



## Test Monitoring Center

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L-37 Information Letter 02-1  
Sequence Number 24  
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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-37 Mailing List

SUBJECT: 1. CRC Rating Manual 21  
2. Report Forms and Data Dictionary

1. At the November 28, 2001 L-37 Surveillance Panel meeting, the panel approved a motion to adopt CRC Manual 21 as a replacement for Manuals 17 and 18. Attached are revised Sections 3.1.1, through 3.1.12, 3.1.14, 10.1.8, 12.1.1, 12.2.1, Annex A9.1, Annex A9.3 and Table A9.1 of Test Method D6121. The effective date is January 1, 2002.

2. The L-37 Test Report Forms and Data Dictionary have been removed from Test Method D6121. The TMC will continue to maintain and revise the L-37 Test Report Forms and Data Dictionary as done in the past. The current report forms and data dictionary may be downloaded from the ASTM Test Monitoring Center Web Page at <http://tmc.astm.cmri.cmu.edu/> or can be obtained in hardcopy format from the TMC. Attached are revised Sections 12.2.3.2, 13.1, 13.4, and Annex A7. Sections 12.2.3.3, and 13.5 have been deleted. Section 12.2.3.4 has been renumbered to Section 12.2.3.3 and Section 13.6 has been renumbered to Section 13.5. Annex A11 has been deleted and Annex A12 has been revised and renumbered to Annex A11. The effective date is February 11, 2002.

Donald T. Bartlett  
Chairman  
L-37 Surveillance Panel

John L. Zalar  
Administrator  
ASTM Test Monitoring Center

Attachment

c: [ftp://tmc.astm.cmri.cmu.edu/docs/gear/l-37/procedure\\_and\\_ils/il02-1.pdf](ftp://tmc.astm.cmri.cmu.edu/docs/gear/l-37/procedure_and_ils/il02-1.pdf)

Distribution: US Mail

(Revises Test Method D 6121-00 as amended by Information Letters 00-1 through 01-2)

- 3.1.1 *abrasive wear, n – on ring and pinion gears*, removal of material from the operating surface of the gear caused by lapping of mating surfaces by fine particles suspended in lubricant, fuel, or air or imbedded in a surface (CRC Rating Manual No. 21).<sup>7</sup>
- 3.1.2 *adhesive wear, n – on ring and pinion gears*, removal of material from the operating surface of the gear caused by shearing of junctions formed between operating surfaces in direct metal-to-metal contact; sheared-off particles either remain affixed to the harder of the mating surfaces or act as wear particles between the surfaces (CRC Rating Manual No. 21).
- 3.1.3 *burnish, n – on ring and pinion gears*, an alteration of the original manufactured surface to a dull or brightly polished condition (CRC Rating Manual No. 21).<sup>7</sup>
- 3.1.4 *corrosion, n – in final drive axles*, a general alteration of the finished surfaces of bearings or gears by discoloration, accompanied by roughening not attributable to mechanical action (CRC Rating Manual No. 21).
- 3.1.5 *deposits, n – in final drive axles*, material of pasty, gummy, or brittle nature adhering to or collecting around any of the working parts (CRC Rating Manual No. 21).
- 3.1.6 *discoloration, n – on ring and pinion gears*, any alteration in the normal color of finished steel surfaces (CRC Rating Manual No. 21).
- 3.1.7 *pitting, n – on ring and pinion gears*, small irregular cavities in the tooth surface, resulting from the breaking out of small areas of surface metal (CRC Rating Manual No. 21).
- 3.1.8 *ridging, n – on ring and pinion gears*, an alteration of the tooth surface to give a series of parallel raised and polished ridges running diagonally in the direction of sliding motion, either partially or completely across the tooth surfaces of gears (CRC Rating Manual No. 21).
- 3.1.9 *rippling, n – on ring and pinion gears*, an alteration of the tooth surface to give an appearance of a more or less regular pattern resembling ripples on water or fish scales (CRC Rating Manual No. 21).
- 3.1.10 *scoring, n – on ring and pinion gears*, the rapid removal of metal from the tooth surfaces caused by the tearing out of small contacting particles that have welded together as a result of metal-to-metal contact. The scored surface is characterized by a matte or dull finish (CRC Rating Manual No. 21).
- 3.1.11 *scratching, n – on ring and pinion gears*, an alteration of the tooth surface in the form of irregular scratches, of random length, across the tooth surface in the direction of sliding of the surfaces (CRC Rating Manual No. 21).
- 3.1.12 *spalling, n – on ring and pinion gears*, the breaking out of flakes of irregular area of the tooth surface, a condition more extensive than pitting (CRC Rating Manual No. 21).
- 3.1.14 *wear, n – on ring and pinion gears*, the removal of metal, without evidence of surface fatigue or adhesive wear, resulting in partial or complete elimination of tool or grinding marks or development of a discernible shoulder ridge at the bottom of the contact area near the root or at the toe or heel end of pinion tooth contact area (abrasive wear) (CRC Rating Manual No. 21).

(Revises Test Method D 6121-00 as amended by Information Letters 00-1 through 01-2)

10.1.8 At this time, an optional inspection of the gear set condition is permitted. If chosen, remove the inspection plug located at the top of the axle cover and note the condition of the ring gear in accordance with CRC Rating Manual 21.

12.1.1 Examine the bearings for wear, surface fatigue corrosion, and deposits in accordance with CRC Rating Manual 21.

12.2.1 Examine the tooth surfaces on the drive side of the pinion and ring gear for the following distresses in accordance with CRC Rating Manual 21 and Annex A9: burnishing, wear, pitting/spalling, ridging, rippling, scoring, discoloration, corrosion, and deposits. Rate the distress types of wear, rippling, and ridging using the CRC Reference Photography of Gear Distress photographs. The photographs shall have a serial number of SN001 or greater and have an issuance date of July 8, 2000 or later.

12.2.3.2 Report this rating value on Form 1 and Form 2 (Annex A7) of the test report package.

**DELETE 12.2.3.3**

**RENUMBER 12.2.3.4 to 12.2.3.3**

13.1 For reference oil tests, the standardized report form set and data dictionary for reporting the test results and for summarizing the operational data are required. The report forms and data dictionary are available on the ASTM Test Monitoring Center Web Page at <http://tmc.astm.cmri.cmu.edu/> or can be obtained in hardcopy format from the TMC.

13.4 *Deviations from Test Operational Limits*—Report all deviations from specified test operational limits on Form 4 (Annex A 7) under Other Comments.

**DELETE 13.5**

**RENUMBER 13.6 to 13.5**

A9.1 Additional descriptions have been developed to aid the rater in accurately assessing the distress on the ring gear and pinion following the completion of the test. The definitions described in this annex supersede those found in CRC Rating Manual 21 where applicable.

A9.3 Severity levels applied to distress types. When rating the following distress types, the definitions described supersede those found in CRC Rating Manual 21.

## A7. L-37 TEST REPORT FORMS and DATA DICTIONARY

The required report forms and data dictionary are available on the ASTM Test Monitoring Center Web Page at <http://tmc.astm.cmri.cmu.edu/> or can be obtained in hardcopy format from the TMC.

Form 0	Test Report Cover
Form 1	Test Result Summary Page
Form 2	Gear Tooth Surface Condition
Form 3	Operational Summary Sheet
Form 4	Lost Time and Comments Sheet
Form 5	Operational Validity Summary

**Delete Figures A7.1 Through A7.6**

**Delete Annex A11**

Table A9.1 Gear Rating Guidelines

Use For All Distress Except Pitting/Spalling		
Numerical Value	Level of Distress	
10.0	None	
9.0	Trace	
8.0	Trace-Light	
7.0	Light	
6.0	Light-Medium	
5.0	Medium	
4.0	Medium-Heavy	
3.0	Heavy	
2.0	Heavy to Catastrophic ( up to 50% of gear tooth contact area)	
1.0	Heavy to Catastrophic ( greater than 50% and less than 100% of the gear tooth contact area)	
0.0	Catastrophic (100% of the gear tooth contact area)	
Use For Pitting/Spalling Distress Only		
Numerical Value	Level of Distress	Corresponding CRC 21 Spalling Scale
10.0	None	
9.9	Trace Pitting - Pit size up to 0.24 mm diameter	
9.8	Trace-Light Pitting	
9.7	Light Pitting - Pit size 0.50 mm diameter	
9.6	Light-Medium Pitting	
9.5	Medium Pitting - Pit size 0.74 mm diameter	
9.4	Medium-Heavy Pitting	
9.3	Heavy Pitting - Pit size 0.98 mm diameter	
9.0	Trace Spalling	1 mm <sup>2</sup>
8.0	Trace-Light Spalling	4 mm <sup>2</sup>
7.0	Light Spalling	9 mm <sup>2</sup>
6.0	Light-Medium Spalling	16 mm <sup>2</sup>
5.0	Medium Spalling	25 mm <sup>2</sup>
4.0	Medium-Heavy Spalling	36 mm <sup>2</sup>
3.0	Heavy Spalling	49 mm <sup>2</sup>
2.0	Heavy to Catastrophic (up to 50% of gear tooth contact area and for pitting/spalling, greater than a 3.0 on the spalling template)	
1.0	Heavy to Catastrophic ( greater than 50% and less than 100% of the gear tooth contact area not ratable)	
0.0	Catastrophic (100% of the gear tooth contact area not ratable)	
Spalling in the range from 9.0 to 3.0 references CRC Manual 21 Spalling Template. Any tooth breakage will be noted in the comment section of the final test report.		

## ANNEX A11. GEAR BATCH EXCLUSIONS

A11.1 Comments have been developed to accurately describe approved gear batch exclusions. When reporting test results, place one of the comments in Table A11.1 on Form 2 (Annex A7) in the area of Exclusion Comments.

Table A11.1 Gear Batch Exclusion Comments

Gear Batch	Comment
C1L426/P4L415A Non-lubrited Hardware Only (Reference & Non-reference Tests)	Excludes any pitting/spalling values between 9.3 and 9.9 inclusively, in the wear step area (1/16 <sup>th</sup> in.) of the drive side pinion tooth.
V1L303/P4L514A Non-lubrited Hardware Only (Reference & Non-reference Tests)	Excludes any pitting/spalling values between 3.0 and 9.9 inclusively, in the wear step area (1/16 <sup>th</sup> in.) of the drive side pinion tooth.
V1L686/P4L626A Non-lubrited Hardware Only (Reference & Non-reference Tests)	References how to report the observations of a thin polished line that is sometimes visible in the root heel of the pinion and on the crown of the ring gear. This condition is normal and not oil-related and is to be noted as 'Root and tip line polishing and a function of the gear set manufacturing process'.
Applies to All Gear Batches With No Exclusions	No exclusion applied