance. This prohibition does not apply to your recommended oil and filter changes for newly produced engines, or to idle-speed adjustments.

(d) Select engine operation for accumulating operating hours on your test engines to represent normal in-use operation for the engine family.

(e) If you need more than 50 hours to stabilize emission levels, record your reasons and the method you use to do this. Give us these records if we ask for them.

EFFECTIVE DATE NOTE: At 69 FR 39261, June 29, 2004, §1065.405 is amended by revising paragraph (b), effective Aug. 30, 2004. For the convenience of the user, the revised text is set forth as follows:

§ 1065.405 Preparing and servicing a test engine.

* * * * *

(b) Run the test engine, with all emission-control systems operating, long enough to stabilize emission levels.

(1) For SI engines, if you accumulate 50 hours of operation, you may consider emission levels stable without measurement.

(2) For CI engines, if you accumulate 125 hours of operation, you may consider emission levels stable without measurement.

* * * * *

§ 1065.410 Service limits for stabilized test engines.

(a) After you stabilize the test engine's emission levels, you may do scheduled maintenance, other than during emission testing, as the standard-setting part specifies.

(b) You may not do any unscheduled maintenance to the test engine or its emission-control system or fuel system without our advance approval. Unscheduled maintenance includes adjusting, repairing, removing, disassembling, cleaning, or replacing the test engine. We may approve routine maintenance that is not scheduled such as maintaining the proper oil level.

(1) We may approve other unscheduled maintenance if all of the following occur:

(i) You determine that a part failure or system malfunction (or the associated repair) does not make the engine unrepresentative of production engines in the field and does not require anyone to access the combustion chamber.

(ii) Something clearly malfunctions (such as persistent misfire, engine stall, overheating, fluid leakage, or loss of oil pressure) and needs maintenance or repair.

(iii) You give us a chance to verify the extent of the malfunction before you do the maintenance.

(2) If we determine that a part's failure or a system's malfunction (or the associated repair) has made the engine unrepresentative of production engines, you may no longer use it as a test engine.

(3) You may not do unscheduled maintenance based on emission measurements from the test engine.

(4) Unless we approve otherwise in advance, you may not use equipment, instruments, or tools to identify bad engine components unless you specify they should be used for scheduled maintenance on production engines. In this case, if they are not generally available, you must also make them available at dealerships and other service outlets.

(c) If you do maintenance that might affect emissions, you must completely test the engine for emissions before and after the maintenance, unless we waive this requirement.