

# SECTION 2

# LOCOMOTIVE OPERATIONS

Version: 4.0

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## Document control

| Revision | Date of Approval | Summary of change          |
|----------|------------------|----------------------------|
| 4.0      | 1/05/2020        | Per below detailed summary |
|          |                  |                            |
|          |                  |                            |
|          |                  |                            |

## Summary of changes from previous version

| Clause      | Summary of change   |
|-------------|---|
| All         | Reformatted for ease of reference, some clauses have been recategorised to remove repetition  |
| 1, 2, 3 & 4 | Updated per CRN 20-003  |
| 3           | Requirements have been combined with Clause 1   |
| 9           | Requirements for mixing ECP and Mechanical Brake Valve equipped locomotives integrated into Brake Valve requirements                          |
| 11.3        | Updated per CRN 19-066  |
| 11.4.4      | Updated to supercede CRN 20-014   |
| 16, 17, 18  | Removed reference tables as format changes to CRN TOC Section 10 have provided a similarly formatted lookup table                             |
| 19          | Removed reference tables as section specific load ratings don't necessarily directly relate to the nominal ruling grade for the track section |
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# 1. GENERAL REQUIREMENTS FOR THE SAFE TRANSIT OF FREIGHT ON RAIL

This section specifies the basic principles and minimum requirements for the safe rail conveyance of freight.

- 1.1. Powering Locomotives may be marshalled anywhere within a train.
- 1.2. Powering Locomotives within the Train Consist or at the rear of a train are referred to as Distributed Power Locomotives.
  - 1.2.1. See clause 4 for further Operating conditions on Distributed Power & Banking Locomotives.
- 1.3. A maximum of eight (8) locomotives may be marshalled together in any locomotive group attached to a train:
- 1.4. When determining the hauling power of a locomotive group, the sum of the listed power against the locomotive listing in Section 10 of the TOC shall be taken to be the total power. The power reduction calculations for hauled load do not apply to these power calculations.
  - 1.4.1. All locomotives must be controlled in the synchronous mode of operation, meaning that all locomotives always follow a single command signal at all times.
  - 1.4.2. The maximum number of locomotives permitted to be powering at any given time within a single group shall not exceed 17,600 horsepower
  - 1.4.3. Where a train is operated with mixed loading, lightly loaded vehicles within a heavy train (total train mass exceeding 3600 tonne), all vehicles within one third (1/3) of the total train mass of any locomotive group shall have a minimum bogie load based on the Power of the Locomotive Group.

| POWER OF LOCOMOTIVE GROUP | MINIMUM ALLOWABLE BOGIE LOAD                |
|---------------------------|---|
| 4400 hp (3282 kW)         | 8 tonne (typical vehicle mass of 16 tonne)  |
| 8800 hp (6564 kW)         | 20 tonne (typical vehicle mass of 40 tonne) |
| 13200 hp (9847 kW)        | 30 tonne (typical vehicle mass of 60 tonne) |
| 17600 hp (13129 kW)       | 35 tonne (typical vehicle mass of 70 tonne) |

**Notes:**

- 1. Vehicles arranging in tandem or articulated sets may be presented with more than the typical two (2) bogies per vehicle number. In these cases, the vehicle mass requirement shall be built up by the number of bogies that the vehicle features.
- 2. Low mass vehicles should be marshalled as far as practically possible from all hauling locomotives.

## 2. MAXIMUM SPEED OF LIGHT LOCOMOTIVES

- 2.1. The maximum speeds of all approved locomotive speed types for a specific route, are specified in the **Maximum Speed of Locomotives and Rolling Stock** table, located in the respective Track Section Pages.
  - 2.1.1. All "Light Engine" locomotives shall adhere to the applicable maximum speed nominated in the **Maximum Speed of Locomotives and Rolling Stock** table, located in the respective Track Section Pages.

## 3. DRIVER SAFETY SYSTEMS

Locomotives with the R25 restriction do not have compliant Driver Safety Systems, additionally other locomotives may also have defective Driver Safety System(s)

- 3.1. When operated in a protected shunting yard or siding Locomotives do not require compliant and operable Driver Safety Systems.
- 3.2. In all other cases on the CRN leading locomotives shall have compliant and operable Driver Safety System(s)

## 4. DISTRIBUTED POWER & BANKING LOCOMOTIVES

- 4.1. 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.
- 4.2. In the case of remote wireless control, the operation must be approved via a TOC Waiver before use.
- 4.3. The train driver in the front locomotive must maintain 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.
- 4.4. 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.
- 4.5. If the distributed power locomotives(s) are marshalled at the rear of the train, refer to clause 1.3.4 for the minimum allowable vehicle mass for vehicles in the trailing 1/3 of the train mass.
- 4.6. 4 wheel vehicles and vehicles fitted with buffer couplers **must not** be included in a banked train or a distributed power train consist forward of the distributed power locomotives.
- 4.7. Where a locomotive is marshalled as the last vehicle in the train it may illuminate the rear marker lights to act as "tail lights" to indicate the rear of the train for compliance with the **CNTR 406**. Should the rear marker lights not be illuminated an "End-of-train marker" is required.
- 4.8. Trains conveying Rail Compatible Road Trailers (i.e. Trailerrail) must not be marshalled in a position that is trailing all locomotives within a train.
- 4.9. Distributed Power & Banking Locomotives are not to be marshalled in the first 40% of the train mass.

## 5. EXCESSIVE SANDING

- 5.1. 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.
- 5.2. 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.

## 6. DE-SANDING EQUIPMENT

- 6.1. It is a requirement that all locomotives with sanding equipment, and operating under power, be fitted with de-sanding equipment.
- 6.2. 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**.

## 7. LOCOMOTIVE WHEEL SPIN

- 7.1. 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.
- 7.2. 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.

## 8. LOCOMOTIVE(S) DEAD ATTACHED OR OFFLINE

- 8.1. Dead / offline attached locomotives may be marshalled anywhere within a train consist. Locomotives that are dead attached or offline 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).
- 8.2. If the dead attached locomotives are coupled to the train locomotives, all pneumatic hoses must be coupled.
- 8.3. If the dead attached locomotives are marshalled in the train consist or at the rear of the consist:
  - 8.3.1. These locomotive(s) must be certified as having passed a Single Car Air Test (SCAT) within the previous two years before being considered fit to be marshalled in that position.
  - 8.3.2. If fitted, the dead engine device must be cut-in.
- 8.4. In an emergency, locomotive(s) which do not pass the sensitivity test component of the SCAT 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.

## 9. MARSHALLING OF LOCOMOTIVES DUE TO BRAKE VALVE TYPE

- 9.1. 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)
- 9.2. 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.   |

## 10. DYNAMIC BRAKING RESTRICTIONS

- 10.1. 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:
  - 10.1.1. 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 tonne trailing the empty vehicle or platform/s
  - 10.1.2. 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.

## 11. MIXING AND SPEED MATCHING OF LOCOMOTIVE TYPES

11.1. 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.

11.1.1. Unless otherwise approved in clause 11.4 of this document or by a CRN TOC Waiver, no AC traction locomotives are permitted to operate with DC traction locomotives.

11.2. 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:**

$$81 + 44 \text{ class} = 1,131\text{t} + 615\text{t} = 1,746\text{t} - 175\text{t} (10\%) = 1,571 \text{ tonne}$$

11.3. **Clause 11.2** (aka “10% rule”) **will not apply** when mixing locomotive classes listed within each of the following groups:

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

\* Locomotives C502 – C510 only.

11.4. **The following clauses apply where AC traction are working with DC traction locomotives**

11.4.1. If the combined load is more than 80% of the full sectional load, a DC locomotive shall lead.

11.4.2. A single CLP, CLF, G and X locomotives are approved to operate with up to 3 AC traction locomotives without applying clause 11.2 (aka “10% rule”) however, all other clauses apply.

11.4.3. Any number of NR locomotives are approved to operate with any number of AC traction locomotives without applying clause 11.2 (aka “10% rule”) however, all other clauses apply.

11.4.4. One or more AC6 locomotive maybe substituted into a DC locomotive consist as equivalent to the maximum L rated hauling locomotive within the consist. Clause 11.2 (aka “10% rule”) does not apply if the DC locomotive combination is exempted by clause 11.3

## 12. LOCOMOTIVE PERFORMANCE DATA

12.1. Refer to Section 10 of the CRN TOC Manual for class specific vehicle data.

12.2. Refer to the CRN TOC Manual Section Pages for location specific loads.