

NATIONAL CODE OF PRACTICE

A close-up photograph of several interlocking metal gears, likely from a heavy-duty vehicle transmission or engine. The gears are made of polished metal and are shown in a dynamic, slightly blurred state, suggesting motion. The lighting highlights the texture and metallic sheen of the gear teeth.

**VSB 6**

HEAVY VEHICLE MODIFICATIONS

**Section S**  
**Vehicle Rating**

## HEAVY VEHICLE MODIFICATIONS

## 1. SCOPE

This section relates to the certification of mass ratings for powered vehicles and trailers and the certification of Road Train and B-Double vehicles.

It contains as appendices, separate Modification Codes to allow a Certifying Officer who is approved by the relevant Registration Authority to assign Gross Vehicle Mass, Gross Combination Mass and Aggregate Trailer Mass ratings to modified vehicles or vehicles for which the original Manufacturer's records are no longer available.

Modification Codes are also included to provide guidelines for suitably qualified Certifying Officers to inspect, test and certify Road Train and B-Double vehicles as meeting the minimum requirements of National and State transport regulations.

## 2. GENERAL INFORMATION

The separate Modification Codes included as Appendices in Section S are:

- S1 Gross Vehicle Mass Rating and Gross Combination Mass Rating to S2 or S3 approved design or within vehicle manufacturer's specification
- S2 Approved Design Certification of Gross Vehicle Mass Rating for a modified vehicle
- S3 Approved Design Certification of Gross Combination Mass Rating for a modified vehicle
- S4, S5 and S6 Bus Rating Codes used in Queensland only
- S7 Aggregate Trailer Mass Rating to S12 Approved Design Certification or within vehicle manufacturer's specification
- S8 Road Train Prime Mover Rating
- S9 Rating of B-Double Combination
- S10 Rating for Livestock Loading; used in Queensland
- S11 Rating of Road Train Trailer
- S12 Approved Design Certification of Aggregate Trailer Mass Rating for modified trailers

## HEAVY VEHICLE MODIFICATIONS

The intention of Codes S1 and S7 is to provide guidelines for authorised certifiers/officers to certify mass ratings to trucks or trailers which they have modified or have inspected on behalf of other persons.

The codes require the rating to be based either on a manufacturer's rating for an identical vehicle or on a report prepared in accordance with codes S2, S3 or S12 by a registered professional engineer.

The design certification codes S2, S3 and S12 that are normally provided by approved engineers do not require them to inspect the individual vehicles. The codes specify guidelines under which a report may be prepared (including any information supplied by the S1 or S7 certifying officer), to recommend ratings which could be applied to a vehicle in good mechanical condition and fitted with the specified components.

### 3. ADRs AFFECTED

The ADRs affected under each code are listed in the individual appendices.

### 4. AFFECTING MODIFICATIONS

The "S" series of Modification Codes apply to trucks or trailers that are modified in a way that affects their carrying capacity (GVM/ATM) or hauling/towing capacity (GCM); however "S" codes do not apply to trailer modifications where the basic trailer type is altered e.g. semitrailer conversion to dog trailer or pig trailer.

When a trailer type is altered, the trailer is regarded as being remanufactured rather than modified and as such, requires a new identification plate approval to be issued. The re-manufactured trailer will require a new VIN to be issued to identify correctly the trailer type and the manufacturer.

The Road Train and B-Double rating codes apply to trailers which have been built or modified for use in these applications but which lack the manufacturer's statement "ROAD TRAIN" or "B-DOUBLE" as applicable on the Identification Plate as specified in ADR 61/.. to signify the manufacturer's certification of conformance to all relevant Standards and Regulations.

### 5. GENERAL REQUIREMENTS

Section S applies to all heavy vehicles and should be used in conjunction with the relevant Appendices which are specific for particular rating requirements.

#### 5.1 Increase in GVM/GCM

For a vehicle to qualify for an increase in GVM and/or GCM, the vehicle must be able to safely operate at the increased GVM and/or GCM. If modifications are necessary, it is preferred to reproduce the vehicle manufacturer's specification relevant at the increased GVM/GCM.

A vehicle in standard manufacturer's specification (i.e. without any modifications) cannot be granted an increase in GVM/GCM above the manufacturer's rating unless specifically approved by the vehicle manufacturer by issuing a specific approval letter bearing the VIN. Letters containing a series of VINs or a letter issued by an authorized dealer will not be acceptable.

When modifications such as fitting of additional or replacement axles with higher load rating are carried out, the vehicle frame must be analysed to ensure that it has sufficient strength to accommodate the increased GVM/GCM. Refer to Section H "Calculation of Chassis Strength" of this Code.

A simplified way to look at the frame requirements for each of these ratings, is to associate the bending strength of the chassis with the load carrying capacity (i.e. GVM), and the torsional strength of the chassis with the GCM rating.

When a significant increase in GCM is required, it is often necessary to perform a major rework of the vehicle's chassis. Any rework would be required to stiffen the vehicle's frame as vehicles with a high GCM rating would normally be fitted with larger cross members, as well as larger frame rails. The engine and driveline are also critical components in GCM rating. The GVM, however, is mainly dependent on the frame rail size and this is somewhat more readily upgraded.

The GVM rating cannot exceed the GCM rating.

The chassis, drive-train, axles, suspension, brakes, steering, wheels and tyres are critical components which must be assessed individually to ensure that each is suitable to operate under the increased loads resulting from increased operating mass. Refer to the relevant sections of this Code of Practice.

## 6. RECORDING

Appendices of this document are S1, S2, S3, S7, S8, S9, S11 and S12, which:

- Summarise the scope of modification work which may be certified under each of the corresponding Modification Codes.
- Include lists of Sections of this National Code of Practice covering other areas of the vehicle which may have been affected by the modification and which should be analysed to determine whether they, too, require re-certification.
- Include checklists appropriate to the particular Modification Code that should be completed.

While the checklists allow recording of the most significant vehicle details pertinent to the rating being issued, it is required that records of analysis, work records, sketches and other vehicle data, together with the Calculation Sheets and completed checklists, be retained by the Certifying Officer for at least the period specified in Part A of this National Code of Practice.

## HEAVY VEHICLE MODIFICATIONS

## Appendix 1

## Modification Code S1

**RATING OF GROSS VEHICLE MASS OR  
GROSS COMBINATION MASS  
TO S2 OR S3 APPROVED DESIGN OR WITHIN  
THE VEHICLE MANUFACTURER'S SPECIFICATION**

Certifications that are covered under this Modification Code are:

1. Gross Vehicle Mass (GVM) rating and/or Gross Combination Mass (GCM) rating for a vehicle which has been modified to conform to an alternative specification of the vehicle manufacturer.
2. Gross Vehicle Mass (GVM) rating and/or Gross Combination Mass (GCM) rating for a vehicle which has been inspected and confirmed by the Certifying Officer to have been modified to a design certified by an S2 or S3 Certifying Officer as suitable for the revised rating.
3. Gross Vehicle Mass (GVM) rating and/or Gross Combination Mass (GCM) rating for a vehicle for which the vehicle manufacturer has issued a Letter of Approval certifying the alternative rating.

Certifications that are **not** covered under this modification code are:

1. Gross Vehicle Mass (GVM) rating and/or Gross Combination Mass (GCM) rating for a vehicle where a Certifying Officer does not hold a copy of a design specification certifying the alternative rating issued by either the vehicle manufacturer or by a Certifying Officer with S2 and/or S3 authorisation.
2. Gross Vehicle Mass (GVM) rating reductions (with or without modifications) undertaken for the purpose of reducing the statutory charges (e.g. registration fees, toll charges etc) applying to the vehicle at the vehicle manufacturer's original GVM.

**NOTE: The modified vehicle/modifications must continue to comply with all applicable ADR's, Australian Standards and Regulations/Acts.**

Outlined below are the areas of the vehicle that may have been affected by the modifications and that may require re-certification, testing and/or data to show compliance for the modified vehicle.

| DETAIL       | REQUIREMENTS  |
|--------------|---|
| Brakes       | ADR 35, 35A, 35/.., Modification Codes G4 and G7                  |
| Suspension   | Manufacturer's rating, Modification Code F1                       |
| Steering     | Modification Code E2  |
| Chassis      | Manufacturer's rating, Modification Code H                        |
| Engine       | ADR 30, 30/.., 36, 36A, 36/.., 70/..,80/..<br>Modification Code A |
| Transmission | Manufacturer's rating, Modification Code B                        |
| Tailshaft    | Modification Code C   |

## HEAVY VEHICLE MODIFICATIONS

|       |   |
|-------|---|
| Axles | Manufacturer's rating, Modification Codes D and E |
| Tyres | Manufacturer's rating, ADR 24, 24A, 24/..,42/..   |

If any of the areas listed above are affected by modifications made to the vehicle in order to achieve the GVM or GCM rating, they must comply with the prescribed standards and where necessary, must be approved by a Certifying Officer holding the appropriate modification code/s.

## HEAVY VEHICLE MODIFICATIONS

## Appendix 1

**RATING OF GROSS VEHICLE MASS OR  
GROSS COMBINATION MASS  
TO S2 OR S3 APPROVED DESIGN OR WITHIN  
VEHICLE MANUFACTURER'S SPECIFICATION****SPECIFIC REQUIREMENTS****1.0 General**

Rerating under this Code is restricted to a vehicle modified either to a design configuration for which a certificate and checklist has been issued by an S2 or S3 Certifying Officer, or to the design configuration of an alternative vehicle produced by the vehicle manufacturer.

Under this code, GVM/GCM ratings may be increased or decreased to match the ratings of the modified components.

Typical modifications could include changes from single axle to tandem axle configuration or vice versa, or replacement of engine, transmission, axles or suspension components with alternative components which would allow a different rating.

The rerating must address the compatibility of the entire vehicle for the revised rating and in particular must check that the chassis, suspensions, axles, brakes, transmission and drive train components are used within the manufacturer's rated capacities. Where a component manufacturer has published information reducing the rating capacity of a component for safety reasons, the reduced rating must apply.

Reduction in Gross Vehicle Mass (GVM) rating is not permitted if undertaken for the purpose of reducing the statutory charges (e.g. registration fees, toll charges etc.) applying to the vehicle at the vehicle manufacturer's original GVM.

The revised GVM must not exceed the vehicle manufacturer's original GCM unless the vehicle's GCM has also been revised in accordance with Code S3.

**2.0 Tyre and Wheel Rims**

The sum of the load carrying capacities of the tyres and rims fitted shall be not less than the vehicle's GVM. In addition, the sum of the load carrying capacities of the tyres and rims fitted to an axle, shall be not less than the maximum load permitted on that axle (the lesser of the regulation limit and the axle rating).

The load carrying capacity of any tyre and rim must not be exceeded when the vehicle is loaded to the revised GVM rating.

The tyres and rims must be selected to comply with the requirements of the relevant ADR (ADR 24/... or ADR 42/04) at the revised GVM rating.

The (replaced or amended) tyre placard must continue to indicate the correct tyre and rim specifications for the **vehicle at its revised** GVM rating. The revised tyre size and load rating must also appear on the modification plate

## HEAVY VEHICLE MODIFICATIONS

**3.0 Chassis**

The modified chassis must conform to the design specification certified by the S2 or S3 Certifying Officer; or alternatively it must conform to the specification for material, reinforcement and cross-member installation by the vehicle manufacturer and for variant to which the modified vehicle is being compared.

**4.0 Brakes**

The braking performance of a vehicle is directly affected by changes in the vehicle's GVM. Before an increased GVM can be issued, it is necessary to upgrade the brakes in line with the vehicle manufacturer's specification or the design specification certified by the S2 or S3 Certifying Officer. Where a manufacturer's specification is used for comparison, the braking system must be original and similar to a system fitted by the manufacturer to a vehicle with a GVM equal to or slightly greater than (within 10%) the proposed GVM rating. Care should be taken with vehicles fitted with ESC systems- The increase payload may adversely affect their dynamic /stability performance.

**5.0 Driveline****5.1 Gradeability and Startability**

The vehicle's gradeability and startability should be appropriate for its revised GVM. The gradeability at the revised GVM must be at least 23%.

**5.2 Engine/Transmission**

The GVM rating assigned must not exceed the engine and transmission manufacturer's recommendations, or the limit set by vehicle manufacturers for a vehicle using the engine and transmission models being assessed. Where certification is by comparison with a manufacturer's reference vehicle, the engine and transmission fitted to the modified vehicle must be identical to those fitted by the manufacturer to the reference vehicle.

The engine/transmission mounting system must be assessed for adequacy to resist the maximum engine torque multiplied by the gear ratio of the transmission starting gear. This is particularly important where a transmission with lower gearing or an engine with higher torque output is used to improve the start-ability.

**5.3 Tailshaft**

A higher GVM will place greater demands on the torque capability of the tailshaft, with torque being limited either by the engine torque output or by wheel slip. The maximum possible torque must be established to be within the capability of the tailshaft.

**5.4 Front and Rear Axles and Suspension Assemblies**

Where certification is by comparison with a manufacturer's reference vehicle, the axle and suspension assemblies fitted to the modified vehicle must be identical to those fitted by the manufacturer to the reference vehicle with the higher GVM rating.

Where a component manufacturer has published information reducing the rating capacity of a component for safety reasons, the reduced rating must apply.

The entire steering system must be identical to that fitted by the manufacturer to the reference vehicle or must be approved under Code E2 of this National Code of Practice.



HEAVY VEHICLE MODIFICATIONS

CHECKLIST for Modification Code S1

**RATING OF GROSS VEHICLE MASS OR  
GROSS COMBINATION MASS  
TO S2 OR S3 APPROVED DESIGN OR WITHIN  
VEHICLE MANUFACTURER'S SPECIFICATION**

## HEAVY VEHICLE MODIFICATIONS

## Appendix 2

## Modification Code S2

**RATING OF GROSS VEHICLE MASS APPROVED DESIGN CERTIFICATION  
FOR MODIFIED VEHICLES OR FOR SPECIFIC PURPOSE VEHICLES e.g. MOTORHOMES**

Certifications that are covered under this Modification Code are:

1. Gross Vehicle Mass (GVM) rating increase or decrease for a vehicle which has been modified to a specification which differs from the manufacturer's standard specification.
2. Issue of a Gross Vehicle Mass (GVM) rating recommendation certificate and checklist to an S1 Certifying Officer who will inspect and plate the vehicle, in cases where the vehicle specification is supplied either by the vehicle owner or by the S1 Certifying Officer; the vehicle itself may not have been inspected by the S2 Certifying Officer.
3. Issue of a Gross Vehicle Mass (GVM) rating recommendation certificate and checklist to an S1 Certifying Officer who will inspect and plate the vehicle, for a vehicle whose manufacturer no longer exists and for which a manufacturer's GVM is not available.
4. Gross Vehicle Mass (GVM) rating reductions for Specific Purpose Vehicles (e.g. Motorhomes) where the maximum necessary and likely laden vehicle mass can be established to be lower than the vehicle manufacturer's original GVM.

Certifications that are **not** covered under this Modification Code are:

1. Rating of a vehicle's Gross Combination Mass (GCM). For GCM rating refer to Code S3.
2. Ratings which would cause any component of the vehicle to be loaded in excess of that component manufacturer's rating.
3. A reduction in Gross Vehicle Mass (GVM) rating without physically changing or modifying the vehicle; the change or modification must not reduce the vehicle's safety.

**NOTE: The modified vehicle/modifications must continue to comply with all applicable ADRs, Australian Standards and Regulations/Acts.**

Outlined below are the areas of the vehicle that may have been affected by the modifications and that may require recertification, testing and/or data to show compliance of the modified vehicle.

## HEAVY VEHICLE MODIFICATIONS

| DETAIL       | REQUIREMENTS   |
|--------------|--|
| Brakes       | ADR 35, 35A, 35/.., Modification Codes G4 and G7                   |
| Suspension   | Manufacturer's rating, Modification Code F1                        |
| Steering     | Modification Code E2   |
| Chassis      | Manufacturer's rating, Modification Code H                         |
| Engine       | ADR 30/.., 36, 36A, 36/.., 70/.., ADR 80/..<br>Modification Code A |
| Transmission | Manufacturer's rating, Modification Code B                         |
| Tailshaft    | Modification Code C  |
| Axles        | Manufacturer's rating, Modification Codes D and E,                 |
| Tyres        | Manufacturer's rating, ADR 24, 24A, 24/.., ADR 42/..               |

If any of the areas listed above are affected by modifications made to the vehicle to achieve the GVM rating, those areas must comply with the prescribed standards and where necessary must be approved by a Certifying Officer holding the appropriate modification code.

## HEAVY VEHICLE MODIFICATIONS

## Appendix 2

## Modification Code S2

**RATING OF GROSS VEHICLE MASS  
APPROVED DESIGN CERTIFICATION  
FOR MODIFIED VEHICLES OR FOR  
SPECIFIC PURPOSE VEHICLES (e.g. MOTORHOMES)****1.0 General****SPECIFIC REQUIREMENTS**

The intention of this Code is to allow suitably qualified Certifying Officers to certify the permissible Gross Vehicle Mass (GVM) rating of modified vehicles, either by personal inspection of the vehicle or by examination of written specifications supplied by the owner or the modifier.

Typical modifications would include changes from single axle to tandem axle configuration or vice versa, or replacement of engine, transmission, axles or suspension components with alternative components which would allow a different rating.

In the case of a vehicle which is not inspected by the S2 Certifying Officer, the S2 certificate and checklist should be issued. The checklist confirms the fact that the vehicle has not been inspected, identifies the source of the information and recommends an appropriate rating for a vehicle having components as listed in the checklist, subject to the vehicle being in satisfactory mechanical condition.

The certificate and checklist may then be used by an S1 Certifying Officer to rerate the individual vehicle after inspection to verify that the components are as described in the S2 certificate checklist and that the vehicle's mechanical condition is satisfactory.

The rerating must address the compatibility of the entire vehicle for the revised rating and in particular must check that the chassis, suspensions, axles and drive train components are used within the manufacturer's rated capacities. Where a component manufacturer has published information reducing the rating capacity of a component for safety reasons, the reduced rating must apply.

A GVM rating must not be reduced without a physical change or modification being carried out on the vehicle; the physical change or modification must not reduce vehicle's safety. Replacement of the standard tyres with lower rated tyres to achieve a lower GVM rating to reduce cost of registration is **not** permitted as it is deemed to reduce the vehicle's safety.

The modified vehicle's GVM rating must not exceed the original manufacturer's GCM unless the vehicle has been modified and its GCM is rerated in accordance with Code S3.

**2.0 Tyres and Wheel Rims**

The sum of the load carrying capacities of all the tyres (and rims) fitted to a vehicle must not be less than the GVM. Moreover the sum of the load carrying capacities of all the tyres (and rims) fitted to an axle/axle group must not be less than the load rating of that axle/axle group or the legal mass permitted on that axle/axle group, whichever is less.

The load carrying capacity of any tyre or rim must not be exceeded when the vehicle is loaded to its revised GVM rating and the load is distributed normally.

Where a vehicle is manufactured to comply with ADR 24/..or ADR 42/.., the tyres and rims selected must comply in all respects with the requirements of that ADR at the revised GVM rating.

**HEAVY VEHICLE MODIFICATIONS**

Where a tyre placard is fitted to a vehicle, this placard must be replaced or amended as necessary to indicate the correct tyre specifications for the vehicle at the revised GVM rating. The revised tyre size and load rating must also appear on the modification plate.

**3.0 Chassis**

Certifying Officers must satisfy themselves that the vehicle's chassis has adequate strength for the revised GVM rating. Refer to Section 5.0 of the General Requirements which preface Section S of this National Code of Practice and to Section H - Chassis Frame.

**4.0 Brakes**

The braking performance of a vehicle is directly affected by changes in the vehicle's GVM. Before an increased GVM rating can be issued, it is necessary to ensure that the braking system of that vehicle is recertified to the new GVM. Section G of this National Code of Practice contains details of the certification procedure.

**5.0 Driveline****5.1 Engine/Transmission**

The GVM rating assigned must not exceed the engine and transmission manufacturer's recommendations and the limit set by vehicle manufacturer's for vehicles using the engine and transmission models being assessed.

The engine/transmission mounting system must be assessed for adequacy to resist the maximum engine torque multiplied by the gear ratio of the transmission starting gear. This is particularly important where a transmission with lower gearing or an engine with higher torque output is used to improve the startability.

**5.2 Tailshaft**

A higher GVM will place greater demands on the torque capability of the tailshaft, with torque being limited either by the engine torque output or by wheel slip. The maximum possible torque must be established to be within the capability of the tailshaft.

**5.3 Rear Axles/Rear Suspension**

The maximum GVM limit must be obtained either directly from the axle and suspension manufacturer or by comparison with a vehicle manufacturer's rating for a vehicle of similar axle and suspension components and axle ratio. Where a component manufacturer has published information reducing the rating capacity of a component for safety reasons, the reduced rating must apply.

**6.0 Front Axle/Front Suspension**

The GVM rating assigned must not result in the manufacturer's mass rating of the front axle, front suspension or steering being exceeded. The maximum mass ratings of these components must be obtained either directly from the axle and suspension manufacturer or by comparison with a vehicle manufacturer's rating for a vehicle of similar axle and suspension components.

**Motorhome vehicle rerating**

Commercial vehicles or omnibuses, when converted to motorhomes, frequently have manufacturer's GVM ratings considerably in excess of the maximum laden mass necessary and likely for the vehicle in motorhome configuration.

**HEAVY VEHICLE MODIFICATIONS**

The GVM rating of a vehicle licensed for use as a motorhome may be reduced to the maximum vehicle laden mass as demonstrated by a weighbridge ticket increased where necessary to adjust for the following conditions:

- The vehicle fully furnished and with all personal possessions on board.
- All fluid reservoirs including fuel and water tanks filled to capacity.
- A mass of 68 kg for each occupant which the vehicle is licensed to carry.
- Any bicycle or motorcycle rack to be filled.

Sufficient payload capacity must be ensured to comply with the requirements in the Administrator's Circular 0-4-12 "Certification of Campervans and Motorhomes".

**HEAVY VEHICLE MODIFICATIONS**

**CHECKLIST FOR MODIFICATION CODE S2**

**RATING OF GROSS VEHICLE MASS  
APPROVED DESIGN CERTIFICATION  
FOR MODIFIED VEHICLES OR SPECIAL PURPOSE VEHICLES (e.g. MOTORHOMES)**

## HEAVY VEHICLE MODIFICATIONS

## Appendix 3

**Modification Code S3  
RATING OF GROSS COMBINATION MASS  
APPROVED DESIGN CERTIFICATION  
FOR MODIFIED VEHICLES**

Certifications that are covered under this Modification Code are:

1. Gross Combination Mass (GCM) rating for a vehicle which has been modified to a specification which is beyond the manufacturer's standard specification.
2. Issue of a Gross Combination Mass (GCM) rating recommendation certificate and checklist to an S1 Certifying Officer who will inspect and plate the vehicle: this S3 certification may be based on vehicle specification supplied either by the vehicle owner or by the S1 Certifying Officer or sourced by the S3 Certifying Officer; the vehicle itself may not have been inspected by the S3 Certifying Officer.
3. Issue of a Gross Combination Mass (GCM) rating recommendation certificate and checklist to an S1 Certifying Officer who will inspect and plate the vehicle, whose manufacturer no longer exists or for which a manufacturer's GCM is not available.

Certifications that are **not** covered under this Modification Code are:

1. Rating of a vehicle's Gross Vehicle Mass (GVM).
2. Ratings which would cause any component of the vehicle to be loaded in excess of that component manufacturer's rating.
3. GCM rating of a road train prime mover (See Code S8) or a B Double Prime mover (See Code S9).

**NOTE: The modified vehicle must continue to comply with all applicable ADRs, Australian Standards and Regulations/Acts.**

Outlined below are the areas of the vehicle that may have been affected by the modifications and that may require recertification, testing and/or data to show compliance of the modified vehicle.

| DETAIL     | REQUIREMENTS                                     |
|------------|--|
| Brakes     | ADR 35, 35A, 35/.., Modification Codes G4 and G7 |
| Suspension | Manufacturer's rating, Modification Code F1      |
| Steering   | Modification Code E2                             |
| Chassis    | Manufacturer's rating, Modification Code H       |



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|               |  |
|---------------|--|
| Engine        | ADR 30/.., 36, 36A, 36/.., 70/.., ADR 80/..<br>Modification Code A |
| Transmission  | Manufacturer's rating, Modification Code B                         |
| Tailshaft     | Modification Code C  |
| Axles         | Manufacturer's rating, Modification Codes D and E                  |
| Tyres         | Manufacturer's rating, ADR 24/.., ADR 42/..                        |
| Tow Couplings | ADR 44/.., 62/.., Modification Code P                              |

If any of the areas listed above are affected by modifications made to the vehicle in order to achieve the GCM rating, they must comply with the prescribed standards and, where necessary, must be approved by a Certifying Officer holding the appropriate modification code.

## HEAVY VEHICLE MODIFICATIONS

## Appendix 3

## Modification Code S3

**RATING OF GROSS COMBINATION MASS  
APPROVED DESIGN CERTIFICATION  
FOR MODIFIED VEHICLES****SPECIFIC REQUIREMENTS****1.0 General**

The intention of this Code is to allow suitably qualified Officers to certify the permissible Gross Combination Mass (GCM) rating of modified vehicles, either by personal inspection of the vehicle or by examination of written specifications supplied by the owner or modifier.

Typical modifications would include changes from single axle to tandem axle configuration or vice versa, or replacement of engine, transmission, axles or suspension components with alternative components which would allow a different rating.

In the case of a vehicle which is not inspected by the S3 Certifying Officer, the S3 certificate may not refer to an individual vehicle and checklist should be issued. The checklist confirms the fact that while no particular vehicle has been inspected, identifies the source of the information and recommends an appropriate rating for a vehicle having components as listed in the checklist, subject to the vehicle being in satisfactory mechanical condition.

The certificate and checklist may then be used by an S1 Certifying Officer to re-rate the individual vehicle after inspection to verify that the components are as described in the certificate checklist and that the vehicle's mechanical condition is satisfactory.

The rerating must address the compatibility of the entire vehicle for the revised rating and in particular must check that the chassis, suspensions, axles and drive train components are used within the manufacturer's rated capacities.

**2.0 Chassis**

Certifying Officers must satisfy themselves that the vehicle's chassis has adequate strength for the revised GCM rating. Refer to Section 5 of the General Requirements which preface Section S of this National Code of Practice and to Section H - Chassis Frame.

Particular attention must be paid to the adequacy of the tow coupling and its attachment where a GCM increase is being considered. Refer to Section P - Tow Couplings/Fifth Wheels.

**3.0 Brakes**

A GCM rating must not be revised on a vehicle unless the vehicle is equipped with a trailer brake control system adequate for the intended GCM rating.

Where a GCM increase will permit a trailer with a greater number of axles to be towed or permit multiple trailers, the capacity of the air compressor or other trailer brake energy supply must be checked to ensure that it is adequate to supply the additional trailer brake requirements.

## 4.0 Driveline

### 4.1 Gradeability

The vehicle's gradeability should permit starting on a 13% grade and climbing a 23% grade when the vehicle combination is laden to the revised GCM.

**Note:** 23% is a theoretical figure which will indicate acceptable performance under normal operating conditions.

This ability should be established either by physical test, comparison with a vehicle of similar combination of components or by calculation using the formula:

$$\text{GCM (Maximum)} = \frac{K \times R \times M \times T \text{ (kg)}}{g+1}$$

note for most applications  $g+1 = 24$

where K = drive efficiency constant for type of drive axle fitted to the drawing vehicle

For single drive axles, K = 0.055 For

single drive tandem axles, K = 0.053 For

dual drive tandem axles, K = 0.051 For

tri drive axles, K = 0.047

R = overall gear reduction between engine and drive wheels

M = tyre revolutions per kilometre, determined from Table 1

T = maximum engine net torque (N.m)

g = required minimum grade percentage capability = 23% for general haulage

**Table 1**

Tyre revolutions per kilometre (Source: ADR 65/00 Table 2)

| Tyre size | Nom. revs/km | Tyre size   | Nom. revs/km |
|-----------|--------------|-------------|--------------|
| 8.25*16   | 385          | 9R22.5      | 345          |
| 8.25*20   | 345          | 10R22.5     | 325          |
| 9.00*20   | 325          | 11R22.5     | 315          |
| 10.00*20  | 315          | 12R22.5     | 305          |
| 11.00*20  | 310          | 13R22.5     | 295          |
| 12.00*20  | 295          | 255/70R22.5 | 355          |
| 13.00*20  | 285          | 275/70R22.5 | 345          |
| 14.00*20  | 270          | 275/80R22.5 | 330          |
| 10.00*22  | 300          | 295/75R22.5 | 323          |
| 11.00*22  | 295          | 295/80R22.5 | 320          |
| 11.00*24  | 280          | 315/80R22.5 | 310          |
| 12.00*24  | 270          | 385/65R22.5 | 315          |
|           |              | 425/65R22.5 | 300          |
|           |              | 445/65R22.5 | 290          |

#### 4.2 Engine/Transmission

The GCM rating assigned must not exceed the engine and transmission manufacturer's recommendations, or the limit set by vehicle manufacturer for vehicles using the engine and transmission models being assessed.

The engine and transmission mounting system must be assessed for adequacy to resist the maximum engine torque multiplied by the gear ratio of the transmission starting gear. This is particularly important where a transmission with lower gearing or an engine with higher torque output is used to improve the startability.

#### 4.3 Tailshaft

A higher GCM will place greater demands on the tailshaft, with the maximum torque being limited either by the engine torque output or by wheel slip. The maximum possible torque must be within the capability of the tailshaft.

#### 4.4 Rear Axles/Rear Suspension

The maximum combination mass permitted by the rear axle manufacturer is frequently dependent on the engine torque and the axle ratio. The maximum GCM limit must be obtained either directly from the axle manufacturer or by comparison with a vehicle manufacturer's rating for a vehicle of similar drive train components and axle ratio. The suspension manufacturer may also have limits on the GCM permitted on certain components e.g. walking beams or four-spring suspensions.

**HEAVY VEHICLE MODIFICATIONS**

**Checklist for Modification Code S3**

**RATING OF GROSS COMBINATION MASS  
APPROVED DESIGN CERTIFICATION  
FOR MODIFIED VEHICLES**

**Appendix 7****Modification Code S7****RATING OF AGGREGATE TRAILER MASS  
TO S12 APPROVED DESIGN OR WITHIN  
TRAILER MANUFACTURER'S SPECIFICATION**

Certifications that are covered under this Modification Code are:

1. Aggregate Trailer Mass (ATM) rating for a trailer which has been upgraded or downgraded to conform to the trailer manufacturer's alternative specification
2. Aggregate Trailer Mass (ATM) rating for a trailer which has been inspected by the Certifying Officer and confirmed to have been modified to a design certified by an S12 Certifying Officer as suitable for the revised rating The S7 Certifying Officer must inspect the vehicle to certify compliance
3. Aggregate Trailer Mass (ATM) rating for a trailer whose manufacturer no longer exists and for which a manufacturer's ATM is not available, and where the trailer is inspected by the S7 Certifying Officer and confirmed that the trailer conforms to the description in a Letter of ATM Recommendation issued by an S12 Certifying Officer.

Certifications that are **not** covered under this Modification Code are:

1. Aggregate Trailer Mass (ATM) rating for a trailer which has been modified to change the registration category of the trailer e.g. semitrailer to dog trailer, pig trailer to dog trailer, semi to dolly, etc. Such trailers are regarded as newly manufactured and must be issued with a new Vehicle Identification Number (VIN) and fitted with a new Identity Plate issued by the Department of Infrastructure and Regional Development which will identify the applicable ATM.
2. Aggregate Trailer Mass (ATM) rating for a trailer where the S7 Certifying Officer does not hold a copy of a design specification certifying the alternative rating, issued by the original trailer manufacturer or by a Certifying Officer with S12 authorisation
3. Aggregate Trailer Mass (ATM) rating of Road Train trailers (See Code S11) or B Double trailers (See Code S9).

## HEAVY VEHICLE MODIFICATIONS

**NOTE: The modified vehicle/modifications must continue to comply with all applicable ADR's, Australian Standards and Regulations/Acts.**

Outlined below are the areas of the trailer that may have been affected by the modifications and that may require re-certification, testing and/or data to show compliance of the modified trailer.

| <b>DETAIL</b> | <b>REQUIREMENTS</b>  |
|---------------|--|
| Brakes        | ADR 38, 38/.., Modification Code G3                            |
| Suspension    | Manufacturer's rating, Modification Code F2                    |
| Chassis       | Manufacturer's rating, Modification Code H5                    |
| Tyres         | Manufacturer's rating, ADR 24/.., ADR 42/..                    |
| Tow Couplings | Manufacturer's rating, ADR 62/.., Modification Codes P1 and P2 |

If any of the areas listed above are affected by modifications made to the trailer in order to achieve the ATM rating, they must comply with the prescribed standards and, where necessary, must be approved by a Certifying Officer holding the appropriate modification code.

## HEAVY VEHICLE MODIFICATIONS

Appendix 7  
Modification Code S7RATING OF AGGREGATE TRAILER MASS  
TO S12 APPROVED DESIGN OR WITHIN  
MANUFACTURER'S SPECIFICATION

## SPECIFIC REQUIREMENTS

## 1.0 General

Re-rating of modified trailers under this Code is restricted to trailers modified within the original registration category either to a design configuration for which a certificate and checklist have been issued by an S12 Certifying Officer, or to the design configuration of an alternative model produced by the trailer manufacturer.

Typical modifications would include changes from tandem axle to tri-axle semi-trailer configuration, two axle to three axle dog trailer conversion or replacement of axles, suspensions or control systems with alternative components which would allow a different rating.

Issue of an Aggregate Trailer Mass (ATM) rating is also permitted to an existing trailer where the ATM is not recorded and where the manufacturer no longer exists. The ATM rating may be established by comparison with a trailer for which the ATM is known and which is similar in chassis beam dimensions, axles, suspension, braking system, drawbar (if applicable) and tow coupling or fifth wheel to the trailer to be rated. Alternatively, a rating recommendation letter should be obtained from an S12 Certifying Officer.

In all cases, the rerating must address the compatibility of all components at the revised rating and, in particular, must check that the chassis, suspensions, axles and tow couplings are used within the component manufacturer's rated capacities.

## 2.0 Tyres and Wheel Rims

The sum of the load carrying capacities of the tyres and rims fitted to an axle or axle group must not be less than the load rating of that axle or axle group or the regulation mass limit on that axle or axle group, whichever is less.

Loading of the trailer to its Aggregate Trailer Mass (ATM) with load distributed normally, must not result in load on any tyre or rim exceeding its rated capacity.

For trailers manufactured to comply with ADR 24/..or ADR 42/.., the tyres and rims must be selected and must comply in all respects with the requirements of that ADR at the revised ATM rating.

Where a tyre placard is fitted to a trailer, this placard must be replaced with an amended placard as necessary to indicate the correct tyre and rim specifications for the trailer at the revised ATM and GTM rating. The revised tyre size and load rating must also appear on the modification plate.

## 3.0 Chassis

The chassis of the modified trailer must conform to the design specification certified by the S12 Certifying Officer or must be equivalent to the manufacturer's chassis material specification, reinforcement and cross-member installation for the reference trailer to which the modified trailer is being compared.



#### 4.0 Tow coupling

The tow coupling fitted to a modified trailer must be adequate for the proposed ATM and the coupling installation must conform to the requirements of Code P1 or P2 as applicable.

The drawbar of a pig or dog trailer must be designed to withstand the forces specified in ADR 62/.. .

#### 5.0 Brake System Sub-assemblies

##### Control system, braked axles and suspension

The maximum ATM permitted by an ADR 38 trailer braking system depends on its ability to hold the fully loaded trailer on 18% grade. This is determined by calculations in which certified data published by the sub-assembly manufacturers is used to select brake chamber sizes and slack adjuster lengths such that sufficient braking force can be applied without exceeding the suspension skid limits in an emergency breakaway application.

The brake chamber sizes and slack adjuster lengths must be checked to confirm they are in accordance with either the S12 Certifying Officer's report, or the specifications of the reference trailer.

ADR 38/... requires that dog trailers meet additional requirements for friction utilisation to ensure that the rear axle group wheels do not lock before the front axle group wheels, under specified braking conditions. This requires the front axle group brake torque to be considerably greater than that of the rear axle group for short wheelbase trailers with a high centre of mass. This in turn requires the front axle group brakes to have a high axle mass rating to provide the necessary fade resistance. Before a revised ATM is assigned to a modified dog trailer, it should be established that this aspect of the ADR 38/... requirements has been addressed by the G3 Braking Code rerating.

The length and diameter of piping and the type of connecting fittings within a trailer control system are critical for achievement of brake response and release times within the limits specified by ADR 38 and ADR 38/... The maximum permitted lengths of piping are specified in Department of Infrastructure and Regional Development certified brake system parts lists and installation diagrams which are available from the control system manufacturers. The actual installed lengths of piping should be validated against these specifications if the brake system response and release times are not tested by the officer approving the ATM rating.

#### 6.0 Dimensions

The maximum dimensions of an individual trailer must not exceed the dimensions specified in the current issue of ADR 43/.. .

**HEAVY VEHICLE MODIFICATIONS**

**Checklist for Modification Code S7**

**RATING OF AGGREGATE TRAILER MASS  
TO S12 APPROVED DESIGN OR WITHIN  
MANUFACTURER'S SPECIFICATION**

## HEAVY VEHICLE MODIFICATIONS

## Appendix 8

## Modification Code S8

## RATING OF PRIME MOVER FOR USE IN ROAD TRAIN

Certifications that are covered under this Modification Code are:

1. Rating of prime movers which have been upgraded to conform to the requirements of ADR 35/... and ADR 64/... applicable to prime movers suitable for use in road trains. The certification must verify that the prime movers comply with all the requirements for road train operation and must assign a maximum Road Train Gross Combination Mass Rating (GCM).

Certifications that are **not** covered under this Modification Code are:

1. Road Train rating of prime movers which are already certified by the truck manufacturer as meeting the relevant requirements of ADR 35/... and ADR 64/... for road train operation. ADR 61/... requires the words "ROAD TRAIN" to appear on the Vehicle Plate for such prime movers.
2. Rerating of Road Train GCM that exceeds the original vehicle manufacturer's maximum Road Train GCM rating, except where components have been upgraded to allow such increase in GCM.
3. Rating which would cause any component of the vehicle to operate or be subjected to loads in excess of that component manufacturer's rating.
4. Gross Vehicle Mass (GVM) rating. Codes S1 to S3 apply for this purpose.

**NOTE: The modified vehicle/modifications must continue to comply with all applicable ADR's, Australian Standards and Regulations/Acts.**

Outlined below are the areas of the vehicle that may have been affected by the modifications and that may require recertification, testing and/or data to show compliance of the modified vehicle.

| DETAIL                            | REQUIREMENTS   |
|-----------------------------------|--|
| Chassis                           | Manufacturer's rating, Modification Code H             |
| Engine                            | ADR 30/.., 36, 36A, 36/..,80/..<br>Modification Code A |
| Transmission                      | Modification Code B                                    |
| Tail-shaft                        | Modification Code B                                    |
| Speed Controls                    | ADR 65/.., Modification Code A5                        |
| Braking                           | ADR 35, 35A, 35/.., Modification Code G                |
| Tyres                             | Manufacturer's rating, ADR 24/.., 42/..                |
| Axles                             | Manufacturer's rating, Modification Codes D and E      |
| Fifth Wheels and Turntables       | ADR 62/.., Modification Code P                         |
| Towing Couplings and Drawbar Eyes | ADR 62/.., Modification Code P                         |
| Electrical/Lighting               | ADR 64/.., 13/..                                       |

If any of the areas listed above have been affected by modifications made to the vehicle, the vehicle must comply with the relevant ADR and, where necessary, must be approved by a Certifying Officer holding the appropriate modification code.

## HEAVY VEHICLE MODIFICATIONS

**Appendix 8**  
**Modification Code S8**  
**RATING OF PRIME MOVER FOR USE IN ROAD TRAIN**  
**SPECIFIC REQUIREMENTS**

**1.0 General**

Ratings of prime movers under this Code will require the fitting of a modification plate marked with a maximum Road Train Gross Combination Mass Rating and the issue of a modification certificate.

Ratings that are determined in accordance with this Code S8 will enable prime movers to be used in appropriate Road Train combinations subject to normal permit conditions.

Prime movers that do not have manufacturer's GCM rating must satisfy the following requirements in relation to the vehicle's chassis and driveline.

**2.0 Chassis**

The prime mover chassis must have adequate strength for the relevant GCM rating. Refer to 5.0 General Requirements of this Section S and Section H - Chassis.

Evidence of this suitability is required in the form of at least one of the following:

- a letter from the prime mover manufacturer stating that the chassis is adequate for the proposed GCM;
- comparison with a reference prime mover having an identical chassis and a GCM not less than the proposed GCM;
- a certification letter from an Approved Signatory (e.g. registered Chartered Professional Engineer (CPEng)) confirming the adequacy of the chassis design.

In addition, particular attention must be paid to the adequacy of towing couplings and attachments. Refer to Section P - Towing Couplings/Fifth Wheels of this National Code of Practice.

**3.0 Driveline****3.1 Gradeability**

A prime mover suitable for use in road train, at the proposed GCM, must be capable of starting on a 5% grade. Gradeability should be established by prime mover manufacturer's computer simulation or, when this is not available, by calculation using the formula:

$$\text{GCM (Maximum)} = \frac{KxRxMxT}{g+1} \text{Kg}$$

note for most applications  $g+1 = 24$

where K = drive efficiency constant for type of drive axle fitted to the drawing vehicle

For single drive axles, K = 0.055

For single drive tandem axles, K = 0.053

For dual drive tandem axles, K = 0.051

For tri drive axles, K = 0.047

R = overall gear reduction between engine and driven wheels

M = tyre revolutions per kilometre, determined from Table 1

T = maximum engine net torque (N.m)

g = maximum grade expressed as a percentage (15%)

i.e. 10% starting ability plus 5% operating grade.

## HEAVY VEHICLE MODIFICATIONS

Note: A maximum 42,500 kg GCM limit applies to prime movers with a single drive axle, including vehicles with a tandem rear axle group consisting of a single drive axle and a lazy axle.

Table 1

Tyre revolutions per kilometre (Source: ADR 65/00 Table 2)

| Tyre size | Nom. revs/km | Tyre size   | Nom. revs/km |
|-----------|--------------|-------------|--------------|
| 8.25*16   | 385          | 9R22.5      | 345          |
| 8.25*20   | 345          | 10R22.5     | 325          |
| 9.00*20   | 325          | 11R22.5     | 315          |
| 10.00*20  | 315          | 12R22.5     | 305          |
| 11.00*20  | 310          | 13R22.5     | 295          |
| 12.00*20  | 295          | 255/70R22.5 | 355          |
| 13.00*20  | 285          | 275/70R22.5 | 345          |
| 14.00*20  | 270          | 275/80R22.5 | 330          |
| 10.00*22  | 300          | 295/75R22.5 | 323          |
| 11.00*22  | 295          | 295/80R22.5 | 320          |
| 11.00*24  | 280          | 315/80R22.5 | 310          |
| 12.00*24  | 270          | 385/65R22.5 | 315          |
|           |              | 425/65R22.5 | 300          |
|           |              | 445/65R22.5 | 290          |

### 3.2 Engine/Transmission

The GCM rating assigned must not exceed the engine and transmission manufacturer's recommendations, or the limit set by the manufacturer of the reference vehicles that use the same engine and/or transmission models that are being assessed.

The engine/transmission mounting system must be adequate to resist the maximum engine torque multiplied by the gear ratio of the transmission starting gear. This is particularly important where a transmission with lower gearing or an engine with higher torque output is used to improve the startability.

### 3.3 Rear Axles/Rear Suspension

The maximum combination mass permitted by the rear axle manufacturer is frequently dependent on the engine torque and the axle ratio. The maximum GCM limit must be obtained either directly from the axle manufacturer or by comparison with the rating of a reference vehicle using identical drive train components and axle ratio.

The suspension manufacturer will usually have limits on the GCM permitted on each suspension model, determined by the strength of certain components, e.g. aluminium walking beams, spring pins or torque rods, or by the torque reactivity of the design, e.g. four-spring suspensions. The maximum GCM limit must be obtained either directly from the suspension manufacturer or by comparison with the rating of a reference vehicle using identical suspension and drive axle components.

Hauling units with GCM exceeding 42.5 tonnes are required to have tandem drive rear axle group equipped to provide locking of the inter-axle differential.

## HEAVY VEHICLE MODIFICATIONS

**4.0 Speed Limiting**

The maximum speed of the vehicle must be limited, by one of the methods permitted by ADR 65/... The vehicle must also be capable of maintaining a constant 80 km/h speed on a level road when laden to the rated GCM.

Vehicles not certified by the manufacturer to comply with ADR 65/... for road train speed limits must be certified by a Certifying Officer who holds Code A5 (Road Speed Limiter Installation). In addition, the Certifying Officer must fit a modification plate to the prime mover in a prominent position, adjacent to the compliance plate.

**5.0 Braking****5.1 General requirements**

Road Train prime movers must comply with the relevant requirements of ADR 35/... and prime movers manufactured after 1 July 1991 must also comply with the requirements of ADR 64/...

To prevent incorrect coupling of brake lines, all couplings must be non-interchangeable (polarised) in accordance with Australian Standard 4945-2000, with all fittings having a clear bore (no restrictor or non-return valves).

The parking brake control of a prime mover used in road train must simultaneously apply parking brakes on all attached trailers.

**5.2 Brake application/release times**

The brake application and release times at the trailer control line coupling must be tested, either as part of a road train combination or as an individual vehicle. The following tests are based on 650 kPa but if the manufacturer specifies an Average Operating Pressure other than 650 kPa, then that figure will suffice.

**Combination vehicle test:**

If tested as part of a road train combination, the combination must be a triple road train. The application and release times must meet the following criteria:

**Application time**

With the air reservoirs in all units of the train charged to no more than 650 kPa and the spring brakes released, the elapsed time for the pressure in the least favoured brake chamber to reach 420 kPa, must not exceed 1.5 seconds.

**Release time**

With the air reservoirs in all units of the road train charged to at least 650 kPa, the elapsed time for the pressure in the least favoured brake chamber to decrease to 35 kPa from a full brake application, must not exceed 1.5 seconds.

**Individual vehicle test:**

If tested as a prime mover in isolation, the application and release times are measured at the end of an 800 ml test chamber connected to the trailer service brake coupling by a 2.0 metre long hose of 13 mm internal diameter. The application and release times must meet the following criteria:

**Application time**

With the air reservoirs charged to no more than 650 kPa and the spring brakes released, the elapsed time for the pressure in the 800 ml test chamber to reach 420 kPa, must not exceed 400 milliseconds.

**Release time**

From a full brake application with the air reservoirs charged to at least 650 kPa and the spring brakes released, the elapsed time for the pressure in the 800 ml test chamber to decrease to 35 kPa, must not exceed 500 milliseconds.

**5.3 Compressor capacity**

The air compressor fitted to a prime mover used in road train must have a minimum air delivery of 5.9 litres/second (12.5 cfm) at 690 kPa (100 psi) head pressure for preferential use by the braking system when the engine is operating at the nominated maximum rated engine speed. This may be established by referring to the truck manufacturer's specification.

**6.0 Dimension and Axle Group Requirements**

The vehicle must meet all dimensional requirements of the registering and permit issuing authority. All axle groups in Road Train combinations must be "conforming" and must meet the current requirements for individual State jurisdictions.

**7.0 Electrical Requirements**

All prime movers first introduced into road train service after 1 July 1991 will be required to comply with the requirements of ADR 64/...which states that vehicles designed for use in road train must be:

- (i) Be fitted with a lighting supply system having a minimum capacity available for connection to trailers of 30A at 12V (i.e. 360W) or 15A at 24V (i.e. 360W) in addition to normal vehicle electrical requirements.
- (ii) Be fitted with a single connector for trailer lighting and signaling systems.
- (iii) Be fitted with resettable circuit breakers for all lighting and signaling systems.
- (iv) Be equipped with an electric generator having a minimum rated power output of 100A at nominal 12V (i.e. 1200W) or 50A at nominal 24V (i.e. 1200W).

**8.0 Fifth Wheels**

The location, mounting and strength of the fifth wheel on the prime mover must comply with the appropriate Australian Standards or with ADR 62/.. where the prime mover was built after 1st July 1991.



**HEAVY VEHICLE MODIFICATIONS**

**Checklist for Modification Code S8**

**RATING OF PRIME MOVER  
FOR USE IN ROAD TRAIN**

## HEAVY VEHICLE MODIFICATIONS

## Appendix 9

## Modification Code S9

## RATING OF PRIME MOVER AND TRAILERS FOR USE IN B-DOUBLE

Certifications that are covered under this Modification Code are:

1. Assessment of B-Double combinations (i.e. prime movers and trailers), to determine compliance with the standards specified for the operation as a B-Double at the Registered Gross Combination Mass rating (RGCM-BD).

Certifications that are **not** covered under this Modification Code are:

1. B-Double rating of prime movers which are already certified by the Manufacturer as being manufactured to meet ADR 35/..and ADR 64/.. requirements. The words "B-DOUBLE" are required by ADR 61/.. to appear on the Vehicle Plate for such prime movers.
2. Issue of a B-Double GCM greater than the original manufacturer's maximum B-Double GCM rating except where components have been upgraded to allow such increase in GCM.
3. Rating which would cause any component of the vehicle to operate or be subjected to loads in excess of that component manufacturer's rating.
4. Gross Vehicle Mass (GVM) rating. Codes S1 to S3 apply for this purpose.

**NOTE: The modified vehicle/modifications must continue to comply with all applicable ADR's, Australian Standards and Regulations/Acts.**

Outlined below are the areas of the vehicle that may have been affected by modifications and that may require recertification, testing and/or data to show compliance of a modified vehicle.

| DETAIL                     | REQUIREMENTS   |
|----------------------------|--|
| Chassis                    | Manufacturer's rating, Modification Code H               |
| Engine                     | ADR 30/.., 36, 36A, 36/..80/..,Modification Code A       |
| Transmission               | Modification Code B                                      |
| Tailshaft                  | Modification Code C                                      |
| Speed Controls             | ADR 65/.., Modification Code A5                          |
| Braking                    | ADR 35/.., ADR 38/..,ADR 64/..(ABS), Modification Code G |
| Tyres                      | Manufacturer's rating, ADR 24/.., 42/..                  |
| Axles                      | Manufacturer's rating, Modification Codes D and E        |
| Fifth Wheels and Turntable | ADR 62/.., Modification Code P                           |

If any of the areas listed above have been affected by modifications made to the vehicle, the vehicle must comply with the relevant ADR and where necessary must be approved by a Certifying Officer holding the appropriate modification code.

## HEAVY VEHICLE MODIFICATIONS

## Appendix 9

## Modification Code S9

## RATING OF PRIME MOVER AND TRAILERS FOR USE IN B-DOUBLE

## SPECIFIC REQUIREMENTS

## 1.0 General

Ratings in accordance with this Code will enable prime movers and trailers to be used in B-Double combinations.

Rating of B-Doubles under this code requires the fitting of modification plate marked with a B-Double Gross Combination Mass Rating to prime mover and trailers.

## 2.0 Gross Combination Mass

B-Double prime movers which do not have a manufacturer's GCM must satisfy the requirements of Codes S1 and S3.

## 3.0 Driveline

## 3.1 Gradeability

A prime mover suitable for B-Double operation must have sufficient power and gearing to be able to start on a 10% gradient. Gradeability should be established by manufacturer's computer simulation or, when this is not available, by calculation using the formula:

$$\text{GCM (Maximum)} = \frac{KxRxMxT}{g+1} (\text{kg})$$

note for most applications  $g+1 = 24$

where K = drive efficiency constant for type of drive axle fitted to the drawing vehicle

For single drive axles, K = 0.055

For single drive tandem axles, K = 0.053

For dual drive tandem axles, K = 0.051

For tri drive axles, K = 0.047

R = overall gear reduction between engine and drive wheels

M = tyre revolutions per kilometre, determined from Table 1

T = maximum engine net torque (N.m)

g = maximum grade expressed as a percentage (15%)

i.e. 10% starting ability plus 5% operating grade.

Note: A maximum 42,500 kg GCM limit applies to prime movers with a single drive axle, including tandem rear axle group with one drive and one lazy axle .

## HEAVY VEHICLE MODIFICATIONS

Table 1

Tyre revolutions per kilometre (Source: ADR 65/00 Table 2)

| Tyre size | Nom. revs/km | Tyre size   |
|-----------|--------------|-------------|
| 8.25*16   | 385          | 9R22.5      |
| 8.25*20   | 345          | 10R22.5     |
| 9.00*20   | 325          | 11R22.5     |
| 10.00*20  | 315          | 12R22.5     |
| 11.00*20  | 310          | 13R22.5     |
| 12.00*20  | 295          | 255/70R22.5 |
| 13.00*20  | 285          | 275/70R22.5 |
| 14.00*20  | 270          | 275/80R22.5 |
| 10.00*22  | 300          | 295/75R22.5 |
| 11.00*22  | 295          | 295/80R22.5 |
| 11.00*24  | 280          | 315/80R22.5 |
| 12.00*24  | 270          | 385/65R22.5 |
|           |              | 425/65R22.5 |
|           |              | 445/65R22.5 |

**3.2 Speed Capability**

A B-Double prime mover, at rated GCM, must have the ability (power and gearing) to maintain a constant speed of at least 70 km/h on 1% grade. This should be established by manufacturer's computer simulation or by physical test.

**3.3 Drive Axles**

Prime mover in B-Double operation with rated GCM exceeding 42.5 tonnes, must have tandem drive axle group with provision for positive locking of the inter-axle differential.

Prime movers with single drive axle (i.e. 4x2 configuration) and tandem rear axle group with single drive axle (i.e. 6x2 configuration) can be rated up to a Registered Gross Combination Mass (RGCM-BD) of 42.5 tonnes.

**3.4 Speed Limiting**

The maximum speed of the vehicle must be limited to 100 km/h in accordance with the requirements of ADR 65/00

If not certified by the manufacturer to comply with ADR 65/00, the prime mover must be certified by a Certifying Officer who holds Code A5 (Road Speed Limiter Installation) by fitting a modification plate in a prominent position adjacent to the compliance plate with text A5/100 engraved or stamped on it to indicate the vehicle is speed limited to 100 km/h.

## 4.0 Braking

### 4.1 Existing Vehicles

A prime mover previously approved for use in B-Double is not required to be retro-fitted with anti-lock brakes. Fleets which allow interchange of prime movers and trailers may couple existing prime movers without anti-lock brakes, with trailers having anti-lock brakes and vice versa; however in all cases, when coupled with trailers having anti-lock brakes, the prime mover must provide the electrical connections and driver warning lamps necessary for the operation of the trailer anti-lock braking systems.

### 4.2 Anti-Lock Brakes

Prime movers first introduced into B-Double service on or after 1 July 1991 must be fitted with anti-lock braking systems as required in ADR 64/...

Trailers intended for B-Double service may optionally be fitted with an anti-lock braking system. If fitted, the system must conform to the requirements of ADR 38/01, Appendix 1 or later issues of ADR 38/...

#### 4.2.1 Anti-Lock Braking System Definitions

An "**Anti-Lock Device**" is a component of a service braking system which automatically controls the degree of slip on one or more wheels of the vehicle during braking.

"**Sensor**" means a component designed to identify and transmit to the controller, the condition of rotation of the wheel(s) or the dynamic condition of the wheel(s).

"**Controller**" means a component designed to evaluate the data transmitted by the sensor(s) and to transmit a signal to the modulator.

"**Modulator**" means a component designed to pulsate the braking force(s) in accordance with the signal received from the controller.

"**Directly controlled wheel**" means a wheel whose braking force is pulsated accordingly to the data provided by at least its own sensor.

"**Indirectly controlled wheel**" means a wheel whose braking force is pulsated accordingly to data provided by the sensor(s) of other wheels.

#### 4.2.2 Anti-Lock Braking System Performance

The braking systems of prime movers and trailers optionally equipped with anti-lock braking system must comply with the requirements of ADR 35/... and ADR 38/... respectively. Braking system must meet the requirements applying to it with and without the anti-lock system operational.

#### 4.2.3 Anti-Lock System Configuration

The antilock system, when provided, must be fitted to:

- All wheels on single axle
- All wheels on at least one axle in any tandem axle group
- All wheels on at least two axles in any tri-axle group

## HEAVY VEHICLE MODIFICATIONS

**4.2.4 Anti-Lock System Fail Safe**

In the event of failure of the anti-lock device, the full braking effectiveness of a non anti-lock braking system must be retained.

**4.2.5 Anti-Lock System Electrical Shielding**

The operation of the anti-lock braking system must not be adversely affected by magnetic or electric fields.

**4.2.6 Anti-Lock System Warning Lamps**

Any break in the supply of electricity to the device and/or failure of the anti-lock braking system on the prime mover must be signaled to the driver by an unusual warning signal mounted in the prime mover in clear view of the driver in normal driving position.

A similar requirement applies in relation to the trailers being towed. The visual warning device intended to show failure of trailer anti-lock braking system must not give a signal when a trailer being towed is not fitted with anti-lock brakes, or when no trailer is being towed. This requirement must be met automatically. The visual warning shall light up when the anti-lock device of the trailer is energised; the signal must extinguish once the vehicle speed exceeds 15 km/h and no defect is present in the anti-lock braking system. The visual warning device must be clearly visible in daylight.

Prime movers must be fitted with a warning lamp for the anti-lock braking system failure on the trailers meeting the requirements described above. This function may be reciprocally combined with the warning lamp for failure of the prime mover anti-lock braking system.

Prime movers must be fitted with a warning lamp to indicate to the driver if trailers are not equipped with anti-lock braking system. The warning lamp/s must illuminate immediately upon the first application of the service brakes. This warning signal must be visible in daylight. It must not light up if no trailer is attached. This function must be automatic.

The function of each warning lamp must be clearly identified.

**Note:** A Certifying Officer must not certify a B-Double combination if one trailer is fitted with anti-lock braking system and the other trailer is not.

**4.3 Parking Brake**

When the parking brakes of a B-Double prime mover are applied/released, the parking brakes of each trailer must be simultaneously applied/released by the prime mover park brake control.

**4.4 Brake application/release times**

Where a trailer is modified for use in a B-Double combination and is fitted with a complete new certified braking control system in accordance with the control system sub-assembly manufacturer's installation instructions, brake signal application and release times are **not** required to be tested.

Brake signal application and release times must be measured and verified in all cases where a modified trailer is fitted with only a partial new control system sub-assembly, or may not be fitted in accordance with the installation instructions from the control system manufacturer.

When testing is required, the trailer brake signal application and release times must be tested either as part of a B-Double combination or as an individual vehicle. Details are explained below.

#### **4.5 Combination vehicle test**

If tested as part of a B-Double combination, the application and release times must meet the following criteria:

##### **4.5.1 Application time**

With the air reservoirs in all units of the train charged to no more than 650 kPa and the spring brakes released, the elapsed time for the pressure in the least favoured brake chamber to reach 420 kPa, must not exceed 1.0 second.

##### **4.5.2 Release time**

With the air reservoirs in all units of the train charged to at least 650 kPa, the elapsed time for the pressure in the least favoured brake chamber to decrease to 35 kPa, from a full brake application must not exceed 1.0 seconds.

#### **4.6 Individual trailer test**

If tested as a trailer in isolation, a test rig must be used which meets the requirements defined in ADR 38/.. The test rig, charged to 650 kPa, must be calibrated to achieve an application time of between 0.18 and 0.22 seconds for the pressure to reach 420 kPa when delivered through a 2.5 metre hose of 13 mm internal diameter to an 800 ml test chamber.

The application and release times must meet the following criteria:

##### **4.6.1 Application time**

With the test rig and trailer reservoirs charged to no more than 650 kPa and the trailer spring brakes released, the elapsed time for the pressure to reach 420 kPa must not exceed:

- At the least favoured trailer brake chamber 0.350 seconds.
- At the 800ml test chamber attached to the rear coupling 0.250 seconds.

##### **4.6.2 Release time**

From a full brake application with the test rig and trailer air reservoirs charged to at least 650 kPa, the elapsed time for the pressure to decrease to 35 kPa must not exceed:

- At the least favoured trailer brake chamber 0.650 seconds.
- At the 800ml test chamber attached to the rear coupling 0.550 seconds.

In these tests, the 800ml chamber may be attached directly to the trailer rear coupling.

#### **4.7 Individual prime mover test**

If tested as a prime mover in isolation, the application and release times are measured at the end of an 800 ml test chamber connected to the trailer service brake coupling by a 2.0 metre long hose of 13 mm internal diameter. The application and release times must meet the following criteria:

##### **4.7.1 Application time**

With the air reservoirs charged to no more than 650 kPa and the spring brakes released, the elapsed time for the pressure in the 800 ml test chamber to reach 420 kPa, must not exceed 0.400 seconds.

## HEAVY VEHICLE MODIFICATIONS

**4.7.2 Release time**

From a full brake application with the air reservoirs charged to at least 650 kPa and the spring brakes released, the elapsed time for the pressure in the 800 ml test chamber to decrease to 35 kPa, must not exceed 0.500 seconds.

**5.0 Fifth Wheels**

The location, mounting and strength of fifth wheels used to couple B-Double units must comply with the appropriate Australian Standard or, for a vehicle manufactured on or after 1 July 1991, must comply with ADR 62/...

Fifth wheels must be single plate, single oscillating unless a "Kompensator" or equivalent fifth wheels is required. These are only acceptable for vehicles with a high torsional stiffness (e.g. tankers, freezer vans, skeletal container trailers).

Double oscillating type fifth wheels are **Not** permitted.

**6.0 Axle Groups and Spacing**

All axle groups in a B-Double combination must be "conforming" axle groups and must meet the current requirements for individual State jurisdictions.

**7.0 Anti-Lock Braking System Electrical Requirements**

To ensure compatibility between the various Anti-Lock Braking Systems fitted to prime movers and trailers, the following requirements must be met:

Power supply connection between prime mover and trailer and between trailers shall be by means of a connector complying with DIN Standard 72570. Available from several suppliers, this connector is the same as ISO standard 7638 (1985) used for 24V systems, except that the keyway is located in a different position to prevent accidental connection of between 12V and 24V systems.

Table 2 describes the connector pin functions.

**Table 2: Electrical Connector Pin Functions**

| Contact No | Function   | Current Carrying Capacity |
|------------|--|---------------------------|
| No 1       | +ve HIGH AMP 1ST AND 2ND TRAILERS COMMON SOLENOID VALVE POWER SUPPLY   | 30 A                      |
| No 2       | +ve LOW AMP 1ST (LEAD) TRAILER ELECTRONIC UNIT POWER SUPPLY  | 2 A                       |
| No 3       | -ve LOW AMP 1ST AND 2ND TRAILERS COMMON ELECTRONIC UNIT POWER SUPPLY   | 2 A                       |
| No 4       | -ve HIGH AMP 1ST AND 2ND TRAILERS COMMON SOLENOID VALVE POWER SUPPLY   | 30 A                      |
| No 5       | IN CAB TRAILER ABS FAILURE WARNING (SWITCHED TO PIN 3 BY EITHER TRAILER ELECTRONIC UNIT UPON FAULT DETECTION | 2 A                       |

The nominal system voltage for trailers must be 12V

The combined maximum current demand of solenoid valves for the two trailers (pin 1) must not exceed 30 amps.

The minimum current capacity of the prime mover supply for the trailer solenoid valves (pin 1) must be at least 30 amps.



## HEAVY VEHICLE MODIFICATIONS

To avoid excessive voltage drops, the electrical conductors in the lead trailer power supply cable and the cable for earth return for the solenoid valves (pins 1 and 4) must have a cross section of at least 6 square mm in the case of copper conductors.

### 8.0 Spray Suppression System

Not mandatory. May be fitted.

### 9.0 Dimensional Requirements

The maximum dimensions (both internal and external) of a B-Double combination must not exceed the limits specified by the Registering Authorities.

### 10.0 Sliding Tri-Axle Assembly

Where a sliding tri-axle assembly is fitted, the design of the trailer and assembly must be adequate to take all likely operating loads. Specific design requirements which must also be met are:

- A positive locking device must be fitted to secure the assembly in both fore and aft positions. Air pressure is **Not** an acceptable method to secure a lock in position.
- The release mechanism must be spring loaded so that it immediately returns to the locked position when released.
- The release mechanism must be mounted in a lockable box on the left side of the trailer.
- Clear and concise operating instructions must be displayed in an area adjacent to the release control mechanism.
- Permanent stops of adequate size must be fitted to the trailer chassis to prevent the tri-axle assembly from becoming detached from the trailer.
- An audible and/or visual warning device must be fitted, in a prominent position, clearly visible and/or audible from the driver's normal seated position to indicate incorrect adjustment or position of any locking device mechanism.

### 11.0 "LONG VEHICLE" Sign

A prescribed "Long Vehicle" sign must be fitted to the rear of a B-Double combination. The sign and its fitting must be in accordance with the current requirements published by Registering Authorities.

The sign may be supplied (if ordered) in two pieces ( e.g. cut along a vertical line between the words "LONG" and "VEHICLE"). In this case, the two pieces "LONG" and "VEHICLE" must be mounted in close proximity so as to convey the intended message to other road users.

HEAVY VEHICLE MODIFICATIONS

Checklist for Modification Code S9

RATING OF PRIME MOVER AND TRAILERS FOR USE IN B-DOUBLE

## HEAVY VEHICLE MODIFICATIONS

## Appendix 11

## Modification Code S11

## RATING OF TRAILERS FOR USE IN ROAD TRAIN

Certifications that are covered under this Modification Code are:

1. Aggregate Trailer Mass (ATM) rating and Road Train Rating for a trailer which has been upgraded to conform to the requirements of ADR 38/... and ADR 63/... applicable to Road Train trailers.

Certifications that are **not** covered under this Modification Code are:

1. Road Train rating of trailers which are already certified by the manufacturer as compliant with ADR 38/.. and ADR 63/.. with the words "Road Train Trailer" being marked on the Vehicle Plate as required by ADR 61/...

**NOTE: The modified vehicle/modifications must continue to comply with all applicable ADR's, Australian Standards and Regulations/Acts.**

Outlined below are the areas of the trailer that may have been affected by the modifications and that may require recertification, testing and/or data to show compliance of the modified trailer.

| DETAIL                   | REQUIREMENTS  |
|--------------------------|---|
| Brakes                   | ADR 38/.., Modification Code G3   |
| Suspension               | Manufacturer's rating, Modification Code F2                               |
| Chassis                  | Manufacturer's rating, Modification Code H                                |
| Electrical wiring        | Manufacturer's rating, ADR 63/..  |
| Kingpin and Tow Coupling | Manufacturer's rating, ADR 62/.., ADR 63/.., Modification Codes P1 and P2 |
| Tyres                    | Manufacturer's rating, ADR 24/.., 42/..                                   |

If any of the areas listed above are affected by modifications made to the trailer in order to achieve the Road Train rating, they must comply with the prescribed standards and, where necessary, must be approved by a Certifying Officer holding the appropriate modification code.

## HEAVY VEHICLE MODIFICATIONS

## Appendix 11

## Modification Code S11

## RATING OF TRAILERS FOR USE IN ROAD TRAINS

## 1.0 General

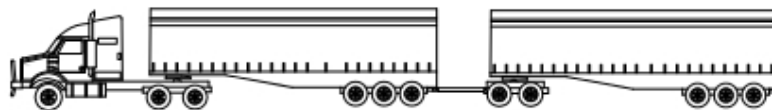
The intention of this Code is to allow suitably qualified Certifying Officers to certify the Aggregate Trailer Mass (ATM) rating and the suitability of use in road train of a modified trailer that is manufactured prior to the introduction of ADR 63/...

A modified trailer intended for use in road train must meet all the relevant requirements of ADR 38/..., and all requirements of ADR 63/...and the nationally agreed dimensional requirements for road trains.

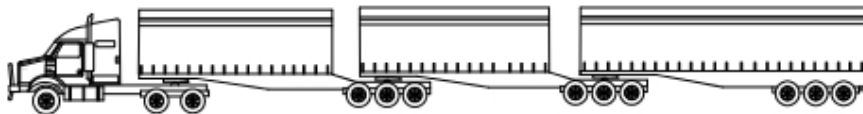
ADR 61/... requires that a trailer suitable for use in road train and manufactured to meet ADR 63/...must be marked with words "Road Train Trailer" on its Vehicle Plate. This signifies that the trailer is suitable for use in any position in a road train, the gross combination mass of which does not exceed 125 tonnes. Such trailers should not be certified using this code.

## 1.1 Road Train Types

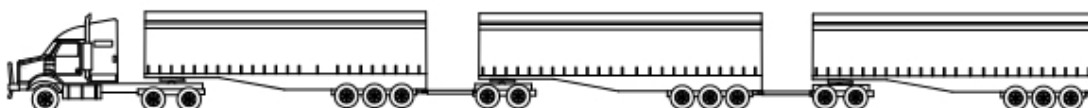
The illustrations below are of the common road train types. These images are generic and do not represent what can be used in any particular Jurisdiction. Check local Regulations to ascertain requirements for access to the road system in your area before taking any action.



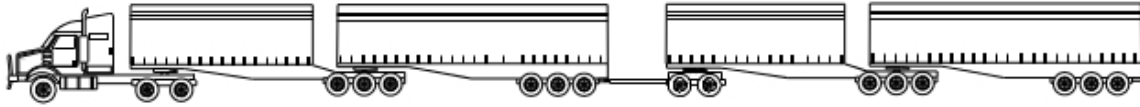
**Double Road Train (A-Double)**  
(prime mover towing an A-trailer, and a dog trailer (converter dolly and A-trailer))



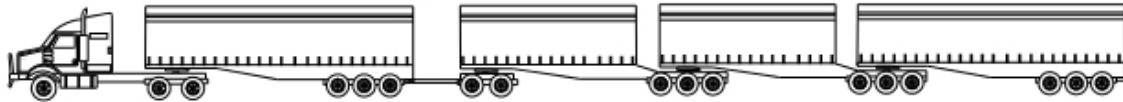
**B-Triple**  
(prime mover towing two B-trailers and an A-trailer)



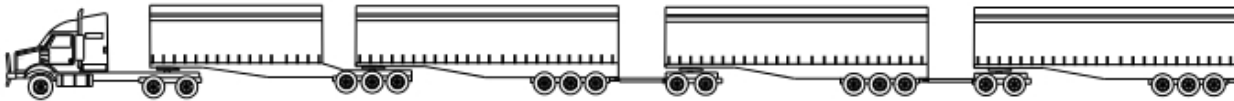
**Triple Road Train (A-Triple)**  
(prime mover towing an A-trailer, and two dog trailers)

**BAB-Quad**

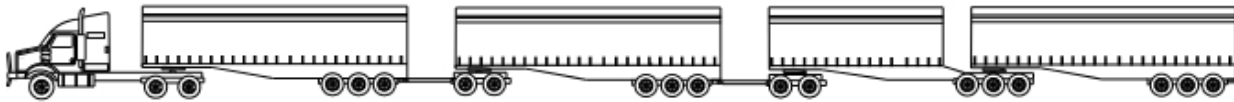
(prime mover towing a B-trailer, an A-trailer, a converter dolly, a second B-trailer and a second A-trailer)

**ABB-Quad**

(prime mover towing an A-trailer, converter dolly, two B-trailers and an A-trailer)

**BAA-Quad**

(prime mover towing a B-trailer, an A-trailer, and two dog trailers.)

**AAB-Quad**

(prime mover towing an A-trailer, a dog trailer, converter dolly, a B-trailer, and a third A-trailer)

**Note:**

“**Double**” **Triple**” or “**Quad**” refers to the number of trailers in the combination – not axles etc.

“**Dog Trailer**” means a **trailer** (including a **trailer** consisting of a semi-**trailer** and converter dolly) with:

- (a) 1 axle group or single axle at the front that is steered by connection to the towing vehicle by a drawbar;
- and (b) 1 axle group or single axle at the rear.

## HEAVY VEHICLE MODIFICATIONS

## Notes:

1. In the interest of consistent nomenclatures, a B-Triple combination should be called BB-Triple and an A-Triple combination should be called AA-Triple.

## 2. Legends

The first part of any combination is a prime-mover and a semitrailer.

## Combination Types:

Combination type XY-Int means a prime-mover and a semitrailer combination sequentially coupled to other trailers using type "X" and type "Y" couplings and contains a total of "Int" trailers.

## Trailer Type:

"A-trailer" A semi-trailer with or without an "A" type coupling at the rear

"B-trailer" A semi-trailer with a "B" type coupling at the rear

3. The last four combinations are permit vehicles (not as-of-right). They may operate under a gazette notice or guideline. A-A-B Quads and B-A-A Quads may be subject to case by case assessment and operate under a permit of exemption.

**2.0 Tyre and Wheel Rims**

The sum of the load carrying capacities of all the tyres (and rims) fitted to an axle/axle group must not be less than the lesser of the manufacturer's rating for that axle/axle group and the legally permissible mass on that axle/axle group.

With the trailer loaded to its revised Aggregate Trailer Mass rating and with the load uniformly distributed, the load on any tyre or rim must not exceed the carrying capacity of that tyre or rim .

For a trailer manufactured to comply with ADR 24/.., or 42/.., the tyres and rims must be selected in accordance with that ADR and must comply with that ADR at the revised ATM rating.

Where a trailer is fitted with a tyre placard, this placard must be replaced with suitably amended placard to indicate the correct tyre specifications for the trailer at the revised ATM rating. The revised tyre size and load rating must also appear on the modification plate.

**3.0 Chassis**

Calculations must be carried out to confirm that the chassis of the modified trailer is adequate for use in any position of a road train with a maximum combination mass possible. The chassis modification, if any, must conform to Section H of the Code of Practice.

**4.0 Electrical wiring**

Electrical wiring and connectors must conform to ADR 63/... This requires electrical connectors for lighting circuits to be rated at minimum 30A at 12V or 15A at 24V. Main supply and return cables must have a minimum copper conductor cross sectional area of 5S<sup>2</sup> mm or a DC resistance of not more than 4mΩ/metre.

**5.0 Tow coupling****5.1 Strength requirement:**

The tow coupling fitted to a road train trailer must meet the requirements of ADR 63/...

The ADR 63/... requirements for couplings include certification to nominated Australian Standards and minimum D- ratings.

**HEAVY VEHICLE MODIFICATIONS**

The couplings, fifth wheels and kingpins of trailers manufactured after 1 July 1991 must be marked as conforming to the relevant Australian Standard.

**5.2 Location requirements:**

The location of couplings and drawbars is to be in accordance with ADR 62/... and ADR 63/... and must meet the current requirements for Registering Authorities.

**6. Brake system**

If a modified trailer is fitted with a complete new certified braking control system in accordance with the control system manufacturer's installation instructions, the application and release times for brake signal are **not** required to be tested.

However the application and release times for brake signal must be tested in all other cases, including where only a partially new control system sub-assembly is used, or where the fitting may not be in accordance with the installation instructions.

When testing is required, the trailer brake signal application and release times must be tested either as part of a road train combination or as an individual vehicle.

The trailer brake system application and release time at the furthest brake chamber and at the rear control line coupling must be tested, either as part of a road train combination or as an individual trailer as specified in ADR38/...

**6.1 Combination test**

If tested as part of a road train combination, the combination must be **at least** a triple road train (i.e. prime mover or truck + 3 trailers, not including any converter dollies). The application and release times must meet the following criteria:

**6.1.1 Application time**

With the air reservoirs in all units of the road train charged to no more than 650 kPa and the spring brakes released, the elapsed time for the pressure in the least favoured brake chamber to reach 420 kPa must not exceed 1.5 second.

**6.1.2 Release time**

With the air reservoirs in all units of the road train charged to at least 650 kPa, the elapsed time for the pressure in the least favoured brake chamber to decrease to 35 kPa from a full brake application must not exceed 1.5 seconds.

**6.2 Test in isolation**

If tested as a trailer in isolation, a test rig must be used which meets the requirements defined in ADR 38/... The test rig, charged to 650 kPa, must be calibrated to achieve an application time of between 0.18 and 0.22 seconds for the pressure to reach 420 kPa when delivered through a 2.5 metre long hose of 13 mm internal diameter to an 800 ml test chamber.

The application and release times must meet the following criteria:

**6.2.1 Application time**

With the test rig and trailer reservoirs charged to no more than 650 kPa and the trailer spring brakes released, the elapsed time for the pressure to reach 420 kPa must not exceed:

At the least favoured trailer brake chamber 0.350 seconds

**HEAVY VEHICLE MODIFICATIONS**

At the 800ml test chamber attached to the rear coupling 0.250 seconds

**6.2.2 Release time**

From a full brake application with the test rig and trailer air reservoirs charged to at least 650 kPa, the elapsed time for the pressure to decrease to 35 kPa must not exceed:

At the least favoured trailer brake chamber:0.650 seconds

At the 800ml test chamber attached to the rear coupling:0.550 seconds

In these tests, the 800ml chamber may be attached directly to the trailer rear coupling.

The air reservoir capacity of each trailer must be not less than 8 times the combined brake chamber volume of the trailer.

**7.0 Brake system calculated performance from sub-assembly data for control system, braked axles and suspension**

The maximum ATM permitted by an ADR 38/... compliant trailer braking system depends on the maximum trailer mass which can be parked on an 18% grade. This is determined by calculations in which certified data published by the sub-assembly manufacturer's is used to select brake chamber sizes and slack adjuster lengths, which will provide sufficient parking force without exceeding the suspension skid limits in an emergency breakaway application.

Where a trailer has been modified for use in road train, the trailer's conformance with all requirements of ADR 38/... must be established. The calculated ERC performance must fall within the limit bands and emergency ERC, parking ability, skid limit performance, friction utilisation and axle fade rating must all meet the specified requirements.

For a modified trailer, the following information must be recorded during the rating process:

- Certified subassemblies for control system, braked axles and suspension.
- Slack adjuster lengths used for each axle
- Brake chamber sizes used for each axle
- Tyre and rim size, load and speed rating
- Aggregate Trailer Mass
- Axle Group Loads

The calculated performance figures for ERC at various levels of Control pressure 'E', together with the upper and lower limit bands should also be included with the records.

**8.0 Road Train Trailer Dimensions**

The maximum dimensions of a road train combination must be in accordance with the limits specified by Registering Authorities.

**9.0 Other Road Train requirements****Signs**

Signs bearing the words "ROAD TRAIN" must be attached to the front and to the rear of a road train combination. The height of the rear sign must not exceed 3 metres from the ground and it must be clearly visible to following traffic.

The signs are to be fitted in accordance with the current requirements published by Registering Authorities.

The signs must not be displayed when the trailer is not operating as a road train



**HEAVY VEHICLE MODIFICATIONS****10.0 Axle Groupings**

All axle groups in the road train combination must conform to the spacing requirements between adjacent single axles/ axle groups published by the Registering Authorities.

HEAVY VEHICLE MODIFICATIONS

Checklist for Modification Code S11

RATING OF TRAILERS FOR USE IN ROAD TRAIN

**Appendix 11****Modification Code S11****Annex 1****Test Rig to ADR 38/..specification for trailer application/release time testing**

Where a trailer 'Brake System' is required to be tested for compliance with application and release time requirements, the test rig described in Figure 2 of ADR 38/... shall be calibrated in accordance with this procedure and connected as described in Figure 3 of ADR 38/...

Where a rear service coupling for towed trailers is provided, time responses shall be measured with an 800 millilitre vessel attached to the rear service coupling as in Figure 3 of ADR 38/...

The test rig described in Figure 2 of ADR 38/.. shall be calibrated by adjustment of the orifice (O) such that with the storage reservoir (R1) charged to 650 kPa, the time between the initial pressure drop measured between the storage reservoir and the control valve (V), and the pressure at the end of the calibrating vessel (R2) increasing to 420 kPa, is between 0.18 and 0.22 seconds.

The test rig and the trailer energy storage devices shall be charged to 650 kPa prior to the test being conducted and no additional energy shall be added to the storage vessel (R1) or the trailer 'Supply Line' during the period of the test.

The brake actuation time shall be taken from when the pressure level, measured between the storage reservoir and the control valve, initially drops to when the pressure in the least favoured brake actuator reached 420 kPa.

With an initial service brake application level of 650 kPa the brake release time shall be taken from when the pressure level, measured between the control valve and the orifice, initially drops to when the pressure in the least favoured brake actuator reaches 35 kPa.

The brake control valve shall be of a configuration that permits energy to flow from the storage reservoir to the orifice (O) when in the 'on' position and from the orifice to waste when in the 'off' position. It shall not allow additional energy to flow into the test rig 'Control Line' by way of its own 'Control Signal'. The brake control valve control shall be designed so that the manner of its operation shall have no effect on the output response of the test rig. The brake control valve may be arranged to provide a modulated test rig output signal for other brake development purposes but which for the purpose of measuring trailer 'Brake System' response will be rendered inoperative.

## HEAVY VEHICLE MODIFICATIONS

## Appendix 12

## Modification Code S12

**RATING OF AGGREGATE TRAILER MASS  
DESIGN CERTIFICATION FOR MODIFIED TRAILERS**

Certifications that are covered under this Modification Code are:

1. Increase or decrease of Aggregate Trailer Mass (ATM) rating for a trailer which has been modified to a specification which differs from the manufacturer's standard specification
2. Issue of an Aggregate Trailer Mass (ATM) rating recommendation certificate and checklist to an S7 Certifying Officer who will inspect and plate the trailer. The trailer specification may have been supplied either by the owner or by the S7 Certifying Officer. The trailer itself may not have been inspected by the S12 Certifying Officer.
3. Issue of an Aggregate Trailer Mass (ATM) rating recommendation certificate and checklist to an S7 Certifying Officer who will inspect and plate the trailer, for a trailer whose manufacturer no longer exists and for which a manufacturer's ATM is not available.

Certifications that are **not** covered under this Modification Code are:

1. Aggregate Trailer Mass (ATM) rating for a trailer which has been modified to change the registration category of the trailer e.g. semitrailer to dog trailer, pig trailer to dog trailer, semi to dolly, etc. Such trailers are regarded as newly manufactured and must obtain a new Vehicle Identification Number (VIN) and be fitted with a new Identification Plate issued by the Department of Infrastructure and Transport which will identify the applicable ATM.
2. Aggregate Trailer Mass (ATM) rating of Road Train trailers (see Code S11) or B Double trailers (see Code S9).

**NOTE: The modified vehicle/modifications must continue to comply with all applicable ADR's, Australian Standards and Regulations/Acts.**

Outlined below are the areas of the trailer that may have been affected by the modifications and that may require recertification, testing and/or data to show compliance of the modified trailer.

**DETAIL**

Brakes

Suspension

Chassis

Tyres

Tow Couplings

**REQUIREMENTS**

ADR 38, 38/.., Modification Code G3

Manufacturer's rating, Modification Code F2

Manufacturer's rating, Modification Code H5

Manufacturer's rating, ADR 24/.., 42/..

Manufacturer's rating, ADR 62/.., Modification Codes P1 and P2

If any of the areas listed above are affected by modifications made to the trailer in order to achieve the ATM rating they must comply with the prescribed standards and where necessary must be approved by a Certifying Officer holding the appropriate modification code.

## HEAVY VEHICLE MODIFICATIONS

## Appendix 12

## Modification Code S12

**RATING OF AGGREGATE TRAILER MASS  
APPROVED DESIGN CERTIFICATION FOR MODIFIED TRAILERS****SPECIFIC REQUIREMENTS****1.0 General**

The purpose of this Code is to allow suitably qualified Certifying Officers to certify the permissible Aggregate Trailer Mass (ATM) rating of trailers modified within the original registration category, either by personal inspection of the trailer or by examination of written specifications supplied by the owner or the modifier or the S7 Certifying Officer.

Typical modifications would include changes from tandem axle to tri-axle semitrailer configuration, two axle to three axle dog trailer conversion or replacement of axles, suspensions or control systems with alternative components which would allow a different rating.

In the case of a trailer which is not inspected by the S12 Certifying Officer, the S12 certificate and checklist should be issued. The checklist confirms the fact that the trailer has not been inspected, identifies the source of the information and recommends an appropriate rating for a trailer having components as listed in the checklist, subject to the trailer being in satisfactory mechanical condition.

The certificate and checklist may then be used by an S7 Certifying Officer to re-rate the individual trailer after inspection to verify that the components are as described in the checklist attached to the S12 certificate and that the trailer's mechanical condition is satisfactory.

Issue of an Aggregate Trailer Mass (ATM) rating certificate is also permitted for an existing trailer where the ATM is not recorded and where the trailer manufacturer no longer exists.

In all cases, the re-rating must address the compatibility of the entire trailer for the revised rating and in particular must check that the chassis, suspensions, axles and tow couplings are used within the component and trailer manufacturer's rated capacities.

**2.0 Tyres and Wheel Rims**

The sum of the load carrying capacities of all the tyres (and rims) fitted to an axle/axle group must not be less than the lesser of the manufacturer's rating for that axle/axle group and the legally permissible mass on that axle/axle group.

With the trailer loaded to its revised Aggregate Trailer Mass rating and with the load uniformly distributed, the load on any tyre or rim must not exceed the carrying capacity of that tyre or rim .

For a trailer manufactured to comply with ADR 24/.., or 42/.., the tyres and rims must be selected in accordance with that ADR and must comply with that ADR at the revised ATM rating.

Where a trailer is fitted with a tyre placard, this placard must be replaced with suitably amended placard to indicate the correct tyre specifications for the trailer at the revised ATM rating. The revised tyre size and load rating must also appear on the modification plate.

### 3.0 Chassis

The modified chassis must be confirmed by calculation to be adequate for the proposed ATM.

### 4.0 Tow coupling

The tow coupling fitted to a modified trailer must be adequate for the proposed ATM and the coupling installation must conform to the requirements of Code P1 or P2 as applicable.

The drawbar of a pig or dog trailer must be designed to withstand the forces specified in ADR 62/.. .

### 5.0 Brake control system - air braked trailer

The length and diameter of piping and the type of connecting fittings within a trailer control system are critical for achievement of brake response and release times within the limits specified by ADR 38 and ADR 38/... The maximum permitted lengths of piping are specified in Department of Transport and Regional Development certified brake system parts lists and installation diagrams, which are available from the control system manufacturers. The actual installed lengths of piping should be checked against these specifications if the brake system response and release times are not tested by the officer approving the ATM rating.

Where a certified brake control system is not used, or is installed with piping lengths exceeding the specified limits or with components other than those shown on the certified parts list, response and release time tests in accordance with the relevant section of ADR 38/... must be conducted, unless it can be established that the system changes are beneficial to time responses.

### 6.0 Brake System Subassemblies (air braked trailer)

#### Control system, braked axles and suspension

The maximum ATM permitted by an ADR 38 trailer braking system depends on the trailer mass which can be parked on an 18% grade. This is determined by calculations in which certified data published by the subassembly manufacturers is used to select brake chamber sizes and slack adjuster lengths which will provide sufficient parking brake force without exceeding the suspension skid limits in an emergency breakaway application.

The conformance of the trailer design must be established to all requirements of ADR 38/... The calculated ERC performance must fall within the limit bands and emergency ERC, parking ability, skid limit performance, friction utilisation and axle fade rating must all meet the specified requirements.

Section 1 of the check list records the trailer data which is critical for these calculations.

The checklist must be supplied with the S12 certificate to the S7 Certifying Officer who is to conduct the physical inspection of the trailer.

Copies of the control system certified diagram and parts lists should also be included with the Certificate.

**Checklist for Modification Code S12**

**RATING OF AGGREGATE TRAILER MASS  
APPROVED DESIGN CERTIFICATION FOR MODIFIED TRAILERS**