

# **General Instruction Pages**

Train Operating Conditions Manual



## **SECTION 2** **LOCOMOTIVE OPERATIONS**

Version: 2.1

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### Document control

| Revision | Date of Approval | Summary of change      |
|----------|------------------|------------------------|
| 1.0      | 18/10/11         | For publication        |
| 2.0      | 23/1/15          | Amended as shown below |
| 2.1      | 25/10/15         | Amended as shown below |
|          |                  |                        |
|          |                  |                        |
|          |                  |                        |

### Summary of changes from previous version

| Section                                       | Summary of change  |
|---|--|
| Mixing and Speed Matching of Locomotive Types | Amended including S Class added to Category (h)<br>AC, ACA and ACB Classes added to Category (r) |
| Locomotive Load Categories. AC Loco Listing   | 93 Class Locomotive added  |
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|   |  |

## MARSHALLING OF LOCOMOTIVES

Powering locomotives may be marshalled anywhere within a train. Powering locomotives within the train consist or at the rear of a train are referred to as distributed power locomotives.

Up to five (5) locomotives may be marshalled together at the front of a train. The number of distributed power locomotives, marshalled together within a train consist and/or at the rear of a train, must not exceed the maximum horsepower limits specified for Assisting (Banking) Locomotives.

Unless otherwise approved by the **Network Manager**, the maximum number of locomotives, which can be marshalled, together and **powering** at any given time is specified under **Multiple Locos** in the **Maximum Speed of Locomotives and Rolling Stock** table, located in the respective Track Section Pages.

The lead locomotive in a light locomotive consist or on a train **must** be fitted with an operable approved *Driver Safety System*. Locomotives operating only in shunting yards are not required to have a *Driver Safety System*.

## MAXIMUM SPEED OF LIGHT LOCOMOTIVES

The maximum speed of light locomotives shall be that shown for each locomotive speed type, as specified in the **Maximum Speed of Locomotives and Rolling Stock** table, located in the respective Track Section Pages.

## ASSISTING (BANKING) LOCOMOTIVES

Additional locomotives may be used to assist a train where there is insufficient train locomotive tractive effort available. Assisting locomotives may be attached to the front or rear of a train.

If the locomotives are attached to the front of the train, the maximum number of powering locomotives specified under **Multiple Locos** in the **Maximum Speed of Locomotives and Rolling Stock** table located in the respective Track Section Pages, must not be exceeded, unless otherwise approved by the **Network Manager**.

If the assisting locomotives are attached to the rear of the train, the minimum allowable vehicle mass for vehicles within the trailing 1/3 of the train mass is shown in the following diagram.

a.

|  |  |                 |             |
|--|--|-----------------|-------------|
| MAXIMUM POWER OF BANK LOCOMOTIVES = 2983 kW<br>4000 HP | Minimum allowable vehicle mass 16 tonnes | LEADING TONNAGE | TRAIN LOCOS |
|--|--|-----------------|-------------|

b.

|  |  |                 |             |
|--|--|-----------------|-------------|
| MAXIMUM POWER OF BANK LOCOMOTIVES = 5966 kW<br>8000 HP | Minimum allowable vehicle mass 40 tonnes | LEADING TONNAGE | TRAIN LOCOS |
|--|--|-----------------|-------------|

c.

|   |  |                 |             |
|---|--|-----------------|-------------|
| MAXIMUM POWER OF BANK LOCOMOTIVES = 8949 kW<br>12000 HP | Minimum allowable vehicle mass 60 tonnes | LEADING TONNAGE | TRAIN LOCOS |
|---|--|-----------------|-------------|

### Notes:

1. In the case of multi-pack vehicles the minimum allowable vehicle mass measured at any bogie **shall not be less than** half the minimum allowable vehicle mass stated above.
2. Trains conveying Rail Compatible Road Trailers (i.e. Trailerrail) **must not** be assisted in the rear without the specific authority of the **Network Manager**.
3. Low mass vehicles should be marshalled, where possible, towards the centre of the train consist.

After a bank locomotive has been detached from the rear of a train, an end of train marker, (EOTM) must be fitted to the end of the rear vehicle on the train.

### DISTRIBUTED POWER

It is permissible to distribute locomotive power throughout a train consist. In addition to the locomotives at the front of a train, additional powering locomotives may be marshalled as a group within a train consist or at the rear of a train. These additional locomotives may be crewed or be controlled from the leading locomotive through hard wiring (for example, as with XPT), or by an approved remote wireless control.

In the case of remote wireless control, the operation must be sanctioned and approved by the **Network Manager** before use.

The train driver in the front locomotive must have full control of the automatic air brake throughout the train including the rear locomotive(s) and shall direct the driver of the distributed power locomotives, if crewed, when to apply and reduce power.

Distributed power trains employing locomotive/s at each end for the purpose of providing a shuttle operation, must be driven from the leading locomotive in the direction of travel, except when shunting or yard working.

If the distributed power locomotives(s) are marshalled at the rear of the train, refer to **Assisting (Banking) locomotives** section for the minimum allowable vehicle mass for vehicles in the trailing 1/3 of the train mass.

4 wheel vehicles and vehicles with non-automatic couplers **must not** be included in a distributed power train consist forward of the distributed power locomotives.

The two red lights on the rear locomotive must be exhibited as tail lights to indicate the rear of the train. A flashing tail light (end-of-train marker) is not required.

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### EXCESSIVE SANDING

Locomotives that apply excessive sand or sand continuously must be stopped and the fault rectified or the sanding magnet valve isolating cock closed. The signaller/train controller must be advised when sanding equipment is isolated.

If adhesion conditions require the use of sand, the sand equipment may be cut in and the train worked under block working conditions until the sand is again isolated. The signaller/train controller must be advised and be in agreement with this working.

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### DE-SANDING EQUIPMENT

It is a requirement that all locomotives with sanding equipment, and operating under power, be fitted with de-sanding equipment.

Locomotives **not fitted** with de-sanding equipment (identified in the **Section 10 Locomotive and Rolling Stock Data** pages, by **note R8**) or locomotives with inoperative de-sanding equipment, operating in **track circuited areas**, when operating as single units or as trailing units in a multiple unit consist **must have** their sanding equipment **isolated**.

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### LOCOMOTIVE WHEEL SPIN

Rails can be severely damaged by uncontrolled wheel spin. All cases of uncontrolled wheel spin and/or rail burns must be reported to the signaller/train controller so that arrangements can be made to have the rails inspected to determine the extent of the damage.

When a train comes to a stand on the ruling grade due to possible loss of locomotive power, insufficient adhesion (inoperative sanding system), train overloaded or there is evidence of wheel spin within the locomotive consist, **NO ATTEMPTS** shall be made to move the train until the defect is corrected. If the defect cannot be corrected the train must be declared a failure and be assisted from the section.

## LOCOMOTIVE (S) DEAD ATTACHED OR OFF LINE

Dead / off line attached locomotives may be marshalled anywhere within a train consist. Locomotives that are dead attached or off line must be included in the train load and for the purpose of train load calculations the live weight of the locomotive/s is multiplied by 1.1 to cover an increase in rolling resistance (due to the traction motor gearing).

If the dead attached locomotives are coupled to the train locomotives, all pneumatic hoses must be coupled.

If the dead attached locomotives are marshalled in the train consist or at the rear of the consist, these locomotive(s) must be certified as having passed the brake system sensitivity part of the single car air test before being considered fit to be marshalled in that position. The dead engine device must be cut-in.

Locomotive(s) which do not pass the sensitivity test cannot operate dead attached within the train or on the rear of the train consist, unless a crew person is available, to ensure the brakes release.

Locomotive(s) dead attached to the rear of a train must pass the brake pressure holding part of the single car air test before being considered fit to be marshalled in that position.

## MARSHALLING OF LOCOMOTIVES DUE TO BRAKE VALVE TYPE

Unless otherwise approved, the following marshalling restrictions apply to locomotives due to the brake valve type on the **lead locomotive**.

| Brake valve type            | Marshalling requirement   |
|-----------------------------|---|
| A7-EL                       | Not to lead in more than a two (2) locomotive consist.<br>This restriction is due to the unreliability of the independent release on A7-EL brake valves on the third or more locomotives. |
| B7 – EL, 26L, 30CDW or Epic | Must lead on multiple locomotive consists of greater than two (2) locomotives.  |
| ECP                         | Can be operated on either ECP equipped trains or normal automatic air brake trains.   |

## MULTIPLE UNIT WORKING OF LOCOMOTIVES

The row headed “**Multiple Locos**” on page 1 of each of the **Track Section Pages**, specifies the maximum number of locomotives powering that may operate coupled together in a locomotive group on each relevant section of track.

A maximum of **five (5)** locomotives is permitted to be marshalled together in any locomotive group attached to a train. However, the number of locomotives that can be **powering** within each locomotive group is as specified on page 1 of each of the **respective Track Section Pages**.

### Dynamic braking restrictions

To control train speed, and dynamic brake is available, the train air brake must be used in conjunction with the dynamic brake under the following circumstances:

- When more than three (3) locomotives are marshalled on the front of the train and they are all capable of providing dynamic brake.
- Irrespective of the number of locomotives marshalled on the front of the train, if any empty vehicle, empty terminal platform or two (2) adjacent empty intermediate platforms (in the case of articulated multi pack vehicles) is marshalled with more than 2000 tonnes trailing the empty vehicle or platform/s.

## MIXING LOCOMOTIVE TYPES (ECP BRAKES)

Mixing of ECP equipped locomotives with standard automatic air brake locomotives on ECP trains is not permitted (except in the case of emergency working or where the standard locomotive is equipped with through wiring for ECP brake control)

## MIXING AC WITH DC TYPE LOCOMOTIVES

AC traction locomotives may be marshalled together in any combination with other AC locomotives.

AC locomotives may be mixed with any of the following DC locomotives (CLP, CLF, G, NR and X ONLY, no other DC locomotive mixing is permitted, unless specifically authorized by CRN TOC waiver)

When mixing AC locomotives with CLP, CLF, G and X class DC locomotives in any combination up to 4 locomotives, the 10% rule will not apply, however if the combined load is more than 80% of the full sectional load, a DC locomotive shall lead.

When mixing AC locomotives with NR class DC locomotives, the full sectional loads are AS published in the relevant Section Pages.

When three (3) or more locomotives are marshalled at the front of a train and are powering there is a risk of track buckling due to compressive reactive forces in the rail immediately behind the last powering locomotive. To minimise this risk, an unloaded vehicle or empty platform in the case of intermodal vehicles, shall not be marshalled in this position when the trailing load exceeds 70% of the maximum load.

Dynamic Braking for an individual operating locomotive shall only be used within the operating range of current DC locomotives: 230kN max from 16 km/h to 45km/h and reducing linearly to zero at speeds below 16 km/h.

These details are represented in Note R14 in Section 10 Locomotive and Rolling Stock Data

## MIXING AND SPEED MATCHING OF LOCOMOTIVE TYPES

Each type of locomotive, when operating on the ruling grade and conveying its Full Sectional Load, has its own specific balancing speed. Thus the mixing of locomotive types may result in the locomotive/s with the higher balancing speed, working excessively harder than the other/s.

To allow for this, where the loads for multiple unit mixed locomotives are not published in the **LOADS & CONDITIONS** table. The following method, unless approved otherwise, shall be used for determining the Full Sectional Load of the locomotive consist. Add together each of the individual **FULL SECTIONAL LOADS** for the required section and reduce the total by 10%. **(10% Rule)**

**e.g. a 1 in 40 gradient:**

$$81 + 44 \text{ class} = 1131t + 615t = 1746t - 175t (10\%) = 1571 \text{ tonnes}$$

**This 10% rule will not apply** when mixing locomotive classes listed within each of the following groups:

|     |  |     |   |
|-----|--|-----|---|
| (a) | *C,90, 81, 82,48 and 830               | (j) | C, 80, 48 and 830   |
| (b) | 81, AN, BL, DL and NR                  | (k) | *C, 48, 80, 81, 82, BL, G, GL, T, X and 830   |
| (c) | 42, 421, and GM                        | (l) | C, 80, 48 and 830   |
| (d) | 43, 44, 44s, 45, 45s, 600, 442, 442s   | (m) | G, DL, GL, RL and VL  |
| (e) | 442, 442s                              | (n) | 2 x 14 (MZ) + 1 x 44 class  |
| (f) | 44, 442, 422, 18, 31 and L             | (o) | DL and 80   |
| (g) | 421 and 422                            | (p) | AN, DL, NR and VL   |
| (h) | CLP, CLF, 31, L, 22, S, GM(12) and 830 | (q) | CM, G, GL and VL  |
| (i) | G, X and T                             | (r) | GWA, LDP, LDP10, SCT, TT, TT100, WH, SSR, 92, 93, 6000, 6020, AC, ACA, ACB, ACC, CEY, CF, FIE, GWU, XRN |

\* Locomotives C502 – C510 only.

Alternate methods of determining locomotive loads may be considered but must be sanctioned and approved by the **Network Manager** before use.

## LOCOMOTIVE LOAD & SPEED CATEGORIES

The following tables identifies locomotives by load and speed categories:

### DC LOCOMOTIVE LISTING

| NUMERICAL CODES |            |           |       |      | ALPHABETICAL CODES |            |           |       |      |
|-----------------|------------|-----------|-------|------|--------------------|------------|-----------|-------|------|
| Loco Code       | Speed Cat. | Load Cat. | Power |      | Loco Code          | Speed Cat. | Load Cat. | Power |      |
|                 |            |           | kW    | HP   |                    |            |           | kW    | HP   |
| 14              | S5         | L7        | 2867  | 3845 | ALF                | S5         | L6        | 2237  | 3000 |
| 18              | S7         | L10       | 1790  | 2400 | AN                 | S4         | L2        | 2983  | 4000 |
| 22              | S9         | L10       | 1491  | 2000 | B                  | S6         | L12       | 1119  | 1500 |
| 31              | S2         | L5        | 2237  | 3000 | BL                 | S5         | L4        | 2237  | 3000 |
| 42              | S6         | L12       | 1305  | 1750 | C#                 | S3         | L4, L8    | 2237  | 3000 |
| 421             | S9         | L12       | 1342  | 1800 | CLF                | S5         | L6        | 2237  | 3000 |
| 422             | S9         | L10       | 1491  | 2000 | CLP                | S5         | L6        | 2237  | 3000 |
| 423             | S11        | L12       | 1119  | 1500 | CM                 | S3         | L3        | 2462  | 3300 |
| 43              | S10        | L12       | 1193  | 1600 | D                  | S6         | L11       | 1454  | 1950 |
| 44              | S9         | L12       | 1342  | 1800 | DL                 | S6         | L5        | 2237  | 3000 |
| 44s             | S10        | L12       | 1193  | 1600 | EL                 | S9         | L7        | 1827  | 2450 |
| 442             | S8         | L11       | 1491  | 2000 | FL                 | S9         | L10       | 1491  | 2000 |
| 442s            | S8         | L11       | 1491  | 2000 | G                  | S5         | L4        | 2237  | 3000 |
| 45              | S9         | L12       | 1342  | 1800 | GL                 | S5         | L4        | 2237  | 3000 |
| 45s             | S9         | L12       | 1342  | 1800 | GM(1)              | S8         | L13       | 1119  | 1500 |
| 47              | S13        | L13       | 746   | 1000 | GM(12)             | S8         | L12       | 1305  | 1750 |
| 48              | S13        | L13       | 671   | 900  | GPU                | S13        | L13       | 671   | 900  |
| 48200           | S13        | L13       | 671   | 900  | HL                 | S9         | L10       | 1491  | 2000 |
| 48s             | S13        | L13       | 671   | 900  | K                  | S9         | L11       | 1454  | 1950 |
| 49              | S13        | L13       | 652   | 875  | L                  | S2         | L6        | 2237  | 3000 |
| 73              | S14        | L14       | 485   | 650  | LQ                 | S2         | L5        | 2237  | 3000 |
| 80              | S6         | L9        | 1491  | 2000 | LZ                 | S2         | L5        | 2237  | 3000 |
| 80s             | S6         | L9        | 1491  | 2000 | MM                 | S13        | L13       | 652   | 875  |
| 81              | S5         | L4        | 2237  | 3000 | NR                 | S4         | L2        | 2983  | 4000 |
| 82              | S5         | L3        | 2237  | 3000 | PL                 | S13        | L13       | 671   | 900  |
| 90              | S1         | L1        | 2983  | 4000 | RL                 | S3         | L4        | 2983  | 4000 |
| 103             | S9         | L12       | 1342  | 1800 | S                  | S8         | L12       | 1342  | 1800 |
| 600             | S9         | L13       | 671   | 900  | T                  | S12        | L13       | 652   | 875  |
| 830             | S13        | L13       | 671   | 900  | VL                 | S5         | L4        | 2237  | 3000 |
| 900             | S13        | L13       | 671   | 900  | X(mk1)             | S8         | L9        | 1342  | 1800 |
| 1100            | S3         | L4        | 2237  | 3000 | X(mk2)             | S8         | L9        | 1491  | 2000 |
|                 |            |           |       |      | X(mk3)             | S8         | ##L7      | 1491  | 2000 |
|                 |            |           |       |      | XR                 | S5         | L5        | 2237  | 3000 |
|                 |            |           |       |      | XRB                | S5         | L5        | 2237  | 3000 |

# L8 Applies only to locomotive C501

## L7 Applies only to locomotives X46, X47 and X51

### AC LOCOMOTIVE LISTING

| NUMERICAL CODES |            |             |       |      | ALPHABETICAL CODES |            |             |       |      |
|-----------------|------------|-------------|-------|------|--------------------|------------|-------------|-------|------|
| Loco Code       | Speed Cat. | Load Cat. % | Power |      | Loco Code          | Speed Cat. | Load Cat. % | Power |      |
|                 |            |             | kW    | HP   |                    |            |             | kW    | HP   |
| 92              | S3         | AC6         | 3350  | 4500 | AC                 | S3         | AC6         | 3350  | 4500 |
| 93              | S3         | AC6         | 2983  | 4500 | ACA                | S3         | AC6         | 3350  | 4500 |
| 5000 \$         | N/A        | N/A         | 2983  | 4500 | ACB                | S3         | AC6         | 3350  | 4500 |
| 6000            | S3         | AC6         | 2983  | 4500 | ACC                | S3         | AC6         | 3350  | 4500 |
| 6020            | S3         | AC6         | 2983  | 4500 | CEY                | S3         | AC6         | 3350  | 4500 |
|                 |            |             |       |      | CF                 | S3         | AC6         | 3350  | 4500 |
|                 |            |             |       |      | FIE                | S3         | AC6         | 3350  | 4500 |
|                 |            |             |       |      | GWA                | S3         | AC6         | 3350  | 4500 |
|                 |            |             |       |      | GWU                | S3         | AC6         | 3350  | 4500 |
|                 |            |             |       |      | LDP                | S3         | AC6         | 3350  | 4500 |
|                 |            |             |       |      | SCT                | S3         | AC6         | 3350  | 4500 |
|                 |            |             |       |      | SSR                | S3         | AC6         | 3350  | 4500 |
|                 |            |             |       |      | TT \$              | S2         | AC6         | 3350  | 4500 |
|                 |            |             |       |      | TT100              | S3         | AC6         | 3350  | 4500 |
|                 |            |             |       |      | XRN                | S3         | AC6         | 3350  | 4500 |
|                 |            |             |       |      | WH                 | S3         | AC6         | 3350  | 4500 |

\$ This locomotive is not authorized to operate on the CRN

% The AC6 loading is based on locomotives with a maximum gross mass of 134 tonnes.

**LOCOMOTIVE LOAD CATEGORIES**

| AC LOCOMOTIVE LOAD CATEGORY |   |       |      |
|-----------------------------|---|-------|------|
| Load Category               | Locomotive Code   | Power |      |
|                             |   | kW    | HP   |
| N/A                         | 5000 \$   | 3080  | 4130 |
| AC6 %                       | 92, 93, 6000, AC,ACA, ACB, ACC, CEY, CF, FIE, GWA, GWU, LDP, SCT, SSR, TT, TT100, WH, XRN | 3350  | 4500 |

\$ This locomotive is not authorized to operate on the CRN  
 % The AC6 loading is based on locomotives with a maximum gross mass of 134 tonnes.

| DC LOCOMOTIVE LOAD CATEGORY |  |         |         |
|-----------------------------|--|---------|---------|
| Load Category               | Locomotive Code  | Power   |         |
|                             |  | kW      | HP      |
| L1                          | 90   | 2983    | 4000    |
| L2                          | AN, NR   | 2983    | 4000    |
| L3                          | 82, CM   | 2237    | 3000    |
| L4                          | 81, BL, C, G, GL, VL, 1100                                 | 2237    | 3000    |
| L4                          | RL   | 2983    | 4000    |
| L5                          | 31, DL, LQ, LZ, XR, XRB                                    | 2237    | 3000    |
| L6                          | ALF, CLF, CLP, L,  | 2237    | 3000    |
| L7                          | 14   | 2867    | 3845    |
| L7                          | EL   | 2237    | 3000    |
| L7                          | X(mk2), X(mk3) ##  | 1491    | 2000    |
| L8                          | C #  | 2237    | 3000    |
| L9                          | 80, 80s, X(mk1)  | 1342    | 1800    |
| L10                         | 18, 22, 422, DC, HL, FL                                    | 1491    | 2000    |
| L11                         | 442, 442s  | 1491    | 2000    |
| L11                         | D, K   | 1454    | 1950    |
| L12                         | 42, 421, 423, 43, 44, 44s, 45, 45s, 103, 600, B, GM(12), S | 1342    | 1800    |
| L13                         | 47, 48, 4800, 48s, GPU, 49, 830, 900, GM(1) , MM, PL, T    | 652-671 | 875-900 |
| L14                         | 73   | 485     | 650     |

# L8 Applies only to locomotive C501  
 ## Applies only to locomotives X46, X47 and X51

When a locomotive with its maximum associated load, is unavailable, a superior or equivalent locomotive may be utilised for that load.

Locomotives that appear on the same line in the table above are deemed to be equivalent locomotives and can operate to the same loads. However these locomotives do not necessarily operate at the same speed when hauling their full load on the ruling grade. Accordingly, reference must be made to the "Mixing Locomotive Types" table to ascertain if a 10% load reduction is required before operating any mixed locomotive loads on the CRN.

When a superior locomotive has been selected, reference must be made to the **Maximum Speed of Locomotives and Rolling Stock Table** for the particular track section covering the intended area of operation, to check that the locomotive "S" rating is approved to operate.



## LOCOMOTIVE SPEED CATEGORIES

## LOCOMOTIVE SPEED CATEGORY

| Speed Category | Locomotive Code  |
|----------------|--|
| <b>S1</b>      | 90   |
| <b>S2</b>      | L, 31, LQ, LZ, TT <b>See Notes</b>   |
| <b>S3</b>      | AC, ACA, ACB, ACC, C, CEY, CF, CM, FIE, GWA, GWU, LDP, LDP10, SCT, SSR, RL, TT100, XRN, WH, 1100, 6000, 6020, 92, 93 |
| <b>S4</b>      | AN, NR   |
| <b>S5</b>      | 81, 82, ALF, BL, CLF, CLP, G, GL, XRB, XR, VL  |
| <b>S6</b>      | 42, 80, 80s, B, DL   |
| <b>S7</b>      | 18   |
| <b>S8</b>      | 442, 442s, 700, GM(1), GM(12), S, X  |
| <b>S9</b>      | 22, 421, 422, 44, 45, 45s, 600, EL, FL, HL   |
| <b>S10</b>     | 43, 44s, 930   |
| <b>S11</b>     | 423  |
| <b>S12</b>     | T  |
| <b>S13</b>     | 47, 48, 48200, 48s, 49, 830, 900, MM, PL, GPU  |
| <b>S14</b>     | 73   |

The above table allocates locomotive types against speed categories.

**NOTES:** **S2** locomotives are not authorized to operate on the CRN unless it is under reduced fuel load conditions.

The speed category shown is purely allocated to a locomotive for its operation on the different track classes and is based on the locomotive axle load and load distribution. The speed categories are NOT TO BE USED for speed matching of locomotives.

## LOCOMOTIVE TRAILING LOAD TABLE

The following table identifies the allowable trailing loads for each locomotive “L” rating based on various ruling grades.

It should be noted that the ruling loads for DC locomotives rated between L2 and L13 have been de-rated to protect the locomotives’ control system whilst operating for extended periods on severe mountain grades.

For the purposes of load setting the locomotives are assumed to be operating with a 2/3 fuel load, which is governing the adhesive tractive effort.

| LOCOMOTIVE TRAILING LOAD TABLE (1) (2) (5) |      |      |      |      |      |      |      |      |      |      |      |      | GRADE |
|--|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| AC6  | L2   | L3   | L4   | L5   | L6   | L7   | L8   | L9   | L10  | L11  | L12  | L13  |       |
| 1133                                       | 900  | 750  | 750  | 696  | 551  | 543  | 517  | 442  | 430  | 388  | 362  | 253  | 1:30  |
| 1246                                       | 900  | 750  | 750  | 700  | 610  | 599  | 573  | 490  | 476  | 431  | 402  | 281  | 1:33  |
| 1393                                       | 1205 | 1110 | 1047 | 978  | 857  | 841  | 806  | 691  | 670  | 609  | 568  | 379  | 1:37  |
| 1500                                       | 1300 | 1200 | 1131 | 1056 | 926  | 909  | 875  | 750  | 725  | 660  | 615  | 410  | 1:40  |
| 1676                                       | 1458 | 1341 | 1265 | 1183 | 1040 | 1018 | 980  | 842  | 815  | 743  | 693  | 483  | 1:45  |
| 1710                                       | 1488 | 1369 | 1292 | 1208 | 1062 | 1040 | 1002 | 860  | 833  | 759  | 708  | 494  | 1:46  |
| 1846                                       | 1607 | 1479 | 1396 | 1307 | 1149 | 1125 | 1085 | 933  | 902  | 823  | 768  | 536  | 1:50  |
| 2011                                       | 1752 | 1613 | 1523 | 1427 | 1256 | 1228 | 1186 | 1020 | 986  | 901  | 841  | 587  | 1:55  |
| 2171                                       | 1892 | 1743 | 1646 | 1543 | 1359 | 1328 | 1285 | 1105 | 1068 | 977  | 912  | 636  | 1:60  |
| 2326                                       | 2028 | 1869 | 1766 | 1656 | 1459 | 1425 | 1380 | 1188 | 1147 | 1051 | 980  | 684  | 1:65  |
| 2357                                       | 2055 | 1894 | 1789 | 1678 | 1479 | 1444 | 1399 | 1204 | 1163 | 1065 | 994  | 693  | 1:66  |
| 2477                                       | 2161 | 1992 | 1882 | 1766 | 1557 | 1519 | 1473 | 1268 | 1224 | 1122 | 1047 | 731  | 1:70  |
| 2623                                       | 2289 | 2111 | 1995 | 1872 | 1651 | 1610 | 1563 | 1346 | 1299 | 1191 | 1112 | 776  | 1:75  |
| 2681                                       | 2340 | 2158 | 2039 | 1914 | 1688 | 1646 | 1598 | 1377 | 1328 | 1219 | 1137 | 793  | 1:77  |
| 2766                                       | 2414 | 2227 | 2104 | 1976 | 1743 | 1699 | 1650 | 1422 | 1372 | 1259 | 1175 | 820  | 1:80  |
| 2877                                       | 2512 | 2317 | 2190 | 2057 | 1815 | 1769 | 1719 | 1481 | 1428 | 1311 | 1224 | 854  | 1:84  |
| 2904                                       | 2536 | 2339 | 2211 | 2077 | 1833 | 1786 | 1736 | 1495 | 1442 | 1324 | 1236 | 862  | 1:85  |
| 2985                                       | 2607 | 2405 | 2274 | 2136 | 1885 | 1837 | 1785 | 1539 | 1484 | 1363 | 1272 | 887  | 1:88  |
| 3039                                       | 2654 | 2449 | 2315 | 2175 | 1920 | 1870 | 1818 | 1567 | 1511 | 1388 | 1295 | 904  | 1:90  |
| 3195                                       | 2791 | 2576 | 2435 | 2289 | 2021 | 1968 | 1915 | 1650 | 1591 | 1462 | 1365 | 952  | 1:96  |
| 3297                                       | 2881 | 2659 | 2514 | 2363 | 2086 | 2032 | 1975 | 1704 | 1643 | 1511 | 1410 | 984  | 1:100 |
| 3372                                       | 2946 | 2720 | 2571 | 2418 | 2135 | 2079 | 2023 | 1744 | 1681 | 1546 | 1443 | 1007 | 1:103 |
| 3421                                       | 2990 | 2760 | 2609 | 2453 | 2167 | 2109 | 2054 | 1770 | 1707 | 1569 | 1465 | 1022 | 1:105 |
| 3470                                       | 3032 | 2799 | 2647 | 2489 | 2198 | 2140 | 2084 | 1796 | 1731 | 1592 | 1486 | 1037 | 1:107 |
| 3542                                       | 3096 | 2858 | 2702 | 2541 | 2245 | 2185 | 2128 | 1835 | 1768 | 1627 | 1518 | 1059 | 1:110 |
| 3660                                       | 3199 | 2954 | 2793 | 2627 | 2321 | 2259 | 2200 | 1897 | 1828 | 1682 | 1570 | 1096 | 1:115 |
| 3775                                       | 3300 | 3047 | 2882 | 2711 | 2395 | 2330 | 2271 | 1959 | 1887 | 1737 | 1621 | 1131 | 1:120 |
| 3887                                       | 3398 | 3138 | 2968 | 2792 | 2467 | 2400 | 2340 | 2018 | 1944 | 1790 | 1670 | 1166 | 1:125 |
| 3974                                       | 3475 | 3210 | 3035 | 2856 | 2524 | 2455 | 2394 | 2065 | 1989 | 1831 | 1709 | 1193 | 1:129 |
| 4102                                       | 3587 | 3314 | 3134 | 2949 | 2607 | 2535 | 2472 | 2133 | 2055 | 1892 | 1766 | 1232 | 1:135 |
| 4206                                       | 3679 | 3398 | 3214 | 3025 | 2674 | 2600 | 2536 | 2188 | 2108 | 1941 | 1812 | 1264 | 1:140 |
| 4308                                       | 3768 | 3481 | 3292 | 3099 | 2739 | 2664 | 2599 | 2242 | 2160 | 1989 | 1857 | 1296 | 1:145 |
| 4407                                       | 3855 | 3562 | 3369 | 3171 | 2803 | 2726 | 2660 | 2295 | 2210 | 2036 | 1900 | 1326 | 1:150 |
| 4504                                       | 3940 | 3640 | 3443 | 3242 | 2866 | 2786 | 2719 | 2346 | 2260 | 2082 | 1943 | 1356 | 1:155 |
| 4598                                       | 4023 | 3717 | 3516 | 3311 | 2927 | 2845 | 2778 | 2397 | 2308 | 2127 | 1985 | 1385 | 1:160 |
| 4691                                       | 4104 | 3792 | 3587 | 3378 | 2987 | 2903 | 2834 | 2446 | 2355 | 2171 | 2026 | 1414 | 1:165 |
| 4956                                       | 4337 | 4008 | 3792 | 3571 | 3158 | 3069 | 2997 | 2687 | 2491 | 2296 | 2143 | 1496 | 1:180 |
| 5057                                       | 4426 | 4090 | 3869 | 3645 | 3223 | 3132 | 3060 | 2641 | 2542 | 2344 | 2188 | 1527 | 1:186 |
| 5122                                       | 4476 | 4137 | 3914 | 3687 | 3260 | 3169 | 3095 | 2671 | 2571 | 2371 | 2213 | 1544 | 1:190 |
| 5172                                       | 4526 | 4184 | 3958 | 3728 | 3297 | 3204 | 3130 | 2702 | 2601 | 2399 | 2239 | 1562 | 1:193 |
| 5204                                       | 4555 | 4210 | 3983 | 3752 | 3318 | 3224 | 3150 | 2719 | 2617 | 2414 | 2253 | 1572 | 1:195 |
| 5283                                       | 4624 | 4274 | 4044 | 3809 | 3369 | 3274 | 3199 | 2761 | 2658 | 2452 | 2288 | 1600 | 1:200 |
| 5283                                       | 4624 | 4274 | 4044 | 3809 | 3369 | 3274 | 3199 | 2761 | 2658 | 2452 | 2288 | 1600 | Level |
| (4)  | (3)  | (3)  | (3)  | (3)  | (3)  | (3)  | (3)  | (3)  | (3)  | (3)  | (3)  | (3)  | NOTES |

**Note (1)** This Maximum Trailing Load Table is based on a locomotive 2/3 fuel load and total train resistance of 3.63 kg/tonne.

**Note (2)** Locomotives with a gross mass exceeding 134 tonnes will only be permitted to operate on specific corridors with the approval of the infrastructure owner/manager.

**Note (3)** The shaded loads shown in the first two lines are governed by grade and length of grade. The following load reductions have been applied to the following grades/locations:  
 1:33 - Blue Mountains Down direction. All load categories L2 to L13 (incl) reduced 20%.  
 1:30 - Illawarra Mountain Down direction. L6 to L12 (incl) 20%, L2 = 8%, L3 to L5 (incl) 12%, L13 = 16%.

**Note (4)** The maximum allowable mass for the operation of AC locomotives on RailCorp and CRN track, is 134 tonnes.

**Note (5)** The maximum trailing loads shown in this table are for generic grades. In some locations the grade may be short enough to permit an increased load, operating under momentum conditions. Load increases will not be granted without substantial test evidence to back up a claim for increased locomotive performance.