

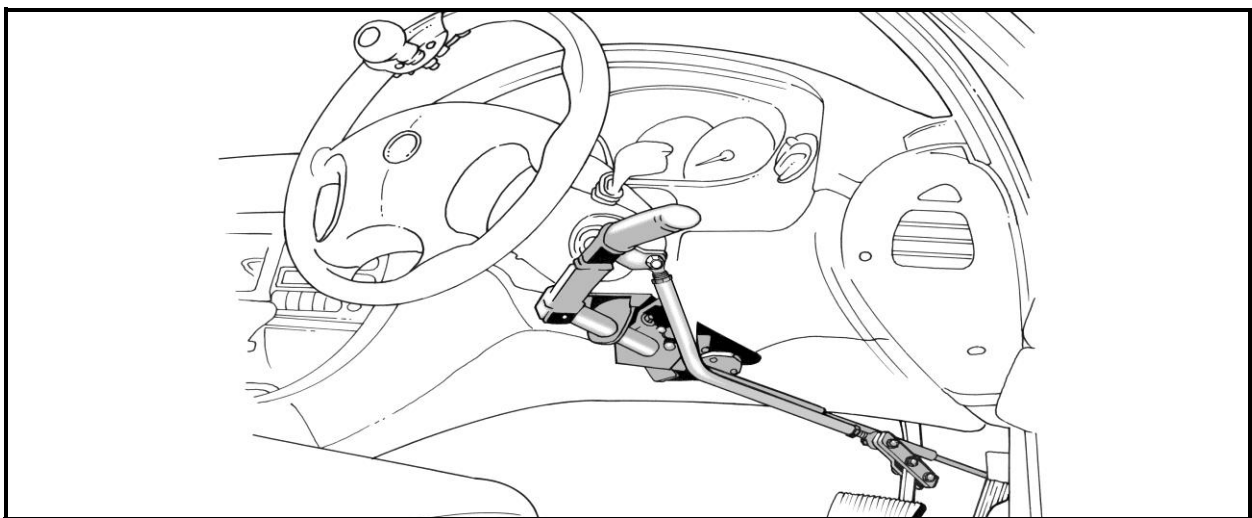
Low Volume Vehicle Technical Association Incorporated

Low Volume Vehicle Standard

45-30(05)

(Disability Adaptive Control Systems)

This Low Volume Vehicle Standard corresponds with: Land Transport Rule: Light-vehicle Brakes 2002 (Rule 32014)



5th Amendment – effective from: 25 October 2016

Signed in accordance with clause 1.5 of the Low Volume Vehicle Code, on.....by:

on behalf of the New Zealand Transport Agency:	on behalf on the Low Volume Vehicle Technical Association(Inc):
--	---

LVV Standard 45-30 Amendment Record:

No:	Detail of amendments:	Version:	Issue date:	Effect date:
1	Initial issue – original version	45-30(00)	1 May 2004	1 May 2004
2	1 st Amendment	45-30(01)	1 September 2004	1 September 2004
3	2 nd Amendment	45-30(02)	1 October 2005	1 October 2005
4	3 rd Amendment	45-30(03)	1 May 2010	1 May 2010
5	4 th Amendment	45-30(04)	1 July 2016	1 July 2016
6	5 th Amendment	45-30(05)	25 October 2016	25 October 2016

Note that highlighted text shows amendments that have been made subsequent to the document’s previous issue, and a grey vertical stroke to the left of the text denotes information that is of a technical (rather than a formatting) nature.

Overview

Background

The Low Volume Vehicle Technical Association Incorporated (LVVTA) represents ten specialist automotive groups who are dedicated to ensuring that vehicles, when scratch-built or modified, meet the highest practicable safety standards. The information in these standards has stemmed from work undertaken by LVVTA founding member organisations that commenced prior to 1990 and has been progressively developed as an integral part of NZ Government safety rules and regulations by agreement and in consultation with the New Zealand Transport Agency. As a result, the considerable experience in applied safety engineering built up by LVVTA and the specialist automotive groups over the past twenty years can be of benefit to members of the NZ public who also wish to build or modify light motor vehicles.

Availability of low volume vehicle standards

Low volume vehicle standards are developed by the LVVTA, in consultation with the New Zealand Transport Agency, and are printed and distributed by the LVVTA. The standards are available to the public free of charge from the LVVTA website; www.lvvta.org.nz

Further information on the availability of the low volume vehicle standards may be obtained by contacting the LVVTA at info@lvvta.org.nz.

Copyright

The content of this document remains the property of the Low Volume Vehicle Technical Association (Inc.), and no part of it may be reproduced without the prior written consent of the copyright holder.

Associated information

Other associated information relevant to the subject matter contained in this low volume vehicle standard, which in the interest of comprehensiveness, should be read in conjunction with this standard, includes:

Document	Page #/Section/Chapter
• LVVTA News May-July 2015 2015 Issue 52	Page 8 Disability Hand Control Installation
• LVV Standard 175-00 (Seatbelt Anchorages)	Relevant requirements for new seatbelt anchorages
• LVV Standard 35-40 (Braking Systems)	Relevant requirements for any braking modifications
•	
•	

Note that all documents referred to in this table, with the exception of the NZ Car Construction Manual, can be accessed from www.lvvta.org.nz free of charge. For information on obtaining the NZ Car Construction Manual, contact info@lvvta.org.nz

Note also that paper copies of documents can become out of date and as such should not be relied upon, therefore LVVTA advises users of this standard to check to ensure that the Associated Information listed here is current, by going to www.lvvta.org.nz/standards.html

Contents

Purpose of this standard		Page 5
Section 1	Scope and application of this standard	5
1.1	Scope of this standard	5
1.2	Application of this standard	5
Section 2	Technical requirements of this standard	6
2.1	General safety requirements	6
2.2	Design requirements for adaptive hand control systems	6
	▪ General hand control system design	6
	▪ Hand control support bar design	7
	▪ Hand control lever design	7
	▪ Hand control system pivot pins	7
	▪ Hand control brake rod design	8
	▪ Hand control systems manufactured outside New Zealand	9
2.3	Assembly requirements for adaptive hand control systems	9
	▪ Welding within the assembly of hand control systems	9
	▪ General assembly requirements of hand control systems	10
	▪ Fasteners used within the assembly of hand control systems	11
2.4	Attachment requirements for adaptive hand control systems	11
	▪ Positioning for hand control system attachment	11
	▪ Hand control system attachment	11
	▪ Brake pedal attachment	11
	▪ Accelerator attachment	12
	▪ Effects on steering column adjustment systems	12
	▪ Effects on vehicle occupant protection systems	12
	▪ Welding within the attachment of a hand control system	13
	▪ Fasteners used to attach a hand control system	13
2.5	Operation requirements for adaptive hand control systems	14
	▪ Hand control system operation	14
	▪ Brake and accelerator release operation	14
	▪ Hand control lever operation	14
	▪ Hand control operation geometry	15

	▪ Pedal operation	15
	▪ Interior impact requirements	16
	▪ Other requirements	16
2.6	Road-test performance requirements	16
	▪ General performance requirements	16
	▪ Service brake performance requirements	17
2.7	Adaptive foot control system requirements	17
Section 3	Exclusions to this standard	18
<hr/>		
3.1	Brake pedal attachment exclusion	18
3.2	LVVTA ‘Component Approval’ exclusion	19
Section 4	Vehicles not required to be certified to this standard	19
<hr/>		
4.1	Vehicles that pre-date legal requirements	19
4.2	Modifications that do not require certification	20
Section 5	Terms and definitions within this standard	22
<hr/>		
Appendix A	LVVTA-recognised Disability Adaptive Control System Manufacturers & Suppliers	25

Disability Adaptive Control Systems (45-30[05])

Purpose of this standard

The purpose of this low volume vehicle standard is to specify requirements for the safe design, construction, and attachment of mechanical-type manually-operated disability adaptive control systems, for people who are prevented by a physical disability, from driving a motor vehicle using conventional controls, in particular those primary controls that operate the brake and accelerator systems. This standard does not apply to electro-mechanical or hydraulic control systems, **nor does the standard directly involve an Occupational Therapist with experience in driver training.**

Section 1 Scope and application of this standard

1.1 Scope of this standard

- 1.1(1) This low volume vehicle standard applies to all light vehicles other than those specified in 1.1(2), which are fitted with a disability adaptive control system on or after 1 January 1992.
- 1.1(2) This low volume vehicle standard does not apply to:
- (a) powered bicycles of Class AB; or
 - (b) motorcycles of Class LA, LB, LC, LD, or LE; or
 - (c) those vehicles specified in *section 4*.

1.2 Application of this standard

- 1.2(1) A light vehicle that is fitted with a disability adaptive control system as in 1.1(1), becomes a low volume vehicle, and must:
- (a) be certified in accordance with the procedures specified in *chapter 2* of the *Low Volume Vehicle Code*; and
 - (b) unless *section 3* applies, comply with all applicable technical requirements contained in *section 2* of this standard.

NOTE 1: Where a vehicle is required to be certified to the *Low Volume Vehicle Code*, but the fitment of the adaptive control system precedes the date specified in 1.2(1), a low volume vehicle certifier must ensure that the vehicle meets the general safety requirements contained in 2.1 of this standard, and should use the applicable technical requirements of *section 2* of this standard as a guideline upon which to base his or her judgements on the safety of the vehicle.

NOTE 2: A vehicle fitted with an adaptive control system must be certified to the applicable version of this low volume vehicle standard that was in force at the time of the modification.

Section 2 **Technical requirements of this standard**

2.1 **General safety requirements**

- 2.1(1) A low volume vehicle must:
- (a) be designed and constructed using materials and components that are fit for their purpose; and
 - (b) be safe to be operated on the road.

NOTE: The requirements specified in 2.1(1) are selected from 2.2.1 of Part 2 of the *Low Volume Vehicle Code*, reproduced here in the interest of convenience, and are over-riding requirements which make it clear that, regardless of what technical requirements are or are not in place, every vehicle certified to the *Low Volume Vehicle Code* must be fit for its purpose, and must be safe.

2.2 **Design requirements for adaptive hand control systems**

General hand control system design

- 2.2(1) A hand control system fitted to a low volume vehicle must be designed and constructed in such a way as to allow the continued use of the original automotive controls by a driver without a disability.

NOTE: Where, in unusual circumstances, 2.2(1) cannot be practicably complied with due to the type of modification required because of the nature of the driver's disability, clear instructions must be attached in a prominent location in clear view of the driver that will inform a normally-abled driver how to safely operate the vehicle.

- 2.2(2) A hand control system fitted to a low volume vehicle may be either of a:
- (a) push-pull design; or
 - (b) radial-control design; or
 - (c) twist-grip design in the case where a person has become familiar with such a system over a long period of time, and it is considered necessary for that person to continue operating such a system.

NOTE: Where none of the hand control system types specified in 2.2(2) can be safely designed and installed so as to meet the individual needs of the disabled driver, an alternative system to those specified in 2.2(2) may be used, provided that the manufacturer or installer is one of the LVVTA-recognised Disability Adaptive Control System Manufacturers and Suppliers listed in *Appendix A*.

- 2.2(3) A hand control system fitted to a low volume vehicle must, in order to compensate for a driver's lack of arm strength comparative to leg strength, be designed in such a way as to apply a mechanical advantage to the hand control brake rod, achieved by the positioning of the hand control brake rod on the hand control lever, in order to provide an advantage ratio that is sufficient to enable the driver to apply the necessary amount of force to achieve the maximum effectiveness of the vehicle's braking system.

NOTE: The advantage ratio necessary to enable a driver to apply sufficient force to a vehicle's braking system will vary from vehicle to vehicle, typically with less effort required on modern vehicles than old ones, just as strengths differ from person to person.

- 2.2(4) A hand control system fitted to a low volume vehicle must be designed and constructed in such a way, and using such materials, that the system is able to withstand all loads that it may be subjected to over the life of the vehicle to which it is fitted, during all normal and emergency operation without distorting or fatiguing to an extent that a failure of any part of the hand control system could occur.

Hand control support bar design

- 2.2(5) The support bar of a hand control system fitted to a low volume vehicle must be manufactured from a material that provides strength and rigidity equal to or greater than 25 mm x 10 mm x 3 mm rectangular hollow section mild steel.

Hand control lever design

- 2.2(6) The lever of a hand control system fitted to a low volume vehicle must be manufactured from a material that provides strength and rigidity equal to or greater than either:

- (a) 12 mm diameter bright commercial round steel bar; or
- (b) 20 mm x 6 mm bright commercial flat steel bar.

- 2.2(7) The lever of a hand control system fitted to a low volume vehicle must exhibit no visible deflection when, with the brake pedal blocked from being depressed, an 18 kg load is applied at the outer end of the lever.

Hand control system pivot pins

- 2.2(8) The main pivot pin that attaches the hand control lever to the hand control support bar, on a hand control system fitted to a low volume vehicle, must be of a:

- (a) tensile strength equal to or greater than grade 8.8 metric [grade-5 imperial]; and
- (b) diameter that is not less than:

- (i) in the case of a main pivot joint of a clevis fork design with the pivot pin in double-shear, 6 mm [1/4 inch]; or
- (ii) in the case of all other designs, 8 mm [5/16 inch].

2.2(9) The main pivot pin that attaches the hand control lever to the hand control support bar, on a hand control system fitted to a low volume vehicle, must:

- (a) be attached in such a way as to be unable to:
 - (i) inhibit or restrict the free operation of the hand control system by clamping or over-tightening; or
 - (ii) become loose through use or vibration;

and

- (b) in the case of a bolt being used as a main pivot pin, have no threaded section of the bolt under the shear load applied by the hand control system.

Hand control brake rod design

2.2(10) The brake rod of a hand control system fitted to a low volume vehicle must be manufactured from a material that provides strength equal to or greater than 10 mm [3/8 inch] diameter solid high-tensile steel or stainless steel.

NOTE 1: 'Bright commercial round' or 'BCR' is a commonly-used term for a material that features the normal properties of solid high-tensile steel, as required in 2.2(10).

NOTE 2: In the unusual case of a hand control rod exceeding 500 mm in length, the rod diameter must be increased from equal or greater than 10 mm (3/8 inch) to equal or greater than 12 mm (1/2 inch).

NOTE 3: A hand control brake rod must always be attached to the brake pedal as closely as possible to 90 degrees to the brake pedal pivot, in order to ensure against misalignment or incorrect loading of the pedal and pedal pivot assembly.

2.2(11) A brake rod in a hand control system fitted to a low volume vehicle, that incorporates a bend or change in shape must:

- (a) incorporate no more than one bend; and
- (b) be bent in such a way as to change the direction of the rod by no more than 30 degrees; and
- (c) be bent in such a way as to not weaken the rod's resistance to flexing under all normal and emergency braking loads.

NOTE: Where a brake rod incorporates a bend or change in shape of more than 20 degrees, the rod diameter must be increased from equal or greater than 10 mm (3/8 inch) to equal or greater than 12 mm (1/2 inch).

- 2.2(12) The brake rod of a hand control system fitted to a low volume vehicle must exhibit no visible deflection when, with the brake pedal blocked from being depressed, an 18 kg load is applied at the outer end of the hand control lever.

Hand control systems manufactured outside New Zealand

- 2.2(13) A hand control system fitted to a low volume vehicle that was manufactured outside of New Zealand must either:
- (a) comply with the requirements of this low volume vehicle standard; or
 - (b) alternatively:
 - (i) comply with a recognised international standard for adaptive hand control systems; and
 - (ii) be fitted in accordance with the hand control system manufacturer's instructions.

NOTE: An LVV Certifier must not approve an overseas-manufactured hand control system, even if it meets the requirements specified in 2.2(13)(b), if, in the opinion of the LVV Certifier good practice and sound engineering principles have not been followed in the system's manufacture and installation.

2.3 Assembly requirements for adaptive hand control systems

Welding within the assembly of hand control systems

- 2.3(1) No welding may be carried out to any part of a hand control system fitted to a low volume vehicle, that is relied upon for the safe operation of the system, other than for:
- (a) the construction of a hand control support bar; or
 - (b) the attachment of a hand control brake rod attachment bracket to a hand control lever.
- 2.3(2) Welding of a hand control support bar, or a hand control brake rod attachment bracket to a hand control lever, on a hand control system fitted to a low volume vehicle, may only be carried out by a person who either:
- (a) holds a relevant current qualification or trade certification for the type of welding being undertaken; or

- (b) has demonstrated to a low volume vehicle certifier, a satisfactory level of competence in the method of welding being undertaken; or
- (c) is a hand control system manufacturer or supplier recognised by the Low Volume Vehicle Technical Association (Inc), that manufactures or supplies the hand control system in a complete and finished form.

NOTE: A list of disability adaptive control system manufacturers recognised by the Low Volume Vehicle Technical Association (Inc), as specified in 2.3(2)(c), is listed in *Appendix A 'LVVTA-recognised Disability Adaptive Control System Manufacturers and Suppliers'*.

2.3(3) Welding of a hand control brake rod attachment bracket to a hand control lever, on a hand control system fitted to a low volume vehicle, must, unless the welding has been carried out by a person specified in 2.3(2)(c), also:

- (a) be non-destructively tested, using a method appropriate for the examination of fatigue cracking or weld penetration, by a person holding not less than a current NDT Level 2 qualification in CBIP, ASNT, AINDT, or other equivalent certification; and
- (b) be accompanied by a report supplied by the person who undertakes the non-destructive testing to verify that the requirements of 2.3(3)(a) have been met, and that the component is considered by the tester to be fit for its purpose.

General assembly requirements of hand control systems

2.3(4) All components within a hand control system fitted to a low volume vehicle, must:

- (a) be protected against corrosion by a permanent anti-corrosive protection, such as paint, or in the case of a component manufactured from a mild steel or high-tensile steel material with a tensile strength of grade-8.8 metric (grade-5 imperial) or less, electro-plating; and
- (b) in the case of those components that are susceptible to wear, be positioned and attached in such a way as to be easily inspected and replaced; and
- (c) have all corners and edges provided with as great a radius as can be practicably achieved.

NOTE: Any component within a hand control system upon which the vehicle's braking control relies, that is manufactured from a mild steel material with a tensile strength of greater than grade-5, must not be electro-plated due to the potential for material embrittlement as a result of hydrogen entrapment occurring during the electro-plating process.

Fasteners used within the assembly of hand control systems

- 2.3(5) Fasteners used in the assembly of components within a hand control system fitted to a low volume vehicle must meet the same requirements specified for fasteners used within the attachment of hand control systems in 2.4(9).

2.4 Attachment requirements for adaptive hand control systems

Positioning for hand control system attachment

- 2.4(1) A hand control system fitted to a low volume vehicle must be positioned in such a way as to place the system as close to the steering column as practicable, in order to maximize the distance between the system and the driver's legs.

Hand control system attachment

- 2.4(2) A hand control system must be attached to a low volume vehicle so that the system will remain securely attached to the vehicle throughout the life of the vehicle, during all normal and emergency operation.
- 2.4(3) A hand control system may be attached to the steering column of a low volume vehicle through the use of U-clamps, provided that:
- (a) the U-clamps are of a diameter not less than 8 mm [5/16 inch]; and
 - (b) the steering column or steering column housing to which the U-clamps are attached, is manufactured from a material capable of resisting any deformation from the clamping effect of the U-clamps when fully tightened.

Brake pedal attachment

- 2.4(4) The attachment of a hand control brake rod to a brake pedal on a hand control system fitted to a low volume vehicle must:
- (a) incorporate a clamping block that clamps over both sides of the brake pedal; and
 - (b) incorporate joints and fittings that operate in such a way that no binding or rubbing can occur throughout the full travel of the brake pedal.
 - (c) apply a predominantly square and even load against the brake pedal, that is offset to the side of the pedal arm by a distance not greater than half of the width of the vehicle's unmodified original brake pedal, so as to minimize twisting loads upon the pedal arm and the pedal pivot assembly.

NOTE: Because some hand control systems project an offset load against the brake pedal arm, brake pedal pivot bushes should be inspected for excessive wear.

Accelerator attachment

2.4(5) An accelerator cable used within a hand control system fitted to a low volume vehicle must, in order to minimise resistance and likelihood of dislodgement, be provided with a route that is unobstructed, and as straight as can be practicably be achieved, through the dashboard area to the accelerator pedal, unless:

- (a) a 'Bowden-type' cable is incorporated; or
- (b) a captive pulley system is incorporated to provide a freely-operating change in direction.

NOTE: If using a replacement accelerator spring to effect easier throttle application via an adaptive hand control system, the spring must be made from a suitably durable material and enable the throttle to return fully and reliably to idle upon release of the accelerator.

Effects on steering column adjustment systems

2.4(6) An adjustable steering column in a low volume vehicle to which a hand control system is fitted, must either:

- (a) if the adjustability is retained, not be able to affect the operation of the hand control system throughout the full travel of the steering column's adjustment; or
- (b) if the adjustability could be affected by the operation of the hand control system:
 - (i) be positioned at the appropriate location for the driver of the vehicle; and
 - (ii) have the adjustability mechanism locked out so that adjustment is no longer possible.

Effects on vehicle occupant protection systems

2.4(7) During the installation of a hand control system to a low volume vehicle, all reasonable efforts must be made to minimise any adverse effects that may be presented by the hand control system to the operation and performance of any occupant protection systems incorporated into the vehicle by the original vehicle manufacturer, with particular consideration to:

- (a) any collapsibility methods, if incorporated, within the steering system by the vehicle manufacturer; or

- (b) any sensing or deployment systems associated with any airbags, if incorporated by the vehicle manufacturer.

NOTE 1: In regard to 2.4(7), it is recognised that in some cases, the adaptive hand control system that best meets the needs of the disabled person's physical condition may not be best-suited for optimum protection in the event of a motor vehicle collision, and therefore a degree of compromise is sometimes required so as to provide an acceptable balance between the additional risks imposed by the hand control system against disabled people's basic needs and rights for mobility.

NOTE 2: In regard to 2.4(7(b)), in any situation where, due to the installation of an adaptive hand control system, the LVV Certifier believes that the disabled driver may be exposed to additional risk as a result of the presence of an SRS airbag, the requirements for 'semi-permanent disablement of airbags' in 2.3(4) of LVV Standard 155-30 (Frontal Impact) must be applied.

Welding within the attachment of a hand control system

- 2.4(8) During the attachment of a hand control system to a low volume vehicle, welding must not be carried out:
- (a) on or to the brake pedal; or
 - (b) any other components or systems which could affect the braking or directional control of the vehicle.

Fasteners used to attach a hand control system

- 2.4(9) Fasteners used in the attachment of a hand control system to a low volume vehicle must:
- (a) be in good condition; and
 - (b) be of an appropriate size for the application; and
 - (c) be secured with nyloc nuts, spring washers, or other vibration-proof locking devices; and
 - (d) in the case of a fastener relied upon to transfer braking effort:
 - (i) have the correct shank area for the application; and
 - (ii) have a tensile strength of not less than grade-8.8 metric [grade-5 imperial]; and
 - (iii) if of a higher tensile strength than grade-8.8 metric [grade-5 imperial], not be electroplated unless the electroplating process is carried out as part of the manufacturing process of the fastener by the fastener manufacturer.

2.5 Operation requirements for adaptive hand control systems

Hand control system operation

2.5(1) A hand control system fitted to a low volume vehicle must operate in such a way that:

- (a) the vehicle's braking system or accelerator system cannot be operated by the hand control system without direct hand contact applied to the hand control system; and
- (b) a distinctly different motion is required to apply:
 - (i) the braking system; and
 - (ii) the accelerator system.

Brake and accelerator release operation

2.5(2) A hand control lever in a hand control system fitted to a low volume vehicle must, when released from:

- (a) a braking application, return to the neutral position;
 - (i) freely and without delay; and
 - (ii) leaving no residual hydraulic pressure applied to the braking system;

and

- (b) an accelerating application, return to the neutral position; and
 - (i) freely and without delay; and
 - (ii) leaving no throttle application to the accelerator system.

Hand control lever operation

2.5(3) A hand control lever in a hand control system fitted to a low volume vehicle must:

- (a) maintain sufficient surplus clearance from the dashboard or any other surfaces, fittings, or structure, so that interference or binding will not be experienced even during an increase in pedal travel required to achieve full braking application when wear in brake components occur; and

- (b) incorporate a handle or surface at the outer end of the lever that is comfortable to hold; and
- (c) enable the driver to make a smooth and easy transition between braking and accelerating applications without shifting the position of the hand; and
- (d) be able to be operated throughout its full range of travel, particularly when fully extended in an emergency braking application position, without interference or binding with any other part of the vehicle surfaces, fittings, or structure; and
- (e) be able to be operated without causing the driver's arm to come into contact with any part of the door, side-glass, or arm-rest.

Hand control operation geometry

2.5(4) The components incorporated within a hand control system fitted to a low volume vehicle must not, during normal and emergency operation:

- (a) exhibit any change in alignment; or
- (b) exhibit any design characteristic that could cause any loosening of any fasteners attaching the components; or
- (c) bind against each other, or any part of the structure or surface of the vehicle to which it is fitted.

Pedal operation

2.5(5) A hand control system fitted to a low volume vehicle must:

- (a) operate the accelerator throughout its full range of travel in a smooth and progressive manner; and
- (b) operate the brake pedal sufficiently to:
 - (i) apply the service brakes with enough effectiveness to meet the service brake operation requirements specified in 2.6(2); and
 - (ii) in the case of a dual-circuit braking system, effectively actuate both circuits of the braking system.

NOTE: Sub-clause 2.5(5)(b)(ii) must be ensured by a physical assessment to ensure that the hand control system does in fact activate the second circuit, requiring the vehicle to be raised with wheels free to rotate, and checking that the wheels are locked by the second circuit when the brakes are applied, with the first braking circuit disabled by releasing the first circuit's bleeder.

- 2.5(6) The brake and accelerator pedals of a low volume vehicle to which a hand control system is fitted must be correctly adjusted at the time of installation of the hand control system.

NOTE: In many cases, fine-tuning and re-adjustment of a hand control system will be required after approximately 2 to 4 weeks of use.

Interior impact requirements

- 2.5(7) A hand control system fitted to a low volume vehicle must be provided with adequate interior impact protection, by either:
- (a) being positioned in such a way that the risk of contact is minimised;
or
 - (b) having exposed parts of the system that may be contacted either:
 - (i) provided with a radius of not less than 3 mm on all edges and corners; or
 - (ii) covered in an energy-absorbing material.

Other requirements

- 2.5(8) A low volume vehicle fitted with a hand control system must comply with:
- (a) in the case of where any modifications have been carried out to the vehicle's braking system in order to meet the needs of the driver, any relevant requirements specified in *LVVTA Low Volume Vehicle Standard 35-00 (Braking Systems)*; and
 - (b) in the case of where any seatbelt anchorages have been retro-fitted in order to meet the needs of the driver, any relevant requirements specified for seatbelt anchorages in *LVVTA Low Volume Vehicle Standard 175-00 (Seatbelt Anchorages)*; and
 - (c) in the case of where any special restraints have been fitted in order to meet the needs of the driver, any relevant requirements specified in *Land Transport Rule 32011 Seatbelts and Seatbelt Anchorages*.

2.6 Road-test performance requirements

General performance requirements

- 2.6(1) A low volume vehicle fitted with a hand control system must be test driven to establish that the vehicle can be safely operated by the low volume vehicle certifier.

Service brake performance requirements

- 2.6(2) In assessing 2.6(1), a one-off service brake performance test must be carried out by the low volume vehicle certifier, on a hard level road surface that is free of loose material, without the deliberate aid of engine compression, during which:
- (a) smooth progressive braking is achieved, and is consistent between the brake pedal and the hand control system; and
 - (b) from a speed of 100 kph to standstill, an average deceleration of 0.65g or greater (4.4 seconds) is recorded whilst achieving maximum braking effect using the hand control system, which is consistent with the average deceleration recorded whilst achieving maximum braking effect using the brake pedal.

NOTE: Whilst LVV Standard 45-30 (Disability Adaptive Control Systems) no longer requires an occupational therapist to be involved in driver assessment as part of the LVV certification process, a driving assessment will still be required (as a separate process) by some or all of the funding providers (such as ACC, Ministry of Health, or Lotteries) as part of their funding criteria. LVVTA recommends that any members of the disabled public who are not accessing funding through the funding providers should seek the help of a suitably qualified person (such as an occupational therapist with experience in driver training) to ensure that all modifications meet the individual needs of the disabled driver.

2.7

Adaptive foot control system requirements

- 2.7(1) A low volume vehicle may be fitted with an accelerator pedal positioned on the left side of the brake pedal, provided that:
- (a) the vehicle retains an accelerator pedal fitted on the right side of the brake pedal; and
 - (b) the vehicle is equipped with an automatic transmission; and
 - (c) adequate clearance is maintained between all pedals; and
 - (d) the additional pedal operates smoothly and safely, and cannot bind against, or have any effect on the safe operation of the original pedal, or any other part of the vehicle controls or structure; and
 - (e) a warning notice is provided in a prominent location warning any driver of the vehicle that the foot controls are not as provided by the vehicle manufacturer; and
 - (f) either:
 - (i) both pedals are hinged so as to fold out of reach when not in use; or

- (ii) the right side accelerator pedal is prevented from being operated by a protective cover, when the left side pedal is in use; or

(iii) drive-by-wire pedals are switched electronically.

NOTE 1: It is recommended that where a low volume vehicle is fitted with an accelerator pedal on each side of the brake pedal, the system is set up so that the folding into position of one pedal automatically retracts the remaining unused pedal out of reach, so as to ensure that only one pedal can be used at any one time.

NOTE 2: In the case of a driver using a right-side leg prosthesis and a left-side accelerator pedal, a cover must be used to prevent accidental operation of the right side accelerator pedal, causing continued accelerator operation when the left side pedal is released.

Section 3 Exclusions to this standard

3.1 Brake pedal attachment exclusion

3.1(1)

A hand control system that was both manufactured and fitted to a low volume vehicle before 1 May 2004, is not required to meet 2.4(4), and may incorporate the attachment of a hand control brake rod to a brake pedal by drilling and bolting through the brake pedal, provided that:

- (a) the hole for the attachment point is positioned:
 - (i) centrally within the width of the brake pedal surface area; and
 - (ii) as far toward the bottom of the pedal as practicable, so as to minimise the load on the pedal and the amount of travel required to operate the braking system through the hand control;

and

- (b) the diameter of the hole for the attachment point is not greater than 25 % of the width of the pedal at the point where the pedal is drilled; and
- (c) a clevis-clamp is used to attach the hand control brake rod to the brake pedal that:
 - (i) supports both sides of the pedal and works squarely against the pedal; and

- (ii) pivots on a free-rotating bush or bearing surface;

and

- (d) the fastener that attaches the brake rod joint to the brake pedal is of a diameter not less than 8 mm [5/16 inch], and meets the requirements specified for fasteners in 2.4(9).

3.2

LVVTA 'Component Approval' exclusion

3.2(1)

A hand control system fitted to a low volume vehicle is not required to meet the technical requirements specified in 2.2, 2.3, and 2.4, provided that:

- (a) the system is one for which a valid copy of an *LVV Component Approval Certificate* has been issued by the Low Volume Vehicle Technical Association (Inc.); and
- (b) the system complies with any conditions and notes recorded on the *LVV Component Approval Certificate* specified in 3.2(a); and
- (c) the system has been installed in accordance with the installation instructions of the hand control system manufacturer; and
- (d) any welding involved in the attachment of the hand control system to the vehicle is carried out by a person who either:
 - (i) holds a relevant current qualification or trade certification for the type of welding being undertaken; or
 - (ii) has demonstrated to a low volume vehicle certifier, a satisfactory level of competence in the method of welding being undertaken.

Section 4 **Vehicles not required to be certified to this standard**

4.1

Vehicles that pre-date legal requirements

4.1(1)

A vehicle is not required to be certified to this standard, if the vehicle was fitted with a disability adaptive control system before 1 January 1992.

4.1(2)

A light vehicle is not required to be certified to this low volume vehicle standard, if the vehicle is identified as having been modified by a second-stage vehicle manufacturer, and complies with an approved overseas standard that is listed in *Annex 6* of the *Low Volume Vehicle Code*.

4.2**Modifications that do not require certification****4.2(1)**

A vehicle is not required to be certified to the *Low Volume Vehicle Code*, provided that the safe performance of the vehicle is not compromised, where the only modification to the vehicle (for the purpose of assisting a disabled person to safely operate a motor vehicle) is the fitting of any one or more of the following items:

(a) the addition of a disability adaptive hand control system, provided that:

- (i) the adaptive hand control operates only the vehicle's accelerator system, and not the vehicle's braking system; and
- (ii) any changes to the controls of the vehicle are such that the risk of injury to any occupants in a crash is not increased significantly;

or

(b) the installation of a mechanical or electrical means of engaging or disengaging the **original equipment** parking brake system, provided that:

- (i) the performance of the parking brake system could not have been compromised as a result of the modification; and
- (ii) in the case of an electrically operated system, a loss of power would result in the parking brake remaining engaged;

or

(c) the addition of an accelerator pedal positioned on the left side of the brake pedal, provided that:

- (i) the vehicle is equipped with an automatic transmission; and
- (ii) the additional pedal can have no effect on the operation of the brake pedal, or any other part of the braking system; and

- (iii) the vehicle retains the original accelerator pedal fitted on the right side of the brake pedal; and
 - (iv) adequate clearance is maintained between all pedals; and
 - (v) the additional pedal operates smoothly and safely, and cannot bind against, or have any effect on the safe operation of the original pedal, or any other part of the vehicle controls or structure; and
 - (vi) the accelerator system is protected from accidental application by the interposition of a shield or cover over the right-side accelerator pedal, or both pedals are hinged so as to enable either pedal being folded out of reach when not in use, and
 - (vii) a warning notice is provided in a prominent location warning any driver of the vehicle that the foot controls are not as provided by the vehicle manufacturer;
- or
- (d) the addition of a brake pedal extension (to accommodate the needs of a person with short limbs), provided that the extension:
 - (i) does not exceed 100 mm in length; and
 - (ii) is securely clamped to the original pedal by a mechanical means; and
 - (iii) has sufficient strength and rigidity to withstand all normal and emergency applied braking effort; and
 - (iv) does not involve any modification to, or compromise the strength of, the original brake pedal; and
 - (v) does not significantly change the sideways load or leverage against the pedal; and
 - (vi) does not significantly increase the weight of the pedal;
- or
- (e) the repositioning of secondary controls, switches, and fittings, provided the positioning of the controls, switches, and fittings are positioned within one or more of the C-zone areas specified within 4.2 of the LVVTA Low Volume Vehicle Standard 155-40 (*Interior Impact*); or

- (f) a steering wheel mounted spinner to assist in operation of the steering wheel, provided that the spinner:
 - (i) is securely attached; and
 - (ii) is positioned inside the outer circumference of the steering wheel; and
 - (iii) has no sharp edges exposed.

Section 5 Terms and definitions within this standard

Automatic transmission	means a type of gearbox, or transmission, that automatically varies the ratios between the input shaft and the output shaft to suit engine speeds automatically, without the driver having to physically select the gears.
Bowden – type cable	means a type of flexible round steel cable commonly used in the attachment of disability hand control systems in motor vehicles.
Clevis clamp	means a clamp that attaches in such a way that it captures both sides of the brake pedal, designed to provide an even and square load distribution against the brake pedal.
Door panel	means a covering positioned on the side of the door facing the occupant cell, to protect the vehicle occupants from hazardous edges and fittings, and to conceal and protect door and window opening mechanisms.
Double-shear	means a method of attachment that relies on a pivoting or hinged object to be captured and supported on both sides, and fastened through all three components of the system.
Driver	means the person for whom the disability adaptive control system has been designed and installed.
Embrittlement	means an effect on a material which causes it to lose its malleability and become brittle, as a result of the electrolysis process involved in the electroplating process causing hydrogen molecules to become entrapped within the material's structure.
Energy-absorbing material	means a deformable high-density material that provides impact protection to vehicle occupants by absorbing energy, and preventing direct contact with any solid surfaces or objects positioned beneath the material in the event of contact. [Energy-absorbing material should not be able to be compressed by more than approximately 30% under firm thumb pressure.]

Hand control brake rod	means the part of a hand control system that transmits effort from the hand control lever to the vehicle's brake pedal.
Hand control lever	means the part of a hand control system that the driver uses to apply pressure to the vehicle's braking and accelerator systems.
Hand control support bar	means the main structure of a hand control system that attaches the hand control system to the vehicle, and from which all other parts of the hand control system attach to and operate from.
Hand control system	means a device that enables a vehicle's braking and accelerating systems to be operated by the driver's hand, instead of the normal foot controls.
Low Volume Vehicle Code	is the code of the Low Volume Vehicle Technical Association (Incorporated) that governs the low volume vehicle certification process in New Zealand, and is incorporated within the land transport regulatory framework through incorporation by reference into the <i>Land Transport Compliance Rule 35001/2</i> .
Push-pull	means a type of hand control system that is operated by a hand control lever that is pulled horizontally towards the steering wheel to apply the vehicle's accelerator system, and pushed horizontally towards the dashboard to apply the vehicle's braking system.
Primary controls	means those vehicle controls used to operate the vehicle's braking, steering, and accelerator systems.
Radial-control	means a type of hand control system that is operated by a hand control lever that is moved vertically in a clockwise direction, following the radius of the steering wheel, to apply the vehicle's accelerator system, and pushed horizontally towards the dashboard to apply the vehicle's braking system.
Seating position	means a seat or part of a seat, of a suitable size and shape for one person.
Secondary controls	means control systems that are not directly related to the steering, braking, and accelerator operations of the vehicle, and include those control systems that operate the windscreen wipers, lighting equipment, horn, and direction indicators.
Steering column	means the mechanism in a motor vehicle by which steering control applied at the steering wheel is mechanically transferred to the steering box or steering rack and pinion assembly.
Steering wheel spinner	means an item which attaches to the steering wheel, to assist in the operation of turning the steering wheel.

Twist-grip means a type of hand control system that is operated by a hand control lever that incorporates a rotational twist handle [similar in design to a motorcycle accelerator control] that is twisted radially to apply the vehicle's accelerator system, and pushed horizontally towards the dashboard to apply the vehicle's braking system.

U-clamp means an attachment system comprising a u-shaped clamp, designed to encompass and secure a tubular shaped object, with two threaded ends that enable capturing and fastening of the open part of the clamp.

NOTE: The terms and definitions found in section 5 are limited to those terms and definitions that are unique to this low volume vehicle standard, and are not necessarily contained within the terms and definitions section of the Low Volume Vehicle Code.

Appendix A

to Low Volume Vehicle Standard 45-30(05) Disability Adaptive Control Systems:

LVVTA-recognised Disability Adaptive Control System Manufacturers & Suppliers

The following manufacturers are the Vehicle Association of N.Z. for People with Disabilities, Inc (VANZ) endorsed manufacturers/installers of disability adaptive control systems referred to in 2.3(2) of LVV Standard 45-30(05) Disability Adaptive Control Systems, as at 25 October 2016.

- **Abiliquip Ltd** 3/100 Carmen Rd, Heihei, Christchurch. Ph 03 281 8181
- **Braiden International Ltd** 127 Belvedere Rd, PO Box 72, Carterton. Ph 06 379 8726
- **M.E.C.O. Engineering Ltd** PO Box 644, New Plymouth. Ph 06 751 0339
- **MMB Engineering** PO Box 11-046, Whangarei. Ph 09 438 3232
- **Mobility For Independence Ltd** PO Box 32-543, Devonport, Auckland. Ph 09 445-8401
- **South Taranaki Toyota** 61-65 Regent St, Hawera. Ph 06 278 6139
- **VAMCO (IKON Engineering Developments)** 2 Canon Pl, Pakuranga, Auckland. Ph 09 576 1090
- **Matangi Motors Ltd** PO Box 13, Matangi. Ph 07 829 5709
- **Wellington Disability Services** 12 Peterkin St, Wingate, Lower Hutt. Ph 04 939 0071 or 021 503 821
- **Vehicle Adaptions for the Disabled** Okiwi Bay, Nelson. 03 576-5410
- **Vehicle Adaptions & Engineering Ltd** 9 Saxon St, Christchurch. (03) 381-1374.