Queensland Code of Practice: Vehicle Modifications (QCOP)

Code S5 Gross Vehicle Mass Rating – Articulated Omnibus

July 2021

Queensland Government

CODE S5
Gross Vehicle Mass Rating – Articulated Omnibus

1. Scope

The following is a summary of the ratings which may be approved by officers authorised with modification code S5 – Articulated Omnibus Mass Rating.

Specific requirements for ratings approved under this Code are included later in this Section S5.

Refer also to Section S – Vehicle Rating of *Vehicle Standards Bulletin 6 (VSB-6): National Code of Practice Heavy Vehicle Modifications* for general technical guidelines for ratings performed under this Code.

1.1 Ratings permitted under Code S5

This Code is to be used to check that fully laden vehicles of the following type do not exceed the safe mass limits specified by the vehicle manufacturer or the Regulatory Authorities:

- Any articulated omnibus subject to a licence or permits issued in respect to the carriage of both passengers and goods.
- Any articulated omnibus which has been rebodied or has been altered in a manner which affects tare mass, seating layout, standee space, or luggage space.

1.2 Ratings not permitted under Code S5

Assessment of the following vehicles are not permitted under this code:

- Rigid Omnibus

2. Compliance with applicable vehicle standards

The vehicle must comply with all applicable Australian Design Rules or Regulations/Acts.

Outlined below in Table S5-1 are areas of the vehicle which may require certification, testing and/or data to show that the vehicle components' ratings will not be exceeded at the vehicle mass rating.

Table S5-1 Summary of items, if modified or altered, may detrimentally affect compliance with applicable ADRs

DETAIL	REQUIREMENT
Brakes	ADR 35, 35A, 35/00 VSB-6 - Section G
Suspension	Manufacturer's rating VSB-6 - Section F
Steering	VSB-6 - Section E
Chassis	Manufacturer's rating VSB-6 - Section H
Engine	ADR 30, 30/00, 36, 36A, 36/00 VSB-6 - Section A
Transmission	VSB-6 - Section B
Tail shaft	VSB-6 - Section C

Axles	Manufacturer's rating VSB-6 - Section D VSB-6 - Section E
Tyres	Manufacturer's rating ADR 24/..

If any of the areas listed above are affected by modifications made to the vehicle in order to achieve the GVM rating they must comply with the prescribed standards and where necessary must be approved by an authorised officer holding the appropriate modification code.

To determine the ADRs that apply to the vehicle in question, the Applicability Tables for individual vehicle categories may be referenced on the Department of Infrastructure and Transport *RVCS* website at the following address and under the section titled *ADR Applicability tables*:

http://rvcs.dotars.gov.au/

The ADRs apply according to the vehicle's category and date of manufacture. It is the responsibility of the signatory to refer to the appropriate ADR applicable to the vehicle.

3. Specific requirements

3.1 General

All components must be used within manufacturer's rated capacities. In particular authorised officers must check suspension, axle, drivetrain, chassis, brakes, steering, wheel and tyre capacities.

3.2 Tyres, rims and wheels

The sum of the load carrying capacities recommended for all the tyres and rims with which the vehicle is equipped shall be not less than the GVM.

The load carrying capacity of any tyre or rim must not be exceeded with the vehicle at the revised GVM rating.

For a vehicle manufactured to comply with ADR 24/.. the tyres and rims must be selected and must comply in all respects with the requirements of that ADR at the revised GVM rating.

In the case of vehicles fitted with a 'tyre placard', this placard must indicate the correct tyre specifications for the vehicle at the revised GVM rating.

3.3 Carrying capacity

The vehicle's passenger and luggage capacity and distribution must be assessed to ensure that, in the fully laden condition, the vehicle component's mass ratings are not exceeded.

Checklist S5

Code S5: Gross Vehicle Mass Rating – Articulated Omnibus

Form No: S5

(N/A= Not Applicable, Y=Yes, N=No)

Procedure

This form is to be completed prior to the Department of Transport and Main Roads inspection of the vehicle. The vehicle details and declaration forms (at the end of Part F and Part G) should be presented with the vehicle at the time of inspection at the Department of Transport and Main Roads Inspection Centre.

APPLICATION CHART

This form is divided into the following parts

A	-	CASES WHERE PARTS OF FORM NEED TO BE COMPLETED
B	-	UNLADEN (TARE) MASS
C	-	MASS OF SEATED PASSENGERS IN REAR SECTION
D	-	MASS OF STANDING PASSENGERS IN REAR SECTION
E	-	MASS OF SEATED PASSENGERS IN FRONT SECTION
F		MASS OF STANDING PASSENGERS IN FRONT SECTION
G	-	SUMMARY OF MAXIMUM LADEN MASS
H	-	REGISTRATION OF DETAILS AND DECLARATIONS

The following chart gives some examples of the more common types of application and indicates those sections which need to be completed. If a vehicle is intended to be used for more than one purpose, each relevant section should be completed. Section G provides for a summary of calculations from each completed section of a route service and a non-route service application.

APPLICATION CHART	A	B	C	D	E	F	G	H
Previously approved (lapsed registration)	✓	✓						✓
Identical to assessed vehicle	✓	✓						✓
Route service with standees and no luggage		✓	✓	✓	✓	✓	✓	✓

Complete all applicable parts

NOTES ON PARTS C, D, E AND F:-

a) Declarations are required on page 27 by the Authorised Officer who complied the form and by the vehicle owner

b) In these calculations, measurements shall be stated to the following orders of accuracy:

Mass to the nearest kilogram

Length to the nearest 5mm

Volume to the nearest litre.

c) “Rear axle line” means the point from which rear overhang is measured.

d) “Pivot line” means the point about which the vehicle articulates in the horizontal plane

Part A – Previously Approved Models or Vehicles

PREVIOUS DETERMINATION OF LADEN MASS

I, the owner of the submitted vehicle, declare that the vehicle has not been modified in any way that would affect the vehicle's laden weight since submission of the following "Articulated Omnibus Mass Rating" form.

Serial Number of Previous Form: …….

Signature of Owner: ……..

Date: ……..

COMPLETE PARTS B AND H ONLY

VEHICLE IDENTICAL TO PREVIOUSLY APPROVED VEHICLE

I, the owner of the submitted vehicle, declare that the vehicle is of identical construction to the vehicle described in the following "Assessment of Gross Laden Mass of a Licenced Omnibus or Vehicle" form.

Serial Number of Previous Form: …….

Signature of Owner: ……..

Date: ……..

COMPLETE PARTS B AND H ONLY

Part B – Unladen Mass

For rating purposes, the unladen mass or tare mass of the vehicle is its actual mass with all permanent equipment fitted, with all oil and water tanks filled and approximately 10 litres of fuel but with no crew or passengers aboard.

The bus must be weighed at a registered public weighbridge to determine the actual loads on the front axle and rear axle (or axle groups).

ATTACH WEIGHBRIDGE TICKET HERE

VEHICLE MANUFACTURERS SPECIFICATIONS TO BE ATTACHED

Details to include make, model, year of manufacture,
front and rear axle manufacturers and specifications.

WRITE AXLE LOADS IN BOXES BELOW FROM WEIGHBRIDGE TICKET OR AS ESTIMATED

Front Axle Tare Mass (FAx) = ……..…… kg

Drive Axle Tare Mass (DAx) = ……..…… kg

Rear Axle Tare Mass (RAx) = …… kg

Aggregate Weight = …… kg

For the purposes of determining laden mass of the vehicle, the mass of two thirds of the fuel tank capacity is included.

Capacity of fuel tank	(Ff) = ……..l
Volume of fuel when weighed	(Fw) = ……....l
Distance from front axle to drive axle	(FWb) = ……m
Distance from drive axle line to centre of fuel tank	(Df) = ……m
Density of fuel:	Diesel = 0.85kg/l
Mass of Fuel Fm=0.66 x Ff x 0.85	=……kg

Additional front axle load due to fuel is given by:

FFu = Fm x Df / FWb

FFu = …… kg

Additional rear axle load due to fuel is given by:

Dfu = Fm - FFu

Dfu = …… kg

ADD THE TARE MASS (Page 8) TO THE FUEL MASS

TO OBTAIN TOTAL UNLADEN MASS

FAx plus FFu		DAx plus DFu
FRONT ……kg FUn	UNLADEN MASS	DRIVE ……kg DUn

Part C – Mass of Seated Passengers in the Rear Section

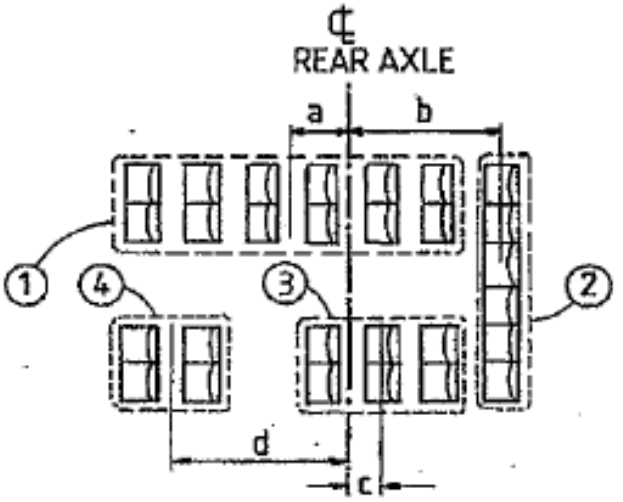
Draw a plan of the seating arrangements in the rear section of the vehicle in the space below. Mark in the position of the rear axle line and the centreline of the pivot at the point of articulation. This distance between the rear axle line and the pivot is RWb.

RWb =

Number each seat, row or group of seats. Enter at the top of the table overleaf, the distance between the point of articulation and rear axle, and then the number of seating positions for each seat, row or group.

Enter the longitudinal distance measured from the rear axle line to the seating reference point for each seat (i.e.. on the centre of the seating position and 150mm towards the front of the seat from the intersection of the seat cushions and seat back). **Note**: that only one entry is required for each transverse row of seats if they are the same distance from the rear axle line. If a group of transverse seats are evenly distributed along the bus, only one entry is required, the longitudinal measurement being the average of the distance to the foremost seating reference point and to the rearmost seating reference point of the group. Similarly, longitudinal seats need only one entry, the longitudinal measurement being to the centre of the seat. See following example of seat grouping.

EG.



Determine the seated loading factor separately for those seats in front of and those behind the rear axle line, by multiplying the number of seating positions by the longitudinal distance from the rear axle line and adding to get a sub-total.

Subtract the sub-total for the rear seats from that for the front seats.

If any seating reference point is above the rear axle line, that seat should be considered in front of the rear axle line, but the distance and load factor will be zero.

AXLE LOADS DUE TO SEATED PASSENGERS Horizontal pivot to rear axle, RWb = ……..metres			
(i) Seating Position	(ii) Number of Occupants	(iii) Distance from Rear Axle (m)	(iv) Load Factor (ii) x (iii)
Seating Reference Point in front of rear axle line			
1. Driver	1		
Sub-Total			A=
Seating Reference Point behind rear axle line			
Sub-Total			B=
Total Occupants		Seated Loading Factor A – B =	

The pivot load due to seated passengers is based on an average passenger mass of 65kg and is calculated below:

$$\text{Pivot Load (Seating)} = \frac{\text{Seated Loading Factor x 65kg}}{\text{RWb}}$$

$$= \frac{\ldots\ldots \text{ x } 65}{\ldots\ldots\ldots}$$

PSe = ……kg

The rear axle load due to seated passengers is the total person mass minus the pivot load.

$$\text{Rear Axle Load (Seating)} = (\text{Total Occupants x } 65\text{kg}) - \text{PSe}$$

$$= (\ldots\ldots\ldots \text{ x } 65 - \ldots\ldots\ldots)$$

RSe = ……kg

WRITE PIVOT AND REAR AXLE LOADS DUE TO SEATED PASSENGERS HERE

PIVOT	SEATED	REAR
……kg		……kg
PSe	MASS	RSe

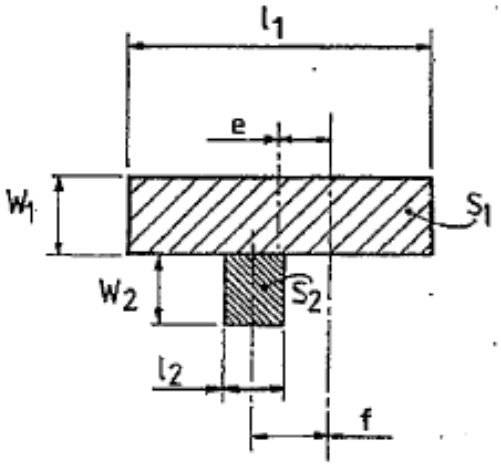
Part D – Mass of Standing Passengers in the Rear Section

This section is to be completed only if application is being made for assignment of a standing capacity.

Draw a plan of the standing spaces in the rear section in the spaces below, excluding 200mm allowance in front of each seat for foot space for seated passengers. Mark each space that is to be used by standing passengers in rectangular portions. Mark in the position of the rear axle line.

Measure the length (L) and width (W) and calculate the area of each rectangular standing space. The table on the next page can be used for calculations. Measure the distance from the rear axle line to the centre of each standing space.

For example:



Calculate the maximum standing capacity by summing the total standing area and multiplying by 6.25 persons/m^2. Take the nearest whole number less than this value for maximum standing capacity. The nominated capacity must not be more than this.

Calculate the effective passenger density by dividing nominated capacity by total standing area.

(i) Standing Space	(ii) Length, l (m)	(iii) Width, w (m)	(iv) Area (m^2) (ii)x(iii)	(v) (iv)xED	(vi) Distance from Rear Axle (negative if behind rear axle)	(vii) Standing Loading Factor (v)x(vi)
		Total Standing Area			Standing Loading Factor	
						(sum column vii)

Total Standing Area (TSA) = …….. m^2

Maximum Standing Capacity = TSA x6.25 = ……. persons

Nominated Standing Capacity (NSC) = …… persons

Effective Density (ED) = NSC/TSA = ……. / ……

ED = …….. persons/ m^2

Standing Loading Factor = …….

The axle loads due to standing passengers are based on an average passenger mass of 65kg and are calculated below:

Pivot Load (standing) PSt = $\frac{\text{Standing Loading Factor x 65kg}}{\text{RWb}}$

= $\frac{\text{…… x 65}}{\text{……}}$

PSt = ……kg

Rear Axle Load (standing) RSt = (Nominated Standing capacity x 65) - PSt

= (……. x 65 - …….)

RSt = ……kg

WRITE PIVOT AND REAR AXLE LOADS DUE TO STANDING PASSENGERS HERE

PIVOT	STANDING	REAR
……kg		……kg
PSt	MASS	RSt

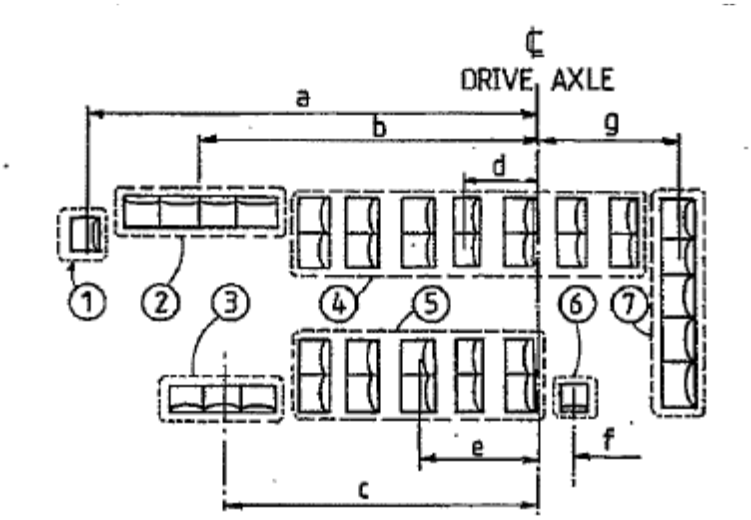
Part E – Mass of Seated Passengers in the Front Section

Draw a plan of the seating arrangements in the space below, including the driver's seat. Mark in the position of the rear axle line.

Number each seat, row or group of seats (include the driver's seat as number one). Enter at the top of the table overleaf, the wheelbase of the vehicle, and then the number of seating positions for each seat, row or group.

Enter the longitudinal distance measured from one rear axle line to the seating reference point for each seat (ie. On the centre of the seating position and 150mm towards the front of the seat from the intersection of the seat cushions and seat back). **Note**: that only one entry is required for each transverse row of seats if they are the same distance from the rear axle line. If a group of transverse seats are evenly distributed along the bus, only one entry is required, the longitudinal measurement being the average of the distance to the foremost seating reference point and to the rearmost seating reference point of the group. Similarly, longitudinal seats need only one entry, the longitudinal measurement being to the centre of the seat. See following example of seat grouping.

EG.



Determine the seated loading factor separately for those seats in front of and those behind the drive axle line, by multiplying the number of seating positions by the longitudinal distance from the drive axle line and adding to get a sub-total.

Subtract the sub-total for the seats behind the drive axle from that for the seats in front of the drive axle.

If any seating reference point is above the drive axle line, that seat should be considered in front of the drive axle line, but the distance and load factor will be zero.

AXLE LOADS DUE TO SEATED PASSENGERS IN THE FRONT SECTION Front axle to Drive axle, FWb = ……..metres			
(i) Seating Position	(ii) Number of Occupants	(iii) Distance from Drive Axle (m)	(iv) Load Factor (ii) x (iii)
Seating Reference Point in front of drive axle line			
1. Driver	1		
Sub-Total			A=
Seating Reference Point behind drive axle line			
Sub-Total			B=
Total Occupants		Seated Loading Factor A – B =	

The front axle load due to seated passengers is based on an average passenger mass of 65kg and is calculated below:

Front Axle Load (Seating) = $\frac{\text{Seated Loading Factor x 65kg}}{\text{Wheelbase}}$

= $\frac{\text{…… x 65}}{\text{……}}$

FSe = ……kg

The drive axle load due to seated passengers is the total person mass minus the front axle load.

Drive Axle Load (Seating) = (Total Occupants x 65kg) - FSe

= (…… x 65 - …….)

DSe = ……kg

WRITE FRONT AND DRIVE AXLE LOADS DUE TO SEATED PASSENGERS HERE

FRONT	SEATED	DRIVE
……kg		……kg
FSe	MASS	DSe

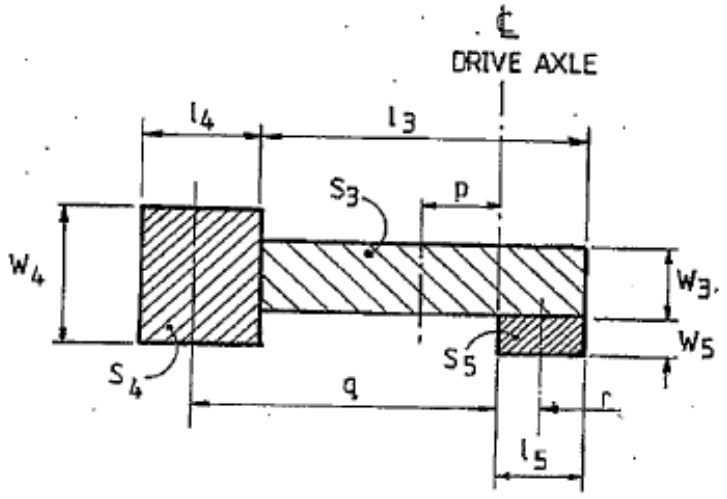
Part F – Mass of Standing Passengers in Front Section

This section is to be completed only if application is being made for assignment of a standing capacity.

Draw a plan of the standing spaces in the front section in the spaces below, excluding 200mm allowance in front of each seat for foot space for seated passengers. Mark each space that is to be used by standing passengers in rectangular portions. Mark in the position of the drive axle line.

Measure the length (L) and width (W) and calculate the area of each rectangular standing space. The table on the next page can be used for calculations. Measure the distance from the rear axle line to the centre of each standing space.

For example:



Calculate the maximum standing capacity in the front section by summing the total standing area and multiplying by 6.25 persons/m^2. Take the nearest whole number less than this value for maximum standing capacity. The nominated capacity must not be more than this.

Calculate the effective passenger density by dividing nominated capacity by total standing area.

(i) Standing Space	(ii) Length, l (m)	(iii) Width, w (m)	(iv) Area (m^2) (ii)x(iii)	(v) (iv)xED	(vi) Distance from Rear Axle (negative if behind rear axle)	(vii) Standing Loading Factor (v)x(vi)
		Total Area			Standing Loading Factor	

(sum column vii)

Total Standing Area (TSA) = …….. m^2

Maximum Standing Capacity = TSA x6.25 = …… persons

Nominated Standing Capacity (NSC) = …… persons

Effective Density (ED) = NSC/TSA = ……. / ……

ED = …….. persons/ m^2

Standing Loading Factor = ……

The axle loads due to standing passengers are based on an average passenger mass of 65kg and are calculated below:

Front Axle Load (standing) FST = $\frac{\text{Standing Loading Factor x 65kg}}{\text{FWb}}$

= $\frac{\text{…… x 65}}{\text{……}}$

FSt = ……kg

Drive Axle Load (standing) DSt = (Nominated Standing capacity x 65) - FSt

= (……. x 65 - …….)

DSt = ……kg

WRITE FRONT AND DRIVE AXLE LOADS DUE TO STANDING PASSENGERS HERE

FRONT	STANDING	DRIVE
……kg		……kg
FSt	MASS	DSt

Part G – Summary of Maximum Laden Mass

Load on pivot due to passengers	P = PSe + PSt	= ..... + ... P = ……kg
Load on rear axle due to passengers	R = RSe + RSt	= ..... + ... R = ……..……kg
Distance between front and drive axles		FWb = ……m L = ……..……m
Negative load on front axle due to load on pivot	Q = (L x P) / FWb	= (……. x …….) / ……. Q = ……kg
Total mass due to passengers on the front axle	F = FSe + FSt + Q	= ……. + ……. + ……. F = ……kg
Load on drive axle due to load on pivot	N = P- Q	= ..... - ..... N = ……kg
Total mass due to passengers on drive axle	D = DSe + DSt + N	= ……. + ……. + ……. D = ……kg

	Front Axle Group	Drive Axle Group	Rear Axle Group	TOTAL
Unladen Mass	FUn=	DUn=	RUn=	=
Mass due to passengers	F=	D=	R=	=
(A) Gross Laden Mass				
(B) Chassis manufacturers load limits				
Tyre Designation				
Tyre Mass Rating x No of Tyres/Axle				
(C) Total Tyre Load Limit				
(D) DTMR Limits				

If the GROSS LADEN MASS (A) is less than or equal to the LIMITS B, C and D, the vehicle is suitable for registration for route service.

Seated Capacity: Standing Capacity: …….
……

NOTE: *DTMR is the Department of Transport and Main Roads*

Note: If the Gross Laden Mass EXCEEDS any of these limits, the bus or coach will not be approved and the passenger or luggage compartment must be reviewed.

Note: Declarations by the person who completed the calculations and the owner are required on page 27.

This page has been left blank for any additional calculations

Part H (continued) – Declarations

DECLARATION BY COMPLIER*			
Authorised Officer			
MA Number			
I am the authorised officer who completed the calculations of laden mass and declare that the information in this form is true and correct.			
Signature		**Date**	
Company/Business		**Telephone**	

DECLARATION BY VEHICLE OWNER*			
Vehicle Owner			
Owner's Address			
Name of Authorised Officer			
As the owner of the vehicle described in this form, I declare that the calculations have been completed by the authorised officer mentioned above.			
Signature		**Date**	
Company/Business		**Telephone**	

* Declarations by the Authorised Officer and owner must be completed before presentation of the vehicle for inspection at the Department of Transport and Main Roads Inspection Centre.

Part H – Vehicle Details and Declarations

Vehicle Owner's Details					
Name					
Company / Business					
Address					
Vehicle Information					
Make		Model		Date of Manufacture	
VIN					
Chassis No *(If applicable)*		Engine Number			
Engine Capacity		Number of Cylinders		Fuel Type	
Body Type		Body Colour			
Overall Body Length		Front Overhang		Rear Overhang	
Axle Specifications					
Front Axle Make		Capacity			
Drive Axle Make		Capacity			
Rear Axle Make		Capacity			
Tag/Tandem Axle Make *(if applicable)*		Capacity			
Only for previously registered vehicles					
Registration		State/Territory			
Name and Address of Most Recent Owner					

The vehicle described in this form has been assessed for axle load compliance with the following passenger capacities					
Motor Omnibus (Route Service)					
Seated		**Standing**		**Luggage**	**Yes / No**
In respect of axle load compliance, this vehicle is approved (subject to the attachment of a weighbridge certificate to the bottom of page 8, indicating front, drive and rear tare mass not exceeding that indicated at the bottom of page 8).					
Authorised officer who examined and approved vehicle					
Name					
Company / Business					
MA Number					
Signature		**Date**			