

Risk Assessment Guidelines for Consumer Products

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1. INTRODUCTION

Consumer products may cause harm when used, such as a hot flat-iron that causes burns, scissors or knives that cause cuts, or a household cleaners that aggresses the skin. In most cases, such damage does not occur because general knowledge or appropriate use instruction teach how to use consumer products safely. Nevertheless, a risk of damage remains.

Such risk can be assessed in different ways. A range of methods have been used to quantify it for consumer products, such as a nomograph method¹, a matrix method², and the method recommended for the RAPEX rapid alert system of the EU³. While the general principles for risk assessment have always been agreeable, the details on how to quantify risks have been under permanent development. This has lead to diverging results and ensuing discussions, as well as considerations on what the best possible practice could be.

The purpose of these Guidelines is therefore to provide a transparent and practicable method of assessing risks of consumer products. They are based on a risk assessment method developed for other purposes⁴, which was adapted to consumer products. Of course some training is needed before it can be applied successfully, and expertise in risk assessment will greatly facilitate the task. The Guidelines can also not replace discussions amongst risk assessors and the fruitful exchange of views, since it is impossible to replace experience accumulated through the years.

Nevertheless, by building up a risk assessment in small, manageable and clearly separated steps, these Guidelines should help to focus the attention on the relevant issues of each product and its use(s), to identify possible divergences of views between risk assessors from the onset, thus avoiding time consuming discussions, and to lead to widely acceptable conclusions on the risks that the manifold consumer products may present.

¹ Benis H (1990): A Product Risk Assessment Nomograph, report prepared for the New Zealand Ministry of Consumer Affairs, dated February 1990; Cited in: European Commission (2005) Establishing a Comparative Inventory of Approaches and Methods Used by Enforcement Authorities for the Assessment of the Safety of Consumer Products Covered by Directive 2001/95/EC on General Product Safety and Identification of Best Practices. Report prepared by Risk & Policy Analysts (RPA), Loddon, Norfolk, UK.

² Method used by Belgian authorities. Cited in: European Commission (2005) Establishing a Comparative Inventory of Approaches and Methods Used by Enforcement Authorities for the Assessment of the Safety of Consumer Products Covered by Directive 2001/95/EC on General Product Safety and Identification of Best Practices. Report prepared by Risk & Policy Analysts (RPA), Loddon, Norfolk, UK.

³ Commission Decision 2004/418/EC of 29 April 2004 laying down guidelines for the management of the Community Rapid Information System (RAPEX) and for notifications presented in accordance with Article 11 of Directive 2001/95/EC. OJ L 208, 10.6.2004, p. 73.

⁴ Kinney G, Wiruth AD (1976) Practical risk analysis for safety management. Naval Weapons Center, California, June 1976.

2. RISK ASSESSMENT - AN OVERVIEW

2.1. Risk – the combination of hazard and probability

Risk is generally understood as something that threatens health or even the lives of people, or that may cause considerable material damage. Nevertheless, people take risks while being aware of the possible damage, because the damage does not always happen. For example:

- Climbing on a ladder always includes the possibility to fall down and be injured. "Falling down" is therefore "built into the ladder", it is intrinsic to the use of the ladder and cannot be excluded. "Falling down" is thus called the intrinsic hazard of the ladder.

This hazard, however, does not always come into effect, since many people climb on ladders and do not fall down, but climb down without being injured. This suggests that there is a certain likelihood (or probability), but no certainty, that the intrinsic hazard comes into effect. The probability can be minimised for example by a prudent behaviour of the person climbing on the ladder;

- Using a household cleaner for blocked sewage water tubes with sodium hydroxide always bears the possibility of very serious damage of the skin, if the product comes into contact with skin, or even of lifelong blindness if drops of the product shoot into the eye. The damage is done because sodium hydroxide is very corrosive, thus the cleaner is intrinsically hazardous.

Nevertheless, when the cleaner is handled properly, the hazard does not come into effect. Proper handling may include wearing plastic gloves and protective glasses. Skin and eyes are then well protected, and the probability of damage is much reduced.

Risk is thus the combination of the severity of the possible damage and the probability that this damage occurs.

To determine the risk, three steps are necessary:

1. Identify the seriousness of the hazard that is intrinsic to the product.

In consumer risk assessment a yardstick for measuring the hazard is the adverse effect that a product can cause to the health of a consumer. It is therefore necessary to consider how the intrinsic hazard of the product can inflict on the consumer's health, namely by describing the different steps that lead to an injury of the consumer. This description is called "injury scenario" (see table 1).

An injury can be more or less severe, depending on the hazard of the product, on the way it is used by the consumer, on the type of consumer who uses the product, and many more. The more severe the injury, the more severe is the hazard, and vice-versa. The "severity of injury" is therefore a means to quantify the hazard in a risk assessment. These Guidelines propose "slight", "moderate", "serious" and "very serious" injuries (see table 3);

2. Determine the probability to which the consumer is in practice injured by the intrinsic product hazard.

While the injury scenario describes how the consumer is injured by the hazard, such scenario only happens with a certain probability. The probability can be expressed in terms such as "Almost certain, might well be expected", or "Only remotely possible", and fraction numbers can be attributed to them, such as "> 50 %" or "> 1/1,000", respectively (see table 4).

3. Combine the hazard (in terms of the severity of injury) with the probability (in terms of fraction numbers) to obtain the risk.

Such combination can be made by looking up both values in a suitable table (see table 5), and the table will provide the level of risk in terms of "serious", "moderate", "low" and "acceptable risk".

With this, the risk assessment is basically done.

2.2. Seek information

As can be seen in the above example, each of the above steps of a risk assessment requires some imagination, since the product under consideration will normally not have caused an accident, and thus the risk will not have materialised (yet). Previous experience with similar products will help in this exercise, as will any other information about the product, its construction, its mechanical stability, its chemical composition, its operation, its use instructions, the type of consumers it is intended for (and those for which it is not), test reports, accident statistics, the EU Injury Data Base (IDB)⁵, information about consumer complaints, about the behaviour of different consumers when they are using the product, and about product recalls. Also product requirements laid down in legislation, in product standards or in checklists such as in ISO 14121 (EN 1050) can be useful sources of information.

Nevertheless, the products to be assessed may be quite specific so that all these sources do not contain the information required. The information may also be incomplete, inconsistent, or not fully plausible. It is then very important to critically assess the information.

Particularly useful can be the feedback from expert colleagues, since they can draw from their real-life experience and provide suggestions that are not immediately evident when assessing a product risk. They may also advise to assess the risk for different types of consumers, such as adults and children (see table 2), since those may handle a product differently. They may further advise to assess the risk for different injuries that a product may cause, and the way in which those injuries emerge through the use of the product (injury scenarios). They can also judge whether an injury scenario is too "far-fetched", too unlikely, and then guide the risk assessor towards more realistic assumptions.

Thus, feedback from experienced colleagues can be helpful in several aspects. A risk assessor from an authority could seek advice from colleagues in that same authority, in other authorities, in industry, in other countries, in scientific groupings, and elsewhere. Conversely, any risk assessor in industry could use his contacts to authorities and elsewhere when a new or improved product is to be assessed before it is placed on the market.

⁵ <https://webgate.ec.europa.eu/idbpa/>

2.3. Make a sensitivity analysis

If all information search and queries to expert colleagues do not provide the required, very specific data, a so-called sensitivity analysis could help. In such an analysis a lower and a higher value than previously chosen is assumed for each parameter of the risk assessment, and taken through the entire risk assessment procedure. The resulting risk levels will show how sensitive the risk reacts to the input of a lower and a higher value. It can thus be estimated in which range the real risk of the product will be.

If the most likely value of each parameter can be estimated, then those most likely values should be taken through the procedure, and the resulting risk level will be the most likely risk.

2.4. Discuss with colleagues

Feedback from colleagues will also help when preparing and finalising the risk assessment. They will be able to provide advice on the assumptions and estimations made during the three steps above, they will feed in their experience and thus help to generate a more robust, more solid and thus more acceptable risk assessment. It is therefore recommended that advice from expert colleagues be sought, possibly in the form of a group discussion, before concluding a risk assessment. Such group, of perhaps 3 to 5 members, should include a combination of expertise appropriate to the product under assessment: engineers, chemists, (micro-) biologists, statisticians, product safety managers, and others. Group discussion will be particularly useful when the product is new on the market, when it has never been assessed before, and in similar situations.

Risk assessments should be solid and realistic. However, since they require some assumptions and imagination, different risk assessors may come to different conclusions. With the step-by-step risk assessment described in these Guidelines, however, discussions amongst experts should be more productive. Each step will be clearly described and can be considered in the necessary detail. Thus, any point of disagreement can be quickly identified, and consensus can more easily be found. This will make any risk assessment more acceptable.

2.5. Several hazards, several injuries – but only one risk

When several hazards, several injury scenarios or differing severities of injuries or probabilities have been identified, each of those should be carried through the entire risk assessment procedure in order to determine the risk for each. As a result, the product may have several risk levels. The overall risk of the product is then the highest risk level identified.

As an example, a hammer may have a weak head and a weak grip, each of which may break when the hammer is used, and the consumer may be injured. If the relevant scenarios lead to different risk levels, the highest risk is "the risk" of the hammer. Such approach will ensure that measures can be taken that reduce the risk most effectively.

It may be argued that

- the apparently most important hazard should be decisive, since it would lead to the most severe injuries. In the above example of the hammer, this could be the breach of the hammer head, since pieces of the broken head could be catapulted into the eye and

eventually lead to blindness. On the other hand, a breach of the hammer grip could never provide small pieces that would hit the eye as seriously.

However, this would be a hazard assessment, not a risk assessment. A risk assessment also requires consideration of the probability of an injury to happen. Thus, the "most important hazard" may lead to an injury that is much less likely than a less important hazard, and end up in a lower risk. Conversely, an injury scenario leading to a less severe injury may be much more likely than an injury scenario ending up in death, and the less severe injury may therefore result in a higher risk;

- the risk stemming from the highest probability should be "the risk" of the product, since the underlying injury scenario would be the one most likely to happen. In the above example of the hammer, if the hammer grip is very weak, the breach of the grip would be the most likely injury scenario, and should therefore be decisive.

However, this would not consider the seriousness of eye injuries that the cracking hammer head could cause. The evaluation of the probability alone thus would provide an incomplete picture.

In conclusion, risk is a balanced combination of both the hazard and the probability of the injury that the hazard can cause. Risk describes neither the hazard, nor the probability, but both at the same time. Taking the highest risk as "the risk" of the product will therefore allow to ensure product safety most effectively.

2.6. Can risks cumulate?

For virtually every product, several injury scenarios can be developed leading to several risks. For example, an angle grinder may present a risk of electric shock, because electric wires may be too easily accessible, and a risk of fire, because during normal use the machine may overheat and ignite. If both risks are considered "moderate", do they not add up to an overall "serious risk" of the grinder ?

Since each risk is based on an injury scenario, and since each injury scenario can happen only at a given time (but never two or more scenarios at the same time), each risk is independent and can only materialise alone. Therefore, risks do not add up. In the above example, the two moderate risks would not add up to a single serious risk.

However, with several risks in a product, it is more likely that any of those risks materialises and causes an injury. The overall likelihood of an injury is therefore increased. Consequently, action to manage the risks should be taken more rapidly and should be more pronounced than if only a single risk existed. For example, with two risks, a product could be immediately taken off the market and recalled from consumers, whereas with a single risk, halting sales could be sufficient.

Note that risk management action is separate from risk assessment. Risk assessment stops when the level of risk has been identified. Nevertheless, some considerations are given further below about the way from risk to action.

2.7. Compliance with limit values in legislation or in standards

In the practice of market surveillance, consumer products are often tested against limit values laid down in legislation or in product safety standards. If the product complies with the limit value(s) or safety standard(s), it is presumed to be safe (of course only for

the safety characteristics covered by the value(s) or standard(s)). This assumption can be made because the risks of a product are taken into account when establishing the limit value(s) or standard(s). It is therefore most convenient for the manufacturer to have his product comply with them, because he may then only have to take care of those risks of his product that may not be covered by the limit value(s) or standard(s).

If the product does not comply with those limits, it is not presumed to be safe. In such case it is left to the manufacturer to provide the evidence that his product is as safe as if it were compliant with the standard(s)/limit value(s). He has to carry out a fully fledged risk assessment on his specific product. This may require more effort than if he chose to manufacture the product in compliance with the limit value(s) or standard(s).

3. BUILDING A RISK ASSESSMENT STEP BY STEP

Although a risk assessment consists of only three steps (see above), there is a little more to consider when a consumer product is evaluated. The sections below describe in detail which considerations have to be made and which questions have to be asked in order to determine the level of risk.

3.1. The product

The product should be identified unambiguously. This includes the product name, the brand, the model name, a possible production lot number, and the country of origin. A picture of the product, the packaging and the marking plate (if appropriate) and a test report(s) identifying the product hazard(s) can also be considered a part of the product description.

In particular cases, the hazard may be limited to a distinct part of the product, which can be separated from it and which is also separately available to consumers. In such case it is sufficient to only assess the distinct part of the product. An example are rechargeable batteries of notebook computers which overheated and were recalled by tens of thousands.

The description of the product includes any label that may be relevant for risk assessment, in particular warning labels. Also the instructions for use may contain relevant information on the risk of the product and how to keep it as low as possible, for example by use of personal protective equipment or by excluding children from using the product. An example for this is a chain saw.

A risk assessment should always consider the entire life time of a product. This is particularly important when a new product has been developed and its risks are going to be assessed: Will age and usage change the type or the extent of the hazard? Will new hazards appear with increasing product age or longer usage? What is the product's lifetime? How long is the product used in practice by the consumer before it becomes waste?

Additional considerations may need to be made when a product becomes unusable after a certain time period although it has never been used. An example are electric heating blankets or pads. The electric cords in the products are usually thin and become fragile after ten years even if the product has never been used. The heating cords may then come in contact with each other and can cause a short-circuit and put the bed clothes on fire.

3.2. The product hazard

Hazard is the intrinsic property of the product that may cause an injury to the consumer who uses the product. It can appear in different forms:

- mechanical hazard, such as sharp edges that may cut fingers, or reduced openings that may squeeze fingers;
- electrical hazard, such as from live electrical parts that may cause an electric shock;
- heat or fire hazard, such as a heater fan that overheats and catches fire;
- thermal hazard, such as the hot outer surface of an oven that might cause a burn;
- chemical hazard, such as a toxic substance that poisons a consumer immediately upon ingestion, or a carcinogenic substance that may cause cancer in the long term. Some chemicals may damage the consumer only after repeated exposure;
- microbiological hazard, for example the bacteriological contamination of cosmetics;
- noise hazard, such as ring tones from toy cellular phones that are much too loud;
- other hazards, such as radiation.

Hazards are often identified and quantified by appropriate tests. Such tests and how to carry them out may be laid down in product standards at European or international level. Compliance of a product with a “harmonised” standard, which is a European standard (“EN ...”) of which the references have been published in the Official Journal, provides the presumption of safety. In such a case it can be presumed that the product presents no risk or only a minimum risk compatible with a high level of protection with regard to the specific hazard tested. Nevertheless, there may be cases where the presumption does not hold, and in such cases a particularly well-documented risk assessment will have to be prepared, including a call for amendment of the harmonised standard. On the other hand, if a product fails the test, a risk can normally be assumed, unless the manufacturer can provide evidence that the product is safe. The same goes if a product does not comply with a limit value laid down in legislation.

For chemicals there are specific instructions on how to prepare a risk assessment⁶, therefore they will not be dealt with in these Guidelines. Nevertheless, they follow the same principles: hazard assessment, exposure assessment, and finally the calculation of the margin of safety. In essence, the exposure is expressed as the dose of the chemical that inflicts on the consumer when he uses the product, and this dose is compared with the dose known to have no observed adverse effect on human health. If there is a sufficiently large margin of safety between the no-observed-adverse-effect level and the exposure, the chemical is not of concern.

For the purpose of these Guidelines, hazards were grouped, linked to the size, shape and surface of a product, to the potential, kinetic or electric energy, to extreme temperatures, and others, as shown in table 1. The table is for orientation, and any risk assessor should adapt it should such adaptation be more appropriate for the product under consideration.

⁶ European Commission (2003), Technical Guidance Document in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances, Commission Regulation (EC) No 1488/94 on Risk Assessment for existing substances and Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market. Available at <http://ecb.jrc.it/tgd/>.

Nevertheless, table 1 should assist and stimulate risk assessors to look for and identify any possible hazards of consumer products that are being assessed. If a product has several hazards, each hazard should be taken separately through an own risk assessment.

Products may still present a risk although they do not cause injuries

Products may not be hazardous but can nevertheless cause a risk. Examples for this can be observed in the area of personal protective equipment or life saving equipment, for example warning waistcoats that car drivers put on after an accident. Such waistcoats should raise the attention of the following drivers and traffic participants and warn them of the accident, in particular at night. However, when the coat's reflector stripes are too small or do not reflect sufficiently, recognition is not ensured, and they do not protect users as they should. Such a waistcoat poses a risk although it is not hazardous by itself.

3.3. The consumer

It is of prime importance to select the type of consumer to whom the risk assessment should apply, because his abilities and his behaviour when using the product may strongly influence the level of risk. When several types of consumers could use the product, a separate risk assessment should be prepared for each of them.

The following aspects should be considered:

- **Intended/non-intended user:** The intended user of a product may use the product without difficulties because he takes all instructions of use well into account, or because he has used the kind of product since long and is therefore familiar with its handling and use, including any apparent or non-apparent hazard(s). The hazard of the product may then not come into effect, and the product risk could be minor.

The non-intended user may not be familiar with the product and may not recognise any hazard(s). He may therefore be injured by the hazard, he is therefore a consumer for whom the product risk is higher.

Thus, the effect of an intended or non-intended user on the risk may differ according to the product and the way it is used;

- **Vulnerable consumers:** For the purpose of risk assessment several categories of vulnerable consumers can be distinguished: Children (0 to 36 months, >36 months to <8 years, 8 to 14 years), vulnerable people and very vulnerable people (see table 2). They have reduced capacities to recognise a hazard or to take account of warning labels, or may have difficulties when using a product they have never used before. They may also exhibit specific behaviour that affects their exposure, for example crawling and mouthing by young children. Therefore a product that is normally safe for an average adult may not be safe for them. This has to be taken into account when preparing a risk assessment that considers vulnerable consumers;
- **Intended and reasonably foreseeable (mis-) use:** Consumers may use a product for other purposes than the product is intended for, although the use instructions are clearly understandable or even contain warnings. Therefore, within a risk assessment, also other uses than the intended ones have to be considered. This aspect is particularly important for the manufacturer of a product since he needs to ensure that his products are safe under any reasonable foreseeable conditions of use.

Such reasonably foreseeable (mis-) uses may have to be imagined, because there may be no information available in official accident statistics and similar sources of information. Due to such imagination, it may then be difficult to draw the line between "reasonably foreseeable" and "too far-fetched" imagined scenarios. Nevertheless, even "too far-fetched" scenarios can be considered under these Guidelines, even when they lead to very severe injuries, because they will have a very low probability. This will eventually safeguard against too large an influence of such "far-fetched" scenario when concluding on the overall risk of the product;

- **Frequency and duration of use:** Different consumers may use a product more or less often, and for longer or shorter periods of time. This depends also on the attractiveness of the product and the ease with which it can be used. Daily or long-time use could make a consumer entirely familiar with a product and its specificities, including its hazards, its use instructions and warning labels, and the risk would be minor. On the other hand, daily or long-time use may make the consumer feel too much accustomed to the product, and he may recklessly ignore use instructions and warning labels because he considers mastering the product entirely. This would increase the risk.

Finally, daily or long-time use may accelerate product usage, and any parts not resisting to such use may soon fail and cause a hazard, and eventually an injury to the consumer. Also this increases the risk;

- **Hazard recognition and ensuing protective behaviour and equipment:** Some products are known for their hazard, such as scissors, knives, do-it-yourself drilling machines or chain saws, roller blades, bicycles, motor bikes or cars. In all such cases, the product hazard is clearly known or easily recognisable, and the consumer can apply personal protective equipment such as gloves, helmet or seat-belt, and use the product in a way that minimises the risk.

In other cases, the product hazard may not be as easily recognisable, such as an upcoming short-circuit within an electrical flat-iron, and the consumer will only in rare cases be able to adopt a risk-reducing behaviour upfront.

- **Consumer behaviour in case of an incident:** When the hazard inflicts on the consumer it may cause him an injury. Within a risk assessment, it is then important to consider how the consumer may react. Will he put the product orderly out of action and put it aside, take appropriate risk management action such as combating a fire caused by the product, or will he throw it away in a panic to get rid of it?
- The **consumer's cultural background** and the way a product is used in his home country may influence the risk of a product. Industry in particular has to take account of such cultural differences when launching a new product onto a market, in order to ensure that the product can indeed be used safely.

3.4. Injury scenario: Steps to the injury(ies) that a hazard can cause

In a risk assessment, it is necessary to consider in detail how the product hazard leads to a consumer injury or other adverse effect to his health. These "steps to injury" should be described clearly and concisely, without exaggerating the level of detail. With some experience, the "shortest path to injury" (or "critical path to injury") will be easily identified.

It is probably easiest to start with a scenario that considers the consumer for whom the product is intended and in which the consumer uses the product in accordance with the use instructions or, if there are none, according to normal handling and use. Further on, other scenarios should be developed which include vulnerable consumers, slight or more pronounced deviations from normal use, unfavourable conditions of use such as when proper daylight or illumination is missing, etc.: Each scenario causing a health damage to the product user should be carried through the entire risk assessment procedure. Of course the entire life-time of the product, thus including product wear, has to be considered.

Scenarios should normally be reasonably foreseeable, but sometimes it may be difficult to determine the boundary between a “still reasonably foreseeable” scenario and an “already extreme” scenario. Nevertheless, also extreme scenarios may be developed under these Guidelines, since they provide for a safeguard against misinterpretation. This safeguard is the assignment of the probability to each scenario, as we will see further below.

To assist and stimulate development of scenarios these Guidelines provide a table with typical injury scenarios (table 1). These should be adapted, as appropriate, to the specific product, consumer type and other circumstances under consideration, in order to provide for the specific scenario(s) required for the risk assessment.

3.5. Severity of injury

The injury that a hazard can cause to the consumer can have different degrees of severity. The severity of injury thus reflects the effect of the hazard on the consumer, it is one of the two core parameters that determine the risk.

The severity of injury depends on:

- the type of the hazard (see list of hazards above and table 1). A mechanical hazard, such as sharp edges, may cause cuts in fingers which are immediately noticed, and the consumer will take action to heal these injuries. On the other hand, a chemical hazard may cause cancer. Such hazard normally passes unnoticed, and the injury may appear only after many years, and is considered to be very severe since cancer is very difficult to remedy, if at all;
- how powerful the hazard is. For example, a surface heated at 50 °C only causes slight burns, whereas a surface at 180 °C provokes severe burns;
- the time that the hazard inflicts on the consumer. A short contact time with an abrasion hazard may scratch the consumer's skin only superficially, whereas a longer time may take off large parts of the skin;
- the body part that is injured. For example, penetration by a sharp point of the arm is painful, but penetration of an eye is a serious injury;
- the impact of the hazard on one or several body parts. An electrical hazard may cause an electric shock with unconsciousness and, subsequently, a fire which may damage the lungs of the consumer when inhaling the smoke;
- the type and behaviour of the consumer. A product labelled with a warning message may well be used, without doing any harm, by an adult consumer, because the

consumer adapts his behaviour when using the product. On the other hand, a child unable to read or understand the warning label may be injured very seriously.

To quantify the severity of injury(ies) identified in the injury scenario, these Guidelines provide table 3 as an orientation on how to classify injuries into the four categories: slight, moderate, serious, and very serious. Of course this categorisation is indicative, and a risk assessor should change category if this is considered to be more appropriate.

If several injury scenarios are considered for the risk assessment of a consumer product, the severity of each injury should be classified separately, and taken through to the entire risk assessment process.

An example: A consumer uses a hammer to knock a nail into the wall. Since the hammer head is too weak (due to inappropriate material), it breaks, and one of the pieces flying around hits the eye of the consumer so vigorously that it causes blindness. The injury is thus “Eye injury, foreign body in eye: Permanent loss of sight (one eye)”, which is “serious” according to table 3.

3.6. Probability of injury

The second core parameter that determines the risk is the probability that an injury scenario indeed comes true during the expected lifetime of the product.

Such probability is relatively easy to calculate when a scenario is described in distinct steps. Each step is given the appropriate probability, and the multiplication of these partial probabilities gives the overall probability of the scenario. If several scenarios have been developed, each scenario eventually has to have an overall probability assigned.

These Guidelines distinguish between 8 levels of probability: From “(virtually) impossible (<1/1,000,000)” to “almost certain, might well be expected (>50%)” (see table 4). The following example of a hammer head that breaks when the user knocks on a nail will illustrate how to assign levels of probability to the steps of an injury scenario:

- Step 1: The hammer head breaks when the user tries to knock a nail into the wall, because the material of the hammer head is too weak. The weakness was determined in a test, and with the reported weakness it is estimated that the probability for the hammer head to break during lifetime is 1/10;
- Step 2: One of the pieces of the breaking hammer hits the user. The probability for this is estimated as 1/10, since the surface that the user’s upper body part offers to the pieces flying around is considered to be 1/10 in relation to the half-sphere in front of the wall. Of course, if the user were standing very close to the wall, his body would take a larger share of the half-sphere, and the probability would be higher;
- Step 3: The piece hits the head of the user. The head is roughly estimated to be about 1/3 of the upper body part, the probability is therefore 1/3;
- Step 4: The piece hits an eye of the user. The eyes are considered to be about 1/20 of the head’s surface offered to the piece flying around, therefore the probability is 1/20.

Multiplying the probabilities of the above steps provides an overall probability for the scenario of $1/10 * 1/10 * 1/3 * 1/20 = 1/6,000$. This translates into “Conceivable, but highly unlikely” according to table 4.

When the overall probability has been calculated for an injury scenario, it should be considered for plausibility. This check requires quite some experience, and the assistance of persons experienced in risk assessment is recommended (see higher above in section “Seek information”).

Assigning probabilities to the different injury scenarios for the same product will normally lead to the following effects:

- When the product is used by more vulnerable consumers, the probability will have to be raised because more vulnerable consumers may be damaged more easily;
- When the risk is easily recognisable, including by warning labels, the probability will have to be lowered because the user will use the product more carefully in order to avoid the risk as far as possible;
- When accidents been reported that fit into the injury scenario, the probability for that scenario should be increased. In cases where accidents have only rarely be reported, or are not known at all, it may be useful to ask the manufacturer of the product whether he is aware of any accident or adverse effect caused by the product;
- When a larger number of conditions is necessary for the injury to occur, the overall probability of the scenario would be lower;
- When the conditions necessary for the injury to occur are easily met, this would increase the probability of the scenario;
- When the test results of the product show a large difference to the limit values required (by the relevant standard or legislation), the probability for the injury (scenario) to occur may be higher than if the product performed close to the limit values.

3.7. Determination of the risk

When the severity of injury and the probability have been thoroughly determined for each of the scenarios developed, the risk for each scenario just needs to be looked up in table 5 that combines both, and eventually the highest risk is "the risk" of the product.

These Guidelines distinguish between 4 levels of risk: Serious, moderate, low and acceptable risk. Note that, between neighbouring severities of injury or probabilities, the risk level normally changes by 1 level. This is consistent with the general experience that risk does not "make leaps" when factors change gradually. However, where the severity of injury decreases from moderate to slight (at the right hand side of the table 5), some changes comprise 2 levels, namely from serious to low risk and from moderate to acceptable risk. This is due to the fact that these Guidelines include 4 graduations of severity, whereas the original method (see Introduction) included 5. Nevertheless, 4 graduations are considered appropriate here, since they allow for a sufficiently robust estimation of severity; 5 levels would be too sophisticated since neither the severity of injury nor the probability can be determined with very high precision.

At the end of the risk assessment, be it for an individual injury scenario, be it for the overall risk of the product, the plausibility of the risk level and the uncertainties in the estimates should be considered.

In this regard, a sensitivity analysis can be very valuable: How does the risk level change when the severity of injury or the probability are changed by 1 degree? If the risk level does not change at all, it is highly plausible that it has been appropriately estimated. If it changes, however, the risk level may be considered borderline. It is then necessary to reconsider the injury scenarios and the assignment of probabilities. At the end of the sensitivity analysis the risk assessor should trust that, in view of all efforts made, the risk level is sufficiently plausible, and that he can communicate it further on.

4. FROM RISK TO ACTION

Risk assessment is essential for all parties concerned with product safety. It should be regarded as a transparent method for the evaluation of the risk level and be used as input to decision making on risk management and for risk communication. Although risk assessment is separate from any measures or action to manage risk, some considerations will be given here to illustrate the possible follow-up of an identified risk.

When a serious risk has been identified in a consumer product, appropriate measures to reduce the risk have to be taken. They may include withdrawal from the market or recall from consumers. Normally, it would not be sufficient to appose warning labels on the product or improve the instructions for use to make a serious risk product safe.

Lower levels of risk normally lead to less rigorous measures than recall or withdrawal from the market. Nevertheless, when the product shows a number of moderate risks, and thus its overall risk is moderate, urgent action may be required since any of the moderate risks may materialise quite swiftly.

When measures or actions taken on a product posing a serious risk are notified to the RAPEX rapid alert system, a clear and concise risk assessment, preferably including a summary for publication on the web, has to underpin the notification. It is not sufficient to report that a product does not comply with the limit value of a standard or in the legislation. Risk assessment therefore can help to avoid unjustified notifications.

For considering the timing and level of risk management measures, it is important to also take into account the exposure of the population as a whole. If a product is used by a large number of consumers, even a less than serious risk may require quick action to avoid adverse effects on the health of those consumers.

Public perception of a risk and its likely consequences are other aspects when deciding how to reduce the risk. Even if a risk assessment results in a moderate (or low) risk level, the public perception of the risk (which may be influenced by media coverage) may require further action in some cases. This may be especially relevant if the concerned consumers are vulnerable, such as children.

Taking action will be necessary in any case when a product is non-compliant with the applicable regulation, even if there is no risk (e.g. incomplete markings). Regarding the urgency or level of action or measures the principle of proportionality has to be considered. In order to prevent risks to consumers actions or measures have to be sufficient and effective.

5. EXAMPLES

5.1. Folding chair

A folding chair has a folding mechanism constructed in such a way that the user's fingers can get entrapped between the seat and the folding mechanism. This can lead to fractures or even loss of one or more fingers.



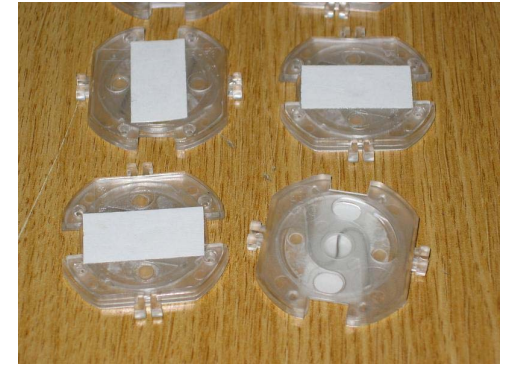
Determination of the risk(s)

Injury scenario	Injury type and location	Severity of injury	Probability of injury	Overall probability	Risk
Person unfolds the chair, grips seat close to the corner by mistake (Person inattentive/distracted), finger gets caught between seat and backrest	Minor pinching of finger	Slight	Unfolding the chair: 1 Gripping the seat at corners: 1/5,000	1/5,000	Acceptable
Person unfolds the chair, grips seat at the side by mistake (Person inattentive/distracted), finger gets caught between seat and link	Minor pinching of finger	Slight	Unfolding the chair: 1 Gripping the seat at the side: 1/5,000	1/5,000	Acceptable
Person unfolds the chair, chair is clamped, Person tries to push down the seat and grips seat close to the corner by mistake (Person inattentive/distracted), finger gets caught between seat and backrest	Fracture of finger	Slight	Unfolding the chair: 1 Chair clamps: 1/1,000 Gripping the seat at corners: 1/50	1/50,000	Acceptable
Person unfolds the chair, chair is clamped, Person tries to push down the seat and grips seat at the side by mistake (Person inattentive/distracted), finger gets caught between seat and link	Fracture of finger	Slight	Unfolding the chair: 1 Chair clamps: 1/1,000 Gripping the seat at the side: 1/50	1/50,000	Acceptable
Person is sitting on chair, wants to move the chair and tries to lift it by gripping the chair at the rear part of the seat, finger gets caught between seat and backrest	Loss of finger	Moderate	Sitting on chair: 1 Moves the chair: 1/3 Grips chair at rear part: 1/4 Finger gets caught: 1/10	1/120	Moderate
Person is sitting on chair, wants to move the chair and tries to lift it by gripping the chair at the rear part of the seat, finger gets caught between seat and link	Loss of finger	Moderate	Sitting on chair: 1 Moves the chair: 1/3 Grips chair at rear part: 1/4 Finger gets caught: 1/10	1/120	Moderate

The overall risk of the folding chair is thus "moderate risk".

5.2. Socket protectors

This case deals with socket protectors. These are devices that users (parents) put into the electrical socket outlets to avoid that small children access live parts by putting long metal object into one of the holes in the outlet and getting a (fatal) electric shock. The holes in this particular protector (where the pins of the plug go trough) are so narrow that the pins might get stuck. This would most likely mean that the user will pull the protector off the outlet when the plug is pulled out. It may occur that the user does not recognize this event.



Determination of the risk(s)

Injury scenario	Injury type and location	Severity of injury	Probability of injury	Overall probability	Risk
Protector is removed from the plug, which becomes unprotected. Child is playing with thin conductible object which can be inserted into the socket, access high voltage and is electrocuted.	Death	Very Serious	Removal of protector: 9/10 Not noticing the removal of protector: 1/10 Child is playing with thin conductible object: 1/10 Child is unattended when playing: 1/2 Child inserts the object into the socket: 3/10 Access to voltage: 1/2 Electrocution due to voltage (without circuit interrupter): 1/4	> 1/10,000	Serious risk - rapid action required
Protector is removed from the plug, which becomes unprotected. Child is playing with thin conductible object which can be inserted into the socket, access high voltage and sustains shock.	Burns 2nd degree	Slight	Removal of protector: 9/10 Not noticing the removal of protector: 1/10 Child is playing with thin conductible object: 1/10 Child inserts the object into the socket: 3/10 Access to voltage: 1/2 Child is unattended when playing: 1/2 Burn due to voltage (without circuit interrupter): 3/4	> 1/10,000	Acceptable
Socket unprotected. Child is playing with thin conductible object which can be inserted into the socket, access high voltage and is electrocuted.	Death	Very Serious	Child is playing with thin conductible object: 1/10 Child is unattended when playing: 1/2 Child inserts the object into the socket: 3/10 Access to voltage: 1/2 Electrocution due to voltage (without circuit interrupter): 1/4	> 1/1,000	Serious risk - rapid action required

The overall risk of the socket protectors is thus "serious risk".

Table 1. Hazards, typical injury scenario and typical injury

Hazard group	Hazard (product property)	Typical injury scenario	Typical injury
Size, shape and surface	Product is obstacle	Person trips over product, falls and hits the floor; or person bumps into product	Bruising; fracture
	Product is impermeable to air	Product covers mouth and/or nose of a person (typically a child)	Suffocation
	Product is or contains small part	Person (child) swallows small part; the part gets stuck in larynx and blocks airways	Internal airway obstruction
	Sharp corner or point	Person hits sharp corner or is hit by moving sharp object; this causes a puncture or penetration injury	Puncture; blinding, foreign body in eye; hearing, foreign body in ear
	Sharp edge	Person touches sharp edge; this lacerates skin or cuts through tissues	Laceration, cut; amputation
	Slippery surface	Person walks on surface, slips and falls hitting the floor	Bruising; fracture
	Rough surface	Person slides along rough surface; this causes friction and/or abrasion	Abrasion
	Gap or opening between elements	Person puts a limb or body in opening and is trapped with finger, arm, neck, head, body or clothing; injury occurs due to gravity or movement	Crushing, fracture, amputation, strangulation
Potential energy	Low mechanical stability	Product tips; person on top of product falls from height, or person near product is hit by the product; electrical product tips, breaks and gives access to live parts, or continues to work heating nearby surfaces	Bruising; dislocation; sprain; fracture; crushing; electric shock; burns
	Low mechanical strength	Product collapses by overloading; person on top of product falls from height, or person near product is hit by the product; electrical product tips, breaks and gives access to live parts, or continues to work heating nearby surfaces	Bruising; dislocation; fracture; crushing; electric shock; burns
	High position of user	Person at high position on the product loses balance, has no support to hold on to and falls from height	Bruising; dislocation; fracture; crushing
	Elastic element or spring	Elastic element or spring under tension is suddenly released; person in the line of movement is hit by the product	Bruising; dislocation; fracture; crushing
	Pressurised liquid or gas, or vacuum	Liquid or gas under pressure is suddenly released; person in the vicinity is hit; or implosion of the product produces flying objects	Dislocation; fracture; crushing; cuts (see also under fire and explosion)
Kinetic energy	Moving product	Person in the line of movement of the product is being hit by the product or run over	Bruising; sprain; fracture; crushing
	Parts moving against one another	Person puts a body part between the moving parts while they move together; the body part gets trapped and put under pressure (crushed)	Bruising; dislocation; fracture; crushing

Hazard group	Hazard (product property)	Typical injury scenario	Typical injury
	Parts moving past one another	Person puts a body part between the moving parts while they move close by (scissor movement); the body part gets trapped between the moving parts and put under pressure (shearing)	Laceration, cut; amputation
	Rotating parts	A body part, hair or clothing of a person is entangled by the rotating part; this causes a pulling force	Bruising; fracture; laceration (skin of the head); strangulation
	Rotating parts close to one another	A body part, hair or clothing of a person is drawn in by the rotating parts; this causes a pulling force and pressure on the body part	Crushing, fracture, amputation, strangulation
	Acceleration	Person on the accelerating product loses balance, has no support to hold on to and falls with some speed	Dislocation; fracture; crushing
	Flying objects	Person is hit by the flying object and depending on the energy sustains injuries	Bruising; dislocation; fracture; crushing
	Vibration	Person holding the product loses balance and falls; or prolonged contact with vibrating product causes neurological disorders, osteo-articular disorder, trauma of the spine, vascular disorder	Bruising; dislocation; fracture; crushing
	Noise	Person is exposed to noise from the product. Tinnitus and hearing loss may occur depending on sound level and distance	Hearing injury
Electrical energy	High/low voltage	Person can touch part of the product that is at high voltage; the person receives an electric shock and may be electrocuted	Electric shock
	Heat production	Product becomes hot; a person touching it may sustain burns; or the product may emit molten particles, steam etc. that hits a person	Burn, scald
	Live parts too close	Electric arc or sparks occur between the live parts. This may cause a fire and intense radiation	Eye injury; burn, scald
Extreme temperatures	Open flames	A person near the flames may sustain burns, possibly after clothing catches fire	Burn, scald
	Hot surfaces	Person does not recognise the hot surface and touches it; the person sustains burns	Burn
	Hot liquids	Person handling a container of liquid spills some of it; the liquid falls on the skin and causes scalds	Scald
	Hot gases	Person breathes in the hot gases emitted from a product; this causes lung burn; or prolonged exposure to hot air causes dehydration	Burn
	Cold surfaces	Person does not recognise the cold surface and touches it; the person sustains frostbite	burn
Radiation	Ultraviolet radiation, laser	Skin or eyes of a person are exposed to radiation emitted by the product	Burn, scald; neurological disorders; eye injury; skin cancer, mutation

Hazard group	Hazard (product property)	Typical injury scenario	Typical injury
	High intensity EMF source; low frequency or high frequency (microwave)	Person is close to the EMF source, body (central nervous system) is exposed	Neurological (brain) damage, Leukemia (children)
Fire and explosion	Flammable substances Explosive mixtures Ignition sources Overheating	Person is near the flammable substance; an ignition source sets the substance to fire; this causes injuries to the person Person is near the explosive mixture; an ignition source causes an explosion; the person is hit by the shock wave, burning material and/or flames The ignition source causes a fire; a person is injured by flames, or intoxicated by gases from the house fire Product overheats; fire, explosion	Burn Burn, scald; eye injury, foreign body in eye; hearing injury, foreign body in ear Burn; poisoning Burn, scald; eye injury, foreign body in eye; hearing, foreign body in ear
Toxicity	Toxic solid or fluid Toxic gas Sensitising substance Irritating or corrosive solid or fluid Irritating or corrosive gas or vapour CMR substance	Person ingests substance from product, e.g. by mouthing; and/or substance gets onto skin Person inhales substance from product; and/or substance gets onto skin Person ingests substance from product, e.g. by mouthing; and/or substance gets onto skin Person ingests substance from product, e.g. by mouthing; and/or substance gets onto skin or in eyes Person inhales substance from product; and/or substance gets onto skin or in eyes Person ingests substance from product, e.g. by mouthing; and/or substance gets onto skin	Acute poisoning; irritation, dermatitis, Acute poisoning in lungs; irritation, dermatitis Sensitisation; allergic reaction Irritation, dermatitis; skin burn; eye injury, foreign body in eye Irritation, dermatitis; skin burn; acute poisoning or corrosive effect in lungs or in eyes Cancer, mutation, reproductive toxicity
Microbiological contamination	Microbiological contamination	Person gets into contact with contaminated product by ingestion, inhalation or skin contact	Infection, local or systemic

Hazard group	Hazard (product property)	Typical injury scenario	Typical injury
Product operating hazards	Unhealthy posture	Design causes unhealthy posture of person when operating the product	Strain; musculoskeletal disorder
	Overexertion	Design requires use of considerable force when operating the product	Sprain or strain; musculoskeletal disorder
	Anatomical unsuitability	Design is not adapted to human anatomy which makes it difficult or impossible to operate	Sprain or strain
	Ignoring personal protection	Design makes it difficult for a person wearing protection to handle or operate the product	Various injuries
	Inadvertent (de)activation	Person can easily (de)activate product which leads to unwanted operation	Various injuries
	Operational inadequacy	Design provokes faulty operation by a person; or product with a protective function does not provide expected protection	Various injuries
	Failure to stop	Person wants to stop the product, but it continues to operate in situation where this is unwanted	Various injuries
	Unexpected start	Product shuts down during a power failure, but resumes operation in a hazardous way	Various injuries
	Inability to stop	In an emergency situation, person is not able to stop operation of the product	Various injuries
	Inadequately fitting parts	Person tries to fit a part, needs too much force to fit, product breaks; or part is too loosely fitted and gets loose during use	Sprain or strain; laceration, cut; bruising; entrapment
	Missing or incorrectly fitted protection	Hazardous parts are reachable for a person	Various injuries
	Insufficient warning texts and symbols	User does not notice warning texts and/or does not understand symbols	Various injuries
Insufficient warning signals	User does not see or hear warning signal (optical or auditive) causing dangerous operation	Various injuries	

Table 2. Vulnerable consumers

Vulnerable consumer	Definition
Very young children	0 to 36 months
Young children	Older than 36 months and younger than 8 years
Older children	8 to 14 years
Children	Includes all the three above definitions
Vulnerable people	Persons having reduced physical, sensory or mental capabilities (e.g. partially disabled, elderly having some reduction in their physical and mental capabilities), or lack of experience and knowledge (e.g. older children)
Very vulnerable people	Persons having very extensive and complex disabilities

Table 3. Severity of injury

Type of injury	Severity of injury			
	Slight	Moderate	Serious	Very serious
Laceration, Cut	Superficial	External (deep) (>10cm long on body) (>5cm long on face) Tendon or into joint White of eye Tongue (deep) Cornea Abdomen (deep but no organ damage)	Optic nerve Thyroid gland Bladder Nerve root cut Brain Larynx Neck artery Trachea Intestines Kidney Liver Spleen Lungs (superficial) Penis	Bronchial tube Oesophagus Aorta Spinal cord (low) Deep lung laceration Deep laceration of intestines, kidney, liver, spleen Severed throat, high spinal cord Completely severed aorta Brain (severe lesion/dysfunction)
Bruising (abrasion/contusion)	Superficial ≤25 cm ² on face ≤50 cm ² on body	Major >25 cm ² on face >50 cm ² on body oesophagus larynx	Trachea Bladder, colon, kidney, liver, spinal cord (minor) Lung (minor) Heart Brain Lung, with blood or air in chest	Brain stem Spinal cord causing paralysis
Concussion		Under 1 hour	Over 1 hour	Coma
Sprain, strain, musculoskeletal disorder	Extremities Joints Spine (no dislocation or fracture)	Knee ligaments (sprain)	Ankle ligament rupture/ tear Achilles tendon rupture/ tear Knee ligament rupture/ tear Ripped muscle/ tear Whiplash	-
Entrapment/ pinching	Minor pinching	Loss of digit	(refer to the final outcomes bruising, crushing, fracture, dislocation, amputation, as applicable)	(Refer to Suffocation / Strangulation)
Dislocation	Finger Toe Loss of Tooth (or loosening)	Foot Elbow Heel Hand Forearm Jaw	Ankle Wrist Shoulder Hip Knee Spine	Spinal column

Type of injury	Severity of injury			
	Slight	Moderate	Serious	Very serious
Fracture	Nose Finger Teeth Rib Toe	Skull Sternum Hand Wrist Foot Heel Forearm Jaw and teeth Eye, bones around eye Ear bones Upper arm Lower leg (shaft)	Ankle Femur Hip Thigh Base of skull Spine (minor compression fracture) Jaw (severe) Larynx Multiple rib fractures Blood or air in chest Severe fracture of skull	Neck Spinal column
Crushing	-	Finger Toe	Elbow Hand Trachea Foot Wrist Ankle Shoulder Heel Forearm Knee Leg Larynx Pelvis Fingers (hand disabled)	Spinal cord Mid-low neck Chest (massive crushing) Brain stem
Amputation	-	--	Hand Foot Forearm Heel Leg Eye Finger(s) Toe(s)	Both legs Decapitation

Type of injury	Severity of injury			
	Slight	Moderate	Serious	Very serious
Piercing, puncturing	Arm Leg Foot Head Finger Body (minor penetration)	Abdominal wall (no organ involvement)	Eye Internal organs Chest wall	Aorta Heart Bronchial tube Abdominal Organs (liver, kidney, bowel, etc) deep
Ingestion	-	-	Internal organ injury (refer also to internal airway obstruction in case the ingested object gets stuck high in the oesophagus)	Permanent damage to internal organ
Internal airway obstruction	-	-	Oxygen flow to brain blocked without permanent consequences	Oxygen flow to brain blocked with permanent consequences
Suffocation / Strangulation	-	-	Oxygen flow to brain blocked without permanent consequences	Fatal suffocation / strangulation
Submersion / Drowning	-	-	-	Fatal drowning
Burn/ Scald	1°, up to 100% of body surface 2° or 3°, <6% of body surface	2° or 3°, 6-15% of body surface	2° or 3°, 16-35% of body surface Inhalation burn	2° or 3°, >35% of body surface Inhalation burn requiring respiratory assistance
Electric shock	-	Local effects (temporary cramp or muscle paralysis)	-	Electrocution
Neurological disorders	-	-	Triggered epileptic seizure Neurological effects of EMF	-
Eye injury, foreign body in eye	-	-	Partial loss of sight Permanent loss of sight (one eye)	Permanent loss of sight (both eyes)
Hearing injury, foreign body in ear	-	-	Partial loss of hearing Complete loss of hearing (one ear)	Complete loss of hearing (both ears)
Poisoning from substances (ingestion, inhalation, dermal)	Diarrhoea, vomiting, local symptoms	Reversible damage to internal organs, e.g. liver, kidney, slight haemolytic anaemia	Irreversible damage to internal organs, e.g. oesophagus, stomach, liver, kidney, haemolytic anaemia, reversible damage to nerve system	Irreversible damage to nerve system Fatality

Type of injury	Severity of injury			
	Slight	Moderate	Serious	Very serious
Irritation, dermatitis, inflammation or corrosive effect of substances (inhalation, dermal)	Local slight irritation, inflammation or corrosive effects on: Arm Leg Hand Foot Finger	Reversible eye damage Reversible systemic effects	Lungs, respiratory insufficiency, chemical pneumonia Irreversible systemic effects Partial loss of sight	Lungs, requiring respiratory assistance Asphyxia
Allergic reaction or sensitisation	Allergic contact dermatitis, Superficial and local	Sensitisation, widespread allergic contact dermatitis	Severe sensitisation	Anaphylactic reaction, shock Fatality
Long-term damage from contact with substances or from exposure to radiation	Diarrhoea, vomiting, local symptoms	Reversible damage to internal organs, e.g. liver, kidney, slight haemolytic anaemia	Damage to nerve system (e.g. OPS), Irreversible damage to internal organs, e.g. oesophagus, stomach, liver, kidney, haemolytic anaemia, reversible damage to nerve system	Cancer (leukaemia) Effects on reproduction Effects on offspring CNS depression
Microbiological Infection		Reversible damage	Irreversible effects	Infection requiring prolonged hospitalisation, antibiotics resistant organisms Fatality

Table 4. Probability of injury

Probability of damage during the foreseeable lifetime of the product	
Almost certain, might well be expected	> 50 %
Quite possible	> 1/10
Unusual but possible	> 1/100
Only remotely possible	> 1/1,000
Conceivable, but highly unlikely	> 1/10,000
Practically impossible	> 1/100,000
Impossible unless aided	> 1/1,000,000
(Virtually) Impossible	< 1/1,000,000

Table 5. Risk level from the combination of the severity of injury and the probability

Probability of damage during the foreseeable lifetime of the product		Severity of Injury			
		Very Serious	Serious	Moderate	Slight
Almost certain, might well be expected	> 50 %	S	S	S	M
Quite possible	> 1/10	S	S	S	L
Unusual but possible	> 1/100	S	S	S	L
Only remotely possible	> 1/1,000	S	S	M	A
Conceivable, but highly unlikely	> 1/10,000	S	M	L	A
Practically impossible	> 1/100,000	M	L	A	A
Impossible unless aided	> 1/1,000,000	L	A	A	A
(Virtually) Impossible	< 1/1,000,000	A	A	A	A

S – Serious Risk
M – Moderate Risk
L – Low Risk
A – Acceptable Risk

