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**QM-C-7.1/Polymer/0001**

**Inspection Plan(Check Sheet)**

**Item:** Poly Urethane Side Bearer Pads for freight stock  
**Specn. :** WD-38 Misc-2004 Rev 1 of Jan'08  
**Amd.:** 1 of Mar'08  
**Drg. No. & Alt.:** AAL-021101 Alt-8

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1. Firm's Name :
2. Date (period) of Inspection :
3. Contract Details :
  - a. Contract no. and date.
  - b. Order placing authority.
  - c. Specification no.  
(as mentioned in contract)
  - d. Drawing no.  
(as mentioned in contract)
4. Quantity on order
5. Quantity offered for inspection on date
6. Consignee
7. Delivery Period

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Summary of results

| Sr.No.  | Parameters  | Specified value  | Observation |      |
|---|---|--|-------------|------|
|   |   |  | Max.        | Min. |
| 8.1   | Visual Check  | Foreign materials, pin holes, cracks & trapped air bristles etc. & marking |             |      |
| 8.2   | Dimensional Check   |  |             |      |
| 8.3   | Physical Properties   |  |             |      |
| Before Ageing   | Tensile Strength Min.   | 200 Kg/Cm <sup>2</sup>   |             |      |
|   | Elongation at Break Min.  | 300%   |             |      |
|   | Hardness of PU Ring Shore A Min.                                    | 87   |             |      |
|   | Hardness of TPU Sleeve Shore A Min.                                 | 95   |             |      |
|   | Ash Content Max.  | 1%   |             |      |
|   | Specific Gravity of PU Ring   | 1.20   |             |      |
|   | Specific Gravity of TPU Sleeve Max.                                 | 1.30   |             |      |
| 8.4   |   |  |             |      |
| After Ageing change at 70 <sup>o</sup> ± 1 <sup>o</sup> C for 24 +0 -2 Hrs. | Tensile Strength  | ± 25%  |             |      |
|   | Elongation at break   | ± 25%  |             |      |
|   | Hardness  | +3 / -2 <sup>o</sup> Shore A   |             |      |
|   | Compression Set Max.  | 25%  |             |      |
| 8.5   | Resistance to Hydrolysis  |  |             |      |
|   | Boiling in distilled water at atmospheric pressure for 72 +0/-2 Hrs |  |             |      |
|   | change in Tensile strength  | ± 25%  |             |      |
|   | Change in elongation at break                                       | +50.0 – 0.0  |             |      |
|   | Hardness  | +0.0 / -7.0  |             |      |
| 8.6   | Compressive Load Deflection Test                                    |  |             |      |
|   | At 2.70 t   | Max. 20.5 mm<br>Min. 18.5mm  |             |      |
| 8.6.1   | Strength Test   | Should not home at 45.0t   |             |      |
| 8.7   | Fatigue Test  | 1 Million cycle  |             |      |

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**TEST RESULTS**  
**(Maximum Lot Size 2000 Side Bearer Assemblies)**

8.1 Visual Check:-  
 Specification: Polyurethane component shall be smooth, free from air bubbles, surface streaks, splash mark, pin hole, voids  
 Specified sample size – 20 assemblies  
 Actual sample size – assemblies

| Assembly No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |  |
|--------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|--|
| Visual Check |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |

8.2 Dimensional Check-  
 Specified sample size – 20 assemblies  
 Actual sample size – assemblies

| Assembly No.            | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |  |
|-------------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|--|
| Top Housing             |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 158 ± 2.5               |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 71 ± 0.8                |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 57 ± 2.0                |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 136 ± 0.8               |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 87.5 ± 0.8              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| Bottom Housing          |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 280 ± 2.5               |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 150 ± 2.5               |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 130 ± 0.8               |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 110 ± 0.8               |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 15 ± 0.5                |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 216 ± 0.5               |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 21.5 ± 0.5              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 142.5 ± 1.6             |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| PU Ring                 |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 101 ± 2x40 ± 2x33 ± 0.7 |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| TPU Sleeve              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 136X132X71 (T)          |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 110X106X75 (B)          |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| Spacer Plate            |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 104 ± 0.8               |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| 6 ± 0.5                 |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |
| Th. 32.00 ± 1.3         |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |  |

Note: Tolerance Taken as per Firms Drawing and QAP approved by Wagon Directorate, RDSO.  
 (All dimensions in mm)

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8.3 Physical properties of PU Ring before Ageing  
Specified sample size – 2 assemblies  
Actual sample size – assemblies

A. Tensile Strength :-

| Parameters              | Permissible Limit           | 1 |   |   | 2 |   |   |
|-------------------------|-----------------------------|---|---|---|---|---|---|
|                         |                             | a | b | c | a | b | c |
| Thickness (mm)          |                             |   |   |   |   |   |   |
| Width (mm)              |                             |   |   |   |   |   |   |
| Area (mm <sup>2</sup> ) |                             |   |   |   |   |   |   |
| Load at break (kg)      |                             |   |   |   |   |   |   |
| Tensile Strength        | 200Kg/cm <sup>2</sup> (min) |   |   |   |   |   |   |
| Mid Value               |                             |   |   |   |   |   |   |

B. Elongation at break :-

| Parameters           | Permissible Limit | 1 |   |   | 2 |   |   |
|----------------------|-------------------|---|---|---|---|---|---|
|                      |                   | a | b | c | a | b | c |
| Bench Length (mm)    |                   |   |   |   |   |   |   |
| Length at break (mm) |                   |   |   |   |   |   |   |
| Elongation (%)       | 300% min.         |   |   |   |   |   |   |
| Mid Value            |                   |   |   |   |   |   |   |

C. Compression Set (at 70 ± 1°C for 24 +0/-2 Hrs) :-

| Parameters                  | Permissible Limit | 1 |   |   | 2 |   |   |
|-----------------------------|-------------------|---|---|---|---|---|---|
|                             |                   | a | b | c | a | b | c |
| Thickness before ageing(mm) |                   |   |   |   |   |   |   |
| Spacer Thickness (mm)       |                   |   |   |   |   |   |   |
| Thickness after ageing (mm) |                   |   |   |   |   |   |   |
| Compression Set             | 25% (max.)        |   |   |   |   |   |   |
| Average Compression Set     |                   |   |   |   |   |   |   |

D. Hardness of PU Ring :-

| Parameters         | Permissible Limit | 1 |   |   | 2 |   |   |
|--------------------|-------------------|---|---|---|---|---|---|
|                    |                   | a | b | c | a | b | c |
| Hardness Shore 'A' |                   |   |   |   |   |   |   |
| Mid Value          | 87 (Min.)         |   |   |   |   |   |   |

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E. Hardness of TPU Sleeve:

| Parameters         | Permissible Limit | 1 |   |   | 2 |   |   |
|--------------------|-------------------|---|---|---|---|---|---|
|                    |                   | a | b | c | a | b | c |
| Hardness Shore 'A' |                   |   |   |   |   |   |   |
| Mid Value          | 95 (Min.)         |   |   |   |   |   |   |

F. Specific Gravity of PU :-

| Parameters       | Permissible Limit | 1 |   |   | 2 |   |   |
|------------------|-------------------|---|---|---|---|---|---|
|                  |                   | a | b | c | a | B | c |
| Specific Gravity | 1.20 (Max.)       |   |   |   |   |   |   |
| Mid Value        |                   |   |   |   |   |   |   |

G. Specific Gravity of TPU Sleeve

| Parameters       | Permissible Limit | 1 |   |   | 2 |   |   |
|------------------|-------------------|---|---|---|---|---|---|
|                  |                   | a | b | c | a | b | c |
| Specific Gravity | 1.30 (Max.)       |   |   |   |   |   |   |
| Mid Value        |                   |   |   |   |   |   |   |

H. Ash Content :- Specified Value 1% (max.)

| Parameters               | 1 |   |   | 2 |   |   |
|--------------------------|---|---|---|---|---|---|
|                          | a | b | c | a | b | c |
| Wt. of Crucible          |   |   |   |   |   |   |
| Wt. of Crucible + Sample |   |   |   |   |   |   |
| Wt. of Sample            |   |   |   |   |   |   |
| Wt. of Crucible + Ash    |   |   |   |   |   |   |
| Wt. of Ash               |   |   |   |   |   |   |
| Ash Content %            |   |   |   |   |   |   |

8.4 Physical Properties after Ageing (at 70 ± 1°C for 24 +0/-2 Hrs.)

Specified sample size – 2 assemblies

Actual sample size – assemblies

A- Tensile Strength :-

| Parameters                             | Permissible Limit | 1 |   |   | 2 |   |   |
|--|-------------------|---|---|---|---|---|---|
|  |                   | a | b | c | a | b | C |
| Thickness (mm)                         |                   |   |   |   |   |   |   |
| Width (mm)                             |                   |   |   |   |   |   |   |
| Area (mm <sup>2</sup> )                |                   |   |   |   |   |   |   |
| Load at break (kg)                     |                   |   |   |   |   |   |   |
| Tensile Strength (kg/cm <sup>2</sup> ) |                   |   |   |   |   |   |   |
| Mid Value                              |                   |   |   |   |   |   |   |
| % change after ageing                  | ± 25%             |   |   |   |   |   |   |

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**B- Elongation at Break :-**

| Parameters            | Permissible Limit | 1 |   |   | 2 |   |   |
|-----------------------|-------------------|---|---|---|---|---|---|
|                       |                   | a | b | c | a | b | c |
| Bench Length (mm)     |                   |   |   |   |   |   |   |
| Length at break (mm)  |                   |   |   |   |   |   |   |
| Elongation %          |                   |   |   |   |   |   |   |
| Mid Value             |                   |   |   |   |   |   |   |
| % change after ageing | ± 25%             |   |   |   |   |   |   |

**C- Hardness of PU Donut :-**

| Parameters         | Permissible Limit | 1 |   |   | 2 |   |   |
|--------------------|-------------------|---|---|---|---|---|---|
|                    |                   | a | b | c | a | b | c |
| Hardness Shore 'A' |                   |   |   |   |   |   |   |
| Mid Value          |                   |   |   |   |   |   |   |
| Change in Hardness | +3/-2             |   |   |   |   |   |   |

**8.5 Resistance to Hydrolysis : 2 Assemblies (Verify firm's internal test records & record the following)**

Boiling in distilled water at atmospheric pressure for 72 +0/-2 Hrs.

**A Tensile Strength :-**

| Parameters              | Permissible Limit | 1 |   |   | 2 |   |   |
|-------------------------|-------------------|---|---|---|---|---|---|
|                         |                   | a | b | c | a | b | c |
| Thickness (mm)          |                   |   |   |   |   |   |   |
| Width (mm)              |                   |   |   |   |   |   |   |
| Area (mm <sup>2</sup> ) |                   |   |   |   |   |   |   |
| Load at break (kg)      |                   |   |   |   |   |   |   |
| Tensile Strength        |                   |   |   |   |   |   |   |
| Mid Value               |                   |   |   |   |   |   |   |
| % change                | ± 25%             |   |   |   |   |   |   |

**B Elongation at break :-**

| Parameters           | Permissible Limit | 1 |   |   | 2 |   |   |
|----------------------|-------------------|---|---|---|---|---|---|
|                      |                   | a | b | c | a | b | c |
| Bench Length (mm)    |                   |   |   |   |   |   |   |
| Length at break (mm) |                   |   |   |   |   |   |   |
| Elongation %         |                   |   |   |   |   |   |   |
| Mid Value            |                   |   |   |   |   |   |   |
| % change             | +50/-0            |   |   |   |   |   |   |

**C Hardness :-**

| Parameters         | Permissible Limit | 1 |   |   | 2 |   |   |
|--------------------|-------------------|---|---|---|---|---|---|
|                    |                   | a | b | c | a | b | c |
| Hardness Shore 'A' |                   |   |   |   |   |   |   |
| Mid Value          |                   |   |   |   |   |   |   |
| Change in Hardness | +0.0/-7.0         |   |   |   |   |   |   |

Note : Permissible Limit for item 8.3, 8.4, & 8.5 are as per firms QAP approved by Wagon Dte, RDSO.

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**8.6 Compressive Load Deflection Test**

Specified sample size 20 assemblies  
Actual Sample size assemblies

Atmospheric temperature – 27 ± 2°C  
Machine Speed : 10 ± 5 mm/minute

Three successive loading up to 2.7 t. During the fourth cycle the pad shall be compressed with load of 50 Kg., deflection taken at Zero at this point.

|             |                  |           |           |           |           |           |           |           |           |           |           |
|-------------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>Load</b> | <b>Sp. Value</b> | <b>1</b>  | <b>2</b>  | <b>3</b>  | <b>4</b>  | <b>5</b>  | <b>6</b>  | <b>7</b>  | <b>8</b>  | <b>9</b>  | <b>10</b> |
| 2.7 Ton     | 18.5 to 20.5     |           |           |           |           |           |           |           |           |           |           |
| <b>Load</b> | <b>Sp. Value</b> | <b>11</b> | <b>12</b> | <b>13</b> | <b>14</b> | <b>15</b> | <b>16</b> | <b>17</b> | <b>18</b> | <b>19</b> | <b>20</b> |
| 2.7 Ton     | 18.5 to 20.5     |           |           |           |           |           |           |           |           |           |           |

**8.6.1 Strength Test**

Specified sample size 5 assemblies  
Actual Sample size assemblies

Three successive loading upto 45 Tonnes at a interval of 1.0 Minutes

|                       |             |   |   |   |   |
|-----------------------|-------------|---|---|---|---|
| Load<br>(45 Tonnes)   | Observation |   |   |   |   |
|                       | 1           | 2 | 3 | 4 | 5 |
| Condition of Assembly |             |   |   |   |   |

The pad should not home (solid) and no damage to any component.

**8.7 Fatigue Test in Vertical Mode : as per specification clause 9.4**

Specified sample size : 1 assembly  
Actual Sample size assembly

| Load in Tonnes | No. of Cycles | Frequency |
|----------------|---------------|-----------|
| 0 to 4.0       | 10,00,000     | 2 HZ      |
| 0 to 4.5       | 6000          | 1.5 HZ    |
| 0 to 5.0       | 2000          | 1.0 HZ    |
| 0 to 6.0       | 1000          | 0.5 HZ    |

Specified Permanent Set (4 mm Max.)

(Observed set to be measured after 10 minutes of testing but not later than 20 minutes)

| No. of assemblies | Height before Fatigue | Height after Fatigue | Permanent set in mm |
|-------------------|-----------------------|----------------------|---------------------|
|                   |                       |                      |                     |
|                   |                       |                      |                     |

|     |   |          |        |
|-----|---|----------|--------|
| 8.8 | Whether any sign of cracking/perishing in the polyurethane components and sign of deformation/damage in metallic components | Assembly | Yes/No |
|     |   | 1        |        |
|     |   | 2        |        |

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