



QM-C-7.1/SPRING/0006
Inspection Plan(Check Sheet)

Item: Suspension Coil Springs for Locomotive
Specn. : MP.0.4900.12, Rev.1 of July'08
Amd.:
Drg. No. & Alt.:

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

6. Date of offering for inspection.

7. Consignee

8. Delivery Period

QC INCHARGE OF M/s

RDSO INSPECTING OFFICIAL



SUMMARY OF RESULT
Lot size 500 nos.

| Sr No. | Parameters | | Specified Value | | | | | | | Observation | |
|--------|--|-----------|--|----------|---------|---------|----------|-----------|-----------|-------------|------|
| | | | | | | | | | | Max. | Min. |
| 1 | Spring surface | | | | | | | | | | |
| 2 | Stamping | | As per drawing | | | | | | | | |
| 3 | Dimensional check | | As per drawing | | | | | | | | |
| 4 | Squareness | | As per drawing/specification | | | | | | | | |
| 5 | Parallelism | | As per drawing/specification | | | | | | | | |
| 6 | End preparation | | As per drawing/specification | | | | | | | | |
| 7 | Tip thickness | | As per drawing/specification | | | | | | | | |
| 8 | Scragging | | No permanent set | | | | | | | | |
| 9 | Permanent set | | As per drawing/specification | | | | | | | | |
| 10 | Length of contact area b/w Inactive & active coil at working load | | As per drawing/specification | | | | | | | | |
| 11 | Static load test stiffness | | As per drawing | | | | | | | | |
| 12 | Working height | | As per drawing/specification | | | | | | | | |
| 13 | Max. spacing between two adjacent active coil under 85% deflection | | | | | | | | | | |
| 14 | Pitch uniformity | | As per drawing/specification | | | | | | | | |
| 15 | Crack detection | | As per drawing/specification | | | | | | | | |
| 16 | Shot peening | | As per drawing/specification | | | | | | | | |
| 17 | Depth of decarb | | 0.5% of nominal bar dia | | | | | | | | |
| 18 | Surface hardness | | As per drawing/specification | | | | | | | | |
| 18.1 | Core hardness | | As per drawing/specification | | | | | | | | |
| | Variation b/w surface & core hardness | | 20 BHN | | | | | | | | |
| 19 | | C | Si | Mn | S (max) | P (max) | Cr | V | Mo | | |
| 19.1 | 60Si7 | 0.55-0.65 | 1.5-2.0 | 0.80-1.0 | 0.025 | 0.025 | -- | -- | | | |
| 19.2 | 52Cr ₄ Mo ₂ V | 0.48-0.56 | 0.15-0.4 | 0.70-1.1 | 0.025 | 0.025 | 0.90-1.2 | 0.07-0.12 | 0.15-0.25 | | |
| 20 | Grain structure | | 6 or finer | | | | | | | | |
| 21 | Inclusion rating | | Not worse than 2.0ABCD for thin series and 1.0 ABCD for thick series | | | | | | | | |
| 22 | Macro etching | | Not worse than C2,R2,S2 of ASTM E-381 Plate 1 st | | | | | | | | |
| 23 | Paint quality | | As per drawing/specification | | | | | | | | |
| 24 | Powder coating | | As per drawing/specification | | | | | | | | |
| 25 | Grouping & steel band coding | | As per drawing/specification | | | | | | | | |

QC INCHARGE OF M/s

RDSO INSPECTING OFFICIAL



| Sr. No. | | Actual sample | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. |
|---------|-----------------|-------------------------------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | Spring Surface | 100% Springs | | | | | | | | | | | | | | | | | | | | |
| | | 2% after Shot peening | | | | | | | | | | | | | | | | | | | | |
| 2 | Stamping | 10% or 20 springs whichever is less | | | | | | | | | | | | | | | | | | | | |
| 3 | Free Height | | | | | | | | | | | | | | | | | | | | | |
| 3.1 | Bar Diameter | | | | | | | | | | | | | | | | | | | | | |
| 3.2 | Outer Diameter | | | | | | | | | | | | | | | | | | | | | |
| 3.3 | Inner Diameter | | | | | | | | | | | | | | | | | | | | | |
| 4 | Squareness | | | | | | | | | | | | | | | | | | | | | |
| 5 | Parallelism | | | | | | | | | | | | | | | | | | | | | |
| 6 | End preparation | | | | | | | | | | | | | | | | | | | | | |
| 7 | Tip thickness | 10% or 20 springs whichever is less | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |

QC INCHARGE OF M/s

RDSO INSPECTING OFFICIAL

REVISION 0



8 & 9. Scragging & permanent set

Sample size – 10% or 20 springs whichever is less

Actual No of Sample-

Scragging load/height-

| Sr. No | Height after one stroke (mm) | Height after 4 th stroke (mm) | Permanent set (mm) | Sr. No | Height after one stroke (mm) | Height after 4 th stroke (mm) | Permanent set (mm) |
|--------|------------------------------|--|--------------------|--------|------------------------------|--|--------------------|
| 1. | | | | 11. | | | |
| 2. | | | | 12. | | | |
| 3. | | | | 13. | | | |
| 4. | | | | 14. | | | |
| 5. | | | | 15. | | | |
| 6. | | | | 16. | | | |
| 7. | | | | 17. | | | |
| 8. | | | | 18. | | | |
| 9. | | | | 19. | | | |
| 10. | | | | 20. | | | |

10 . Length of contact area b/w Inactive & active coil at working load

Specified No. of Samples: 10% or 20 springs whichever is less

Actual No. of samples-

Specified length-

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. |
| | | | | | | | | | |
| 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. |
| | | | | | | | | | |

QC INCHARGE OF M/s

RDSO INSPECTING OFFICIAL



11. Static load test stiffness

Specified No. of Samples :10% or 20 springs whichever is less

Actual No. of samples :

Load of 30% -

Load of 70% -

Specified Spring rate –

| Sample No. | Load in Kg. | | | |
|------------|-------------|--------------------|--------------------|-----------------|
| | Height | Height at Load 30% | Height at Load 70% | Stiffness Kg/mm |
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |
| 11. | | | | |
| 12. | | | | |
| 13. | | | | |
| 14. | | | | |
| 15. | | | | |
| 16. | | | | |
| 17. | | | | |
| 18. | | | | |
| 19. | | | | |
| 20. | | | | |

QC INCHARGE OF M/s

RDSO INSPECTING OFFICIAL



12. Working height (Static Load Test)

Sample Size-10% or 20 springs whichever is less

Actual No. of samples:

| Sample | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|--------|----------------------|---|---|---|---|---|---|---|
| | <i>Load in tons.</i> | | | | | | | |
| | <i>Deflection</i> | | | | | | | |
| 1 | Height | | | | | | | |
| | Diff | | | | | | | |
| 2 | Height | | | | | | | |
| | Diff | | | | | | | |
| 3 | Height | | | | | | | |
| | Diff | | | | | | | |
| 4 | Height | | | | | | | |
| | Diff | | | | | | | |
| 5 | Height | | | | | | | |
| | Diff | | | | | | | |
| 6 | Height | | | | | | | |
| | Diff | | | | | | | |
| 7 | Height | | | | | | | |
| | Diff | | | | | | | |
| 8 | Height | | | | | | | |
| | Diff | | | | | | | |
| 9 | Height | | | | | | | |
| | Diff | | | | | | | |
| 10 | Height | | | | | | | |
| | Diff | | | | | | | |
| 11 | Height | | | | | | | |
| | Diff | | | | | | | |
| 12 | Height | | | | | | | |
| | Diff | | | | | | | |
| 13 | Height | | | | | | | |
| | Diff | | | | | | | |
| 14 | Height | | | | | | | |
| | Diff | | | | | | | |
| 15 | Height | | | | | | | |
| | Diff | | | | | | | |
| 16 | Height | | | | | | | |
| | Diff | | | | | | | |
| 17 | Height | | | | | | | |
| | Diff | | | | | | | |

QC INCHARGE OF M/s

RDSO INSPECTING OFFICIAL



| | | | | | | | |
|----|--------|--|--|--|--|--|--|
| 18 | Height | | | | | | |
| | Diff | | | | | | |
| 19 | Height | | | | | | |
| | Diff | | | | | | |
| 20 | Height | | | | | | |
| | Diff | | | | | | |

13 Maximum spacing between 2 acting coil under 85% deflection

Specified No. of Samples : 10% or 20 springs whichever is less

Actual No. of samples :

Nominal Spacing = Free Height – Solid Height / No. of active coils=X

| Sr. no. | Free height (mm) | Solid Height | No. of active coils | Nominal Spacing (X) | Maximum spacing between 2 acting coil (A) | B= $\frac{A \times 100}{X}$ (%) |
|---------|------------------|--------------|---------------------|---------------------|---|---------------------------------|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |
| 11. | | | | | | |
| 12. | | | | | | |
| 13. | | | | | | |
| 14. | | | | | | |
| 15. | | | | | | |
| 16. | | | | | | |
| 17. | | | | | | |
| 18. | | | | | | |
| 19. | | | | | | |
| 20. | | | | | | |

Note : B should not be more than 40%

QC INCHARGE OF M/s

RDSO INSPECTING OFFICIAL



| | | | | | | | | | | | | | |
|-----------|-----------------------------|--|--------------------------|--|--|--|--|--|--|--|--|--|--|
| 14 | Pitch uniformity | 10% or 20 springs whichever is less | Actual Sample size | | | | | | | | | | |
| | | | | | | | | | | | | | |
| 15 | Crack Detection | 2% of lot or min. 10 springs | Actual Sample size | | | | | | | | | | |
| | | | | | | | | | | | | | |

16. Shot peening (Internal records must be checked)

17 . Metallurgical –(Depth of decarb)

Sample Size - 2% or 2 springs whichever is less

Actual No. of Samples-

| Sample No. | Depth of Decarb |
|------------------------|------------------------------------|
| Specified value | 0.5% of the nominal bar dia |
| 1 | |
| 2 | |

QC INCHARGE OF M/s

RDSO INSPECTING OFFICIAL



18. Surface Hardness :

Sample size –10% or 20 springs whichever is less

Actual no. of samples-

Hardness Specified 60Si7 380-440 BHN

52Cr₄Mo₂V 415-460 BHN

| SNo | Dia of Indentation | | Hardness (BHN) | SNo. | Dia of Indentation | | Hardness (BHN) |
|-----|--------------------|-----|----------------|------|--------------------|-----|----------------|
| | 1 st | 2nd | | | 1st | 2nd | |
| 1 | | | | 11 | | | |
| 2 | | | | 12 | | | |
| 3 | | | | 13 | | | |
| 4 | | | | 14 | | | |
| 5 | | | | 15 | | | |
| 6 | | | | 16 | | | |
| 7 | | | | 17 | | | |
| 8 | | | | 18 | | | |
| 9 | | | | 19 | | | |
| 10 | | | | 20 | | | |

18.1 Core hardness & Variation between surface and core hardness -

Samples size - 2% or 2 springs whichever is less

Actual no. of Samples:

Specified Value - 20 BHN

| Sample | 1 | | | | 2 | | | |
|-----------|---|----|----|-----|---|----|----|-----|
| | I | II | Av | BHN | I | II | Av | BHN |
| Surface | | | | | | | | |
| Core | | | | | | | | |
| Variation | | | | | | | | |

19. Chemical Compositions -

Sample size - 2% or 2 springs whichever is less

Actual No. of Samples-

| No | Specified Value | C | Mn | Si | S (max) | P(Max) | Cr | V | Mo |
|----|-------------------------------------|--------------|------------|--------------|---------|--------|------------|--------------|--------------|
| | 60 Si 7 | 0.55 to 0.65 | 0.8 to 1.0 | 1.5 to 2.0 | 0.025 | 0.025 | -- | -- | -- |
| | 52Cr ₄ Mo ₂ V | 0.48 to 0.56 | 0.7 to 1.1 | 0.15 to 0.40 | 0.025 | 0.025 | 0.9 to 1.2 | 0.07 to 0.12 | 0.15 to 0.25 |
| 1 | Value observed | | | | | | | | |
| 2 | | | | | | | | | |

QC INCHARGE OF M/s

RDSO INSPECTING OFFICIAL



20. Metallurgical –(Grain size)

Sample Size -2% or 2 springs whichever is less

Actual No. of Samples-

| Sample No. | Grain Size |
|-----------------|--------------------|
| Specified value | ASTM no.6 or finer |
| 1 | |
| 2 | |

21. Inclusion Rating-

Sample size – 2% or 2 springs whichever is less

Actual No. of Samples-

Specified Value – Not worse than 2.0 A B C D for thin series and 1.0 A B C D for thick series.

| Sample | A | | B | | C | | D | |
|--------|------|-------|------|-------|------|-------|------|-------|
| | Thin | Thick | Thin | Thick | Thin | Thick | Thin | Thick |
| 1 | | | | | | | | |
| 2 | | | | | | | | |

22. Macro Etching-

Sample size – 2% or 2 springs whichever is less

Actual No. of Samples-

Specified Value-C2, R2, S2 max.

| Sample No. | Macro Etch level | | |
|------------|------------------|---|---|
| | C | R | S |
| 1 | | | |
| 2 | | | |



| | | | | | | | | | | | | | | | | | | | | |
|---------|---------------------------------|----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 23 & 24 | Paint Quality or Powder coating | 10% of springs | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 25 | Grouping & steel band coding | 10% of springs | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

QC INCHARGE OF M/s

RDSO INSPECTING OFFICIAL

REVISION 0



26. Fatigue testing

(As per clause 11 of specification)

It is to be done in first lot of each type of spring supplied in every alternate year.

1. Fatigue testing previously done for this spring..... Yes/no
If no, then the following procedure is to be followed:
2. Fatigue testing is to be done for this lot:..... Yes/no
If yes, then the following procedure is to be followed:
3. Particulars of spring before fatigue testing:-
 - a) Free height =mm
 - b) Solid height =mm
 - c) Static deflection = (Free height – Working height.) =mm
 - d) Static (working) height =mm
 - e) Load at static height =kg
4. Particulars of spring during fatigue testing:-
 - a) Frequency of test (not < 2H_z) = H_z
 - b) Stroke (Static height ± 30% of static deflection) =mm
 - c) Static height measurement (on static load):-

| Measurement Cycle | Load at Static height kg (e) | Static Height (mm) |
|-------------------|------------------------------|--------------------|
| 2,50,000 | | |
| 5,00,000 | | |
| 7,50,000 | | |
| 10,00,000 | | |
| 12,50,000 | | |
| 15,00,000 | | |
| 17,50,000 | | |

5. Particulars of spring after fatigue testing :- (After 2 million cycle)
 - a) Free height =mm
 - b) Solid height =mm
 - c) Static deflection = (Free height. – Working height) =mm
 - d) Static (working) height =mm
 - e) Load at static height =kg
6. Actual load verses height graph from free to static height and free to solid height for both (before and after fatigue testing) is to be plotted.
7. Magna flux testing after fatigue is to be done – crack detected/not detected.
8. Failure of spring during fatigue testing observed:- Yes/No
If yes, full details are to be given.

Note: In case the fatigue test has not been done so fatigue test is required to be done at “FIRST”

QC INCHARGE OF M/s

RDSO INSPECTING OFFICIAL