§ 86.1337–96 Engine dynamometer test run.

(a) The following steps shall be taken for each test:

(1) Prepare for the cold-start test. (i) For gasoline- and methanol-fueled engines only, evaporative emission canisters shall be prepared for use in this testing in accordance with the procedures specified in §86.1232–96 (h) or (j). The size of the canisters used for testing shall correspond with the largest canister capacity expected in the range of vehicle applications for each engine. The Administrator may, at his discretion, use a smaller canister capacity. Attach the evaporative emission canister(s) to the engine, using the canister purge plumbing and controls employed in vehicle applications of the engine being tested. Plug the canister port that is normally connected to the fuel tank.

(ii) Prepare the engine, dynamometer, and sampling system.

(iii) Change filters, etc., and leak check as necessary. For a single dilution particulate system, a propane check will not reveal a pressure side leak (that portion of the system downstream of the pump) since the volume concentration in ppm will not change if a portion of the sample is lost. A separate leak check is needed. A leak check of a filter assembly that has only one seal ring in contact with the filter media will not detect a leak when tested under vacuum. A pressure leak test should be performed.

(2) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample systems.

(3) For methanol-fueled vehicles, install fresh methanol and formaldehyde impingers (or cartridges) in the exhaust and dilution air sample systems for methanol and formaldehyde. A single dilution air sample covering the total test period may be utilized for methanol and formaldehyde background. (Background measurements of methanol and formaldehyde may be omitted and concentrations assumed to be zero for calculations in §86.1344.)

(4) Adjust the sample flow rates to the desired flow rates and set the CVS gas flow measuring devices to zero. CFV-CVS sample flow rate is fixed by the ventiluri design.

(5) For diesel engines tested for particulate emissions, carefully install a clean particulate sample filter into each of the filter holders and install the assembled filter holders in the sample flow line (filter holders may be preassembled).

(6) Follow the manufacturer’s choke and throttle instructions for cold starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For petroleum-fueled diesel engines (and natural gas-fueled, liquefied petroleum gas-fueled or methanol-fueled diesels, if used) turn on the hydrocarbon and NOX (and CO and CO\textsubscript{2}, if continuous) analyzer system integrators (if used), and turn on the particulate sample pumps and indicate the start of the test on the data collection medium.

(7) As soon as it is determined that the engine is started, start a “free idle” timer. Allow the engine to idle freely with no-load for 24±1 seconds. This idle period for automatic transmission engines may be interpreted as an idle speed in gear. All other idle conditions shall be interpreted as an idle speed in neutral or park. It is permissible to lug the engine down to...
curb idle speed during the last 8 seconds of the free idle period for the purpose of engaging dynamometer control loops.

(10) Begin the transient engine cycles such that the first non-idle record of the cycle occurs at 25 ± 1 seconds. The free idle time is included in the 25 ± 1 seconds.

(i) During diesel particulate sampling it must be demonstrated that the ratio of main tunnel flow to particulate sample flow does not change by more than ±50 percent of its set point value (except for the first 10 seconds of sampling). For double dilution operation, sample flow is the net difference between the flow rate through the sample filters and the secondary dilution air flow rate.

(ii) Record the average temperature and pressure at the gas meter(s) or flow instrumentation inlet, where needed to calculate flow. If the set flow rate cannot be maintained because of high particulate loading on the filter, the test shall be terminated. The test shall be rerun using a lower flow rate and/or a larger diameter filter.

(11) Begin the transient engine cycles such that the first non-idle record of the cycle occurs at 25 ± 1 seconds. The free idle time is included in the 25 ± 1 seconds.

(12) On the last record of the cycle, cease sampling. Immediately turn the engine off and start a hot-soak timer. Also turn off the particulate sample pumps, the gas flow measuring device(s) and any continuous analyzer system integrator and indicate the end of the test on the data collection medium. Sampling systems should continue to sample after the end of the test cycle until system response times have elapsed.

(13) Immediately after the engine is turned off, turn off the engine cooling fan(s) if used, and the CVS blower (or disconnect the exhaust system from the CVS). As soon as possible, transfer the "cold start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to §86.1340. A stabilized reading of the exhaust sample on all analyzers shall be obtained within 20 minutes of the end of the sample collection phase of the test. Analysis of the methanol and formaldehyde samples shall be obtained within 24 hours of the end of the sample collection period. For petroleum-fueled and methanol-fueled diesel engines, carefully remove the filter holder from the sample flow apparatus, remove each particulate sample filter from its holder and invert the secondary filter and place it stain side to stain side on top of the primary filter. Place the filter pair in a petri dish and cover.

(14) Allow the engine to soak for 20 ± 1 minutes.

(15) Prepare the engine and dynamometer for the hot start test.

(16) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(17) Install fresh methanol and formaldehyde impingers (or capsules) in the exhaust and dilution air sample systems for methanol and formaldehyde.

(18) Start the CVS (if not already on) or connect the exhaust system to the CVS (if disconnected). Start the sample pumps (except the particulate sample pump(s), if applicable), the engine cooling fan(s) and the data collection system. The heat exchanger of the constant volume sampler (if used) and the heated components of any continuous sampling system(s) (if applicable) shall be preheated to their designated operating temperatures before the test begins. See §86.1340(e) for continuous sampling procedures.

(19) Adjust the sample flow rates to the desired flow rate and set the CVS gas flow measuring devices to zero.

(20) For diesel engines tested for particulate, carefully install a clean particulate filter in each of the filter holders and install assembled filter holders in the sample flow line (filter holders may be preassembled).

(21) Follow the manufacturer's choke and throttle instruction for hot starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For diesel engines, turn on the hydrocarbon and NOX (and CO and CO2, if continuous) analyzer system integrator (if used), indicate the start of the test on the data collection medium, and turn on the particulate sample pump(s).
(22) As soon as it is determined that
the engine is started, start a “free
idle” timer.

(23) Allow the engine to idle freely
with no-load for 24±1 seconds. The pro-
visions and interpretations of para-
graph (a)(9) of this section apply.

(24) Begin the transient-engine cycle
such that the first non-idle record of
the cycle occurs at 25±1 seconds. The
free idle is included in the 25±1 seconds.

(25) On the last record of the cycle,
allow sampling system response times
to elapse and cease sampling. Turn off
the particulate sample pump(s) (if ap-
propriate), the gas flow measuring de-
vice(s) and any continuous analyzer
system integrator and indicate the end
of the test on the data collection me-
dium.

(26) As soon as possible, transfer the
“hot start cycle” exhaust and dilution
air bag samples to the analytical sys-
tem and process the samples according
to § 86.1340. A stabilized reading of the
exhaust sample on all analyzers shall
be obtained within 20 minutes of the
end of the sample collection phase of
the test. Analyze the methanol and
formaldehyde samples within 24 hours.
(If it is not possible to perform analysis
within 24 hours, the samples should be
stored in a cold (approximately 0 °C)
dark environment until analysis can be
performed). For petroleum-fueled and
methanol-fueled diesel engines, care-
fully remove the assembled filter hold-
er from the sample flow lines and re-
move each particulate sample filter
from its holder and invert the sec-
ondary filter and place it stain side to
stain side on top of the primary filter.
Place the filter pairs in a clean petri
dish and cover as soon as possible.
Within 1 hour after the end of the hot
start phase of the test, transfer the
particulate filters to the weighing
chamber for post-test conditioning.

(27) The CVS and the engine may be
turned off, if desired.

(b) The procedure in paragraph (a) of
this section is designed for one sample
bag for the cold start portion and one
for the hot start portion. It is also per-
missible to use more than one sample
bag per test portion.

(c) If a dynamometer test run is de-
termined to be void, corrective action
may be taken. The engine may then be
allowed to cool (naturally or forced)
and the dynamometer test rerun per
paragraph (a) or (b) of this section.

[58 FR 16065, Mar. 24, 1993, as amended at 59
FR 48533, Sept. 21, 1994; 60 FR 34375, June 30,

§ 86.1337–2007 Engine dynamometer
test run.

(a) The following steps shall be taken
for each test:

(1) Prepare for the cold-start test.

(i) For gasoline- and methanol-fueled
engines only, evaporative emission
canisters shall be prepared for use in
this testing in accordance with the pro-
cedures specified in § 86.1232–96 (h) or
(j). The size of the canisters used for
testing shall correspond with the larg-
est canister capacity expected in the
range of vehicle applications for each
engine. (The Administrator may, at
his/her discretion, use a smaller can-
ister capacity.) Attach the evaporative
emission canister(s) to the engine,
using the canister purge plumbing and
controls employed in vehicle applica-
tions of the engine being tested. Plug
the canister port that is normally con-
nected to the fuel tank.

(ii) Prepare the engine, dynamom-
eter, and sampling system.

(iii) Change filters, etc., and leak
check as necessary.

(2) Connect evacuated sample collec-
tion bags to the dilute exhaust and di-
lution air sample collection systems if
bag sampling is used.

(3) For methanol-fueled vehicles, in-
stall fresh methanol and formaldehyde
impingers (or cartridges) in the ex-
haust and dilution air sample systems
for methanol and formaldehyde. A sin-
gle dilution air sample covering the
total test period may be utilized for
methanol and formaldehyde back-
ground. (Background measurements of
methanol and formaldehyde may be
omitted and concentrations assumed to
be zero for calculations in § 86.1344.)

(4) Attach the CVS to the engine ex-
haust system any time prior to start-
ing the CVS.

(5) Start the CVS (if not already on),
the sample pumps (except for the par-
ticulate sample pump(s), if applicable),
the engine cooling fan(s), and the data
collection system. The heat exchanger
of the constant volume sampler (if