Section S

Vehicle Rating

Contents

Section S — Overview

1. Description

This section of Vehicle Standards Bulletin 6 (VSB6) relates to the certification of:

- motor vehicles for use in B-double configurations
- motor vehicles for use in road train configurations
- trailers for use in road train configurations
- mass rating changes to motor vehicles or trailers
- mass rating changes to motor vehicles or trailers required as a result of modifications that affect their carrying capacity (gross vehicle mass / aggregate trailer mass, gross trailer mass) or hauling/towing capacity (gross combination mass).

Examples of modifications that might require rating changes include replacing engines, transmissions, axles or suspension components that are differently rated.

Modification codes

The section consists of the following modification codes:

S1	GVM/GCM re-rating
S2	GVM re-rating (design)
S3	GCM re-rating (design)
S7	ATM/GTM re-rating
S8	Motor vehicle road train rating
S9	Prime mover B-double rating
S11	Road train trailer rating
S12	ATM/GTM re-rating (design)

Not covered by this section of VSB6

Although the modification codes in this section apply to the modification of a motor vehicle or trailer unless specifically mentioned, this section does not apply to a trailer that has been modified to change the trailer's basic type, e.g., semitrailer to dog trailer, pig trailer to dog trailer, semitrailer to dolly, etc. Such trailers are deemed to be newly manufactured and must be certified as a new entry onto the RAV. For more information about the certification of new vehicles, please refer to the Federal Transport Department.

Conversion of a semitrailer to a B-double lead trailer is not a change of basic trailer type and must be done in accordance with the applicable sections of VSB6 including Section G — Brakes and Section P — Tow couplings.

Modification code checklists:

The following checklists form part of each associated code and are to be completed by persons certifying modifications:

S1	Checklist — GVM/GCM re-rating
S2	Checklist — GVM re-rating (Design)
S3	Checklist — GCM re-rating (Design)
S7	Checklist — ATM/GTM re-rating
S8	Checklist — Motor vehicle road train rating
S9	Checklist — Prime mover B-double rating
S11	Checklist — Road train trailer rating
S12	Checklist — ATM/GTM re-rating (design)

S1 and S7 modification codes

These codes allow accredited approved vehicle examiners (AVEs) to re-rate or assign gross vehicle mass (GVM) and/or gross combination mass (GCM) (S1), or aggregate trailer mass (ATM) and/or gross trailer mass (GTM) (S7) ratings to vehicles.

A rating for a heavy vehicle must be based either on a manufacturer's rating for an identical vehicle or on a design certificate and checklist prepared in accordance with Modification Codes S2 (GVM), S3 (GCM) or S12 (ATM and/or GTM) by an appropriately qualified and accredited AVE.

S2, S3 or S12 modification codes

These codes enable accredited AVEs to issue a design certificate and checklist to allow an accredited S1 or S7 AVE to re-rate or assign the GVM and/or GCM (S1), or ATM and/or GTM (S7) of heavy vehicles. These re-ratings can be based on personal inspection or by examination of vehicle design specifications supplied by the owner, modifier, S1 or S7 accredited certifying AVE or otherwise supplied.

S8, S9 or S11 modification codes

These codes enable accredited AVEs to certify vehicles for use in multi-combination configurations. This includes inspecting, testing and certifying modifications to road train motor vehicles and trailers, as well as B-double prime movers where they have been modified to meet the minimum requirements of the applicable heavy vehicle regulator.

The road train rating codes apply to motor vehicles and trailers as applicable. The B-double rating code applies to prime movers only which have been built or modified for use in B-doubles, but which lack the statement ROAD TRAIN or B-DOUBLE on the identification plate as specified in ADR 61/.. to signify manufacturer certification that it conforms to relevant standards and regulations, or to re-rate the ATM or GCM of the vehicle as applicable.

Evidence of manufacturer's specification

In this code, the ratings of a vehicle (GVM, GCM, ATM, GTM, Road Train GCM and B-double GCM) may be re-rated to the manufacturer's specifications for the vehicle or a similar vehicle from the same manufacturer. The vehicle must be modified to reflect all specifications of the comparison vehicle and the modifier as well as the accredited AVE must have written evidence of the manufacturer's specification that they are certifying the vehicle to.

Ensure that written evidence:

- is issued by the manufacturer; evidence issued by a dealer or other agent is not acceptable
- identifies the make, model, year and build state, or identifies a specific vehicle where vehicles are constructed to a build list
- contains enough information to allow confirmation that all major components relevant to determining the vehicle's GVM/GCM are the same, this includes engine, transmission, chassis rails, brakes, suspension, steering and axles.

↘ Manufacturers' publications, such as spare parts guides, are considered to be acceptable evidence provided they are detailed enough to allow a comprehensive comparison of the vehicles. For vehicles with dual GVM ratings, manufacturer data indicating that the vehicle is dual rated is considered to be acceptable.

2. Related Australian Design Rules

The Australian Design Rules (ADRs) relevant to this section include:

ADR no.	Title
13/..	Installation of Lighting
24, 24A, 24/..	Tyre & Rim Selection
28/.., 83/..	External Noise of Motor Vehicles
30, 30/..	Smoke Emission Control for Diesel Vehicles
35, 35A, 35/..	Commercial Vehicle Brake Systems
38, 38/..	Trailer Braking Systems
36,36A, 36/.., 70/.., 80/..	Emission Control for Heavy Vehicles
42/..	General Safety Requirements
44/..	Specific Purpose Vehicle Requirements
62/..	Mechanical Connections between Vehicles
63/..	Trailers Designed for Use in Road Trains
64/..	Heavy Goods Vehicles Designed for Use in Road Trains & B-Doubles
65/..	Maximum Road Speed Limiting for Heavy Goods Vehicles and Heavy Omnibuses

3. Record keeping

Recommended for persons certifying modifications:

- Collate complete records, including drawings, calculations, test results and copies of the appropriate version of any relevant Australian Standards and ADRs.
- Make the records available upon request for inspection by officers of the relevant federal, state or territory authority or heavy vehicle regulator.
- Retain records of analysis, work records, test results, evidence, sketches and other vehicle data, calculation sheets and completed checklists for at least seven years after the certification of the modified vehicle or design certificate.

4. Design requirements

Advanced braking systems

Advanced braking systems are an important safety feature fitted to many new vehicles.

Advanced braking systems are programmed by the vehicle manufacturer and are specific to the vehicle to which they are fitted. Changes made to the vehicle, such as engine, tyre size, steering control, suspension characteristics, vehicle mass and its distribution, may impact the performance of the advanced braking system.

Exercise extra caution when modifying vehicles fitted with advanced braking systems. Electric braking systems may be known as:

- electronic stability control (ESC)
- electronic stability program (ESP)
- vehicle stability control (VSC)
- dynamic stability control (DSC)
- vehicle stability assist (VSA)
- roll stability control (RSC)
- roll control system (RCS)
- electronic braking system (EBS)
- trailer electronic braking system (TEBS).

Advanced braking systems and their components may be easily damaged by common modification, maintenance and servicing techniques, such as the use of rattle guns within one metre of the sensors. When undertaking any work on a vehicle fitted with an advanced braking system, ensure all modifiers are familiar with these systems and the precautions that must be taken.

Ensure that before undertaking any modification on a vehicle that is fitted with an advanced braking system the modifier and approved vehicle examiner (AVE) consult with the vehicle manufacturer to determine the impact on the system.

Modification Code S1 — GVM/GCM re-rating

1. Scope

The purpose of this code is to allow an accredited S1 AVE to certify GVM/GCM rating changes of motor vehicles. Examples of modifications that might require rating changes include adding or removing axles, replacing engines, transmissions, or suspension components with differently rated alternatives.

Modifications covered under this code:

Covered

- GVM/GCM rating changes for a motor vehicle that conforms to an alternative specification from the motor vehicle's manufacturer for a vehicle that has the same GVM/GCM as the revised rating
- GVM/GCM rating changes for a motor vehicle that has been inspected and confirmed to conform to a design certificate issued by an appropriately qualified and accredited S2 (GVM) or S3 (GCM) AVE
- administrative re-rating of 10,000 lb vehicles
- GVM/GCM reductions without modification.

Not covered

- GVM/GCM rating reduction of a vehicle if the certifying AVE does not hold a copy of:
  - a design specification certifying the alternative rating issued by the vehicle manufacturer; or
  - a design certificate issued by an accredited S2 (GVM) or S3 (GCM) AVE
- GVM/GCM rating increase of a vehicle where it is unmodified (other than where it is in accordance with the manufacturer's specifications).

2. Related standards

Modified vehicles must comply with all applicable ADRs, Australian Standards, acts and regulations. Below are some but not all of the areas that may be affected by the modifications in this code and require certification testing or evidence to demonstrate compliance.

The AVE must ensure that the modified vehicle continues to comply with all related ADRs.

This…	Must comply with…
Brakes	ADR 35, 35A, 35/.., VSB6 Section G
Suspension	Manufacturer's rating, Modification Code F1
Steering	Manufacturer's rating, VSB6 Section E
Chassis	Manufacturer's rating, VSB6 Section H
Engine	ADR 30, 30/.., 36, 36A, 36/.., 70/..,80/.. VSB6 Section A
Transmission	Manufacturer's rating, VSB6 Section B
Tail shaft	Manufacturer's rating, VSB6 Section C
Axles	Manufacturer's rating, VSB6 sections D and E
Tyres	Manufacturer's rating, ADR 24, 24A, 24/.., 42/.., VSB6 Section E
Front underrun protection	ADR84/.. , Modification Code H6
Road speed limiter	ADR65/.. , Modification Code A5

3. Certification procedure

The certification procedure for this modification code is as follows:

1.	Modifier	Determine if the GVM/GCM re-rating is within the manufacturer's specifications for the vehicle or a similar vehicle from the same manufacturer. • If **yes**, proceed to step 2. • If **no**, proceed to step 4.
2.	Modifier	Obtain written evidence of the manufacturer's specifications. Proceed to step 3.
3.	Modifier	Determine if the vehicle is to be modified to change the GVM/GCM. • If **yes**, proceed to step 6. • If **no**, proceed to step 7.
4.	Modifier	Contact an accredited S2/S3 AVE to supply the vehicle specifications or organise the vehicle inspection by an accredited S2/S3 AVE.
5.	S2/S3 AVE	Provide design certification to modifier.
6.	Modifier	Consult with an AVE who is accredited to certify each modification for guidance on how any modification is required to be performed. Follow the certification procedure in each applicable modification code. *For example, where a suspension modification is required to re-rate the GVM/GCM, refer to an accredited F1 AVE and VSB6 Modification Code F1.*
7.	Modifier	Organise an approval inspection by an accredited S1 AVE.
8.	S1 AVE	Perform inspection, ensure all modifications have been certified (if applicable), complete S1 checklist and determine if compliance has been achieved. • If **yes**, proceed to step 9. • If **no**, do not proceed, advise modifier rework is required to ensure compliance. Return to step 6.
9.	S1 AVE	Issue modification certificate, affix modification plate listing the changed GVM/GCM, and submit paperwork as required by the relevant AVE registration scheme.

AVEs must be satisfied that the vehicle modification requirements are being met. It is advised that before modifications are carried out they be discussed with the certifying AVE.

4. Compliance requirements

When a significant increase in GCM is required, major rework of the vehicle's chassis may be needed to stiffen the chassis. A vehicle with a high GCM rating is normally fitted with larger cross-members and a larger chassis. The engine and driveline are also critical components in GCM rating. The GVM, however, depends mainly on chassis rail size and brake system capability, which are more readily upgradable.

When a vehicle's GVM is reduced, the braking system's performance is also affected; replacement or adjustment of any load proportioning valves may be required.

Required:

- Re-rate a vehicle **only** if it conforms to:
  - a vehicle specification for which an accredited S2 (GVM) or S3 (GCM) AVE has issued a design certificate and checklist; or
  - the design specification of an alternative vehicle produced by the vehicle manufacturer.
- For a vehicle to qualify for a change in GVM/GCM, ensure that it can operate safely at the revised GVM/GCM.
- Ensure the vehicle maintains a net carry capacity that is practical and reflects its intended use. Ensure that calculations used to establish the revised GVM consider the following:
  - tare mass of the vehicle
  - intended load
  - mass of occupants (driver/passengers)
  - any additional equipment carried (i.e., toolboxes).
- Individually assess critical components, such as the chassis, driveline, axles, suspension, brakes, steering, wheels and tyres, to ensure that each can operate under loads imposed at the revised GVM/GCM.
- Where a manufacturer has published a reduced rating capacity for a component, ensure the reduced rating is applied.
- Where the change in GVM/GCM requires modifications, ensure each modification is performed and certified in accordance with the relevant VSB6 modification code.
- When modifications such as fitting of additional or replacement axles with higher load rating are carried out, analyse the vehicle chassis to ensure that it has sufficient strength to accommodate the increased GVM/GCM (see VSB6 Section H — Chassis).
- Do not reduce a GVM rating simply in order to reduce statutory charges (registration fees, toll charges etc.) that apply to the vehicle at the manufacturer's original GVM, unless supported by:
  - a design specification certifying the alternative rating issued by the vehicle manufacturer; or
  - a design certificate issued by an accredited S2 (GVM) or S3 (GCM) AVE.
- Ensure the vehicle complies with all ADRs applicable to the vehicle at the revised GVM/GCM rating.
- Ensure the vehicle's GCM rating exceeds the revised GVM.
- Ensure the modification plate contains the changed GVM/GCM rating.

Recommended:

- If modifications are needed, wherever possible reproduce the vehicle manufacturer's specification relevant at the increased or decreased GVM/GCM.
- Simplify examination of the chassis requirements for each rating by associating 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.

5. Design requirements

Speed limiter requirements

Required:

- Limit the maximum speed of the vehicle to 100 km/h in accordance with the requirements of ADR 65/.. .
- If the speed limiter is not certified by the manufacturer to comply with ADR 65/.. , ensure the vehicle had a speed limiter installed and certify in accordance with VSB6 Modification Code A5.

Tyre and wheel rims requirements

Required:

- Ensure the sum of the manufacturer's load ratings of the tyres and rims fitted to an axle or axle group, is not less than the load rating of that axle or axle group.
- Ensure the manufacturer's load rating of each tyre and rim is not exceeded when the vehicle is loaded to the revised GVM rating.
- Select tyres and rims to comply with requirements of the relevant ADR (ADR 24/.. or ADR 42/04) at the revised GVM rating.
- If a tyre placard is fitted to a vehicle, replace this placard or amend it as necessary to indicate the correct tyre specifications for the vehicle at the revised GVM rating.
- Ensure the revised tyre size and load rating also appears on the modification plate.
- If tyre or wheel changes are performed, they must be conducted in accordance with VSB6 Section E — Front axle steering wheels and tyres.

Chassis requirements

Required:

- Ensure, where modified, the chassis modification is performed and certified in accordance with VSB6 Section H — Chassis and the chassis conforms to the:
  - design specification certified by the accredited S2 (GVM) or S3 (GCM) AVE; or
  - specification for material, reinforcement and cross-member installation by the vehicle manufacturer and the model variant to which the modified vehicle is being compared.

Brakes requirements

The braking performance of a vehicle is directly affected by changes in the vehicle's mass.

Required:

- Before any change in GVM can be certified, if the brake system is modified, ensure that the modification is performed and certified in accordance with VSB6 Section G — Brakes.
- Before an increased GVM can be certified, upgrade the brake system in line with the vehicle manufacturer's specification or the design specification certified by the accredited S2 (GVM) or S3 (GCM) AVE. If the brake system is modified, perform and certify the modified braking system in accordance with VSB6 Section G — Brakes.
- If a manufacturer's specification is used for comparison, ensure the modified braking system matches the comparison braking system design and componentry as fitted by the manufacturer to a vehicle with a GVM equal to or slightly greater than (within 10% above) the proposed GVM rating.
- Before a reduction in GVM can be certified, ensure that, if applicable, the brake system is modified to meet the specifications of the:
  - vehicle manufacturer's design specification; or
  - the design certificate issue by an accredited S2 (GVM) AVE.

Recommended:

- Take care with vehicles fitted with electronic stability control (ESC) or other advanced braking systems as increased payload, or altered load centre of gravity may adversely affect the dynamic performance or stability of the modified vehicle. Consult with the vehicle manufacturer for guidance.

Driveline requirements

Gradeability and startability

Required:

- Ensure the vehicle's gradeability at the revised GVM/GCM is at least 23%.
- Ensure the vehicle's startability at the revised GVM/GCM is at least 13%.

Recommended:

- Whilst a gradeability of 23% and startability of 13% is mandatory, where a vehicle is intended to operate on increased grades, it is recommended to ensure the vehicle's gradeability and startability is appropriate for its revised GVM/GCM.

Engine/transmission

Required:

- Ensure the GVM/GCM rating assigned does not exceed the engine and transmission manufacturer's recommendations, or the limit set by vehicle manufacturer for a vehicle using the engine and transmission models being assessed.

Certification by comparison with manufacturer's reference vehicle

Required:

- Ensure the engine and transmission fitted to the modified vehicle are identical to those fitted by the manufacturer to the reference vehicle, and where modified perform and certify in accordance with VSB6 Section A — Engines and Section B — Transmissions.
- Assess the engine and transmission mounting system for adequacy to resist maximum engine torque multiplied by the gear ratio of the transmission starting gear, especially if a transmission with lower gearing or an engine with higher torque output is used to improve startability. Note that maximum torque may instead be achieved with the use of an auxiliary or endurance brake such as an engine retarder. Ensure that any supporting modifications are performed and certified in accordance with *VSB6 Sections A: Engines and B: Transmissions*.

Tail shaft

A higher GVM/GCM requires an increased torque capability of the tail shaft, with torque being limited either by the engine torque output or by wheel slip.

Required:

- Assess that the maximum possible torque is within the capability of the tail shaft. Note that maximum torque may instead be achieved with the use of an auxiliary or endurance brake such as an engine retarder. Ensure that any supporting modifications are performed and certified in accordance with VSB6 Section C — Tail shafts.

Front and rear axles and suspension assemblies

Required:

- If certification is by comparison with a manufacturer's reference vehicle, ensure that the modified vehicle's axle and suspension assemblies are identical to those of the reference vehicle with the higher GVM rating.
- Where a manufacturer has published a reduced rating capacity for a component, ensure the reduced rating is applied.
- Ensure that the modified vehicle steering system matches the steering system design and componentry as fitted to the comparison vehicle, and where modified is performed and certified in accordance with VSB6 Section E — Front axle steering wheels and tyres.

Reduction in GVM — without modification

Required:

- Where a motor vehicle's GVM is to be reduced without physical modification that does not result in a change of ADR category, ensure the re-rating is certified under this modification code.
- Where the re-rating results in a change of ADR category, ensure the modification is performed in accordance with a design certificate issued by an appropriately qualified and accredited S2 AVE.

Administrative re-rating of 10,000 lb vehicles

If a vehicle has originated from the United States market and is rated at 10,000 lbs (4536 kg) GVM, the GVM may be re-rated to 4490 kg without modification. This re-rating of GVM changes the vehicle category from NB2 to NB1. As a modification that affects ADR certification, re-rating of a 10,000 lb vehicle must not be performed before a vehicle has been supplied to the market.

Supply to the market is defined under the Commonwealth *Motor Vehicle Standards Act 1989*.

Required:

- The vehicle must meet all applicable ADRs for the new (NB1) category, including but not limited to braking performance.
- If physical modifications are required to support the revised re-rating, including but not limited to changes to align with the manufacturer's specifications, the modification must be performed and certified in accordance with the relevant sections of VSB6.

S1 Checklist — GVM/GCM re-rating (example)

S1 Checklist — GVM/GCM re-rating

This checklist is for use by S1 certifying approved vehicle examiners (AVEs) when certifying a GVM/GCM re-rating.

Vehicle and modifier details

Vehicle make:	Vehicle model:	Month and year of manufacture:
VIN (if applicable):	**Vehicle chassis no. (if applicable):**	**Vehicle modifier (company name):**
Vehicle make, model and year used for comparison:		**Vehicle modifier (company name):**
Make	Model	Year
Certifying S2/S3 AVE name:	**AVE no.:**	**S2/S3 design certificate number:**

Component details (as applicable)

Component details					
Component	Make/model	Manufacturer's max. GVM and	GCM ratings	Low/top ratios	
Transmission		kg	kg	1:	1:
Aux. transmission		kg	kg	1:	1:
Rear axle(s)		kg	kg	1:	1:
Rear suspension		kg	kg		
Front axle(s)		kg	kg	1:	1:
Front suspension		kg	kg		
Tyres front		kg			
Tyres rear		kg			
Chassis section		kg	kg		
Tow coupling / fifth wheel		D-rating		kN	
Tow coupling overhang	Applicable: Yes ☐ No ☐	Amount		mm	
Wheelbase	mm	Overhang		mm	
Modified GCM rating GCM assigned		Vehicle make/model, if used for comparison			
kg					

Assessment

Assessment — Check Yes, No, N/A as applicable:	Yes	No	N/A
1 Is the modified GVM/GCM within all the component manufacturer's limits?	☐	☐	
2 Have the following been kept for future audit: • details of components of the vehicle model used for reference; or • a copy of the S2/S3 design certification and checklist?	☐	☐	
3 Is the vehicle identical, including air system compressor, chassis reinforcements, steering system, to: • the reference vehicle; or • according to the S2/S3 report specification?	☐	☐	
4 Has the tyre placard, if fitted, been updated where necessary to record the correct tyre and rim sizes, axle configurations, axle loads and tyre inflation pressures for the modified vehicle?	☐	☐	☐
5 Are the tyres and rims fitted to the vehicle in accordance with the tyre placard?	☐	☐	☐
6 Has gradeability been established as adequate for the modified GVM/GCM?	☐	☐	

Vehicle chassis no./VIN:	Date:	Signed:

Vehicle Standards Bulletin 6 — Version 3.2
Section S — Vehicle rating
1 of 2

S1 Checklist — GVM/GCM re-rating

This checklist is for use by S1 certifying approved vehicle examiners (AVEs) when certifying a GVM/GCM re-rating.

Advanced braking systems

Braking systems	Check Yes, No, N/A as applicable:	Yes	No	N/A
1	Is the advanced braking system (where fitted) un-affected or re-certified after the vehicle modification?	☐	☐	☐

Modification details

Modification criteria	Check Yes or No as applicable:	Yes	No
1	Has the modification been performed in accordance with the manufacturer's guidelines?	☐	☐

Compliance

Modification	Check Yes or No as applicable:	Yes	No
1	Does this modification meet all the requirements of the manufacturer's guidelines / Modification Code S1?	☐	☐
2	Is the quality of the work to an accepted industry standard?	☐	☐
3	Does the vehicle comply with all applicable Australian Design Rules (ADRs) requirements at the revised GVM/GCM (i.e., vehicle rates to 4490kg, NB1 category requirements including but not limited to brake performance?)	☐	☐
4	Does the vehicle continue to comply with ADRs and heavy vehicle standards regulations affected by the modification?	☐	☐

Authorisation

Other than modification criteria, if the answer to any relevant question is NO the modification is not acceptable.

Comments:			
Examined by:	Company (if applicable):		AVE no.:
Signed:	Modification certificate no.:	Modification plate no.:	Date:

Vehicle chassis no./VIN:	Date:	Signed:

Modification Code S2 — GVM re-rating (design)

1. Scope

The purpose of this code is to allow an accredited S2 AVE to issue a design certification and checklist that allows an accredited S1 AVE to certify the permissible GVM rating of heavy motor vehicles.

Examples of modifications that might require GVM rating changes include adding or removing axles, and replacing engines, transmissions, or suspension components with differently rated alternatives.

The design certificate can be based on vehicle specifications:

- obtained directly from the vehicle by the accredited S2 AVE
- provided to the accredited S2 AVE, by the owner, modifier, accredited S1 AVE or otherwise.

Modifications covered under this code:

Covered

- the issuing of a design certificate and checklist for use by an accredited S1 AVE to inspect and re-rate the GVM of a motor vehicle. The vehicle itself may or may not have been inspected by the accredited S2 AVE
- the issuing of a certificate and checklist for use by an accredited S1 AVE to permit the GVM rating reductions where the maximum necessary and likely laden vehicle mass can be established to be lower than the vehicle manufacturer's original GVM.

Not covered

- the issuing of a design certificate for the rating of a vehicle's GCM (covered by VSB6 Modification Code S3)
- the issuing of a design certificate that allows for GVM rating changes that would cause any component of the vehicle to be loaded in excess of the manufacturer's rating
- the issuing of a design certificate that allows for GVM rating changes (increase or reduction) that would cause the vehicle to be non-compliant with any applicable ADRs, Australian Standards, acts and regulations at the changed rating.

2. Related standards

Modified vehicles must comply with all applicable ADRs, Australian Standards, acts and regulations. Below are some but not all of the areas that may be affected by the modifications in this code and require certification testing or evidence to demonstrate compliance.

The AVE must ensure that the modified vehicle continues to comply with all related ADRs.

This…	Must comply with…
Brakes	ADR 35, 35A, 35/.. , VSB6 Section G
Suspension	Manufacturer's rating, Modification Code F1
Steering	VSB6 Section E
Chassis	Manufacturer's rating, VSB6 Section H
Engine	ADR 30/.. , 36, 36A, 36/.. , 70/.. , ADR 80/.. VSB6 Section A
Transmission	Manufacturer's rating, VSB6 Section B
Tail shaft	VSB6 Section C
Axles	Manufacturer's rating, VSB6 sections D and E
Tyres	Manufacturer's rating, ADR 24, 24A, 24/.. , ADR 42/.. , VSB6 Section E
Front underrun protection	ADR84/.. , Modification Code H6
Road speed limiter	ADR65/.. , Modification Code A5

3. Certification procedure

The certification procedure for this modification code is as follows:

1.	Modifier	Contact appropriately qualified and accredited S2 AVE to supply vehicle specifications or organise vehicle inspection by an accredited S2 AVE.
2.	S2 AVE	Assess and provide design certification to modifier listing specifications and GVM rating.
3.	Modifier	Consult with an accredited S2 AVE for guidance on what modifications are required.
4.	Modifier	Consult with an AVE who is accredited to certify each modification for guidance on how any modification is required to be performed. Follow the certification procedure in each applicable modification code. *For example, where a suspension modification is required to re-rate the GVM, refer to an accredited F1 AVE and VSB6 Modification Code F1.*
5.	Modifier	Organise approval inspection by an accredited S1 AVE.
6.	S1 AVE	Perform inspection, ensure all modifications have been certified (if applicable), complete S1 checklist and determine if compliance has been achieved. • If **yes**, proceed to step 7. • If **no**, do not proceed, advise modifier rework is required to ensure compliance. Return to step 4.
7.	S1 AVE	Issue modification certificate, affix modification plate listing the changed GVM, and submit paperwork as required by the relevant AVE registration scheme.

AVEs must be satisfied that the vehicle modification requirements are being met. It is advised that before modifications are carried out they be discussed with the certifying AVE.

4. Compliance requirements

Required:

- If modifications are required to be made to the vehicle to support a GVM re-rating (i.e., axle substitution), ensure that the modification, is performed and certified in accordance with the relevant sections of VSB6.
- Ensure the vehicle complies with all ADRs applicable to the vehicle at the revised GVM rating.
- Ensure the vehicle's GCM rating exceeds the vehicle's changed GVM rating.
- Assess the compatibility of the entire vehicle in relation to the revised rating, including by checking that chassis, suspension, axle and driveline components are within the manufacturer's rated capacities at the revised GVM.
- Where a manufacturer has published a reduced rating capacity for a component, ensure the reduced rating is applied.
- Issue a design certificate which:
  - clearly identifies whether it refers to a specific vehicle or to a range of vehicles:

specific vehicle	clearly identify the make, model, VIN, and any other relevant details

type or range of vehicles	clearly outline the range of vehicles the rating applies to including make, model / model range, year range and any other relevant details

- includes a checklist of all relevant specifications of the vehicle, such as chassis material, engine, suspension and driveline components etc., for the accredited S1 AVE to verify that the vehicle meets the requirements of the S2 design certificate
- identify the source of any specifications or ratings.

Change in GVM

When a significant increase in GVM is required, the chassis may require modification to ensure an adequate strength rating is provided.

When a vehicle's GVM is reduced, the braking system's performance is also affected; replacement or adjustment of any load proportioning valves may be required.

Required:

- For a vehicle to qualify for a change in GVM, ensure that it can operate safely at the revised GVM.
- Where modifications to the vehicle are required in order to support a GVM re-rating (i.e., chassis modifications) ensure that the modification is performed and certified in accordance with the relevant sections of VSB6.
- When modifications such as fitting of additional or replacement axles with higher load rating are carried out, analyse the vehicle chassis, including for localised loading imposed by the additional or replacement axles to ensure that the chassis has sufficient strength to accommodate the increased GVM (see VSB6 Section H — Chassis).
- Ensure the vehicle's GCM rating exceeds the vehicle's GVM rating.
- Individually assess critical components, such as the chassis, driveline, axles, suspension, brakes, steering, wheels and tyres, to ensure that each can operate under increased loads resulting from increased GVM.

Recommended:

- A simplified examination of the chassis requirements for each rating may be conducted by associating the bending strength of the chassis with the load carrying capacity.
- If modifications are needed, wherever possible reproduce the vehicle manufacturer's specification relevant at the increased GVM.

5. Design requirements

Speed limiter

Required:

- Limit the maximum speed of the vehicle to 100 km/h in accordance with the requirements of ADR 65/.. .
- If the speed limiter is not certified by the manufacturer to comply with ADR 65/.. , ensure the vehicle had a speed limiter installed and certify in accordance with VSB6 Modification Code A5.

Tyres and wheel rims

Required:

- Ensure the sum of manufacturer's load ratings of the tyres and rims fitted is not less than the vehicle's GVM.
- Ensure the sum of manufacturer's load ratings of the tyres and rims fitted to an axle or axle group is not less than the load rating of that axle or axle group.
- Ensure the load carrying capacity of any tyre or rim is not exceeded when the vehicle is loaded to its revised GVM rating, and the load is distributed normally.
- Select tyres and rims to comply with the relevant ADR (ADR 24/.. or ADR 42/..) at the revised GVM rating.
- If a tyre placard is fitted to a vehicle, replace this placard or amend it as necessary to indicate the correct tyre specifications for the vehicle at the revised GVM rating.
- Ensure the revised tyre size and load rating appears on the modification plate.
- Where tyre or wheel changes are made, ensure that the modification is performed and certified in accordance with VSB6 Section E — Front axle steering wheels and tyres.

Brakes

The braking performance of a vehicle is directly affected by changes in the vehicle's GVM.

Required:

- Ensure that the vehicle's braking system is adequate for the revised GVM rating.
- Before any change in GVM can be certified, ensure that any modification performed on the brake system is certified in accordance with VSB6 Section G — Brakes.
- Before a reduction in GVM can be certified, ensure that specifications for the brake system are listed in the design certification and checklist. This includes modifications required to comply with the applicable brake performance requirements.

Chassis and driveline

Chassis

Required:

- Ensure that the vehicle's chassis has adequate strength for the revised GVM rating (see '4. Compliance requirements of this code' and VSB6 Section H — Chassis*)*.

Driveline

Gradeability

Gradeability is the ability of a vehicle to climb a grade when the vehicle is laden to the certified GVM and GCM. The theoretical figure of 23% indicates acceptable performance under normal operating conditions.

Required:

- Ensure the vehicle's gradeability at the revised GVM is at least 23%.
- Establish gradeability via the motor vehicle manufacturer's computer simulation or, when this is not available, by calculation using the formula:

$$GCM\ (Maximum) = \frac{K \times R \times M \times T}{(g_g + 1)} \quad \text{or}$$

$$g_g\ (Maximum\ gradeability) = \frac{K \times R \times M \times T}{(GCM)} - 1$$

g_g = maximum grade expressed as a percentage (15%) i.e., 10% starting ability plus 5% operating grade. For most applications g+1 = 24

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 (Nm)

Table 1: Tyre revolutions per kilometre

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
Source: ADR 65/00 Table 2		445/65R22.5	290

Recommended:

- Whilst a gradeability of 23% is mandatory, where a vehicle is intended to operate on higher grades it is recommended to ensure the vehicle's gradeability is appropriate for its intended use at its revised GVM.

Startability

Startability is the ability of a vehicle to start moving on a grade when the vehicle is laden to the GVM and GCM. The theoretical figure of 13% indicates acceptable performance under normal operating conditions.

Required:

- Ensure the vehicle's startability at the revised GVM is at least 13%.
- Establish startability via the motor vehicle manufacturer's computer simulation or, when this is not available, by calculation using the formula:

$$\text{GCM } (Maximum) = \frac{T_{800} \times R \times M}{19.87 \times g_s}$$

$$g_s\ (Maximum\ startability) = \frac{T_{800} \times R \times M}{19.87 \times GCM}$$

g_s = maximum grade expressed as a percentage (15%) i.e., 10% starting ability plus 5% operating grade. For most applications g+1 = 24

R = overall gear reduction between engine and driven wheels

M = tyre revolutions per kilometre, determined from Table 1

T_{800} = engine torque at clutch engagement RPM (typically 800 RPM) (Nm)

Engine/transmission

Required:

- Ensure the GVM rating assigned does not exceed the manufacturer's engine and transmission recommendations and their limits for vehicles using the engine and transmission models being assessed.
- Assess the adequacy of the engine/transmission mounting system to resist maximum engine torque multiplied by the gear ratio of the transmission starting gear, especially if a transmission with lower gearing or an engine with higher torque output is used to improve startability.

Tail shaft

A higher GVM requires an increased torque capability of the tail shaft, with torque being limited either by the engine torque output or by wheel slip.

Required:

- Ensure the maximum possible torque does not exceed capability of the tail shaft. Maximum torque may be achieved using an auxiliary or endurance brake such as an engine retarder.
- Ensure that any modifications are certified and performed in accordance with VSB6 Section C — Tail shafts.

Axles/suspension

Required:

- Obtain the maximum axle and/or axle group mass limits from:
  - the vehicle manufacturer; or
  - the axle and suspension manufacturer; or
- where the manufacturer's ratings cannot be established, comparison with a vehicle manufacturer's rating for a vehicle with identical:
  - axle and suspension components; and
  - axle ratio; and
- where the axle/suspension is modified, ensure the modification is performed and certified in accordance with VSB6 sections D — Rear Axles, E — Front axle steering wheels and tyres, and F — Suspension.
- Ensure the GVM rating assigned does not result in the axle, axle group or suspension rating being exceeded.
- Where a manufacturer has published a reduced rating capacity for a component, ensure the reduced rating is applied.

Motor vehicle rating reduction

Motorhomes

Motor vehicles including omnibuses, when converted to motorhomes or used for specific tasks, the manufacturer's GVM is frequently in excess of the maximum laden mass necessary for the vehicle in service.

Required:

- Ensure the vehicle has sufficient payload capacity to:
  - accommodate its intended use without exceeding the revised GVM when in use
  - if the motor vehicle used is to be used as a motorhome, ensure compliance with the applicable requirements in the Administrator's Circular 0-4-12 *Certification of Campervans and Motorhomes* available on the Department of Infrastructure and Regional Development website.
- Where the vehicle is converted for use as a motorhome, reduce the GVM rating to its '*maximum loaded vehicle mass*' (as defined in the Australian Design Rule – Definitions and Vehicle Categories). Ensure evidence that demonstrates the vehicle's weight, (i.e., a weighbridge ticket) is obtained with the vehicle loaded and adjusted for the following:
  - vehicle is fully furnished with all personal possessions on board
  - all fluid reservoirs (including all gas, fuel and water tanks) are filled to capacity
  - all supplied equipment, such as cooking equipment and utensils, refrigerator, cooling/heating systems, bedding, toilet, shower, TV/entertainment systems, LPG or NG bottle(s), etc.
  - a mass of 68 kg for each designated seating position
  - an additional mass equivalent to 13.6 kg for each seating position (i.e., for luggage / personal items)
  - a mass equivalent to 60 kg for each of the first two sleeping berths plus 20 kg for each additional sleeping berth.

Recommended:

The reduced GVM should also include the following items:

- If fitted, a bicycle or motorcycle rack loaded to its manufacturer's capacity.
- A reasonable weight for unexpected items (which should not exceed 500 kg).

S2 Checklist — GVM re-rating (design) (example)

S2 Checklist — GVM re-rating (design)

A copy of this checklist must be supplied with the design certificate to the S1 certifying approved vehicle examiner (AVE).

Vehicle/vehicle age and modifier details

Vehicle make:	Vehicle model:	Month and year of manufacture:
VIN (if applicable):	Vehicle chassis no. (if applicable):	Vehicle modifier (company name):

Vehicle examined or details supplied by:	S2 design certificate no.:

Engine make/mode:	Engine no.:	Rated power @ rpm:	Governed rpm:	Max torque @ rpm:
		kW @ RPM		Nm @ RPM

Tail shaft series/size:	Manufacturers max. torque:	T800 torque @ rpm:
mm (if applicable)	Nm	Nm @ RPM

Component details

Component	Make/model	Manufacturer's max. GCM rating	Low/top ratios
Transmission		kg	1: 1:
Aux. transmission		kg (if applicable)	1: 1:
Rear axle(s)		kg	1: 1:
Rear suspension		kg	
Front axle(s)		kg (if applicable)	1: 1:
Front suspension		kg (if applicable)	
Tyres front			
Tyres rear			
Chassis section			
Tow coupling / fifth wheel		D-rating	kN
Tow coupling overhang	Applicable: Yes ☐ No ☐	Amount	mm
Wheelbase	mm	Overhang	mm

Modified GCM rating GCM assigned	Vehicle make/model, if used for comparison
kg	

Assessment

Assessment	Check Yes, No, N/A as applicable:	Yes	No	N/A
1	Is the revised GVM within the component manufacturer's limits?	☐	☐	
2	Does the chassis have adequate strength?	☐	☐	
3	Have the chassis strength calculations or details of a vehicle model used as reference been retained for future audit?	☐	☐	
4	Does the design certificate specify the vehicle's braking system and has it been assessed to ensure that the vehicle will comply with brake performance requirements at the modified GVM?	☐	☐	
5	Does the design certificate specify the tyre placard changes for the vehicle if fitted so that it records the correct tyre and rim sizes, axle configurations, axle loads and inflation pressures for the modified vehicle?	☐	☐	☐
6	Has gradeability been established to exceed 23% at the modified GVM? Gradeability rating: %	☐	☐	
7	Has startability been established to exceed 13% at the modified GVM? Startability rating: %	☐	☐	
8	At the revised GVM, are the loads on the front axle and suspension, and rear axles and suspension within the manufacturer's maximum mass ratings for these components?	☐	☐	
9	Do the vehicle specifications on the design certificate ensure that the vehicle will comply with all applicable Australian Design Rules (ADRs) at the changed GVM/GCM rating?	☐	☐	

Advanced braking systems

Braking systems	Check Yes, No, N/A as applicable:	Yes	No	N/A
1	Is the advanced braking system (where fitted) un-affected or re-certified after the vehicle modification?	☐	☐	☐

Vehicle chassis no./VIN:	Date:	Signed:

Vehicle Standards Bulletin 6 — Version 3.2
Section S — Vehicle rating
1 of 2

S2 Checklist — GVM re-rating (design)

➘ A copy of this checklist must be supplied with the design certificate to the S1 certifying approved vehicle examiner (AVE).

Compliance

Modification	Check Yes or No as applicable:	Yes	No
1	Does this modification meet all the requirements of the manufacturer's guidelines / Modification Code S2?	☐	☐
2	Is the quality of the work to an accepted industry standard?	☐	☐
3	Does the vehicle continue to comply with ADRs and heavy vehicle standards regulations affected by the modification?	☐	☐

Authorisation

If the answer to any relevant question is NO, the modification is not acceptable.			
Comments:			
Issued by:	**Company (if applicable):**		**AVE no.:**
Signed:	**Modification certificate no.:**	**S2 design certificate no. issued:**	**Date:**

Vehicle chassis no./VIN:	Date:	Signed:

Modification Code S3 — GCM re-rating (design)

1. Scope

The purpose of this code is to allow an accredited S3 AVE to issue a design certification and checklist that allows an accredited S1 AVE to certify the permissible GCM rating of modified vehicles.

Examples of modifications that might require GCM rating changes include adding or removing axles, and replacing engines, transmissions, or suspension components with differently rated alternatives.

The design certificate can be based on vehicle specifications:

- obtained directly from the vehicle by the accredited S3 AVE; or
- provided to the accredited S3 AVE, by the owner, modifier, accredited S1 AVE or otherwise.

Modifications covered under this code:

Covered
• the issuing of a design certificate and checklist for use by an accredited S1 AVE to inspect and re-rate the GCM of a motor vehicle. The vehicle itself may or may not have been inspected by the accredited S3 AVE
Not covered
• the issuing of a design certification for the rating of a vehicle's GVM (covered by VSB6 Modification Code S2) • the issuing of a design certificate that allows ratings that would cause any component of the vehicle to be loaded in excess of that component manufacturer's rating • the issuing of a design certificate to allow the GCM rating of a vehicle for use as a road train motor vehicle (see VSB6 Modification Code S8) or a B-double prime mover (see VSB6 Modification Code S9).

2. Related standards

Modified vehicles must comply with all applicable ADRs, Australian Standards, acts and regulations. Below are some but not all of the areas that may be affected by the modifications in this code and require certification testing or evidence to demonstrate compliance.

The AVE must ensure that the modified vehicle continues to comply with all related ADRs.

This…	Must comply with…
Brakes	ADR 35, 35A, 35/.. , VSB6 Section G
Suspension	Manufacturer's rating, Modification Code F1
Steering	VSB6 Section E
Chassis	Manufacturer's rating, VSB6 Section H
Engine	ADR 30/.. , 36, 36A, 36/.. , 70/.. , ADR 80/.. VSB6 Section A
Transmission	Manufacturer's rating, VSB6 Section B
Tail shaft	VSB6 Section C
Axles	Manufacturer's rating, VSB6 sections D and E
Tyres	Manufacturer's rating, ADR 24, 24A, 24/.. , 42/.. , VSB6 Section E
Tow couplings	ADR 44/.. , 62/.. , VSB6 Section P

3. Certification procedure

The certification procedure for this modification code is as follows:

1.	Modifier	Contact an accredited S3 AVE to supply vehicle specifications or organise vehicle inspection by appropriately qualified and accredited S3 AVE.
2	S3 AVE	Assess and provide design certification to modifier listing specifications and GCM rating.
3	Modifier	Consult with an accredited S3 AVE for guidance on what modifications are required.
4.	Modifier	Consult with an AVE who is accredited to certify each modification for guidance on how any modification is required to be performed. Follow the certification procedure in each applicable modification code. *For example, where a suspension modification is required to re-rate the GCM, refer to an accredited F1 AVE and VSB6 Modification Code F1.*
5.	Modifier	Organise approval inspection by an accredited S1 AVE.
6.	S1 AVE	Perform inspection, ensure all modifications have been certified (if applicable), complete S1 checklist and determine if compliance has been achieved. • If **yes**, proceed to step 7. • If **no**, do not proceed, advise modifier rework is required to ensure compliance. Return to step 4.
7.	S1 AVE	Issue modification certificate, affix modification plate listing the changed GCM, and submit paperwork as required by the relevant AVE registration scheme.

AVEs must be satisfied that the vehicle modification requirements are being met. It is advised that before modifications are carried out they be discussed with the certifying AVE.

4. Compliance requirements

- If modifications are required to the vehicle to support a GCM re-rating (i.e., axle substitution), ensure that the modification is performed and certified in accordance with the relevant sections of VSB6.
- Ensure a modified vehicle's GCM rating is not less than the vehicle's GVM rating.
- Assess the compatibility of the entire vehicle in relation to the revised rating and check that chassis, suspension, axle and driveline components are within the manufacturer's rated capacities.
- Where a manufacturer has published a reduced rating capacity for a component, ensure the reduced rating is applied.
- Issue a design certificate which:
  - clearly identifies whether it refers to a specific vehicle or to a range of vehicles:

specific vehicle	clearly identify the make, model, VIN and any other relevant details
type or range of vehicles	clearly outline the range of vehicles the rating applies to including make, model / model range, year range and any other relevant details

- includes a checklist for the accredited S1 AVE to verify that relevant component specifications such as chassis material, engine, suspension and driveline, etc. meet the requirements of the S3 design certificate
- identifies the source of any specifications or ratings.

Driveline change in GCM

The engine and driveline are also critical components in GCM rating. When a significant increase in GCM is required, the chassis may require modification to ensure an adequate strength rating is achieved.

Required:

- Ensure that the vehicle can operate safely at the increased GCM.
- Ensure the vehicle's GCM rating exceeds the vehicle's GVM rating.
- When modifications such as fitting of additional or replacement axles with higher load rating are carried out, analyse the vehicle chassis to ensure that it has sufficient strength to accommodate the increased GCM (see VSB6 Section H — Chassis).
- Individually assess critical components, such as the chassis, driveline, axles, suspension, brakes, steering, wheels and tyres, to ensure that each can operate under increased loads resulting from increased GCM.

Recommended:

- A simplified examination of the chassis requirements for each rating may be conducted by associating the torsional strength of the chassis with the GCM rating.

5. Design requirements

Chassis and brakes requirements

Chassis

Required:

- Ensure that the vehicle's chassis has adequate strength for the revised GCM rating. Refer to the 'compliance requirements' of this code and VSB6 Section H — Chassis.
- Ensure that the tow coupling and its attachment are assessed and adequate at the revised GCM rating (see VSB6 Section P — Tow couplings).

Brakes

Required:

- Do not revise a GCM rating on a vehicle unless it is equipped with a trailer brake control system that is adequate for the intended GCM rating.
- Ensure that the vehicle's braking system is adequate for the revised GCM rating and, where applicable, modifications are performed and certified to the new GCM in accordance with VSB6 Section G — Brakes.
- Where a motor vehicle is modified to include trailer brake controls, ensure that it is performed and certified in accordance with VSB6 Modification Code G2.

Driveline requirements

Gradeability

Gradeability is the ability of a vehicle to climb a grade when the vehicle is laden to the GVM and GCM. The theoretical figure of 23% indicates acceptable performance under normal operating conditions.

Required:

- Ensure the vehicle's gradeability at the revised GCM is at least 23%.
- Establish gradeability via the motor vehicle manufacturer's computer simulation or, when this is not available, by calculation using the formula:

$$GCM\ (Maximum) = \frac{K \times R \times M \times T}{(g_g + 1)} \quad \text{or}$$

$$g_g\ (Maximum\ gradeability) = \frac{K \times R \times M \times T}{(GCM)} - 1$$

g_g = maximum grade expressed as a percentage (15%) i.e., 10% starting ability plus 5% operating grade. For most applications g+1 = 24

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)

Table 1: Tyre revolutions per kilometre

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
Source: ADR 65/00 Table 2		445/65R22.5	290

Recommended:

Whilst a gradeability of 23% is mandatory, where a vehicle is intended to operate on higher grades, it is recommended to ensure the vehicle's gradeability is appropriate for its intended use at its revised GCM.

Startability

Startability is the ability of a vehicle start moving on a grade when the vehicle is laden to the GVM and GCM. The theoretical figure of 13% indicates acceptable performance under normal operating conditions.

Required:

- Ensure the vehicle's startability at the revised GCM is at least 13%.
- Establish startability via the motor vehicle manufacturer's computer simulation or, when this is not available, by calculation using the formula:

$$\text{GCM } (Maximum) = \frac{T_{800} \times R \times M}{19.87 \times g_s}$$

$$g_s\ (Maximum\ startability) = \frac{T_{800} \times R \times M}{19.87 \times GCM}$$

g_s = maximum grade expressed as a percentage (15%) i.e., 10% starting ability plus 5% operating grade. For most applications g+1 = 24

R = overall gear reduction between engine and driven wheels

M = tyre revolutions per kilometre, determined from Table 1

T_{800} = engine torque at clutch engagement RPM (typically 800R PM) (Nm)

Engine/transmission

Required:

- Ensure the assigned GCM rating does not exceed the engine, transmission or vehicle manufacturer's recommendations.
- Assess the adequacy of the engine and transmission mounting system to resist maximum torque.
  - Maximum torque is typically peak engine torque multiplied by the lowest gear ratio of the transmission (i.e., starting or reverse gear).

↘ Note that maximum torque may instead be achieved with the use of an auxiliary or endurance brake such as an engine retarder.

- Ensure that any supporting modifications are certified and performed in accordance with VSB6 sections A — Engines and B — Transmissions.

Tail shaft

A higher GCM requires an increased torque capacity of the tail shaft, with the maximum torque being limited either by the engine torque output or by wheel slip.

Required:

- Ensure that the maximum possible torque is within the capability of the tail shaft.

↘ Note that maximum torque may instead be achieved with the use of an auxiliary or endurance brake such as an engine retarder.

- Ensure that any supporting modifications are certified and performed in accordance with VSB6 Section C — Tail shafts.

Axles/suspension

The maximum combination mass permitted by the axle manufacturer is frequently dependent on the engine torque and the axle ratio.

Required:

- Obtain the maximum axle and/or axle group mass limits from:
  - the vehicle manufacturer; or
  - the axle and suspension manufacturer; or
  - where the manufacturer's ratings cannot be established, comparison with a vehicle manufacturer's rating for a vehicle of identical:
  - driveline components; and
  - axle ratio; and
  - suspension components.

↘ The suspension manufacturer may also have limits on the GCM permitted on certain components, e.g., torque rods, walking beams or four-spring suspensions.

- Where the axle/suspension is modified, ensure the modification is performed and certified in accordance with VSB6 sections D — Rear axles, E — Front axle steering wheels and tyres, and F — Suspension.
- Ensure the GCM rating assigned does not result in any axle, axle group or suspension rating being exceeded.
- Where a manufacturer has published a reduced rating capacity for a component, ensure the reduced rating is applied.

S3 Checklist — GCM re-rating (design) (example)

S3 Checklist — GCM re-rating (design)

➘ A copy of this checklist must be supplied with the design certificate to the S1 certifying approved vehicle examiner (AVE).

Vehicle and engine details

Vehicle make:	Vehicle model:	Month and year of manufacture:
VIN (if applicable):	Vehicle chassis no (if applicable):	Vehicle modifier (company name):

Vehicle examined or details supplied by:	S3 design certificate no.:

Engine make/mode:	Engine no.:	Rated power @ rpm:	Governed rpm:	Max. torque @ rpm:
		kW @ RPM		Nm @ RPM

Tail shaft series/size:	Manufacturer's max. torque	T_{800} torque @ rpm
mm (if applicable)	Nm	Nm @ RPM

Component details

Component	Make/model	Manufacturer's max. GCM rating	Low/top ratios
Transmission		kg	1: 1:
Aux. transmission		kg (if applicable)	1: 1:
Rear axle(s)		kg	1: 1:
Rear suspension		kg	
Front axle(s)		kg (if applicable)	1: 1:
Front suspension		kg (if applicable)	
Tyres front			
Tyres rear			
Chassis section		kg	

Tow coupling / fifth wheel		D-rating		kN
Tow coupling overhang	Applicable: Yes ☐ No ☐	Amount		mm
Wheelbase	mm	Rear overhang		mm

Modified GCM rating GCM assigned	Vehicle make/model, if used for comparison
kg	

Assessment

Assessment — Check Yes, No, N/A as applicable:					Yes	No	N/A
1	Is the modified GCM within the component manufacturer's limits?				☐	☐	
2	Does the chassis have adequate strength? (Have chassis strength calculations or details of reference vehicle model used for comparison been retained for future audit?)				☐	☐	
3	Are the cross-members and tow coupling specified in the design certificate adequate for any increase in GCM as outlined in VSB6 Section H and Section P?				☐	☐	
4	Does the design certificate specify the vehicle's braking system and has it been assessed to ensure that the vehicle will comply with brake performance requirements at the modified GCM?				☐	☐	
5	Does the design certificate specify the tyre placard changes for the vehicle, if fitted, so that it records the correct tyre and rim sizes, axle configurations, axle loads and inflation pressures for the modified vehicle?				☐	☐	☐
6	Has gradeability been established to exceed 23% at the modified GCM?	Gradeability rating:		%	☐	☐	
7	Has startability been established to exceed 13% at the modified GCM?	Startability rating:		%	☐	☐	
8	Have all other modifications supporting the modified GCM rating been performed and certified in accordance with the relevant section(s) of VSB6?				☐	☐	
9	Do the vehicle specifications on the design certificate ensure that the vehicle will comply with all applicable Australian Design Rules (ADRs) at the changed GVM/GCM rating?				☐	☐	

Vehicle chassis no./VIN:	Date:	Signed:

Vehicle Standards Bulletin 6 — Version 3.2
Section S — Vehicle rating
1 of 2

S3 Checklist — GCM re-rating (design)

➘ A copy of this checklist must be supplied with the design certificate to the S1 certifying approved vehicle examiner (AVE).

Advanced braking systems

Braking systems — Check Yes, No, N/A as applicable:	Yes	No	N/A
1 Is the advanced braking system (where fitted) un-affected or re-certified after the vehicle modification?	☐	☐	☐

Compliance

Modification — Check Yes or No as applicable:	Yes	No
1 Does this modification meet all the requirements of the manufacturer's guidelines / Modification Code S3?	☐	☐
2 Is the quality of the work to an accepted industry standard?	☐	☐
3 Does the vehicle continue to comply with ADRs and heavy vehicle standards regulations affected by the modification?	☐	☐

Authorisation

If the answer to any relevant question is NO, the modification is not acceptable.			
Comments:			
Issued by:	Company (if applicable):		AVE no.:
Signed:	Modification certificate no.:	S3 design certificate no. issued:	Date:

Vehicle chassis no./VIN:	Date:	Signed:

Modification Code S7 — ATM/GTM re-rating

1. Scope

The purpose of this code is to allow an accredited S7 AVE to certify ATM/GTM rating changes to modified trailers. Examples of modifications that might require rating changes include adding or removing axles from an existing axle group, and replacing suspensions or control systems with alternative components of a different rating.

The modified vehicle can be re-rated in accordance with:

- a design certificate issued by an accredited S12 AVE; or by
- an existing vehicle's manufacturer's specification, if that trailer has the same ATM/GTM rating as the modified trailer after it is modified.

Modifications covered under this code:

Covered

- ATM/GTM rating changes for trailers modified to conform to specifications for a trailer at the revised ATM/GTM rating assigned by the trailer's manufacturer, provided the AVE has written evidence of the specifications
- ATM/GTM rating changes for a trailer inspected and confirmed to a design certified by an accredited S12 AVE.

Not covered

- ATM/GTM rating for a trailer that has been modified to change the trailer's basic type, e.g., semitrailer to dog trailer, pig trailer to dog trailer, semitrailer to dolly, etc. Such trailers are deemed to be newly manufactured and must be certified as a new vehicle through on the RAV. For more information about the certification of new vehicles, please refer to the Federal Transport Department
- ATM/GTM rating for a trailer where the accredited S7 AVE does not have written evidence of the specifications for an alternative rating issued by the original trailer manufacturer, or a design certificate issued by an accredited S12 AVE
- Certification for use in a road train combination (see VSB6 Modification Code S11).

2. Related standards

Modified vehicles must comply with all applicable ADRs, Australian Standards, acts and regulations. Below are some but not all of the areas that may be affected by the modifications in this code and require certification testing or evidence to demonstrate compliance.

The AVE must ensure that the modified vehicle continues to comply with all related Australian Design Rules.

This…	Must comply with…
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/.. , VSB6 Section E
Tow couplings	Manufacturer's rating, ADR 62/.. , VSB6 Section P

3. Certification procedure

The certification procedure for this modification code is as follows:

1.	Modifier	Determine if the ATM/GTM re-rating is within the manufacturer's specifications for the trailer or a similar trailer from the same manufacturer. • If **yes**, proceed to step 2. • If **no**, proceed to step 4.
2.	Modifier	Obtain written evidence of the manufacturer's specifications. Proceed to step 3.
3.	Modifier	Determine if the trailer is to be modified to change the ATM/GTM. • If **yes**, proceed to step 6. • If **no**, proceed to step 7.
4.	Modifier	Contact an accredited S12 AVE to supply vehicle specifications or organise vehicle inspection by an accredited S12 AVE.
5.	S12 AVE	Provide design certification to modifier.
6.	Modifier	Consult with an AVE who is accredited to certify each modification for guidance on how any modification is required to be performed. Follow the certification procedure in each applicable modification code. *For example, where a suspension modification is required to re-rate the ATM/GTM, refer to an accredited F2 AVE and VSB6 Modification Code F2.*
7.	Modifier	Organise approval inspection by an accredited S7 AVE.
8.	S7 AVE	Perform inspection, ensure all modifications have been certified (if applicable), complete S7 checklist and determine if compliance has been achieved. • If **yes**, proceed to step 9. • If **no**, do not proceed, advise modifier rework is required to ensure compliance. Return to step 6.
9.	S7 AVE	Issue modification certificate, affix modification plate listing the changed ATM/GTM, and submit paperwork as required by the relevant AVE registration scheme.

AVEs must be satisfied that the vehicle modification requirements are being met. It is advised that before modifications are carried out they be discussed with the certifying AVE.

4. Compliance requirements

Required:

When rating an existing trailer where the ATM/GTM is not recorded and the manufacturer no longer exists:

- When modifications are made to the trailer to support an ATM/GTM re-rating (i.e., axle substitution), ensure that the modification is performed and certified in accordance with the relevant sections of VSB6.
- Ensure that the modified trailer's GTM is not more than the trailer's ATM.
- Ensure the trailer complies with the design certificate issued by an accredited S12 AVE.

5. Design requirements

Dimensions

Required:

- Ensure all dimensions of a vehicle, including internal (where applicable) and external, are in accordance with the limits specified by the applicable in-service heavy vehicle regulator.

Tyres and wheel rims

Required:

- Ensure the sum of load carrying capacities of tyres and rims fitted to an axle or axle group is not less than the GTM rating of the trailer.
- Ensure the loading of the trailer to its ATM and GTM with load distributed normally, does not result in load on any tyre or rim exceeding its rated capacity.
- For trailers manufactured to comply with ADR 24/.. or ADR 42/.. , select the tyres and rims to comply in all respects with the requirements of that ADR at the revised ATM/GTM rating.
- If a tyre placard is fitted to a trailer, replace this placard with an amended one to indicate the correct tyre and rim specifications for the trailer at the revised ATM/GTM rating.
- Ensure, where applicable, the revised tyre size and load rating appears on the modification plate.
- Ensure if the tyre rolling diameter is changed that the trailer brake system is re-certified in accordance with VSB6 Section G — Brakes.

Chassis and tow coupling

Chassis

Required:

- Ensure the chassis of the modified trailer conforms to the specifications detailed by the design certificate issued by the accredited S12 AVE or is equivalent to the manufacturer's specifications, including chassis material reinforcement and cross-member configuration and installation.

Tow coupling

Required:

- Ensure the tow coupling fitted to a modified trailer is adequate for the proposed ATM.
- Ensure the coupling installation conforms to the requirements of VSB6 Section P — Tow couplings.
- Ensure that the design of the drawbar (if applicable) complies with ADR62/.. including being able to withstand the forces specified in ADR 62/.. at the revised ATM and GTM.

Brake system sub-assemblies

The maximum ATM permitted by ADR 38/.. Trailer Braking Systems depends on its ability to hold the trailer fully loaded on 18% grade. The sub-assembly manufacturer's certified data is used, along with the brake chamber sizes and slack adjuster lengths, to establish the braking force and the ATM and GTM that can be applied without exceeding suspension skid limits in an emergency breakaway application.

ADR 38/.. requires that dog trailers meet additional requirements for friction utilisation to ensure, under specified conditions, that rear axle group wheels do not lock before front axle group wheels. Front axle group brake torque therefore has 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.

The length and diameter of piping and the type of connecting fittings within a trailer control system are critical for achieving brake response and release times within the limits specified by ADR 38 and ADR 38/.. . The maximum permitted transmission lengths (lengths of piping) are specified in the 'component type approval' data. This maximum transmission length, as well as parts lists and installation diagrams, are typically available from the control system manufacturer.

Required:

- Check brake chamber sizes and slack adjuster lengths as applicable to confirm they match with either the accredited S12 AVE's design certificate, or the specifications from the trailer manufacturer.
- If the braking system is modified, perform and certify the modifications in accordance with VSB6 Section G — Brakes.

Recommended:

- Before assigning a revised ATM/GTM to a modified trailer, establish that the trailer meets ADR 38/.. including the friction utilisation for dog trailers.
- Ensure the brake system has been modified and certified in accordance with VSB6 Modification Code G3.
- If the brake system response and release times are not tested by the AVE approving the ATM/GTM rating, validate the actual installed lengths of piping.

S7 Checklist — ATM/GTM re-rating (example)

S7 Checklist — ATM/GTM re-rating

This checklist is for use by S7 certifying approved vehicle examiners (AVEs) when certifying an ATM/GTM re-rating.

Trailer and modifier details

Vehicle make:	Vehicle model:	Month and year of manufacture:

VIN (if applicable):	Vehicle chassis no. (if applicable):	Vehicle modifier (company name):

Wheelbase:	Forward radius:	Rear overhang:	Tow coupling overhang:	Drawbar length:
mm	mm	mm	mm	mm

Point of articulation to rear overhang line:	Modified ATM:	Modified GTM:	Tare mass:
mm	kg	kg	kg

Certifying S12 AVE name:	AVE no.:	S12 design certificate no.:

Trailer component details

Component details:					
Component	Make	Model	Compliance mark approval/SARN	Load rating	
Control system					
Braked axles					kg
Front suspension					kg
Rear suspension					kg
Tyre size					kg
Axle group: Front	Axle number 1	Axle number 2	Axle number 3	Axle group load	
Brake chamber size					kg
Slack adjuster length					
Axle group: Rear	Axle number 1	Axle number 2	Axle number 3	Axle number 4	Axle group load
Brake chamber size					kg
Slack adjuster length					
Chassis section					

Tow coupling / fifth wheel	Make	Model	D-rating
			kN

Basis for rating determination	Reference trailer make/model for comparison	Compliance plate approval no. if ADR 38/.. approved

Assessment

Assessment		Check Yes, No, N/A as applicable:	Yes	No	N/A
1	Have the following been kept for future audit: • details of components of the reference trailer model used for comparison; or • a copy of the S12 design certification and checklist?		☐	☐	
2	Does the trailer as a whole conform to the detail construction, section properties and cross-member location of the comparison chassis or the S12 design certification and checklist?		☐	☐	
3	If the vehicle has been modified to comply with question 2, have the modifications been performed and certified to the relevant section of VSB6?		☐	☐	☐
4	Are the trailer dimensions within the permitted maximum limits?		☐	☐	
5	Is the trailer's entire braking system, including brake chamber sizes and slack adjuster length setting, identical to the braking system of the reference comparison trailer or the S12 design certification and checklist?		☐	☐	
6	Have the brake system piping lengths been established to not exceed the maximum lengths specified in the control system manufacturer's certified data sheet?		☐	☐	
7	Is the parking brake system capable of holding the trailer on an 18% gradient at the modified ATM rating?		☐	☐	

Vehicle chassis no./VIN:	Date:	Signed:

Vehicle Standards Bulletin 6 — Version 3.2
Section S — Vehicle rating
1 of 2

S7 Checklist — ATM/GTM re-rating

This checklist is for use by S7 certifying approved vehicle examiners (AVEs) when certifying an ATM/GTM re-rating.

Assessment	Check Yes, No, N/A as applicable:	Yes	No	N/A
8	Has the tyre placard, if fitted, been updated where necessary to record the correct tyre and rim sizes, axle configurations, axle loads and inflation pressures for the modified trailer?	☐	☐	☐
9	Are tyres and rims fitted in conformance to the tyre placard?	☐	☐	☐
10	Do the tow coupling, tow coupling mounting and drawbar (if applicable) meet the requirements of Australian Design Rule (ADR) 62/.. ?	☐	☐	☐

Advanced braking systems

Braking systems	Check Yes, No, N/A as applicable:	Yes	No	N/A
1	Is the advanced braking system (where fitted) un-affected or re-certified after the vehicle modification?	☐	☐	☐

Modification details

Modification criteria	Check Yes or No as applicable:	Yes	No
1	Has the modification been performed in accordance with the manufacturer's guidelines?	☐	☐

Compliance

Modification	Check Yes or No as applicable:	Yes	No
1	Does this modification meet all the requirements of the manufacturer's guidelines / Modification Code S7?	☐	☐
2	Does the trailer comply with all applicable ADRs requirements at the revised ATM/GTM?	☐	☐
3	Is the trailer in satisfactory mechanical condition?	☐	☐
4	Is the quality of the work to an accepted industry standard?	☐	☐
5	Does the vehicle continue to comply with ADRs and heavy vehicle standards regulations affected by the modification?	☐	☐

Authorisation

Other than modification criteria, if the answer to any relevant question is NO the modification is not acceptable.

Comments:	

Examined by:	Company (if applicable):		AVE no.:
Signed:	**Modification certificate no.:**	**Modification plate no.:**	**Date:**

Vehicle chassis no./VIN:	Date:	Signed:

Vehicle Standards Bulletin 6 — Version 3.2
Section S — Vehicle rating
2 of 2

Modification Code S8 — Motor vehicle road train rating

1. Scope

The purpose of this code is to certify a motor vehicle as compliant for use in a road train combination and change or assign a 'road train GCM' to complying vehicles.

Modifications covered under this code:

Covered

- certification of a road train motor vehicle to demonstrate compliance with the standards required for operation as a road train motor vehicle, including where a motor vehicle has been upgraded to conform to ADR 35/.. and ADR 64/.. requirements as applicable to road train vehicles
- road train GCM changes of motor vehicles certified for use in road trains.

Not covered

- road train rating of motor vehicles already certified by the vehicle manufacturer as meeting the requirements for road train operation. This is indicated by 'ROAD TRAIN' being displayed on the vehicle plate
- road train GCM rating changes that would cause any component of the vehicle to operate or be subjected to loads in excess of that component manufacturer's rating
- GVM/GCM re-rating for which VSB6 Modification Code S1 applies
- GVM re-rating of a motor vehicle (see VSB6 modification codes S1 and S2)
- B-double GCM re-rating (see VSB6 Modification Code S9)
- GCM re-rating of a motor vehicle for use in a single trailer configuration (see VSB6 modification codes S1 and S3).

2. Related standards

Modified vehicles must comply with all applicable ADRs, Australian Standards, acts and regulations. Below are some but not all of the areas that may be affected by the modifications in this code and require certification testing or evidence to demonstrate compliance.

The AVE must ensure that the modified vehicle continues to comply with all related ADRs.

This…	Must comply with…
Chassis	Manufacturer's rating, VSB6 Section H
Engine	Manufacturer's rating, ADR 30/.. , 36, 36A, 36/.. , 80/.. VSB6 Section A
Transmission	Manufacturer's rating, VSB6 Section B
Tail shaft	Manufacturer's rating, VSB6 Section C
Road speed limiter	ADR 65/.. , VSB6 Modification Code A5
Braking	ADR 35, 35A, 35/.. , VSB6 Section G
Tyres	Manufacturer's rating, ADR 24/.. , 42/.. VSB6 Section E
Axles	Manufacturer's rating, VSB6 sections D and E
Fifth wheels and turntables	ADR 62/.. , VSB6 Section P
Towing couplings and drawbar eyes	ADR 62/.. , VSB6 Section P
Electrical/lighting	ADR 64/.. , 13/..

3. Certification procedure

The certification procedure for this modification code is as follows:

1.	Modifier	Determine if the proposed road train GCM is within the manufacturer's specifications for the vehicle or a similar vehicle from the same manufacturer. • If **yes**, proceed to step 2. • If **no**, proceed to step 4.
2.	Modifier	Obtain written evidence of the manufacturer's specifications. Proceed to step 3.
3.	Modifier	Determine if the vehicle is to be modified to change the road train GCM. • If **yes**, proceed to step 6. • If **no**, proceed to step 7.
4.	Modifier	Contact an accredited S8 AVE to organise vehicle assessment.
5.	S8 AVE	Inspect vehicle and determine modifications required.
6.	Modifier	Consult with an AVE who is accredited to certify each modification for guidance on how any modification is required to be performed. Follow the certification procedure in each applicable modification code. *For example, where a suspension modification is required to re-rate the road train GCM, refer to an accredited F1 AVE and VSB6 Modification Code F1.*
7.	Modifier	Organise approval inspection by accredited S8 AVE.
8.	S8 AVE	Perform inspection, ensure all modifications have been certified (if applicable), complete S8 checklist and determine if compliance has been achieved. • If **yes**, proceed to step 9. • If **no**, do not proceed, advise modifier rework is required to ensure compliance. Return to step 6.
9.	S8 AVE	Issue modification certificate, affix modification plate listing the road train GCM and the words 'ROAD TRAIN', and submit paperwork as required by the relevant AVE registration scheme.

AVEs must be satisfied that the vehicle modification requirements are being met. It is advised that before modifications are carried out they be discussed with the certifying AVE.

4. Compliance requirements

Required:

- For a vehicle to qualify for an increase in road train GCM, ensure that it can operate safely at the increased road train GCM.
- When modifications such as fitting of additional or replacement axles with higher load rating are carried out, analyse the vehicle chassis to ensure that it has sufficient strength to accommodate the increased GCM (see VSB6 Section H — Chassis).
- Ensure the road train GCM exceeds the vehicle's GVM.
- Individually assess critical components such as the chassis, driveline, axles, suspension, brakes, steering, wheels and tyres to ensure that each can operate under increased loads resulting from increased road train GCM.

- Assign a maximum road train GCM and ensure the certification verifies that the motor vehicle complies with all the requirements for road train operation.
- Ensure that where a motor vehicle is certified for use in a road train combination via this modification code, that the modification plate contains the road train GCM and shows the words 'ROAD TRAIN'.

Recommended:

- If modifications are needed, wherever possible reproduce the vehicle manufacturer's specification relevant to the road train certification; or at the increased road train GCM.
- Simplify examination of the chassis requirements for the rating by associating the torsional strength of the chassis with the road train GCM.

5. Design requirements

Speed limiting

Required:

- Ensure the following types of vehicles are fitted with a road speed limiter that complies with ADR 65/.. :
  - a prime mover with a GVM of more than 15 tonnes built from 1 January 1988; or
  - an NC category vehicle built from 1 January 1991.
- Where a road speed limiter is fitted to a vehicle as part of certification as a road train vehicle, ensure that the modification is performed and certified in accordance with VSB6 Modification Code A5.

Dimension and axle group

Required:

- Ensure all dimensions of a vehicle, including internal (where applicable) and external, are in accordance with the limits specified by the applicable in-service heavy vehicle regulator.
- Ensure all axle groups in road train combinations are conforming axle groups and meet current requirements for the applicable in-service heavy vehicle regulator.

Chassis

Required:

- Ensure the motor vehicle chassis has adequate strength for the relevant road train GCM (see VSB6 Section H — Chassis).
- Provide evidence of this suitability using at least one of these:
  - written evidence from the motor vehicle manufacturer stating that the chassis is adequate for the proposed road train GCM
  - a certification letter from an accredited S8 AVE confirming the adequacy of the chassis design.
- Ensure that the towing coupling and its attachment is assessed and is adequate at the road train GCM (see VSB6 Section P — Tow couplings).

Speed capability

Required:

- Ensure the vehicle can maintain a constant 80 km/h speed on a level road when laden to the rated road train GCM.

Drive axles

Required:

- A maximum road train GCM limit of 42,500 kg applies to motor vehicles with a single drive axle, including vehicles with a tandem rear axle group consisting of a single drive axle and a lazy axle for use in road train applications.

Gradeability

Required:

- Ensure the vehicle's gradeability at the road train GCM is at least 5%. The theoretical figure of 5% indicates acceptable performance under road train operating conditions.
- If a vehicle's road train GCM is based on a manufacturer's specifications, the gradeability requirements below are still applicable.
- Establish gradeability via the motor vehicle manufacturer's computer simulation or, when this is not available, by calculation using the formula:

$$Road\ train\ GCM\ (Maximum) = \frac{K \times R \times M \times T}{(g_g + 1)}$$

or

$$g_g\ (Maximum\ gradeability)\ = \frac{K \times R \times M \times T}{(GCM)} - 1$$

g_g = maximum grade expressed as a percentage (15%) i.e., 10% starting ability plus 5% operating grade. For most applications g+1 = 24

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 (Nm)

Table 1: Tyre revolutions per kilometre

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
Source: ADR 65/00 Table 2		445/65R22.5	290

Startability

Required:

- Ensure the vehicle's startability at the road train GCM is at least 8%. The theoretical figure of 8% indicates acceptable performance under road train operating conditions.
- Establish startability via the motor vehicle manufacturer's computer simulation or, when this is not available, by calculation using the formula:

$$\text{Road train GCM } (Maximum) = \frac{T_{800} \times R \times M}{19.87 \times g_s}$$

$$g_s\ (Maximum\ startability) = \frac{T_{800} \times R \times M}{19.87 \times GCM}$$

g_s = maximum grade expressed as a percentage (15%) i.e., 10% starting ability plus 5% operating grade. For most applications g+1 = 24

R = overall gear reduction between engine and driven wheels

M = tyre revolutions per kilometre, determined from Table 1

T_{800} = engine torque at clutch engagement RPM (typically 800 RPM) (Nm)

Engine/transmission

Required:

- Ensure the assigned road train GCM does not exceed the engine, transmission or vehicle manufacturer's recommendations.
- Assess the adequacy of the engine and transmission mounting system to resist maximum torque.
  - Maximum torque is typically peak engine torque multiplied by the lowest gear ratio of the transmission (i.e., starting or reverse gear).
- Ensure that any supporting modifications are certified and performed in accordance with VSB6 sections A — Engines and B — Transmissions.

Axles/suspension

The maximum road train GCM permitted by the axle manufacturer is frequently dependent on the engine torque and the axle ratio.

The suspension manufacturer will usually have limits on the road train 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.

Required:

- Obtain the maximum road train GCM limit for suspension or axles either directly from the component manufacturer or by comparison with a reference vehicle with identical driveline components, suspension components and axle ratio.
- Ensure where a road train GCM exceeds 42.5 tonnes, hauling units are fitted with a tandem drive rear axle group equipped to provide locking of the inter-axle differential.

Braking

Required:

- Ensure the road train motor vehicle complies with relevant requirements of ADR 35/.. . Additionally, ensure vehicles manufactured after 1 July 1991 comply with the requirements of ADR 64/.. .
- To prevent incorrect coupling of brake lines, ensure all couplings are non-interchangeable (polarised) in accordance with the requirements of ADR 35/.. and all fittings have a clear bore (no restrictor or non-return valve).
- Ensure that the motor vehicle parking brake control simultaneously applies parking brakes on all attached trailers.
- Ensure that the vehicle's brake application/release times meet the requirements in ' 6. Testing requirements'.

➘ Note Brake system electrical supply requirements for vehicles equipped to tow a trailer are contained in ADR 35/.. and may vary depending on if the vehicle is designed to a single trailer, B-double or road train.

Electrical

Required:

- Ensure all motor vehicles introduced into road train service after 1 July 1991 comply with the requirements of ADR 64/.. , which requires vehicles designed for use in road trains to be fitted with:
  - a lighting supply system with minimum capacity for connection to trailers of 30 A at 12 V (360 W) or 15 A at 24 V (360 W) in addition to normal vehicle electrical requirements
  - a single connector for trailer lighting and signalling systems
  - resettable circuit breakers for all lighting and signalling systems
  - an electric generator with minimum rated power output of 100 A at nominal 12 V or 50 A at nominal 24 V (1200 W).

Coupling

Required:

- Ensure the location, mounting and strength of the coupling on the motor vehicle complies with appropriate Australian Standards or, if the motor vehicle was built after 1 July 1991 with ADR 62/.. .
- Ensure all modifications are completed in accordance with VSB6 Section P — Tow couplings.

6. Testing requirements

Braking tests

The following tests are based on an average operating pressure of 650 kPa. Ensure this pressure value is used unless an alternate average operating pressure is specified by the manufacturer.

Combination vehicle test

If tested as part of a road train combination, ensure a triple road train combination is used and that application and release times meet the following criteria:

Application elapsed time	must not exceed 1.5 seconds for the pressure in the least favoured brake chamber to reach 420 kPa with air reservoirs in all units of the train charged to no more than 650 kPa and spring brakes released.
Release elapsed time	must not exceed 1.5 seconds for pressure in the least favoured brake chamber to decrease to 35 kPa from a full brake application with air reservoirs in all units of the road train charged to at least 650 kPa.

Individual vehicle test

If tested as a motor vehicle 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 m long hose of 13 mm (1/2") internal diameter. The application and release times must meet the following criteria:

Application elapsed time	must not exceed 400 milliseconds for the pressure in the 800 ml test chamber to reach 420 kPa, with the air reservoirs charged to no more than 650 kPa and spring brakes released.
Release elapsed time	must not exceed 500 milliseconds for the pressure in the 800 ml test chamber to decrease to 35 kPa from a full brake application with air reservoirs charged to at least 650 kPa and spring brakes released.

Compressor capacity

Required:

- Ensure the air compressor fitted to a motor vehicle used in a road train has a minimum air delivery of 5.9 L/s (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.

Recommended:

Refer to the truck manufacturer's specification to establish the nominated flow rate at the required head pressure and engine speed.

S8 Checklist — Motor vehicle road train rating (example)

S8 Checklist — Motor vehicle road train rating

This checklist is for use by approved vehicle examiners (AVEs) when assessing modifications of motor vehicles used in road trains.

Vehicle and engine details

Vehicle make:	Vehicle model:	Month and year of manufacture:
VIN (if applicable):	Vehicle chassis no. (if applicable):	Vehicle modifier (company name):

Engine make/mode:	Engine no:	Rated power @ rpm:	Governed rpm:	Max torque @ rpm:
		kW @ RPM		Nm @ RPM

Tail shaft series/size:	Manufacturers max torque:	T_{800} torque @ rpm:
mm (if applicable)	Nm	Nm @ RPM

Component details

Component	Make/model	Manufacturer's max. GCM rating	Low/top ratios	
Transmission		kg	1:	1:
Aux. transmission		kg (if applicable)	1:	1:
Rear axle(s)		kg	1:	1:
Rear suspension		kg		
Front axle(s)		kg (if applicable)	1:	1:
Front suspension		kg (if applicable)		
Tyres front				
Tyres rear				
Chassis section		kg		

Tow coupling / fifth wheel			D-rating		kN
Tow coupling overhang	Applicable:	Yes ☐ No ☐	Amount		mm
Wheelbase	mm		Rear overhang		mm

Road train motor vehicle tests					
Speed limited by:	Gearing ☐	Road speed governor ☐	Maximum governed speed:		km/h
Brake timing test	Combination of vehicles ☐	Individual vehicle ☐	Test results	Application: ms	Release: ms

Modified road train GCM assigned	Vehicle make/model, if used for comparison
kg	

Assessment

	Assessment	Check Yes, No, N/A as applicable:		Yes	No	N/A
1	Does the chassis have adequate strength for the assigned GCM?			☐	☐	
2	Have details of the reference vehicle used for comparison, truck manufacturer's letter or AVE report certifying adequacy of the chassis been retained for future audit?			☐	☐	
3	Are the tow couplings and attachments adequate for the GCM as outlined in VSB6 Section P?			☐	☐	
4	Has gradeability been established to exceed 10% at the modified GCM?	Gradeability rating:	%	☐	☐	
5	Has startability been established to exceed 5% at the modified GCM?	Startability rating:	%	☐	☐	
6	Is the road train GCM within the component manufacturers' limits?			☐	☐	
7	If the motor vehicle GCM exceeds 42.5 tonnes, is the prime mover fitted with a tandem rear drive axle group and is it equipped to provide positive locking of the inter-axle differential?			☐	☐	☐
8	Does the vehicle meet the speed limiting requirements of Australian Design Rule (ADR) 65/.. or Modification Code A5 if it is applicable?			☐	☐	
9	Does the vehicle meet the applicable requirements, including trailer signal application and release test times as well as air compressor capacity, of the design requirements portion of this code?			☐	☐	
10	Do the vehicle's dimensions meet the requirements of the design requirements portion of Modification Code S8?			☐	☐	
11	Are all axle groups on the vehicle 'conforming axle groups' and do they comply with the applicable axle group spacing requirements?			☐	☐	
12	Does the vehicle meet the electrical requirements of the design requirements portion of Modification Code S8?			☐	☐	

Vehicle chassis no./VIN:	Date:	Signed:

Vehicle Standards Bulletin 6 — Version 3.2
Section S — Vehicle Rating
1 of 2

S8 Checklist — Motor vehicle road train rating

This checklist is for use by approved vehicle examiners (AVEs) when assessing modifications of motor vehicles used in road trains.

Advanced braking systems

Braking systems	Check Yes, No, N/A as applicable:	Yes	No	N/A
1	Is the advanced braking system (where fitted) un-affected or re-certified after the vehicle modification?	☐	☐	☐

Compliance

Modification	Check Yes or No as applicable:	Yes	No
1	Does this modification meet all the requirements of the manufacturer's guidelines / Modification Code S8?	☐	☐
2	Does the vehicle meet the requirements of ADR 64/.. ?	☐	☐
3	Are all supporting modifications performed and certified in accordance with the relevant sections of VSB6?	☐	☐
4	Is the vehicle in satisfactory mechanical condition?	☐	☐
5	Is the quality of the work to an accepted industry standard?	☐	☐
6	Does the vehicle continue to comply with ADRs and heavy vehicle standards regulations affected by the modification?	☐	☐

Authorisation

If the answer to any relevant question is NO, the modification is not acceptable.

Comments:	

Examined by:	Company (if applicable):		AVE no.:
Signed:	**Modification certificate no.:**	**Modification plate no.:**	**Date:**

Vehicle chassis no./VIN:	Date:	Signed:

Modification Code S9 — Prime mover B-double rating

1. Scope

The purpose of this code is to certify a prime mover as compliant for use in a B-double combination and to change the 'B-double GCM' of complying vehicles.

Modifications covered under this code:

Covered

- certification of a B-double prime mover to demonstrate compliance with the standards required for operation as a B-double prime mover, including where the prime mover has been upgraded to conform to ADR 35/.. and 64/.. as applicable to B-double vehicles
- B-double GCM rating changes of prime movers certified for use in B-double combinations.

Not covered

- B-double GCM changes on prime movers that do not have ABS
- certification of prime movers without ABS for use in B-double combinations
- B-double GCM changes that would cause any component of the vehicle to operate at or be subjected to loads exceeding the manufacturer's rating
- GVM re-rating of a motor vehicle (see VSB6 modification codes S1 and S2)
- GCM re-rating for a road train configuration (see VSB6 Modification Code S8)
- GCM re-rating of a motor vehicle for use in a single trailer configuration (see VSB6 modification codes S1 and S3).

2. Related standards

Modified vehicles must comply with all applicable ADRs, Australian Standards, acts and regulations. Below are some but not all of the areas that may be affected by the modifications in this code and require certification testing or evidence to demonstrate compliance.

The AVE must ensure that the modified vehicle continues to comply with all related ADRs.

This…	Must comply with…
Chassis	Manufacturer's rating, VSB6 Section H
Engine	ADR 30/.. , 36, 36A, 36/.. , 80/.. , VSB6 Section A
Transmission	Manufacturer's rating, VSB6 Section B
Tail shaft	VSB6 Section C
Road speed limiter	ADR 65/.. , Modification Code A5
Braking	ADR 35/.. , ADR 64/.. , VSB6 Section G
Tyres	Manufacturer's rating, ADR 24, 24A ADR 24/.. , 42/.. , VSB6 Section E
Axles	Manufacturer's rating, VSB6 sections D and E
Fifth wheels and turntable	ADR 62/.. , VSB6 Section P

3. Certification procedure

The certification procedure for this modification code is as follows:

1.	Modifier	Determine if the proposed B-double GCM is within the manufacturer's specifications for the vehicle or a similar vehicle from the same manufacturer. • If **yes**, proceed to step 2. • If **no**, proceed to step 4.
2.	Modifier	Obtain written evidence of the manufacturer's specifications. Proceed to step 3.
3.	Modifier	Determine if the vehicle is to be modified to change the B-double GCM. • If **yes**, proceed to step 6. • If **no**, proceed to step 7.
4.	Modifier	Contact S9 AVE to organise vehicle assessment.
5.	S9 AVE	Inspect vehicle and determine modifications required.
6.	Modifier	Consult with an AVE who is accredited to certify each modification for guidance on how any modification is required to be performed. Follow the certification procedure in each applicable modification code. *For example, where a suspension modification is required to achieve the proposed B-double GCM, refer to an accredited F1 AVE and VSB6 Modification Code F1.*
7.	Modifier	Organise approval inspection by an accredited S9 AVE.
8.	S9 AVE	Perform inspection, ensure all modifications have been certified (if applicable), complete S9 checklist and determine if compliance has been achieved. • If **yes**, proceed to step 9. • If **no**, do not proceed, advise modifier rework is required to ensure compliance. Return to step 6.
9.	S9 AVE	Issue modification certificate, affix modification plate listing the B-double GCM and the words 'B-DOUBLE', and submit paperwork as required by the relevant AVE registration scheme.

AVEs must be satisfied that the vehicle modification requirements are being met. It is advised that before modifications are carried out they are discussed with the certifying AVE.

4. Compliance requirements

Required:

- Ensure that when a manufacturer's GCM is unavailable, B-double prime movers are rated in accordance with VSB6 modification codes S1 and S3.
- Ensure that the vehicle can operate safely at the increased B-double GCM.
- When modifications such as fitting of additional or replacement axles with higher load rating are carried out, analyse the vehicle chassis to ensure that it has sufficient strength to accommodate the increased GCM (see VSB6 Section H — Chassis).
- Ensure the B-double GCM exceeds the vehicle's GVM.
- Individually assess critical components, such as the chassis, driveline, axles, suspension, brakes, steering, wheels and tyres, to ensure that each can operate under increased loads resulting from increased B-double GCM.

- Assign a maximum B-double GCM and ensure the certification verifies that the motor vehicle complies with all the requirements for B-double operation.
- Ensure that where a prime mover is certified for use in a B-double combination via this modification code, that the modification plate contains the B-double GCM and shows the words 'B-DOUBLE'.

5. Design requirements

Speed limiter

Required:

- Ensure the following types of vehicles are fitted with a road speed limiter that complies with ADR 65/.. :
  - a prime mover with a GVM of more than 15 tonnes built from 1 January 1988; or
  - an NC category vehicle built from 1 January 1991.
- Where a road speed limiter is fitted to a vehicle as part of certification as a road train vehicle, ensure that the modification is performed and certified in accordance with VSB6 Modification Code A5.

Dimension

Required:

- Ensure all internal (where applicable) and external dimensions of a B-double and, where available, a combination vehicle, are in accordance with the limits specified by the applicable in-service heavy vehicle regulator.

Chassis and driveline requirements

Chassis requirements

Required:

- Ensure the chassis has adequate strength for the relevant B-double GCM (see VSB6 Section H — Chassis).
- Provide evidence of this suitability using at least one of these:
  - written evidence from the vehicle manufacturer stating that the chassis is adequate for the proposed B-double GCM rating
  - a certification letter from an accredited S9 AVE confirming the adequacy of the chassis design for the proposed B-double GCM.
- Ensure that the towing coupling and its attachment is assessed and is adequate at the B-double GCM rating (see VSB6 Section P — Tow couplings).

Driveline requirements

Drive axles

Required:

- A maximum B-double GCM limit of 42.5 t applies to prime movers with a single drive axle, including tandem rear axle group with one drive and one lazy axle for use in B-double configurations.
- Ensure a vehicle with B-double GCM rating exceeding 42.5 t, is fitted with a tandem drive axle group with provision for positive locking of the inter-axle differential.

Speed capability

Required:

- Ensure that a B-double prime mover, at the B-double GCM, can maintain a constant speed of at least 70 km/h on 1% grade. Establish this by manufacturer's advice, computer simulation or physical test.

Gradeability

Required:

- Ensure the vehicle's gradeability at the B-double GCM is at least 12%. The theoretical figure of 12% indicates acceptable performance under B-double operating conditions.
- If a vehicle's B-double GCM is based on a manufacturer's specification, the gradeability requirements below are still applicable.
- Establish gradeability via the motor vehicle manufacturer's computer simulation or, when this is not available, by calculation using the formula:

$$B-double\ GCM\ (Maximum) = \frac{K \times R \times M \times T}{(g_g + 1)} \quad \text{or}$$

$$g_g\ (Maximum\ gradeability) = \frac{K \times R \times M \times T}{(GCM)} - 1$$

g_g = maximum grade expressed as a percentage (15%) i.e., 10% starting ability plus 5% operating grade. For most applications g+1 = 24

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 (Nm)

Table 1: Tyre revolutions per kilometre

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
Source: ADR 65/00 Table 2		445/65R22.5	290

Startability

Required:

- Ensure the vehicle's startability at the B-double GCM is at least 15%. The theoretical figure of 15% indicates acceptable performance under B-double operating conditions.
- Establish startability via the motor vehicle manufacturer's computer simulation or, when this is not available, by calculation using the formula:

$$\text{B} - \text{double GCM}\ (Maximum) = \frac{T_{800} \times R \times M}{19.87 \times g_s}$$

$$g_s\ (Maximum\ startability) = \frac{T_{800} \times R \times M}{19.87 \times GCM}$$

g_s = maximum grade expressed as a percentage (15%) i.e., 10% starting ability plus 5% operating grade. For most applications g+1 = 24

R = overall gear reduction between engine and driven wheels

M = tyre revolutions per kilometre, determined from Table 1

T_{800} = engine torque at clutch engagement RPM (typically 800RPM) (Nm)

Braking

Required:

- Ensure the B-double prime mover complies with relevant requirements of ADR 35/.. and that if manufactured after 1 July 1991 it also complies with the requirements of ADR 64/.. .
- To prevent incorrect coupling of brake lines, ensure all couplings are non-interchangeable (polarised) in accordance with the requirements of ADR 35/.. and all fittings have a clear bore (no restrictor or non-return valves).
- Test the brake application and release times at the trailer control line coupling, as part of a B-double combination or as an individual vehicle in accordance with ‘6. Testing requirements’ of this modification code.

➘ Note Brake system electrical supply requirements for vehicles equipped to tow a trailer are contained in ADR 35/.. and may vary depending on if the vehicle is designed to a single trailer, B-double or road train.

Existing vehicles

A prime mover, including those previously approved for use in B-double, is required to be retro-fitted with anti-lock brakes if not previously fitted, see anti-lock braking system subsection in VSB6 Section G — Brakes. Fleets that 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.

Required:

- In all cases, when coupled with trailers having anti-lock brakes, ensure the prime mover provides the electrical connections and driver warning lamps needed to operate the trailer anti-lock braking systems.
- If the braking system is modified, perform and certify in accordance with VSB6 Section G— Brakes.

Fifth wheels

Required:

- Ensure the location, mounting and strength of fifth wheels used to couple B-double units complies with appropriate Australian Standards or, for vehicles manufactured on or after 1 July 1991, with ADR 62/.. .
- Ensure that the fifth wheel installation is either by the vehicle manufacturer or performed and certified in accordance with VSB6 Modification Code P2.
- Ensure fifth wheels are single oscillating unless a restricted double oscillating fifth wheel is required. Restricted double oscillating fifth wheels are only acceptable for use in combination with vehicles that have a high torsional stiffness (e.g., tankers, freezer vans, skeletal (skel) container trailers).
- Do not use non-restricted double oscillating type fifth wheels.

6. Testing requirements

Braking tests

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

Combination vehicle test

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

Application elapsed time	for pressure in the least favoured brake chamber to reach 420 kPa, must not exceed 1.0 second with air reservoirs in all units of the train charged to no more than 650 kPa and spring brakes released.
Release elapsed time	for pressure in the least favoured brake chamber to decrease to 35 kPa, from a full brake application must not exceed 1.0 seconds with air reservoirs in all units of the train charged to at least 650 kPa.

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 m long hose of 13 mm (1/2”) internal diameter.

The application and release times must meet the following criteria:

Application elapsed time	for the pressure in the 800 ml test chamber to reach 420 kPa, must not exceed 0.400 seconds with the air reservoirs charged to no more than 650 kPa and the spring brakes released.
Release elapsed time	for the pressure in the 800 ml test chamber to decrease to 35 kPa, must not exceed 0.500 seconds from a full brake application with the air reservoirs charged to at least 650 kPa and the spring brakes released.

Insert S9 Checklist — Prime mover B-double rating (example)

S9 Checklist — Prime mover B-double rating

This checklist is for use by approved vehicle examiners (AVEs) when rating a prime mover for use in B-doubles.

Prime mover and engine details

Vehicle make:	Vehicle model:	Month and year of manufacture:
VIN (if applicable):	**Vehicle chassis no. (if applicable):**	**Vehicle modifier (company name):**

Engine make/mode:	Engine no.:	Rated power @ rpm:	Governed rpm:	Max. torque @ rpm:
		kW @ RPM		Nm @ RPM

Tail shaft series/size:	Manufacturers max torque:	T_{800} torque @ rpm:
mm (if applicable)	Nm	Nm @ RPM

Prime mover component details

Component	Make/model	Manufacturer's max. GCM rating	Low/top ratios
Transmission		kg	1: 1:
Aux. transmission		kg (if applicable)	1: 1:
Rear axle(s)		kg	1: 1:
Rear suspension		kg	
Front axle(s)		kg (if applicable)	1: 1:
Front suspension		kg (if applicable)	
Tyres front			
Tyres rear			
Chassis section		kg	

Tow coupling / fifth wheel		D-rating	kN
Tow coupling overhang	Applicable: Yes ☐ No ☐	Amount	mm
Wheelbase	mm	Rear overhang	mm

B-double prime mover tests

Speed limited by:	Gearing ☐	Road Speed Governor ☐	Maximum governed speed:	km/h					
Brake timing test	Combination of vehicles	☐	Individual vehicle	☐	Test results	Application:	ms	Release:	ms
Startability at GCM	%	Gradeability at GCM	%	Gradeability at 70 km/h, at GCM	%				

Modified B-double GCM assigned	Vehicle make/model, if used for comparison
kg	

Assessment

	Assessment	Check Yes, No, N/A as applicable:		Yes	No	N/A
1	Is the modified GCM within the component manufacturers' limits?			☐	☐	
2	Are the tow couplings and attachments adequate for the GCM/ATM and do they meet the requirements of the design requirements portion of Modification Code S9?			☐	☐	
3	Has gradeability been established to exceed 12% at the modified GCM?	Gradeability rating:	%	☐	☐	
4	Has startability been established to exceed 15% at the modified GCM?	Startability rating:	%	☐	☐	
5	Are the ratings of all driveline components adequate for the GCM rating of the B-double?			☐	☐	
6	In the case of a prime mover with GCM rating exceeding 42.5 tonnes, does the driveline meet the axle configuration restrictions of the design requirements portion of Modification Code S9?			☐	☐	☐
7	Does the vehicle satisfy the speed limiting requirements of Australian Design Rule (ADR) 65/.. or Modification Code A5 if it is applicable?			☐	☐	☐
8	Does the vehicle meet the brake requirements, including but not limited to trailer signal response time for brake application and release as well as air compressor capacity (if applicable), of the design requirements portion of this code?			☐	☐	
9	Are all axle groups on the vehicle 'conforming' axle groups and do they comply with the applicable heavy vehicle regulator's requirements for axle group spacing?			☐	☐	

Vehicle chassis no./VIN:	Date:	Signed:

Vehicle Standards Bulletin 6 — Version 3.2
Section S — Vehicle rating
1 of 2

S9 Checklist — Prime mover B-double rating

This checklist is for use by approved vehicle examiners (AVEs) when rating a prime mover for use in B-doubles.

Assessment	Check Yes, No, N/A as applicable:	Yes	No	N/A
10	Do the vehicle's dimensions meet the requirements of the design requirements portion of Modification Code S9?	☐	☐	
11	Does the vehicle meet the electrical requirements of the design requirements portion of Modification Code S9?	☐	☐	
12	Is the vehicle in satisfactory mechanical condition?	☐	☐	

Advanced braking systems

Braking systems	Check Yes, No, N/A as applicable:	Yes	No	N/A
1	Is the advanced braking system (where fitted) un-affected or re-certified after the vehicle modification?	☐	☐	☐

Compliance

Modification	Check Yes, No as applicable:	Yes	No	N/A
1	Does this modification meet all the requirements of the manufacturer's guidelines / Modification Code S8?	☐	☐	
2	Does the vehicle meet the requirements of ADR 64/.. ?	☐	☐	
3	Are all supporting modifications performed and certified in accordance with the relevant sections of VSB6?	☐	☐	
4	Is the vehicle in satisfactory mechanical condition?	☐	☐	
5	Are all supporting modifications performed and certified in accordance with the relevant sections of VSB6?	☐	☐	☐
6	Is the quality of the work to an accepted industry standard?	☐	☐	
7	Does the vehicle continue to comply with ADRs and heavy vehicle standards regulations affected by the modification?	☐	☐	

Authorisation

If the answer to any relevant question is NO, the modification is not acceptable.

Comments:			
Examined by:	Company (if applicable):		AVE no.:
Signed:	Modification certificate no.:	Modification plate no.:	Date:

Vehicle chassis no./VIN:	Date:	Signed:

Modification Code S11 — Road train trailer rating

1. Scope

The purpose of this code is to allow an accredited S11 AVE to certify a trailer as compliant for use in a road train combination and to change the ATM/GTM of a road train rated trailer.

Modifications covered under this code:

Covered

- certification of a trailer as compliant for use in road train combinations that has been upgraded to conform to the requirements of ADR 38/.. and ADR 63/.. applicable to road train trailers
- re-rating the ATM/GTM of a road train trailer that has been modified in accordance with the manufacturer's specification.

Not covered

- road train rating of trailers already certified by the manufacturer as complying with ADR 38/.. and ADR 63/.. with the words *road train trailer* marked on the vehicle plate as required by ADR 61/.. which have not been modified
- rating of trailers used in a combination with a gross combination mass exceeding 125 tonnes (this will require a specific modification application to your applicable heavy vehicle regulator).

2. Related standards

Modified vehicles must comply with all applicable ADRs, Australian Standards, acts and regulations. Below are some but not all of the areas that may be affected by the modifications in this code and require certification testing or evidence to demonstrate compliance.

The AVE must ensure that the modified vehicle continues to comply with all related ADRs including but not limited to:

This…	Must comply with…
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, 24A, 24/.. , 42/.. , VSB6 Section E

3. Certification procedure

The certification procedure for this modification code is as follows:

1.	Modifier	Determine if the proposed road train trailer rating is within the manufacturer's specifications for the vehicle or a similar vehicle from the same manufacturer. • If **yes**, proceed to step 2. • If **no**, proceed to step 3.
2.	Modifier	Obtain written evidence of the manufacturer's specifications. Proceed to step 6.
3.	Modifier	Contact S11 AVE to organise vehicle assessment.
4.	S11 AVE	Inspect vehicle and determine modifications required.
5.	Modifier	Consult with an AVE who is accredited to certify each modification for guidance on how any modification is required to be performed. Follow the certification procedure in each applicable modification code. *For example, where a rear tow coupling is required to achieve the proposed road train trailer rating, refer to an accredited P1 AVE and VSB6 Modification Code P1.*
6.	Modifier	Organise approval inspection by an accredited S11 AVE.
7.	S11 AVE	Perform inspection, ensure all modifications have been certified (if applicable), complete S11 checklist and determine if compliance has been achieved: • If **yes**, proceed to step 9. • If **no**, do not proceed, advise modifier rework is required to ensure compliance. Return to step 6.
8.	S11 AVE	Issue modification certificate, affix modification plate including the words 'ROAD TRAIN TRAILER', and submit paperwork as required by the relevant AVE registration scheme.

AVEs must be satisfied that the vehicle modification requirements are being met. It is advised that before modifications are carried out they be discussed with the certifying AVE.

4. Road train combinations

The first part of many typical road train combinations is a prime-mover and a road train rated semitrailer. The remaining parts of the combination are trailers of various types connected by various couplings.

Combinations consisting of a prime mover followed by a semitrailer are designated in the format *XY Number,* based on:

XY refers to the coupling types used between the trailers, starting from the rear of the first trailer, and treating any connection of a semitrailer to a converter dolly via a fifth wheel as a dog trailer (for the purposes of naming convention).

The number terms (i.e., double, triple and quad) refer to the number of trailers in a combination, not to the number of axles or axle groups, again treating any connection of a semitrailer to a converter dolly via a fifth wheel as a dog trailer (for the purposes of naming convention).

That is, a prime-mover and a semitrailer combination coupled to another two trailers using type **X** and type **Y** couplings, would create an XY triple.

Combinations with a rigid truck towing more than one trailer are also considered a road train; however, they do not follow the same naming convention.

Coupling types may include:

'A' type couplings	A drawbar-based coupling type. This coupling type does not transfer roll or, generally speaking, load between the vehicle units. That is, a trailer connected to the previous trailer with a drawbar type coupling with or without a coupling at the rear. This includes semitrailers coupled to a converter dolly (forming a dog trailer).
'B' type couplings	A fifth wheel connection coupling. This coupling type typically transfers roll and load between the vehicle units. That is, a semitrailer with a fifth wheel coupling at the rear.

Where a combination is consistently one type they are referred to as only the coupling type, i.e., three trailers connected via 'B' type couplings, B-triple or three trailers connected by 'A' type couplings as an A-Triple.

Some common road train types are shown below. These are examples only. Always check local regulations for requirements to access the road network.

A-double

A prime mover towing a semitrailer towing another semitrailer connected by a converter dolly.

B-triple

A prime mover towing three semitrailers. The second and third semitrailers are connected by a fifth wheel located towards the rear of the preceding semitrailer.

AB-triple

A prime mover towing three semitrailers. The second semitrailer is connected by a converter dolly and the third trailer is connected by a fifth wheel located towards the rear of the preceding semitrailer. Can also be described as a semitrailer towing a B-double using a converter dolly.

BA-triple

A prime mover towing three semitrailers. The second semitrailer is connected by a fifth wheel located towards the rear of the preceding semitrailer and the third semitrailer is connected by a converter dolly. Can also be described as a B-double towing a semitrailer using a converter dolly.

A-triple

A prime mover towing three semitrailers. The second and third semitrailers are each connected by a converter dolly.

BAB-quad

A prime mover towing four semitrailers. The second and fourth semitrailers are connected by a fifth wheel located towards the rear of the preceding semitrailer and the third semitrailer is connected by a converter dolly. Can also be described as a B-double towing a B-double using a converter dolly.

ABB-quad

A prime mover towing four semitrailers. The third and fourth semitrailers are connected by a fifth wheel located towards the rear of the preceding semitrailer and the second semitrailer is connected by a converter dolly. Can also be described as a semitrailer towing a B-triple using a converter dolly.

BAA-quad

A prime mover towing four semitrailers. The second semitrailer is connected by a fifth wheel located towards the rear of the preceding semitrailer and the third and fourth semitrailers are connected by a converter dolly. Can also be described as a B-double towing an A-double using a converter dolly.

AAB-quad

A prime mover towing four semitrailers. The second and third semitrailers are connected by a converter dolly and the fourth semitrailer is connected by a fifth wheel located towards the rear of the preceding semitrailer. Can also be described as an A-double towing a B-double using a converter dolly.

5. Compliance requirements

Required:

- Ensure that a modified trailer intended for use in a road train meets all relevant requirements of ADR 38/.. , ADR 62/.. ADR 63/.. and the dimensions.
- In accordance with ADR 61/.. , ensure that a trailer originally built as suitable for use in a road train and manufactured to meet ADR 63/.. shows the words 'ROAD TRAIN TRAILER' on its vehicle plate to signify that it is suitable for use in any position in a road train with a GCM not exceeding 125 tonnes.
- Ensure that where a trailer is certified for use in a road train combination via this modification code, that the modification plate contains the ATM/GTM and shows the words 'ROAD TRAIN TRAILER'.

6. Design requirements

Chassis

Required:

- Perform calculations to confirm that the chassis of the modified trailer is adequate for use in any position of a road train with a GCM of up to 125 t and conforms to VSB6 Section H — Chassis.

Tow coupling

Required:

- Ensure the tow coupling fitted to a road train trailer meets the coupling requirements of ADR62/.. and ADR 63/.. , which includes certification to nominated Australian Standards and minimum D-ratings.
- Ensure all tow couplings, including fifth wheels and kingpins, of trailers manufactured after 1 July 1991 are marked as conforming to the relevant Australian Standard.
- Ensure the location of couplings and drawbars is in accordance with ADR 62/.. and ADR 63/.. and meets the current requirements for the applicable heavy vehicle regulator.

Tyre and wheel rims requirements

Required:

- Ensure the sum of load carrying capacities of all tyres and rims fitted to an axle or axle group is not less than the vehicle manufacturer's rating for that axle or axle group.
- Ensure the load on any tyre or rim does not exceed its carrying capacity with the trailer loaded to its revised ATM rating and with the load uniformly distributed.
- For a trailer manufactured to comply with ADR 24/.. , or 42/.. , select the tyres and rims in accordance with that ADR and ensure that it complies with that ADR at the revised ATM rating.
- If a trailer is fitted with a tyre placard, replace it with one suitably amended to indicate correct tyre specifications for the trailer at the revised ATM rating and update the modification plate to show the revised tyre size and load rating.

Electrical wiring requirements

Required:

- Ensure the electrical wiring and connectors conform to ADR 63/..
- Ensure that electrical wiring and connectors also conform to ADR 42/.. , which requires electrical connector configuration, wiring support and protection.

Axle groupings requirements

Required:

- Ensure all axle groups in the road train combination conform to the spacing requirements between adjacent single axles or axle groups as required by the applicable heavy vehicle regulator.

Dimension and signage requirements

Dimensions

Required:

- Ensure the internal (where applicable) and external dimensions of a road train and, where available, combination vehicle are in accordance with the limits specified by the applicable in-service heavy vehicle regulator.

Signs

Required:

- Fit the required vehicle marking sign(s) i.e., ROAD TRAIN sign to the front and rear of a road train combination, in accordance with the requirements of the applicable heavy vehicle regulator.

Brake system requirements

Required:

- Ensure where the braking system is modified, it is performed and certified in accordance with VSB6 Section G — Brakes.
- Ensure that the application and release times for brake signal are tested, particularly if a partially new control system sub-assembly is used.
- Test the trailer brake signal application and release times either as part of a road train combination or as an individual vehicle.
- Test the trailer brake system application and release time at the furthest brake chamber and at the rear control line coupling, either as part of a road train combination or as an individual trailer as specified in ADR38/.. .
- Ensure when designing a trailer for use in a road train the brake timing performance as per '7. Testing requirements' is considered.

↘ Note Electrical supply requirements for trailer braking systems are contained in ADR 38/.. and may vary depending on if the trailer is designed for single trailer, B-double or road train use.

7. Testing requirements

Braking tests

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

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

Combination test

Whilst it is possible for a road train combination to consist only of two trailers, this code requires testing as part of at least a triple road train (i.e., prime mover or truck plus three trailers, not including any converter dollies) and that the application and release times meet the following criteria:

Application elapsed time	must not exceed 1.5 seconds for the pressure in the least favoured brake chamber to reach 420 kPa with air reservoirs in all units of the road train charged to no more than 650 kPa and the spring brakes released.
Release elapsed time	must not exceed 1.5 seconds for the pressure in the least favoured brake chamber to decrease to 35 kPa from a full brake application with the air reservoirs in all units of the road train charged to at least 650 kPa.

Test in isolation

If tested as a trailer in isolation, use a test rig that:

- meets requirements defined in ADR 38/..
- is charged to 650 kPa and 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 (1/2") internal diameter to an 800 ml test chamber.

The application and release times must meet the following criteria:

Application elapsed time	for the pressure to reach 420 kPa must not exceed: • 0.350 seconds at the least favoured trailer brake chamber • 0.250 seconds at the 800 ml test chamber attached to the rear coupling with test rig and trailer reservoirs charged to no more than 650 kPa and the trailer spring brakes released.
Release elapsed time	for pressure to decrease to 35 kPa must not exceed: • 0.650 seconds at the least favoured trailer brake chamber • 0.550 seconds at the 800 ml test chamber attached to the rear coupling from a full brake application with the test rig and trailer air reservoirs charged to at least 650 kPa.

Trailer brake system testing and axle groupings

When testing a trailer brake system for compliance with application and release time requirements, calibrate the test rig shown in Figure 2 of ADR 38/.. in accordance with the following requirements and connect it as shown in Figure 3 of ADR 38/.. .

Required:

- Where a rear coupling for towed trailers is provided, measure time responses with an 800 millilitre vessel attached to the rear service coupling as in Figure 3 of ADR 38/.. .
- Calibrate the test rig described in Figure 2 of ADR 38/.. by adjustment of the orifice (O) such that with the storage reservoir (R1) charged to 650 kPa, there is a delay of 0.18 to 0.22 seconds 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.
- Charge the test rig and the trailer energy storage devices to 650 kPa before the test is conducted and do not add energy to the storage vessel (R1) or the trailer supply line during the test.
- Measure brake actuation time from when the pressure level in the storage reservoir and control valve initially drops to the point it reaches 420 kPa in the least favoured brake actuator.
- With there is an initial service brake application level of 650 kPa, measure the brake release time from the time it takes the pressure level between the control valve and the orifice to drop to 35 kPa in the least favoured brake actuator.

- Ensure the brake control valve is configured to permit energy to flow from the storage reservoir to the orifice (0) when in the **ON** position and from the orifice to waste when in the **OFF** position.
- Do not allow additional energy to flow into the test rig control line by way of its own control signal.
- Design the brake control valve control so that its operation does not affect the output response of the test rig.
- Arrange the brake control valve to provide a modulated test rig output signal for other brake development purposes but render it inoperative to measure trailer brake system response.

Brake system calculated performance

Establish 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.

Where the braking system of the trailer is modified, the modifications must be performed and certified in accordance with VSB6 Section G — Brakes.

Required:

- Determine maximum trailer mass, which can be parked on an 18% grade by calculations using certified data published by the sub-assembly manufacturer.
- Use this data to select brake chamber sizes and slack adjuster lengths that provide sufficient parking force without exceeding suspension skid limits in an emergency breakaway application.
- If a trailer has been modified for use in a road train, establish that it conforms to all ADR 38/.. requirements.
- Ensure that the calculated established retardation coefficient (ERC) performance falls within the limit bands and emergency ERC, and that parking ability, skid limit performance, friction utilisation and axle fade rating all meet the specified requirements.
- For a modified trailer, record the following when rating it:
  - certified sub-assemblies 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.

Recommended:

- Include with the records the calculated performance figures for ERC at various levels of control pressure E, together with the upper and lower limit bands.

S11 Checklist — Road train trailer rating (example)

S11 Checklist — Road train trailer rating

This checklist is for use by approved vehicle examiners (AVEs) when rating trailers for use in road train combinations.

Trailer details (as applicable)

Vehicle make:	Vehicle model:	Month and year of manufacture:
VIN (if applicable):	**Vehicle chassis no. (if applicable):**	**Vehicle modifier (company name):**

Wheelbase:	Forward radius:	Rear overhang:	Tow coupling overhang:	Drawbar length:
mm	mm	mm	mm	mm

Point of articulation to rear overhang line:	Modified ATM:	Modified GTM:	Tare mass:
mm	kg	kg	kg

Trailer component details

Component details:					
Component	Make/model			Compliance mark approval (SARN)	Load rating
Control system					
Braked axles					kg
Front suspension					kg
Rear suspension					kg
Tyre size					kg

Axle group: front	Axle number 1	Axle number 2	Axle number 3	Axle group load
Brake chamber size				kg
Slack adjuster length				

Axle group: rear	Axle number 1	Axle number 2	Axle number 3	Axle number 4	Axle group load
Brake chamber size					kg
Slack adjuster length					

Chassis construction	

Tow couplings	Make	Model	D-rating
Front tow coupling / fifth wheel			kN
Rear tow coupling / fifth wheel			kN

Brake timing test (if applicable):	Application time:	Release time:
Rear brake chamber	ms	ms
Rear coupling to test cylinder	ms	ms

Calculated braking performance:					
Calculated ERC deceleration performance relative to Australian Design Rule (ADR) 38/.. upper and lower boundaries at different control signal strengths.					
Control signal 'E'	0.2	0.4	0.6	0.8	1.0
Control signal kPa	130	260	390	520	650
Calculated ERC					

Parking grade percent at modified ATM	Emergency skid limit	Certified suspension skid limit
%		

All trailers:	Dog trailer:				
Axle fade rating required (tonnes)	Front friction utilisation				Rear friction utilisation
		at		ERC	

Vehicle chassis no./VIN:	Date:	Signed:

Vehicle Standards Bulletin 6 — Version 3.2
Section S — Vehicle rating
1 of 2

S11 Checklist — Road train trailer rating

This checklist is for use by approved vehicle examiners (AVEs) when rating trailers for use in road train combinations.

Trailer component details

If you answer NO to any question below, the modification is not acceptable.	Check Yes, No, N/A as applicable:	Yes	No	N/A
1	Have all calculations or manufacturer's specifications required to establish the modified ATM been retained for future audit?	☐	☐	
2	Has the chassis construction been assessed (by calculations) to be adequate for the modified axle group loads and ATM?	☐	☐	
3	Are the requirements of ADR 38/.. met including for ERC, emergency skid limits, friction utilisation and axle fade rating ?	☐	☐	
4	Does the parking brake ability exceed 18% gradient at the modified ATM?	☐	☐	
5	Are the brake application and release times (if applicable) within the permitted limits?	☐	☐	
6	Has the tyre placard, if fitted, been updated where necessary to record the correct tyre and rim sizes, axle configurations, axle loads and inflation pressures for the modified vehicle?	☐	☐	☐
7	Are tyres and rims fitted in accordance with the tyre placard?	☐	☐	☐
8	Do the fifth wheel and fifth wheel mounting meet the requirements of ADR 62/.. and ADR 63/...?	☐	☐	☐
9	Do the tow coupling, tow coupling mounting and drawbar (if applicable) meet the requirements of ADR 62/.. and ADR 63/...?	☐	☐	☐
10	Does the trailer comply with all applicable ADR requirements at the revised road train rating?	☐	☐	
11	Are the trailer dimensions within the permitted maximum limits?	☐	☐	
12	Are road train signs fitted in accordance with Section 9 'Dimension and signage requirement' of Modification Code S9?	☐	☐	

Advanced braking systems

Braking systems	Check Yes, No, N/A as applicable:	Yes	No	N/A
1	Is the advanced braking system (where fitted) un-affected or re-certified after the vehicle modification?	☐	☐	☐

Modification details

Modification criteria	Check Yes or No as applicable:	Yes	No
1	Has the modification been performed in accordance with the manufacturer's guidelines?	☐	☐

Compliance

Modification	Check Yes or No as applicable:	Yes	No
1	Does this modification meet all the requirements of the manufacturer's guidelines / Modification Code S7?	☐	☐
2	Is the quality of the work to an accepted industry standard?	☐	☐
3	Does the vehicle continue to comply with ADRs and heavy vehicle standards regulations affected by the modification?	☐	☐

Authorisation

Other than modification criteria, if the answer to any relevant question is NO the modification is not acceptable.

Comments:			
Examined by:	Company (if applicable):		AVE no.:
Signed:	Modification certificate no.:	Modification plate no.:	Date:

Vehicle chassis no./VIN:	Date:	Signed:

Modification Code S12 — ATM/GTM re-rating (design)

1. Scope

The purpose of this code is to allow an accredited S12 AVE to issue a design certification and checklist that allows an accredited S7 AVE to certify the permissible ATM/GTM rating of modified trailers. Examples of modifications that may require rating changes include adding or removing axles from an existing axle group, and replacement of suspensions or control systems with alternative components which would allow a different rating.

The design certificate can be based on vehicle specifications:

- obtained directly from the vehicle by the S12 AVE; or
- provided to the S12 AVE, by the owner, modifier, S7 AVE or otherwise.

Modifications covered under this code:

Covered

- the issuing of a design certificate and checklist for use by an accredited S7 AVE to inspect and re-rate the ATM/GTM of a trailer. The trailer itself may not have been inspected by the accredited S12 AVE

Not covered

- ATM/GTM rating for a trailer that has been modified to change the trailer's basic type, e.g., semitrailer to dog trailer, pig trailer to dog trailer, semitrailer to dolly, etc. When a trailer type is altered the trailer is regarded as being remanufactured rather than modified, and as such a new entry onto the RAV is required along with a new VIN issued to identify correctly the trailer and the manufacturer.
- the issuing of a design certificate that allows ratings that would cause any component of the vehicle to be loaded in excess of that component manufacturer's rating
- ATM rating of a trailer used in a road train (see VSB6 Modification Code S11).

2. Related standards

Modified vehicles must comply with all applicable ADRs, Australian Standards, acts and regulations. Below are some but not all of the areas that may be affected by the modifications in this code and require certification testing or evidence to demonstrate compliance.

The AVE must ensure that the modified vehicle continues to comply with all related ADRs.

This…	Must comply with…
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, 24A, 24/.. , 42/.. , VSB6 Section E
Tow couplings	Manufacturer's rating, ADR 62/.. , modification codes P1 and P2

3. Certification procedure

The certification procedure for this modification code is as follows:

1.	Modifier	Contact S12 AVE to supply vehicle specifications or organise vehicle inspection by S12 AVE.
2.	S12 AVE	Provide design certification including brake assessment to modifier.
3.	Modifier	Consult with an accredited S12 AVE for guidance on what modifications are required.

AVEs must be satisfied that the vehicle modification requirements are being met. It is advised that before modifications are carried out they are discussed with the certifying AVE.

4. Compliance requirements

Required:

- Assess the compatibility of the entire trailer in relation to the revised rating and check that the chassis, suspensions, axles and any tow couplings are within the component and trailer manufacturer's rated capacities.
- Where a manufacturer has published a reduced rating capacity for a component, ensure the reduced rating is applied.
- Issue a design certificate which:
  - clearly identifies whether it refers to a specific trailer or to a range of trailers:

specific trailer	clearly identify the make, model, VIN and any other relevant details
type or range of trailers	clearly outline the range of trailers the rating applies to including make, model / model range, year range and any other relevant details

  - includes a checklist of all relevant specifications of the trailer such as chassis material, suspension and braking system components etc. for the accredited S7 AVE to verify that the trailer meets the requirements of the S12 design certificate
  - identify the source of any specifications or ratings.
- If modifications are made to the trailer in order to support an ATM/GTM re-rating (i.e., brake system modification), ensure that all modifications are performed and certified in accordance with the relevant sections of VSB6.
- Ensure that the modified trailer's GTM is not more than the trailer's ATM.

5. Design requirements

Tyres and wheel rims requirements

Required:

- Ensure the sum of the load carrying capacities of all the tyres and rims fitted to an axle or axle group is not less than the GTM rating of the trailer.
- Ensure the loading of the trailer to its ATM/GTM with load distributed normally, does not result in load on any tyre or rim exceeding its rated capacity.
- For a trailer manufactured to comply with ADR 24/.. , or 42/.. , select the tyres and rims to comply in all aspects with the requirements of that ADR at the revised ATM/GTM.
- If a tyre placard is fitted to a trailer, replace this with an amended placard to indicate the correct tyre and rim specifications for the trailer at the revised ATM /GTM rating.
- Ensure, where applicable, the revised tyre size and load rating also appear on the modification plate.
- Ensure if the tyre rolling diameter is changed that the trailer brake system is re-certified in accordance with VSB6 Section G — Brakes.

Chassis

Required:

- Confirm by calculation that the modified chassis is adequate for the proposed ATM/GTM as applicable.

Tow coupling

Required:

- Ensure the tow coupling(s) fitted to a modified trailer are adequate for the proposed ATM/GTM and that the coupling installation conforms to VSB6 Section P — Tow couplings.
- Ensure that the design of the drawbar (if applicable) complies with ADR62/.. including being able to withstand the forces specified in ADR 62/.. at the revised ATM and GTM.

Braking system requirements

Where the braking system of the trailer is modified, the modifications must be performed and certified in accordance with VSB6 Section G — Brakes.

Brake control system

Required:

- The length and diameter of piping and the type of connecting fittings within a trailer control system are critical for achieving brake response and release times within the limits specified by ADR 38 and ADR 38/.. . The maximum permitted transmission lengths (lengths of piping) are specified in the *component type approval* data. This maximum transmission length, as well as parts lists and installation diagrams, are typically available from the control system manufacturer.
- Check the actual installed lengths of piping 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, conduct response and release time tests in accordance with the relevant section of ADR 38/.. , unless it can be established that the system changes are beneficial to time responses.

Brake system sub-assemblies (air braked trailer)

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

Required:

- Establish that the trailer design conforms to all ADR 38 or ADR 38/.. requirements as applicable; that the calculated ERC performance falls within the limits and emergency ERC, and that the parking ability, skid limit performance, friction utilisation and axle fade rating all meet requirements.
- Supply the checklist, which records the trailer data essential for these calculations, with the S12 certificate to the accredited S7 AVE who will be physically inspecting the trailer.

Recommended:

- Include copies of the control system certified diagram and parts lists when providing the certificate.

S12 Checklist — ATM/GTM re-rating (design) (example)

S12 Checklist — ATM/GTM re-rating (design)

A copy of this checklist must be supplied with the design certificate to the S7 approved vehicle examiner (AVE).

Trailer details (as applicable) identity and information source

Vehicle make:	Vehicle model:	Month and year of manufacture:
VIN (if applicable):	**Vehicle chassis no. (if applicable):**	**Vehicle modifier (company name):**

Vehicle examined or details supplied by:	S12 design certificate number:

Wheelbase:	Forward radius:	Rear overhang:	Tow coupling overhang:	Drawbar length:
mm	mm	mm	mm	mm

Point of articulation to rear overhang line:	Modified ATM:	Modified GTM:	Tare mass:
mm	kg	kg	kg

Trailer component details

Component details:					
Component	Make/model			Compliance mark approval (SARN)	Load rating
Control system					
Braked axles					kg
Front suspension					kg
Rear suspension					kg
Tyre size					kg
Axle group: front	Axle number 1	Axle number 2	Axle number 3	Axle group load	
Brake chamber size					kg
Slack adjuster length					
Axle group: fear	Axle number 1	Axle number 2	Axle number 3	Axle number 4	Axle group load
Brake chamber size					kg
Slack adjuster length					
Chassis construction					

Tow couplings	Make	Model	D-rating
Front tow coupling / fifth wheel			**kN**
Rear tow coupling / fifth wheel			**kN**

Brake timing test (if applicable):	Application time:	Release time:
Rear brake chamber	ms	ms
Rear coupling to test cylinder	ms	ms

Calculated braking performance					
Calculated ERC deceleration performance relative to Australian Design Rule (ADR) 38/.. upper and lower boundaries at different control signal strengths.					
Control signal 'E'	0.2	0.4	0.6	0.8	1.0
Control signal kPa	130	260	390	520	650
Calculated ERC					

Parking grade percent at modified ATM	Emergency skid limit	Certified suspension skid limit
%		

All trailers:	Dog trailer:				
Axle fade rating required (tonnes)	Front friction utilisation				Rear friction utilisation
		at		ERC	

Vehicle chassis no./VIN:	Date:	Signed:

Vehicle Standards Bulletin 6 — Version 3.2
Section S — Vehicle Rating
1 of 2

S12 Checklist — ATM/GTM re-rating (design)

➘ A copy of this checklist must be supplied with the design certificate to the S7 approved vehicle examiner (AVE).

Trailer component details

If you answer NO to any question below, the modification is not acceptable. Check Yes, No, N/A as applicable:		Yes	No	N/A
1	Have all calculations required to establish the modified ATM been retained for future audit?	☐	☐	
2	Has the chassis construction been assessed (by calculations) to be adequate for the modified axle group loads, GTM and/or ATM as applicable?	☐	☐	
3	Are the trailer dimensions within the permitted maximum limits?	☐	☐	
4	Does design certification give adequate specification so that the S7 AVE can verify that the chassis conforms to the detail construction, section properties, cross member location and dimensions of the S12 design certification?	☐	☐	
5	Does the design certification specify the trailer's entire braking system, including brake chamber sizes and slack adjuster length setting?	☐	☐	
6	Does the parking brake ability exceed 18% gradient at the modified ATM?	☐	☐	
7	Are the requirements of ADR 38/.. met including ERC, emergency skid limits, friction utilisation and axle fade rating?	☐	☐	
8	Do the tow coupling, tow coupling mounting components and drawbar (if applicable) meet the requirements of ADR 62/.. ?	☐	☐	
9	Does the design certificate specify the tyre placard changes for the trailer, if fitted, so that it records the correct tyre and rim sizes, axle configurations, axle loads and inflation pressures for the modified trailer?	☐	☐	☐

Compliance

Modification	Check Yes, No as applicable:	Yes	No
1	Does this modification meet all the requirements of the manufacturer's guidelines / Modification Code S12?	☐	☐
2	Is the quality of the work to an accepted industry standard?	☐	☐
3	Does the vehicle continue to comply with ADRs and heavy vehicle standards regulations affected by the modification?	☐	☐

Authorisation

If the answer to any relevant question is NO, the modification is not acceptable.

Comments:			
Issued by:	Company (if applicable):		AVE no.:
Signed:	Modification certificate no.:	S12 design certificate no. issued:	Date:

Vehicle chassis no./VIN:	Date:	Signed: