

AS 4602.1:2024



STANDARDS
Australia



High visibility safety garments

Part 1: Garments for high risk applications



AS 4602.1:2024

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- Transport for NSW

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High visibility safety garments

Part 1: Garments for high risk applications

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Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Technical Committee SF-050 High Visibility Clothing, to supersede AS/NZS 4602.1:2011.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this document as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this document is to provide the conspicuity requirements for high visibility safety garments for occupational wear by people who may be exposed to the hazard of moving traffic, moving plant or equipment in high risk situations. The document covers garments suitable for use —

- (a) in daylight conditions only;
- (b) in night-time conditions only, where they will be seen by retroreflected light;
- (c) under both conditions of daylight and night-time;
- (d) in low light conditions; and
- (e) in adverse environmental conditions.

A list of all parts in the AS 4602 series can be found in the Standards Australia online catalogue.

The major changes in this edition are as follows:

- (i) Introduction of new levels of conspicuity within each garment class.
- (ii) Introduction of specifications for garment arms and legs.
- (iii) Revision of the material wash specification as documented in AS/NZS 1906.4.
- (iv) New definitions for garment reference points.
- (v) Addition of requirements for durability.

The terms “normative” and “informative” are used in Standards to define the application of the appendices to which they apply. A “normative” appendix is an integral part of a Standard, whereas an “informative” appendix is only for information and guidance.

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Introduction

This document has been developed to enable selection of the appropriate high visibility safety garment for use in high-risk applications. It introduces classification levels that may be assigned to garments after a risk assessment of the end-use application has been conducted. See [Appendix C](#) for guidance on the selection of garments.

When selecting occupational high visibility safety garments for use in high-risk applications, the impact that contrast plays in the basic principles of conspicuity needs to be considered in relation to the wearer's occupation, environment, tasks and risks. The ability to see an object depends on how it differs from or contrasts with its environment in size, colour, shape and motion. Greater contrast provides improved visibility.

The requirements for occupational high visibility safety garments for use in high risk applications have been based primarily on the need in road and rail traffic situations for the wearer to be seen within the time necessary for any safety action to be completed by the operators of approaching vehicles. This will reduce the risk of an accident and/or reduce the severity of injury in an accident. Their use is, however, recommended in all occupational situations of similar risk level, where wearers of garments need to be seen at distance, against variable and potentially complex visual backgrounds, in conditions of reduced or poor visibility or where the wearer may appear suddenly in the path of a vehicle or item of moving plant.

It is important that, in order to achieve the most effective use from high visibility garments, wearers have some understanding of the way fluorescent and retroreflective materials achieve high visibility. These mechanisms are as follows:

(a) *High visibility materials for daytime and low light conditions —*

Daytime and low light high visibility for safety garments is typically achieved through the use of fluorescent materials.

Fluorescent material is impregnated with a substance that may be a dye or pigment and has the property of converting energy at shorter wavelengths (including ultraviolet) to light in the visible spectrum, noticeably increasing the amount of visible light and colour reflected and emitted from its surface. Fluorescent material emits electromagnetic radiation at visible wavelengths longer than those absorbed and therefore works best where there is an appreciable amount of shorter wavelengths (most notably, in this context, daylight) falling on the material.

Importantly, the fluorescent dye or pigment is typically applied to synthetic fibres, as it cannot practicably be applied to some fibres such as wool, cotton, and aramid.

Garments made from some synthetic fibres may not be practical or fit-for-purpose in some environments. For this reason, an allowance is made for the use of non-fluorescent colours in situations where, for health and safety reasons, in addition to conspicuity outcomes, fibres that will not adequately retain fluorescent colour may be used as the safety solution.

(b) *Retroreflective materials for use at night-time and low light conditions —*

Night-time and low light high visibility for safety garments is typically achieved through the use of retroreflective materials. Retroreflected colour is not specified for retroreflective materials. The essential night-visibility requirement for high visibility garment material is for absolute retroreflective performance regardless of colour.

Typically, high visibility materials do not provide conspicuity in low light conditions, and retroreflective materials do not provide conspicuity in daytime conditions.

Attention is drawn to the additional night-time conspicuity which can be achieved by the use of retroreflective material on the limbs applied in design to a 360° biomotion pattern (arms and legs), in

addition to the retroreflective material applied to the torso. Requirements for biomotion garments are specified in [Clause 5](#). See [Appendix B](#) for additional information on this topic.

NOTE Biomotion is the motion of a moving human being.

Australian Standard®

High visibility safety garments

Part 1: Garments for high risk applications

1 Scope

This document specifies the conspicuity requirements for high visibility safety garments for occupational wear by people who may be exposed to the hazard of moving traffic, moving plant or equipment in high risk situations. The document covers garments suitable for daytime, night-time and low light, as well as environmental conditions that may impact visibility.

Selection of an appropriate garment is predicated on a risk assessment relevant to its intended use and for the life of the garment.

This document does not cover garments used by fire services for firefighting activities

NOTE Visual requirements for firefighters' garments and ensembles are specified in AS/NZS 4602.2.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS 4399, *Sun protective clothing — Evaluation and classification*

AS/NZS 1906.4, *Retroreflective materials and devices for road traffic control purposes, Part 4: High visibility materials for safety garments*

AS/NZS 1957, *Textiles—Care labelling*

ISO 3758, *Textiles — Care labelling code using symbols*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in AS/NZS 1906.4 and the following apply.

3.1

background material

coloured daytime high visibility materials intended to be highly conspicuous, that meet the chromaticity and luminance requirements of AS/NZS 1906.4

3.2

classification of garments

class of garment design, style or type intended to meet functional requirements for an individual with the intent to provide improved safety outcomes where the risk in hazardous situations of not being seen is high

3.3

styles of high visibility safety garment

styles of garments specified under specific viewing conditions with the intent to provide an individual with improved safety outcomes where the risk in hazardous situations of not being seen is high

3.3.1

coverall

sleeveless or sleeved garment where the torso and trouser section are permanently joined to form a single garment

3.3.2

ensemble

torso garment and a separate trouser garment where, although not joined, both garments are worn together so that the torso garment and trouser garment will be viewed as a whole in a similar manner to the coverall garment, typically referred to as an ensemble combination garment

Note 1 to entry: The ensemble combination garment will typically be worn to enable a conforming torso garment to achieve equality with a coverall garment where this is required. The torso section of this combination may still be worn by itself.

3.3.3

outer wear

garment that is designed to be worn untucked over the top of other clothes

Note 1 to entry: Outer wear may include jackets, vests and items that fit over garments that cover the legs.

3.3.4

shirt

garment designed to be worn on the torso

3.4

cleaning

process by which a high visibility safety garment is kept serviceable and/or hygienically wearable by removing any dirt or contamination

3.5

high visibility safety garment

garment designed and configured to provide improved conspicuity for an individual in situations where the risk of not being seen in hazardous situations is high

3.6

retroreflective material

material in accordance with AS/NZS 1906.4 that exhibits retroreflective properties. Retroreflective material may have fluorescent properties, or have a combination of both retroreflective and fluorescent properties

Note 1 to entry: Retroreflective material is attached to the outermost surface of the high visibility safety garment

Note 2 to entry: Class R, Class RF or Class SP retroreflective material with a material or fabric substrate; produced or altered to form perforated holes across the bandwidth of the retroreflective material to enhance breathability, may be applied to the outermost surface of the safety garment.

3.6.1

Class R

retroreflective material

material, fabric or laminated transfer film intended to exhibit retroreflective properties throughout the entire area of the material

3.6.2

combined performance material

material, fabric or laminated transfer film intended to exhibit both fluorescent background properties and retroreflective properties throughout the entire area of the material

3.6.3**separate performance material**

material, fabric or laminated transfer film intended to exhibit separately retroreflective properties (Class R) and fluorescent background properties (Class F) in different sections of the material

3.6.4**chequered material**

combined performance or separate performance material designed in a chequered pattern of different colours throughout the entire area of the retroreflective material

3.6.5**segmented material**

separate performance or combined performance laminated transfer film that has portions removed from an area of the material

3.7.6**perforated retroreflective tape**

retroreflective material, combined performance material or separate performance material constructed with a solid material or fabric substrate intended to exhibit retroreflective or fluorescent background properties. Perforated retroreflective tape is constructed with holes penetrating through the material or fabric for improved airflow, which may improve comfort to the wearer in certain environments and or applications

3.8**torso**

trunk or core of the body to which the arms, legs, and neck are attached

Note 1 to entry: Measurement of the area of a garment covering the torso is specified in [Clause 6.4](#).

3.9**washing cycle**

one washing and separate drying cycle

3.10**wash durability**

change to product performance over time due to exposure to cleaning

3.11**wet weather garment**

high visibility safety garment manufactured using material that conforms to AS/NZS 1906.4 Class F(W) or NF(W)

4 Reference garments for assessment purposes

4.1 General

The garment used for assessment against this document shall meet the following requirements. Garments that cover the torso (including coveralls) shall be sized to fit a 100 cm to 105 cm body chest measurement. Trousers shall be sized to fit an 85 cm to 89 cm waist. All other sizes in the range shall remain consistent through the garment size range with the grading increasing or decreasing according to the design of the garment. The measurement reference points used throughout this document shall be determined in accordance with [Clause 4](#).

4.2 Elbow reference point

The elbow reference point is the mid-point between the bottom of sleeve and underarm reference point. See [Figure 1](#).

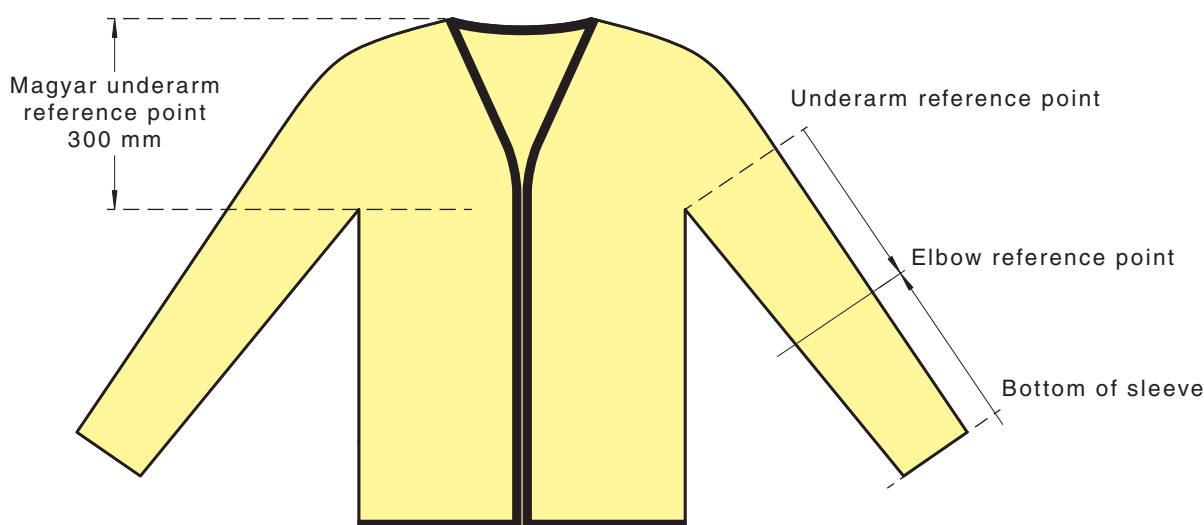


Figure 1 — Elbow reference point and Magyar underarm reference point

4.3 Underarm reference point

The junction of the armhole seam and the side of the body seam becomes the underarm reference point. Where there is a Magyar or batwing design, the Magyar underarm reference point is determined by measuring 300 mm vertically down the body of the garment from the high shoulder point and then at 90 degrees until the side seam is intersected. See [Figure 1](#).

4.4 Knee reference point

The knee reference point is the position at half the inleg length (i.e. from the inleg seam junction to the bottom of the hem), and 50 mm towards the waist of the garment. A line running 90 degrees across the leg from the marked point is the knee reference point. See [Figure 2](#).

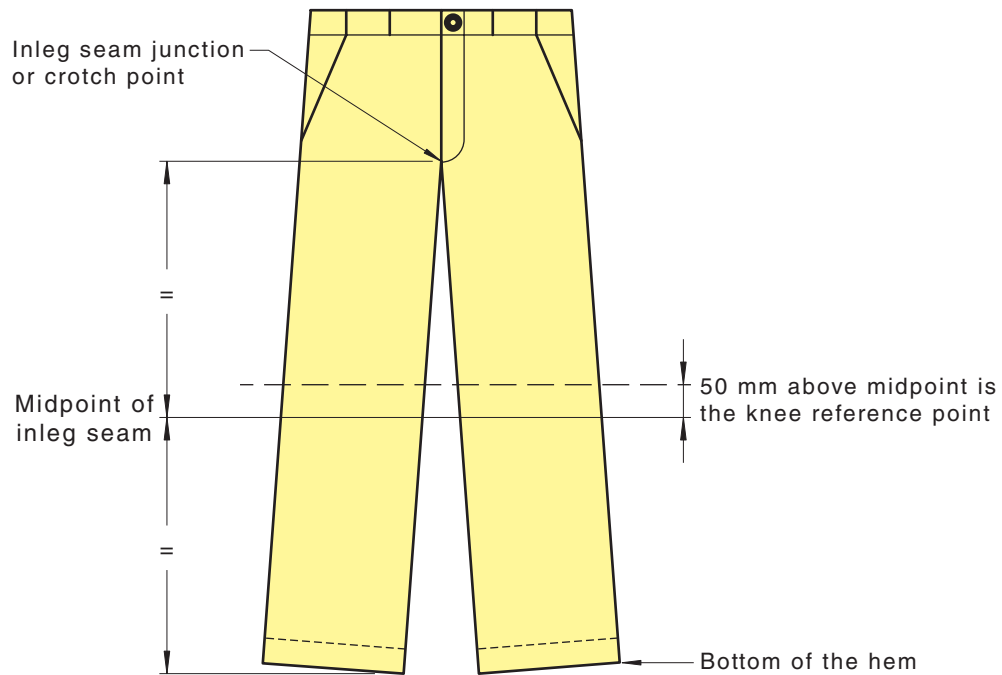


Figure 2 — Knee reference points

4.5 High visibility (HV) waist level

The high visibility (HV) waist level runs across the width of the garment, 550 mm below the high shoulder point. The waist level may be lower for garments designed to be worn over clothing or worn as outer wear (e.g. vests, jackets, coveralls, etc). See [Figure 3](#).

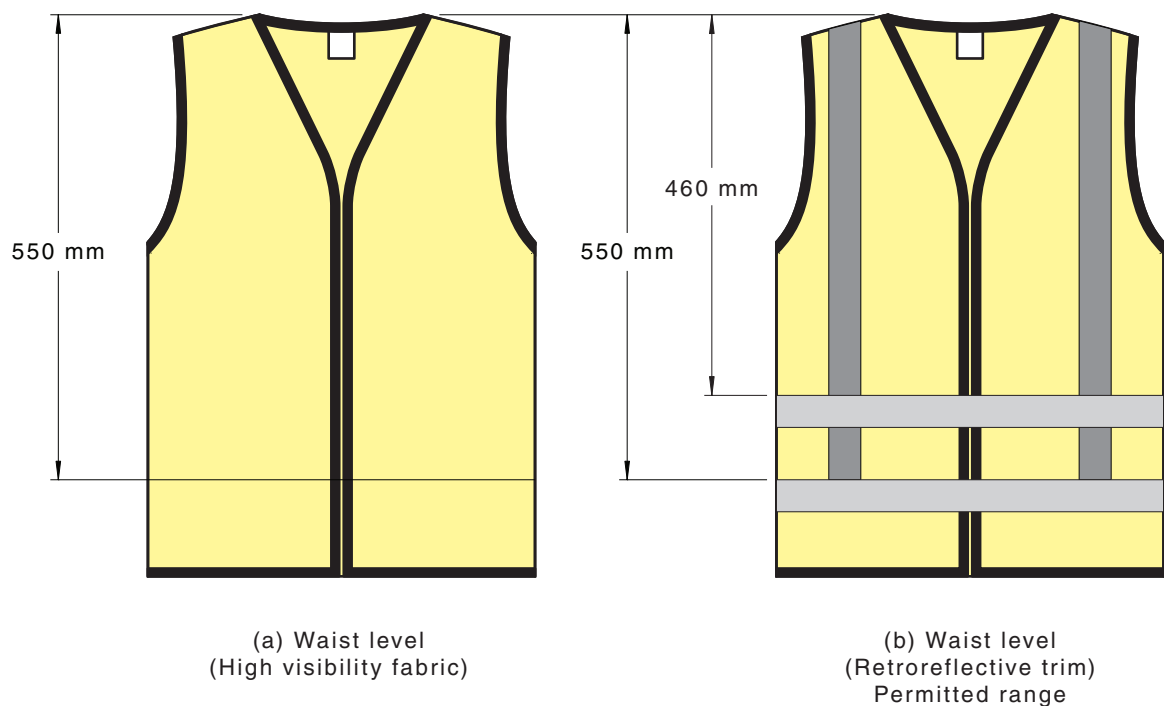


Figure 3 — HV and RT waist levels

4.6 Retroreflective trim (RT) waist level

The retroreflective trim (RT) waist level runs across the width of the garment, between 460 mm to 550 mm from the high point of the shoulder. See [Figure 3](#).

5 Classification of garments

5.1 Classification of garment end use

The applicable end use of garments specified in this document are:

- (a) Class D — A high visibility safety garment designed for daytime use only.
- (b) Class N — A high visibility safety garment designed for night-time use only.
- (c) Class D/N — A high visibility safety garment designed for daytime and night-time use.

5.2 Classification of garment levels

The garments specified in this document are classified as follows in [Tables 1](#) and [2](#):

Table 1 — Torso garment requirements

Classification	Level	Type of garment	General description
Class D		Covering torso with or without arms	Shirts, vests, coveralls (torso only), and outer wear made using background material meeting the requirements of Clause 3.1 . See Clause 6.4 .
Class N	1	Covering torso with or without arms	Shirts, vests, coveralls (torso only), and outer wear that incorporate retroreflective trim meeting the design requirements of Clause 7.3.2 (a). See Clause 7.3 .
	2	Covering torso and arms	Shirts, coveralls (torso only), and outer wear that incorporate retroreflective trim meeting the design requirements of Clause 7.3.2 (b) (i.e. one hoop of retroreflective trim on each arm). See Clause 7.4 .
	3	Covering torso and arms	Shirts, coveralls (torso only), and outer wear meeting the design requirements of Class N Level 2, with the addition of an extra hoop of retroreflective trim on arms (i.e. two hoops on each arm in a biomotion design). See Clause 7.6 .
Class D/N	1	Covering torso with or without arms	Shirts, vests, coveralls (torso only), and outer wear made using background material meeting the requirements of Clause 3.1 and the addition of retroreflective trim meeting the design requirements of Clause 7.3.2 (a). See Clause 8.5 .
	2	Covering torso and arms	Shirts, coveralls (torso only), and outer wear made using background material meeting the requirements of Clause 3.1 and the addition of retroreflective trim meeting the design requirements of Clause 7.3.2 (b) (i.e. one hoop of retroreflective trim on each arm). See Clause 8.6 .
	3	Covering torso and arms	Shirts, coveralls (torso only), and outer wear made using background material meeting the requirements of Clause 3.1 and meeting the design requirements of Class D/N Level 2, with the addition of an extra hoop of retroreflective trim on arms (i.e. two hoops on each arm in a biomotion design). See Clause 8.8 .

Specific requirements for each level can be found in the relevant classes of garment.

Table 2 — Coverall and ensemble garments — Torso and trouser requirements

Classification	Level	Type of garment	General description
Class N-E	2	Ensemble	Coveralls (below waist) and trousers made using contrast material, with one hoop of retroreflective trim on each leg positioned below or above the knee reference point. Coverall upper shall meet the requirements of Class N Level 2. Trousers shall be worn with a Class N Level 2 torso garment to complete the ensemble. See Clause 7.5
	3	Ensemble	Coveralls (below waist) and trousers made using contrast material, with two hoops of retroreflective trim on each leg positioned below and above the knee reference point. Coverall upper shall meet the requirements of Class N Level 3. Trousers shall be worn with a Class N Level 3 torso garment to complete the ensemble. See Clause 7.7 .
Class D/N-E	2	Ensemble	Coveralls (below waist) and trousers made using background material meeting the requirements of Clause 3.1 and the design requirements of Clause 8.7 , with one hoop of retroreflective trim on each leg positioned below or above the knee reference point. Coverall upper shall meet the requirements of Class D/N Level 2. Trousers shall be worn with a Class D/N Level 2 torso garment to complete the ensemble. See Clause 8.7
	3	Ensemble	Coveralls (below waist) and trousers made using background material meeting the requirements of Clause 3.1 and design requirements of Clause 8.7 , with one hoop of retroreflective trim on each leg positioned below and above the knee reference point. Coverall upper shall meet the requirements of Class D/N Level 3. Trousers shall be worn with a Class D/N Level 3 torso garment to complete the ensemble. See Clause 8.9 .

NOTE Although coveralls are a one-piece garment, for the purposes of design and testing, the section below the waist is classified as an ensemble trouser.

Garment labels for trousers shall include information specifying the accompanying torso garment required to complete an ensemble (See [Clause 12](#)). Trousers worn by themselves do not meet the requirements of an ensemble.

To be a conforming high visibility ensemble, the torso and trouser garment levels shall match. For example, a level 2 torso garment would have to be paired with a level 2 trouser to achieve a level 2 ensemble. Where the torso and trouser garments do not match, this does not form an ensemble, and it defaults to the torso-only conforming garment. The torso and below waist sections of coveralls shall be assessed in the same way.

5.3 Classification of materials

The materials specified in this document are classified as follows:

- (a) Class F — High daytime visibility fluorescent material.

- (b) Class F(W) — High daytime visibility fluorescent material that has met both the requirements for Class F material and the wet weather test.
- (c) Class R — Retroreflective material for use on garments used in night-time and low light conditions.
- (d) Class RF — Combined performance retroreflective/fluorescent material meeting all of the requirements of Class R and the daytime colour of Class F.
- (e) Class NF — High daytime visibility non-fluorescent material.
- (f) Class NF(W) — High daytime visibility non-fluorescent material that has met both the requirements for Class NF and the wet weather test.
- (g) Class SP — Separate performance material where one component meets the requirements of Class F and a separate component meets the requirements of Class R.

NOTE Refer to AS/NZS 1906.4 for requirements of these materials.

6 Class D garments

6.1 General

Class D garments are intended to provide the wearer with high visibility under daylight and low light viewing conditions. Wearers should take care that these garments are not mistakenly worn in night-time and low light conditions in situations that put the wearer at risk. All risk assessments shall be carried out on the reference garment specified in [Clause 4](#).

NOTE 1 For selection and use information, see [Appendix C](#).

NOTE 2 Daytime, high visibility materials are generally not as effective when viewed under artificial light.

6.2 Fluorescent background material

Unless permissible in accordance with [Clause 6.3](#), Class D garments shall be made from background material conforming to the requirements of AS/NZS 1906.4 for Class F or F(W) materials.

NOTE An optional subdivision of the colour orange-red into orange and red is shown in AS/NZS 1906.4 for the benefit of industries that require the distinction for colour coding purposes. Those who require such distinction are advised to determine whether garment colours meet their requirements by visual inspection.

6.3 Non-fluorescent background materials

Where used, non-fluorescent background materials shall meet the requirements of AS/NZS 1906.4 Class NF or NF(W).

Materials practicably capable of accepting fluorescent dyestuff shall meet the requirements of [Clause 6.2](#). These materials shall not be assessed against [Clause 6.3](#).

Garments that contain Class NF or NF(W) materials do not have the high daytime visibility properties of fluorescent (Class F or F(W)) materials and will provide reduced conspicuity for the wearer.

Where specific safety requirements exist (e.g. metabolic heat-loss, protection from heat and flame and electrostatic requirements) that require a garment to be made from a background material not meeting the requirements of [Clause 6.2](#), Class NF or NF(W) materials may be used.

NOTE It is recommended that a risk assessment is undertaken before utilizing a garment made of NF or NF(W) material.

6.4 Design of garments — Class D

6.4.1 General description

A Class D garment shall comprise a garment or combination of garments of any desired type or style which, at a minimum, encircles the torso.

High visibility background material as specified in [Clause 6.2](#) or [6.3](#) shall extend continuously downwards from the top of the torso (inclusive of shoulders) and for the entire circumference of the torso, permitted openings and gussets excepted until at least the minimum specified area as described in [Clause 6.4.2](#) is provided on both the front and back of the garment

This requirement does not permit the use of side panels of non-conforming background material.

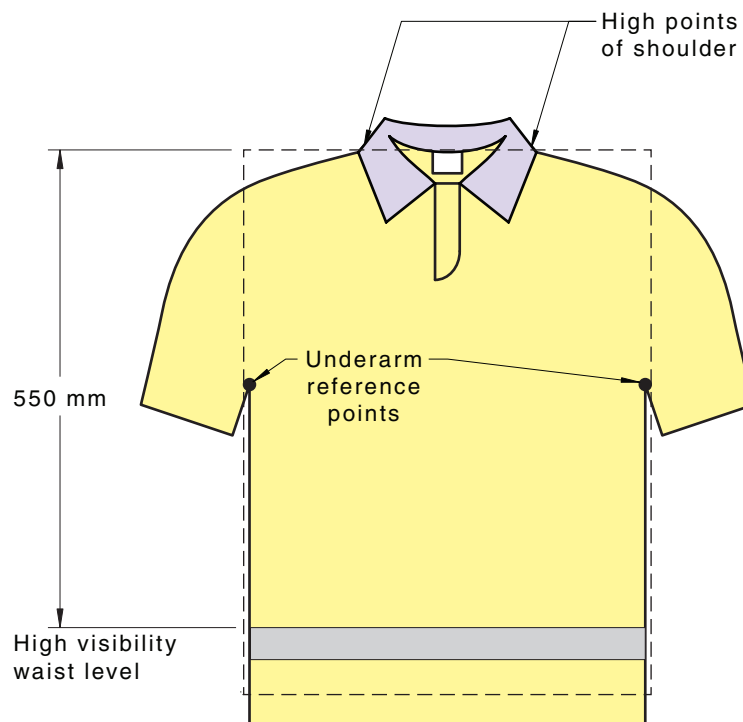
Contrasting thread is permissible for functional or structural seam purposes.

6.4.2 Area of background material

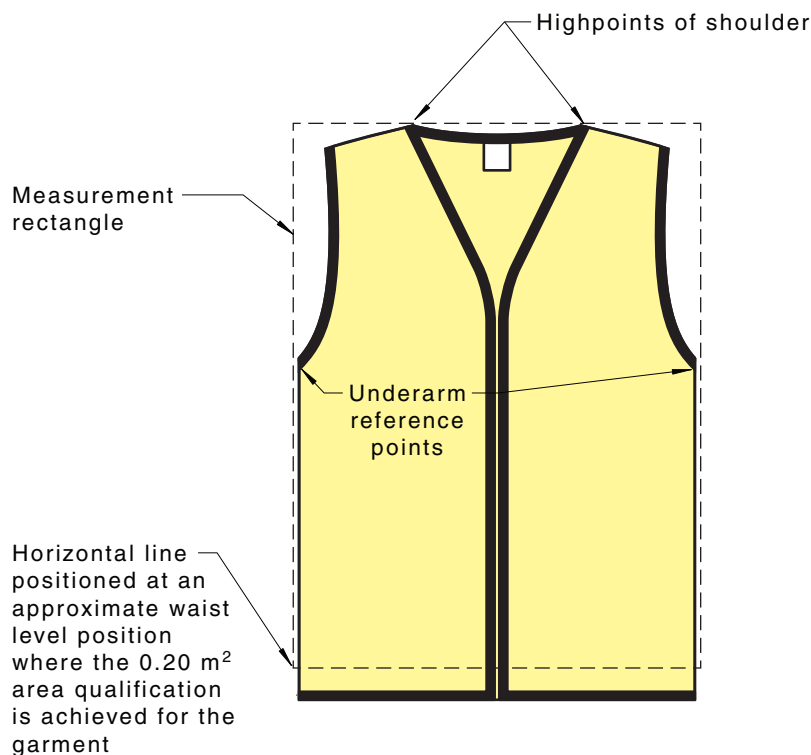
The area of background material shall be not less than 0.20 m² on each of the front and the back of the garment.

The measurable area of background material covering the torso on each of the front and back of a garment shall be determined as follows:

- (a) With the garment laid flat and not stretched in any direction, the area of all high visibility material covering the torso shall be that lying entirely within a rectangle bounded by a horizontal line through the high points of the shoulders, vertical lines through the two underarm reference points and a horizontal line at HV waist level, as shown in [Figures 4\(a\)](#) and [4\(b\)](#).



(a) Shirt with sleeves



(b) Torso outerwear garment

NOTE For torso outer wear garments, calculate the area of the rectangle, then deduct areas without high visibility material, such as the neck opening, the area above the shoulders and the area at the arm hole, under retroreflective strips, gussets, patches, logos, etc.

Figure 4 — Torso background material area measurement

- (b) The following shall be deducted from the total area of the torso material in Item (a):
- (i) Any area below a discontinuity in the full width coverage of background material other than words, logos, pocket trims, permitted openings.
 - (ii) The area of words, logos, pocket trims, underarm ventilation gussets, or retroreflective trims that do not qualify as background material.
 - (iii) The area of any permitted openings.
 - (iv) A collar or any area covered by a collar.

The background material should be measured in accordance with [Appendix A](#).

6.4.3 Permitted openings

In addition to neck and arm holes, vertical openings may be provided for the purpose of donning and doffing the garment. There shall not be more than one such opening visible from any viewing angle. Any such opening shall not be more than 50 mm wide.

6.4.4 Underarm gussets

Underarm ventilation gussets may be provided for wearer comfort. Where provided, they shall —

- (a) visually match the background colour, but do not need to meet the requirements AS/NZS 1906.4; and

- (b) be a maximum of 100 mm wide under each arm and extending not more than 100 mm below the underarm reference point on the torso.

The gusset material shall not qualify as background material for the purposes of [Clause 6.4.2](#), unless it meets all of the colour specification requirements of AS/NZS 1906.4 including the luminance factor.