Queensland Code of Practice: Vehicle Modifications (QCOP)

Code LS16: Gross Combination Mass Re-rating

Feb 2023

Queensland Government

CODE LS16
Gross Combination Mass Re-rating

1. Scope

The LS16 modification code specifies arrangements for re-rating of the Gross Combination Mass (GCM) and Braked Towing Capacity (BTC) of a light vehicle, that is a vehicle with a Gross Vehicle Mass (GVM) rating that does not exceed 4,500 kg.

Re-rating of GCM/BTC under LS16 code is permitted only on a light vehicle that is constructed on a ladder type chassis frame with a cabin and/or body mounted on it. Vehicles with integrated frame and body, commonly known as unitary or monocoque construction, are not eligible.

The original equipment manufacturer (OEM) is the entity holding the First Stage Identification Plate Approval (IPA). An entity holding the Second Stage Manufacture (SSM) Approval or Registered Automotive Workshop Scheme (RAWS) Approval is not the OEM.

The OEM GCM for the vehicle must be used as the baseline to undertake this modification. No re-rating of GCM under this code may be undertaken without confirmation of the OEM GCM. This information must be obtained from a reliable and traceable source. If no GCM is readily available, check with your transport agency before designing or performing the GCM modification.

A SSM approval cannot be used for re-rating a vehicle's GCM in-service under this code. A complete design package must be included and documented for use under this code.

This GCM code can be used in conjunction with any state or territory transport agency current and applicable policy or modification code for re-rating of Gross Vehicle Mass (GVM).

The Road Vehicle Descriptor (RVD) continues to be valid under *Road Vehicle Standards Act 2018* and is referenced in the Road Vehicle Regulator (ROVER) system. Note that evidence of the design package for the SSM approval must be supplied. Simply citing the SSM IPA is not deemed sufficient to provide the certification.

Appendix A of the LS16 code contains important information and guidance for the Approved Persons (AP) using this code.

1.1 What is permitted

Modifications that may be certified under LS16 code are:

- GCM rating changes for a vehicle that has an alternative specification by the OEM.
- GCM rating changes for a vehicle that has been inspected and confirmed to conform to a design certificate issued by an appropriately qualified AP.
- GCM rating changes in accordance with the following:
  - retaining the OEM GVM and re-rating the Braked Towing Capacity (BTC)
  - an appropriately approved GVM re-rating, without changing the OEM BTC.
  - with an appropriately approved GVM re-rating and an appropriately approved BTC rating.
- Re-rating of towing capacity as documented in Section 1.3
- Restoring the GCM rating to the OEM rating but only after ensuring that all vehicle components are also restored to the OEM specification.

1.2 What is not permitted

Modifications that must not be certified under LS16 code are:

- Modifications other than those described in Section 1.1.
- GCM re-rating increase of a vehicle where it is unmodified (other than where it is in accordance with the OEM specifications).
- Where a complete design specification has not been issued by an AP, prior to certification of the modification code.
- Testing has not been completed to determine the GCM rating as specified in this modification code.

1.3 Towing Capacity and LS16 Code

- LS16 code must be used for re-rating of the BTC of the vehicle, retaining the OEM GVM.
- LS16 code must be used for re-rating the GCM of a vehicle, retaining the OEM BTC rating where a GVM increase has been performed.
- LS16 code must be used for re-rating of the GCM and BTC of the vehicle, where a GVM increase has also been appropriately certified.
- Towing capacity cannot be increased where the towing vehicle is unmodified.

Please note it is recommended that the BTC capacity should not exceed the GVM rating of the towing vehicle. This is however at the AP's discretion and certification.

2. General Requirements

All work must comply with the requirements contained in sub-section 2 General Requirements of Section LS of the National Code of Practice (NCOP) – Light Vehicle Construction and Modification (VSB14).

2.1 Compliance with applicable vehicle standards

2.1.1 The modified vehicle must continue to comply with the ADRs that apply to it.

2.1.2 If different or additional ADRs apply to the modified vehicle, it must comply with those ADRs that apply to it.

Vehicle owners, registered operators, builders and modifiers of vehicles need to be aware that compliance with this code does not guarantee that a vehicle will be acceptable for continued registration as a modified registered production vehicle. If, for example, a vehicle does not handle or brake satisfactorily or has any other feature that renders the vehicle unsafe or not roadworthy, it will not be accepted for registration.

Builders and owners need to keep abreast of changes to legislation and vehicle registration policy in their jurisdiction, particularly in cases where a project is expected to take some years to complete. Similarly, regulations pertaining to vehicle modifications, vehicle standards or registration policy may change causing certain vehicle modifications to become unacceptable in the future.

2.1.3 A modified pre-ADR vehicle must continue to comply with local transport regulations.

2.1.4 Outlined in Table LS16, are areas of the vehicle that may be affected by the modifications and may require re-certification, testing and/or data to show compliance of the modified vehicle.

Table LS16 List of items and likely affected ADRs

DETAIL	REQUIREMENTS
Tyre and Rim Selection	ADR 42/…
Braking Systems	ADR 31/…or ADR 35/…
Brake Performance (for non-ADR vehicles)	*Please refer to your local transport agency for pertinent regulation and standards.*

The above is not an exhaustive list and compliance with other ADRs may also be affected.

Section 2.2 and 2.3 relate to the general requirements applying to the selected pathway required to re-rate vehicle's GCM using LS16 code.

2.2 Pathway-1 GCM re-rating based on OEM's alternative rating

2.2.1 The GCM of a light vehicle may be re-rated to match the OEM's rating for another variant of the same make/model/chassis series.

2.2.2 All components, including suspension, transmission, engine, brakes, engine and transmission cooling systems, tyres and rims must be the same as those specified for the reference variant.

2.2.3 All components, including suspension, transmission, engine, brakes, engine and transmission cooling systems, tyres and rims should be fitted with equivalent components as those specified for the reference variant.

2.3 Pathway-2 GCM rating changes for a vehicle that has been inspected and confirmed to conform to a design certificate issued by an appropriately qualified Approved Person

2.3.1 The GCM of a light vehicle may be re-rated subject to a confirmed design certificate that has been issued by an AP.

3. Specific Requirements

The following specific requirements apply to all pathways.

3.1 Chassis

3.1.1 Chassis modifications should be performed in accordance with section LH5 of VSB14. If the necessary information is not available in LH5 code, then the relevant sections of H code of the Heavy Vehicle Modification Code of Practice (VSB6) may be consulted, as appropriate.

3.1.2 For calculating chassis strength, VSB6 may be consulted.

3.1.3 For calculating tow couple rating, ADR62 must be used.

3.2 Engine/Transmission

3.2.1 Ensure that any supporting modifications are performed in accordance with section LA and LB of VSB14.

3.3 Axle and suspension Ratings

AP's may perform a GVM upgrade under the LS11 modification code and must comply with the following points.

3.3.1 If no GVM re-rating increase has been performed on the towing vehicle, the OEM axle and suspension ratings must not be exceeded.

3.3.2 If a GVM re-rating increase has been performed, or is being performed, on the towing vehicle through an approved method of certification (for example LS11 or SSM), the re-rated axle capacity must not be exceeded

3.3.3 The revised axle component load, if different from the OEM rating, must be recorded on the Modification Certificate, the Load Capacity Label and updated in the owner's handbook.

3.4 Brakes

3.4.1 A vehicle’s braking performance is directly affected by changes to its mass ratings. Therefore, the towing vehicle’s braking system must be assessed to determine if the performance of the original system is adequate for the re-rated GCM, or the braking system requires to be modified or replaced with appropriately rated components.

3.5 Steering

3.5.1 If the steering system is modified or a new steering system is fitted, it must be certified under the LS section of VSB14.

3.6 Tyres and Rims

3.6.1 The tyres and rims must be selected to comply with the requirements of the relevant ADR at the re-rated GVM.

3.6.2 The initial rating will be given by the OEM, if required an AP may assess and re-rate rims. The certification must be to an applicable standard. In addition, if the GCM code is performed in conjunction with a GVM upgrade or on a vehicle that has already had a GVM upgrade, the tyres and rims must meet the loading requirements.

3.6.3 The load carrying capacity of all tyres and rims must not be exceeded when the combination is loaded to the re-rated GCM, and the load is evenly distributed.

3.6.4 The load capacity of the tyres (and rims) on each axle must be adequate to support the potential maximum mass on that axle.

3.6.5 The revised tyre size and load rating must also appear on the modification plate and in the owner's handbook. A tyre and rim assessment report must be retained.

3.6.6 The effect of alternative tyres on the compliance of the speedometer and odometer accuracy must be considered and maintained in accordance with the relevant ADR when manufactured.

4. Performance requirements

The design of the GCM modification must be validated to key performance criteria specified below (4.1 – 4.5). These performance criteria are based upon the documented test procedures in SAE J2807 and associated performance standards.

Where a design package is delivered, the design package shall be physically validated to provide a baseline for any computer simulation activity.

4.1 Tow vehicle structural performance

The towing vehicle shall be tested to, and meet, the requirements of SAE J2807 for structural performance.

4.2 Tow vehicle propulsion performance

4.2.1 Level road acceleration

The towing vehicle shall be tested to, and meet, the requirements documented in SAE J2807 for level road acceleration.

4.2.2 Startability

Startability is the ability of a vehicle to start moving on a grade when the vehicle is laden to the GVM and GCM to assess any difficulties and resulting performance. Vehicles shall demonstrate startability of a minimum grade of 12% (as per J2807).

For light vehicles, the following variation is accepted; *a transmission efficiency factor of 1.42 may be utilized for automatic transmission vehicles.* Design may be derived through calculation and validated through physical testing; the calculation can be performed using the equations:

$$GCM_{max} = \frac{T \times R \times M \times E}{19.87 \times g_s} \qquad \textit{Eq. 1}$$

$$g_{smax} = \frac{T \times R \times M \times E}{19.87 \times GCM} \qquad \textit{Eq. 2}$$

Where:

T = Engine torque at clutch engagement RPM (Nm)

R = Overall gear reduction between engine and driven wheels

M = Tyre revolutions per kilometre

E = Transmission efficiency
for manual transmission, E = 1
for automatic transmission, E = 1.42

g_s = Maximum grade (%)

4.2.3 Gradeability

Gradeability is the ability of a vehicle to climb a grade when the vehicle is loaded to the GVM and GCM to assess any difficulties and resulting performance. Vehicles shall demonstrate the minimum grade requirement of 23%.

The following variation to VSB6 is accepted; *a transmission efficiency factor of 1.42 may be utilised for automatic transmission vehicles.* Design may be derived through calculation and validated through physical testing; the calculation can be performed using the equations:

$$GCM_{max} = \frac{K \times R \times M \times T \times E}{(g_g + 1)} \qquad \textit{Eq. 1}$$

$$g_{gmax} = \frac{K \times R \times M \times T \times E}{GCM} - 1 \qquad \textit{Eq. 2}$$

Where:

K = Drive efficiency for type of drive axle fitted to the towing vehicle
for single drive axles, K = 0.055
for single drive tandem axles, K = 0.053
for dual drive tandem axles, K = 0.051

R = Overall gear reduction between engine and driven wheels

M = Tyre revolutions per kilometre

T = Maximum engine net torque (Nm)

E = Transmission efficiency
for manual transmission, E = 1
for automatic transmission, E = 1.42

g_g = Maximum grade (%)

4.2.4 Highway gradeability

In addition to the requirement in 4.2.3, the highway gradeability portion of SAE J2807 shall be carried out with the use of a towing dynamometer or a suitable programmable chassis dynamometer, with the Davis Dam profile, utilised to validate the thermal loading and durability of the towing combination.

If a chassis dynamometer is used, the simulated airflow over the front of the vehicle must be adjusted and controlled so that it represents the ambient conditions specified in SAE J2807 and the airflow rate is similar or less than what would be encountered if a physical road test were to be conducted.

4.3 Handling

The towing combination must be tested in accordance with, and meet, the combination handling test requirements in SAE J2807.

4.4 Braking

The towing combination must be tested in accordance with, and meet, the combination braking test requirements in SAE J2807.

4.5 Mechanical connections

Devices utilised for fastening a trailer to a towing vehicle and relevant towing vehicle structures shall satisfy the requirements of *ADR62/.. Mechanical connections between vehicles*.

The vehicle's towbar must be suitably rated for the modification. A towbar cannot be re-rated to a higher load capacity, other than by the original towbar manufacturer and then only in accordance with the relevant mandatory Australian Standard (AS) or ADR. The AS or ADR requirement also applies to any replacement bar with a higher rating to suit the vehicle modification, be it a new design or modification of an existing towbar design.

For the fitting of gooseneck and fifth wheel couplings and their mounting systems, VSB6 may be used as a reference. If possible, these types of couplings must be mounted direct to the chassis rails. If dimensions for a light vehicle means this is not possible, an auxiliary subframe mounting system that is attached directly to the chassis rails may be utilised for attachment, subject to full assessment by the AP as part of the design package. Refer to your relevant transport agency for any clarification.

5. Owner’s Handbook and Load Capacity Label

The vehicle operator must be adequately informed of the changes.

5.1 Owner's Handbook

5.1.1 To inform the vehicle operator about the vehicle’s load capacity and tyre and rim requirements, the vehicle handbook must be updated. The update must provide specific details of any changes to the tyres, rims and the load capacity.

5.1.2 If the vehicle handbook is not available, this information must be provided in written form to the owner of the vehicle.

5.1.3 A copy of all the information provided to the vehicle owner must retained as part of the evidence of this certification. The owner must be made aware of this requirement. This evidence must be provided when requested by an authorised officer.

5.1.4 Re-rated GCM must be shown on the modification plate fitted to the vehicle.

5.2 Load Capacity Label

5.2.1 A Load Capacity Label must be fitted to display information as illustrated below.

5.2.2 The certifying engineer must ensure that the revised ratings are communicated to the purchaser of the modification and that the GCM component must not be exceeded.

5.2.3 The Load Capacity Label must be made of durable material.

5.2.4 Letter size and contrast should be similar to the tyre placard.

5.2.5 The Load Capacity Label must be fitted as close as practicable to the vehicle's tyre placard.

5.2.6 This is in addition to the plates fitted to any identification and certification plate on the Towbar.

Load Capacity Label

Item	Information
SSM Approval Number (if applicable)[1]	
Re-rated GVM[2]	kg
GCM Rating by Original Equipment Manufacturer[3]	kg
Re-rated GCM[4]	kg
Maximum Allowed Front Axle Rating[5]	kg
Maximum Allowed Rear Axle/s Rating[6]	kg
Re-rated vertical load capacity on towball[7]	kg
Original Equipment Manufacturer BTC[8]	kg
Re-rated BTC[9]	
For further information regarding towing capacity and operation please refer to the vehicle owner's handbook.	

Explanatory Notes

1. Applicable only if GVM re-rating is based upon a SSM approval. If not applicable, indicate XXXX.
2. Re-rated GVM certified under approved transport agency method.
3. GCM rating, if published by the OEM in owner's handbook or on OEM website. Contact your registration authority if there is no documented GCM.
4. Re-rated GCM certified under LS16 code.
5. Front axle rating as published by the OEM in owner's handbook/OEM website, or if assessed by the AP, the re-rated axle load.
6. Rear axle rating as published by the OEM in owner's handbook/OEM website, or if assessed by the AP, the re-rated axle load.
7. Re-rated tow ball load certified under LS16 code.
8. BTC rating, if published by the OEM in owner's handbook or on OEM website. Contact your registration authority if there is no documented BTC.
9. Re-rated BTC certified under LS16 code.

6. Limitations

Section 1.2 of this code provides information about which types of modifications are not permitted to be certified under the LS16 code. In addition, the following limitations apply.

6.1 Electronic Stability Control

If the vehicle is fitted with Electronic Stability Control (ESC) system by the OEM, the following requirements must be met:

6.1.1 The ESC system must not be disabled.

6.1.2 It must be ensured that the modifications being certified do not reduce the effectiveness of the ESC system.

6.1.3 It must be ensured that the modifications being certified do not reduce the effectiveness of any trailer sway control elements or ESC systems on a trailer.

7. Additional Modifications and Changes to Vehicle Category

7.1 Additional modifications that are not essential for GCM re-rating must be assessed separately and certified using appropriate codes or specific approvals. For example, GVM requires certification under LS11.

7.2 If the vehicle's category has changed due to the GVM re-rating, the vehicle must comply with the vehicle standards that apply to it. Certification of such compliance using the appropriate additional code(s) must be provided. For example, the LO1 code.

8. Use of LS16 code to provide certification for GCM re-rating

The LS16 code may be used to provide design certification for GCM re-rating of vehicles of a particular make / model / variant / chassis series.

8.1 Design Package

This output must result in a set of documents that clearly and comprehensively address the following four requirements:

8.1.1 Scope of what is eligible

The design package must clearly identify which make/model/variant/chassis series it applies to. If its applicability is restricted to specific build years that also must be mentioned. Reference must be made to Identification Plate Approval / Vehicle Type Approval Number, eligible typical VIN(s) and eligible variants/chassis series.

Since the certification under the LS16 code is being provided on in-service vehicles, the condition of the vehicle is important when providing the certification. The design package must include instructions about what is to be inspected and the acceptance criteria to decide that the vehicle is in a safe and serviceable condition at the point of certification. Condition of the shock absorbers, suspension, frame, tow equipment and brakes are key areas to inspect. Absence of cracks, deformations, leaks and structural damage due to previous overloading, accidents or rust are critical.

The design and certification package must include a template checklist for use by the AP certifying the modification. The checklist will be completed by the AP who certifies the physical modification, to confirm that the vehicle was inspected and was found in safe and serviceable condition at the point of certification.

8.1.2 Evidence package

The design package must include all the test reports and engineering calculations that validate the re-rating, when modified as prescribed. Test reports must be from approved test laboratories, have a unique test facility identification number (TFIN) and be signed and dated. All test reports must make unambiguous reference to the specific make/model/variants of the vehicle or component to which they apply. The test reports must contain the criteria or standard against which testing is performed and clear conclusion about pass or fail outcome according to the relevant criteria or standard.

Engineering calculations must be legible and must include assumptions, if any. They must be compiled under a unique identifier document that is dated and signed.

If any evidence is sourced from a third party, the evidence package must include a written permission from that party for use of its reports as evidence.

For reasons of commercial confidence or sensitivity, sometimes the LS16 certifier may choose not to include all the test reports in the design package to be supplied to the client. In such cases the design package must still include a full list of all the test reports and the calculation sheets (using their unique identifiers) and provide written assurance to the client that the full evidence package will be made available, on request, for audit and enforcement purposes.

8.1.3 Work instructions for modification

The design package must include clear and comprehensive work instructions on how to modify the vehicle, what parts to be used, the sequence of actions to be performed, precautions to be taken and what process controls to be applied.

The work instructions must include details of any (non-destructive) testing and inspections to be carried out to ensure that the modification standards are met.

The work instructions must be easy to understand, unambiguous and should include sufficient pictorials such as photos and graphics.

8.2 Certificate of Modification

The LS16 certifying AP must issue a Certificate of Modification to their client for the LS16 design and certification provided.

8.3 Modification Checklist

The LS16 certifying AP must complete the checklist provided at the end of this code and must retain it as part of his/her records to show that the certification met the objectives of this code.

Checklist LS16

CODE LS16: Gross Combination Mass Re-rating

Form No: LS16
(Y=Yes, N=No,)

Note: For informative content and guidance, refer to Appendix A.			
Modification Certificate Number :			
1	**Design**		
1.1	Insert LS16 Design Number……(the design)		
1.2	Is a comprehensive design package provided?	Y	N
1.3	Does the design package have a unique identification number?	Y	N
1.4	Does the design package clearly describe which make/model/variant/chassis series is covered?	Y	N
1.5	Does the design package include guidance on what to inspect and criteria to decide if the vehicle is in safe and serviceable condition for re-rating?	Y	N
1.6	Does the design package include a complete Evidence Package that forms the basis of this certification?	Y	N
1.7	Does the design package include comprehensive work instructions including work to be done, precautions to be taken, control of processes and tests to be conducted?	Y	N
1.8	Does the design package include a checklist for the modifier of the vehicle?	Y	N
1.9	Does the design package include a checklist for the certifier of the modified vehicle?	Y	N
1.10	Does the design package meet all the requirements of this code?	Y	N
1.11	Has the vehicle been modified exactly in accordance with the plans and specifications issued under the LS16 Design Number given above?	Y	N
1.12	Have the new ratings been communicated by the AP?	Y	N
2	**Suspension**		
2.1	Is the vehicle's suspension suitable for the re-rated GCM?	Y	N
3	**Chassis**		
3.1	Is the chassis frame suitable for the re-rated GCM?	Y	N
4	**Axles and Driveshafts**		
4.1	Are the axles and driveshafts suitable for the re-rated GCM?	Y	N
5	**Engine / Transmission / and mountings**		

5.1	Are the engine/transmission and mountings suitable for the re-rated GCM?	Y	N
6	**Braking System**		
6.1	Has a brake test been carried out on the modified vehicle to ensure compliance with ADR 31/… or 35/… for the design package?	Y	N
6.2	Is the vehicle trailer brake control system suitable for the re-rated GCM?	Y	N
6.3	Has the vehicle been tested to the requirements in SAE J2807?	Y	N
7	**Tyres and Rims**		
7.1	Does the Modification Plate record the correct tyre and rim sizes and load ratings for the modified vehicle?	Y	N
7.2	If a revised tyre placard is required, has it been fitted to the vehicle and a copy attached to this checklist? Indicate Y if a revised tyre placard is NOT relevant.	Y	N
7.3	Do the tyres and rims fitted conform to the modification plate and the tyre placard?	Y	N
7.4	Are load ratings of the tyres and rims adequate for the vehicle's re-rated GCM and the potential axle masses?	Y	N
8	**Electronic Stability Control System (if fitted)**		
8.1	Is it ensured that the ESC system is not disabled?	Y	N
8.2	Is it ensured that the ESC system is not made less effective due to modifications carried out for GCM re-rating?	Y	N
8.3	Trailer sway control systems unaffected?	Y	N
9	**Load Capacity Information**		
9.1	Is the Load Capacity label attached to the vehicle?	Y	N
9.2	Has the vehicle's handbook been amended, and a copy of the relevant modified content attached to this checklist?	Y	N
10	**Re-rating based on Manufacturer's Optional GCM (complete if applicable)**		
10.1	Does the re-rated GCM match an alternative option for the same make, model produced by the vehicle manufacturer?	Y	N
10.2	Are all components relevant to the GCM re-rating (brake, engine, transmission, suspension, chassis, tyres and rims etc) identical to the original vehicle manufacturer's alternative specification?	Y	N
11	**Re-rating based on fitting of an additional axle (complete if applicable)**		
11.1	If the re-rated GCM is more than 110% of the OEM rating, does the additional axle share load within its group? (Respond Y if the re-rated GVM is within 110% limit)	Y	N

Note: If the answer to any question is **N (No)** the design cannot be certified under LS16 code.

CERTIFICATION DETAILS																		
Make						**Model**						**Year(s) of Manufacture**						
VIN																		
Chassis Number (If applicable)																		
Brief Description of Modification/s																		
Vehicle Modified By (if applicable)																		
Certificate Number																		
Vehicle/design Certified By (*Print*) Name																		
Approved Person's Employer (If applicable)																		
Approved Person's Signature												**Date**						

Appendix A

This Appendix contains supplementary guidance to the content of this code.

1. General

1.1. The vehicle should be able to safely operate at the re-rated GCM. All affected components including the chassis frame, drivetrain, axles, suspension, brakes, steering, engine and transmission cooling systems, rims and tyres should be assessed individually to ensure that they can safely support the loads resulting from the re-rated GCM.

1.2. It should also be noted that durability and endurance of components may be shortened through wear and tear and be subject to earlier repair or replacement. The OEM standard servicing intervals may no longer be applicable. The AP should clarify this point to the modifier and the vehicle operator.

1.3. Increased GCM may affect the warranty provided by the OEM. It is the responsibility of the vehicle operator and the AP to consider any such effect on the warranty. Any effect this modification may have on the product warranty is outside the scope of this code. The AP should clarify this point to the modifier and the vehicle operator.

1.4. Increased GCM may affect the insurance cover provided by the vehicle insurer. It is the responsibility of the vehicle operator to consider any such effect on the insurance cover. Any effect tis modification may have on the insurance cover is outside the scope of this code. The AP should clarify this point to the modifier and the vehicle operator.

1.5. The provision of this modification code is centred around the application of engineering principles or data and must be performed by appropriately qualified persons. Please check with your local transport agency for requirements.

1.6. An engineering service is a service which is based on or requires the application of scientific and mathematical principles and data to the design, construction, maintenance and operation of man-made structures, machines, systems and processes.

1.7. The ADR applicability is according to the vehicle's category and date of manufacture. It is the responsibility of the certifying AP to refer to the appropriate ADRs applicable to the vehicle. The certification must include the vehicle date of manufacture in addition to the date of modification.

1.8. All components, including suspension, transmission, engine, brakes, engine and transmission cooling systems, tyre and rims should be validated as fit for purpose for the means of re-rating the GCM.

2. Chassis

2.1. Ensure the vehicle chassis has adequate strength for the revised GCM rating. This will include, but not limited to, items such as torsional strength of the chassis with the increased load carrying and towing capacity. Chassis torsional strength is highly dependent on the type of crossmembers used in the design. These should be assessed for validity of the modification.

2.2. When modifications such as fitting of additional or replacement axle(s) with higher load rating are carried out, the vehicle frame should be analysed to ensure that it has sufficient strength to support the re-rated GCM. This may be completed through the use of finite element analysis and a physical test, for example, full chassis twist with Factor of Safety of +3.

2.3. Ensure the tow coupling and the attachments are evaluated and rated accordingly for the revised GCM rating. VSB6 may be consulted for guidance.

3. Engine/transmission

3.1. The engine/transmission should be validated through the use of testing to ensure that these components are suitable for the re-rating of the GCM.

3.2. The engine and transmission mounting should be assessed for being suitable for the re-rating of the GCM. This may require replacement parts be fitted. If a replacement engine is fitted, with greater power and torque, the AP should ensure that the components are rated as capable of handling the torque loading.

4. Axle and suspension ratings

4.1. Axle loading at the re-rated GCM must be assessed to ensure that the axles are suitable for the increased loading and maximum torque, and that the vehicle is safe to operate on road.

4.2. Increased GCM and/or BTM will almost certainly result in increased gross mass on the tow vehicle and additional load on its systems such as axles, suspension and brakes. Suitability of the towing vehicle under the additional load should be considered.

4.3. Ensure that the GCM re-rating does not result in any axle, axle group or suspension rating being exceeded.

4.4. If a component manufacturer has published instructions to reduce the rating of a component for safety reasons, the reduced rating must apply.

4.5. All other suspension components should be assessed and suitably rated for the increased loads.

5. Tail Shaft

5.1. Changes associated with re-rated GCM may place additional load on a vehicle's tail shaft. For example:

- changes to vehicle's ride height which may alter the tail shaft and pinion angles.
- alterations to a vehicle's wheelbase may result in change in tail shaft length.
- changes to engine and/or transmissions may impose increased torsional loading on the tail shaft.

5.2. The vehicle’s tail shaft and bearing strength and its installation should be suitable to the vehicles re-rated GCM. Ensure that the maximum possible torque is within the capacity of the tail shaft and associated components.

6. Brakes

6.1. A GCM upgrade will potentially accommodate the towing of a larger trailer. The towing vehicle is required to have compatible controls for the trailer brakes to achieve suitable braking performance on the vehicle combination.

6.2. If a modified braking system is required, it must be designed, installed and certified appropriately in compliance with the applicable ADR's, vehicle standards and local regulations at the time of modification.

7. Tyres and rims

7.1. Tyres and rims may be re-rated under a GVM increase if in accordance with an applicable standard.

7.2. The sum of the load carrying capacities of the tyres fitted must be at least equal to the re-rated GCM. The same applies to the load carrying capacities of the rims.

7.3. If re-rated GCM and axle masses require a different tyre and rim combination, a new tyre placard must be fitted to indicate the revised tyre and rim specifications for the vehicle at the re-rated GCM.

8. Mechanical connections

If the towing mass is increased, and the tow vehicle is loaded to its re-rated GCM, the effect of the vertical load on tow ball (ball weight) must be considered when certifying the vehicle.