

# MACK T-10 EGR ENGINE OIL TEST

REPORT PACKET VERSION NO. 20010102

CONDUCTED FOR  
*TSTSPON1*  
*TSTSPON2*

|                 |  |
|-----------------|--|
| <i>LABVALID</i> | V = VALID; THE REFERENCE OIL/NON-REFERENCE OIL WAS EVALUATED IN ACCORDANCE WITH THE TEST PROCEDURE.  |
|                 | I = INVALID; THE REFERENCE OIL/NON-REFERENCE OIL WAS NOT EVALUATED IN ACCORDANCE WITH THE TEST PROCEDURE.  |
|                 | N = RESULTS CANNOT BE INTERPRETED AS REPRESENTATIVE OF OIL PERFORMANCE (NON-REFERENCE OIL) AND SHALL NOT BE USED IN DETERMINING AN AVERAGE TEST RESULT USING MULTIPLE TEST CRITERIA. |

|               |                             |
|---------------|-----------------------------|
| <i>TSTOIL</i> | NR = Non Reference Oil Test |
|               | RO = Reference Oil Test     |

|                                     |                             |                                 |                              |
|-------------------------------------|-----------------------------|---------------------------------|------------------------------|
| STAND: <i>STAND</i>                 | STAND RUN NO.: <i>STRUN</i> | ENGINE NO.: <i>ENGINE</i>       | ENGINE HOURS: <i>ENHOURS</i> |
| END OF TEST DATE: <i>DTCOMP</i>     |                             | END OF TEST TIME: <i>EOTIME</i> |                              |
| OIL CODE: <i>OILCODE</i>            |                             |                                 |                              |
| FORMULATION/STAND CODE: <i>FORM</i> |                             |                                 |                              |
| ALTCODE1: <i>ALTCODE1</i>           | ALTCODE2: <i>ALTCODE2</i>   | ALTCODE3: <i>ALTCODE3</i>       |                              |

In my opinion this test *OPVALID* been conducted in a valid manner in accordance with the Test Method Dxxx and the appropriate amendments through the information letter system. The remarks included in this report describe the anomalies associated with this test.

SUBMITTED BY: \_\_\_\_\_ *SUBLAB*  
 \_\_\_\_\_  
 Testing Laboratory  
 \_\_\_\_\_  
*SUBSIGIM*  
 \_\_\_\_\_  
 Signature  
 \_\_\_\_\_  
*SUBNAME*  
 \_\_\_\_\_  
 Typed Name  
 \_\_\_\_\_  
*SUBTITLE*  
 \_\_\_\_\_  
 Title

**MACK T-10**  
**EGR Engine Oil Test**  
**Form 10**  
**Liner Wear Summary**

|   |                        |                         |
|---|------------------------|-------------------------|
| Laboratory <i>LAB</i>   | EOT Date <i>DTCOMP</i> | EOT Time <i>EOTTIME</i> |
| Test Number <i>STAND</i> <i>-STRUN</i> <i>-ENGINE</i> <i>-ENHOURS</i> |                        |                         |
| Oil Code <i>OILCODE</i>   |                        |                         |
| Formulation/Stand Code <i>FORM</i>                                    |                        |                         |

| POSITION           | WEAR STEP (µm)  |               |               |               |               |               |
|--------------------|-----------------|---------------|---------------|---------------|---------------|---------------|
|                    | Cylinder Number |               |               |               |               |               |
|                    | 1               | 2             | 3             | 4             | 5             | 6             |
| 1:00               | <i>C1LW1</i>    | <i>C2LW1</i>  | <i>C3LW1</i>  | <i>C4LW1</i>  | <i>C5LW1</i>  | <i>C6LW1</i>  |
| 2:00               | <i>C1LW2</i>    | <i>C2LW2</i>  | <i>C3LW2</i>  | <i>C4LW2</i>  | <i>C5LW2</i>  | <i>C6LW2</i>  |
| 3:00 (Thrust)      | <i>C1LW3</i>    | <i>C2LW3</i>  | <i>C3LW3</i>  | <i>C4LW3</i>  | <i>C5LW3</i>  | <i>C6LW3</i>  |
| 4:00               | <i>C1LW4</i>    | <i>C2LW4</i>  | <i>C3LW4</i>  | <i>C4LW4</i>  | <i>C5LW4</i>  | <i>C6LW4</i>  |
| 5:00               | <i>C1LW5</i>    | <i>C2LW5</i>  | <i>C3LW5</i>  | <i>C4LW5</i>  | <i>C5LW5</i>  | <i>C6LW5</i>  |
| 6:00 (Rear)        | <i>C1LW6</i>    | <i>C2LW6</i>  | <i>C3LW6</i>  | <i>C4LW6</i>  | <i>C5LW6</i>  | <i>C6LW6</i>  |
| 7:00               | <i>C1LW7</i>    | <i>C2LW7</i>  | <i>C3LW7</i>  | <i>C4LW7</i>  | <i>C5LW7</i>  | <i>C6LW7</i>  |
| 8:00               | <i>C1LW8</i>    | <i>C2LW8</i>  | <i>C3LW8</i>  | <i>C4LW8</i>  | <i>C5LW8</i>  | <i>C6LW8</i>  |
| 9:00 (Anti-Thrust) | <i>C1LW9</i>    | <i>C2LW9</i>  | <i>C3LW9</i>  | <i>C4LW9</i>  | <i>C5LW9</i>  | <i>C6LW9</i>  |
| 10:00              | <i>C1LW10</i>   | <i>C2LW10</i> | <i>C3LW10</i> | <i>C4LW10</i> | <i>C5LW10</i> | <i>C6LW10</i> |
| 11:00              | <i>C1LW11</i>   | <i>C2LW11</i> | <i>C3LW11</i> | <i>C4LW11</i> | <i>C5LW11</i> | <i>C6LW11</i> |
| 12:00 (Front)      | <i>C1LW12</i>   | <i>C2LW12</i> | <i>C3LW12</i> | <i>C4LW12</i> | <i>C5LW12</i> | <i>C6LW12</i> |
| Average            | <i>C1ALW</i>    | <i>C2ALW</i>  | <i>C3ALW</i>  | <i>C4ALW</i>  | <i>C5ALW</i>  | <i>C6ALW</i>  |

| Summary                     | As Measured   | Outlier Screened <sup>A</sup> | Adjusted to X.XX% Soot <sup>A</sup> |
|-----------------------------|---------------|-------------------------------|-------------------------------------|
| Average, µm                 | <i>AMACLW</i> | <i>ACLW</i>                   | <i>ALW</i>                          |
| Std. Dev., µm               | <i>AMSCLW</i> | <i>SCLW</i>                   |                                     |
| Minimum, µm                 | <i>AMICLW</i> | <i>ICLW</i>                   |                                     |
| Maximum, µm                 | <i>AMXCLW</i> | <i>XCLW</i>                   |                                     |
| Outlier Liners <sup>A</sup> | <i>OUTLIN</i> |                               |                                     |

<sup>A</sup> Wear results are not currently outlier screened or adjusted for soot. Wear results may eventually be screened and/or adjusted pending the results of the T-10 test matrix.

FIG A1.10 - Liner Wear Summary



**MACK T-10**  
**EGR Engine Oil Test**  
**Form 12**  
**Test Fuel Analysis (Last Batch)**

|  |                                   |                         |
|--|-----------------------------------|-------------------------|
| Laboratory <i>LAB</i>  | EOT Date <i>DTCOMP</i>            | EOT Time <i>EOTTIME</i> |
| Test Number <i>STAND</i> - <i>STRUN</i> - <i>ENGINE</i> - <i>ENHOURS</i> |                                   |                         |
| Oil Code <i>OILCODE</i>  |                                   |                         |
| Formulation/Stand Code <i>FORM</i>                                       |                                   |                         |
| Supplier <i>FUELSUP</i>  | Batch Identifiers <i>FUELBTID</i> |                         |

| Measurement                       | Specs.       | Analysis |          | Test Method            |
|-----------------------------------|--------------|----------|----------|------------------------|
|                                   |              | NEW      | EOT      |                        |
| Total Sulfur, % Weight            | 0.04 - 0.05  | FUELSNEW | FUELSEOT | D 2622                 |
| Gravity, ° API                    | 34.5 - 36.5  | APIGRNEW | APIGREOT | D 287 or D 4052        |
| <b>Hydrocarbon Composition</b>    |              |          |          |                        |
| Aromatics % Vol.                  | 28 - 33      | FUELAROM |          | D 1319                 |
| Olefin                            | Report       | FUELOLEF |          | D 1319                 |
| Cetane Index                      | Report       | CETANEIN |          | D 976 & D 4737         |
| Cetane No.                        | 42 - 48      | CETANENO |          | D 613                  |
| Copper Strip Corrosion            | 1 Maximum    | FUELCU   |          | D 130                  |
| Flash Point, °C                   | 54 Minimum   | FLASHPT  |          | D 93                   |
| Pour Point, °C                    | -18 Maximum  | FUELPOUR |          | D 97                   |
| Carbon Residue on 10% Residuum, % | 0.35 Maximum | FUELGRES |          | D 524<br>(10% Bottoms) |
| Water & Sediment, % Vol           | 0.05 Maximum | FUELH2O  |          | D 2709                 |
| Viscosity, cSt @ 40°C             | 2.4 - 5.0    | KINVIS   |          | D 445                  |
| Total Acid Number                 | 0.05 Maximum | FUELTAN  |          | D 664                  |
| Strong Acid Number                | 0.00 Maximum | FUELSAN  |          | D 664                  |
| Accelerated Stability             | tbd          | FUELACS  |          | D 2274                 |
| <b>Distillation, °C</b>           |              |          |          |                        |
| IBP                               | Report       | FUELIBP  |          | D 86                   |
| 10%                               | Report       | FUEL10   |          | D 86                   |
| 50%                               | Report       | FUEL50   |          | D 86                   |
| 90%                               | 282 - 338    | FUEL90   |          | D 86                   |
| EP                                | Report       | FUELEP   |          | D 86                   |

**MACK T-10**  
**EGR Engine Oil Test**  
**Form 13**  
**Characteristics of the Data Acquisition System**

|   |                        |                         |
|---|------------------------|-------------------------|
| Laboratory <i>LAB</i>   | EOT Date <i>DTCOMP</i> | EOT Time <i>EOTTIME</i> |
| Test Number <i>STAND</i> <i>_STRUN</i> <i>_ENGINE</i> <i>_ENHOURS</i> |                        |                         |
| Oil Code <i>OILCODE</i>   |                        |                         |
| Formulation/Stand Code <i>FORM</i>                                    |                        |                         |

| PARAMETER<br>(1)    | SENSING<br>DEVICE<br>(2) | CALIBRATION<br>FREQUENCY<br>(3) | RECORD<br>DEVICE<br>(4) | OBSERVATION<br>FREQUENCY<br>(5) | RECORD<br>FREQUENCY<br>(6) | LOG<br>FREQUENCY<br>(7) | SYSTEM<br>RESPONSE<br>(8) |
|---------------------|--------------------------|---------------------------------|-------------------------|---------------------------------|----------------------------|-------------------------|---------------------------|
| <b>Temperatures</b> |                          |                                 |                         |                                 |                            |                         |                           |
| Oil @ Filt.         | <i>OTEMSENS</i>          | <i>OTEMCALF</i>                 | <i>OTEMRECD</i>         | <i>OTEMOBSF</i>                 | <i>OTEMRECF</i>            | <i>OTEMLOGF</i>         | <i>OTEMSYSR</i>           |
| Fuel In.            | <i>FTEMSSENS</i>         | <i>FTEMCALF</i>                 | <i>FTEMRECD</i>         | <i>FTEMOBSF</i>                 | <i>FTEMRECF</i>            | <i>FTEMLOGF</i>         | <i>FTEMSYSR</i>           |
| Intake Air          | <i>AITSENS</i>           | <i>AITCALF</i>                  | <i>AITRECD</i>          | <i>AITOBSF</i>                  | <i>AITRECF</i>             | <i>AITLOGF</i>          | <i>AITSYSR</i>            |
| Intake Man.         | <i>IMANSENS</i>          | <i>IMANCALF</i>                 | <i>IMANRECD</i>         | <i>IMANOBSF</i>                 | <i>IMANRECF</i>            | <i>IMANLOGF</i>         | <i>IMANSYSR</i>           |
| Pre-Turb.           | <i>PTURSENS</i>          | <i>PTURCALF</i>                 | <i>PTURRECD</i>         | <i>PTUROBSF</i>                 | <i>PTURRECF</i>            | <i>PTURLOGF</i>         | <i>PTURSYSR</i>           |
| Cool. Out           | <i>COTSENS</i>           | <i>COTCALF</i>                  | <i>COTRECD</i>          | <i>COTOBSF</i>                  | <i>COTRECF</i>             | <i>COTLOGF</i>          | <i>COTSYSR</i>            |
| <b>Other</b>        |                          |                                 |                         |                                 |                            |                         |                           |
| Fuel Flow           | <i>FFLOSENS</i>          | <i>FFLOCALF</i>                 | <i>FFLORECD</i>         | <i>FFLOOBSF</i>                 | <i>FFLORECF</i>            | <i>FFLOLOGF</i>         | <i>FFLOSYSR</i>           |
| Engine RPM          | <i>RPMSSENS</i>          | <i>RPMCALF</i>                  | <i>RPMRECD</i>          | <i>RPMOBSF</i>                  | <i>RPMRECF</i>             | <i>RPMLOGF</i>          | <i>RPMSYSR</i>            |
| Load                | <i>LOADSENS</i>          | <i>LOADCALF</i>                 | <i>LOADRECD</i>         | <i>LOADOBSF</i>                 | <i>LOADRECF</i>            | <i>LOADLOGF</i>         | <i>LOADSYSR</i>           |
| Inlet Restr.        | <i>INRESENS</i>          | <i>INRECALF</i>                 | <i>INREREC</i>          | <i>INREOBSF</i>                 | <i>INRERECF</i>            | <i>INRELOGF</i>         | <i>INRESYSR</i>           |
| Exh. Press.         | <i>EXPRSSENS</i>         | <i>EXPRCALF</i>                 | <i>EXPRRECD</i>         | <i>EXPROBSF</i>                 | <i>EXPRRECF</i>            | <i>EXPRLOGF</i>         | <i>EXPRSYSR</i>           |
| Oil Gal. Press.     | <i>OILGSENS</i>          | <i>OILGCALF</i>                 | <i>OILGRECD</i>         | <i>OILGOBSF</i>                 | <i>OILGRECF</i>            | <i>OILGLOGF</i>         | <i>OILGSYSR</i>           |

**LEGEND:**

- (1) Operating Parameter
- (2) The type of device used to measure temperature, pressure or flow
- (3) Frequency at which the measurement system is calibrated
- (4) The type of device where data is recorded  
 LG - Handlog Sheet  
 DL - Automatic Data Logger  
 SC - Strip Chart Recorder  
 C/M - Computer, Using Manual Data Entry  
 C/D - Computer, Using Direct I/O Entry
- (5) Data are observed but only if recorded off spec.
- (6) Data are recorded but are not retained at EOT
- (7) Data are logged as permanent record, note specify if:  
 SS - Snapshot Taken at Specified Frequency  
 AG/X - Average of X Data Points at Specified Frequency
- (8) Time for the output to reach 63.2% of final value for step change at input

**MACK T-10  
EGR Engine Oil Test  
Form 14  
Build-up and Hardware Information**

|  |                        |                         |
|--|------------------------|-------------------------|
| Laboratory <i>LAB</i>                            | EOT Date <i>DTCOMP</i> | EOT Time <i>EOTTIME</i> |
| Test Number <i>STAND -STRUN -ENGINE -ENHOURS</i> |                        |                         |
| Oil Code <i>OILCODE</i>                          |                        |                         |
| Formulation/Stand Code <i>FORM</i>               |                        |                         |

**INJECTION TIMING**

| <b>Timing Hours</b> | <b>Timing (Deg)</b>  |
|---------------------|----------------------|
| <i>SITHR001</i>     | SIT_R001             |
|                     |                      |
|                     |                      |
|                     |                      |
|                     |                      |
| <i>TOTSIT</i>       | Total Timing Changes |

**HARDWARE**

| <b>Part</b>           | <b>Part Number</b> | <b>Serial Number</b> |
|-----------------------|--------------------|----------------------|
| Primary Turbocharger  | <i>TRBCHPPN</i>    |                      |
| Secondary Charger     | <i>TRBCHSPN</i>    |                      |
| Cylinder Head (front) | <i>CYLHFRPN</i>    | <i>CYLHFRSN</i>      |
| Cylinder Head (rear)  | <i>CYLHRRPN</i>    | <i>CYLHRRSN</i>      |
| Pistons               | <i>PISTONPN</i>    |                      |
| Injection Nozzles     | <i>INJNOZPN</i>    |                      |
| Rod Bearings          | <i>RODBRGPN</i>    |                      |
| Liners                | <i>LINERPN</i>     |                      |
| Ring Set              | <i>RINGSTPN</i>    |                      |

| <b>Cylinder Kit Location</b> | <b>CPD ID Number</b> |
|------------------------------|----------------------|
| Cylinder 1                   | <i>CPDIDC1</i>       |
| Cylinder 2                   | <i>CPDIDC2</i>       |
| Cylinder 3                   | <i>CPDIDC3</i>       |
| Cylinder 4                   | <i>CPDIDC4</i>       |
| Cylinder 5                   | <i>CPDIDC5</i>       |
| Cylinder 6                   | <i>CPDIDC6</i>       |

**MACK T-10**  
**EGR Engine Oil Test**  
**Form 15**  
**Rating Summary: Piston #1**

|   |                             |                           |
|---|-----------------------------|---------------------------|
| Laboratory <i>LAB</i>                             | EOT Date <i>DTCOMP</i>      | EOT Time <i>EOTTIME</i>   |
| Test Number <i>STAND STRUN - ENGINE - ENHOURS</i> |                             |                           |
| Oil Code <i>OILCODE</i>                           |                             |                           |
| Formulation/Stand Code <i>FORM</i>                |                             |                           |
| Date Rated <i>DTRATE</i>                          | Rater Initials <i>RINIT</i> | Verified By <i>VRINIT</i> |

| <b>TOTAL PISTON RATINGS SUMMARY</b>                      |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |                 |                 |                 |                 |     |
|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----|
|  | DEP. FACTOR     | GROOVES         |                 |                 |                 | LANDS           |                 |                 |                 | DEP. FACTOR     | GROOVE          |                      | LANDS           |                 |                 |                 | OIL COOLING     |                 | UNDER CROWN     |                 |     |
|  |                 | NO. 1           |                 | NO. 2           |                 | NO. 1           |                 | NO. 2           |                 |                 | NO. 3           | NO. 3                | NO. 4           |                 | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            |     |
|  |                 | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            |                 | A,%             | DEM.                 | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            | A,% |
| <b>C<br/>A<br/>R<br/>B<br/>O<br/>N</b>                   | HC - 1.0        | <i>G1HCA1</i>   | <i>G1HCD1</i>   | <i>G2HCA1</i>   | <i>G2HCD1</i>   | <i>L1HCA1</i>   | <i>L1HCD1</i>   | <i>L2HCA1</i>   | <i>L2HCD1</i>   |                 | <i>G3HCA1</i>   | <i>G3HCD1</i>        | <i>L3HCA1</i>   | <i>L3HCD1</i>   | <i>L4HCA1</i>   | <i>L4HCD1</i>   |                 |                 |                 |                 |     |
|  | MC - 0.5        | <i>G1MCA1</i>   | <i>G1MCD1</i>   |                 |                 |                 |                 |                 |                 |                 | <i>G3MCA1</i>   | <i>G3MCD1</i>        |                 |                 |                 |                 |                 |                 |                 |                 |     |
|  | LC - .25        | <i>G1LCA1</i>   | <i>G1LCD1</i>   | <i>G2LCA1</i>   | <i>G2LCD1</i>   | <i>L1LCA1</i>   | <i>L1LCD1</i>   | <i>L2LCA1</i>   | <i>L2LCD1</i>   |                 | <i>G3LCA1</i>   | <i>G3LCD1</i>        | <i>L3LCA1</i>   | <i>L3LCD1</i>   | <i>L4LCA1</i>   | <i>L4LCD1</i>   | <i>OG1CA1</i>   | <i>OG1CD1</i>   | <i>UC1CA1</i>   | <i>UC1CD1</i>   |     |
|  |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |                 |                 |                 |                 |     |
|  | TOTAL           | <i>G1ACTOT1</i> | <i>G1DCTOT1</i> | <i>G2ACTOT1</i> | <i>G2DCTOT1</i> | <i>L1ACTOT1</i> | <i>L1DCTOT1</i> | <i>L2ACTOT1</i> | <i>L2DCTOT1</i> |                 | <i>G3ACTOT1</i> | <i>G3DCTOT1</i>      | <i>L3ACTOT1</i> | <i>L3DCTOT1</i> | <i>L4ACTOT1</i> | <i>L4DCTOT1</i> | <i>OGACTOT1</i> | <i>OGDCTOT1</i> | <i>UCACTOT1</i> | <i>UCDCTOT1</i> |     |
| <b>V<br/>A<br/>R<br/>I<br/>A<br/>T<br/>I<br/>O<br/>N</b> | 8 - 9           | <i>G1V9A1</i>   | <i>G1V9D1</i>   | <i>G2V9A1</i>   | <i>G2V9D1</i>   | <i>L1V9A1</i>   | <i>L1V9D1</i>   | <i>L2V9A1</i>   | <i>L2V9D1</i>   |                 |                 |                      |                 |                 |                 |                 |                 |                 |                 |                 |     |
|  | 7 - 7.9         | <i>G1V8A1</i>   | <i>G1V8D1</i>   | <i>G2V8A1</i>   | <i>G2V8D1</i>   | <i>L1V8A1</i>   | <i>L1V8D1</i>   | <i>L2V8A1</i>   | <i>L2V8D1</i>   | 7.5             | <i>G3V75A1</i>  | <i>G3V75D1</i>       | <i>L3V75A1</i>  | <i>L3V75D1</i>  | <i>L4V75A1</i>  | <i>L4V75D1</i>  | <i>OGV75A1</i>  | <i>OGV75D1</i>  | <i>UCV75A1</i>  | <i>UCV75D1</i>  |     |
|  | 6 - 6.9         | <i>G1V7A1</i>   | <i>G1V7D1</i>   | <i>G2V7A1</i>   | <i>G2V7D1</i>   | <i>L1V7A1</i>   | <i>L1V7D1</i>   | <i>L2V7A1</i>   | <i>L2V7D1</i>   |                 |                 |                      |                 |                 |                 |                 |                 |                 |                 |                 |     |
|  | 5 - 5.9         | <i>G1V6A1</i>   | <i>G1V6D1</i>   | <i>G2V6A1</i>   | <i>G2V6D1</i>   | <i>L1V6A1</i>   | <i>L1V6D1</i>   | <i>L2V6A1</i>   | <i>L2V6D1</i>   |                 |                 |                      |                 |                 |                 |                 |                 |                 |                 |                 |     |
|  | 4 - 4.9         | <i>G1V5A1</i>   | <i>G1V5D1</i>   | <i>G2V5A1</i>   | <i>G2V5D1</i>   | <i>L1V5A1</i>   | <i>L1V5D1</i>   | <i>L2V5A1</i>   | <i>L2V5D1</i>   | 4.5             | <i>G3V45A1</i>  | <i>G3V45D1</i>       | <i>L3V45A1</i>  | <i>L3V45D1</i>  | <i>L4V45A1</i>  | <i>L4V45D1</i>  | <i>OGV45A1</i>  | <i>OGV45D1</i>  | <i>UCV45A1</i>  | <i>UCV45D1</i>  |     |
|  | 3 - 3.9         | <i>G1V4A1</i>   | <i>G1V4D1</i>   | <i>G2V4A1</i>   | <i>G2V4D1</i>   | <i>L1V4A1</i>   | <i>L1V4D1</i>   | <i>L2V4A1</i>   | <i>L2V4D1</i>   |                 |                 |                      |                 |                 |                 |                 |                 |                 |                 |                 |     |
|  | 2 - 2.9         | <i>G1V3A1</i>   | <i>G1V3D1</i>   | <i>G2V3A1</i>   | <i>G2V3D1</i>   | <i>L1V3A1</i>   | <i>L1V3D1</i>   | <i>L2V3A1</i>   | <i>L2V3D1</i>   |                 |                 |                      |                 |                 |                 |                 |                 |                 |                 |                 |     |
|  | 1 - 1.9         | <i>G1V2A1</i>   | <i>G1V2D1</i>   | <i>G2V2A1</i>   | <i>G2V2D1</i>   | <i>L1V2A1</i>   | <i>L1V2D1</i>   | <i>L2V2A1</i>   | <i>L2V2D1</i>   | 1.5             | <i>G3V15A1</i>  | <i>G3V15D1</i>       | <i>L3V15A1</i>  | <i>L3V15D1</i>  | <i>L4V15A1</i>  | <i>L4V15D1</i>  | <i>OGV15A1</i>  | <i>OGV15D1</i>  | <i>UCV15A1</i>  | <i>UCV15D1</i>  |     |
|  | >0 - 0.9        | <i>G1V1A1</i>   | <i>G1V1D1</i>   | <i>G2V1A1</i>   | <i>G2V1D1</i>   | <i>L1V1A1</i>   | <i>L1V1D1</i>   | <i>L2V1A1</i>   | <i>L2V1D1</i>   |                 |                 |                      |                 |                 |                 |                 |                 |                 |                 |                 |     |
|  | CLEAN           | <i>G1VCLNA1</i> | 0               | <i>G2VCLNA1</i> | 0               | <i>L1VCLNA1</i> | 0               | <i>L2VCLNA1</i> | 0               | CLEAN           | <i>G3VCLNA1</i> | 0                    | <i>L3VCLNA1</i> | 0               | <i>L4VCLNA1</i> | 0               | <i>OGVCLNA1</i> | 0               | <i>UCVCLNA1</i> | 0               |     |
| TOTAL  | <i>G1AVTOT1</i> | <i>G1DVTOT1</i> | <i>G2AVTOT1</i> | <i>G2DVTOT1</i> | <i>L1AVTOT1</i> | <i>L1DVTOT1</i> | <i>L2AVTOT1</i> | <i>L2DVTOT1</i> |                 | <i>G3AVTOT1</i> | <i>G3DVTOT1</i> | <i>L3AVTOT1</i>      | <i>L3DVTOT1</i> | <i>L4AVTOT1</i> | <i>L4DVTOT1</i> | <i>OGAVTOT1</i> | <i>OGDVTOT1</i> | <i>UCAVTOT1</i> | <i>UCDVTOT1</i> |                 |     |
| RATING   | <i>G1UWD1</i>   | <i>G2UWD1</i>   | <i>L1UWD1</i>   | <i>L2UWD1</i>   |                 | <i>G3UWD1</i>   | <i>L3UWD1</i>   | <i>L4UWD1</i>   |                 | <i>OGUWD1</i>   | <i>UCUWD1</i>   |                      |                 |                 |                 |                 |                 |                 |                 |                 |     |
| LOCATION FACTOR  | 2               | 3               | 1               | 3               |                 | 20              | 20              | 60              |                 | 0.5             | 1               |                      |                 |                 |                 |                 |                 |                 |                 |                 |     |
| IND RATING   | <i>G1WD1</i>    | <i>G2WD1</i>    | <i>L1WD1</i>    | <i>L2WD1</i>    |                 | <i>G3WD1</i>    | <i>L3WD1</i>    | <i>L4WD1</i>    |                 | <i>OGWD1</i>    | <i>UCWD1</i>    |                      |                 |                 |                 |                 |                 |                 |                 |                 |     |
| WDP  |                 | TGC             |                 |                 | TLC             |                 |                 | UNWEIGHTED DEP. |                 |                 |                 | T.L. FLAKED CARBON % |                 |                 |                 |                 |                 |                 |                 |                 |     |
| <i>WD1</i>   |                 | <i>TGC1</i>     |                 |                 | <i>TLC1</i>     |                 |                 | <i>UWD1</i>     |                 |                 |                 | <i>TLFC1</i>         |                 |                 |                 |                 |                 |                 |                 |                 |     |

FIG A1.15 - Rating Summary: Piston #1

**MACK T-10**  
**EGR Engine Oil Test**  
**Form 16**  
**Rating Summary: Piston #2**

|   |                             |                           |  |
|---|-----------------------------|---------------------------|--|
| Laboratory <i>LAB</i>                             | EOT Date <i>DTCOMP</i>      | EOT Time <i>EOTTIME</i>   |  |
| Test Number <i>STAND STRUN - ENGINE - ENHOURS</i> |                             |                           |  |
| Oil Code <i>OILCODE</i>                           |                             |                           |  |
| Formulation/Stand Code <i>FORM</i>                |                             |                           |  |
| Date Rated <i>DTRATE</i>                          | Rater Initials <i>RINIT</i> | Verified By <i>VRINIT</i> |  |

| <b>TOTAL PISTON RATINGS SUMMARY</b>          |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------------|-----------------|-----------------|-----------------|-----------------|-----|
|  | DEP. FACTOR     | GROOVES         |                 |                 |                 | LANDS           |                 |                 |                 | DEP. FACTOR     | GROOVE          |                 | LANDS           |                 |                 |                      | OIL COOLING     |                 | UNDER CROWN     |                 |     |
|  |                 | NO. 1           |                 | NO. 2           |                 | NO. 1           |                 | NO. 2           |                 |                 | NO. 3           | NO. 3           | NO. 4           |                 | A,%             | DEM.                 | A,%             | DEM.            | A,%             | DEM.            |     |
|  |                 | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            |                 | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.                 | A,%             | DEM.            | A,%             | DEM.            | A,% |
| <b>C<br/>A<br/>R<br/>B<br/>O<br/>N</b>       | HC - 1.0        | <i>G1HCA2</i>   | <i>G1HCD2</i>   | <i>G2HCA2</i>   | <i>G2HCD2</i>   | <i>L1HCA2</i>   | <i>L1HCD2</i>   | <i>L2HCA2</i>   | <i>L2HCD2</i>   |                 | <i>G3HCA2</i>   | <i>G3HCD2</i>   | <i>L3HCA2</i>   | <i>L3HCD2</i>   | <i>L4HCA2</i>   | <i>L4HCD2</i>        |                 |                 |                 |                 |     |
|  | MC - 0.5        | <i>G1MCA2</i>   | <i>G1MCD2</i>   |                 |                 |                 |                 |                 |                 |                 | <i>G3MCA2</i>   | <i>G3MCD2</i>   |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | LC - .25        | <i>G1LCA2</i>   | <i>G1LCD2</i>   | <i>G2LCA2</i>   | <i>G2LCD2</i>   | <i>L1LCA2</i>   | <i>L1LCD2</i>   | <i>L2LCA2</i>   | <i>L2LCD2</i>   |                 | <i>G3LCA2</i>   | <i>G3LCD2</i>   | <i>L3LCA2</i>   | <i>L3LCD2</i>   | <i>L4LCA2</i>   | <i>L4LCD2</i>        | <i>OG1CA2</i>   | <i>OG1CD2</i>   | <i>UC1CA2</i>   | <i>UC1CD2</i>   |     |
|  |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | TOTAL           | <i>G1ACTOT2</i> | <i>G1DCTOT2</i> | <i>G2ACTOT2</i> | <i>G2DCTOT2</i> | <i>L1ACTOT2</i> | <i>L1DCTOT2</i> | <i>L2ACTOT2</i> | <i>L2DCTOT2</i> |                 | <i>G3ACTOT2</i> | <i>G3DCTOT2</i> | <i>L3ACTOT2</i> | <i>L3DCTOT2</i> | <i>L4ACTOT2</i> | <i>L4DCTOT2</i>      | <i>OGACTOT2</i> | <i>OGDCTOT2</i> | <i>UCACTOT2</i> | <i>UCDCTOT2</i> |     |
| <b>V<br/>A<br/>R<br/>N<br/>I<br/>S<br/>H</b> | 8 - 9           | <i>G1V9A2</i>   | <i>G1V9D2</i>   | <i>G2V9A2</i>   | <i>G2V9D2</i>   | <i>L1V9A2</i>   | <i>L1V9D2</i>   | <i>L2V9A2</i>   | <i>L2V9D2</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | 7 - 7.9         | <i>G1V8A2</i>   | <i>G1V8D2</i>   | <i>G2V8A2</i>   | <i>G2V8D2</i>   | <i>L1V8A2</i>   | <i>L1V8D2</i>   | <i>L2V8A2</i>   | <i>L2V8D2</i>   | 7.5             | <i>G3V75A2</i>  | <i>G3V75D2</i>  | <i>L3V75A2</i>  | <i>L3V75D2</i>  | <i>L4V75A2</i>  | <i>L4V75D2</i>       | <i>OGV75A2</i>  | <i>OGV75D2</i>  | <i>UCV75A2</i>  | <i>UCV75D2</i>  |     |
|  | 6 - 6.9         | <i>G1V7A2</i>   | <i>G1V7D2</i>   | <i>G2V7A2</i>   | <i>G2V7D2</i>   | <i>L1V7A2</i>   | <i>L1V7D2</i>   | <i>L2V7A2</i>   | <i>L2V7D2</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | 5 - 5.9         | <i>G1V6A2</i>   | <i>G1V6D2</i>   | <i>G2V6A2</i>   | <i>G2V6D2</i>   | <i>L1V6A2</i>   | <i>L1V6D2</i>   | <i>L2V6A2</i>   | <i>L2V6D2</i>   | 4.5             | <i>G3V45A2</i>  | <i>G3V45D2</i>  | <i>L3V45A2</i>  | <i>L3V45D2</i>  | <i>L4V45A2</i>  | <i>L4V45D2</i>       | <i>OGV45A2</i>  | <i>OGV45D2</i>  | <i>UCV45A2</i>  | <i>UCV45D2</i>  |     |
|  | 4 - 4.9         | <i>G1V5A2</i>   | <i>G1V5D2</i>   | <i>G2V5A2</i>   | <i>G2V5D2</i>   | <i>L1V5A2</i>   | <i>L1V5D2</i>   | <i>L2V5A2</i>   | <i>L2V5D2</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | 3 - 3.9         | <i>G1V4A2</i>   | <i>G1V4D2</i>   | <i>G2V4A2</i>   | <i>G2V4D2</i>   | <i>L1V4A2</i>   | <i>L1V4D2</i>   | <i>L2V4A2</i>   | <i>L2V4D2</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | 2 - 2.9         | <i>G1V3A2</i>   | <i>G1V3D2</i>   | <i>G2V3A2</i>   | <i>G2V3D2</i>   | <i>L1V3A2</i>   | <i>L1V3D2</i>   | <i>L2V3A2</i>   | <i>L2V3D2</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | 1 - 1.9         | <i>G1V2A2</i>   | <i>G1V2D2</i>   | <i>G2V2A2</i>   | <i>G2V2D2</i>   | <i>L1V2A2</i>   | <i>L1V2D2</i>   | <i>L2V2A2</i>   | <i>L2V2D2</i>   | 1.5             | <i>G3V15A2</i>  | <i>G3V15D2</i>  | <i>L3V15A2</i>  | <i>L3V15D2</i>  | <i>L4V15A2</i>  | <i>L4V15D2</i>       | <i>OGV15A2</i>  | <i>OGV15D2</i>  | <i>UCV15A2</i>  | <i>UCV15D2</i>  |     |
|  | >0 - 0.9        | <i>G1V1A2</i>   | <i>G1V1D2</i>   | <i>G2V1A2</i>   | <i>G2V1D2</i>   | <i>L1V1A2</i>   | <i>L1V1D2</i>   | <i>L2V1A2</i>   | <i>L2V1D2</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | CLEAN           | <i>G1VCLNA2</i> | 0               | <i>G2VCLNA2</i> | 0               | <i>L1VCLNA2</i> | 0               | <i>L2VCLNA2</i> | 0               | CLEAN           | <i>G3VCLNA2</i> | 0               | <i>L3VCLNA2</i> | 0               | <i>L4VCLNA2</i> | 0                    | <i>OGVCLNA2</i> | 0               | <i>UCVCLNA2</i> | 0               |     |
| TOTAL  | <i>G1AVTOT2</i> | <i>G1DVTOT2</i> | <i>G2AVTOT2</i> | <i>G2DVTOT2</i> | <i>L1AVTOT2</i> | <i>L1DVTOT2</i> | <i>L2AVTOT2</i> | <i>L2DVTOT2</i> |                 | <i>G3AVTOT2</i> | <i>G3DVTOT2</i> | <i>L3AVTOT2</i> | <i>L3DVTOT2</i> | <i>L4AVTOT2</i> | <i>L4DVTOT2</i> | <i>OGAVTOT2</i>      | <i>OGDVTOT2</i> | <i>UCAVTOT2</i> | <i>UCDVTOT2</i> |                 |     |
| RATING                                       | <i>G1UWD2</i>   |                 | <i>G2UWD2</i>   |                 | <i>L1UWD2</i>   |                 | <i>L2UWD2</i>   |                 |                 | <i>G3UWD2</i>   |                 | <i>L3UWD2</i>   |                 | <i>L4UWD2</i>   |                 | <i>OGUWD2</i>        |                 | <i>UCUWD2</i>   |                 |                 |     |
| LOCATION FACTOR                              | 2               |                 | 3               |                 | 1               |                 | 3               |                 |                 | 20              |                 | 20              |                 | 60              |                 | 0.5                  |                 | 1               |                 |                 |     |
| IND RATING                                   | <i>G1WD2</i>    |                 | <i>G2WD2</i>    |                 | <i>L1WD2</i>    |                 | <i>L2WD2</i>    |                 |                 | <i>G3WD2</i>    |                 | <i>L3WD2</i>    |                 | <i>L4WD2</i>    |                 | <i>OGWD2</i>         |                 | <i>UCWD2</i>    |                 |                 |     |
| WDP  |                 |                 |                 | TGC             |                 |                 |                 | TLC             |                 |                 |                 | UNWEIGHTED DEP. |                 |                 |                 | T.L. FLAKED CARBON % |                 |                 |                 |                 |     |
| <i>WD2</i>                                   |                 |                 |                 | <i>TGC2</i>     |                 |                 |                 | <i>TLC2</i>     |                 |                 |                 | <i>UWD2</i>     |                 |                 |                 | <i>TLFC2</i>         |                 |                 |                 |                 |     |

FIG A1.16 - Rating Summary: Piston #2



**MACK T-10**  
**EGR Engine Oil Test**  
**Form 17**  
**Rating Summary: Piston #3**

|   |                             |                           |  |
|---|-----------------------------|---------------------------|--|
| Laboratory <i>LAB</i>                             | EOT Date <i>DTCOMP</i>      | EOT Time <i>EOTTIME</i>   |  |
| Test Number <i>STAND STRUN - ENGINE - ENHOURS</i> |                             |                           |  |
| Oil Code <i>OILCODE</i>                           |                             |                           |  |
| Formulation/Stand Code <i>FORM</i>                |                             |                           |  |
| Date Rated <i>DTRATE</i>                          | Rater Initials <i>RINIT</i> | Verified By <i>VRINIT</i> |  |

| <b>TOTAL PISTON RATINGS SUMMARY</b>          |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------------|-----------------|-----------------|-----------------|-----------------|-----|
|  | DEP. FACTOR     | GROOVES         |                 |                 |                 | LANDS           |                 |                 |                 | DEP. FACTOR     | GROOVE          |                 | LANDS           |                 |                 |                      | OIL COOLING     |                 | UNDER CROWN     |                 |     |
|  |                 | NO. 1           |                 | NO. 2           |                 | NO. 1           |                 | NO. 2           |                 |                 | NO. 3           | NO. 3           | NO. 4           |                 | A,%             | DEM.                 | A,%             | DEM.            | A,%             | DEM.            |     |
|  |                 | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            |                 | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.                 | A,%             | DEM.            | A,%             | DEM.            | A,% |
| <b>C<br/>A<br/>R<br/>B<br/>O<br/>N</b>       | HC - 1.0        | <i>G1HCA3</i>   | <i>G1HCD3</i>   | <i>G2HCA3</i>   | <i>G2HCD3</i>   | <i>L1HCA3</i>   | <i>L1HCD3</i>   | <i>L2HCA3</i>   | <i>L2HCD3</i>   |                 | <i>G3HCA3</i>   | <i>G3HCD3</i>   | <i>L3HCA3</i>   | <i>L3HCD3</i>   | <i>L4HCA3</i>   | <i>L4HCD3</i>        |                 |                 |                 |                 |     |
|  | MC - 0.5        | <i>G1MCA3</i>   | <i>G1MCD3</i>   |                 |                 |                 |                 |                 |                 |                 | <i>G3MCA3</i>   | <i>G3MCD3</i>   |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | LC - .25        | <i>G1LCA3</i>   | <i>G1LCD3</i>   | <i>G2LCA3</i>   | <i>G2LCD3</i>   | <i>L1LCA3</i>   | <i>L1LCD3</i>   | <i>L2LCA3</i>   | <i>L2LCD3</i>   |                 | <i>G3LCA3</i>   | <i>G3LCD3</i>   | <i>L3LCA3</i>   | <i>L3LCD3</i>   | <i>L4LCA3</i>   | <i>L4LCD3</i>        | <i>OG LCA3</i>  | <i>OG LCD3</i>  | <i>UC LCA3</i>  | <i>UC LCD3</i>  |     |
|  |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | TOTAL           | <i>G1ACTOT3</i> | <i>G1DCTOT3</i> | <i>G2ACTOT3</i> | <i>G2DCTOT3</i> | <i>L1ACTOT3</i> | <i>L1DCTOT3</i> | <i>L2ACTOT3</i> | <i>L2DCTOT3</i> |                 | <i>G3ACTOT3</i> | <i>G3DCTOT3</i> | <i>L3ACTOT3</i> | <i>L3DCTOT3</i> | <i>L4ACTOT3</i> | <i>L4DCTOT3</i>      | <i>OGACTOT3</i> | <i>OGDCTOT3</i> | <i>UCACTOT3</i> | <i>UCDCTOT3</i> |     |
| <b>V<br/>A<br/>R<br/>N<br/>I<br/>S<br/>H</b> | 8 - 9           | <i>G1V9A3</i>   | <i>G1V9D3</i>   | <i>G2V9A3</i>   | <i>G2V9D3</i>   | <i>L1V9A3</i>   | <i>L1V9D3</i>   | <i>L2V9A3</i>   | <i>L2V9D3</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | 7 - 7.9         | <i>G1V8A3</i>   | <i>G1V8D3</i>   | <i>G2V8A3</i>   | <i>G2V8D3</i>   | <i>L1V8A3</i>   | <i>L1V8D3</i>   | <i>L2V8A3</i>   | <i>L2V8D3</i>   | 7.5             | <i>G3V75A3</i>  | <i>G3V75D3</i>  | <i>L3V75A3</i>  | <i>L3V75D3</i>  | <i>L4V75A3</i>  | <i>L4V75D3</i>       | <i>OGV75A3</i>  | <i>OGV75D3</i>  | <i>UCV75A3</i>  | <i>UCV75D3</i>  |     |
|  | 6 - 6.9         | <i>G1V7A3</i>   | <i>G1V7D3</i>   | <i>G2V7A3</i>   | <i>G2V7D3</i>   | <i>L1V7A3</i>   | <i>L1V7D3</i>   | <i>L2V7A3</i>   | <i>L2V7D3</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | 5 - 5.9         | <i>G1V6A3</i>   | <i>G1V6D3</i>   | <i>G2V6A3</i>   | <i>G2V6D3</i>   | <i>L1V6A3</i>   | <i>L1V6D3</i>   | <i>L2V6A3</i>   | <i>L2V6D3</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | 4 - 4.9         | <i>G1V5A3</i>   | <i>G1V5D3</i>   | <i>G2V5A3</i>   | <i>G2V5D3</i>   | <i>L1V5A3</i>   | <i>L1V5D3</i>   | <i>L2V5A3</i>   | <i>L2V5D3</i>   | 4.5             | <i>G3V45A3</i>  | <i>G3V45D3</i>  | <i>L3V45A3</i>  | <i>L3V45D3</i>  | <i>L4V45A3</i>  | <i>L4V45D3</i>       | <i>OGV45A3</i>  | <i>OGV45D3</i>  | <i>UCV45A3</i>  | <i>UCV45D3</i>  |     |
|  | 3 - 3.9         | <i>G1V4A3</i>   | <i>G1V4D3</i>   | <i>G2V4A3</i>   | <i>G2V4D3</i>   | <i>L1V4A3</i>   | <i>L1V4D3</i>   | <i>L2V4A3</i>   | <i>L2V4D3</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | 2 - 2.9         | <i>G1V3A3</i>   | <i>G1V3D3</i>   | <i>G2V3A3</i>   | <i>G2V3D3</i>   | <i>L1V3A3</i>   | <i>L1V3D3</i>   | <i>L2V3A3</i>   | <i>L2V3D3</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | 1 - 1.9         | <i>G1V2A3</i>   | <i>G1V2D3</i>   | <i>G2V2A3</i>   | <i>G2V2D3</i>   | <i>L1V2A3</i>   | <i>L1V2D3</i>   | <i>L2V2A3</i>   | <i>L2V2D3</i>   | 1.5             | <i>G3V15A3</i>  | <i>G3V15D3</i>  | <i>L3V15A3</i>  | <i>L3V15D3</i>  | <i>L4V15A3</i>  | <i>L4V15D3</i>       | <i>OGV15A3</i>  | <i>OGV15D3</i>  | <i>UCV15A3</i>  | <i>UCV15D3</i>  |     |
|  | >0 - 0.9        | <i>G1V1A3</i>   | <i>G1V1D3</i>   | <i>G2V1A3</i>   | <i>G2V1D3</i>   | <i>L1V1A3</i>   | <i>L1V1D3</i>   | <i>L2V1A3</i>   | <i>L2V1D3</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |
|  | CLEAN           | <i>G1VCLNA3</i> | 0               | <i>G2VCLNA3</i> | 0               | <i>L1VCLNA3</i> | 0               | <i>L2VCLNA3</i> | 0               | CLEAN           | <i>G3VCLNA3</i> | 0               | <i>L3VCLNA3</i> | 0               | <i>L4VCLNA3</i> | 0                    | <i>OGVCLNA3</i> | 0               | <i>UCVCLNA3</i> | 0               |     |
| TOTAL  | <i>G1AVTOT3</i> | <i>G1DVTOT3</i> | <i>G2AVTOT3</i> | <i>G2DVTOT3</i> | <i>L1AVTOT3</i> | <i>L1DVTOT3</i> | <i>L2AVTOT3</i> | <i>L2DVTOT3</i> |                 | <i>G3AVTOT3</i> | <i>G3DVTOT3</i> | <i>L3AVTOT3</i> | <i>L3DVTOT3</i> | <i>L4AVTOT3</i> | <i>L4DVTOT3</i> | <i>OGAVTOT3</i>      | <i>OGDVTOT3</i> | <i>UCAVTOT3</i> | <i>UCDVTOT3</i> |                 |     |
| RATING                                       | <i>G1UWD3</i>   |                 | <i>G2UWD3</i>   |                 | <i>L1UWD3</i>   |                 | <i>L2UWD3</i>   |                 |                 | <i>G3UWD3</i>   |                 | <i>L3UWD3</i>   |                 | <i>L4UWD3</i>   |                 | <i>OGUWD3</i>        |                 | <i>UCUWD3</i>   |                 |                 |     |
| LOCATION FACTOR                              | 2               |                 | 3               |                 | 1               |                 | 3               |                 |                 | 20              |                 | 20              |                 | 60              |                 | 0.5                  |                 | 1               |                 |                 |     |
| IND RATING                                   | <i>G1WD3</i>    |                 | <i>G2WD3</i>    |                 | <i>L1WD3</i>    |                 | <i>L2WD3</i>    |                 |                 | <i>G3WD3</i>    |                 | <i>L3WD3</i>    |                 | <i>L4WD3</i>    |                 | <i>OGWD3</i>         |                 | <i>UCWD3</i>    |                 |                 |     |
| WDP  |                 |                 |                 | TGC             |                 |                 |                 | TLC             |                 |                 |                 | UNWEIGHTED DEP. |                 |                 |                 | T.L. FLAKED CARBON % |                 |                 |                 |                 |     |
| <i>WD3</i>                                   |                 |                 |                 | <i>TGC3</i>     |                 |                 |                 | <i>TLC3</i>     |                 |                 |                 | <i>UWD3</i>     |                 |                 |                 | <i>TLFC3</i>         |                 |                 |                 |                 |     |

FIG A1.17 - Rating Summary: Piston #3

**MACK T-10**  
**EGR Engine Oil Test**  
**Form 18**  
**Rating Summary: Piston #4**

|   |                             |                           |  |
|---|-----------------------------|---------------------------|--|
| Laboratory <i>LAB</i>                             | EOT Date <i>DTCOMP</i>      | EOT Time <i>EOTTIME</i>   |  |
| Test Number <i>STAND STRUN - ENGINE - ENHOURS</i> |                             |                           |  |
| Oil Code <i>OILCODE</i>                           |                             |                           |  |
| Formulation/Stand Code <i>FORM</i>                |                             |                           |  |
| Date Rated <i>DTRATE</i>                          | Rater Initials <i>RINIT</i> | Verified By <i>VRINIT</i> |  |

| <b>TOTAL PISTON RATINGS SUMMARY</b>          |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |      |             |      |             |  |
|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------------|-----------------|-----------------|-----------------|-----------------|------|-------------|------|-------------|--|
|  | GROOVES         |                 |                 |                 |                 |                 |                 |                 | LANDS           |                 |                 |                 |                 | GROOVE          |                 |                      |                 | LANDS           |                 |                 |      | OIL COOLING |      | UNDER CROWN |  |
|  | DEP. FACTOR     | NO. 1           |                 | NO. 2           |                 | NO. 1           |                 | NO. 2           |                 | DEP. FACTOR     | NO. 3           |                 |                 | NO. 3           |                 | NO. 4                |                 | A,%             | DEM.            | A,%             | DEM. |             |      |             |  |
|  |                 | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            |                 | A,%             | DEM.            |                 | A,%             | DEM.            | A,%                  | DEM.            |                 |                 |                 |      | A,%         | DEM. |             |  |
| <b>C<br/>A<br/>R<br/>B<br/>O<br/>N</b>       | HC - 1.0        | <i>G1HCA4</i>   | <i>G1HCD4</i>   | <i>G2HCA4</i>   | <i>G2HCD4</i>   | <i>L1HCA4</i>   | <i>L1HCD4</i>   | <i>L2HCA4</i>   | <i>L2HCD4</i>   | <b>7.5</b>      | <i>G3HCA4</i>   | <i>G3HCD4</i>   | <i>L3HCA4</i>   | <i>L3HCD4</i>   | <i>L4HCA4</i>   | <i>L4HCD4</i>        |                 |                 |                 |                 |      |             |      |             |  |
|  | MC - 0.5        | <i>G1MCA4</i>   | <i>G1MCD4</i>   |                 |                 |                 |                 |                 |                 |                 | <i>G3MCA4</i>   | <i>G3MCD4</i>   |                 |                 |                 |                      |                 |                 |                 |                 |      |             |      |             |  |
|  | LC - .25        | <i>G1LCA4</i>   | <i>G1LCD4</i>   | <i>G2LCA4</i>   | <i>G2LCD4</i>   | <i>L1LCA4</i>   | <i>L1LCD4</i>   | <i>L2LCA4</i>   | <i>L2LCD4</i>   |                 | <i>G3LCA4</i>   | <i>G3LCD4</i>   | <i>L3LCA4</i>   | <i>L3LCD4</i>   | <i>L4LCA4</i>   | <i>L4LCD4</i>        | <i>OG1CA4</i>   | <i>OG1CD4</i>   | <i>UC1CA4</i>   | <i>UC1CD4</i>   |      |             |      |             |  |
|  |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |      |             |      |             |  |
|  | TOTAL           | <i>G1ACTOT4</i> | <i>G1DCTOT4</i> | <i>G2ACTOT4</i> | <i>G2DCTOT4</i> | <i>L1ACTOT4</i> | <i>L1DCTOT4</i> | <i>L2ACTOT4</i> | <i>L2DCTOT4</i> |                 | <i>G3ACTOT4</i> | <i>G3DCTOT4</i> | <i>L3ACTOT4</i> | <i>L3DCTOT4</i> | <i>L4ACTOT4</i> | <i>L4DCTOT4</i>      | <i>OGACTOT4</i> | <i>OGDCTOT4</i> | <i>UCACTOT4</i> | <i>UCDCTOT4</i> |      |             |      |             |  |
| <b>V<br/>A<br/>R<br/>N<br/>I<br/>S<br/>H</b> | 8 - 9           | <i>G1V9A4</i>   | <i>G1V9D4</i>   | <i>G2V9A4</i>   | <i>G2V9D4</i>   | <i>L1V9A4</i>   | <i>L1V9D4</i>   | <i>L2V9A4</i>   | <i>L2V9D4</i>   | <b>7.5</b>      | <i>G3V75A4</i>  | <i>G3V75D4</i>  | <i>L3V75A4</i>  | <i>L3V75D4</i>  | <i>L4V75A4</i>  | <i>L4V75D4</i>       | <i>OGV75A4</i>  | <i>OGV75D4</i>  | <i>UCV75A4</i>  | <i>UCV75D4</i>  |      |             |      |             |  |
|  | 7 - 7.9         | <i>G1V8A4</i>   | <i>G1V8D4</i>   | <i>G2V8A4</i>   | <i>G2V8D4</i>   | <i>L1V8A4</i>   | <i>L1V8D4</i>   | <i>L2V8A4</i>   | <i>L2V8D4</i>   |                 | <i>G3V45A4</i>  | <i>G3V45D4</i>  | <i>L3V45A4</i>  | <i>L3V45D4</i>  | <i>L4V45A4</i>  | <i>L4V45D4</i>       | <i>OGV45A4</i>  | <i>OGV45D4</i>  | <i>UCV45A4</i>  | <i>UCV45D4</i>  |      |             |      |             |  |
|  | 6 - 6.9         | <i>G1V7A4</i>   | <i>G1V7D4</i>   | <i>G2V7A4</i>   | <i>G2V7D4</i>   | <i>L1V7A4</i>   | <i>L1V7D4</i>   | <i>L2V7A4</i>   | <i>L2V7D4</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |      |             |      |             |  |
|  | 5 - 5.9         | <i>G1V6A4</i>   | <i>G1V6D4</i>   | <i>G2V6A4</i>   | <i>G2V6D4</i>   | <i>L1V6A4</i>   | <i>L1V6D4</i>   | <i>L2V6A4</i>   | <i>L2V6D4</i>   | <b>4.5</b>      | <i>G3V15A4</i>  | <i>G3V15D4</i>  | <i>L3V15A4</i>  | <i>L3V15D4</i>  | <i>L4V15A4</i>  | <i>L4V15D4</i>       | <i>OGV15A4</i>  | <i>OGV15D4</i>  | <i>UCV15A4</i>  | <i>UCV15D4</i>  |      |             |      |             |  |
|  | 4 - 4.9         | <i>G1V5A4</i>   | <i>G1V5D4</i>   | <i>G2V5A4</i>   | <i>G2V5D4</i>   | <i>L1V5A4</i>   | <i>L1V5D4</i>   | <i>L2V5A4</i>   | <i>L2V5D4</i>   |                 | <i>G3VCLNA4</i> | <i>G3VCLND4</i> | <i>L3VCLNA4</i> | <i>L3VCLND4</i> | <i>L4VCLNA4</i> | <i>L4VCLND4</i>      | <i>OGVCLNA4</i> | <i>OGVCLND4</i> | <i>UCVCLNA4</i> | <i>UCVCLND4</i> |      |             |      |             |  |
|  | 3 - 3.9         | <i>G1V4A4</i>   | <i>G1V4D4</i>   | <i>G2V4A4</i>   | <i>G2V4D4</i>   | <i>L1V4A4</i>   | <i>L1V4D4</i>   | <i>L2V4A4</i>   | <i>L2V4D4</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |      |             |      |             |  |
|  | 2 - 2.9         | <i>G1V3A4</i>   | <i>G1V3D4</i>   | <i>G2V3A4</i>   | <i>G2V3D4</i>   | <i>L1V3A4</i>   | <i>L1V3D4</i>   | <i>L2V3A4</i>   | <i>L2V3D4</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |      |             |      |             |  |
|  | 1 - 1.9         | <i>G1V2A4</i>   | <i>G1V2D4</i>   | <i>G2V2A4</i>   | <i>G2V2D4</i>   | <i>L1V2A4</i>   | <i>L1V2D4</i>   | <i>L2V2A4</i>   | <i>L2V2D4</i>   | <b>1.5</b>      | <i>G3V1A4</i>   | <i>G3V1D4</i>   | <i>L3V1A4</i>   | <i>L3V1D4</i>   | <i>L4V1A4</i>   | <i>L4V1D4</i>        | <i>OGV1A4</i>   | <i>OGV1D4</i>   | <i>UCV1A4</i>   | <i>UCV1D4</i>   |      |             |      |             |  |
|  | >0 - 0.9        | <i>G1V1A4</i>   | <i>G1V1D4</i>   | <i>G2V1A4</i>   | <i>G2V1D4</i>   | <i>L1V1A4</i>   | <i>L1V1D4</i>   | <i>L2V1A4</i>   | <i>L2V1D4</i>   |                 | <i>G3VCLNA4</i> | <i>G3VCLND4</i> | <i>L3VCLNA4</i> | <i>L3VCLND4</i> | <i>L4VCLNA4</i> | <i>L4VCLND4</i>      | <i>OGVCLNA4</i> | <i>OGVCLND4</i> | <i>UCVCLNA4</i> | <i>UCVCLND4</i> |      |             |      |             |  |
|  | CLEAN           | <i>G1VCLNA4</i> | <i>G1VCLND4</i> | <i>G2VCLNA4</i> | <i>G2VCLND4</i> | <i>L1VCLNA4</i> | <i>L1VCLND4</i> | <i>L2VCLNA4</i> | <i>L2VCLND4</i> | CLEAN           | <i>G3VCLNA4</i> | <i>G3VCLND4</i> | <i>L3VCLNA4</i> | <i>L3VCLND4</i> | <i>L4VCLNA4</i> | <i>L4VCLND4</i>      | <i>OGVCLNA4</i> | <i>OGVCLND4</i> | <i>UCVCLNA4</i> | <i>UCVCLND4</i> |      |             |      |             |  |
| TOTAL  | <i>G1AVTOT4</i> | <i>G1DVTOT4</i> | <i>G2AVTOT4</i> | <i>G2DVTOT4</i> | <i>L1AVTOT4</i> | <i>L1DVTOT4</i> | <i>L2AVTOT4</i> | <i>L2DVTOT4</i> | <i>G3AVTOT4</i> | <i>G3DVTOT4</i> | <i>L3AVTOT4</i> | <i>L3DVTOT4</i> | <i>L4AVTOT4</i> | <i>L4DVTOT4</i> | <i>OGAVTOT4</i> | <i>OGDVTOT4</i>      | <i>UCAVTOT4</i> | <i>UCDVTOT4</i> |                 |                 |      |             |      |             |  |
| RATING                                       | <i>G1UWD4</i>   |                 | <i>G2UWD4</i>   |                 | <i>L1UWD4</i>   |                 | <i>L2UWD4</i>   |                 | <b>7.5</b>      | <i>G3UWD4</i>   |                 | <i>L3UWD4</i>   |                 | <i>L4UWD4</i>   |                 | <i>OGUWD4</i>        |                 | <i>UCUWD4</i>   |                 |                 |      |             |      |             |  |
| LOCATION FACTOR                              | 2               |                 | 3               |                 | 1               |                 | 3               |                 |                 | 20              |                 | 20              |                 | 60              |                 | 0.5                  |                 | 1               |                 |                 |      |             |      |             |  |
| IND RATING                                   | <i>G1WD4</i>    |                 | <i>G2WD4</i>    |                 | <i>L1WD4</i>    |                 | <i>L2WD4</i>    |                 |                 | <i>G3WD4</i>    |                 | <i>L3WD4</i>    |                 | <i>L4WD4</i>    |                 | <i>OGWD4</i>         |                 | <i>UCWD4</i>    |                 |                 |      |             |      |             |  |
| WDP  |                 |                 |                 | TGC             |                 |                 |                 | TLC             |                 |                 |                 | UNWEIGHTED DEP. |                 |                 |                 | T.L. FLAKED CARBON % |                 |                 |                 |                 |      |             |      |             |  |
| <i>WD4</i>                                   |                 |                 |                 | <i>TGC4</i>     |                 |                 |                 | <i>TLC4</i>     |                 |                 |                 | <i>UWD4</i>     |                 |                 |                 | <i>TLFC4</i>         |                 |                 |                 |                 |      |             |      |             |  |

FIG A1.18 - Rating Summary: Piston #4

**MACK T-10**  
**EGR Engine Oil Test**  
**Form 19**  
**Rating Summary: Piston #5**

|   |                             |                           |  |
|---|-----------------------------|---------------------------|--|
| Laboratory <i>LAB</i>                             | EOT Date <i>DTCOMP</i>      | EOT Time <i>EOTTIME</i>   |  |
| Test Number <i>STAND STRUN - ENGINE - ENHOURS</i> |                             |                           |  |
| Oil Code <i>OILCODE</i>                           |                             |                           |  |
| Formulation/Stand Code <i>FORM</i>                |                             |                           |  |
| Date Rated <i>DTRATE</i>                          | Rater Initials <i>RINIT</i> | Verified By <i>VRINIT</i> |  |

| <b>TOTAL PISTON RATINGS SUMMARY</b>          |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |      |
|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------------|-----------------|-----------------|-----------------|-----------------|-----|------|
|  | DEP. FACTOR     | GROOVES         |                 |                 |                 | LANDS           |                 |                 |                 | DEP. FACTOR     | GROOVE          |                 | LANDS           |                 | NO. 4           |                      | OIL COOLING     |                 | UNDER CROWN     |                 |     |      |
|  |                 | NO. 1           |                 | NO. 2           |                 | NO. 1           |                 | NO. 2           |                 |                 | NO. 3           |                 | NO. 3           |                 | NO. 4           |                      | OIL COOLING     |                 | UNDER CROWN     |                 |     |      |
|  |                 | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            |                 | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.                 | A,%             | DEM.            | A,%             | DEM.            | A,% | DEM. |
| <b>C<br/>A<br/>R<br/>B<br/>O<br/>N</b>       | HC - 1.0        | <i>G1HCA5</i>   | <i>G1HCD5</i>   | <i>G2HCA5</i>   | <i>G2HCD5</i>   | <i>L1HCA5</i>   | <i>L1HCD5</i>   | <i>L2HCA5</i>   | <i>L2HCD5</i>   | <b>7.5</b>      | <i>G3HCA5</i>   | <i>G3HCD5</i>   | <i>L3HCA5</i>   | <i>L3HCD5</i>   | <i>L4HCA5</i>   | <i>L4HCD5</i>        |                 |                 |                 |                 |     |      |
|  | MC - 0.5        | <i>G1MCA5</i>   | <i>G1MCD5</i>   |                 |                 |                 |                 |                 |                 |                 | <i>G3MCA5</i>   | <i>G3MCD5</i>   |                 |                 |                 |                      |                 |                 |                 |                 |     |      |
|  | LC - .25        | <i>G1LCA5</i>   | <i>G1LCD5</i>   | <i>G2LCA5</i>   | <i>G2LCD5</i>   | <i>L1LCA5</i>   | <i>L1LCD5</i>   | <i>L2LCA5</i>   | <i>L2LCD5</i>   |                 | <i>G3LCA5</i>   | <i>G3LCD5</i>   | <i>L3LCA5</i>   | <i>L3LCD5</i>   | <i>L4LCA5</i>   | <i>L4LCD5</i>        | <i>OG1CA5</i>   | <i>OG1CD5</i>   | <i>UC1CA5</i>   | <i>UC1CD5</i>   |     |      |
|  |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |     |      |
|  | TOTAL           | <i>G1ACTOT5</i> | <i>G1DCTOT5</i> | <i>G2ACTOT5</i> | <i>G2DCTOT5</i> | <i>L1ACTOT5</i> | <i>L1DCTOT5</i> | <i>L2ACTOT5</i> | <i>L2DCTOT5</i> |                 | <i>G3ACTOT5</i> | <i>G3DCTOT5</i> | <i>L3ACTOT5</i> | <i>L3DCTOT5</i> | <i>L4ACTOT5</i> | <i>L4DCTOT5</i>      | <i>OGACTOT5</i> | <i>OGDCTOT5</i> | <i>UCACTOT5</i> | <i>UCDCTOT5</i> |     |      |
| <b>V<br/>A<br/>R<br/>N<br/>I<br/>S<br/>H</b> | 8 - 9           | <i>G1V9A5</i>   | <i>G1V9D5</i>   | <i>G2V9A5</i>   | <i>G2V9D5</i>   | <i>L1V9A5</i>   | <i>L1V9D5</i>   | <i>L2V9A5</i>   | <i>L2V9D5</i>   | <b>7.5</b>      | <i>G3V7SA5</i>  | <i>G3V7SD5</i>  | <i>L3V7SA5</i>  | <i>L3V7SD5</i>  | <i>L4V7SA5</i>  | <i>L4V7SD5</i>       | <i>OGV7SA5</i>  | <i>OGV7SD5</i>  | <i>UCV7SA5</i>  | <i>UCV7SD5</i>  |     |      |
|  | 7 - 7.9         | <i>G1V8A5</i>   | <i>G1V8D5</i>   | <i>G2V8A5</i>   | <i>G2V8D5</i>   | <i>L1V8A5</i>   | <i>L1V8D5</i>   | <i>L2V8A5</i>   | <i>L2V8D5</i>   |                 | <i>G3V4SA5</i>  | <i>G3V4SD5</i>  | <i>L3V4SA5</i>  | <i>L3V4SD5</i>  | <i>L4V4SA5</i>  | <i>L4V4SD5</i>       | <i>OGV4SA5</i>  | <i>OGV4SD5</i>  | <i>UCV4SA5</i>  | <i>UCV4SD5</i>  |     |      |
|  | 6 - 6.9         | <i>G1V7A5</i>   | <i>G1V7D5</i>   | <i>G2V7A5</i>   | <i>G2V7D5</i>   | <i>L1V7A5</i>   | <i>L1V7D5</i>   | <i>L2V7A5</i>   | <i>L2V7D5</i>   |                 | <i>G3V1SA5</i>  | <i>G3V1SD5</i>  | <i>L3V1SA5</i>  | <i>L3V1SD5</i>  | <i>L4V1SA5</i>  | <i>L4V1SD5</i>       | <i>OGV1SA5</i>  | <i>OGV1SD5</i>  | <i>UCV1SA5</i>  | <i>UCV1SD5</i>  |     |      |
|  | 5 - 5.9         | <i>G1V6A5</i>   | <i>G1V6D5</i>   | <i>G2V6A5</i>   | <i>G2V6D5</i>   | <i>L1V6A5</i>   | <i>L1V6D5</i>   | <i>L2V6A5</i>   | <i>L2V6D5</i>   | <b>4.5</b>      | <i>G3V1SA5</i>  | <i>G3V1SD5</i>  | <i>L3V1SA5</i>  | <i>L3V1SD5</i>  | <i>L4V1SA5</i>  | <i>L4V1SD5</i>       | <i>OGV1SA5</i>  | <i>OGV1SD5</i>  | <i>UCV1SA5</i>  | <i>UCV1SD5</i>  |     |      |
|  | 4 - 4.9         | <i>G1V5A5</i>   | <i>G1V5D5</i>   | <i>G2V5A5</i>   | <i>G2V5D5</i>   | <i>L1V5A5</i>   | <i>L1V5D5</i>   | <i>L2V5A5</i>   | <i>L2V5D5</i>   |                 | <i>G3V1SA5</i>  | <i>G3V1SD5</i>  | <i>L3V1SA5</i>  | <i>L3V1SD5</i>  | <i>L4V1SA5</i>  | <i>L4V1SD5</i>       | <i>OGV1SA5</i>  | <i>OGV1SD5</i>  | <i>UCV1SA5</i>  | <i>UCV1SD5</i>  |     |      |
|  | 3 - 3.9         | <i>G1V4A5</i>   | <i>G1V4D5</i>   | <i>G2V4A5</i>   | <i>G2V4D5</i>   | <i>L1V4A5</i>   | <i>L1V4D5</i>   | <i>L2V4A5</i>   | <i>L2V4D5</i>   |                 | <i>G3V1SA5</i>  | <i>G3V1SD5</i>  | <i>L3V1SA5</i>  | <i>L3V1SD5</i>  | <i>L4V1SA5</i>  | <i>L4V1SD5</i>       | <i>OGV1SA5</i>  | <i>OGV1SD5</i>  | <i>UCV1SA5</i>  | <i>UCV1SD5</i>  |     |      |
|  | 2 - 2.9         | <i>G1V3A5</i>   | <i>G1V3D5</i>   | <i>G2V3A5</i>   | <i>G2V3D5</i>   | <i>L1V3A5</i>   | <i>L1V3D5</i>   | <i>L2V3A5</i>   | <i>L2V3D5</i>   |                 | <i>G3V1SA5</i>  | <i>G3V1SD5</i>  | <i>L3V1SA5</i>  | <i>L3V1SD5</i>  | <i>L4V1SA5</i>  | <i>L4V1SD5</i>       | <i>OGV1SA5</i>  | <i>OGV1SD5</i>  | <i>UCV1SA5</i>  | <i>UCV1SD5</i>  |     |      |
|  | 1 - 1.9         | <i>G1V2A5</i>   | <i>G1V2D5</i>   | <i>G2V2A5</i>   | <i>G2V2D5</i>   | <i>L1V2A5</i>   | <i>L1V2D5</i>   | <i>L2V2A5</i>   | <i>L2V2D5</i>   | <b>1.5</b>      | <i>G3V1SA5</i>  | <i>G3V1SD5</i>  | <i>L3V1SA5</i>  | <i>L3V1SD5</i>  | <i>L4V1SA5</i>  | <i>L4V1SD5</i>       | <i>OGV1SA5</i>  | <i>OGV1SD5</i>  | <i>UCV1SA5</i>  | <i>UCV1SD5</i>  |     |      |
|  | >0 - 0.9        | <i>G1V1A5</i>   | <i>G1V1D5</i>   | <i>G2V1A5</i>   | <i>G2V1D5</i>   | <i>L1V1A5</i>   | <i>L1V1D5</i>   | <i>L2V1A5</i>   | <i>L2V1D5</i>   |                 | <i>G3V1SA5</i>  | <i>G3V1SD5</i>  | <i>L3V1SA5</i>  | <i>L3V1SD5</i>  | <i>L4V1SA5</i>  | <i>L4V1SD5</i>       | <i>OGV1SA5</i>  | <i>OGV1SD5</i>  | <i>UCV1SA5</i>  | <i>UCV1SD5</i>  |     |      |
|  | CLEAN           | <i>G1VCLNA5</i> | 0               | <i>G2VCLNA5</i> | 0               | <i>L1VCLNA5</i> | 0               | <i>L2VCLNA5</i> | 0               | CLEAN           | <i>G3VCLNA5</i> | 0               | <i>L3VCLNA5</i> | 0               | <i>L4VCLNA5</i> | 0                    | <i>OGVCLNA5</i> | 0               | <i>UCVCLNA5</i> | 0               |     |      |
| TOTAL  | <i>G1AVTOT5</i> | <i>G1DVTOT5</i> | <i>G2AVTOT5</i> | <i>G2DVTOT5</i> | <i>L1AVTOT5</i> | <i>L1DVTOT5</i> | <i>L2AVTOT5</i> | <i>L2DVTOT5</i> | <i>G3AVTOT5</i> | <i>G3DVTOT5</i> | <i>L3AVTOT5</i> | <i>L3DVTOT5</i> | <i>L4AVTOT5</i> | <i>L4DVTOT5</i> | <i>OGAVTOT5</i> | <i>OGDVTOT5</i>      | <i>UCAVTOT5</i> | <i>UCDVTOT5</i> |                 |                 |     |      |
| RATING                                       | <i>G1UWD5</i>   |                 | <i>G2UWD5</i>   |                 | <i>L1UWD5</i>   |                 | <i>L2UWD5</i>   |                 | <i>G3UWD5</i>   |                 | <i>L3UWD5</i>   |                 | <i>L4UWD5</i>   |                 | <i>OGUWD5</i>   |                      | <i>UCUWD5</i>   |                 |                 |                 |     |      |
| LOCATION FACTOR                              | 2               |                 | 3               |                 | 1               |                 | 3               |                 | 20              |                 | 20              |                 | 60              |                 | 0.5             |                      | 1               |                 |                 |                 |     |      |
| IND RATING                                   | <i>G1WD5</i>    |                 | <i>G2WD5</i>    |                 | <i>L1WD5</i>    |                 | <i>L2WD5</i>    |                 | <i>G3WD5</i>    |                 | <i>L3WD5</i>    |                 | <i>L4WD5</i>    |                 | <i>OGWD5</i>    |                      | <i>UCWD5</i>    |                 |                 |                 |     |      |
| WDP  |                 |                 |                 | TGC             |                 |                 |                 | TLC             |                 |                 |                 | UNWEIGHTED DEP. |                 |                 |                 | T.L. FLAKED CARBON % |                 |                 |                 |                 |     |      |
| <i>WD5</i>                                   |                 |                 |                 | <i>TGC5</i>     |                 |                 |                 | <i>TLC5</i>     |                 |                 |                 | <i>UWD5</i>     |                 |                 |                 | <i>TLFC5</i>         |                 |                 |                 |                 |     |      |

FIG A1.19 - Rating Summary: Piston #5

**Form 2**  
**T10**  
**EGR ENGINE OIL TEST**

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FIG. A1.2 Table of Contents

**MACK T-10**  
**EGR Engine Oil Test**  
**Form 20**  
**Rating Summary: Piston #6**

|   |                             |                           |  |
|---|-----------------------------|---------------------------|--|
| Laboratory <i>LAB</i>                             | EOT Date <i>DTCOMP</i>      | EOT Time <i>EOTTIME</i>   |  |
| Test Number <i>STAND STRUN - ENGINE - ENHOURS</i> |                             |                           |  |
| Oil Code <i>OILCODE</i>                           |                             |                           |  |
| Formulation/Stand Code <i>FORM</i>                |                             |                           |  |
| Date Rated <i>DTRATE</i>                          | Rater Initials <i>RINIT</i> | Verified By <i>VRINIT</i> |  |

| <b>TOTAL PISTON RATINGS SUMMARY</b>          |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |
|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------------|-----------------|-----------------|-----------------|-----------------|
|  | DEP. FACTOR     | GROOVES         |                 |                 |                 | LANDS           |                 |                 |                 | DEP. FACTOR     | GROOVE          |                 | LANDS           |                 |                 |                      | OIL COOLING     |                 | UNDER CROWN     |                 |
|  |                 | NO. 1           |                 | NO. 2           |                 | NO. 1           |                 | NO. 2           |                 |                 | NO. 3           | NO. 3           | NO. 4           |                 | A,%             | DEM.                 | A,%             | DEM.            | A,%             | DEM.            |
|  |                 | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.            |                 | A,%             | DEM.            | A,%             | DEM.            | A,%             | DEM.                 | A,%             | DEM.            | A,%             | DEM.            |
| <b>C<br/>A<br/>R<br/>B<br/>O<br/>N</b>       | HC - 1.0        | <i>G1HCA6</i>   | <i>G1HCD6</i>   | <i>G2HCA6</i>   | <i>G2HCD6</i>   | <i>L1HCA6</i>   | <i>L1HCD6</i>   | <i>L2HCA6</i>   | <i>L2HCD6</i>   |                 | <i>G3HCA6</i>   | <i>G3HCD6</i>   | <i>L3HCA6</i>   | <i>L3HCD6</i>   | <i>L4HCA6</i>   | <i>L4HCD6</i>        |                 |                 |                 |                 |
|  | MC - 0.5        | <i>G1MCA6</i>   | <i>G1MCD6</i>   |                 |                 |                 |                 |                 |                 |                 | <i>G3MCA6</i>   | <i>G3MCD6</i>   |                 |                 |                 |                      |                 |                 |                 |                 |
|  | LC - .25        | <i>G1LCA6</i>   | <i>G1LCD6</i>   | <i>G2LCA6</i>   | <i>G2LCD6</i>   | <i>L1LCA6</i>   | <i>L1LCD6</i>   | <i>L2LCA6</i>   | <i>L2LCD6</i>   |                 | <i>G3LCA6</i>   | <i>G3LCD6</i>   | <i>L3LCA6</i>   | <i>L3LCD6</i>   | <i>L4LCA6</i>   | <i>L4LCD6</i>        | <i>UGLCA6</i>   | <i>UGLCD6</i>   | <i>UCLCA6</i>   | <i>UCLCD6</i>   |
|  |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |
|  | TOTAL           | <i>G1ACTOT6</i> | <i>G1DCTOT6</i> | <i>G2ACTOT6</i> | <i>G2DCTOT6</i> | <i>L1ACTOT6</i> | <i>L1DCTOT6</i> | <i>L2ACTOT6</i> | <i>L2DCTOT6</i> |                 | <i>G3ACTOT6</i> | <i>G3DCTOT6</i> | <i>L3ACTOT6</i> | <i>L3DCTOT6</i> | <i>L4ACTOT6</i> | <i>L4DCTOT6</i>      | <i>OGACTOT6</i> | <i>OGDCTOT6</i> | <i>UCACTOT6</i> | <i>UCDCTOT6</i> |
| <b>V<br/>A<br/>R<br/>N<br/>I<br/>S<br/>H</b> | 8 - 9           | <i>G1V9A6</i>   | <i>G1V9D6</i>   | <i>G2V9A6</i>   | <i>G2V9D6</i>   | <i>L1V9A6</i>   | <i>L1V9D6</i>   | <i>L2V9A6</i>   | <i>L2V9D6</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |
|  | 7 - 7.9         | <i>G1V8A6</i>   | <i>G1V8D6</i>   | <i>G2V8A6</i>   | <i>G2V8D6</i>   | <i>L1V8A6</i>   | <i>L1V8D6</i>   | <i>L2V8A6</i>   | <i>L2V8D6</i>   | 7.5             | <i>G3V75A6</i>  | <i>G3V75D6</i>  | <i>L3V75A6</i>  | <i>L3V75D6</i>  | <i>L4V75A6</i>  | <i>L4V75D6</i>       | <i>OGV75A6</i>  | <i>OGV75D6</i>  | <i>UCV75A6</i>  | <i>UCV75D6</i>  |
|  | 6 - 6.9         | <i>G1V7A6</i>   | <i>G1V7D6</i>   | <i>G2V7A6</i>   | <i>G2V7D6</i>   | <i>L1V7A6</i>   | <i>L1V7D6</i>   | <i>L2V7A6</i>   | <i>L2V7D6</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |
|  | 5 - 5.9         | <i>G1V6A6</i>   | <i>G1V6D6</i>   | <i>G2V6A6</i>   | <i>G2V6D6</i>   | <i>L1V6A6</i>   | <i>L1V6D6</i>   | <i>L2V6A6</i>   | <i>L2V6D6</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |
|  | 4 - 4.9         | <i>G1V5A6</i>   | <i>G1V5D6</i>   | <i>G2V5A6</i>   | <i>G2V5D6</i>   | <i>L1V5A6</i>   | <i>L1V5D6</i>   | <i>L2V5A6</i>   | <i>L2V5D6</i>   | 4.5             | <i>G3V45A6</i>  | <i>G3V45D6</i>  | <i>L3V45A6</i>  | <i>L3V45D6</i>  | <i>L4V45A6</i>  | <i>L4V45D6</i>       | <i>OGV45A6</i>  | <i>OGV45D6</i>  | <i>UCV45A6</i>  | <i>UCV45D6</i>  |
|  | 3 - 3.9         | <i>G1V4A6</i>   | <i>G1V4D6</i>   | <i>G2V4A6</i>   | <i>G2V4D6</i>   | <i>L1V4A6</i>   | <i>L1V4D6</i>   | <i>L2V4A6</i>   | <i>L2V4D6</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |
|  | 2 - 2.9         | <i>G1V3A6</i>   | <i>G1V3D6</i>   | <i>G2V3A6</i>   | <i>G2V3D6</i>   | <i>L1V3A6</i>   | <i>L1V3D6</i>   | <i>L2V3A6</i>   | <i>L2V3D6</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |
|  | 1 - 1.9         | <i>G1V2A6</i>   | <i>G1V2D6</i>   | <i>G2V2A6</i>   | <i>G2V2D6</i>   | <i>L1V2A6</i>   | <i>L1V2D6</i>   | <i>L2V2A6</i>   | <i>L2V2D6</i>   | 1.5             | <i>G3V15A6</i>  | <i>G3V15D6</i>  | <i>L3V15A6</i>  | <i>L3V15D6</i>  | <i>L4V15A6</i>  | <i>L4V15D6</i>       | <i>OGV15A6</i>  | <i>OGV15D6</i>  | <i>UCV15A6</i>  | <i>UCV15D6</i>  |
|  | >0 - 0.9        | <i>G1V1A6</i>   | <i>G1V1D6</i>   | <i>G2V1A6</i>   | <i>G2V1D6</i>   | <i>L1V1A6</i>   | <i>L1V1D6</i>   | <i>L2V1A6</i>   | <i>L2V1D6</i>   |                 |                 |                 |                 |                 |                 |                      |                 |                 |                 |                 |
|  | CLEAN           | <i>G1VCLNA6</i> | 0               | <i>G2VCLNA6</i> | 0               | <i>L1VCLNA6</i> | 0               | <i>L2VCLNA6</i> | 0               | CLEAN           | <i>G3VCLNA6</i> | 0               | <i>L3VCLNA6</i> | 0               | <i>L4VCLNA6</i> | 0                    | <i>OGVCLNA6</i> | 0               | <i>UCVCLNA6</i> | 0               |
| TOTAL  | <i>G1AVTOT6</i> | <i>G1DVTOT6</i> | <i>G2AVTOT6</i> | <i>G2DVTOT6</i> | <i>L1AVTOT6</i> | <i>L1DVTOT6</i> | <i>L2AVTOT6</i> | <i>L2DVTOT6</i> |                 | <i>G3AVTOT6</i> | <i>G3DVTOT6</i> | <i>L3AVTOT6</i> | <i>L3DVTOT6</i> | <i>L4AVTOT6</i> | <i>L4DVTOT6</i> | <i>OGAVTOT6</i>      | <i>OGDVTOT6</i> | <i>UCAVTOT6</i> | <i>UCDVTOT6</i> |                 |
| RATING                                       | <i>G1UWD6</i>   |                 | <i>G2UWD6</i>   |                 | <i>L1UWD6</i>   |                 | <i>L2UWD6</i>   |                 |                 | <i>G3UWD6</i>   |                 | <i>L3UWD6</i>   |                 | <i>L4UWD6</i>   |                 | <i>OGUWD6</i>        |                 | <i>UCUWD6</i>   |                 |                 |
| LOCATION FACTOR                              | 2               |                 | 3               |                 | 1               |                 | 3               |                 |                 | 20              |                 | 20              |                 | 60              |                 | 0.5                  |                 | 1               |                 |                 |
| IND RATING                                   | <i>G1WD6</i>    |                 | <i>G2WD6</i>    |                 | <i>L1WD6</i>    |                 | <i>L2WD6</i>    |                 |                 | <i>G3WD6</i>    |                 | <i>L3WD6</i>    |                 | <i>L4WD6</i>    |                 | <i>OGWD6</i>         |                 | <i>UCWD6</i>    |                 |                 |
| WDP  |                 |                 |                 | TGC             |                 |                 |                 | TLC             |                 |                 |                 | UNWEIGHTED DEP. |                 |                 |                 | T.L. FLAKED CARBON % |                 |                 |                 |                 |
| <i>WD6</i>                                   |                 |                 |                 | <i>TGC6</i>     |                 |                 |                 | <i>TLC6</i>     |                 |                 |                 | <i>UWD6</i>     |                 |                 |                 | <i>TLFC6</i>         |                 |                 |                 |                 |

FIG A1.20 - Rating Summary: Piston #6

# MACK T-10 EGR Engine Oil Test Form 3

## Summary of Test Method

The Mack T-10 EGR Engine Oil Test is a fuel engine-dynamometer test which evaluates the ability of a lubricant to minimize piston ring wear, cylinder liner wear, and lead corrosion. This test is a two-phase, steady state test (constant speed and load). The first phase is 75 h and is run with retarded fuel injection timing to produce elevated soot levels in the oil. The second phase is 225 h and is run under heavy load conditions to induce piston ring and cylinder liner wear.

The test engine is a Mack E-TECH V-MAC III diesel engine with EGR. It is an in-line six cylinder, four-stroke, turbocharged engine. It has electronically controlled fuel injection with six individual electronic unit pumps. A one h break-in is conducted prior to each test since a new engine build is used for each test.

### MACK T-10 TEST CONDITIONS

| Parameter                      | Phase I           | Phase II          |
|--------------------------------|-------------------|-------------------|
| Time, h                        | 75                | 225               |
| Injection Timing, °BTDC        | Variable          | 18                |
| Speed, r/min                   | 1800              | 1200              |
| Fuel Flow, kg/h                | 59.2              | 63.5              |
| O <sub>2</sub> Level, %        | 8.1               | 6.1               |
| Inlet Manifold Temp., °C       | 66                | 66                |
| Coolant Out Temp., °C          | 66                | 85                |
| Fuel In Temp., °C              | 40                | 40                |
| Oil Gallery Temp., °C          | 88                | 104               |
| Intake Air Temp., °C           | 25                | 25                |
| Inlet Air Restriction, kPa     | 3.5 - 4.0         | 3.5 - 4.0         |
| Inlet Manifold Pressure, kPa   | tbd               | tbd               |
| Exhaust Back Pressure, kPa     | 2.7 - 3.5         | 2.7 - 3.5         |
| Crankcase Pressure, kPa        | 0.25 - 0.75       | 0.25 - 0.75       |
| Power, kW                      | ~257              | ~324              |
| Torque, Nm                     | Record            | Record            |
| Pre-Turbine Exhaust Temp., °C  | Record            | Record            |
| Tailpipe Exhaust Temp., °C     | Record            | Record            |
| Oil Sump Temp., °C             | Record            | Record            |
| EGR Pre-Venturi Temp., °C      | Record            | Record            |
| Inlet Air Dew Point, °C        | Record            | Record            |
| Inlet Air Humidity, kg/kg      | Record            | Record            |
| Main Gallery Oil Pressure, kPa | Record            | Record            |
| Oil Cooler Delta P, kPa        | Record            | Record            |
| Oil Filter Delta P, kPa        | Not to exceed 138 | Not to exceed 138 |

FIG. A1.3 Summary of Test Method

**MACK T-10  
EGR ENGINE OIL TEST  
FORM 4  
TEST RESULTS SUMMARY**

|  |                         |                          |
|--|-------------------------|--------------------------|
| Laboratory: <i>LAB</i>                               | EOT Date: <i>DTCOMP</i> | EOT Time: <i>EOTTIME</i> |
| Test Number: <i>STAND - STRUN - ENGINE - ENHOURS</i> |                         |                          |
| Oil Code: <i>OILCODE</i>                             |                         |                          |
| Formulation/Stand Code: <i>FORM</i>                  |                         |                          |

| <b>TEST RESULTS</b>                           |                                     |                              |                                   |
|---|-------------------------------------|------------------------------|-----------------------------------|
| Date Test Started <i>DTSTRT</i>               | Start Time <i>STRTIME</i>           | Test Length <i>TESTLEN</i>   |                                   |
| TMC Oil Code <sup>A</sup> <i>IND</i>          | Laboratory Oil Code <i>LABOCODE</i> | SAE Viscosity <i>SAEVisc</i> |                                   |
| Average TGA Soot % at 75 h                    |                                     | <i>TGAAVG</i>                |                                   |
| Average Oil Consumption g/kWh (0.304 maximum) |                                     | <i>OILCON</i>                |                                   |
| Centrifugal Oil Filter Mass Gain, g           |                                     | <i>MASSG</i>                 |                                   |
| Oil Filter Delta P, kPa (138 maximum)         |                                     | <i>XOILDp</i>                |                                   |
| EOT TBN                                       |                                     | <i>TBNEOT</i>                |                                   |
|   | DELTA Pb @<br>EOT (ppm)             | AVG. LINER<br>WEAR (µm)      | AVG. TOP RING<br>WEIGHT LOSS (mg) |
| Original Result                               | <i>DPBEOT</i>                       | <i>ALW</i>                   | <i>ATRWL</i>                      |
| Transformed Result <sup>B</sup>               | <i>TRNDPB</i>                       | <i>TRNALW</i>                | <i>TRNATRWL</i>                   |
| Correction Factor <sup>B</sup>                | <i>DPBCF</i>                        | <i>ALWCF</i>                 | <i>ATRWLCF</i>                    |
| Corrected Transformed Result <sup>B</sup>     | <i>DPBCOR</i>                       | <i>ALWCOR</i>                | <i>ATRWLCOR</i>                   |
| Severity Adjustment <sup>B</sup>              | <i>DPB_SA</i>                       | <i>CLW_SA</i>                | <i>ATRWL_SA</i>                   |
| Final Transformed Result <sup>B</sup>         | <i>TDPBFNL</i>                      | <i>TCLWFNL</i>               | <i>TTRWLFNL</i>                   |
| Final Original Unit Result                    | <i>DPBFNL</i>                       | <i>CLWFNL</i>                | <i>ATRWLFNL</i>                   |

| <b>LAST STAND REFERENCE RESULTS</b>       |   |                         |                                   |
|---|---|-------------------------|-----------------------------------|
| Test Number                               | <i>RSTAND - RSTRUN - RENGINE - RENHOURS</i> |                         |                                   |
| Oil Code                                  | <i>ROILCODE</i>                             |                         |                                   |
| Test Length                               | <i>RTESTLEN</i>                             | TMC Oil Code            | <i>RIND</i>                       |
| EOT Date                                  | <i>RDTCOMP</i>                              | EOT Time                | <i>REOTTIME</i>                   |
| Stand Calibration Expiration Date         | <i>DTCALEXP</i>                             |                         |                                   |
| Average TGA Soot % at 75 h                |   | <i>RTGAAVG</i>          |                                   |
|   | DELTA Pb @<br>EOT (ppm)                     | AVG. LINER<br>WEAR (µm) | AVG. TOP RING<br>WEIGHT LOSS (mg) |
| Original Result                           | <i>RDPBEOT</i>                              | <i>RALW</i>             | <i>RATRWL</i>                     |
| Transformed Result <sup>B</sup>           | <i>RTRNDPB</i>                              | <i>RTRNALW</i>          | <i>RTRNTRWL</i>                   |
| Correction Factor <sup>B</sup>            | <i>RDPBCF</i>                               | <i>RALWCF</i>           | <i>RATRWLCF</i>                   |
| Corrected Transformed Result <sup>B</sup> | <i>RDPBCOR</i>                              | <i>RALWCOR</i>          | <i>RTRWLCOR</i>                   |
| Final Transformed Result <sup>B</sup>     | <i>RTDPBFNL</i>                             | <i>RTCLWFNL</i>         | <i>RTTRWLFNL</i>                  |
| Final Original Unit Result                | <i>RDPBFNL</i>                              | <i>RCLWFNL</i>          | <i>RTRWLFNL</i>                   |

<sup>A</sup> Reference Tests Only

<sup>B</sup> Transformed Units

**MACK T-10  
Operational Summary  
FORM 5**

|                                     |                         |                         |
|-------------------------------------|-------------------------|-------------------------|
| Laboratory <i>LAB</i>               | EOT Date                | EOT Time                |
| Test Number <i>STAND -STRUN</i>     | <i>-ENGINE -ENHOURS</i> | Oil Code <i>OILCODE</i> |
| Formulation/Stand Code: <i>FORM</i> |                         |                         |

|                           | Parameter             | Units     | QI Threshold | EOT QI <sup>A</sup> | Target          |                 | Average         |                 | Samples <sup>B</sup> | BQD <sup>C</sup> | Over/Under Range <sup>D</sup> |
|---------------------------|-----------------------|-----------|--------------|---------------------|-----------------|-----------------|-----------------|-----------------|----------------------|------------------|-------------------------------|
|                           | Controlled Parameters | Speed     | r/min        | 0.000               | <i>QRPM</i>     | 1800            | 1200            | <i>ARPM1</i>    | <i>ARPM2</i>         | <i>NRPM</i>      | <i>BRPM</i>                   |
| Fuel Flow                 |                       | kg/h      | 0.000        | <i>QFFLO</i>        | 59.2            | 63.5            | <i>AFFLO1</i>   | <i>AFFLO2</i>   | <i>NFFLO</i>         | <i>BFFLO</i>     | <i>OFFLO</i>                  |
| O <sub>2</sub> Level      |                       | %         | 0.000        | <i>QO2L</i>         | 8.1             | 6.1             | <i>AO2L1</i>    | <i>AO2L2</i>    | <i>NO2L</i>          | <i>BO2L</i>      | <i>OO2L</i>                   |
| Inlet Manifold Temp.      |                       | °C        | 0.000        | <i>QINMANT</i>      | 66              |                 | <i>AINMANT</i>  |                 | <i>NINMANT</i>       | <i>BINMANT</i>   | <i>OINMANT</i>                |
| Coolant Out Temp.         |                       | °C        | 0.000        | <i>QCOLOUT</i>      | 66              | 85              | <i>ACOLOUT1</i> | <i>ACOLOUT2</i> | <i>NCOLOUT</i>       | <i>BCOLOUT</i>   | <i>OCOLOUT</i>                |
| Fuel In Temp.             |                       | °C        | 0.000        | <i>QFUELT</i>       | 40              |                 | <i>AFUELT</i>   |                 | <i>NFUELT</i>        | <i>BFUELT</i>    | <i>OFUELT</i>                 |
| Oil Gallery Temp.         |                       | °C        | 0.000        | <i>QOILGT</i>       | 88              | 104             | <i>AOILGT1</i>  | <i>AOILGT2</i>  | <i>NOILGT</i>        | <i>BOILGT</i>    | <i>OOILGT</i>                 |
| Intake Air Temp.          |                       | °C        | 0.000        | <i>QINAIRT</i>      | 25              |                 | <i>AINAIRT</i>  |                 | <i>NINAIRT</i>       | <i>BINAIRT</i>   | <i>OINAIRT</i>                |
| Inlet Air Restriction     |                       | kPa       |              |                     | 3.5 - 4.0       |                 | <i>AINAIRR</i>  |                 | <i>NINAIRR</i>       | <i>BINAIRR</i>   | <i>OINAIRR</i>                |
| Inlet Man. Pressure       |                       | kPa       |              |                     | TBD             | TBD             | <i>AINMANP1</i> | <i>AINMANP2</i> | <i>NINMANP</i>       | <i>BINMANP</i>   | <i>OINMANP</i>                |
| Exh. Back Pressure        |                       | kPa       |              |                     | 2.7 - 3.5       |                 | <i>AEXHSTP</i>  |                 | <i>NEXHSTP</i>       | <i>BEXHSTP</i>   | <i>OEXHSTP</i>                |
| Crankcase Pressure        |                       | kPa       |              |                     | 0.25 - 0.75     |                 | <i>ACCASEP</i>  |                 | <i>NCCASEP</i>       | <i>BCCASEP</i>   | <i>OCCASEP</i>                |
|                           |                       | Parameter | Units        | Typical Values      |                 | Average         |                 |                 |                      |                  |                               |
| Non-controlled Parameters | Power                 | kW        | TBD          | TBD                 | <i>APWR1</i>    |                 | <i>APWR2</i>    |                 |                      |                  |                               |
|                           | Torque                | Nm        | TBD          | TBD                 | <i>ALOAD1</i>   |                 | <i>ALOAD2</i>   |                 |                      |                  |                               |
|                           | Pre-Turbine Temp. (L) | °C        | TBD          | TBD                 | <i>APTURFT1</i> |                 | <i>APTURFT2</i> |                 |                      |                  |                               |
|                           | Pre-Turbine Temp. (R) | °C        | TBD          | TBD                 | <i>APTURRT1</i> |                 | <i>APTURRT2</i> |                 |                      |                  |                               |
|                           | Tailpipe Temp.        | °C        | TBD          | TBD                 | <i>ATAILPT1</i> |                 | <i>ATAILPT2</i> |                 |                      |                  |                               |
|                           | Oil Sump Temp.        | °C        | TBD          | TBD                 | <i>AOILST1</i>  |                 | <i>AOILST2</i>  |                 |                      |                  |                               |
|                           | EGR Pre-Venturi Temp. | °C        | TBD          | TBD                 | <i>AEGRPVT1</i> |                 | <i>AEGRPVT2</i> |                 |                      |                  |                               |
|                           | Blowby                | L/min     | TBD          | TBD                 | <i>ABLOBY1</i>  |                 | <i>ABLOBY2</i>  |                 |                      |                  |                               |
|                           | Inlet Air Dew Point   | °C        | TBD          | TBD                 | <i>AINADP1</i>  |                 | <i>AINADP2</i>  |                 |                      |                  |                               |
|                           | Inlet Air Humidity    | g/kg      | TBD          | TBD                 | <i>AHUMID1</i>  |                 | <i>AHUMID2</i>  |                 |                      |                  |                               |
| Main Gallery Oil Pressure | kPa                   | TBD       | TBD          | <i>AOILPRS1</i>     |                 | <i>AOILPRS2</i> |                 |                 |                      |                  |                               |
| Oil Cooler Delta P        | kPa                   | TBD       | TBD          | <i>AOCOLDP1</i>     |                 | <i>AOCOLDP2</i> |                 |                 |                      |                  |                               |

*A* QI values above the threshold are acceptable by the Mack Surveillance Panel. QI values below the threshold may not be considered acceptable based on an engineering review. Refer to Annex A5.

*B* Total number of data points taken. Minimum acceptable value is 3000.

*C* Number of Bad Quality Data points not used in the calculation of the statistical measures.

*D* Number of points clipped by over/under range limits.

FIG A1.5 - Operational Summary



**MACK T-10**  
**EGR Engine Oil Test**  
**Form 6**  
**Rod Bearing Weight Loss**

|   |                        |                         |
|---|------------------------|-------------------------|
| Laboratory <i>LAB</i>   | EOT Date <i>DTCOMP</i> | EOT Time <i>EOTTIME</i> |
| Test Number <i>STAND</i> <i>-STRUN</i> <i>-ENGINE</i> <i>-ENHOURS</i> |                        |                         |
| Oil Code <i>OILCODE</i>   |                        |                         |
| Formulation/Stand Code <i>FORM</i>                                    |                        |                         |

| Cylinder # | Location | SOT Weight, g | EOT Weight, g | Weight Change, mg |
|------------|----------|---------------|---------------|-------------------|
| 1          | Upper    | BWSOTU1       | BWEOTU1       | BWLU1             |
| 2          | Upper    | BWSOTU2       | BWEOTU2       | BWLU2             |
| 3          | Upper    | BWSOTU3       | BWEOTU3       | BWLU3             |
| 4          | Upper    | BWSOTU4       | BWEOTU4       | BWLU4             |
| 5          | Upper    | BWSOTU5       | BWEOTU5       | BWLU5             |
| 6          | Upper    | BWSOTU6       | BWEOTU6       | BWLU6             |

| SUMMARY                                 | As Measured | Outlier Screened |
|---|-------------|------------------|
| Upper Bearing Average Weight Loss, mg   | ABWLU       | OABWLU           |
| Upper Bearing Weight Loss Std. Dev., mg | SBWLU       | OSBWLU           |
| Upper Bearing Minimum Weight Loss, mg   | IBWLU       | OIBWLU           |
| Upper Bearing Maximum Weight Loss, mg   | XBWLU       | OXBWLU           |
| Outlier Upper Rod Bearing <sup>A</sup>  | BWLOUT      |                  |

<sup>A</sup> Cylinder number

| Cylinder #                              | Location | SOT Weight, g | EOT Weight, g | Weight Change, mg |
|---|----------|---------------|---------------|-------------------|
| 1                                       | Lower    | BWSOTL1       | BWEOTL1       | BWLL1             |
| 2                                       | Lower    | BWSOTL2       | BWEOTL2       | BWLL2             |
| 3                                       | Lower    | BWSOTL3       | BWEOTL3       | BWLL3             |
| 4                                       | Lower    | BWSOTL4       | BWEOTL4       | BWLL4             |
| 5                                       | Lower    | BWSOTL5       | BWEOTL5       | BWLL5             |
| 6                                       | Lower    | BWSOTL6       | BWEOTL6       | BWLL6             |
| Lower Bearing Average Weight Loss, mg   |          |               |               | ABWLL             |
| Lower Bearing Weight Loss Std. Dev., mg |          |               |               | SBWLL             |
| Lower Bearing Minimum Weight Loss, mg   |          |               |               | IBWLL             |
| Lower Bearing Maximum Weight Loss, mg   |          |               |               | XBWLL             |

FIG A1.6 - Rod Bearing Weight Loss

**MACK T-10  
EGR Engine Oil Test  
Form 7  
Ring Weight Loss**

|   |                        |                         |
|---|------------------------|-------------------------|
| Laboratory <i>LAB</i>                               | EOT Date <i>DTCOMP</i> | EOT Time <i>EOTTIME</i> |
| Test Number <i>STAND - STRUN - ENGINE - ENHOURS</i> |                        |                         |
| Oil Code <i>OILCODE</i>                             |                        |                         |
| Formulation/Stand Code <i>FORM</i>                  |                        |                         |

| Cylinder # | Top Ring SOT Weight, g | Top Ring EOT Weight, g | Weight Loss, mg |
|------------|------------------------|------------------------|-----------------|
| 1          | <i>TRWSOT1</i>         | <i>TRWEOT1</i>         | <i>TRWL1</i>    |
| 2          | <i>TRWSOT2</i>         | <i>TRWEOT2</i>         | <i>TRWL2</i>    |
| 3          | <i>TRWSOT3</i>         | <i>TRWEOT3</i>         | <i>TRWL3</i>    |
| 4          | <i>TRWSOT4</i>         | <i>TRWEOT4</i>         | <i>TRWL4</i>    |
| 5          | <i>TRWSOT5</i>         | <i>TRWEOT5</i>         | <i>TRWL5</i>    |
| 6          | <i>TRWSOT6</i>         | <i>TRWEOT6</i>         | <i>TRWL6</i>    |

| Summary                            | As Measured <sup>A</sup> | Outlier Screened |
|------------------------------------|--------------------------|------------------|
| Top Ring Average Weight Loss, mg   | <i>AMATRWL</i>           | <i>ATRWL</i>     |
| Top Ring Weight Loss Std. Dev., mg | <i>AMSTRWL</i>           | <i>STRWL</i>     |
| Top Ring Minimum Weight Loss, mg   | <i>AMITRWL</i>           | <i>ITRWL</i>     |
| Top Ring Maximum Weight Loss, mg   | <i>AMXTRWL</i>           | <i>XTRWL</i>     |
| Outlier Ring <sup>B</sup>          | <i>OUTTR</i>             |                  |

<sup>A</sup> Results calculated without rings with plasma flaking.

<sup>B</sup> Ring number wear results are not currently outlier screened.

| Cylinder # | 2nd Ring SOT Weight, g             | 2nd Ring EOT Weight, g | Weight Loss, mg |
|------------|------------------------------------|------------------------|-----------------|
| 1          | <i>R2WSOT1</i>                     | <i>R2WEOT1</i>         | <i>R2WL1</i>    |
| 2          | <i>R2WSOT2</i>                     | <i>R2WEOT2</i>         | <i>R2WL2</i>    |
| 3          | <i>R2WSOT3</i>                     | <i>R2WEOT3</i>         | <i>R2WL3</i>    |
| 4          | <i>R2WSOT4</i>                     | <i>R2WEOT4</i>         | <i>R2WL4</i>    |
| 5          | <i>R2WSOT5</i>                     | <i>R2WEOT5</i>         | <i>R2WL5</i>    |
| 6          | <i>R2WSOT6</i>                     | <i>R2WEOT6</i>         | <i>R2WL6</i>    |
|            | 2nd Ring Average Weight Loss, mg   |                        | <i>AR2WL</i>    |
|            | 2nd Ring Weight Loss Std. Dev., mg |                        | <i>SR2WL</i>    |
|            | 2nd Ring Min. Weight Loss, mg      |                        | <i>IR2WL</i>    |
|            | 2nd Ring Max. Weight Loss, mg      |                        | <i>XR2WL</i>    |

| Cylinder # | Oil Ring SOT Weight, g             | Oil Ring EOT Weight, g | Weight Loss, mg |
|------------|------------------------------------|------------------------|-----------------|
| 1          | <i>ORWSOT1</i>                     | <i>ORWEOT1</i>         | <i>ORWL1</i>    |
| 2          | <i>ORWSOT2</i>                     | <i>ORWEOT2</i>         | <i>ORWL2</i>    |
| 3          | <i>ORWSOT3</i>                     | <i>ORWEOT3</i>         | <i>ORWL3</i>    |
| 4          | <i>ORWSOT4</i>                     | <i>ORWEOT4</i>         | <i>ORWL4</i>    |
| 5          | <i>ORWSOT5</i>                     | <i>ORWEOT5</i>         | <i>ORWL5</i>    |
| 6          | <i>ORWSOT6</i>                     | <i>ORWEOT6</i>         | <i>ORWL6</i>    |
|            | Oil Ring Average Weight Loss, mg   |                        | <i>AORWL</i>    |
|            | Oil Ring Weight Loss Std. Dev., mg |                        | <i>SORWL</i>    |
|            | Oil Ring Minimum Weight Loss, mg   |                        | <i>IORWL</i>    |
|            | Oil Ring Maximum Weight Loss, mg   |                        | <i>XORWL</i>    |

FIG A1.7 - Ring Weight Loss

**MACK T-10**  
**EGR Engine Oil Test**  
**Form 8**  
**Oil Analysis Summary**

|   |                         |                         |
|---|-------------------------|-------------------------|
| Laboratory <i>LAB</i>                               | EOT Date <i>DTCOMP</i>  | EOT Time <i>EOTTIME</i> |
| Test Number <i>STAND - STRUN - ENGINE - ENHOURS</i> | Oil Code <i>OILCODE</i> |                         |
| Formulation/Stand Code: <i>FORM</i>                 |                         |                         |

| HOURS    | SOOT<br>Wt. %<br>TGA | Viscosity<br>at 100°C<br>cSt | Viscosity<br>Increase<br>cSt | TBN      | TAN      | Integrated<br>IR | Metals in Parts per Millions |          |          |          |          |          |          |          |
|----------|----------------------|------------------------------|------------------------------|----------|----------|------------------|------------------------------|----------|----------|----------|----------|----------|----------|----------|
|          |                      |                              |                              |          |          |                  | Elements                     |          |          |          |          |          |          |          |
|          |                      |                              |                              |          |          |                  | Fe                           | Pb       | Cu       | Cr       | Al       | Si       | Sn       | Na       |
| TST_H000 | TGA_H000             | V100H000                     |                              | TBN_H000 | TAN_H000 | IRINH000         | FEWMH000                     | PBWMH000 | CUWMH000 | CRWMH000 | ALWMH000 | SIWMH000 | SNWMH000 | NAWMH000 |
| TST_H025 | TGA_H025             | V100H025                     | IVISH025                     | TBN_H025 | TAN_H025 | IRINH025         | FEWMH025                     | PBWMH025 | CUWMH025 | CRWMH025 | ALWMH025 | SIWMH025 | SNWMH025 | NAWMH025 |
| TST_H050 | TGA_H050             | V100H050                     | IVISH050                     | TBN_H050 | TAN_H050 | IRINH050         | FEWMH050                     | PBWMH050 | CUWMH050 | CRWMH050 | ALWMH050 | SIWMH050 | SNWMH050 | NAWMH050 |
| TST_H075 | TGA_H075             | V100H075                     | IVISH075                     | TBN_H075 | TAN_H075 | IRINH075         | FEWMH075                     | PBWMH075 | CUWMH075 | CRWMH075 | ALWMH075 | SIWMH075 | SNWMH075 | NAWMH075 |
| 75 (2nd) | TGA75_2              |                              |                              |          |          |                  |                              |          |          |          |          |          |          |          |
| 75 AVG.  | TGAAVG               |                              |                              |          |          |                  |                              |          |          |          |          |          |          |          |
| TST_H100 | TGA_H100             | V100H100                     | IVISH100                     | TBN_H100 | TAN_H100 | IRINH100         | FEWMH100                     | PBWMH100 | CUWMH100 | CRWMH100 | ALWMH100 | SIWMH100 | SNWMH100 | NAWMH100 |
| TST_H125 | TGA_H125             | V100H125                     | IVISH125                     | TBN_H125 | TAN_H125 | IRINH125         | FEWMH125                     | PBWMH125 | CUWMH125 | CRWMH125 | ALWMH125 | SIWMH125 | SNWMH125 | NAWMH125 |
| TST_H150 | TGA_H150             | V100H150                     | IVISH150                     | TBN_H150 | TAN_H150 | IRINH150         | FEWMH150                     | PBWMH150 | CUWMH150 | CRWMH150 | ALWMH150 | SIWMH150 | SNWMH150 | NAWMH150 |
| TST_H175 | TGA_H175             | V100H175                     | IVISH175                     | TBN_H175 | TAN_H175 | IRINH175         | FEWMH175                     | PBWMH175 | CUWMH175 | CRWMH175 | ALWMH175 | SIWMH175 | SNWMH175 | NAWMH175 |
| TST_H200 | TGA_H200             | V100H200                     | IVISH200                     | TBN_H200 | TAN_H200 | IRINH200         | FEWMH200                     | PBWMH200 | CUWMH200 | CRWMH200 | ALWMH200 | SIWMH200 | SNWMH200 | NAWMH200 |
| TST_H225 | TGA_H225             | V100H225                     | IVISH225                     | TBN_H225 | TAN_H225 | IRINH225         | FEWMH225                     | PBWMH225 | CUWMH225 | CRWMH225 | ALWMH225 | SIWMH225 | SNWMH225 | NAWMH225 |
| TST_H250 | TGA_H250             | V100H250                     | IVISH250                     | TBN_H250 | TAN_H250 | IRINH250         | FEWMH250                     | PBWMH250 | CUWMH250 | CRWMH250 | ALWMH250 | SIWMH250 | SNWMH250 | NAWMH250 |
| TST_H275 | TGA_H275             | V100H275                     | IVISH275                     | TBN_H275 | TAN_H275 | IRINH275         | FEWMH275                     | PBWMH275 | CUWMH275 | CRWMH275 | ALWMH275 | SIWMH275 | SNWMH275 | NAWMH275 |
| TST_H300 | TGA_H300             | V100H300                     | IVISH300                     | TBN_H300 | TAN_H300 | IRINH300         | FEWMH300                     | PBWMH300 | CUWMH300 | CRWMH300 | ALWMH300 | SIWMH300 | SNWMH300 | NAWMH300 |

|                     |                    |                                 |
|---------------------|--------------------|---------------------------------|
| <b>Summary</b>      | <b>As Measured</b> | <b>Outlier Bearing Adjusted</b> |
| Delta Pb @ EOT, ppm | AMDPBEOT           | DPBEOT                          |

FIG A1.8 - Oil Analysis Summary

**MACK T-10**  
**EGR Engine Oil Test**  
**Liner Surface Roughness & Bore Diameter**  
**Form 9**

|  |                        |                         |
|--|------------------------|-------------------------|
| Laboratory <i>LAB</i>  | EOT Date <i>DTCOMP</i> | EOT Time <i>EOTTIME</i> |
| Test Number <i>STAND</i> - <i>STRUN</i> - <i>ENGINE</i> - <i>ENHOURS</i> |                        |                         |
| Oil Code <i>OILCODE</i>  |                        |                         |
| Formulation/Stand Code <i>FORM</i>                                       |                        |                         |

| LINER NO. | LOCATION               | Ra (µm)        | BORE DIAMETER (mm) |         | Ra (µm)        | DIA. (mm)      |
|-----------|------------------------|----------------|--------------------|---------|----------------|----------------|
| 1         | Top Ring Travel @ 0°   | <i>LIN1RAA</i> | <i>LIN1IDA</i>     | AVG     | <i>ALIN1RA</i> | <i>ALIN1ID</i> |
|           | Top Ring Travel @ 90°  | <i>LIN1RAB</i> | <i>LIN1IDB</i>     | STD DEV | <i>SLIN1RA</i> |                |
|           | Top Ring Travel @ 180° | <i>LIN1RAC</i> |                    | MIN     | <i>ILIN1RA</i> |                |
|           | Top Ring Travel @ 270° | <i>LIN1RAD</i> |                    | MAX     | <i>XLIN1RA</i> |                |

|   |                        |                |                |         |                |                |
|---|------------------------|----------------|----------------|---------|----------------|----------------|
| 2 | Top Ring Travel @ 0°   | <i>LIN2RAA</i> | <i>LIN2IDA</i> | AVG     | <i>ALIN2RA</i> | <i>ALIN2ID</i> |
|   | Top Ring Travel @ 90°  | <i>LIN2RAB</i> | <i>LIN2IDB</i> | STD DEV | <i>SLIN2RA</i> |                |
|   | Top Ring Travel @ 180° | <i>LIN2RAC</i> |                | MIN     | <i>ILIN2RA</i> |                |
|   | Top Ring Travel @ 270° | <i>LIN2RAD</i> |                | MAX     | <i>XLIN2RA</i> |                |

|   |                        |                |                |         |                |                |
|---|------------------------|----------------|----------------|---------|----------------|----------------|
| 3 | Top Ring Travel @ 0°   | <i>LIN3RAA</i> | <i>LIN3IDA</i> | AVG     | <i>ALIN3RA</i> | <i>ALIN3ID</i> |
|   | Top Ring Travel @ 90°  | <i>LIN3RAB</i> | <i>LIN3IDB</i> | STD DEV | <i>SLIN3RA</i> |                |
|   | Top Ring Travel @ 180° | <i>LIN3RAC</i> |                | MIN     | <i>ILIN3RA</i> |                |
|   | Top Ring Travel @ 270° | <i>LIN3RAD</i> |                | MAX     | <i>XLIN3RA</i> |                |

|   |                        |                |                |         |                |                |
|---|------------------------|----------------|----------------|---------|----------------|----------------|
| 4 | Top Ring Travel @ 0°   | <i>LIN4RAA</i> | <i>LIN4IDA</i> | AVG     | <i>ALIN4RA</i> | <i>ALIN4ID</i> |
|   | Top Ring Travel @ 90°  | <i>LIN4RAB</i> | <i>LIN4IDB</i> | STD DEV | <i>SLIN4RA</i> |                |
|   | Top Ring Travel @ 180° | <i>LIN4RAC</i> |                | MIN     | <i>ILIN4RA</i> |                |
|   | Top Ring Travel @ 270° | <i>LIN4RAD</i> |                | MAX     | <i>XLIN4RA</i> |                |

|   |                        |                |                |         |                |                |
|---|------------------------|----------------|----------------|---------|----------------|----------------|
| 5 | Top Ring Travel @ 0°   | <i>LIN5RAA</i> | <i>LIN5IDA</i> | AVG     | <i>ALIN5RA</i> | <i>ALIN5ID</i> |
|   | Top Ring Travel @ 90°  | <i>LIN5RAB</i> | <i>LIN5IDB</i> | STD DEV | <i>SLIN5RA</i> |                |
|   | Top Ring Travel @ 180° | <i>LIN5RAC</i> |                | MIN     | <i>ILIN5RA</i> |                |
|   | Top Ring Travel @ 270° | <i>LIN5RAD</i> |                | MAX     | <i>XLIN5RA</i> |                |

|   |                        |                |                |         |                |                |
|---|------------------------|----------------|----------------|---------|----------------|----------------|
| 6 | Top Ring Travel @ 0°   | <i>LIN6RAA</i> | <i>LIN6IDA</i> | AVG     | <i>ALIN6RA</i> | <i>ALIN6ID</i> |
|   | Top Ring Travel @ 90°  | <i>LIN6RAB</i> | <i>LIN6IDB</i> | STD DEV | <i>SLIN6RA</i> |                |
|   | Top Ring Travel @ 180° | <i>LIN6RAC</i> |                | MIN     | <i>ILIN6RA</i> |                |
|   | Top Ring Travel @ 270° | <i>LIN6RAD</i> |                | MAX     | <i>XLIN6RA</i> |                |

|  | Ra (µm)       | BORE DIAMETER (mm) |
|--|---------------|--------------------|
| Average Surface Roughness & Bore Diameter            | <i>ALINRA</i> | <i>ALINID</i>      |
| Standard Deviation Surface Roughness & Bore Diameter | <i>SLINRA</i> | <i>SLINID</i>      |
| Minimum Surface Roughness & Bore Diameter            | <i>ILINRA</i> | <i>ILINID</i>      |
| Maximum Surface Roughness & Bore Diameter            | <i>XLINRA</i> | <i>XLINID</i>      |

FIG A1.9 - Liner Surface Roughness & Bore Diameter