WAKA KOTAHI
NZ TRANSPORT AGENCY

NZTA E06:2023
SPECIFICATION FOR THE DESIGN AND MANUFACTURE OF HIGH VISIBILITY SAFETY GARMENTS FOR TEMPORARY TRAFFIC CONTROL PURPOSES

New Zealand Government

August 2023

Publication Edition 1.0

More information

Waka Kotahi NZ Transport Agency
Published June 2023

ISBN 978-1-99-106803-3

If you have further queries, call our contact centre on 0800 699 000 or write to us:

Waka Kotahi NZ Transport Agency
Private Bag 6995
Wellington 6141

This document is available on the Waka Kotahi NZ Transport Agency's website at www.nzta.govt.nz

This Specification will be updated periodically to incorporate advances in technology and changes within the industry. The Waka Kotahi website should be checked to confirm the most recent edition of the specification.

DOCUMENT INFORMATION	
Document Name	**Specification for the design and manufacture of high visibility safety garments for temporary traffic control purposes**
Document Number	**E06**
Partnering Documents	New Zealand Guide for Temporary Traffic Management
Document Status	**Replaces** CoPTTM Section B3 *High visibility garments*
Document Availability	These documents are located in electronic form on the Waka Kotahi NZ Transport Agency's website at www.nzta.govt.nz

RECORD OF AMENDMENTS

Edition Number	Subject of change	Effective Date	Updated by
Initial Working Draft	**NZTA E06:2022** Specification for the design and manufacture of high visibility safety garments for temporary traffic control purposes	March 2022	Julian Chisnall
Working Draft V2.0	**NZTA E06:2022** Specification for the design and manufacture of high visibility safety garments for temporary traffic control purposes	May 2022	Julian Chisnall
Publication Edition 1.0	**NZTA E06:2023** Specification for the design and manufacture of high visibility safety garments for temporary traffic control purposes **To be Withdrawn** CoPTTM Section B3 *High visibility garments*	August 2023	Julian Chisnall

1. FOREWORD

The objective for the introduction of **NZTA E06:2023** *Specification for the design and manufacture of high visibility safety garments for traffic control purposes* is to provide an up-to-date guidance for Manufacturers or Suppliers wishing to supply garments for the use in traffic control situations in New Zealand.

Relative to the garments specified in this document, it is the responsibility of the employer or wearer to select the garment that is appropriate for the task, activity and circumstances at hand.

This specification replaces the Code of Practice for Temporary Traffic Management (CoPTTM) Section B3.

2. RELATED DOCUMENTS

(a) Australian and New Zealand Standard AS/NZS 1906.4 *Retroreflective materials and devices for road traffic control purposes* - Part 4 *High visibility materials for safety garments*[1]

(b) Australian Standard AS 4602.1 *High visibility garments* Part 1 *Garments for high risk applications*[2]

(c) Australian and New Zealand Standard AS/NZS 4967 *Protective clothing for firefighting*

(d) Standards New Zealand NZS ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories.

(e) New Zealand Guide for Temporary Traffic Management (NZGTTM)

Note: Readers should comply with the most current publication of the document being referenced.

3. SCOPE

This specification provides continuity of guidance for Manufacturers, Designers and Suppliers wishing to supply high visibility safety garments for use in temporary traffic management activities in New Zealand.

The content of this specification closely matches the information previously contained in the Code of Practice for Temporary Traffic Management (CoPTTM) Section B3 plus amendments specified in technical notes issued since CoPTTM Section B3 2018.

High visibility materials used in compliant garments manufactured to this specification must comply with the specifications in the AS/NZS 1906.4 Standard and the design of any compliant garment must comply with both AS 4602.1 and this specification. The manufacturer must be able to confirm this compliance based on testing completed by an approved independent materials testing organisation within New Zealand or Australia..

4. TERMS AND DEFINITIONS

- **Acceptable:** See also “suitable for purpose” is a term used to describe a garment that when visually checked on site is deemed to be exhibiting sufficient conspicuity to be achieving its primary safety purpose. High visibility garments must be withdrawn if they deteriorate to a marginal rating when suitability for purpose is questionable or could be described as marginal
- **Cd/lx:** Candela per lux – a measurement of retroreflectivity ‘*R*’
- **CIL:** Coefficient of luminous intensity - Quotient of the luminous intensity reflected in the direction considered, divided by the illuminance at the retroreflector for given angles of entrance, observation and rotation
- **Fluorescent Colour:** When fluorescent orange or fluorescent yellow is specified this shall include the potential use of a non-fluorescent alternative material if a risk, secondary to conspicuity, so requires (unless this specification rules otherwise).
- **May:** A term used to indicate something that is optional and may be considered for use

[1] At the time of publication of this specification the 1906.4 Standard was being revised with an expected publication date in 2023
[2] At the time of publication of this specification the 4602.1 Standard was being revised with an expected publication date in 2023

- **Must:** A term used to indicate something that is mandatory or required by law
- **Non-compliant colour:** Where quoted this colour may be any colour other than the compliant high visibility colour. Typically a darker colour, colours such a blue, green and black may be adopted
- **Retroreflective:** Describes a material or device that reflects light back to the light source being distinct from simple mirror reflection that beams light away from a light source in an equal but opposite direction to its direction of input
- **RCA:** Road Controlling Authority. Roading authority responsible for the maintenance and management of the road in any specific region
- **Should:** Term used to indicate a recommendation based on industry best practice
- **Specification:** In this document, the word "Specification" shall be interpreted as referring to NZTA E06 *Specification for the design and manufacture of high visibility garments for traffic control purposes*
- **Standard:** In this specification the word "Standard" shall be interpreted as a Waka Kotahi approved national or international document that has been published by a recognised Standards organisation being used to provide a means of compliance with this specification. Standards must be identified by their Standards organisation and number, e.g. AS/NZS 1906.4.
- **Suitable for purpose** (Suitability): A statement of overall daytime appearance and night-time retroreflective performance referred to as being *Suitable for Purpose* is not a finite measurement but recognises that the degree of day and night visibility is deemed to be sufficient for a driver to identify the presence of a worker or traffic controller and act in a safe manner, relative to the safe travel through the work site.
- **Supplier:** The entity, sometimes the actual manufacturer, that supplies high visibility garments to specialised distribution or direct to roading contractors
- **Symbol '*R*'**: Coefficient of retroreflection expressed in Cd/lx: the quotient of the coefficient of luminous intensity (CIL) of a plane retroreflecting surface and its area
- **Test Size**: This garment is made to fit a 100cm to 105cm body chest measurement. It will frequently become a size Large "L". The measurements in each Figure are for this size garment. This is the garment "test" size that is submitted to a test organisation in order to gain confirmation of compliance. All garment sizes within any specific garment range must increase or decrease in relation to this size. Logos, labels and panels (STMS and TIM) will maintain the dimensions specified unless otherwise specified.
- **Underarm gusset**: This acts as an underarm ventilation point for a long-sleeved garment provided for wearer comfort. Refer to Clause 6.4.4 AS 4602.1 and Clause 7(c) herein.
- **Will**: A term used to indicate something that is mandatory or required by law

5. GENERAL

In order to confirm compliance with this specification, compliance letters TTMC-W23 (previously TTMC-W17) of a practicable size must be included on the primary permanent garment sew in label[3].

This same garment label must also confirm Country of Origin, fibre content and care instructions.

Garments compliant with this specification are based on the Australian Standard AS 4602.1 *Garments for high-risk applications* in as much as this is considered appropriate for the circumstances at hand.

[3] *The specification recognises that garment labels must indicate compliance with the relevant garment material Standard AS/NZS 1906.4 and garment design Standard AS 4602.1. Both standards are currently under review with the amended versions scheduled for publication in 2023. To enable these label changes to be completed in a practicable and timely manner, compliance letters 'TTMC-W17' (as per CoPTTM Section B) or 'TTMC-W23' (this specification) will be equally accepted until 30 June 2024. From 1 July 2024, all compliance lettering must read 'TTMC-W23'.*

The NZTA E06 Specification recognises that working within the roading corridor and or its close proximities or related development sites arguably represent the highest risk factors of any worksite in New Zealand where risk of serious injury is both frequent and the outcome serious.

For this reason this specification seeks to provide increased conspicuity wherever it is reasonable to do so while remaining compliant with AS 4602.1 *Garments for high risk applications*. This specification also recognises that the resultant garment must provide the best conspicuity possible in all weather conditions and times of day or night.

The wearer of the resultant garment must not be required to make a determination as to when a garment may no longer be suitable for purpose on site at any specific time, such as for weather conditions when a garment is dampened by conditions of work, or the work period extends for any reason beyond sunset into night-time conditions.

This is not to suggest that a wearer will not change, by choice, into rainwear in conditions of rain or a different garment as night occurs, but it does confirm that any general compliant garment suitability is not negated when any such change of conditions occurs.

The design of the garment also seeks to provide an element of recognition or a consistency of image for approaching drivers though the use of set designs that are constant wherever the wearer may be employed.

Garment manufacturers and end users must be aware that the addition of any printing or panels or trims etc after manufacture may negate the garment compliance.

High visibility garments must always be worn correctly fastened.

6. HIGH VISIBILITY GARMENTS

6.1 Material Compliance

All material used in the manufacture of the garment must comply with the joint Australian and New Zealand Standard AS/NZS 1906.4 *Retroreflective materials and devices for road traffic control purposes* Part 4 *High visibility materials for safety garments*.

Manufacturers must be able to demonstrate compliance with AS/NZS 1906.4 for all high visibility background and retroreflective materials used in the manufacture of compliant garments via a recognised independent testing laboratory's certificate of compliance[4]

6.1.1 Colour

The background material must be either fluorescent Class F orange red or fluorescent Class F yellow, yellow green conforming to the requirements of Clause 2.3, Table 2.1 and Table 2.2 in AS/NZ1906.4 when tested in a dry condition. The measurement for fluorescent and non-fluorescent luminance is made over a black background therefore some open mesh materials may not comply.

Where specific safety requirements in addition to conspicuity, such as the risk of static electricity build-up for gas related projects, or the need for fire retardance exist, contractors may wear garments made from a fibre or blend of fibres incapable of retaining a fluorescent colour such as natural fibres or a blend of synthetic and natural fibres.

The resultant Class NF, non-fluorescent high visibility coloured material conforming to Clause 2.4, Table 2.1 and Table 2.3 in AS/NZS 1906.4, when tested in a dry condition may be used.

[4] *Application of uncertainty of measurement* explains the protocol by which a testing laboratory is able to declare a "*pass*" result or issue a "*fail*" result subsequent to completing a specific test. It also explains the "*uncertain*" result, a situation where a result may be within the accuracy of the laboratory equipment and operating procedure. In such instances Waka Kotahi recognises that such a result is extremely close to compliance and because of this Waka Kotahi will typically accept an uncertain outcome as a pass. Reference and explanation can be found in either AS 1906.1 or AS/NZS 1906.3.

All Class F and Class NF background materials must comply with the wet weather performance test specified in Clause 2.6 of AS/NZS1906.4, meeting all the requirements of Clause 2.3 (Class F) and Clause 2.4 (Class NF) except for a reduction in luminance factor to not less than 85% of that specified in Table 2.2 for Class F materials and Table 2.3 for Class NF materials.

Although the wet weather performance test is noted as optional for Class F and NF material compliance in the AS/NZ1906.4 Standard, all Class F and Class NF background material must comply with this test as noted for compliance with this specification.

6.1.2 Retroreflectivity

All retroreflective material including segmented tapes must comply with the specification for Class '*R*' material as noted in Section 3 and Table 3.2 of AS/NZS1906.4.

Retroreflective chequered patterned material must comply with Class '*R*' material as noted in Section 3 and Table 3.2 of AS/NZS 1906.4. Note: The application of red and white (or red and silver) chequered retroreflective material is strictly limited to garments designed for Traffic Incident Management (TIM) response personnel.

Retroreflective orange red material for STMS panels must comply with the colour specification for Class F background material as noted in Clause 6.1.1 and exhibit a level of retroreflectivity no less than 60 CIL/m^2 at entrance angle 5.0 degrees and observation angle 0.2 degrees. Compliance with Class F luminous intensity and other retroreflectivity durability tests are not required.

6.2 Logos

Garments must not display any unapproved lettering, symbols, patches, panels, trims or logos or add any design elements not authorised by Waka Kotahi. The STMS and TIM panels are included with the relative garment design. Garment logos are strictly limited to:

6.2.1 Primary Logo:

This logo will typically provide the wearers company identification. It must be positioned on the wearer's upper left front of the garment. The maximum area permitted is 7500mm^2 (e.g. 100mm x 75mm).

Garment designs that include a clear plastic pocket on the wearer's upper left front chest where a business card or similar identification may be displayed must locate this pocket within the above described maximum 7500mm^2 logo position. This option therefore replaces the standard 7500mm^2 logo option.

Note: The STMS garment is limited to the STMS logo located on the wearer's upper front left side of the garment and as specified on the back of the garment plus a material technical recognition ID logo when appropriate. No other logos or labels may be added.

6.2.2 Material Technical Recognition ID Panel:

Where required for specific safety reasons a material "Technical Recognition" ID Panel of a maximum 1500mm^2 (e.g. 60mm x 25mm) may only be added to the wearer's upper front right side of a garment. This panel is strictly for adding identification of a fabrics technical capability, such as but not limited to a Hazard Risk Category (HRC) or Calorific Arc (CAL) rating or flame retardance logo where a visible confirmation of the feature must be immediately visible. No additional detail may be added.

6.2.3 Garment manufacturers naming label:

A manufacturers label to a maximum size of 50mm x 20mm (e.g. 1000mm^2) that names the garment manufacturer or the manufacturer's logo may be sewn or printed within the designated area for non-compliant coloured material only on a lower sleeve and or leg of the garment (refer to position of non-compliant coloured material in Figures 5, 7, 8 and 9) even if this area remains as a compliant colour.

For garments that include a non-compliant coloured shirt type collar (centre item Figure 2) a logo to a maximum area of 225 mm^2 (eg 15 x 15 mm) may be added at the centre back of the collar only.

6.2.4 Traffic Incident Management ID label

As a first responder associating with Police and other emergency services, Traffic Incident Management (TIM) personnel must display personal identification on the wearer's upper right front chest position. Typically held in a clear pocket that holds an ID card this pocket will be to a maximum of 100mm x 60mm.

This unique ID label requirement must **not** be added to any other high visibility garments.

6.3 Garment Compliance

Garment compliance is based on the Australian Standard AS 4602.1 *High visibility safety garments* Part 1*: Garments for high risk applications*[5] including amendments as may have been added, and the additional sections and figures that follow herein. All background high visibility material must comply with the wet test, as specified in section 6.1.1 Colour.

Note: Refer to section 9 Exemption for extra small size garments

All retroreflective material applied to garments, including extra small size garments complying with section 9 must be in strips no less than 50mm wide. Except for the overall garment design (refer to section 7.3 Overall Garment) hoops must completely encircle the torso with no breaks except for the permitted front opening. The retroreflective hoop positioned at the 'waist' for the overall garment may include additional breaks no greater than 50mm at each side to enable pocket openings.

The retroreflective 'braces' front and back and/or the rear retroreflective cross configuration must meet at the top of the shoulder and at the waist hoop aligned as shown in the relative Figures.

Vertical measurement for establishing the position of the 'waist' hoop is taken from the high shoulder point (HSP) to harmonise with AS 4602.1 (Refer to garment Figures).

Garment compliance specifications herein must be achieved for a garment size designed to fit a 100 - 105cm body chest measurement – commonly, but not always, denoted as a size "Large" or "L". This garment is referred to as the Test Size (section 4) being the garment that is to be issued to a testing organisation for confirmation of compliance.

Manufacturers must then guarantee that the "test garment" design remains consistent throughout the garment size range, grading increasing or decreasing proportionately with the design integrity of the test size[6].

New garment designs must not be introduced and current designs altered without the direct authority of Waka Kotahi. Waka Kotahi may request a garment manufacturer to present a compliance certificate to confirm garment design compliance.

In such instances the garment manufacturer will be required to forward material compliance certificates covering colour, luminance and retroreflectivity with the garment to an accepted materials testing laboratory.

If any garment includes the addition of a hood the colour of the hood must be the compliant colour of the garment. When being used as a hood it must not unduly hinder the field of vision or peripheral vision of the wearer. When "down" no non-compliant hood colour is to be visible with the exception of a drawstring that will preferably match the garment colour or be black. The material area of the hood may not be used to achieve area high visibility compliance.

While not specifically mentioned in this document a high visibility trouser garment may be issued and worn with a TTMC compliant garment (7.2.1 thru 7.2.4; 7.3 and 7.5) whenever this is thought to be appropriate for the circumstances at hand.

Such garment should conform to AS 4602.1 in design, but recognition is given to the location where high visibility ends on the lower leg respectful of footwear and potential for discolouration/damage.

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[5] Previously Australian and New Zealand Standard AS/NZS 4602.1

[6] Hereafter, mention of the '*Test Size*' refers to the garment size designed to fit a body chest measurement 100-105cm. This in most instances will be a size large "L" garment.

The AS 4602.1 document permits non-conforming coloured areas on the trouser legs. These are not permitted for this specification. The lower leg area should comply with the leg design of the overalls garment (section 6.4).

7. GARMENT DESIGN

Manufacturers should be aware that the specification herein is a combination of the specific wording and the relative figure. Interpretation of the specification wording must result in a garment that generally complies equally with the related Figure. Details shown in figures are not to scale.

7.1 General

This specification is based on AS 4602.1 Standard, *Garments for high risk applications*.

Note: In harmony with the revision of the AS/NZS 1906.4 Standard (Garment Materials), AS 4602.1 (Garment design) is also scheduled to be revised. Both revisions are being made to incorporate new high visibility background colour(s), and recognise the use of new natural fibre/synthetic fibre material blends that may or may not be able to accept sufficient fluorescent dyestuffs to achieve fluorescent colour compliance[7].

(a) Garment Closures

Garment closures for the front of a garment, such as zips, buttons, domes or hook and loop fastenings may be black, but a colour matching the garment colour is preferred.

Closures for pockets may use but are not limited to the use of buttons, zips, domes or hook and loop fastenings but in each instance the colour must harmonise with the background garment colour, i.e. orange with orange/yellow with yellow etc. However while the closures colour must be a close approximation of the background material colour it need not be a compliant colour.

(b) Retroreflective configuration

Historically Waka Kotahi has seen little evidence that supports an improvement of safety by using the cross configuration on the back of high visibility garments rather than the braces configuration.

Notwithstanding this lack of evidence Waka Kotahi allows the use of an optional cross configuration on the back of most high visibility garments.

Contractors will be able to request this optional cross configuration for their staff but will not be able to require subcontractors or any visitors to site to have the cross configuration rather than the braces configuration on the back of their high visibility garments.

The optional retroreflective cross configuration on the back of a garment is not permitted for the “STMS” or “TIM” garments.

(c) Garment underarm gussets

The material gusset will comply with AS 4602.1:2010 Clause 6.4.4 and typically be a light mesh type fabric that will enhance ventilation and the wearer’s comfort. Where permitted therefore the gusset is not required to be a compliant colour but it must be a material colour that closely approximates the high visibility garment colour. If not a compliant colour the gusset area may not be included as compliant background area.

Alternatively the fabric gusset may be replaced by up to four 10mm (maximum) eyelets. The eyelets should preferably match the colour of the garment and be positioned to be totally within the gusset’s 100mm x 100mm area as noted.

The maximum dimension is 100mm x 100mm positioned centrally on the garment side seam extending down from the underarm point. This gusset dimension may be replicated into the sleeve. (Figure 1)

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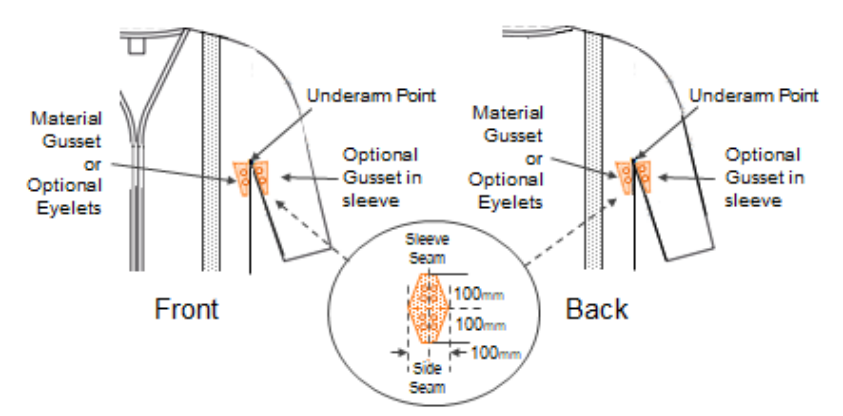
[7] It is therefore likely that primary sew in permanent garment labels will need to update confirmation of compliance to the publication dates/year of these revised Standards. Refer to Clause 5 General.
NOTE: The garment label may quote compliance with AS/NZS 4602.1 but reference to just AS 4602.1 is preferred.

Figure 1: Location of material gusset and optional alternative eyelets



(d) Garment binding

A material binding added to the edge of the compliant high visibility material should use a binding colour that is compliant and matches the garment colour. If this is not possible the colour must very closely approximate the garment colour. This binding need not be fluorescent but if not fully compliant it must not form part of a garments compliant high visibility area. The maximum binding width visible externally on the outer edge of the garment material is 10mm.

(e) Garment pockets

If a slit type pocket or patch type pocket is included across a retroreflective element a break in the retroreflective tape must not be evident when the garment is worn in its normal manner as indicated in Figure 7. Some degree of overlap into a pocket may be required in order to lessen any gapping due to wearer movement.

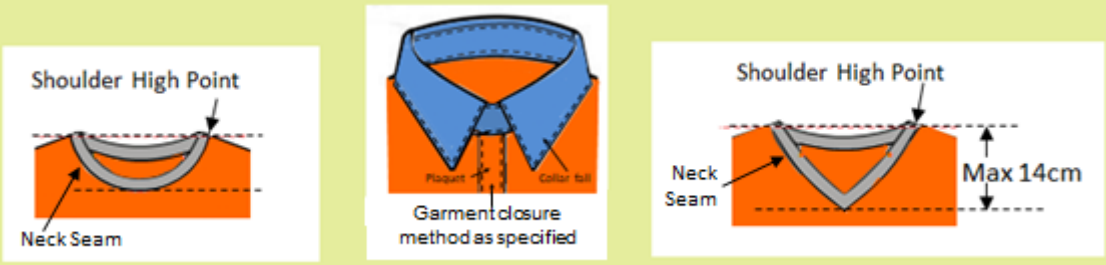
(f) Addition of "D" rings

If a so called "D" ring is added to any garment enabling an object to be attached to hang from it, the "D" ring must only be attached to the bottom hem to ensure that any attached object will not interfere with the compliant high visibility area.

(g) Collars

The collar is the part of a garment that is sewn to the neck seam (Figure 2) For the purpose of this specification this does not include a placket, or anything attached below the front neck drop point; the part of the garment that is the lowest point of the front neck seam measured from high shoulder point (HSP). The maximum front neck drop for a V-neck or scoop neck is 14cm.

Figure 2: Collars



The collar material may be a non-compliant colour. Non-compliant material must not be sewn to the garment below the front neck point. Any placket or part of the garment that is sewn below the neck point must be a compliant colour.

Where a collar has a fall, such as a shirt collar or a ribbed collar, any compliant hi-visibility material that is covered by the collar in its down position must be deducted from the qualifying torso area.

7.2 Sleeveless vests

7.2.1 Standard Sleeveless vest requirements

The Standard sleeveless vest design (Figure 3) based on the Australian Standard AS 4602.1 (previously AS/NZS 4602.1) must include the following additional requirements:

(a) When calculating the area of high visibility background material as specified AS 4602.1, the measurement rectangle shown in Appendix A Figure A1 will be extended below “waist” level to the bottom of the garment providing such extension for the 100 - 105cm test size does not exceed 710mm at the front.

(b) The design must include a shirt tail back that is 150±5mm longer than the front.

(c) The garment’s shirt tail may be split, providing an overlap of material ensures that continuity of background material is maintained. It is recommended that a hook and loop product secures the split. This feature may be included if there is a danger that the garment could snag when the wearer alights from any construction equipment. However, good practice dictates that when alighting from any construction equipment the operator should be facing the vehicle.

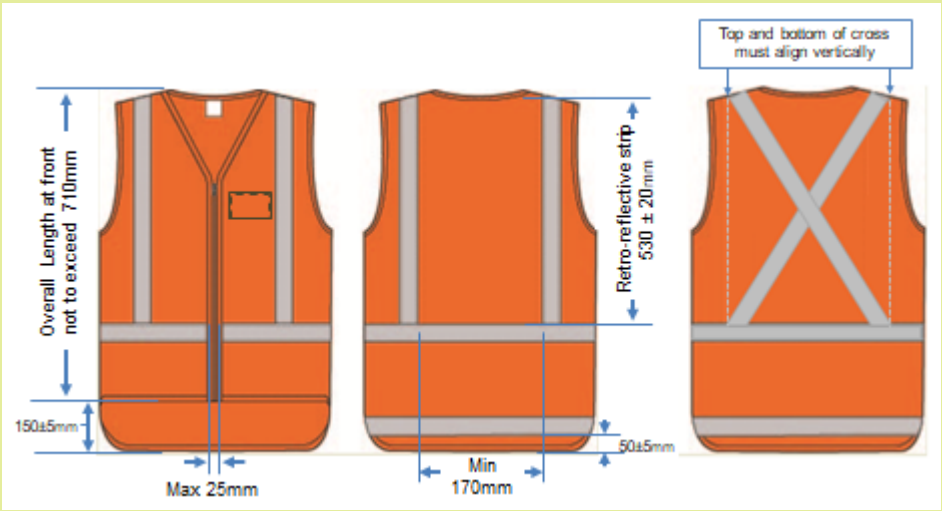
(d) Background high visibility material must encircle the torso from the top without the inclusion of any other colour except for:

i. Specified retroreflective material
ii. Permitted primary logo area
iii. Permitted front opening and
iv. Permitted fabric technical ID panel (when appropriate)

(e) The minimum qualifying area measurement of background high visibility material for the recognised 100 - 105cm test size vest not covered by retroreflective material, logos or printing must be:

i. Front of garment 0.24m^2
ii. Rear of garment including the 150mm shirt tail 0.3m^2

Figure 3: Standard Sleeveless vest. (Dimensions are for the Test size)



(f) A permitted front opening to accommodate a zip fastener or similar closing device may be no wider than 25mm.

(g) Compliant retroreflective material must be positioned to comply with the pattern in Figure 3

(h) The retroreflective elements must form a recognised belt and braces pattern with an additional horizontal strip on the shirt tail located 50±5mm above the bottom hem. The braces join the belt at the front, passing over the shoulder to the belt at the back

(i) Each brace must be spaced a minimum of 170mm apart at the belt, front and back as shown in Figure 3

(j) An optional cross configuration permitted for the back only must meet the front braces at the shoulder and (nominally) at the belt on the back vertically below the shoulder position to comply with the pattern in Figure 3

(k) Being sleeveless no manufacturers label is permitted. If sleeves are recognised as being appropriate refer to Clause 7.5 Miscellaneous Garments.

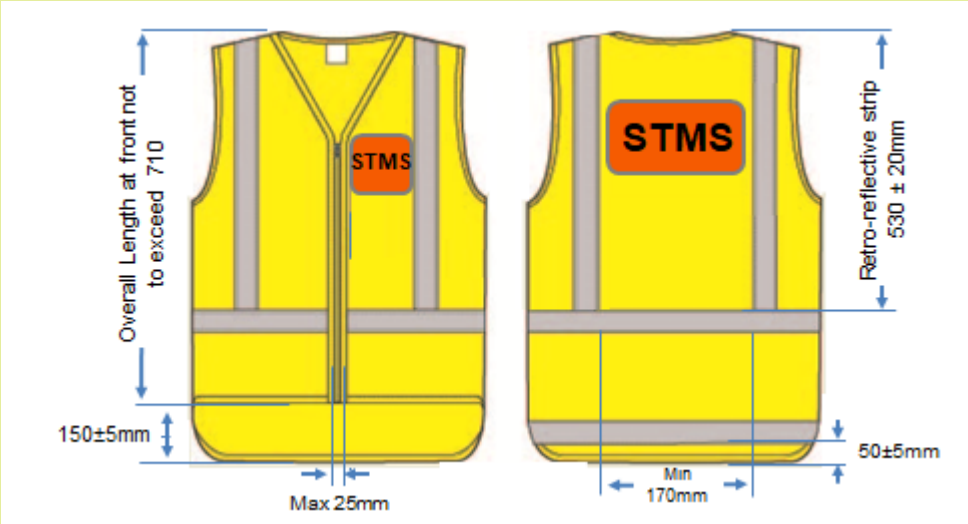
Note: Refer to section 9 Exemption for extra small size garments.

7.2.2 STMS Special Purpose Sleeveless vest

This special purpose sleeveless vest design must comply with the standard compliant orange garment design specified in Clause 7.2.1 Standard Sleeveless Vest above except that the background material colour for this vest must become a compliant fluorescent yellow green (sometimes referred to as lime yellow).

The STMS sleeveless vest garment identifies the specialised responsibility of the wearer. It enables the person responsible for TTM at a worksite to be readily identified. Hence it may only be worn by the person responsible for this function at the time.

Figure 4: STMS Sleeveless vest (Dimensions are for the Test size)



STMS Panel			
The orange red panels with black STMS legend must be displayed on the back and front left in the following manner conforming to Figure 4. Note: XS sizes and smaller STMS garments may use a special reduced size panel graded to achieve this design.			
Front Panel Dimensions	100 x 100 ±10mm	**Rear panel dimensions**	250 x 130 ± 10mm
Lettering Colour	Black	**Font**	Helvetica Bold
Letter Height	Front: 35±5mm	Back: 85±5mm	
	Letter height for size XS and smaller STMS garment panels may use an appropriate letter height		

The STMS vest (Figure 4) has the same specifications as the Standard Sleeveless vest specified in Clause 7.2.1 above except for the following sections:

(a) The background material colour must be fluorescent yellow or yellow green, as specified in clause 2.3, Table 2.1 and Table 2.2 of AS/NZS 1906.4. Note: Class NF non-fluorescent high visibility background material may be used for an STMS vest when appropriate. (Refer to 6.1.1 Colour)

(b) A retroreflective orange red STMS panel (Refer to 6.1.2) must be placed on the wearer's upper left front of the garment as shown in Figure 4. This panel may not cover any of the primary retroreflective elements at the front and it replaces the permitted *Primary* logo area referred to in section 6.2 Logos

(c) A retroreflective orange red STMS panel must be placed on the centre upper back of the garment as shown in Figure 4, between the retroreflective braces. This panel may not cover any of the primary retroreflective elements at the back

(d) The optional retroreflective cross configuration on the back of a garment is **not permitted** for STMS garments.

The STMS sleeveless vest may be substituted by a long-sleeved coat, overalls or miscellaneous garment design but must maintain the STMS badging and colour specification.

An STMS must wear this garment on all Level 2 and Level 3 roads.

This garment must also be worn by an STMS on Level LV and Level 1 roads where there are three or more personnel on the site. Where there are fewer than three personnel on the site the STMS may wear a standard orange red garment.

7.2.3 Optional MTC Long-sleeved Vest

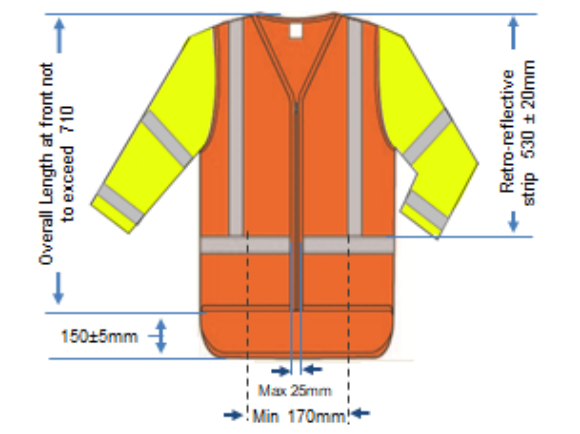
The optional addition of fluorescent yellow material for the sleeve of the Manual Traffic Control (MTC) STOP/GO operator is designed to provide additional visibility for this function when thought appropriate for the location. (Figure 5)

The only item of difference to the compliant fluorescent orange red Standard Sleeveless vest garment is the addition of the sleeve and the sleeve colour together with the addition of retroreflective hoops around the arms to enhance this function when required at night. No additional changes may be included.

The sleeve colour must comply with the colour specified for the STMS Sleeveless vest (refer section 7.2.2 STMS sleeveless vest).

Two compliant retro-reflective hoops must be positioned to comply with the pattern in Figure 5. Each sleeve must have two retroreflective hoops, one positioned above the elbow and one below the elbow close to the wrist. This is designed to maximise conspicuity at night as noted in AS 4602.1 for the addition of hoops on arms and legs.

Figure 5: Optional MTC sleeve for Stop/Go operator
(Dimensions are for the Test size)



7.2.4 Special purpose long-sleeved vest garment for electrical work

This design recognises that the wearer of this garment has a secondary risk in addition to conspicuity. Use of this special purpose long sleeve garment (Figure 6) is limited to electrical employees working with or in and around electrical reticulation systems, substations, switchboards and similar locations where the risk of arc flash is a serious concern.

The design is based on the standard sleeveless vest specified in 7.2.1 and Figure 3. The special purpose long-sleeved vest requirements specify the following significant design features:

(a) The background high visibility and the retroreflective material will exhibit an additional feature such as but not limited to flame retardance hence the background material may be required to be a non-fluorescent orange option. Retroreflectivity will be compliant with ISO 15025 for flame resistance.

(b) In recognition of the added material features it may be necessary to exhibit a material Technical Recognition ID panel on the wearer's upper right front of the garment. (Shown in Figure 6)

(c) Long sleeves have been added

(d) Sleeve colour must comply with the orange colour specified for the sleeveless vest in 7.2.1 Standard Sleeveless vest requirements

(e) Each sleeve must have two compliant flame-retardant retroreflective hoops, one positioned above the elbow and one below the elbow approximately midway between the elbow and the wrist. Minimum separation of these two hoops is 120mm.

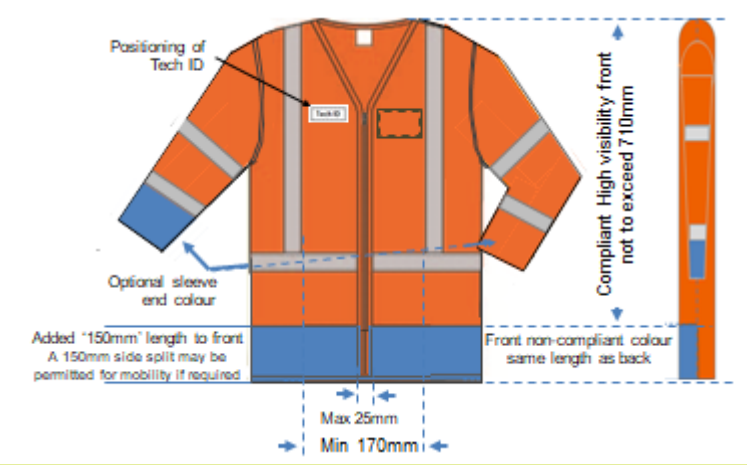
(f) To lessen the effect of wear discolouration, a non-compliant colour (Clause 4 herein) may be added below the retroreflective hoop positioned at the approximate midpoint between the wrist and the elbow

(g) Because the garments material performance is required to protect the entire torso the garment length measurement at the front of the garment has been extended by 150mm to equal the length at the back of the garment.

(h) This extended front section must be a non-compliant colour (Clause 4 herein), other than orange, matching the non-compliant lower sleeve colour if chosen as noted above. A 150mm split in the side seam may be permitted for mobility if required

(i) The rear retroreflective configuration may be an "X" design.

Figure 6: Special purpose garment for electrical work
(Dimensions are for the Test size)



7.2.5 Traffic Incident Manager (TIM) long-sleeved vest garment

The Traffic Incident Manager's role is to guide traffic through a motorway or expressway incident or accident situation frequently coordinating with NZ Police and other emergency services. Their high visibility presentation is similar to the police but with the red and white (or red and silver) checkered retroreflective elements.

Use of this special purpose long sleeve garment (or long-sleeved coat) is strictly limited to authorised Traffic Incident Management (TIM) response personnel because it indicates unique responsibilities and authority.

The long-sleeved design is based on the sleeveless vest specified in 7.2.1 (or the long-sleeved coat specified in 7.3 and Figure 8. This garment must be fluorescent yellow as for the STMS vest specified in 7.2.2 with the following significant design features:

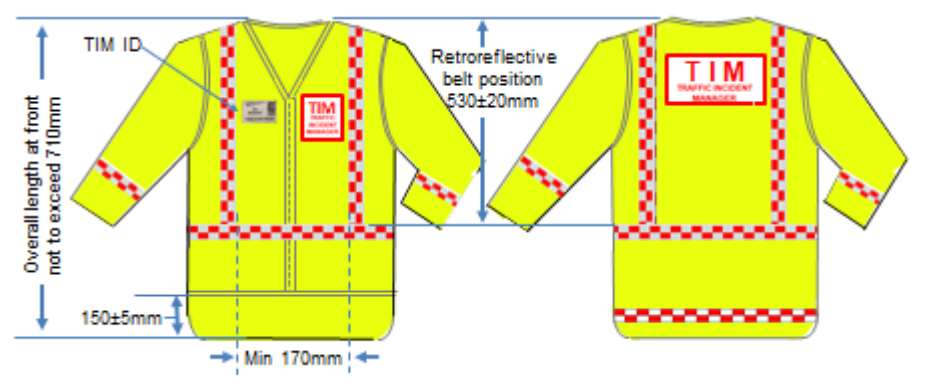
(a) Long sleeves have been added where the sleeve colour must comply with the fluorescent yellow colour specified for the STMS sleeveless vest in 7.2.2

(b) A material TIM ID panel may be added on the wearer's upper right front of the garment. (Shown in Figure 7)

(c) Retroreflective elements must be compliant red and white (or red and silver) chequered material of minimum 50mm width configured as shown in Figure 7.

(d) The optional retroreflective cross configuration on the back of a garment is not permitted for TIM garments

Figure 7: Traffic Incident Manager (TIM) long-sleeved garment
(Dimensions are for the Test size)



TIM Panels and Personal ID Panel

Note: No other high visibility garment may use the red and white or red and silver chequered retroreflective material.

TIM Panel Border Colour	Red 5±2mm (approx equal to red chequer)	
Tim Panel Print Colour	Red (approximate equal to red chequer)	
TIM Panel Font	Helvetica Bold	Front: 25±3mm Back: 50±5mm
TIM Panel Wording	Helvetica	Front: 7 – 10mm Back: 12 – 15mm
Front TIM Panel Max Dimensions	80±5mm x 110±10mm	
Rear TIM Panel Max Dimensions	240±10mm x 110±10mm	
Personal ID Clear Pocket Max Dimensions	100mm x 60mm	

(e) Each sleeve must have a compliant red and white/silver retroreflective hoop positioned at the approximate midpoint between the wrist and the elbow. Addition of a hoop on the arm above the elbow is also permitted if considered to be appropriate for the activity/task/role.

(f) The TIM long-sleeved garment may be substituted by a long-sleeved coat as specified in 7.3, but must maintain the TIM badging (as shown in Figure 7) and maintain the colour specification

A compliant retroreflective white or silver panel must be placed on the wearer's upper left front of the garment (Figure 7). The red print will not be retroreflective. This panel must not cover any of the vertical retroreflective elements on the front of the garment and it will replace the permitted primary logo area.

A retroreflective white or silver panel must be placed on the wearer's upper centre back of the garment between the retroreflective braces (Figure 7). This panel must not cover any of the retroreflective elements on the back of the garment.

Note: XS size and smaller TIM garments may use a special reduced size panel graded to achieve the design shown in Figure 7 without covering any vertical retroreflective elements.

The legend, TIM and TRAFFIC INCIDENT MANAGER, must be displayed on the back and the wearer's upper front left panel as shown in Figure 7.

A matching colour trouser garment may be worn with this garment if thought appropriate, (refer to Clause 6.3 Garment compliance) with compliant red and white (or red and silver) retroreflective hoops, one above the knee and one below the knee with minimum separation of 120mm if considered appropriate.

7.3 Long-sleeved coat

A worker, supervisor, associated engineer or site visitor may, in some instances, find it necessary or practicable to wear a long-sleeve outer coat. (Figure 8) If this garment is to act as a high visibility garment it must comply with the general requirements for the high visibility sleeveless vest specified in section 7.2.1 Standard Sleeveless vest as well as the following additional sections:

(a) The 150mm shirt tail design is to be deleted.

(b) The minimum qualifying area measurement of background high visibility material for the recognised 100 - 105cm test size coat not covered by retroreflective material or printing must be measured in the same way as the sleeveless vest specified in section 7.2.1 Standard Sleeveless vest except that the measurement rectangle must extend a minimum of 830mm at the front and back. Sleeves are not included in this area.

(c) The area of background material must be determined as follows:

i. Front of garment 0.35m^2
ii. Rear of garment 0.35m^2

(d) The sleeves of the garment must be the same fluorescent colour as the torso to a point between the elbow and the wrist.

(e) The collar may be a non-compliant colour (refer Clause 4) but if so the area of compliant material covered when the collar is down must be deducted to achieve the 0.35m^2

(f) Like the Sleeveless vest in 7.2.1 the long-sleeved coat may have either the retroreflective braces configuration or cross configuration on the back. If the optional cross configuration is adopted the cross at the top must align with the front braces at the shoulder and vertically below the shoulder position at the belt to comply with the pattern in Figures 3 and 8.

(g) A hoop of complying retroreflective material must be located between the wrist and the elbow on each sleeve. This may be at the point of a colour change if the lower arm design includes a different colour. Note: An optional hoop of compliant retroreflective material may be located on the sleeves above the elbow if considered appropriate.

(h) A strip of complying retroreflective material must be located on the back of the garment from side seam to side seam positioned 50±5mm from the bottom hem. Note: An option permits this strip to completely encircle the garment.

(i) Non-compliant colours may not be located within the qualifying torso area as trim or pocket flaps. Collar material (refer to Clause 7.1 (g) and Figure 2) may be a non-compliant colour but any such material that covers qualifying high visibility material in its collar down position must be deducted from the qualifying torso area.

Figure 8: Long-sleeved coat (Dimensions are for the Test size)

(j) To lessen the effect of wear discolouration, non-compliant material colours may be used:
- i. As noted above for the garment collar (also refer to Clause 7.1 (g) and Figure 2)
- ii. Below the retroreflective hoop at the midpoint between elbow and wrist.

(k) The long sleeve coat may incorporate an underarm gusset (Clause 7(c)) using either material or up to four 10mm (max) eyelets per sleeve to provide underarm ventilation for a wearer's personal comfort (Figure 1)

(l) A matching colour trouser garment may be worn with this garment if thought appropriate, (Refer to Clause 6.3 Garment compliance) with compliant retroreflective hoops that should be configured to approximate the lower area and legs of the overalls garment (section 6.4).

7.4 Overall Garment

Where required, a worker may find it necessary or practicable to wear a one-piece overall type garment as shown in Figure 9. If this garment is to act as a high visibility garment it must comply with the general requirements for the high visibility standard sleeveless vest specified in section 7.2.1 Standard Sleeveless vest as well as the following additional sections:

(a) The 150mm shirt tail design is no longer applicable.

(b) The minimum qualifying area measurement of background high visibility material for the recognised 100 - 105cm test size garment not covered by retroreflective material or printing must be measured in the same way as the sleeveless vest specified in section 7.2.1 Standard Sleeveless vest except that the measurement rectangle must be extended to a point on the leg above the knee. Sleeves are not included in this area. High visibility material colour may extend below the knee if considered appropriate.

(c) The minimum area of background material must be determined as follows:
- i. Front of garment 0.35m^2
- ii. Rear of garment 0.35m^2

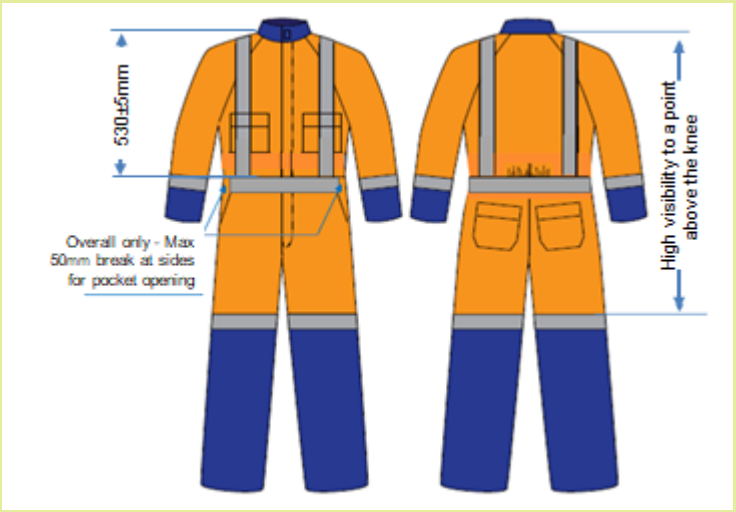
(d) The sleeves of the garment must be the same high visibility orange colour as the torso to a point no less than midway between the elbow and the wrist (refer also to Item (j) below)

(e) Compliant retroreflective material on the torso must be positioned to comply with the configuration in Figure 9. Note: A break in the 'waist' hoop of no more than 50mm on each side is permitted (refer section 6.3 Garment compliance) to enable pocket openings.

(f) An optional cross configuration permitted for the back only must meet the front braces at the shoulder and the belt at the back vertically below the shoulder position to comply with the pattern in Figure 9

(g) A compulsory hoop of compliant retroreflective material must be located between the wrist and the elbow on each sleeve and above the knee on each leg to enhance long distance recognition of the wearer as outlined in AS 4602.1 and Figure 9. These hoops of retroreflective may be located at a change of colour if a change is designed. (refer Item (j) below)

Figure 9: Overalls garment (Dimensions are for the Test size)



(h) An optional hoop of compliant retroreflective material may be located on the sleeves above the elbow and on the legs below the knee close to the ankle if considered appropriate (AS 4602.1)

(i) Non-compliant colours may not be located within the qualifying area as trim or pocket flaps. Collar material may be a non-compliant colour but any such material that covers qualifying high visibility material in its normal worn position must be deducted from the qualifying torso area.

(j) To lessen the effect of wear discolouration non-compliant material colours (refer Clause 4 Definitions) such as blue as shown in Figure 9 may be used:

i. As noted above for the garment collar (refer also to Clause 7.1 (g) and Figure 2)
ii. Below the retroreflective hoop between elbow and wrist on the arm and below the upper hoop on the leg of the overall.

7.5 Miscellaneous garment

Garment types alternative to the primary garment specified in section 7.2.1 Standard Sleeveless vest such as Polo shirts, woven shirts, 'T' Shirts, long sleeved vests and polar fleece garments may be granted compliance providing the following is met:

(a) The garment is originally designed to be used as a compliant high visibility garment versus being modified from an "off the shelf" garment.

(b) An optional cross configuration permitted for the back only must meet the front braces at the shoulder and the belt at the back vertically below the shoulder position to comply with the pattern in Figure 10.

Figure 10: Miscellaneous garment (Dimensions are for the Test size)

(c) The minimum qualifying area measurement of background high visibility material for the recognised 100-105cm test size garment not covered by retroreflective material must be:

i. Front of garment 0.24m^2
ii. Rear of garment including the 150mm shirt tail 0.3m^2.
iii. Sleeves are not included in this area

(d) The configuration of compliant retroreflective material complies with the configuration specified in Figure 10 including a strip on the shirt tail at the back

(e) Where the design includes short sleeves they must remain the same high visibility colour as the garment. If long sleeves they must remain the same high visibility colour to a point no less than midway between the elbow and wrist

(f) If the garment has long sleeves, placement of a compliant retroreflective hoop on the arm between the elbow and the wrist is required as shown in Figure 10.

i. Material area in the sleeves must not be used to achieve area compliance for high visibility background colour
ii. An optional hoop of compliant retroreflective material may be located on the sleeves above the elbow if considered appropriate

(g) The area of compliant high visibility background material is measured from material that will be visible when the garment is worn in its normal manner. Note: Wearers should be aware that such garments will not comply when tucked into trouser type garments

(h) Non-compliant colours may not be located within the qualifying torso area as trim or pocket flaps. Collar material may be a non-compliant colour but any such material that covers qualifying high visibility material in its collar down position must be deducted from the qualifying torso area.

(i) A matching colour trouser garment may be worn with this garment if thought appropriate, (Refer to Clause 6.3 Garment compliance) with compliant retroreflective hoops that should be configured to approximate the lower area and legs of the overalls garment (section 6.4).

8. EMERGENCY SERVICES GARMENTS

Emergency Service personnel attending emergencies within the roading network are reminded of the need to be visible in all conditions whilst on or near the roading network.

The objective of this section is to recognise special requirements for emergency services personnel while working on or near the road at a fire or other emergency where the wearing of safety garments must first meet the unique requirements of the emergency service in attendance or any unique situation at hand.

Essential emergency service related garment recognition patches or printing may exceed section 6.2 Logo specifications provided size and number are limited and do not risk overall visibility safety.

It is recognised that emergency services background high visibility material will be a colour other than orange providing immediate differentiation from roading contract employees. The material however must be Class F or Class NF conforming to the requirements of clause 2.3 or 2.4, Table 2.1 and Table 2.2 or Table 2.3 in AS/NZ1906.4. Such material should comply in a dry and wet condition as noted in section 6.1.1 Colour herein.

When carrying out routine tasks within the roading corridor, not actively involved in an emergency, such as surveying/servicing equipment or reviewing a site where recognition of the individual service is not essential, a high visibility garment complying with this document should be worn providing this is appropriate for the situation at hand and the wearing of such a garment will not become inappropriate or hazardous for the wearer[8].

Emergency services personnel attending such emergencies within the roading network are exempted from wearing *TTMC-W23* compliant high visibility garments in the following circumstances:

8.1 Fire and Emergency Services (FENZ)

(a) FENZ personnel are at the immediate fire or potential fire location

(b) High visibility is achieved by a garment that in addition to compliance with AS/NZS 4967 or AS/NZS 4824 Standards also complies with AS/NZS 4602.2 *High visibility safety garments Part 2: Garments for fire service personnel*

(c) Fire service personnel carrying out traffic control support of an emergency are reminded of the need to be visible.

8.2 NZ Police

NZ Police personnel attending situations within the roading network, for emergency or standard duties are exempted from wearing TTMC-W23 compliant high visibility garments when wearing specialised police safety garments.

8.3 Ambulance services

It is recognised that ambulance services such as, but not limited to, St John Ambulance and Wellington Free Ambulance may wear yellow green garments that, typically, closely approximate the TTMC high visibility design specifications in this document. Such garments are accepted by this document.

Ambulance personnel required to wear specialised safety garments when attached to and working in emergency situations with NZ Police (Refer section 8.2), are exempted from the requirement to wear high visibility garments or when specifically engaged in an activity where wearing high visibility is adjudged inappropriate for identifiable safety reasons.

[8] *TTMC-W17* compliant or such updated confirmation designation as may be required. At time of publication of this specification garment label compliance lettering is forecast to change to *TTMC-W23*

9. EXEMPTION FOR EXTRA SMALL SIZE GARMENTS

Dispensation for an extra small fitting garment will be permitted provided it meets the requirements of the compliant recognised 100 - 105cm test size garment with the following exceptions:

(a) If any extra small garment in a compliant design range is unable to meet the minimum 0.24m^2 (front) and 0.3m^2 (rear) area of compliant high visibility background material the garment will be deemed to comply provided the design grading decreases proportionately without affecting the design integrity of the compliant 100 - 105cm test size of the garment range

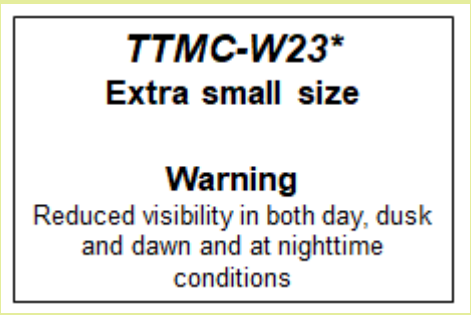
(b) Such extra small size garment must maintain the same configuration of compliant minimum 50mm wide retroreflective material as specified for the recognised 100 - 105cm test size of the design.

In addition, the following sections also apply to extra small fitting garments:

A card, which is clearly visible to a purchaser, must be included in the garment's packaging stating that this extra small fitting garment has reduced visibility in both daytime and night conditions.

An additional separate sewn in label clearly visible to the wearer (refer Figure 11) must alert the wearer to the reduced conspicuity of extra small fitting garments.

Figure 11: Extra small size garment label



** Must change from TTMC-W17 to TTMC-W23 by 30th June 2024.*

10. GARMENT DURABILITY

Due care and maintenance of high visibility safety garments is recommended. Garment soiling, colour fading of background high visibility material, abrasion and damage to retroreflective strips all affect the high visibility performance of safety garments.

Employers and wearers of high visibility safety garments must be aware of the condition of any such garment on the day it is being worn. Garments must be inspected on a regular basis and replaced if they are badly damaged, soiled or faded, or the retroreflective material has ceased to function.

High visibility safety garments must be in an acceptable condition at all times. To maximise durability of high visibility garments:

(a) High visibility garments must be kept clean by washing or cleaning as regularly as is practicable ensuring that manufacturer's instructions are noted and followed

(b) Where ever practicable garments should be stored in such a way as to limit fading of high visibility background material especially fluorescent colours. When not in use place in a dark location away from natural light. High visibility background material colour, especially fluorescent colours, fade when left in natural daylight and especially in direct sunlight.

11. OPTIONAL ILLUMINATED ATTACHMENTS

In specific circumstances within a worksite it may be appropriate to enhance personal night-time/low light retroreflective garment conspicuity with the addition of a self-illuminating system that will attach to an approved high visibility garment that already complies with one of the options specified in section 7 Garment design

Such circumstances would normally be limited to specific locations within a worksite where moving vehicles and or equipment do not have or may not be operating an appropriate head light system that is necessary to provide retroreflective light back to the driver of such vehicles or equipment. In areas where headlights are active the retroreflective performance provides worker conspicuity and this will typically overpower an illuminated attachment.

The wearer of any such approved system must be aware that its performance is limited and will only be visible to a vehicle or equipment operator when positioned within the driver's line of sight. The wearer must be instructed to be vigilant whenever working or moving behind operating vehicles that may be reversing and equipment that may swing through an operational circle.

Equally the wearer of an approved illuminated attachment must be responsible for ensuring it is fully charged and suitable for use at the time it is being used and that site management or the STMS is aware of its use on site.

Any such system must be approved by the Lead Safety Advisor Waka Kotahi prior to being marketed for use in TTM sites within the roading network.

To be approved, a system must be adjudged suitable for purpose by Waka Kotahi and comply with the following specifications:

(a) The illuminating system must be removable from the garment during daylight hours or when not in use

(b) No part of the system may cover any part of the garment's compliant retroreflective configuration

(c) The illuminated area must be in the vertical plane and limited to the length of the vertical retroreflective strips without crossing the retro-reflective hoop at the waist

(d) The colour when illuminated must be white or a close blue/white proximity. No other bold colours are permitted

(e) The illumination must be non-flashing. If a flashing capability is possible it must not be activated on any TTM worksite

(f) To ensure compatibility with the retroreflective strips the illuminated area must be not less than 10mm or more than 15mm in width

(g) During the hours of daylight no part of the illuminating attachment may cover any portion of the compliant area of day time high visibility material

(h) If the illuminating component of the system requires a permanently fixed attachment this must be transparent and not impair the compliant daytime background high visibility compliant area of the garment. Garments are only to be fitted with the attachment system where there is a high probability of regular use of the system. The permanently attached component must be no more than 10mm wider than the illuminating component

(i) The system design should ensure that, when attached, potential for the system to catch on machinery or structures is limited and or in case of the system being caught that it will release and not endanger the wearer

(j) Any system approved must comply with section 6.2 Logos

(k) When tested the surface luminance must be no less than 15cd/m^2 or greater than 25cd/m^2 measured at 90 degrees to the illuminated surface

(l) The battery system must be specifically matched to the system's requirements, be robust, light weight and weatherproof and held firmly into a compliant pocket of the garment

(m) The tested system must demonstrate that the battery has the ability to maintain a level of performance suitable for purpose for a minimum of eight hours and preferably include a warning indicator for low battery status

(n) Any garment fitted with a permanent attachment component for an illumination system must include this in the garments care instructions on the label.

Should a visiting site safety engineer sight an illumination system currently in use to be exhibiting a performance deemed not suitable for the situation at hand such engineer may require the system to be withdrawn from use and retested to determine that performance qualifies to this specification.