

Subject 402E (12402-
5,1123,1180,1191,1175,1177,1197,1517)

August 31, 2012

SUMMARY OF TOPICS

The following requirements are being proposed:

1. The first edition of the Standard for Personal Flotation Devices - Part 5: Buoyancy Aids (Level 50) - Safety Requirements, UL 12402-5

STP BALLOTS DUE: October 30, 2012

COMMENTS DUE: October 30, 2012

1. The first edition of the Standard for Personal Flotation Devices - Part 5: Buoyancy Aids (Level 50) - Safety Requirements, UL 12402-5

RATIONALE

Proposal submitted by: Samuel Wehr, Mustang Survival on behalf of International Harmonization Committee for Adoption of UL ISO based Personal Flotation Device Standards (IHC for PFDs).

The PFD community desires to replace the current standards with:

- a) A comprehensive, consolidated wearable PFD standard that serves the current needs of US and Canadian users as well as provide flexibility for innovation, future special or unusual circumstances, and increased wear rate;
- b) A new system of classification that is clear to the user and aligns with ISO standards, where practical, to facilitate international marketing and use; and
- c) Clear product markings and consumer safety information to promote proper selection and encourage use.

This proposed standard is based on the first edition of the ISO standard, published in 2006 (ISO 12402-5:2006), and the amendments published in 2010 (ISO 12402-5/Amd1:2010). The ISO text is proposed to be adopted verbatim with the exception of the National Differences (DVs) described in this Rationale document.

It should be noted that the ISO 12402 series standards are currently under systematic review by the ISO Sub-Committee on Personal protective equipment (ISO/TC188/SC1), in preparation for publication of a second edition of the standards. The proposal contains several DVs (denoted "DT" in the proposal) which have been tentatively agreed by the ISO Sub-Committee for inclusion in the next edition of the ISO standard. Additional discussions of these differences can be obtained via the US/ANSI TAG to ISO/TC188/SC1.

Additionally, the proposal includes a number of editorial DVs (denoted "DE" or, in some cases, "DT" in the proposal), which are not itemized in this Rationale document. Editorial revisions include:

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- removing redundant or conflicting statements,
- replacing references to ISO 12402 with UL 12402,
- clarifying wording or statements, and
- correcting cross-references of clauses within the UL 12402-5 and 12402-9.

Scope

1DV – The phrase “with a buoyancy of not less than 50 N” is removed as it is misleading, according to the buoyancy minimums prescribed by Table 2DV of this Part. Additionally, a statement that all references to ISO 12402 standards are to the requirements as modified by National Differences is added to avoid excessive number additional DVs just to account for changes in the referenced standard(s).

Normative references

2DV – The reference to ISO 12402-9:2006 is updated to the UL 12402-9 version so that the test procedures as modified by Canada and the US are followed.

2DV.1 – ANSI/UL 1191 standard added for use in specifying components that meet current requirements. The IHC has not fully evaluated the impact that harmonizing with ISO 12402-7 will have on the existing PFD market. This normative reference may be removed in the future if/when we adopt Part 7, be it ISO 12402-7 or UL 12402-7.

Terms and Definitions

3.11DV – Multi-chamber buoyancy systems are redefined to be compatible with the new definitions of primary and back-up inflation chambers being added to clarify and simply the requirements. This approach is the result of a working group led by the US and/or Canadian delegation and has been tentatively agreed by the ISO SC.

3.19DV – The definition of hybrid-type PFD is clarified to allow the minimal inherent buoyancy needed to ensure that inflatable PFDs float without inflation similar to current practice.

3.20DV – Bunching defined for use in limiting the displacement of buoyancy within PFDs.

3.21DV & 3.22DV – Definitions for Sheltered waters and Offshore are added to support the revised Performance levels and Classification clauses. This approach is the result of a working group led by the US and/or Canadian delegation and has been tentatively agreed by the ISO SC.

3.23DV through 3.27DV – Primary and secondary inflation and primary, backup, and supplemental inflation chambers are defined to simplify the requirements for the various inflation options provided for multi-chamber buoyancy systems in the standard. This approach is the result of a working group led by the US and/or Canadian delegation and has been tentatively agreed by the ISO SC. (see 3.11DV)

3.28DV – Several terms are added to deal with in-water weight and somatotype requirements in the subject selection requirements in 12402-9/5.6.1.2DV. The IHC realizes that as more data is obtained, adjustments to the limits for the various body types may be needed.

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3.29DV & 3.30DV – Definitions for primary and secondary closure are added to clarify the application of the Secondary closure attachment strength test (See UL 12402-9/5.5.2.9.DV)

3.31DV – Definition of structural component is added to clarify the application of ANSI/UL 1191 in Part 5. (See UL 12402-5/5.1DV)

3.32DV – Definition of Design inflation range is added to clarify the requirements for the inflation test (See UL 12402-5/5.3.2DV)

Classification

4.1DV – The descriptions of the three classes, “buoyancy aids”, “lifejackets”, and “special purpose devices” are revised to use consistent terminology, and improve accuracy and comprehension. The language in this section is the result of a working group led by the US and/or Canadian delegation and has been tentatively agreed by the ISO SC.

Performance levels

4.2DV – The descriptions of the performance levels 50, 100, 150, and 275 are revised to use consistent terminology, and improve accuracy and comprehension. The language in this section is the result of a working group led by the US and/or Canadian delegation and has been tentatively agreed by the ISO SC. Additionally, Level 70 is added to address the “Type III PFDs” in the US and “PFDs” in Canada, which comprise a significant portion of the PFD market.

General Requirements

5.1DV.1 – Specifies the applicability of UL 1191 to all structural components. Note that use codes are not applicable in this standard. However, as Part 5 applies only to buoyancy aids, any component with use code 3 or higher would be considered appropriate. As noted above, this deviation will be revisited after the IHC has completed review and harmonization of ISO 12402-7.

5.1DV.2 – Requires that all child inflatables be fully automatic, not use secondary donning, and have inflators with cylinder seal indication. The reference to multi-chamber arrangements is removed, as they are addressed elsewhere. Additionally, acceptance criteria are added for performance following the inadvertent inflation test.

5.1DV.3 – Several provisions are added consistent with current practice:

1. Limiting the rotating shock bin test to inflatable PFDs and specifying the acceptance criteria.
2. Specifying inflation system status indicator visibility.
3. Requiring that closures be prevented from becoming disengaged from the PFD.
4. Specifying acceptance criteria following temperature cycling exposure.
5. Specifying that lock-type stitching or equivalent be used.
6. Specifying that materials be used in a way that minimizes the potential for raveling.

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7. Specifying acceptance criteria following flame exposure and certain exceptions when the test is not required.

8. Specifying that child size devices be provided with a crotch strap or equivalent.

9. Specifying that certain PFDs meeting specific closure requirements may be identified as suitable for towed and similar uses.

Combination of buoyancy aids and accessories

5.2.1DV, 5.2.1DV.1, 5.2.1DV.2, and 5.2.1DV.3 – Removes requirement that accessories must comply with Part 8. All accessories on buoyancy aids are optional. As such, it is inappropriate to specify requirements for them, outside of the expectation that they not interfere with the performance of the PFD. This clause is currently under review by the ISO SC to resolve the inconsistencies between 5.2.1 and ISO 12402-8.

This DV may be reconsidered following IHC harmonization of ISO 12402-8.

Lifting loop

5.2.2DV.1 – The location of lifting loop is modified for clarity, as agreed by the ISO SC.

5.2.2DV.2 – The lifting loop dimension details are clarified as agreed by the ISO SC.

5.2.3DV – The whistle requirements are removed because they exceed the current US requirements, which have no indication of being inadequate.

Types of buoyancy

5.3.1.3DV – Adds a requirement for the uninflated inflatable PFD to float, according to current practice. (See UL 12402-9/5.5.14DV)

Inflatable buoyancy chambers

5.3.2.1DV and 5.3.2.1DV.1 – The overpressure requirements are modified to be consistent with the revised test method in Part 9 of the standard.

5.3.2.2DV – The time limits for achieving minimum buoyancy and operating forces for the manual inflation head test are moved from Part 9 to Part 5.

5.3.2.3DV – Puncture resistance test is added according to current practice.

Inherently buoyant material

5.3.3DV – Deleted by the ISO SC, as the requirements are covered elsewhere. The subsequent clauses will be renumbered in the next revision.

Total buoyancy provided

5.3.4.2DV – Revised to cite the revised Table 2DV with Level 70 additions.

Table 2DV – Level 70 PFDs and certain child-sized devices are added for continued use of buoyancy aids currently approved in the US and Canada

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5.3.5DV (5.3.5DV.1 – 5.3.5DV.5) and Table 3DV – The V-factor correction calculations for foam flotation material is added according to current practice.

Retroreflective material

5.4.2DV – As retroreflective material is optional for buoyancy aids, prescriptive requirements are removed.

Strength

5.5DV.1 – Modified too account for the change to the horizontal strength test procedure, wherein buoyancy aids are tested with all closures together, as opposed to current practice of testing each closure individually. The increased load should be distributed across multiple closures. However, currently approved single-closure devices may not be able to hold the increased load, so the proposed DV reduces the load for single-closure devices, consistent with current practice.

5.5DV.3 – Requirements for the (collar handles test, holding down device test, body strap hardware secureness test, secondary closure attachment strength, and strength of attachment test for inflatable PFDs) are added, consistent with current practice.

Performance

5.6.1.1DV – Limits on bunching of internal buoyant material are added to limit the displacement of buoyancy within PFDs, consistent with current practice.

5.6.1.2DV – The requirements are clarified as have been tentatively agreed by the ISO SC.

5.6.1.4DV – The boarding test is modified to only be performed when a subject is observed as having trouble exiting the water. Additionally, the allowance to use a liferaft is added, consistent with the test method in Part 9.

5.6.2.1DV – The requirement for ties and fastenings to be “few and simple” is removed, as it is difficult to assess and could be design-restrictive. The donning test is sufficient to determine whether the device is sufficiently simple to don.

5.6.2.2DV – The donning requirements are modified to remove the requirement for evaluation of donning in “cold, wet, and dark” conditions, and to allow donning to be considered acceptable if the device meets the in-water performance requirements in the as-donned condition, consistent with current practice. Additionally, a requirement is added to ensure that inflatable PFDs designed for children can be inflated manually and orally by the wearer notwithstanding the requirement for the device have automatic inflation.

5.6.2.3DV – The security of fit requirements are modified to delete the redundancy with Part 9 (“within stated size range”), minimize confusion between a crotch strap (i.e., a holding down device) and secondary closures that provide a secure fit. Additionally the requirement to test a device both with and without crotch straps is limited to adult devices only. Child devices are tested only with the crotch straps in place.

5.6.2.4DV – To evaluate placement security, a ride-up requirement is added similar to the current practice. This is an issue that is being investigated by ISO TC188 SC1 for the next edition of the standard.

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5.6.2.5DV – Modified to clarify that manual and oral inflation is to be evaluated during the inflation test (UL 12402-9/5.6.7.2.2), and not the other ergonomics assessments listed in 5.6.7.

5.6.2.6DV – Rearming and repacking requirements are added, consistent current practice.

5.6.3.1DV.3 – Acceptance criteria for the water entry test(s) are added, consistent with current requirements.

5.6.3.1DV.4 – Freeboard requirements are added for Level 70 PFDs, corresponding to the current requirements for US Type IIIs or Canadian PFDs.

5.6.3.1DV.5 – Stability requirements are added, consistent with current requirements.

5.6.3.3DV – Acceptance criteria for the inflation test are moved from Part 9 to Part 5.

Multi-chamber buoyancy systems

5.7DV – The multi-chamber buoyancy system requirements are modified to delete the reference to Part 8, since the IHC has not yet harmonized ISO 12402-8. As a general rule the level of performance provided by a backup chamber(s) is intended to be specified as one level lower than the performance required for a primary chamber of the particular part. For Part 5, lowest level of performance available is Level 50 whether it's a Level 50 or 70 buoyancy aid.

Marking

6DV – The entire clause is replaced with a requirement that markings must be to the satisfaction of the Administration. Marking requirements are currently under review by the Labels Task Group, who will submit a parallel proposal. Once consensus is gained on the labeling approach, the requirements will be included in this standard.

Information supplied by manufacturer

7DV – The entire clause is replaced with a requirement that the information supplied by the manufacturer be satisfactory to the Administration.

Consumer information at point of sale

8DV – The entire clause is replaced with a requirement that a pamphlet be provided, subject to the satisfaction of the Administration. The USCG and TC are currently reviewing the "Think Safe" and "Wise Choice" pamphlets, as well as the Child Placard to identify necessary revisions resulting from the adoption of this standard. The results of this review will be circulated separately, but may not be included in this standard.

The National Difference Page and IEC Foreword have been provided for your reference in reviewing this document. However, they are not considered to be part of the ANSI balloted material.

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NATIONAL DIFFERENCES

There are six types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

DR – These are National Differences based on the **national regulatory requirements**.

D1 – These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

D2 – These are national differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

DC – These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

DE – These are National Differences based on **editorial comments or corrections**.

DT – These are National Differences that are the result of pending changes that have been tentatively agreed internationally by ISO TC188/SC1 for the next edition of the standard and therefore are expected outcomes of the second edition of ISO 12402. These changes include both clarifications and substantive changes in requirements and that will be reviewed when the next edition of ISO 12402 is published.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

Addition / Add - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

Modification / Modify - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

Deletion / Delete - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

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ISO

Personal Flotation Devices – Part 5: Buoyancy Aids (Level 50) – Safety Requirements

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 124025 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 162, *Protective clothing including hand and arm protection and lifejackets*, in collaboration with Technical Committee ISO/TC 188, *Small craft*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

ISO 12402 consists of the following parts, under the general title *Personal flotation devices*:

- *Part 1: Lifejackets for seagoing ships – Safety requirements*
- *Part 2: Lifejackets, performance level 275 – Safety requirements*
- *Part 3: Lifejackets, performance level 150 – Safety requirements*
- *Part 4: Lifejackets, performance level 100 – Safety requirements*
- *Part 5: Buoyancy aids (level 50) – Safety requirements*
- *Part 6: Special purpose lifejackets and buoyancy aids – Safety requirements and additional test methods*
- *Part 7: Materials and components – Safety requirements and test methods*
- *Part 8: Accessories – Safety requirements and test methods*
- *Part 9: Test methods*
- *Part 10: Selection and application of personal flotation devices and other relevant devices*

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Introduction

ISO 12402 has been prepared to give guidance on the design and application of personal flotation devices (hereafter referred to as PFDs) for persons engaged in activities, whether in relation to their work or their leisure, in or near water. PFDs manufactured, selected, and maintained to this standard should give a reasonable assurance of safety from drowning to a person who is immersed in water.

Requirements for lifejackets on large, commercial seagoing ships are regulated by the International Maritime Organization (IMO) under the International Convention for the Safety of Life at Sea (SOLAS). ISO 12402-1 addresses lifejackets for seagoing ships.

ISO 12402 allows for the buoyancy of a PFD to be provided by a wide variety of materials or designs, some of which may require preparation before entering the water (e.g. inflation of chambers by gas from a cylinder or blown in orally). However, PFDs can be divided into the following two main classes:

- those which provide face up in-water support to the user regardless of physical conditions (lifejackets), and
- those which require the user to make swimming and other postural movements to position the user with the face out of the water (buoyancy aids).

Within these main two classes there are a number of levels of support, types of buoyancy, activation methods for inflatable devices, and auxiliary items (such as location aids), all of which will affect the user's probability of survival. Within the different types of buoyancy allowed, inflatable PFDs either provide full buoyancy without any user intervention other than arming (i.e. PFDs inflated by a fully automatic method) or require the user to initiate the inflation. Hybrid PFDs always provide some buoyancy but rely on the same methods as inflatable PFDs to achieve full buoyancy. With inherently buoyant PFDs, the user only needs to put the PFD on to achieve the performance of its class.

PFDs that do not require intervention (automatically operating PFDs) are suited to activities where persons are likely to enter the water unexpectedly; whereas PFDs requiring intervention (e.g. manually inflated PFDs) are only suitable for use if the user believes there will be sufficient time to produce full buoyancy, or help is close at hand. In every circumstance, the user should ensure that the operation of the PFD is suited to the specific application. The conformity of a PFD to this part of ISO 12402 does not imply that it is suitable for all circumstances. The relative amount of required inspection and maintenance is another factor of paramount importance in the choice and application of specific PFDs.

ISO 12402 is intended to serve as a guide to manufacturers, purchasers, and users of such safety equipment in ensuring that the equipment provides an effective standard of performance in use. Equally essential is the need for the designer to encourage the wearing of the equipment by making it comfortable and attractive for continuous wear on or near water, rather than for it to be stored in a locker for emergency use. Throwable devices and flotation cushions are not covered by this part of ISO 12402. The primary function of a PFD is to support the user in reasonable safety in the water. Within the two classes, alternative attributes make some PFDs better suited to some circumstances than others or make them easier to use and care for than others. Important alternatives allowed by ISO 12402 are the following:

- to provide higher levels of support (levels 100, 150, or 275) that generally float the user with greater water clearance, enabling the user's efforts to be expended in recovery rather than avoiding waves; or to provide lighter or less bulky PFDs (levels 50 or 100);
- to provide the kinds of flotation (inherently buoyant foam, hybrid, and inflatable) that will accommodate the sometimes conflicting needs of reliability and durability, in-water performance, and continuous wear;

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- to provide automatically operating (inherently buoyant or automatically inflated) PFDs that float users without any intervention on their part, except in initially donning the PFD (and regular inspection and rearming of inflatable types), or to provide user control of the inflatable PFD's buoyancy by manual and oral operation; and

- to assist in detection (location aids) and recovery of the user.

PFDs provide various degrees of buoyancy in garments that are light in weight and only as bulky and restrictive as needed for their intended use. They will need to be secure when worn, in order to provide positive support in the water and to allow the user to swim or actively assist herself/himself or others. The PFD selected shall ensure that the user is supported with the mouth and nose clear of the water under the expected conditions of use and the user's ability to assist.

Under certain conditions (such as rough water and waves), the use of watertight and multilayer clothing, which provide (intentionally or otherwise) additional buoyancy, or the use of equipment with additional weight (such as tool belts) will likely alter the performance of the PFD. Users, owners and employers need to ensure that this is taken into account when selecting a PFD. Similarly, PFDs may not perform as well in extremes of temperature, although fully approved under this part of ISO 12402. PFDs may also be affected by other conditions of use, such as chemical exposure and welding, and may require additional protection to meet the specific requirements of use. If the user intends taking a PFD into such conditions, she/he has to be assured that the PFD will not be adversely affected. This part of ISO 12402 also allows a PFD to be an integral part of a safety harness designed to conform to ISO 12401, or an integral part of a garment with other uses, for example to provide thermal protection during immersion, in which case the complete assembly as used is required to conform to this part of ISO 12402.

In compiling the attributes required of a PFD, consideration has also been given to the potential length of service that the user might expect. Whilst a PFD needs to be of substantial construction and material, its potential length of service often depends on the conditions of use and storage, which are the responsibility of the owner, user and/or employer. Furthermore, whilst the performance tests included are believed to assess relevant aspects of performance in real-life use, they do not accurately simulate all conditions of this. For example, the fact that a device passes the self-righting tests in swimming attire, as described herein, does not guarantee that it will self-right an unconscious user wearing waterproof clothing; neither can it be expected to completely protect the airway of an unconscious person in rough water. Waterproof clothing can trap air and further impede the self-righting action of a lifejacket.

It is essential that owners, users and employers choose those PFDs that meet the correct standards for the circumstances in which they will be used. Manufacturers and those selling PFDs have to make clear to prospective purchasers the product properties, alternative choices and the limitations to normal use, prior to the purchase.

Similarly, those framing legislation regarding the use of these garments should consider carefully which class and performance levels are most appropriate for the foreseeable conditions of use, allowing for the higher risk circumstances. These higher risk circumstances should account for the highest probabilities of occurrence of accidental immersion and the expected consequences in such emergencies. More information on the selection and application is given in ISO 12402-10.

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Personal flotation devices – Part 5: Buoyancy aids (level 50) – Safety requirements

1 Scope

This part of ISO 12402 specifies the safety requirements for buoyancy aids with a buoyancy of not less than 50 N used in sheltered waters with help and rescue close at hand under such circumstances where more bulky or buoyant devices can impair the user's activity. It applies to buoyancy aids used by adults or children.

This part of ISO 12402 is not applicable to one-piece suits.

1DV.1 DE Modification by replacing clause 1 as follows:

This part specifies the safety requirements for buoyancy aids used in sheltered waters with help and rescue close at hand under such circumstances where more bulky or buoyant devices can impair the user's activity. It applies to buoyancy aids used by adults or children. This part is not applicable to one-piece suits.

1DV.2 DR Addition of 1DV.2 to Clause 1 as follows:

Where references are made to ISO 12402 standards, the referenced requirements found in these standards shall apply as modified by any applicable North American National Difference.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 12402-7:2006, *Personal flotation devices – Part 7: Materials and components – Safety requirements and test methods*

ISO 12402-8:2006, *Personal flotation devices – Part 8: Accessories – Safety requirements and test methods*

ISO 12402-9:2006, *Personal flotation devices – Part 9: Test methods*

IMO Resolution A.658 (16), *Use and fitting of retro-reflective materials on life-saving appliances*, International Maritime Organization²⁾

²⁾ IMO is an institution with domicile in London issuing regulations which are then published as laws by its Member States.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 personal flotation device PFD garment or device which, when correctly worn and used in water, will provide the user with a specific amount of buoyancy which will increase the likelihood of survival

3.2 inherently buoyant material material which is permanently less dense than water

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