A Program of ASTM International

Test Monitoring Center

@ Carnegie Mellon University
6555 Penn Avenue, Pittsburgh, PA 15206, USA

http://astmtmc.cmu.edu
412-365-1000

Sequence VID Information Letter 14-2
Sequence Number 14
November 5, 2014

ASTM consensus has not been obtained on this information letter. An appropriate ASTM ballot will be issued in order to achieve such consensus.

TO: Sequence VI Surveillance Panel

SUBJECT: 1. Standardized wording describing the role of the TMC
2. Additional Oil Pan Displacement Block

1. At a June 23, 2014 meeting, ASTM Section D02.B0.10 on Standards Acceleration approved standardized wording describing the role of the Test Monitoring Center. Subcommittee B has requested that the TMC incorporate this wording into all test methods through the information letter system. These changes are effective with the issuance of this letter
2. At the October 20, 2014 Surveillance Panel Meeting the panel approved the addition of OHT oil pan displacement block, part number OHT6E001021, as acceptable for use in the VID test. Section 6.6.5.11 has been revised to incorporate the additional displacement block and to list displacement block OHT6D001021 which is included with the VID oil pan. This change is effective October 21, 2014.

Test Method D7589 has been revised to incorporate these changes. The text of the revisions is shown in the attachment.

Bruce Matthews
Engine Oil Test Development and Support
GM Powertrain Materials Engineering

Frank M. Farber
Director
ASTM Test Monitoring Center

Attachment

c: ftp://ftp.astmtmc.cmu.edu/docs/gas/sequencevi/vid/procedure_and_ils/il14-2.pdf

Distribution: Email

(Revises Test Method D7589-14 as amended by Information Letter 14-01)

The following Table summarizes the renumbering of Annexes.

Current Annex Description	Current Annex Number	New Annex Number
Detailed Specifications and Drawings of Apparatus	Annex A2	Annex A5
Oil Heater Cerrobase Refill Procedure	Annex A3	Annex A6
Engine Part Number Listing	Annex A4	Annex A7
Safety Precautions	Annex A5	Annex A8
Report Format	Annex A6	Annex A9
Statistical Equations for Mean and Standard Deviations	Annex A7	Annex A10
Oil Sump Full Level Determination Consumption Measurement Calibration Procedure	Annex A8	Annex A11
Fuel Injector Evaluation	Annex A9	Annex A12
Pre-test Maintenance Checklist	Annex A10	Annex A13
Blow-by Ventilation System Requirements	Annex A11	Annex A14
Calculation of Test Results	Annex A12	Annex A15
Calculation of Unweighted Baseline Shift	Annex A13	Annex A16
Non–Phased Cam Gear and Position Actuator Installation Procedure	Annex A14	Annex A17

Revised introduction section to address additional TMC description items

INTRODUCTION

This test method is written for use by laboratories that utilize the portions of the test method that refer to ASTM Test Monitoring Center (TMC) services (see Annex A1). Laboratories that choose not to use the TMC services may simply disregard these portions.

The TMC provides reference oils, and engineering and statistical services to laboratories that desire to produce test results that are statistically similar to those produced by laboratories previously calibrated by the TMC.

In general, the Test Purchaser decides if a calibrated test stand is to be used. An organization such as the American Chemistry Council require that a laboratory use the TMC services as part of their test registration process. In addition, the American Petroleum Institute requires that a laboratory utilize the TMC services in seeking qualification of oil against its specifications.

Added new note one

Note 1--The advantage of using the TMC services to calibrate test stands is that the test laboratory (and hence the Test Purchaser) has an assurance that the test stand was operating at the proper level of test severity. It should also be borne in mind that results obtained in a non calibrated test stand may not be the same as those obtained in a test stand participating in the ASTM TMC services process.

The following Sections have been revised to update references to Annexes or Figures in Annexes whose designation has changed.

6.5 *Engine Cooling System*—Use an external engine cooling system, as shown in Figs. A5.1-A5.5, to

maintain the specified jacket coolant temperature and flow rate during the test. An alternative cooling system is shown in Fig. A5.3. The systems shall have the following features:

6.5.1 Pressurize the coolant system at the top of the reservoir. Control the system pressure to (70 ± 10) kPa. Install a pressure cap or relief valve (PC-1 in Figs. A5.1-A5.3) (see X1.6) capable of maintaining system pressure within the above requirements.

6.5.2 The pumping system shall be capable of producing (80 ± 4) L/min. A Gould's G&L centrifugal pump (P-1 in Figs. A5.1-A5.3), Model NPE, Size 1ST, mechanical seal, with a 1.4914 kW, 3450 r/min motor, has been found suitable for this application (see X1.7). Voltage and phase of the motor is optional. VFD [variable frequency drive] devices are acceptable in this application.

6.5.3 The coolant system volume is not specified; however certain cooling system components are specified as shown in Figs. A5.1-A5.3. Adhere to the nominal ID of the line sizes as shown in Figs. A5.1-A5.3.

6.5.4 The specified heat exchanger (HX-1 in Fig. A5.1) is an ITT Standard brazed plate model 320-20, Part No. 5-686-06-020-001 or ITT Bell and Gossett brazed plate model BP-75H-20, Part No. 5-686-06-020-001 (see X1.8). Parallel or counter flow through the heat exchanger is permitted.

6.5.4.2 The specified heat exchanger(s) for the alternative cooling system (see Figs. A5.2 and A5.3) are an ITT shell and tube Model BCF 5-030-06-048-001 or an American Industrial AA-1248-3-6-SP (see X1.8).

6.5.5 An orifice plate (OP-1 in Fig. A5.1) is specified.

6.5.5.1 An orifice plate (OP-1) is not required when using the alternative cooling system (see Figs. A5.2 and A5.3).

6.5.6 An orifice plate (differential pressure) (FE-103 in Figs. A5.1-A5.3) is specified (see X1.9). Use an orifice flange, $1^1/_2$ NPT. Size the orifice plate to yield a pressure drop of (11.21 ± 0.50) kPa at a flow rate of 80 L/min. There shall be 10 diameters upstream and 5 diameters downstream of straight, smooth pipe with no reducers or increasers. Flange size shall be the same size as pipe size. Threaded, slip-on or weld neck styles can be used as long as a consistent pipe diameter is kept throughout the required lengths. An orifice obtained from Flowell (see X1.9) has been found suitable.

6.5.7 A control valve (TCV-104 in Figs. A5.1 and A5.2) is required for controlling coolant temperature by directing flow through the heat exchanger, HX-1, or diverting it through the bypass portion of the cooling system.

6.5.7.4 Control valve (TCV-104) is not required when using the alternative cooling system (see Figs. A5.2 and A5.3).

6.5.8 A control valve (FCV-103 in Figs. A5.1-A5.3) is required for controlling the coolant flow rate to (80.0 ± 4) L/min. A Badger Meter Inc. Model No. 9003GCW36SV3A29L36, 2-way globe, 2 in., air-to-close valve is the specified valve (see X1.10). A VFD device (P-1 in Fig. A5.3) would require this value.

6.5.9 Use a Viatran model 274/374, Validyne model DP15 or P55, or Rosemount models 1151 or 3051 differential pressure transducer for reading the coolant flow rate at the orifice plate (FE-103 in Figs. A5.1-A5.3) (see X1.11).

6.5.10 Replace the engine water pump with a water pump plate OHT6D-005-1, shown in Fig. A5.4.

6.5.11 A coolant reservoir, a coolant overflow container, and a sight glass are required as shown in Figs. A5.1-A5.3 and Fig. A5.5. The design or model of these items is optional.

6.5.12 Use a control valve (TCV-101 in Figs. A5.2 and A5.3) for controlling the process water flow rate through the heat exchanger HX-1. A Badger Meter Inc. Model 9001GCW36SV3Axxx36 (air-to-close) or Model 9001GCW36SV1Axxx36 (air-to-open), 2-way globe, 1-in. valve have been found to be suitable for this application (see X1.10).

6.5.13 Use a $1^1/_2$-in. NPT sight glass in the main coolant circuit (SG-1 in Figs. A5.1-A5.3). The make/model is optional.

6.6 *External Oil System*—An external oil system as shown in Figs. A5.6-A5.10 is required. Although all of the systems are interconnected in some manner, the overall external oil system is comprised of two separate circuits: *(1)* the flying flush system, which allows the oil to be changed while the engine is running, and *(2)* the circulation system for oil temperature control. Consider the engine oil pan (OHT6D-001-1) shown in Fig. A5.9 a part of the external oil system. Minimize the external oil volume of all of the circuits as well as the length of connections and surfaces that are in contact with more than one oil in the flush system to enable more thorough flying flushes (see X1.23).

6.6.4 The flying flush system (see Fig. A5.6) shall have the following features:

6.6.4.5 A dump reservoir (see Fig. A5.8) with a minimum capacity of 6.0 L.

6.6.4.6 A dump reservoir float switch is required. (FLS-136 in Fig. A5.8) The make and model is optional. An OHT-6D001-04/ Switch, Level, Gems, high temperature float switch has been found suitable for this application (see X1.23).

Existing Note 1 renumbered.

Note 2—If using a V-belt drive, use a 1:1 pulley ratio so that the final speed of the pump is a nominal 1150 r/min.

Continuing changes to Annex references necessitated by the addition of new annexes.

6.6.5.3 Use solenoid valves (FCV-150A, FCV-150C, FCV-150D, and FCV-150E, in Fig. A5.6) (see X1.16).

6.6.5.4 Use control valve (TCV-144 in Fig. A5.6). The specified valve is a Badger Meter Inc. Model No. 1002TBN36SVOSALN36, 3-way globe (divert), $^{1}/_{2}$ in., air to open valve (see X1.17).

6.6.5.5 Use a heat exchanger (HX-6 in Fig. A5.6) for oil cooling. The specified heat exchanger is an ITT model 310-20 or an ITT Bell & Gossett, model BP-25-20 (Part No. 5-686-04-020-001), brazed plate (see X1.18).

Existing Note 2 renumbered.

NOTE 3—The ITT Standard and ITT Bell and Gossett heat exchangers have been standardized under one model and part number. The new replacement is Model BP410-20, Part No. 5-686-04-020-002.

Continuing changes to Annex references necessitated by the addition of new annexes.

6.6.5.6 Use an electric heater (EH-5 in Fig. A5.6) for oil heating. The specified heater is a heating element inserted in the liquid Cerrobase inside a Labeco oil heater housing (see X1.19). Any heater elements rated at 3000 W may be used within the Labeco housing. There are two recommended heating elements: *(1)* a three element with Incaloy sheath, Chromolox Part No. GIC-MTT-330XX, 230 V, single phase, and *(2)* Wiegland Industries/Chromolox, Emerson Electric Model MTS-230A, Part No. 156-019136-014, 240 V single phase.

(1) It is specified that a thermocouple be installed in the external oil heater so that the temperature can be monitored. Install this thermocouple into the top of the heater into the Cerrobase (see Fig. A5.7) to an insertion depth of (245 ± 3) mm. Do not exceed the maximum temperature of 205 °C.

(2) The procedure for replacing a heating element is detailed in Annex A6.

6.6.5.7 Install two oil filters (FIL-1 and FIL-2 in Fig. A5.6) in the external oil system. The filters specified are OHT6A-012-3 with a stainless steel screen having a rating of 28 µm, Part No. OHT6A-013-2 (see X1.20). Locate one filter anywhere in the external oil system after the oil circulation pump, and locate the other between the engine oil pump and where the oil enters the engine oil gallery.

6.6.5.8 Use modified oil filter adapter assembly, Part No. OHT6D-003-1 (see X1.21), as shown in Fig. A5.6.

6.6.5.9 Engine oil plumbing shall be stainless steel tubing or piping or flexible hose suitable for use with oils at the temperatures specified (see Fig. A5.6). When using a flexible hose in the external oil system, excluding the line to the dump tank, use either Aeroquip No. 8 (Part No. 2807-8) or Aeroquip No. 10 (Part No. 2807-10) (see X1.22).

Additional oil displacement block listed, item 2 of information letter and updated Annex reference.

6.6.5.11 *Engine Oil Pan*—Use oil pan OHT6D-001-1. Use oil displacement blocks OHT-6D-001-0201 or OHT-6E-001-0201. A sight glass is provided for monitoring the oil level and determining oil consumption. See A11.2 for instructions on oil consumption measurement/calibration.

Continuing changes to annex references necessitated by the addition of new annexes.

6.7 Fuel System—A typical fuel delivery system incorporating all of the required features is shown in Fig. A5.11. The fuel system shall include provisions for measuring and controlling fuel temperature and pressure into the fuel flow measuring equipment and into the engine fuel rail.

Corrected incorrect unit designation in equation

6.8.1 Intake Air Humidity—Measure humidity with the laboratory's primary humidity system. Correct each reading for non-standard barometric conditions, using the following equation:

$$\text{Humidity (corrected), g/kg} = 621.98 \times \left(\frac{Psat}{Pbar - Psat}\right) \quad (1)$$

where:

Psat =saturation pressure, mm Hg, and

Pbar=barometric pressure, mm Hg.

Continuing changes to annex references necessitated by the addition of new annexes.

6.9.5.5 *Intake Air*—Locate the thermocouple in the GM plastic elbow in front of the throttle body as shown in Fig. A5.12.

6.10.2 The specified location of the analyzer sensing element in the exhaust system is shown in Fig. A5.13.

6.11.1 *Exhaust Manifolds*—Use production cast iron exhaust manifolds, GM Part # 12571102 Left and 12571101 Right, heat shields, GM part numbers 12617267 and 12580706, and OHT left #OHT6D-010-1 and right #OHT6D-009-1 take down tube assemblies (see X1.34). Take down tubes may need to be shortened to facilitate installation at the laboratory. O2 sensors, OHT Part # OHT6D-047-1, will mount in the second hole downstream on the take down tubes. Plug unused holes. Take down tubes are shown in Figs. A5.14 and A5.15.

6.11.2 *Laboratory Exhaust System*—The exhaust system specified is shown in Fig. A5.13. Components can be clocked trimmed or modified as needed to ease installation, but install all components in the order shown. The laboratory has the discretion to design the system downstream differently than the location shown in Fig. A5.13.

6.11.3 *Exhaust Back Pressure*—The exhaust system shall have the capability for controlling exhaust back pressure to the pressures specified in Tables 2-4. The specified exhaust back pressure probe is shown in Fig. A5.16, and the specified exhaust back pressure probe location in the exhaust system is shown in Fig. A5.13

6.12.5 *Exhaust Back Pressure*—Locate the exhaust back pressure probe as shown in Fig. A5.13. Use sensor accuracy to within 2 % of full scale with resolution of 25 Pa.

6.12.6 *Intake Air*—Measure the intake air pressure at the location shown in Fig. A5.16. Use a sensor/readout accuracy of 2 % of full scale with resolution of 5.0 Pa.

6.12.9 *Crankcase Pressure*—Locate the crankcase pressure tap as detailed in Annex A14.

6.13.3 *Thermostat Block-off Adapter Plate*—Use an adapter plate OHT6D-004-1 as shown in Fig. A5.5 in place of the thermostat.

6.14.1.1 Flywheel Torque Tool, Purchase from the CPD, OHT3H-002-1 shown in Fig. A5.18.

6.14.1.2 Balancer Torque Tool, Purchase from the CPD, OHT3H-003-1 shown in Fig. A5.19.

7.2 *Test Fuel*—Use only Haltermann (see X1.33) HF 003 fuel. Specification for HF 003 fuel is contained in Table 1. (**Warning—**Danger! Extremely flammable. Vapors harmful if inhaled. Vapors may cause flash fire (see Annex A8).)

7.4.1 *Organic Solvent Penmul L460*—See X1.29. (**Warning—**Harmful vapor. Store at moderate temperature (see Annex A8)).

9.4.1 *General Assembly Instructions*—Assemble the external engine dress components according to the detailed description in the 2008 VID Assembly Manual, a copy of which can be obtained from the ASTM TMC (see Annex A4) website. In cases of disparity, the explicit instructions contained in this test method

take precedence over the assembly manual.

9.4.4 New parts required for each new test stand installation (see X1.3) are listed in Annex A7.

9.4.10.5 *PCV*—Remove the PCV valve and install OHT6D-013-1, vent all PCV points of connection to the crankcase pressure control system as detailed in Annex A14 and Fig. A5.17 (see 6.12.9). Plug all associated vacuum lines.

9.4.12.1 *Fuel Injectors*—Use fuel injectors, OHT6D-042-1. Refer to Annex A12 for injector flow specifications. Verification of each injector is required prior to use.

9.4.13.3 *Air Cleaner Modification*—Modify the GM elbow #25733251 for the thermocouple and pressure taps (see Fig. A5.16).

9.4.20 *Non-Phased Camshaft Gears*—These gears (OHT6D-016-1 GEAR, CAMSHAFT, EXHAUST & OHT6D-017-1 GEAR, CAMSHAFT, INTAKE) will need to be installed by the end user prior to running the new engine break-in; they will be supplied with the engine when purchased. Install these gears in accordance with the instructions detailed in Annex A17.

9.4.22 *Camshaft Position Actuator Modification*—For Sequence VID test operation, the camshaft position actuator shall be in place to provide lubrication to the front camshaft journals. Close, by tig welding, the actuator drain ports to reduce excessive oil bleeding through the control valves during engine operation as the valves are positioned in a manner that allows complete drainage through the spool valves (see Fig. A5.21).

Calibration Section revised to remove items addressed in Annex A2.

10. Calibration

10.1 *Stand/Engine Calibration*—To ensure proper response to various oil parameters, conduct a reference oil test when a new or previously used test engine is installed in a test stand. This event is monitored by the TMC. See Annex A2 prior to attempting calibration of a new stand. The TMC assigns reference oils for calibration tests. These oils are formulated or selected to represent specific chemical, or performance levels, or both. They are usually supplied directly to a testing laboratory under code numbers to ensure that the laboratory is not influenced by prior knowledge of acceptable results in assessing test results. The TMC determines the specific reference oil the laboratory shall test. Number each Sequence VID test to identify the stand number, the number of runs on that stand, the engine number, and the number of runs on the engine. For example, 56-21-3-8 defines a test on stand 56, which is test 21 on stand 56, engine number 3, and the 8th test on engine number 3. For reruns of operationally invalid or unacceptable reference oil the stand run number shall be incremented by one and the engine run number shall be followed by the letter A for the first re-run, B for the second re-run, and so forth. For example, the next test number for an operationally invalid or unacceptable test would be 56-22-3-8A.

10.1.1 *Procedure*—Test stand/engine calibration is accomplished by conducting tests on TMC reference oils (see Annex A2).

10.1.1.1 Conduct reference oil tests on each test stand/engine combination within a laboratory according to TMC Lubricant Test Monitoring System (LTMS)[19] guidelines. *Do not terminate a reference test due to an FEI result.*

10.1.1.2 The first three calibration periods on a given stand/engine combination are ten full–length non-reference oil tests or 1750 engine hours or 100 days, whichever occurs first.

10.1.1.3 Subsequent calibration periods on a given stand/engine combination are seven full–length non-reference oil tests or 1225 engine hours or 100 days, whichever occurs first.

10.1.1.4 If the elapsed time between Sequence VID tests on a stand/engine combination is more than 100 days EOT (end-of-test) to SOT (start-of-test), a minimum of one operationally valid, statistically acceptable reference oil test is required.

10.1.1.5 Re-reference the engines once removed from the test stand and re-installed, even if the test number and time criteria are met by the engine. Laboratories shall inform the TMC with a written explanation when a test engine is removed from a test stand and installed into another test stand. Only appropriate Sequence VID test engines (see X1.3) may be referenced.

10.1.1.6 The effective date of a reference test is the LTMS date and time of the reference test. Test start time is defined as the introduction of the reference oil into the engine, but the total test length shall

[9] The Lubricant Test Monitoring System may be obtained from the ASTM Test Monitoring Center, 6555 Penn Avenue, Pittsburgh, PA 15206-4489, Attention: Administrator.

include the BLB runs also. The LTMS date and time are defined as the date and time the test was completed (completion of the BL run following the reference oil) unless a different date and time are assigned by the TMC. The TMC may schedule more frequent reference oil tests (or approve less frequent reference oil tests) at its discretion. Under special circumstances (that is, extended downtime due to industry-wide parts or fuel outages) the TMC may extend reference periods. Note non-reference oil tests conducted during the extended time allowance in the test note section of the report.

10.1.1.7 Failure of a reference oil test to meet Shewhart or Exponentially Weighted Moving Average (EWMA) control chart limits can be indicative of a false alarm, engine, test stand, or industry-related problem. When this occurs, the laboratory, in conjunction with the TMC, shall attempt to determine the problem source. The ASTM Sequence VI Surveillance Panel adjudicates industry problems. The TMC decides, with input as needed from industry expertise (testing laboratories, test procedure developer, ASTM Technical Guidance Committee, Surveillance Panel, and so forth), if the reason for any unacceptable blind reference oil test is isolated to one particular engine or stand or related to other stands. If it is decided that the problem is isolated to an individual engine or stand, calibrated testing on other stands may continue throughout the laboratory. The laboratory may elect to attempt additional reference oil tests in the same engine. In the event the engine does not attain calibration, the laboratory shall remove the engine and go through the normal process of calibrating a new engine. Include operationally valid, statistically unacceptable data on removed engines in all appropriate databases (industry reference oil severity and precision) unless the engine failing to calibrate is a new engine (has never been calibrated and conducted non-reference oil tests).

10.1.1.8 If a non-standard test is conducted on a previously calibrated test stand, the laboratory shall conduct a reference oil test on that stand to demonstrate that it continues to be calibrated, prior to running standard tests.

10.1.2 *Reporting Reference Oil Test Results*—Upon completion of the reference oil test, the test laboratory transmits the data electronically to the TMC, as described in Section 13. The TMC reviews the data and contacts the laboratory engineer to report the laboratory's calibration status. All reference oil test results, whether aborted, invalidated, or successfully completed, shall be reported to the TMC..

10.1.3. *BL Baseline Calibration Oil and BL-FO Flush Oil*—The Baseline Calibration (BL) Oil and BL-FO Flush Oil may be analyzed only to the extent required to evaluate the effectiveness of a test stand's flushing system. This analysis will be limited to molybdenum content. Do not subject the BL oil or BL-FO oil to further physical or chemical analyses other than those specified within this procedure unless specifically authorized by the TMC. In such instances, supply written confirmation of the circumstances involved, the data to be obtained, and the name of the person requesting the analysis to the TMC.

Additional sections requiring update of Annex references.

11.6.10 *Percent Delta Calculation for BLB1 vs. BLB2*—Following the completion of BLB-2, calculate the Total Consumed (non-weighted) between these using the equations in A16.8.

12.1.1 Calculate the test results as detailed in Annex A15.

Report section revised to address additional items from D0.02.B0.10 guidelines

13. Report

13.1 For reference oil results, use the standardized report form set available from the ASTM TMC and data dictionary for reporting test results and for summarizing operational data.
NOTE-4 Report the non-reference oil test results on these same forms if the results are intended to be submitted as candidate oil results against a specification.

13.1.1 Fill out the report forms according to the formats shown in the data dictionary.
13.1.2 Transmit results to the TMC within 5 working days of test completion.
13.1.3 Transmit the results electronically as described in the ASTM Data Communications Committee Test Report Transmission Model (Section 2 — Flat File Transmission Format) available from the ASTM TMC. Upload files via the TMC’s website.

13.2 All reference oil test results, whether aborted, invalidated, or successfully completed, shall be reported to the TMC.
13.3 *Deviations from Test Operational Limits*—All deviations from specified test shall be reported.
13.4 *Precision of Reported Units*—Use the Practice E29 rounding off method for critical pass/fail test result data. Report the data to the same precision as indicated in data dictionary. (13.1.1)
13.5 In the space provided, note the time, date, test hour, and duration of any shutdown or off-test condition. Document the outcome of all prior reference oil tests from the current calibration sequence that were operationally or statistically invalid.
13.6 If a calibration period is extended beyond the normal calibration period length, make a note in the comment section and attach a written confirmation of the granted extension from the TMC to the test report. List the outcomes of previous runs that may need to be considered as part of the extension in the comment section.
13.7 *Validity Statement*—Include a statement pertaining to the validity of the test at the bottom of the appropriate form, that is signed by the person responsible for conducting the test.
13.8 *BL Before 1 and 2 Start Dates*—The BL before 1 and 2 start dates are defined as the date when the BL before test oil(s) flush enters into the engine.
13.9 *BL Before Start Time*—The BL before start time(s) are defined as the time when the BL before test oil(s) flush enters into the engine.
13.10 *Test Oil Start Date*—This is defined as the date when the first non-reference or reference test oil flush enters into the engine.
13.11 *Test Oil Start Time*—This is defined as the time when the first non-reference or reference test oil flush enters into the engine.
13.12 *BL After Test Oil Start Date*—The BL after test oil start date is defined as the date when the FO test oil flush enters into the engine.
13.13 *BL After Test Oil Start Time*—The BL after test oil start time is defined as the time when the FO test oil flush enters into the engine.
13.14 *Total Engine Hours at End of Test*—This is defined as the cumulative engine hours at the completion of BL After Test Oil.
13.15 *Total Test Length*—This is defined as the total test hours accumulated from BLB1 time/date through the completion of BLA Stage 6.
13.16 *Fuel Batch*—This is defined as the batch number for the most recent batch of fuel that has been put into the fuel tank (it is recognized that in most cases a fuel tank will not be completely empty before a new load of fuel is put into the tank, so the fuel in the tank may actually be a mixture of two or more batches).
13.17 *Oil Viscosity Measurement*—Measure and report viscosity determinations at 40 °C and 100 °C on the appropriate form for New Oil and for Aged (Phase II) Oil. Make the viscosity determinations according to Test Method D445.

Renumbered note 3.

NOTE 5—Intermediate precision is the appropriate term for this test method rather than repeatability, which defines more rigorous within-laboratory conditions.

Annex A1 revised and new annexes A2, A3, and A4 added.

ANNEXES
(Mandatory Information)

A1.1 *Nature and Functions of the ASTM Test Monitoring Center (TMC)*—The TMC is a non-profit organization located in Pittsburgh, Pennsylvania and is staffed to: administer engineering studies; conduct laboratory inspections; perform statistical analyses of reference oil test data; blend, store, and ship reference oils; and provide the associated administrative functions to maintain the referencing calibration program for various lubricant tests as directed by ASTM Subcommittee D02.B0 and the ASTM Executive Committee. The TMC coordinates its activities with the test sponsors, the test developers, the surveillance panels, and the testing laboratories. Contact TMC through the TMC Director at:

ASTM Test Monitoring Center

6555 Penn Avenue
Pittsburgh, PA 15206-4489
www.astmtmc.cmu.edu

A1.2 *Rules of Operation of the ASTM TMC*—The TMC operates in accordance with the ASTM Charter, the ASTM Bylaws, the Regulations Governing ASTM Technical Committees, the Bylaws Governing ASTM Committee D02, and the Rules and Regulations Governing the ASTM Test Monitoring System.

A1.3 *Management of the ASTM TMC*—The management of the Test Monitoring System is vested in the Executive Committee elected by Subcommittee D02.B0. The Executive Committee selects the TMC Director who is responsible for directing the activities of the TMC.

A1.4 *Operating Income of the ASTM TMC*—The TMC operating income is obtained from fees levied on the reference oils supplied and on the calibration tests conducted. Fee schedules are established by the Executive Committee and reviewed by Subcommittee D02.B0.

A2. ASTM TEST MONITORING CENTER: CALIBRATION PROCEDURES

A2.1 *Reference Oils*—These oils are formulated or selected to represent specific chemical, or performance levels, or both. They are usually supplied directly to a testing laboratory under code numbers to ensure that the laboratory is not influenced by prior knowledge of acceptable results in assessing test results. The TMC determines the specific reference oil the laboratory shall test.

A2.1.1 *Reference Oil Data Reporting* – Test laboratories that receive reference oils for stand calibration shall submit data to the TMC on every sample of reference oil they receive. If a shipment contains any missing or damaged samples, the laboratory shall notify the TMC immediately.

A2.2 *Calibration Testing:*

A2.2.1 Full-scale calibration testing shall be conducted at regular intervals. These full-scale tests are conducted using coded reference oils supplied by the TMC. It is a laboratory's responsibility to keep the on-site reference oil inventory at or above the minimum level specified by the TMC test engineers.

A2.2.2 *Test Stands Used for Non-Standard Tests*—If a non-standard test is conducted on a previously calibrated test stand, the laboratory shall conduct a reference oil test on that stand to demonstrate that it continues to be calibrated, prior to running standard tests.

A2.3 *Reference Oil Storage*—Store reference oils under cover in locations where the ambient temperature is between -10 °C and +50 °C.

A2.4 *Analysis of Reference Oil*—Unless specifically authorized by the TMC, do not analyze TMC reference oils, either physically or chemically. Do not resell ASTM reference oils or supply them to other laboratories without the approval of the TMC. The reference oils are supplied only for the intended purpose of obtaining calibration under the ASTM Test Monitoring System. Any unauthorized use is strictly forbidden. The testing laboratory tacitly agrees to use the TMC reference oils exclusively in accordance with the TMC's published Policies for Use and Analysis of ASTM Reference Oils, and to run and report the reference oil test results according to TMC guidelines. Additional policies for the use and analysis of ASTM Reference Oils are available from the TMC.

A2.5 *Conducting a Reference Oil Test*—When laboratory personnel are ready to run a reference calibration test, they shall request an oil code via the TMC website.

A2.6 *Reporting Reference Oil Test Results*—Upon completion of the reference oil test, the test laboratory transmits the data electronically to the TMC, as described in Section 13. The TMC reviews the data and contacts the laboratory engineer to report the laboratory's calibration status. All reference oil test results, whether aborted, invalidated, or successfully completed, shall be reported to the TMC.

A2.6.1 All deviations from the specified test method shall be reported.

A3. ASTM TEST MONITORING CENTER: MAINTENANCE ACTIVITIES

A3.1 *Special Reference Oil Tests*—To ensure continuous severity and precision monitoring, calibration tests are conducted periodically throughout the year. Occasionally, the majority or even all of the industry's test stands will conduct calibration tests at roughly the same time. This could result in an

unacceptably large time frame when very few calibration tests are conducted. The TMC can shorten or extend calibration periods as needed to provide a consistent flow of reference oil test data. Adjustments to calibration periods are made such that laboratories incur no net loss or gain in calibration status.

A3.2 *Special Use of the Reference Oil Calibration System*—The surveillance panel has the option to use the reference oil system to evaluate changes that have potential impact on test severity and precision. This option is only taken when a program of donated tests is not feasible. The surveillance panel and the TMC shall develop a detailed plan for the test program. This plan requires all reference oil tests in the program to be completed as close to the same time as possible, so that no laboratory/stand calibration status is left pending for an excessive length of time. In order to maintain the integrity of the reference oil monitoring system, each reference oil test is conducted so as to be interpretable for stand calibration. To facilitate the required test scheduling, the surveillance panel may direct the TMC to lengthen and shorten reference oil calibration periods within laboratories such that the laboratories incur no net loss or gain in calibration status. To ensure accurate stand, or laboratory, or both severity assessments, conduct non-reference oil tests the same as reference oil tests.

A3.3 *Donated Reference Oil Test Programs*—The surveillance panel is charged with maintaining effective reference oil test severity and precision monitoring. During times of new parts introductions, new or re-blended reference oil additions, and procedural revisions, it may be necessary to evaluate the possible effects on severity and precision levels. The surveillance panel may choose to conduct a program of donated reference oil tests in those laboratories participating in the monitoring system, in order to quantify the effect of a particular change on severity and precision. Typically, the surveillance panel requests its panel members to volunteer enough reference oil test results to create a robust data set. Broad laboratory participation is needed to provide a representative sampling of the industry. To ensure the quality of the data obtained, donated tests are conducted on calibrated test stands. The surveillance panel shall arrange an appropriate number of donated tests and ensure completion of the test program in a timely manner.

A3.4 *Intervals Between Reference Oil Tests*—Under special circumstances, such as extended downtime caused by industry-wide parts or fuel shortages, the TMC may extend the intervals between reference oil tests.

A3.5 *Introducing New Reference Oils*—Reference oils produce various results. When new reference oils are selected, participating laboratories will be requested to conduct their share of tests to enable the TMC to recommend industry test targets. ASTM surveillance panels require a minimum number of tests to establish the industry test targets for new reference oils.

A3.6 *TMC Information Letters*—Occasionally it is necessary to revise the test method, and notify the test laboratories of the change, prior to consideration of the revision by Subcommittee D02.B0. In such a case, the TMC issues an Information Letter. Information Letters are balloted semi-annually by Subcommittee D02.B0, and subsequently by D02. By this means, the Society due process procedures are applied to these Information Letters.

A3.6.1 *Issuing Authority*—The authority to issue an Information Letter differs according to its nature. In the case of an Information Letter concerning a part number change which does not affect test results, the TMC is authorized to issue such a letter. Long-term studies by the surveillance panel to improve the test procedure through improved operation and hardware control may result in the issuance of an Information Letter. If obvious procedural items affecting test results need immediate attention, the test sponsor and the TMC issue an Information Letter and present the background and data supporting that action to the surveillance panel for approval prior to the semiannual Subcommittee D02.B0 meeting.

A3.7 *TMC Memoranda*—In addition to the Information Letters, supplementary memoranda are issued. These are developed by the TMC and distributed to the appropriate surveillance panel and participating laboratories. They convey such information as batch approvals for test parts or materials, clarification of the test procedure, notes and suggestions of the collection and analysis of special data that the TMC may request, or for any other pertinent matters having no direct effect on the test performance, results, or precision and bias.

A4. ASTM TEST MONITORING CENTER: RELATED INFORMATION

A4.1 *New Laboratories*—Laboratories wishing to become part of the ASTM Test Monitoring System will be requested to conduct reference oil tests to ensure that the laboratory is using the proper testing techniques. Information concerning fees, laboratory inspection, reagents, testing practices, appropriate committee membership, and rater training can be obtained by contacting the TMC Director.

A4.2 *Information Letters: COTCO Approval*—Authority for the issuance of Information Letters was given by the committee on Technical Committee Operations in 1984, as follows: "COTCO recognizes that D02 has a unique and complex situation. The use of Information Letters is approved providing each letter contains a disclaimer to the affect that such has not obtained ASTM consensus. These Information Letters should be moved to such consensus as rapidly as possible."
A4.3 *Precision Data*—The TMC determines the precision of test methods by analyzing results of calibration tests conducted on reference oils. Precision data are updated regularly. Current precision data can be obtained from the TMC

Table A7.2 Sequence VID Part List (November , 2014)

OHT6D001001	PAN, OIL, SEQ. VID
	(w/ Gems Sensor and Displacement Block OHT6D001021)
OHT6E001021	Displacement Block Sequence VIE

Additional Annex reference change.

A12.10 Adjust the FEI engine hour adjusted result(s) on non-reference oil tests for the stand/engine severity in accordance with Annex A10.

The following changes pertain to item 2 of the cover letter.

Table A7.2 Sequence VID Part List (November , 2014)

OHT6D-001-1	PAN, OIL, SEQ. VID
	(w/ Gems Sensor and Displacement Block OHT6D-001-021)
OHT6E-001-1	