A Program of ASTM International

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L-33-1 Information Letter 16-1
Sequence Number 17
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ASTM consensus has not been obtained on this information letter. An appropriate ASTM ballot will be issued in order to achieve such consensus.

TO: L-33-1 Surveillance Panel

SUBJECT: Adoption of American Axle K2XX hardware for test use

During an April 19, 2016 teleconference, the L-33-1 Surveillance Panel approved the use of American Axle K2XX hardware for future testing. Adoption of this hardware will require the use of a +0.6 merit correction factor in order to maintain historic test severity. This action was further discussed during the panel's May 11, 2016 meeting.

D7038 has been extensively revised to incorporate this change. The text of the revisions is shown in the attachment. This change is effective immediately.

Angela Trader
Chairman
L-33-1 Surveillance Panel

Frank Farber
Director
ASTM Test Monitoring Center

Attachment

cc: ftp://ftp.astmtmc.cmu.edu/docs/gear/l331/procedure_and_ils/il16-1.pdf

Distribution: Email

(Revises Test Method D 7038-15)

Replace Section 4. through 4.5 with the following:

4. Summary of Test Method

4.1 This procedure uses a new hypoid differential assembly as the primary test unit. The differential assembly is installed on a motoring rig and charged with test lubricant and a small amount of water. The test unit is then sealed and driven until the lubricant temperature has increased to 180 °F (82.2 °C). The motoring phase is continued for 4 h and the test unit is then removed from the motoring rig and placed in a storage box for 162 h with the lubricant temperature controlled at 125 °F (51.7 °C). The test is completed at that time and the differential assembly is drained, disassembled, and inspected for rust, stain, and other deposits.

Delete Footnote 6, renumber Footnote 7 to Footnote 10, and Footnotes 8 and 9 to Footnotes 7 and 8.

Replace section 6.2 with the following:

6.2 Test Unit:-- This procedure uses a hypoid differential assembly (without axle tubes) made by American Axle Mfg. The model designation is K2XX, Part No. P40128429A, 3:42 ratio, standard 218.4 mm (8.6 in.). This is an open differential with uncoated ring and pinion[9,10]. Until June 23, 2017, a Dana Model 30 V01.1 may also be used.

[9] The sole source of supply of the apparatus known to the committee at this time is American Axle Manufacturing, 2965 Rochester Hills, MI 48309

[10] If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

Renumber existing footnotes accordingly

Replace section 6.2.1 with the following:

6.2.1 Mount the differential housing assembly on the motoring rig so that the housing cover attaching face is in the vertical plane and at a height that allows the temperature sensing probe to be located in the bottom of the housing. Elements of the motoring rig design are shown in Figs. A5.1-A5.4.

Replace section 6.2.2.1 with the following:

6.2.2.1 Electric Motor –approximately 2.0 hp (1.5 kW), enclosed, 3600 r/min, 0.87 in. (22.2 mm) diameter shaft.

Delete current Footnote 10, and renumber existing footnotes accordingly

Replace section 6.2.5 with the following:

6.2.5 Housing Axle Tube Opening Seals — Since the differential is tested without axle shafts or axle tubes, seal the housing openings. Use a stainless steel plumbing test plug for a 2.9 to 3.1 inch pipe diameter. McMaster-Carr p/n 2908K28[12] with the outer washer and seal ring cut to 74 mm to 79 mm (2.9 in. to 3.1 in.) has been found acceptable. Install a pair of seals in the axle housing openings before installing carrier/case into the axle housing. When using Dana Model 30 hardware rather than the AAM K2XX hardware see Fig. A5.2 for an example of construction dimensions for fabricating a pair of suitable seals.

[12] Available from McMaster-Carr Supply Company, 200 Aurora Industrial Pkwy, Cleveland, OH 44202.

Insert footnote 12 and renumber existing footnotes accordingly

Replace section 8.1 with the following:

8.1 Use 1.0 gal (3.7 L) of fluid for each test. The housing capacity is 91 oz (2.7 L). The remaining oil is used for coating the test parts during disassembly. When using Dana model 30 hardware rather than the AAM K2XX hardware the housing capacity is 40 oz (1.2 L).

Replace section 9 title with the following:

9. Preparation of American Axle K2XX Hardware (when Dana Model 30 hardware is used instead, follow the preparation instructions in Annex A10.)

Replace section 9.2.1.1 and 9.2.1.2 with the following:

9.2.1.1 Disassembly—Disassemble the differential housing assembly leaving the pinion inner and outer races in place. Remove all parts from the differential case. Disassemble all bearings from their mating parts. Maintain right differential case shim for axle assembly.

9.2.1.2 Differential Housing Modification—Drill and tap the housing to accept the temperature sensor using the template shown in Figs. A5.12 and A5.13. Install the temperature sensor so that the tip of the sensor is 1 in. ± 0.25 in. (25.4 mm ± 6.4 mm) from the floor of the differential housing as shown in Fig.

A5.4. Tap the housing vent tube opening to ¼ inch NPT to install the pressure control device.

Replace section 9.2.2.1through 9.2.2.4 with the following:

9.2.2.1 Drive Pinion Shaft Installation—Assemble the drive pinion shaft with its bearings and install it in the housing following the guidelines in 9.2.2. A late model GM, GMC or Chevrolet service manual may be used for assembly detail.
(1) Install the rear pinion bearing onto the pinion shaft with the original shim.
(2) Place the front pinion bearing into the housing and then install the pinion front seal into the housing. Note that the front seal might be damaged during disassembly and may need to be replaced.
(3) Install the pinion shaft into the differential housing. The front bearing may need to be tapped into place using a small punch. Install the pinion yoke washer and nut. Torque pinion-nut until a turning torque of 3 lbf-in to 10 lbf-in (0.3 N·m to 1.1 N·m) is achieved.
(4) If necessary, replace the pinion crush collar and repeat pinion assembly process.
(5) Record the final pinion break and turning torque on the appropriate test report form.

9.2.2.2 Differential Case Installation—Assemble the differential pinion, side gears, shafts and thrust washers, shims, and bearings. Install the differential case assembly and bearing caps in the differential housing. Torque the differential housing bearing caps to 35 lbf-ft to 50 lbf-ft (48 N·m to 68 N·m). Measure break and turning torque; turn torque shall be 7 lbf-in. to 13 lbf-in. (0.8 N·m to 1.5 ·m) and break torque shall be 8 lbf-in. to 18 lbf-in.(0.9 N·m to 2.0 N·m).
(1) Adjust the final turning torque by removing the differential case, adding or removing shims on the left ring gear side only, and then reassemble to obtain final preload.

9.2.2.3 Test Oil Addition—Charge 91 oz ± 2.3 oz (2.7 L ± 0.07 L) of test oil to the test unit.

9.2.2.4 Cover Plate, Seals, Temperature Probe Installation—Install the cover plate with a new TFE fluorocarbon gasket, pre-wetted with the test oil on both sides (see 6.2.4). Use a new TFE fluorocarbon cover plate gasket for every test. Torque the cover plate bolts to 20 lbf-ft to 25 lbf-ft (27 N·m to 34 N·m). Install the temperature probe using TFE fluorocarbon tape as shown in Fig. A5.4, Fig. A5.11, and Fig. A5.12. Install the NPT stainless steel 90° street ell and stainless steel full port valve.

Replace section 10.1 with the following:

10.1 Reference Test Frequency—Conduct one reference test every ten test starts or every five months, whichever comes first. This calibration frequency is subject to change as required. Current calibration information is available from the TMC. (See Annex A2 for general calibration information.) Any test started on or before the stand calibration expiration date is defined to have been run on a calibrated stand.

Replace sections 10.4.1 through 10.4.3 with the text below then renumber 10.4.3.1 through 10.4.3.5 as 10.4.2.1 through 10.4.2.5:

10.4.1 Prior to every stand calibration attempt, calibrate the drive speed measuring system and the temperature control systems (storage box and motoring stand) against a known standard, traceable to NIST.[19]

10.4.2 Prior to every stand calibration attempt, calibrate the pressure relief system using the following process:

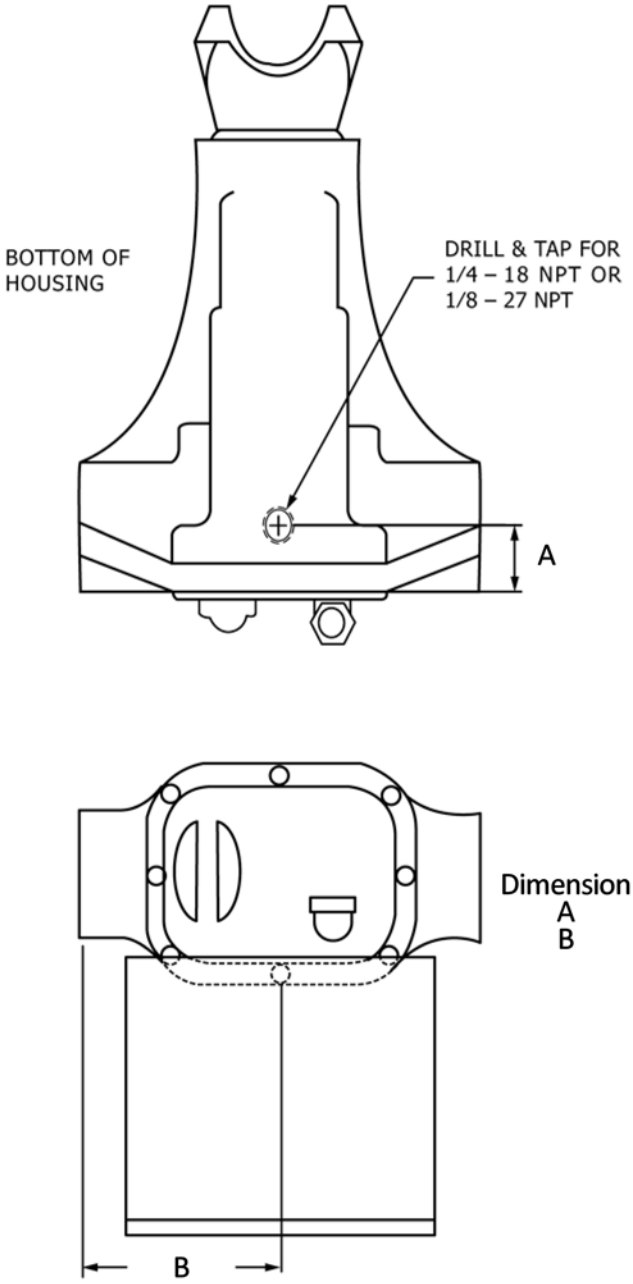
Replace section 11.1.5 with the following:

11.1.5 Using a syringe, add 67.5 mL ± 0.6 mL (2.3 oz ± 0.02 oz) of specified test water to the test unit through the full port valve within 5 min after starting the drive motor. If using Dana Model 30 hardware rather than the AAM K2XX hardware add 1.00 oz ± 0.02 oz (29.6 mL ± 0.6 mL) instead. Connect the pressure relief system.

Replace section 12.4 with the following:

12.4 By filling in values on the rating sheet and then applying the appropriate weighting values shown in Annex A9, a final deposit merit value is obtained. To maintain comparable test severity to the Dana Model 30 hardware, add 0.6 merits to the final deposit merit value when using AAM K2XX hardware. Note the presence, location, and amount of additional deposits, such as stain and sludge, or other, in the Remarks section on the rating sheet. Also note rust in non-rated areas in the Remarks section.

Replace Fig A5.4 with the following:



Dimension	Hardware AAM K2XX	Dana Model 30
A	3.00 (76)	2.36 (60)
B	8.75 (222)	7.00 (178)

Add Annex A10 with the following text:

A10. Preparation of Dana Model 30 Hardware

A10.1 Test Unit Preparation:
A10.1.1 Cleaning of Reused Fittings, Seals, and other parts – Clean, as necessary, all reusable parts including axle tube opening seals, pressure relief system and elbow, and the temperature sensor and its fittings.

A10.2 Differential Assembly Build-Up:

A10.2.1 Cleaning and Preparation of Parts:

A10.2.1.1 Disassembly—Completely disassemble the differential housing assembly and remove all parts from the differential case. Discard the axle spacer block, which is not used in the build-up of the test axle. Disassemble all bearings from their mating parts. Maintain pinion and differential case shim packs for axle assembly.

A10.2.1.2 Differential Housing Modification—Drill and tap the housing to accept the temperature sensor using the test fixture shown in Figs. A5.12 and A5.13. Install the temperature sensor so that the tip of the sensor is 1 in. ± 0.25 in. (25.4 mm ± 6.4 mm) from the floor of the differential housing as shown in Fig. A5.4.

A10.2.1.3 Cleaning—Pressure wash the differential housing and each individual component with solvent (see 7.2) using a round plastic bristle brush. Rinse the differential housing and each individual component with solvent, and dry them with compressed air or nitrogen. Do not use wire brushes or abrasive cleaning pads to clean the differential housing and individual components. Remove all grease and oil used during manufacturer's assembly from bearings and wipe clean lip seals with a dry cloth.

A10.2.1.4 Functional Surface and Cover Plate Preparation — Abrasive blast the entire differential case, ring, pinion, side gears, differential pinion gears (spider gears), all four thrust washers and the inside surface of the housing cover plate by uniformly abrasive blasting with 80 grit aluminum oxide. Do not abrasive blast the bearings, bearing cups and differential shaft (cross shaft pin). Do not touch any cleaned surface with bare hands as moisture can cause rusting.

(1) After abrasive blasting and pre-test inspection (see A10.2.1.5), pressure wash abrasive blasted parts, all four bearings, and bearing cups with solvent and a round plastic bristle brush (pressure not to exceed 30 psi (207 kPa) (see 6.1.2). After pressure washing, rinse with solvent and dry with filtered compressed air or nitrogen (pressure not to exceed 30 psi (207 kPa) (see 7.2). A Wilkerson filter, model M18-02-CH00[17,7] is required to filter the compressed air or nitrogen. A Wilkerson model MTP-96-64617[17,7] is the required replacement element for the filter assembly. Do not use wire brushes or abrasive-cleaning pads to clean the abrasive blasted parts. Do not spin dry the bearings with the compressed air or nitrogen. Only use blowguns without a safety bypass to air-dry the parts. A Milton model S15[18,7] has been found to be acceptable.

A10.2.1.5 Pre-Test Inspection—After the parts have been abrasive blasted, and before cleaning and rinsing, carefully inspect the abrasive blasted parts, bearings, and bearing cups for rust or corrosion and damage. If any rated area is found to have rust, re-prepare as described in A10.2.1.4. If defects are found, such as casting flaws and so forth, that might be

mistaken for rust at the end of test inspection, add a notation of their pre-test existence to the test report. If any bearing is found to have rust or damage, replace it with a new one that is rust-free. The replaced bearing shall be from the same manufacturer and have the same bearing part number. At the end of test inspection and rating make no allowances for parts rusted before start of test.

A10.2.1.6 Test Oil Coating—Immediately coat all abrasive blasted parts evenly with test oil after they have been cleaned, rinsed, and dried. Immediately coat all four bearings, bearing cups, and differential shaft (cross shaft pin) evenly with test oil after they have been cleaned and rinsed. (Bearings, bearing cups, and differential shaft (cross shaft pin) are not abrasive blasted). Dipping the parts in test oil or pouring the test oil over the parts are acceptable methods. Do not use brushes to coat the parts with test oil. Do not touch any test parts with bare hands; fingerprints can cause rusting.

A10.2.1.7 Lightly coat all bolts with test oil prior to assembly of test axle.

A10.2.1.8 Clean, rinse, dry, and coat all parts with test oil within 2 h after abrasive blasting.

A10.2.2 Assembly of Test Unit:

A10.2.2.1 Drive Pinion Shaft Installation—Assemble the drive pinion shaft with its bearings and install it in the housing following the guidelines in A10.2.2. Dana Bulletin No. 5304-2 may be used for additional information, however in all cases the L-33-1 procedure supersedes all information in this bulletin.

(1) Install pinion bearing races into the differential housing. Use care to place the appropriate shims and oil slinger under the rear-bearing race.

(2) Install the rear pinion bearing onto the pinion shaft.

(3) Place the front pinion bearing and oil slinger into the housing and then install the pinion front seal into the housing. Note that the front seal might be damaged during disassembly and may need to be replaced.

(4) Install the pinion shaft, with appropriate bearing preload shims, into the differential housing. The front bearing may need to be tapped into place using a small punch. Install the pinion yoke washer and nut. Torque pinion-nut to 160 lbf-ft to 200 lbf-ft (217 N•m to 271 N•m). This will achieve the compression on the components to eliminate any shaft leakage. Unload the pinion bearings by tapping the pinion with a hammer and punch on the yoke side and gear side. This should completely seat the bearings and races.

(5) Determine the pinion-turning torque. Pinion turning torque is the primary control of the final break and turn results. Set the pinion turning torque to 3 lbf-in to 10 lbf-in (0.34 N•m to 1.13 N•m).

(6) If necessary, adjust the pinion preload shim pack by removing the pinion nut and tapping the pinion out of the housing. Shims can be used in various combinations to achieve the proper preload. Shim thickness is limited to 0.003, 0.005,

0.010, and 0.030 in. ((0.076, 0.013, 0.025, and 0.726)mm). Add or remove shims to adjust the turning torques. Use caution, shims may remain on the bearing or in the bearing bore.
(7) Repeat item 4 of A10.2.2.1 to assemble pinion.
(8) Record the final pinion break and turning torque on the appropriate test report form.
A10.2.2.2 Differential Case Installation—Assemble the differential pinion, side gears, shafts and thrust washers, shims, and bearings. Install the differential case assembly and bearing caps in the differential housing. Torque the differential housing bearing caps to 35 lbf-ft to 50 lbf-ft (48 N•m to 68 N•m). Measure break and turning torque; turn torque shall be 7 lbf-in. to 13 lbf-in. (0.8 N•m to 1.5 N•m) and break torque shall be 8 lbf-in. to 18 lbf-in. (0.9N•m to 2.0N•m).
(1) Adjust the final turning torque by removing the differential case and side bearing, adding or removing shims, and then reassemble to obtain final preload.
(2) Repeat item 1 of A10.2.2.2 until the appropriate final turning torque is reached.
(3) Record final break and turning torque on the appropriate test report form.
(4) After completion of the test axle build and before the cover plate installation, place the test axle in a vertical position with the yoke in the upward position. Place the cover in a vertical position. Allow the assembled test axle and cover plate to drain for a minimum of 10 min.
A10.2.2.3 Test Oil Addition—Charge 40 oz ± 1 oz (1.20L ± 0.03L) of test oil to the test unit.
A10.2.2.4 Cover Plate, Seals, Temperature Probe Installation—Install the cover plate with a new TFE fluorocarbon gasket, pre-wetted with the test oil on both sides (see 6.2.4). Use a new TFE fluorocarbon cover plate gasket for every test. Torque the cover plate bolts to 20 lbf-ft to 25 lbf-ft (27N•m to 34N•m). Insert the two axle tube opening seals shown in Fig. A5.2 until they touch the differential case bearings, then pull back approximately 1/8 in. (3.2 mm). Tighten the seals and install the temperature probe using TFE fluorocarbon tape as shown in Fig. A5.4, Fig. A5.12, and Fig. A5.13. Install the NPT stainless steel 90° street ell and stainless steel full port valve.