

MANUFACTURER'S GUIDE TO DEVELOPING CONSUMER PRODUCT INSTRUCTIONS

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Using this Guide

CPSC staff is providing this guide to help manufacturers develop the wide range of instructional materials that are associated with consumer products. These materials include the following:

- owner's manuals
- assembly instructions
- training materials
- product repair or recall information
- maintenance and troubleshooting guides
- quick reference guides
- storage or disposal information.

Each of these materials serves a different purpose, and the design issues for each will differ. You also need to consider the product for which you are developing instructional materials. This guide helps you customize your approach to best meet the needs of your particular application. It will help you identify the right questions to ask and will help you answer those questions.

Many books, manuals, research papers, industry standards, and regulations deal with some aspect of consumer product instructions. Unfortunately, much of this information is scattered, hard to find, overly technical, or narrow in perspective. This guide integrates information from many sources and provides it in a convenient form. This guide does not provide a detailed “how-to” for each type of instructional material or product. Instead, it shows those principles of good design that are generally applicable to all instructions associated with consumer products. This guide does not prescribe requirements, and it is not a CPSC rule.

Other sources may offer greater detail or more topics, and one purpose of this guide is to direct you to other good sources when you need more information. Recommendations for other documents appear throughout this guide. The References section includes complete citations.

What Are Instructions?

Consumers use products to do things. Instructions provided by the manufacturer are intended to help consumers do these things properly. Instructions do not exist in a vacuum. They are part of a system of product-related elements that must work together. These elements include the physical product design, user interface, on-product warnings and messages, packaging, marketing, and training. You should view instructions as a part of your product system that is supported by the other elements and, in turn, supports them.

Instructions are a tool for consumers to use to do something. Like any other good tool, instructions must be designed for use. Think of their development not as an effort of writing, but of engineering. You design and build the instructions so consumers can use them as a tool. There are creative aspects to the “art” of writing and illustration, but these skills are used to fulfill the design need.

Good instructions can do several important things. They can

- describe the actions or procedures necessary to perform a task.
- explain how a product works and applications for which it is used.
- describe how the product may be misused.
- warn consumers about hazards (safety information).
- encourage consumers to act in a safe and appropriate way.
- meet legal obligations for duty to warn.
- meet regulatory requirements or standards for providing certain information.

However, you should not expect instructions, regardless of how well they are written, to overcome poor product design or problems such as:

- overly complex procedures
- unreasonable demands on consumer memory
- inconsistency with consumer motivations and behaviors
- hazards that are difficult to perceive, appreciate, or control
- contradictory messages consumers may infer from the features or marketing of the product.

How Can Instructions Fail?

Providing instructions does not guarantee that the instructions will be successful in helping consumers meet their goals. Too often, consumers act in a way that is inconsistent with what the manufacturer intended. This means the instructions failed to achieve some purpose. We do not mean “fail” in a judgmental sense—the point is not one of blame. Rather, the use of the word “fail” is a straightforward way of acknowledging that instructions are designed for a purpose, and what is important is whether they achieve that purpose. Influencing real-world human behavior through written material is often challenging and this process can fail for many reasons.

The instruction developer must create and carry out a strategy to make the instructions effective. The major stages of the development process in which poor decisions may lead to ineffective instructions include the following:

- *Planning the instructions.* You should view your instructions as a tool that is designed to meet goals. You must comprehensively define these goals before you design the instructions. Understanding these goals may sound trivial, but it often requires careful analysis. You also need to understand who the users of your instructions are and what needs and preferences they have. Consumers may come to the product with backgrounds and understanding that differ from yours. Their needs, preferences, and abilities should influence your strategy for designing the instructions.
- *Designing the instructions.* To effectively design the instructions, you must understand what happens to them when they get to consumers. For instructions to have the desired effect on consumer behavior, they must be successful at each point in a sequence of stages. They must *capture* and *maintain* the attention of consumers when they are needed. Consumers then must *comprehend* or understand the instructions. Once understood, the message must *motivate* consumers to follow it. Ultimately, the instructions must elicit the behavior that you want. This “behavior” includes overt actions, such as following a sequence of assembly steps. Actions may be performed as the instructions are read or may be recalled later from memory. For example, consumers may need to learn and remember what to do if a warning light comes on, especially if the instructions are not available.
- *Evaluating and testing the instructions.* How do you know if your instructions are an effective tool for consumers? Defining what constitutes success and finding a good way to measure it are

important aspects of developing good instructions. For complex applications, such as many owner's manuals, you may need to evaluate and test the instructions throughout their development. An effective strategy for evaluating and refining the instructions should be part of your design strategy from the beginning, not an afterthought.

How Is this Guide Organized?

Most guides or manuals on instructions tend to dedicate each section to some attribute of the instructions, such as “Graphics” or “Page Layout.” However, for the most part, this guide is organized around the major concepts you must consider when developing instructions. In other words, what should you be doing with the instructions, and what do your instructions need to do to be effective? Are your instructions “Capturing and Maintaining Attention”? Are you “Securing Comprehension”? This structure is intended to change your way of thinking about instructions, so that you are not simply following guidance and recommendations without understanding why you should do so.

Each section of this guide includes an overview of major issues, guidelines for instruction design, and references to other documents that provide more information, if applicable. Safety is critical for consumers and instructions must address safety issues. For this reason, this guide includes a separate section on special issues that arise when presenting safety instructions.

At the end of this guide, you will find a checklist designed to help you identify the major considerations discussed within this guide. The checklist also includes cross-references to those sections of the guide that address the considerations in greater detail.

2 Planning the Instructions

You face three primary questions when you set out to write instructions:

- What do you want consumers to know or to do?
- What do consumers expect from the product and from the instructions?
- How can you get consumers to know what they need to know?

The first two questions have to do with goals: your goals and your consumers' goals. You must have detailed answers to these "what" questions if you hope to answer the "how" question. If your answers to the "what" questions are not complete and precise, they cannot guide the design of the instructions. Also, the more precise your goals, the more easily you can find out if the instructions you develop are successful.

Why do you have to ask what consumers want and expect? Isn't it enough to understand your own goals for the instructions and to write the instructions based on that? Not necessarily. The goals may be yours, but you must view instruction use and product use from the consumers' perspective to plan an effective approach. Also, some consumer goals may influence your own goals. If consumers have a particular way of using your product, your goal must be to tell them how to use it that way, if it is appropriate, or how to prevent inappropriate use.

The questions addressed in this section are:

- What Are the Goals of the Instructions?
- Who Is the Audience?
- What Are the Constraints?

What Are the Goals of the Instructions?

Generally speaking, instructions are meant to help consumers properly use products and perform tasks. However, your goals must be more specific than this. First, consider the demands that your product places on consumers. What are the potential hazards and challenges that are inherent in the product? In what ways might consumers use the product? What skills must consumers have to use the product in these ways? If you

are familiar with your product and market, the answers to these questions might seem obvious to you. However, critical issues are easy to miss, especially because consumers may come to the situation with different knowledge and motivation.

Once you define the goals of your instructions, you must specify measurable criteria for what defines “success” in meeting those goals. A variety of systematic techniques can help. Product design efforts or marketing analyses for your product may already use some of these same techniques. They are equally important for the design of the instructions. Section 7, *Evaluating the Instructions*, provides more detailed guidance on how to determine if your instructions are successful.

✓ ***Define the scope of your instructions.***

Are your instructions intended to cover the entire product-life-cycle—that is, assembly, use, storage, maintenance, and disposal—or are your instructions purposefully limited?

✓ ***Identify key tasks that the user must perform based on the scope of the instructions.***

We refer to “key” tasks because your criteria for success do not have to include every minor aspect of consumer use. You should view the word “task” broadly and not just as physical acts. For example, a key task may be learning the meaning of icons on a display panel. You should define key tasks for evaluation at a large-scale level, such as installing a dishwasher, and at a more limited or narrow level, such as correctly securing a hose.

✓ ***Define specific and measurable criteria for success for each key task.***

Find an objective way to figure out if the instructions are successful at each key task; one that would allow any outside observer to look at consumers’ behavior and accurately conclude whether it met the criteria for “success.” You may want to consider multiple dimensions to success, such as accuracy, time, comprehension, cost, user satisfaction, and so forth.

✓ ***Find out how consumers are likely to use your product under real-world conditions.***

Consumers may use your product in ways you did not intend. Therefore, you must consider not only the intended uses of your product, but also other ways consumers may use it, including potential misuse and risk factors. Detailed analyses of consumer injuries and deaths with your product or with products that share some common feature may also provide insight into likely hazards

and problems in use. For example, if you are analyzing hazards for a riding lawnmower, you also may analyze hazards posed by all-terrain vehicles and golf carts. These products are comparable because they share potential problems of stability on outdoor terrain.

The U.S. Consumer Product Safety Commission (CPSC), through its National Injury Information Clearinghouse, is one important source of such information. The Clearinghouse collects and distributes data and other information related to injuries or deaths associated with consumer products. Various qualitative techniques can also help you explore how consumers may use a product:

- *Focus groups* can be helpful at any stage of product development. A focus group is a small-group discussion technique in which the interactions of the participants help reveal people's perceptions, beliefs, and attitudes.
- *Usability testing* requires you to have a working product or effective mock-up. Users' actions and errors are carefully observed during well-defined tasks, often including various sorts of verbal reporting, such as interviews or "thinking out loud."
- *Observational methods* are helpful if the product can be placed in a field setting. Actual behaviors are recorded in the consumer's own environment. "Self observation," by having people keep log diaries about product use, can also be useful.
- *Affordance analyses* look at how features of the product invite or suggest ("afford") different kinds of behavior. For example, a product might have features that a consumer views as affording the opportunity to sit on it. These methods all help to let you see the product through consumers' eyes.

✓ ***Identify all reasonably foreseeable hazards associated with the product.***

Various techniques, such as failure modes and effects analyses and fault tree analyses, can help identify potential hazards. These methods generally focus on the potential sources of injury and the possible modes of product "failure." You should examine comparable products in terms of the hazards they identify in warnings and instructions. You may include in your analysis other products that share a common feature with your product. Existing incident and injury data can also help identify potential product hazards.

- ✓ ***Specify the knowledge and skills required to successfully perform each task with your product.***

When consumers use your product, each task can be viewed as a sequence of smaller subtasks, or steps. At each step, some skill or knowledge might be required. Before you write the instructions, you must find those points where you have to provide consumers with information they may not have. This requires reducing every task to its components. Experts or others who are familiar with the product may have difficulty recognizing all the user steps and information requirements because they seem automatic or obvious. A task analysis can help you identify required actions, information needs and sources, user capabilities, the ways in which errors in product use occur, and factors that can influence product performance.

For Further Reading:

Cohen and Cunningham (1984) discuss the need for instructional objectives. They organize a step-by-step approach to instruction writing based around the use of a series of “plan sheets,” including “The Task Detail Sheet” for organizing performance objectives.

Frantz, Rhoades, and Lehto (1999) discuss methods of identifying and analyzing product hazards. The authors describe how hazard identification fits into the process of developing warnings and cites reference sources for various techniques.

U.S. Consumer Product Safety Commission (CPSC) product injury data and information can be accessed through its Web site at <http://www.cpsc.gov/>. You can also request injury information through CPSC’s National Injury Information Clearinghouse, by phone (301-504-7921) or mail (National Injury Information Clearinghouse, U.S. Consumer Product Safety Commission, Washington, DC, 20207).

Who Is the Audience?

Consumers do not approach your instructions with a “blank slate,” ready to absorb all the information you provide without bias or prejudice. What consumers take in from instructions is colored by their knowledge and beliefs about the product, as well as their more general knowledge and attitudes. Their understanding of your product may be limited and may also be inaccurate. This may be because of a misinformed idea of how a product works or should be used. Therefore, you must view the product

from consumers' perspective so that you can develop instructions that respect and complement that perspective.

Before you begin writing, consider who will be reading the instructions. Your audience is likely to represent a wide range of backgrounds, abilities, attitudes, and perceptions. Subgroups of users—for example, expert users, older consumers, and non-English-literate consumers—may have particular needs that you should address. Remember too that these subgroups are in most audiences. In general, you should consider them part of your audience rather than separate groups to address individually.

✓ ***Identify and characterize the population of reasonably foreseeable users of your product and instructions.***

Consider factors such as age, gender, literacy, disabilities, and cultural biases. Also consider how familiar consumers are likely to be with your product or similar types of products. Are there potential users other than the original buyer? In what environments will the product and instructions be used, and what tools or other resources will consumers have available?

✓ ***Find out consumers' attitudes and beliefs about your product.***

What misperceptions might your audience have about your product? You might monitor Web sites and chat areas where consumers comment on products. For example, some Web sites allow consumers to post their own reviews of products that they have used. Other sites have bulletin boards where consumers can exchange information about product experiences. These comments sometimes reveal what consumers expected and where misunderstandings occurred. The information you get from Web sites is not systematic or comprehensive, but reading this information is a convenient way to “listen in” on real consumer beliefs and attitudes. Marketing research that has been done for the product may also provide detail on consumer beliefs.

✓ ***Consider the different needs and abilities of novice and expert users.***

In general, you should write instructions at a level appropriate for novice users of the product. However, some instructions or tasks may be intended specifically for expert users. Expert users may understand technical terminology and graphics. They may have tools and accessories that other consumers may not have. They may understand the steps and options for accomplishing a particular task, so that the instructions do not have to explain every required action. However, if you write instructions for expert users only, you must

distinguish those portions of your instructions that are intended for novice versus expert audiences.

For some applications, there may be instructions intended for a general audience and other instructions intended specifically for an expert audience. For example, there may be installation, maintenance, or repair activities that untrained users should not attempt. Clearly highlight sections where expertise is required, or consider providing separate documents (such as a repair manual) for each audience. Include prominent warnings on instruction materials if the general public should not use the product or attempt a task. Describe the expertise or training that is assumed. Stating “For professional use only” is insufficient. Put warnings on product packaging and possibly on the product itself. Place applicable legal or regulatory restrictions in prominent locations.

✓ ***Consider the needs and abilities of the elderly.***

Aging generally results in decreased visual ability. Specific difficulties may include reduced visual acuity, problems with poor brightness contrast and glare, and problems with visually complex and cluttered instructions. Therefore, although 10- to 12-point type is often recommended for the general population, 14-point type may be helpful for older consumers. Other relevant changes that affect some older people include a decreased ability to process and remember information, and decreased dexterity, flexibility, and other motor skills. Although you should recognize these changes, you should not stereotype older people and discount their competence.

✓ ***Consider the needs and abilities of non-English-literate users.***

Although manufacturers have a legal duty to warn consumers of potential product hazards, no generally applicable laws or standards specifically state which conditions require you to provide instructions in multiple languages. Nonetheless, some court decisions have found manufacturers at fault for failing to provide warnings in multiple languages. How many of your users cannot read English? What are the costs to those users if the instructions are only written in English? Specific questions that you should consider to help decide whether to provide multilingual instructions include:

- Is the product sold outside of the United States?
- Is the product targeted to a non-English-literate audience?
- Is the product marketed in multiple languages?
- Do incident, injury, and death data associated with the product suggest that some non-English-literate groups are at risk?

A number of design alternatives are available to communicate to non-English-literate users. You can:

- *translate the full text of the instructions.* You may put both languages within a single document or create a separate document for each language. If you put both in a single document, make each language easily distinguishable from one another—for example, by its typeface. Using separate documents for each language is especially important when the instructions in any one language are more than four or five pages/sides long.
- *make alternative language versions of the instructions available upon request.* These might be available on the Internet or by mail order. Note the availability of the instructions, in the appropriate language, within the English language version or accompanying materials.
- *provide safety warnings in multiple languages, but the rest of the instructions in English.* See Section 6 for more information on presenting safety instructions.
- *use diagrams and graphics to illustrate actions; rely less on text.* Use graphics that show the tasks users must perform, but only if those graphics are well understood by your audience. If consumers have a difficult time understanding the graphic alone, you should supplement it with multilingual text. You should also keep in mind that some tasks and concepts cannot be adequately expressed using graphics. In such cases, written instructions may be the only effective option.

For Further Reading:

The Department of Trade and Industry (1998) in the United Kingdom conducted research on differences among categories of consumers (such as “young family” or “teenagers living at home”) and their report provides guidance on matching instructions to user traits. This document also discusses ways to design and format text and graphics for multilingual instructions. The discussion includes examples of formats you can use to combine multilingual text and graphics.

Sanderlin (1988) provides a review of the literature on creating instructions for non-English-literate consumers. The article discusses translation methods and includes a brief set of guidelines on designing instructions for non-English-literate users.

Schoff and Robinson (1984) have an informative chapter on the spectrum of instruction users and how to adapt features of instruction manuals to

their characteristics. They also include a general section on designing instructions for expert users and a more extensive section on designing service manuals for professional audiences. Another chapter discusses manuals for international consumers, including those in industrialized and developing nations. The authors discuss issues in translation, the presentation and format of graphics and text, word choice, product maintenance and service, and cultural differences. The chapter also includes sample multilingual instructions and a list of translation services.

Van Hees (1996) provides a review of the literature on characteristics of older people that you should consider when designing instructions. Emphasis is placed on cognitive limitations and their implications for the design of the instructions. The author includes a brief set of guidelines on considerations for older consumers.

Vignali (1995) discusses major court decisions that involved the duty to warn non-English-literate users about product hazards. Based on these decisions, the author outlines the major factors that you should consider when providing safety information for non-English-literate users.

What Are the Constraints?

Sometimes what you must state in instructions, or the way you present the information, is imposed upon you. These requirements may come from formal regulations, legal requirements or concerns, or industry standards and accepted practice. Some imposed approaches may be recommendations more than formal requirements. While you may have more latitude with these, you still must carefully consider them and be cautious if you adopt a different approach. Your instructions must meet imposed requirements, but your approach must remain effective to create a good tool for consumers. Before you begin designing instructions, you must identify all the requirements or recommended practices that apply to your product's warnings and instructions.

- ✓ ***Identify government regulations that relate to instructions, warnings, and other required consumer information for your type of product.***

Even if regulations do not specifically relate to instructions, they may indirectly affect your approach. For example, if a warning label is required on the product, you must address the same hazard within the instructions.

- ✓ ***Identify requirements imposed by legal considerations, including duty to warn.***

Even if no laws specifically require safety instructions for your product, you may still be legally responsible for providing consumers with information about potential hazards.

- ✓ ***See if government agencies related to your product have available guidance or recommendations.***

Federal or state agencies may have considered your type of product and put forth information and suggestions that might directly or indirectly relate to instructions. Agency Web sites provide one easy way of getting this information or finding appropriate contacts. The U.S. Consumer Product Safety Commission (<http://www.cpsc.gov/>) is a useful source for many products.

- ✓ ***Identify voluntary standards and industry-recommended practices that relate to instructions, warnings, and other required consumer information for your type of product.***

Besides standards and practices that apply narrowly to your product category, you also should address broader or cross-cutting standards and practices. This might include general standards on warning information, like the American National Standards Institute's ANSI Z535 series, or standards related to materials used in your product.

- ✓ ***Identify requirements imposed by the manufacturer.***

There may be company practices for format, style, illustration, materials, packaging, and so forth. You should include these limitations when you assemble the set of constraints that you must work within.

For Further Reading:

Helyar (1992) provides an overview of the elements you must include in consumer product instructions to make them legally adequate. The author presents brief case studies in which courts determined that instructions were insufficient.

Wogalter, DeJoy, and Laughery (1999), in a book titled *Warnings and Risk Communication*, provide several chapters with good discussions of topics described above:

- Collins (1999) gives an overview of standards and government regulations in the United States.

Section 2: Planning the Instructions

- Frantz, Rhoades, and Lehto (1999) address some sources of information you can draw on to identify imposed requirements.
- Madden (1999) discusses the law as it relates to safety instructions.

3



Capturing and Maintaining Attention

You cannot assume that all consumers will seek the instructions. The physical features of the document and the placement of information must convey an immediate message to consumers that “there is something here and it is going to be important to me.” Your instructions should convey this message to the original purchasers before they interact with the product. You also should keep awareness of the instructions in mind for later use, including maintenance, troubleshooting, or advanced applications. Consider that the original purchaser may not be the only user of the product. There may be multiple users or subsequent owners, and you must convey the importance of the instructions to them as well. Therefore, you should consider the appearance and location of instructions in the packaging, during use, and in storage.

Even if the instructions are noticed and recognized for what they are, consumers may not read them. If read, the instructions may only be skimmed. The “look and feel” of the document can encourage consumers to begin reading and can promote deeper reading. Poor legibility, layout, and structure can discourage reading, but a user-friendly appearance and structure can encourage it.

The questions addressed in this section are:

- What Gets the Instructions Noticed?
- What Makes the Page Layout Inviting?
- What Makes the Text and Graphics Inviting?

What Gets the Instructions Noticed?

After buying a new product, consumers often want to use it immediately, so written items accompanying the product may seem like a distraction. Often, a variety of documents besides instructions accompany the product. These include warranties, dealer location information, and catalogs of related products. Your instructions must stand out from all of these and make an immediate impression on consumers if they are to attract attention.

You must locate the instructions effectively to capture consumers’ attention when the product is first used. However, consumers may also

need the instructions after the first use to refresh their knowledge, learn about advanced features, find reference information, or perform tasks that typically occur after initial use, such as maintenance or disposal. People other than the first owner may also need to use the instructions, and they too should be able to get critical information when and where it is needed. Locate your instructions so that the effort it takes to seek and notice them is minimized and the effort it takes to avoid and ignore them is maximized.

Instructions should be conspicuous and attractive. In other words, they should be immediately obvious to the consumer, and should be clear, bright, and visually pleasing. The instructional document should also appear important. It should convey the impression that it is needed for proper use of the product. Meeting these criteria for all physical features of the document will help to improve consumers' awareness of the instructions.

✓ ***Place the instructions where consumers will encounter them the first time they interact with the product.***

Locate the instructions where consumers are likely to be looking while unpacking or first using the product. Require consumers to take some action that involves handling the instructions. For example, you might attach the instructions to the product or include them within an assembly parts package. Avoid making consumers seek out the instructions, and avoid bundling instructions within a packet of other (less critical) print materials.

✓ ***Consider using supplemental directives with the product.***

Supplemental directives are messages that relate or point to the complete set of instructions. Often, they can be more eye-catching than the main document. For example, a hang tag can direct consumers to the instructions and emphasize their importance. You might attach an abbreviated set of safety instructions to the product or in a highly visible area, and refer to the full instructions for more complete information. Permanent product labels can direct users to the instructions. Informational messages about certain product functions or requirements might be placed in the most appropriate locations on the product, but point to the full instructions for further detail. For example, if battery replacement and disposal require certain procedures, a label referring to the full procedures can be located on the battery housing.

Warnings for specific hazards can point to the instructions for full information. However, you should be careful to avoid mixing general instructions with warnings. Information that is not directly related to

safety should not appear within safety labels. See Section 6, *Presenting Safety Information*, for more on the design of safety information. Supplemental information may be most effective when it interrupts a routine sequence of behavior and requires consumers to physically interact with the material. For example, a supplemental directive taped over an ignition switch on a riding mower requires users to remove the tape and interrupts the sequence of *sitting* → *starting the engine* → *engaging the gears*.

✓ ***Consider delivering the instructions prior to the product.***

For some products with extended delivery times, you might consider sending instruction and training materials—possibly video in addition to print matter—to the purchaser in advance of the product itself. This may improve the likelihood that the instructions will be noticed. It can also help with the problem of an eager consumer who just wants to start using the product without taking the time to read instructions. Without the product at hand, interest in the product may be channeled into reading the material you send in advance. Including the instructions with the product is still important, however, in case the ones sent earlier are lost.

✓ ***Promote convenient and reliable storage of the instructions.***

Include an explicit message on the document that tells consumers to save and store the instructions, such as, “Keep these instructions.” You may want to offer some reasons why it might be important to keep the instructions handy. These might include maintenance information, parts replacement, and advanced features you might not use right away. Design the document to be durable with repeated use and storage. Where feasible, provide a pocket or sleeve for instructions on the product itself. Where this is not feasible, it may be possible to store an abbreviated set of instructions or warnings with the product and have it refer to the complete instructions.

✓ ***Provide access to new, supplemental, or replacement materials.***

Provide an address, Web site, or phone number where consumers can go for instructions. Ideally, you would put this information on the product itself so users can refer to it if the original instructions are lost or inaccessible. Consumers may be more likely to use instructions if you allow for them to get the information immediately, such as from a Web site. Contact sources can be used not only for replacing original documents, but also for updated information, access to versions in languages other than English, or technical support numbers.

✓ ***Use high contrast and simple bold elements on the document cover.***

A bold and distinct color will catch a person's eye. It will also make the document more memorable and easier to notice and locate later. There should be brightness contrast (dark on light or light on dark) and color contrast (colors that stand out from one another) among elements on the cover page and between the document and its surrounding environment. Simple bold graphic elements can also attract attention. Avoid clutter and fine detail. Large-sized text and graphics can also make the document more conspicuous.

✓ ***Choose cover information and materials that convey the purpose and importance of the document.***

The title should make the purpose of the document obvious. Where appropriate, the title or other cover information should convey that it contains important safety information. This may be especially important where consumers feel they already are familiar with the product. Notices to “keep this document” may also reinforce the message that the document is important. The quality of the materials, such as the heaviness of cover stock, lamination, or print quality, can also contribute to the implied message that your instructions are important. Avoid conveying the sense that your document is primarily a promotional item or set of technical specifications.

✓ ***Include, in the title or on the title page, the name and model of the product and the name of the manufacturer.***

This is especially important if the product is packaged with other documents, or if the instructions must be noticed and accessed during later use or by consumers other than the first user.

For Further Reading:

The Department of Trade and Industry (1989) in the United Kingdom provides more in-depth guidance on color, contrast, and color printing.

Wogalter, Barlow, and Murphy (1995) discuss noticeability and tools to increase noticeability to users.

What Makes the Page Layout Inviting?

Page layout refers to the arrangement and placement of all text and graphics on a page; that is, the visual appearance of a page. Developing a functional layout can improve the readability and organization of your

instructions. Because instructions contain many different components, it is not easy to make them all fit and, most importantly, to make the finished product attractive and readable. Keep simplicity, logic, and consistency in mind when planning the layout of your instructions.

✓ ***Choose the most appropriate page size.***

Standard sizes are 8 ½" × 11" or 5 ½" × 8 ½", but you are not necessarily restricted to these. To determine the best page size for your instructions, consider the following:

- *What paper sizes are available and how much will printing cost?* Although a nonstandard page size may be desirable, paper of these sizes may be more difficult or expensive to get and to print.
- *How will the instructions be packaged?* Consider the amount of space that is available for the instructions.
- *How will the instructions be used?* Consider the amount of information users need on a single page and how much space it will require. Large page sizes and foldouts may overwhelm users with too much information on a page and make referencing specific sections of the instructions difficult.
- *Where will the instructions be stored?* This could be on a bookshelf, in a folder, with the original product packaging, next to the product, inside the product, and so forth.
- *Are foldout instructions appropriate?* If a large page size is desirable but the space for packaging or storage is limited, consider using foldout instructions. However, make sure consumers can easily re-fold the instructions.
- *Who will be using the instructions?* Older consumers may have difficulty handling small pages and foldout instructions. They also may need instructions to be written in larger type, which could make smaller page sizes inappropriate. Instructions in multiple languages may be difficult to fit on smaller pages.

✓ ***Choose a consistent format and location for elements that are used on more than one page.***

Repetitive elements (such as page numbers, headers, footers, and headings) should share common physical features. This will help users locate information and understand the structure of the instructions.

- ✓ ***Use white space generously to break up different elements on a page.***

White space is the blank area around and between the other elements on a page. You can use it to divide information into more manageable chunks, which helps make the organization of the instructions evident. Use white space around the page to frame the information, between sentences to separate one from another, between paragraphs to distinguish one idea from the next, around headings and important information to emphasize importance, and around graphic displays to increase their clarity. White space is, in general, a positive feature and you should use it consciously to improve the structure of your instructions.

- ✓ ***Use graphic elements to create visual interest and highlight structure.***

Text boxes, lines, and icons can be used to draw attention, separate segments of information, and create structure. But use these only if they do not clutter the instructions.

- ✓ ***Use highlighting techniques to emphasize key information.***

Text formats that can be used for emphasis include the use of boldface, larger type, all uppercase letters, underlining, italics, and color (text color or background shading). Overuse of highlighting techniques, however, may overload consumers and devalue the highlighted text, and can even make the text more difficult to read.

- ✓ ***Avoid excessively long line lengths.***

In general, each horizontal line of text should be between 35 and 70 characters, including spaces. Fewer characters per line may be better when consumers must look back and forth from the directions to the product. To shorten line length, consider changing your text formatting, manipulating margin width, or switching to a two-column format.

- ✓ ***Follow a standard format of justified left edge with a ragged right edge in bodies of text.***

This paragraph is formatted so it is justified—also referred to as “full justified” or as “left- and right-justified.” This formatting can give the text a “cleaner” or more formal look since the line length is identical for every line. However, the spaces between words can differ dramatically unless the line lengths are long or you frequently hyphenate. This can make the text harder to read. The rest of this Guide has been formatted so it is left-justified with a ragged right edge. It is easier to read because the spacing between each word remains the same.

✓ ***Place each graphic next to the text in which it is referenced.***

Each graphic should be referred to within the text. Place graphics such as pictures, charts, and tables on the same page as the text, and as close to the text as possible. If the graphic and text cannot fit on the same page, put the graphic on the page after the text and reference its location in the text. Orient the figure so consumers do not have to rotate the page to see it in its proper orientation.

For Further Reading:

Alred, Brusaw, and Oliu (2000) provide a checklist for creating and integrating illustrations. Going through the checklist will ensure that visual elements have been properly integrated.

Felker, Pickering, Charrow, Holland, and Redish (1981) discuss highlighting techniques and give many examples of their use. A brief summary of research on highlighting is also included.

Schoff and Robinson (1984) provide further information on mechanical elements, such as paper, page size, and binding.

What Makes the Text and Graphics Inviting?

The following guidelines provide generally agreed upon characteristics for distinguishing text and graphics so they can be easily identified. These help maintain attention and encourage consumers to read the instructions.

✓ ***Choose a legible typeface.***

The words “typeface” and “font” are often used interchangeably, but a font, technically, is a typeface of a particular size. Not all typefaces are equally legible. Use those that have easily distinguished letters. Commonly used typefaces, such as Times New Roman and Arial, are usually safe choices. For example, this paragraph is written in Times New Roman. Here are the first three sentences rewritten in Arial:

The words “typeface” and “font” are often used interchangeably, but a font, technically, is a typeface of a particular size. Not all typefaces are equally legible. Use those that have easily distinguished letters.

✓ ***Use about 12-point type for passages of text.***

Type is measured in “points,” where 1 point = $\frac{1}{72}$ of an inch. The point size of a typeface is the approximate distance from the top of an uppercase letter to the bottom of a lowercase letter with a descender (for example, the bottom of a “j”). Differences in typeface design are why one typeface may look smaller or larger than another, even if the point size for both is the same.

Type sizes ranging from 10- to 12-point may be acceptable if read at a standard reading distance, but 12-point is often recommended. Smaller type can be difficult for some people to read, and extensive passages of small, dense text can discourage consumers. When the reading distance might be greater than usual, such as when the user must assemble a product, type sizes larger than 12-point may be necessary. Larger type sizes—14-point or larger—are preferred for older or visually impaired users, or in poor viewing environments. The text in this paragraph is written in 12-point Times New Roman. The following are examples of smaller and larger type sizes:

This sentence is written in 8-point Times New Roman. This might be considered legible for certain consumer applications, but generally is not appropriate, especially for long passages or critical information.

This sentence is written in 14-point Times New Roman. This or larger type may be necessary for audiences that include elderly consumers or for instructions that will be read from a distance.

✓ ***Use serif typefaces for long passages of text.***

Serif typefaces, like Times New Roman, have extra lines at the tip and base of each letter. These help to distinguish letters, which makes them easier to recognize. They also help guide the eyes as consumers read. Serif typefaces are often used for most of the text in books and magazines. Sans serif typefaces, like Arial, lack these extra lines and may make long passages of text more difficult to read. Children, however, may find sans serif typefaces more legible than serif ones.

Abcd

Serif Typeface

Abcd

Sans Serif Typeface

✓ ***Use both uppercase and lowercase letters in sentences.***

Text with all-uppercase letters may be appropriate for headings, warnings, or short sentences that deserve special attention. However, the use of lowercase letters with initial uppercase letters (sentence capitalization) makes sentences and long passages of text easier to read. For example:

This sentence is written using sentence capitalization, so it includes both uppercase and lowercase letters.

THIS SENTENCE IS WRITTEN USING ALL-UPPERCASE LETTERS. IT IS MORE DIFFICULT TO READ AND CAN BE CONFUSING BECAUSE THERE IS LESS VARIATION AMONG THE LETTER SHAPES.

✓ ***Use dark type on a lighter background for passages of text.***

Dark print on a lighter background is generally recommended for text passages. However, highly contrasted light print on a dark background is also acceptable, especially where text is limited—as on a cover page.

✓ ***Write procedures that involve multiple sequential tasks as a series of numbered steps.***

Each step should describe a single action, when possible. Use Arabic numbers (1, 2, 3...) rather than letters, roman numerals, or words. A long list or a continuous paragraph of steps is undesirable because users can lose their place easily and have difficulty understanding how each step fits into the overall task. For example:

Paragraph form:	Pull out part A. Snap part B onto part C. Insert part D into part B, making sure the label faces up.
Rewritten as numbered steps:	1. Pull out part A. 2. Snap part B onto part C. 3. Insert part D into part B. Make sure the label faces up.

✓ ***Use bullets or separate lines to list multiple non-sequential items.***

Avoid writing out long lists in paragraph form, and using a series of commas or other punctuation marks to separate items. For example:

Paragraph form:	...includes 1 top, 1 bottom, 3 rods...
Rewritten as a bullet list:	...includes the following: • 1 top • 1 bottom • 3 rods...

✓ ***Use graphics that are simple, clear, and whose relevant details are visible from a reasonably foreseeable reading distance.***

Do not rely on fine detail to give meaning to critical aspects of the image. Also, make sure that the legibility of a graphic and its labels does not diminish after reduction, enlargement, or duplication. Line drawings are usually good choices. Photographs do not photocopy well.

For Further Reading:

Alred, Brusaw, and Oliu (2000) provide a technical handbook that addresses many writing issues in depth. The section on layout and design covers type size and typeface in detail, providing examples and rationales for their guidance.

Hartley (1985) includes chapters entitled “Type sizes, typefaces and spacing” (Chapter 3) and “Space and Structure” (Chapter 4). The author addresses the effects of format on legibility. Many visual examples are provided.

Ryan (1991) discusses legibility features such as stroke width and width-to-height ratio. Information is presented in easy to read tables providing useful guidance.

4



Securing Comprehension

Instructions cannot be successful if users do not understand what they must do. Consumer products are often used by a broad cross-section of the population, so you must consider various factors to ensure all users fully and accurately understand the necessary messages. When developing the instructions, consider whether procedures may be too complicated or too technical for your audience to understand. “Translate” overly complicated instructions into common language, or provide users with background definitions and explanations.

The best way to organize information is usually based on the individual tasks users must perform to successfully achieve their goals. In contrast, many documents are organized around things that the product can do, such as the features, functions, and technical capabilities of the product. This may not match what consumers need and expect. Adopting a user perspective will help you write instructions that speak directly to your audience, address the issues that concern them, and structure the instructions in a logical and usable way.

This brief guide cannot fully address the skills of composing and organizing text and of developing effective graphics. However, this section highlights some of the most important general principles and common problems.

The questions addressed in this section are:

- What Structure Is Helpful?
- What Makes the Text Readable?
- When Are Graphics Effective?

What Structure Is Helpful?

Consumers use instructions like maps, looking for clues and signs that will help them to locate where they are and where they are trying to go. To maintain attention and encourage reading, consider how consumers will use the instructions and organize accordingly. Several organizational tools can help you to structure instructions and make important information obvious to consumers. However, so many types of instruction materials exist it is not possible to provide specific guidance

here. For example, organizing an owner's manual for a technologically complex product is different from organizing a two-page assembly sheet.

✓ **Consider dividing the instructions into more than one document.**

This might be worth considering if any of the following conditions apply to you:

- *You are trying to reach two or more audiences, each of which has different needs and abilities.* Many products are used by consumers with varying skill levels. For example, beginners and professionals may use a sewing machine, but each has different needs and expectations from the instructions. Also, the American National Standards Institute (1990) suggests including two sets of instructions for products that are assembled or installed by someone other than the user. The first set could be used by the purchaser or contractor and should address such topics as assembly, safety, and testing. The second set should be written for the subsequent user and should address ownership issues such as use, care, and safety.
- *Different parts of the instructions are used at different times or for different purposes.* You may separate sections of the instructions that do not need to be used in conjunction with one another. For example, you may be able to separate assembly instructions from usage instructions.
- *You are writing to an audience that includes many non-English-literate users.* Including several languages in one document can clutter the instructions with irrelevant text, make it more difficult for consumers to find information, and increase the size of the document. Instead, you can make smaller documents or put the instructions in a binder so that irrelevant information can be easily discarded.
- *Your product comes in multiple models.* Instructions that are tailored specifically to one model of a product are more usable because consumers are only given information that is relevant to their product.
- *You cannot organize all the information in the document without making it look intimidating.*

✓ **Organize the contents based on the order that your audience will want and need the information.**

A document structure is usually most effective when it is based on what users must do and how to do it, rather than on the features or functions of the product. In other words, tell consumers how to

perform a specific task rather than telling them what the product can do. Design the content and structure of the instructions so users are guided to their goals effectively and efficiently. Provide procedural instructions in a logical sequence of discrete steps. If there are many steps, break the process into discrete stages with just a few steps in each stage. Place only the “need to know” information in the main body of the instructions.

If not all users require the same information, consider using a flow chart to guide them to the sections that are relevant to them while bypassing irrelevant information. For example, camera owners who do not intend to use a telephoto lens can be instructed to bypass the section of the owner's manual that gives instructions on using a telephoto lens.

✓ ***Number the pages if the instructions exceed about three pages.***

Only use Arabic numbers (1, 2, 3, etc.) for the body of the instructions. Roman numerals (i, ii, iii, etc.) might be acceptable for materials that come before the actual instructions, such as the title page, copyright information, or table of contents. Never use Roman numerals, however, for pages cited within the table of contents. Some people are not familiar with this numbering system and will find it confusing.

✓ ***Include a table of contents if the instructions exceed about four pages.***

Place the table of contents at the beginning of the instructions. List the headings and subheadings in the order that they appear in the document. Include page numbers for each to help users locate the sections of text they are seeking. As another navigational aid, consider stating the chapter number or title in the headers or footers.

✓ ***Use short, meaningful headings that stand out from surrounding text, and use them consistently throughout the instructions.***

Choose a type of heading, such as question heading, statement heading, or topic heading. You may choose different heading types for different levels, but all headings of the same level should be of the same type throughout the instructions. For example, all primary headings might be written as questions, and all sub-headings might be written as statements. Keep the headings short, but make sure they stand out from and accurately identify the material they introduce. If you use numbered headings, avoid using more than three levels of numbering (for example, Section 1.2.2).

- ✓ ***Provide a brief product overview before the instructional procedures.***

This may include information such as what the product is and is not intended to do, the potential hazards of misuse, and a list of product parts. Limit the overview to information that helps consumers to understand the instructions and to use the product more effectively, efficiently, and safely. There is no formula for designing an ideal product overview; individualize the content and format to best suit the product and the needs of your users. To decide whether your instructions will benefit from an overview, ask yourself if you can teach consumers something about the product in a few words that will better enable them to achieve their goals.

- ✓ ***Include a graphic near the beginning of the instructions that shows the product and labels its parts.***

This should appear before any text that might refer to parts of the product. Be sure that each key component is clearly identified. Exploded-view diagrams are often useful for more complex products. A complete list of parts and components, along with a picture of each, may serve as a valuable reference for consumers.

- ✓ ***Give short, meaningful names to parts and procedures, and use them consistently throughout the instructions.***

Consider whether users will understand complex or technical words before using them. Do not use abstract names that may have multiple meanings. When possible, replace technical words and factory part numbers with common language. For example, use “mirror” rather than “reflection plate” or “part ZRT 289.” Once you choose an appropriate word, use it consistently throughout the instructions. Do not refer to the same part by different names, even if the difference seems very small. For example, do not refer to a “lid” as a “top” later in the instructions.

- ✓ ***Consider repeating task-critical or time-sensitive information rather than using cross-references.***

Cross-references between sections can reduce redundancy in your document. However, having key information in different places can interrupt the flow of the instructions needed to perform a task and can confuse readers. Therefore, avoid using cross-references when the referenced information is task-critical or time-sensitive. If consumers need the information to perform a task, repeat it rather than cross-reference it. Besides reducing the effort required to find information, repetition may also improve users’ comprehension and memory. If

you must use cross-references, keep the format consistent throughout the document.

- ✓ ***Consider including an index at the end of the instructions if the instructions contain many tasks and concepts.***

List index entries alphabetically and make them specific. Include every task or concept, and give either the page or section number in which it appears. However, most instructions, even long documents, may not require an index if they have a detailed and well-structured table of contents.

- ✓ ***Consider including a glossary only if the instructions contain unfamiliar words, abbreviations, or acronyms that you cannot avoid.***

A glossary eliminates the need to repeatedly define words in text and provides a central location for consumers to look up the meanings of unfamiliar words. However, you should write the instructions simply enough that they do not require a glossary. Including a glossary does not make it acceptable to use unfamiliar or complicated words when it is unnecessary. Definitions should appear within the instructions themselves whenever possible. If you must use a glossary, list the words alphabetically and clearly and simply define each word. Use highlighting techniques such as boldface or italics to identify words within the text that appear in the glossary.

For Further Reading:

Cohen and Cunningham (1984) provide chapters on “Explaining what the product or procedure is” and “Explaining how to use the product or procedure.”

Gilreath (1994) provides an extensive overview of text labels (headings) and the major issues and considerations surrounding them: when to use them, which types are needed, and how many levels are appropriate.

Van der Meij and Carroll (1995) provide a thorough explanation of the minimalist design of instructions, which includes such topics as “Choosing an Action-Oriented Approach.”

What Makes the Text Readable?

Sentence composition has a big influence on the comprehension of instructions. Simple, active, and affirmative sentences aid users. The guidelines here are good general practices that are adequate for most

situations. Nonetheless, they are not unbreakable rules. The clarity of the text is the most important consideration.

✓ ***Write to the lowest reading level of likely users.***

A 6th to 8th grade reading level is often considered suitable for the general public, but an even lower level may be desirable for critical information. Higher reading levels might be acceptable for more literate and educated audiences. When in doubt, write to the 6th grade reading level. See Section 7, *Evaluating the Instructions*, for more information on evaluating readability.

✓ ***Keep sentences short and limit each sentence to one main idea or step.***

Describe the idea or step with as few words as reasonable, excluding all task-irrelevant information. The optimum sentence length varies depending on your audience. However, you should write your instructions so the average length is about 15 to 25 words per sentence. Keep all sentences to less than about 30 words. Consider replacing long sentences with several shorter sentences, but maintain some variation in sentence length so the text is not “choppy.”

✓ ***Use no more than one subordinate clause per sentence.***

A clause is a part of a sentence that describes or explains another statement in the same sentence. It always contains a subject and a verb. For example, in the first sentence of this paragraph, “that describes or explains another statement in the same sentence” is a subordinate clause.

Including several clauses may create wordiness and confusion. Clauses are generally most readable when they are at the end of a sentence, but be careful. Certain clauses, such as “after unplugging the product,” could cause the consumer to perform an action out of sequence if placed at the end of the sentence. You can simplify a sentence with multiple clauses by dividing it into two or more sentences. Put the main message in the first sentence. For example:

One sentence with multiple clauses:	Using the screwdriver, loosen all four screws after unplugging the product.
Rewritten as two sentences:	Unplug the product. Loosen all four screws using the screwdriver.

✓ **Write in the active voice.**

The “voice” refers to the relation of the subject and the verb. It identifies who is responsible for what action. Write sentences using the active voice, which follows the order of *subject* → *verb* → *object*. If you are writing a command, you can usually omit the subject because it is understood to be the reader. Avoid the passive voice, which follows the order of *object* → *verb* → *subject*. For example:

Passive voice:	The dial should be turned to OFF [by you].
Active voice:	[You] Turn the dial to OFF.

✓ **Avoid noun strings.**

These are sequences of nouns—usually three or more—that modify one another. They are easy to identify because they do not have any connecting words in between them. Break these awkward nouns apart whenever possible. For example, rewrite “storage compartment cover” as “cover of the storage compartment” or, better yet, just “cover” (assuming there are no other “covers” within the instructions).

✓ **Avoid multiple negatives.**

Two or more negative words can make a sentence difficult to understand. Try to rephrase sentences with multiple negatives as positive sentences. For example:

Double negative:	Do not unlock the door.
Rewritten:	Keep the door locked.
Double negative:	This may prevent you from avoiding injury.
Rewritten:	You may be injured.

✓ **Use everyday words that are familiar to and appropriate for your audience.**

Unfamiliar or technical words make sentences and messages harder to read, understand, and remember. Avoid using a technical or unfamiliar word, such as “torque” or “ascertain,” if a simple, everyday word or phrase, such as “tighten” or “find out,” will do. A

good rule of thumb is to use words that are learned early in life. If you must use a word that may not be familiar to your audience, define it the first time it is used. Avoid the use of nouns that are based on verbs when you could just as easily use a verb. For example, consumers should be told to “decide,” not to “make a decision.”

✓ ***Use specific, concrete words rather than ambiguous or abstract ones.***

Use words that describe a thing or object that consumers can see or visualize. Avoid using words that users can interpret in more than one way. When addressing an amount, try to give a specific quantity rather than a vague adjective such as “several,” “few,” or “many.” Phrases such as “well tightened” or “well ventilated” could be interpreted and acted upon differently by each consumer who reads the instructions. Your audience should not have to infer the meaning of any word or phrase.

✓ ***Use consistent terminology.***

Use the same words for procedures and components throughout the instructions, including diagrams. For example, if you refer to a “blade guard” in one location, do not call it a “shield” elsewhere.

✓ ***Use personal pronouns.***

Address the consumer as “you” and yourself as “I” or “we.” Consumers understand and remember information better when personal pronouns are used because it allows the speaker to stand out. Addressing consumers also creates a more personal sounding document (“I” am speaking to “you” rather than “the writer” is speaking to “the reader”).

✓ ***Use gender-neutral language.***

Do not alienate one gender if your audience includes both males and females. Use the second person (you), the plural (they), or he/she to avoid bias.

✓ ***Limit the use of abbreviations and acronyms.***

If you must use these, spell them out the first time they are used, and put the abbreviation or acronym in parentheses immediately after. However, in some cases, like with “CD-ROM,” the general public is more familiar with the abbreviation or acronym than their original form. In those cases, use of the shorter version is preferable.

✓ ***Define unfamiliar words, jargon, abbreviations, and acronyms.***

You can define words in the text, in footnotes, or in a glossary. A glossary can be useful when many words require definitions, but including a glossary does not mean you can write instructions at a higher education level than your audience. See Section 3, *Capturing and Maintaining Attention*, for more information on glossaries.

For Further Reading:

Alred, Brusaw, and Oliu (2000) provide excellent explanations for all aspects of sentence structure. However, this book is intended to be a reference for all writers; it is not intended specifically for instruction writers.

Backinger and Kingsley (1993) provide many guidelines for word choice. Each recommended guideline is followed by an example.

Felker, Pickering, Charrow, Holland, and Redish (1981) discuss word choice and provide examples of ways to improve your writing. They include a list of difficult words with their simple counterparts and a list of nouns with the verbs from which they originated. Research background and rationale follows each suggestion.

Lauchman (2002) provides extensive information on word choice and other techniques to help keep text simple. This document gives guidance on format, sentence structure, tone, clarity, conciseness, and so forth.

When Are Graphics Effective?

Written text is not the only effective means of communication. Alternatives to text, such as drawings, photographs, diagrams, and tables can provide users with information that text alone cannot supply as effectively. Sometimes, graphic elements can present information in a clearer and more concise way and can help clarify abstract concepts that users could otherwise misinterpret. When you present information graphically rather than textually, you also have a better chance of being understood by a wide range of users, such as non-English-literate users.

Graphics, however, cannot always substitute for text, and tend to be most effective and best understood when accompanied by text. Remember that writers are not necessarily the best people to design visuals. Professional graphics designers may be better able to design attractive and understandable graphics.

✓ ***Use line drawings rather than photographs.***

Line drawings or illustrations are very flexible in that you can design them to show exactly what you want them to. Include only relevant information and details. This will minimize clutter and confusion, and can draw consumers' attention to important information.

Although drawings are cost-effective and versatile, they often require interpretation if done poorly. Good drawings are accurate and minimize the need for interpretation. Photographs are realistic, but may show irrelevant information and details that line drawings can leave out.

✓ ***Show the consumer's point of view in all drawings.***

Line drawings can be manipulated to show normally hidden or hard to see parts (for example, cutaway views or cross-sectional views). However, consumers might find these hard to interpret since the graphic does not reflect their point of view. If you use multiple graphics to show a sequence of events, make sure consumers can see the effect of their previous action in the next graphic.

✓ ***Label all relevant parts of a drawing or illustration.***

When you refer to a drawing or illustration in a procedure, make sure all parts cited in that procedure are clearly labeled on the drawing. Label the parts by name, not using a code that consumers must translate into part names (for example, "part A" or "4").

✓ ***Use symbols that reliably convey meaning to your entire audience.***

Limit the use of symbols, pictograms, or pictorials that are not widely known or that require inference. Commonly used and standardized symbols are usually safe. For example, the circle-and-slash is a commonly used symbol for prohibition, though an "X" may convey this better to certain audiences. More specific symbols may be appropriate for expert audiences.

✓ ***Consider flow charts to show the movement of events or if you want consumers to solve a problem.***

A well-designed flow chart can make the structure and sequence of a set of procedures obvious at a glance. Flow charts are particularly useful for procedures that are complex, nonlinear, or dependent on status feedback. They are interactive because consumers must answer questions to progress. A flow chart can also be a helpful navigation tool, similar to a table of contents. Use flow charts with care, however, because not all users will be familiar with them. Unless you are sure your audience will understand them, do not use them.

- ✓ ***Consider using graphs, charts, or tables to show trends or to make comparisons with numerical information.***

Graphs are particularly good at showing trends (that something has increased or decreased) and comparing data. Both charts and tables are excellent ways of neatly organizing large amounts of related information. But like flow charts, not all users will be familiar with these. Consider using them only if you are sure your audience will understand them.

For Further Reading:

American National Standards Institute (2002a) ANSI Z535.3-2002 presents basic guidance for the design of graphic symbols for use in product safety signs and labels. It is the U.S. voluntary consensus standard for this application. This standard was not developed with instruction materials in mind, but its principles and practices can be helpful when developing graphics for instructions.

Frantz, Rhoades, and Lehto (1999) list some issues to consider when developing and using symbols, particularly for warnings.

Hartley (1981) provides a thorough description of the different types of graphics, such as tables, graphs, illustrations, diagrams, charts, and symbols, along with accompanying research for when they are best used.

Jansen and Steehouder (1996) provide information on several types of visual aids, such as flow charts, logic trees, and decision trees.

Section 4: Securing Comprehension

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5



Motivating Compliance

If consumers understand what to do, are capable of doing it, and understand the implications, they can make an informed choice about whether to follow the instruction. Informed choice is an important goal for instructions, but the ultimate goal is to get consumers to comply with what you say. Unfortunately, consumers may not necessarily accept the instructions as being important or relevant to them. They may suspect your motives and not accept the instructions as credible.

Even if consumers accept the instructions as relevant and important, they may still fail to act as you want them to. This could be a result of competing motives. For example, consumers might choose not to use a blade guard on a saw because doing so makes sawing more awkward. This could also be a result of consumers being unable to do so when and where they need. For example, if consumers are required to take some action in response to an emergency, but it does not occur until much later, they may be unable to recall the proper actions. You can do things in writing the instructions, however, that will improve the likelihood that consumers will behave the way you would like.

The questions addressed in this section are:

- What Makes Instructions Credible?
- What Affects Perceptions of Instruction Relevance?
- What Affects Recall of the Instructions?

What Makes Instructions Credible?

If consumers doubt your authority or motivation, your message may not be perceived as credible. If consumers think that your instructions reflect your interests, but not theirs, it can weaken the acceptance of the entire document. For example, consumers may perceive that some instruction is there to protect the manufacturer from product liability, to limit warranty obligations, or to promote the sale of accessory items. You also must consider whether you are asking consumers to do something reasonable when there are trade-offs to be made. For example, users might see your directions about using protective gear, schedules of preventive maintenance, or limits on capacity as self-interested “overkill” on your part that interferes with convenient use of the product. The way in which

you present your instructions can promote or undermine user acceptance of your intentions.

✓ ***Maintain a consistent message.***

Contradictory messages within your document, or between your document and other sources of consumer information about your product, weaken your credibility. This is not limited to explicit written statements. Contradictions may occur from visual images, the tone of the message, or other nonverbal communication. Your message might be contradicted by product packaging, point-of-sale displays, advertising material, publicity, other product-related documents (such as owner's manuals, assembly guides, and warranties), and even the appearance of the product itself. For example, users of the instructions may disbelieve an instruction to wear safety goggles if illustrations on the packaging show users without goggles. Similarly, the tone of the message could be viewed as contradictory if the instructions specify a careful maintenance regimen while other accompanying material suggests a "worry free" or "low care" product.

✓ ***Do not trivialize your message by including minor points, obvious information, or "throwaway" statements.***

Statements such as "use common sense" or "use only as intended" tell consumers that they, as sensible people, do not need to pay further attention. Obvious cautions, platitudes, or blanket statements, such as "use with caution," weaken the impact of instructions. Long, undifferentiated lists that mix critical information with items that seem minor, self-evident, or absurd to the average consumer give the impression that the manufacturer is simply trying to protect itself if any negative events occur. Do not blur serious messages by mixing in positive phrases to soften the impact. For example, do not introduce a safety instruction with "Although this product has an unmatched safety record..."

✓ ***Explain necessarily complex, precise, or demanding tasks.***

Instructions that seem excessive cause consumers to question your motivation. For example, "Check tire pressure before every use" may seem to be an overly cautious recommendation that is designed to protect the manufacturer rather than to help users. If the need for such instructions is genuine, you must clarify the intent of the instructions if they are to appear credible.

✓ ***Prioritize and organize information.***

Give important items more prominence through layout, highlighting, or graphics. If a list is not organized, and if there are no priorities, the material may not seem designed to communicate and instruct. Sometimes you may have to include instructions or cautions that you know will strike many consumers as unnecessary. By organizing information, you may be able to minimize these concerns.

✓ ***Cite authority or background where appropriate.***

If consumers believe that your motivations conflict with theirs, advice may be more acceptable from an independent party. Research shows that people are more likely to comply with requests and warnings from highly credible sources, so it may be helpful to cite authorities or research findings if the sources have strong credibility with your audience. However, do not cite authorities or regulations in a way that distances you from the instruction. The instruction must come from you and not appear imposed upon you.

✓ ***Convey your competence and your commitment to consumers through the quality of your instructions.***

The manufacturer's commitment to the instructions can be undermined by poor quality materials and printing, careless writing, weak translations, or other evidence of limited effort. For example, copies of engineering drawings may be convenient to use as illustrations, but they may not be suitable for use within the instructions. A professional tone and confident, direct writing style can project competence. Confront issues of proper use and safety directly, without trying to soften the message or to avoid difficult or ambiguous questions that users may raise.

For Further Reading:

Alfred, Brusaw, and Oliu (2000) include a section on ethics in writing in their *Handbook of Technical Writing*. Various points covered are related to the writer's motivation and how it may be perceived. The discussion covers language that tries to avoid responsibility, misleading and vague language, information suppression or deemphasis, and misleading statements.

What Affects Perceptions of Instruction Relevance?

Consumers interpret your instructions in personal terms. “Is this information meant for me, or does it apply to somebody else? Is the instruction the best way for me to do what I want to do?” If consumers see other ways of performing a task, your document must persuade them that their interests are best served by accepting what you say instead. Consumers also may need tools, information, and other resources when they try to perform a task. They can be successful if they know what is required of them, have what is needed at hand, and have it in a form that is most usable. As they perform the task, they must be able to follow the sequence of steps easily and accurately. They also need some way of knowing if they are doing things correctly. If you do not provide what consumers need to support their success, you may leave them frustrated and confused.

Lastly, a consumer’s perceived benefits from following the instruction must outweigh the costs of complying. The “costs” of complying do not refer simply to the financial cost, but also to any outlay of effort, time, or discomfort. This might include social costs such as embarrassment or self-image. Research shows that relatively small changes in cost can have substantial effects on whether consumers follow an instruction. This is especially true if consumers do not understand the benefits of compliance. For example, a bicyclist may not wear a helmet for reasons other than the financial cost of the helmet. The “cost” of compliance may be the nuisance of carrying the helmet around, or could be a fear of appearing timid. You might view these costs as minor compared with the risk of head injury, yet they can heavily influence compliance with the instructions. Keep in mind that you are dealing with consumers’ subjective sense of cost and benefit. Individual consumers may perceive cost and benefit differently and may behave differently as a result. While you cannot change this aspect of human behavior, some things can minimize the effects of compliance costs.

✓ ***Minimize the effort needed to use your document.***

Costs in time and effort can undermine the proper use of your instructions just as they can undermine proper use of the product. Consider your document as a tool and think about how people will use it. Streamline the instructions and minimize annoyances and barriers to effective use. For example, consider the need to flip back and forth between sections of a manual or between multiple documents, the ease with which users can navigate the document when they must find something, and the accessibility of the document when and where it is needed. Task analyses or usability testing can be

helpful for this; see Section 2 for more information on defining user tasks and conducting task analyses.

✓ ***Structure tasks so they require as little effort as possible to perform.***

Although you may have limited control over the costs of using the product as intended, there may still be opportunities. Sequence task steps efficiently so users feel a sense of progress. Provide tools, job aids, or protective gear with the instructions. Provide packing materials and pre-addressed mailing materials for repairs.

✓ ***Provide resources and information to support consumers.***

From the outset of the task, consumers should know what is required of them and should have access to whatever they might need. State up-front what tools or supplies may be required. If required tools or hardware are unusual or difficult to get, you may need to include them with the product. Provide job aids, such as templates or look-up tables, that will make the task easier. State how long the task should take so consumers can set aside the proper amount of time and recognize if there seems to be a problem. Provide a parts list and have consumers check it before starting the task. If consumers can get technical support for the task, provide the phone number, Web site, or other contact information in a noticeable location.

✓ ***Deal directly with consumers' beliefs and perspectives.***

Consider how your product and instructions will appear from consumers' perspectives. Directly confront likely gaps in understanding, inaccurate beliefs, and inappropriate motivations that consumers may have. If consumers feel competent to carry out a task without the benefit of your instructions, they might see the instructions as a barrier rather than an aid. You must convince consumers that the instruction contains critical information that they are unlikely to know. You could cast this as unique product functions and features, potential pitfalls, time and money savers, and so forth.

✓ ***State what the consumer should do using specific, positive words.***

Describe specific acts rather than more abstract or general goals that users have to interpret. Consumers are more likely to comply with an instruction if you state what should be done rather than what should not be done. This does not mean you should never use negative words. Certain words, such as "never," can convey concepts that a positive instruction cannot. However, you should not leave it up to the consumer to decide what should be done. For example, consumers may not know how to "avoid contact with skin" when

using a particular product. This makes it difficult for the consumer to comply. “Wear rubber gloves” is more direct and explicit.

✓ ***Emphasize the benefits of complying with the instructions.***

Be explicit about the benefits of compliance and the problems with noncompliance. If there are safety consequences, be clear about the reality of the hazard. Consumers are less likely to comply with an instruction when the consequences seem distant in time or the outcome seems largely out of their control. Therefore, you should do what you can, while staying credible, to provide users with a sense of immediate results and emphasize their control of events.

✓ ***State the consequences of the consumer’s actions explicitly.***

Explain to consumers how following, or not following, an instruction can have specific consequences for them. Do not expect consumers to make important inferences without your guidance. State explicitly what they should do and how to do it. Make potential errors, risks, damage, or time delays evident enough to give credence to your instruction. If you give consumers an appropriate overview of the product and the task, it helps them put your message in a context where they can see the purpose of the instructions. If undesirable consequences may result from an improper action, tell consumers what not to do, why not to do it, and what should be done instead.

One of the difficult problems for instructions to overcome is what has been termed “benign experience.” When consumers violate some rule or ignore some caution and nothing bad happens, they see the instruction as a “false alarm.” Because bad outcomes may be chance events, consumers can often get away with ignoring some instruction. As familiarity with a product increases, consumers may disregard or devalue certain instructions as not relevant to them. This might relate to safety behaviors, improper applications of the product, maintenance routines, and so forth.

✓ ***Provide consumers with feedback on their progress.***

Consumers should be able to tell if they have done something correctly or incorrectly. Ideally, this feedback would be obvious from the operation of the product itself (for example, a clicking sound when something locks into place). Then your instructions need only to highlight this fact for consumers. Where feedback is not obvious, you must provide some way for consumers to know if they performed the instruction properly.

For Further Reading:

Dobrin (1985) provides an insightful discussion of how consumer product instructions often can seem inappropriate to users and break the basic “rules” for communication. The article shows how some common practices can be self-defeating when viewed from the users’ perspective. However, the article also has a tongue-in-cheek tone and some of Dobrin’s suggestions for alternative instructions must be viewed skeptically.

What Affects Recall of the Instructions?

Some instructions do not have to be remembered. Assembly and installation procedures, for example, are typically performed only once, with instructions at hand. If consumers perform the actions as they read the instructions, the need to remember information is minimal. However, other instructions may have to be remembered for long periods of time. If consumers cannot recall the instructions when an action is required, they cannot comply with the instructions.

For example, an owner’s manual may have a section describing the warning indicator lights on the product. Yet it may be months or years before a particular indicator lights up. Even if the manual was read thoroughly when the product was bought, the owner must now try to remember the meaning of the light and the appropriate action to take. To help consumers remember critical instructions, consider what makes information memorable and what you can use to aid memory.

✓ *Use graphics and text highlighting.*

Research has shown that information may be better retained if graphics are included with the text. Simple, well-understood graphics are more effective than complex or vague symbols. You can also improve memory by making key sections of text more conspicuous through the use of highlighting techniques like boldface or large type, colors, and text boxes.

✓ *Organize information into small, meaningful groups.*

Group a large amount of information into smaller “chunks” of related information. Turn long lists of instructions into several shorter lists that are organized in a meaningful, hierarchical structure. Avoid lists of more than five to seven simple instructions. Make lists of complex instructions even shorter.

✓ ***Provide concise summary material that restates critical instructions.***

Brief and convenient summary documents can be useful memory aids, especially if they can be stored more handily than the complete instructions. For example, many cellular phones come packaged with a card that briefly outlines button functions and commonly used features. Summary materials can include quick-start guides, troubleshooting guides, maintenance procedures and schedules, and safety instructions. Such materials should supplement, but not replace, the related sections of your complete instructions. They should parallel the instructions in terminology, icons, and procedural steps.

✓ ***Provide on-product reminders.***

Product labels must normally be limited in content and are not a substitute for complete instructions. However, they can be effective as reminders of the full instructions and as pointers to the primary information. Labels can warn about specific hazards, list short procedures, or refer consumers to the appropriate document. Be careful, however, not to overuse labels especially if there are critical safety messages.

✓ ***Provide examples in dynamic media.***

Although this guide is focused on print documents, you may consider the potential of other media as a supplement. You can include a videotape, CD-ROM, or DVD with the product, or provide access to a Web site. These media allow dynamic presentations and possibilities for user interaction. Watching someone model proper behavior or seeing the effects of improper actions can be vivid and memorable.

✓ ***Encourage training and practice.***

Training and practice can improve recall of procedures or recognition of infrequent events, such as hazard situations. Where appropriate, instructions can provide practice drills and knowledge tests. More sophisticated training and testing can also be provided through interactive media (CD-ROMs or Web sites).

6



Presenting Safety Information

Safety information is a critical part of many instructional documents. In some documents, nearly everything could be seen as related to safety. For example, in assembling a bunk bed, failure to properly follow any of various steps might lead to an unstable structure that could collapse. However, in this section, we are concerned only with messages that explicitly discuss safety and hazards. Before you develop a safety message, you must answer several questions:

- What should the safety message say?
- Where within the document should the safety message appear?
- How should the safety message look?

This section provides guidance for answering these questions. Many of the guidelines provided in other sections of this guide also pertain to safety messages. However, some considerations are specific to warnings and safety messages. For example, safety messages must stand out from other messages and be immediately recognized as safety-critical. They must make clear the hazard, its consequence, and what to do about it. Safety messages function as part of a system that may include on-product warnings, training materials, and other product materials.

No well-established procedures or standards exist for providing safety messages within instructional materials. However, a great deal of guidance, research, standards, and regulatory requirements exist for safety messages and warning labels that are placed *on* consumer products. Many of the relevant issues are common to both product labels and instructional materials, but product labeling practices may not always be appropriate for documents that accompany the product.

The American National Standards Institute Z535 Accredited Standards Committee coordinates development of consensus voluntary standards in the United States for safety signs, labels, and colors. This Committee recently formed a subcommittee (ANSI Z535.6) to develop a new standard for presenting safety messages in product-accompanying literature. The subcommittee has identified two main types of safety information common to owner's manuals:

- *Universal safety information.* This includes safety messages that generally apply to the entire document or to many portions of it, and typically appear near the beginning of the document. These

may deal with broad aspects of product usage—for example, describing the importance of a guard to remain in place for many tasks that are discussed in the instructions. They also may deal with consumer errors that arise from misperceptions about how to use the product. These might include the need to wear protective gear, such as a helmet, or precautions about actions that might lead to electrical problems, such as immersing an appliance in water. Perhaps the most general safety message of all is one that states that the instructions contain important safety information that consumers need to read.

- *Local safety information.* This includes safety messages that generally apply to only a portion of the instructions, whether that portion be a section of the instructions or a specific step within a section. These safety messages generally appear within the body of the document. Proper placement is the key to making local safety messages effective. They should appear in your text when consumers need them. You must figure out whether the safety message applies throughout a section of your document, to a number of related steps, or to a single step. The placement and format depends on whether the message applies to a single instruction or to a broader section of the document.

When the ANSI Z535.6 subcommittee produces a consensus standard, it will be an important source of guidance. More information about the planned activity may be found in Young, Frantz, Rhoades, and Hall (2002). Meanwhile, the guidance in this section is based on available research, recommendations, and common practice.

The questions addressed in this section are:

- What Safety Messages Are Needed?
- What Information Should Appear in the Messages?
- Where Should Safety Messages Appear?
- How Should Safety Messages Look?

What Safety Messages Are Needed?

Many parts of your instructions may be related to safety in some general way, but certain messages have a clear and immediate relationship to potential injury. You must decide what messages should be given this special safety status.

- ✓ ***Identify all reasonably foreseeable hazards associated with your product that you cannot design out or guard against.***

Methods for identifying reasonably foreseeable hazards are discussed in greater detail within Section 2, *Planning the Instructions*. Keep in mind that even the best safety messages cannot ensure safe behavior. It is always preferable to design the product so hazards are removed or physically guarded against. You should not use instructions to compensate for fixable problems in product design or for overly complex procedures.

- ✓ ***Repeat all safety messages that appear on the product.***

The content of every safety-related label on the product should also appear within the owner's manual. The reverse is not necessarily true—there may be many more safety messages in the instructions than on the product.

- ✓ ***Avoid “overwarning.”***

If you include too many safety messages for highly unlikely and trivial hazards, you weaken the effectiveness of the more significant messages. There is no objective basis or specific guidance on what is “too many” warnings, but you can limit the number of safety messages by prioritizing them and excluding the less important ones. You can base your prioritization on factors such as the severity of the hazard (likely degree of injury or death); the likelihood of an undesirable event; consumer knowledge of the hazard, consequences, and proper behaviors; and the uniqueness of the hazard to the specific product. If you must include a large number of warnings, organize the items under meaningful categories.

What Information Should Appear in the Messages?

Although safety messages that appear within instructions are not bound by the same extreme limitations on space or location as warning labels on products, the messages must be succinct and immediately understandable. They must specify the hazard and what consumers should do about it.

- ✓ ***Identify the severity of the hazard using a signal word.***

Signal words are used to draw attention to a hazard. ANSI Z535.4-2002, the American National Standard for Product Safety Signs and Labels, defines three signal words for use in safety signs:

- DANGER, which identifies “an imminently hazardous situation which, if not avoided, will result in death or serious injury.”
- WARNING, which identifies “a potentially hazardous situation which, if not avoided, could result in death or injury.”
- CAUTION, which identifies “a potentially hazardous situation which, if not avoided, may result in minor or moderate injury” or in property damage incidents.

Do not use these signal words to alert consumers to installation, operation, or maintenance information unrelated to a specific hazard.

- ✓ ***Describe (1) the nature of the hazard, (2) the consequences of exposure to the hazard, and (3) how to avoid the hazard.***

Describe the hazard and the consequences of exposure to the hazard in a way consumers are likely to understand. In some cases, these may be combined into a single sentence, as in “Moving parts can crush and cut.” If the hazard is only present when the product is used certain ways, describe them. You also must clearly describe how consumers can avoid the hazard. This may involve telling consumers what to do, as in “Wear safety goggles,” or what not to do, as in “Do NOT rub your eyes.” In some cases, both may be appropriate. In either case, the appropriate avoidance behavior must be behavior that consumers are capable of performing.

If users can easily infer the information from the rest of the message, from the context of the situation, or through the use of an accompanying symbol, you may not have to describe all three elements. For example, in the warning “Hazardous voltage inside. Do not remove cover unless power is turned off,” the hazard and the action are described. The consequence of exposure to the hazard may not have to be described because it is obvious from the hazard. The most typical sequence for the information is *hazard → consequences → appropriate avoidance behavior*, but the sequence is flexible and you should adapt it to the application. If consumers are unlikely to read the entire message, stating how to avoid the hazard first may be more effective.

- ✓ ***Write safety messages so they are explicit and unambiguous.***

Safety messages have more influence when the hazard or action is described in explicit, concrete words rather than abstract concepts. Personalizing the message also improves its effectiveness. For example, state that the hazard “can kill you” rather than “can cause death.” Include only information that is directly safety-related within

the safety message. Related instruction information can follow the separately formatted safety message. Do not weaken the impact of your message by softening it for consumer acceptance or by implicitly blaming consumers, such as with the phrase “safe if used with common sense.” This outcome may not even be intentional and you should be aware of it. Some practices that can undermine warnings include:

- downplaying the severity of the hazard
- using vague rather than concrete descriptions of the hazard or injury
- mixing marketing messages and up-beat statements with the safety message
- telling consumers to use common sense or that the product is easy to use
- implying that the safety message is required by an authority, but is not really necessary
- failing to cast the message as a warning, or mixing the message with tips for use.

Where Should Safety Messages Appear?

✓ ***Separate safety messages from non-safety notices and tips for use.***

When safety messages are mixed with non-safety messages, users may see the safety messages as trivial, making them harder to notice and remember. If you want to list non-safety items such as notices or tips for more effective product use, keep these lists separate and clearly label each list.

✓ ***Present safety messages immediately before they are needed.***

Universal safety messages—those that apply to the entire set of instructions—should appear early in the document where consumers can easily find them. If a safety message applies to an entire section of the instructions, it should appear at the beginning of that section. This way, consumers can encounter, understand, and appreciate the safety message before they become immersed in the individual steps of a task. Because the message is not repeated at each relevant step, the safety information must be memorable. However, if a safety message is specific to certain procedures within the instructions (local safety messages), you should embed that message in the text along with the instruction. A safety message that is specific to a particular

step should be embedded in the text either immediately before that step or somewhere within the step, as long as consumers will read it before being exposed to the hazard. Safety messages that are appropriate both as universal and local safety information should be placed in both locations.

- ✓ ***Consider including a list of key safety warnings within the first few pages of the document.***

Collect warnings about the primary hazards and general safety issues in one place. The list should include only safety information and appear early in the document so it is obvious to casual readers. Keep in mind, however, that this can make it easy for consumers to skip over the warnings. Therefore, it is important that you repeat individual warnings in the appropriate places within the procedural instructions.

- ✓ ***Organize lists of safety messages into meaningful groups.***

If a list of safety messages is long, you can aid consumers' comprehension and memory by organizing the messages under several headings, where each heading has relatively few messages under it. Reading and recalling 30 messages is easier if only five or six occur under each of several meaningful headings. For example, you might group universal warnings under the headings of "electrical hazards," "proper environment for use," "protective equipment," "authorized users," and "dealing with problems." You can also include a graphic with each group to make the warnings more attention-getting and memorable.

You may also organize safety messages by priority, beginning the list with the most significant hazards and ending with the least significant hazards. The logic for this approach is that the most significant hazards should be the most evident and consumers should see them even if they do not read the entire list. For a long list of safety messages, this is probably not as effective as organizing the material into meaningful groups, although it could be useful for ordering items within each group.

How Should Safety Messages Look?

Safety messages must convey the general and immediate impression that "this is important safety information." Conventions on how to do this have been developed through research, practice, and standards for on-product warning labels. Many of the general principles for on-product labels can

be applied to safety messages contained within instructions. To design effective safety messages, consider the format of the safety statement and the use of graphic elements.

✓ ***Make safety messages immediately recognizable as important for personal safety.***

Consumers should not have to fully read the text of the message to know that it includes important safety information. When safety messages are mixed with and indistinguishable from non-safety messages, users may see the safety messages as trivial, making them harder to notice and remember. The presence of safety information is conveyed primarily through the use of a unique format used only for safety messages.

You can emphasize the message further through highlighting and graphics. Succinct, headline-style messages also help convey the general message both by their distinct format and because they require minimal reading. If you want to list non-safety items such as notices or tips for more effective product use, keep these lists separate and clearly label each list. If you highlight notices or tips within the body of the instructions, do it in a way that is distinct from how you highlight safety messages.

✓ ***Consider using product labeling elements.***

ANSI Z535.4-2002, the American National Standard for Product Safety Signs and Labels, defines a number of label components and coding conventions. These are familiar to the public and may be adapted to safety messages within instructions. The primary components of labels under this standard include the following:

- A signal word panel that contains a safety alert symbol followed by a signal word
- A message panel that contains the safety message
- An optional symbol/pictorial panel
- A border surrounding the label

A safety alert symbol is an exclamation point surrounded by an equilateral triangle, and indicates a potential for personal injury. You should omit this symbol for property-damage-only applications. The signal word, as described earlier, identifies the severity of the hazard. The DANGER signal word appears as red letters on a white background, WARNING as black letters on an orange background, and CAUTION as black letters on a yellow background. ANSI

Z535.4-2002 also guides font choice and other aspects of layout and message content.

✓ ***Consider using other highlighting techniques.***

Besides product labeling elements, you can use other highlighting techniques to define a consistent and effective format to distinguish safety messages in your document. These techniques include larger or boldface text; distinct typefaces; underlining; lines, borders, or sidebars; margin size; surrounding white space; and color, especially safety colors of red, orange, or yellow. If a list is clearly identifiable as a set of safety messages, you may not need to highlight this fact, such as through the repeated use of safety alert symbols and signal words, for every item within the list.

✓ ***Use a consistent format for each type of safety message.***

The format you choose for section-heading warning messages may be different than the format you choose for embedded step-specific messages. However, you should apply each format consistently throughout the instructions. Present safety messages that apply to a whole section as a separate message rather than part of a list of safety messages or other instructions. Use a standard format for all section-heading safety messages.

Warnings that apply to a specific step must be evident as safety information, but should be integrated within the flow of reading from step to step. These messages should not distract consumers' attention away from the text and the sequence of actions it describes.

Therefore, formal label formats that combine message panels, signal words, and boxed borders may be inappropriate. Consider instead highlighting the message using techniques such as larger type size, boldface, color or shading, a safety alert symbol, or a signal word.

✓ ***Consider using graphics to distinguish safety messages and to communicate the hazard, proper action, or prohibited act.***

Another ANSI standard, ANSI Z535.3-2002, the American National Standard Criteria for Safety Symbols, provides guidance on the use of safety symbols and pictograms in warning signs and labels. It can provide useful guidance and the suggested symbols have a “safety look” that is familiar to consumers. However, other types of illustrations may also be useful and appropriate for instructions. Whatever format you choose, graphic style for safety messages should be consistent throughout your document, forming a coherent set of images.

Graphics for warnings are usually stronger if they show the human figure or body part in interaction with the hazard. Portray the action you want consumers to do, or not to do. If you use a graphic to convey a specific warning message, make sure that your audience understands it. If the graphic is not commonly used or standardized, test it for comprehension on an appropriate sample of consumers. Pay special attention to critical confusions. These are instances where consumers' interpretations of a graphic are opposite the intended meaning and may increase their likelihood of encountering the hazard. An iterative process of design and testing can reduce or eliminate this potential. See Section 7, *Evaluating the Instructions*, for more on this.

For Further Reading:

American National Standards Institute (2002a) ANSI Z535.3-2002 provides basic guidance for the design of graphic symbols for use in product safety signs and labels. It is the U.S. voluntary consensus standard for this application. This standard was not developed with instruction materials in mind, but its principles and practices can be helpful when developing graphics for instructions.

American National Standards Institute (2002b) ANSI Z535.4-2002 provides basic guidance for the design and content of product safety signs and labels. It is the U.S. voluntary consensus standard for this application. It deals with both the format and content of warning signs and labels. This standard was not developed with instruction materials in mind. However, its principles and practices can be helpful when developing safety messages for instructions.

Frantz, Rhoades, Young, and Schiller (1999) provide an overview of the literature on overuse of warnings. Like much of the literature on warnings, it is written primarily from the perspective of on-product warning labels. However, the principles are relevant to warnings within instructions.

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7



Evaluating the Instructions

Once you have designed the instructions, how do you know if they will be successful? Various methods are available for evaluating different aspects of instructions. Section 2 of this guide discusses how to define the goals of your instructions before beginning the design process. Once you have established a clear sense of your goals, you should develop a strategy to confirm that your instructions meet those goals. This strategy must include what performance aspect to evaluate, how to measure performance, and when to conduct the evaluation. When you consider the costs and benefits of evaluation, keep in mind the indirect costs of not evaluating. If consumers experience difficulty using the instructions, there may be later costs related to consumer technical support, product returns, consumer satisfaction and future purchases, and liability for damage or injury.

The questions addressed in this section are:

- What Should Be Considered?
- What Formal Testing Methods Are Available?

What Should Be Considered?

Your instructions should be evaluated and tested to confirm that the instructions are accurate and meet the goals you set forth when planning them. Conducting fully comprehensive “real world” assessments are difficult, but are necessary to understand what will happen when your instructions are in the hands of actual consumers.

✓ ***Verify that your instructions are accurate.***

First, before you perform any formal evaluations or tests on the instructions, check them for accuracy. Make sure there are no factual errors or omissions in your instructions. Have people who are experts on the product review the instructions to verify their accuracy.

✓ ***Seek out human factors experts to conduct all formal tests.***

All formal testing methods require a certain level of expertise to be useful, to be effective, and to avoid bias. Testing instructions can be complex, so you should seek out experts in the fields of human factors, ergonomics, and usability testing to actually plan and perform

the tests. The Human Factors and Ergonomics Society (<http://www.hfes.org>) can be a valuable resource for locating experts in these fields.

✓ ***Use participants who are representative of the target audience.***

You are unlikely to be representative of the typical user. Therefore, you are unlikely to be in the best position to evaluate instructions from a user's perspective. Testing the instructions on employees who are unfamiliar with the product may help you identify the most blatant problems, but they too may not represent the target audience. Testing the instructions is important, but testing them on a representative audience is essential if you want your results to have meaning. Include critical subgroups of likely users, such as the elderly and those whose first language is not English.

✓ ***Test and evaluate the instructions with the product.***

Do not have consumers simply read through the instructions and tell you what they think. They should perform the tasks described in the instructions while using the actual product. Measure the actual behavior of consumers while they are performing these tasks. Cover all tasks that consumers are asked to perform within the instructions.

✓ ***Perform tests in real-life settings.***

The environment in which the instructions are to be used can affect the consumer's ability to follow them. You should make every effort to test in settings that mimic those to which your audience will be exposed while performing the tasks. If you test participants without an appropriate context, you may underestimate how well it will be understood. But if the context is too narrow, it may give away the correct answer and you will overestimate comprehension.

✓ ***Assess the instructions based on all key performance criteria.***

Many formal testing methods can help you identify problems and find out how effective and easy-to-use your instructions are likely to be. You must consider not only whether consumers will understand the instructions, but also whether they will accept them, remember them, and follow them. Consider too the topics covered in this guide. Will consumers notice your instructions? Are the safety messages effective? This guide can help you design the instructions initially, but you must test the instructions to really know the answers to these and other relevant questions.

✓ ***Revise and retest.***

You should revise the instructions based on the results of your evaluations and testing. However, you also must make sure your changes to the instructions are effective. Continue revising and testing until you can be sure that the instructions meet your goals.

What Formal Testing Methods Are Available?

A number of formal evaluation and testing methods are available. Certain methods are more appropriate than others for assessing certain aspects of instructional performance. Some methods apply to a number of performance aspects. Most have many variations and the technical details of applying them cannot be covered in this guide. This section, however, will give you a sample of what methods are out there, and the purpose, approach, and application of these methods.

✓ ***Consider readability formulas to determine whether consumers are likely to find text difficult to read.***

Readability evaluation differs from many other evaluation methods in that it does not require test participants. It is based on applying a formula to analyze text, and generating a score that quantifies how easy or difficult the text is to read. Some popular readability formulas are the Flesch-Kincaid Grade Level Index, the SMOG Readability Formula, and the Dale-Chall Readability Index. All are similar in that they analyze a section of text based on general factors such as sentence length, word length, and vocabulary difficulty. However, they use different criteria and rely on different formulas, so using two or more different readability formulas can give you a more complete impression. Keep in mind, however, that readability is not the same as understandability. A passage of text can have a good readability score, yet make no sense to consumers if it is poorly written.

✓ ***Consider comprehension testing to determine whether a passage of text or a graphic conveys its intended meaning.***

Comprehension testing is applied to a distinct element or short passage, rather than to extended sections. The ANSI Z535.3-2002 standard, Criteria for Safety Symbols, recommends procedures for evaluating safety symbols. Some general principles to keep in mind for comprehension tests include the following:

- *Include open-ended (short answer) questions.* Open-ended questions require test participants to explain in full (1) what the

- graphic or text means and (2) what action they should take, or not take, in response to the message.
- *Establish clear scoring criteria.* Scoring open-ended responses for accuracy is not always easy. Some answers will be vague or only partially correct. Misinterpretations that contradict the intent of the message or could lead to dangerous behaviors—so called “critical confusions”—deserve special attention.
 - *Use multiple choice methods with caution.* They permit easy and objective scoring, but can bias the findings because the answer choices can themselves influence how people respond. Also, if a participant interprets an item in a way other than one of the choices provided, you will not detect the actual error.
 - *Include subgroups of the consumer population for your product that are likely to suffer greater difficulties in comprehension.* This might be based on literacy, age, product experience, or other consumer attributes.
- ✓ ***Consider usability testing to determine whether consumers can easily and properly use your instructions.***

Many variations of usability testing methods exist, but they have in common a systematic and detailed observation of representative users doing real tasks under structured conditions. Usability testing can sometimes be highly revealing even with only a few participants and may identify the cause of problems.

To conduct a usability test, you must first choose a set of tasks for participants to attempt. As the participant tries each task, carefully observe and record details of behavior, such as the time to finish a task and each of its subtasks, the numbers and types of errors, and instances of flipping between sections of the instructions. Usability tests frequently require participants to “think out loud” so that their problems and strategies are more evident. You may also question participants after the task, possibly while they view and comment on a video recording of what they were doing.

- ✓ ***Consider focus groups or in-depth interviews to reveal the perceptions, beliefs, and strategies of consumers.***

Focus groups are good for generating ideas or identifying problems, but they do not indicate how widespread the problems or perceptions may be. A focus group usually consists of 8 to 10 people who share some common attributes of interest. For example, they may all be owners of a certain product or may be inexperienced in using a certain type of device.

Before you conduct the focus group, you must provide participants with an opportunity to individually read and use the instructions. A trained moderator leads the discussion along a predetermined question path and encourages discussion among participants. This allows new issues to come up that you may not have considered. Although you can often learn much from a single focus group, several groups are preferable. Because of the spontaneous nature of the group discussion, you will often get different insights with each group. If you are interested in the perspectives of different consumer groups (for example, old versus young, experienced versus inexperienced, or different geographic regions), you may run separate groups with each type.

In-depth interviews are similar to focus groups in that they allow detailed probing of answers to a predetermined set of general questions, and permit flexibility in adapting questions as the interview continues. Also, like a focus group, the method is primarily qualitative; it seeks to identify and explore user problems and underlying beliefs and attitudes. However, in-depth interviews involve only one participant at a time and the interviewer plays a more active role than in a focus group. The interviewer and the interviewee are partners in a conversation and share the job of extracting the desired information.

In-depth interview methods typically do not involve large numbers of participants. Questions should be open-ended and should not impose a set of answer categories on the respondent. Open-ended questions require some expansion and provide deeper insight into respondents' beliefs and attitudes. The interviewer must be skilled and must be able to adapt the conversation as it proceeds based on what is said, what is omitted, the emotional tone, and nonverbal cues.

✓ ***Consider surveys to measure how often different pre-determined responses to a question occur.***

A survey is a quantitative method of evaluation. It is not designed to raise questions but rather to measure how often different responses to questions occur. For example, a survey question might ask a consumer, "When you assembled the crib, how did you use the instructions?" You might follow this question with a fixed set of alternative answers, such as (a) I did not look at the instructions at all; (b) I glanced at the instructions, but decided I did not need them; (c) I read them carefully as I went from step to step; and so forth. Because the goal of a survey is measurement, there is more concern about the size and makeup of the participant sample than there is for more qualitative methods. Surveys can collect data through written questionnaires, telephone interviews, and in-person interviews.

Internet surveys are also becoming more common. Survey design and implementation is a sophisticated field; the methods for sampling participants require statistical expertise. Because survey results are based on self-report rather than observed behavior, the findings may be subject to bias or error. For example, respondents may be reluctant to report some behaviors or may have difficulty remembering events accurately. You generally cannot follow up if the respondent does not understand how to answer your question, so you should pilot test and refine survey questions before launching the survey.

- ✓ ***Consider log diaries to uncover problems, intentional misuse, unusual applications, incidents and close calls, and other “real world” issues associated with the product and instructions.***

Log diaries rely on study participants to keep systematic records of their use of and problems with a product over some extended period. They can be used only when a draft of the instructions is complete, because this method requires participants to have and use both the product and the instructions.

For the most part, this method does not examine participants' direct use of the instructions, but indirectly evaluates the effectiveness of the instructions by understanding how consumers use the product. However, participants must record instances where the instructions were used; for example, to look up something. One drawback of a log diary is that it may require an extended time period for data collection. Some events may happen only rarely, so you must collect many hours of user experience to encounter relevant examples of user behavior. Other events, like replacing an expired battery, may not arise unless the product has been in use for some time.

- ✓ ***Consider observation methods to document the behavior of consumers as they use the product and instructions in a natural setting.***

Ideally, observations are unobtrusive and participants may not even know they are being observed. Observing consumers in natural settings, like their homes, may be difficult. Instead, you might observe them in settings modified to resemble a natural setting. In a staged setting, you should try to be unobtrusive and you should not influence the behavior of participants. You can record a range of behaviors, from a simple listing of tasks, task times, or errors, to detailed recordings of individual actions like where the person is looking, what each hand is doing, or when pages are turned in the instructions.

- ✓ ***Consider memory recall methods to evaluate instructions that may not be used for some time after the initial reading.***

Your product might include message displays, symbols, or alarms that indicate a malfunction or unsafe condition. Although consumers might understand these when they read the instructions, will the meaning still be clear if the malfunction or condition does not occur until months later?

When study participants initially read the instructions, they should not know that you will be testing them later for recall; they should read with the same frame of mind as any consumer. You must also provide the proper context. Find out which cues are typical of a real world setting so that your memory test is meaningful. Often, the most appropriate context is to provide users with the actual product, but photographs, drawings, or verbal descriptions may also be appropriate.

Keep in mind the distinction between recall and recognition. Recall means coming up with the answer yourself; recognition means identifying the answer when you see it. If you inadvertently use a recognition method, you risk overestimating how well people will recall the procedure when they encounter it.

- ✓ ***Examine archival data on your product or similar products to identify problems or limitations to the instructions.***

These might include records of accidents and incidents, consumer complaints, and calls to technical help lines. Such data may be collected in the normal course of business or may require special efforts to identify and record information for later use. You may also consider providing a mechanism for soliciting consumer opinions by providing, in the instructions or on the product, a Web site or phone number that consumers can use to report incidents or opinions.

Because archival data is not available until the product and instructions are already in use, this is not a source that can help you with designing an initial version of your instructions unless a closely related product and instruction set exist. However, it may be useful for revisions or updates when a new product version is produced.

For Further Reading:

American National Standards Institute (2002a) ANSI Z535.3-2002 provides appendices on how to design and evaluate symbols for product safety. The discussion includes what kinds of tests to do, procedural

details, the appropriate test participant sample to use, how to score the correctness of answers, and criteria for acceptability.

Bryman and Burgess (1999) edited a multi-volume reference work titled *Qualitative Research*. Various chapters address a number of the methods discussed in this section. Volume 2, *Methods of Qualitative Research*, is particularly relevant. It includes two chapters on focus groups, three on interviewing, two on diaries, and three on observation. Volume 3, *Analysis and Interpretation of Quantitative Data*, provides information on how to treat data from these various methods.

Dumas and Redish (1999) provide a detailed practical guide for conducting usability testing. The book covers the planning and conduct of usability tests and how to use the results.

Kish (1995), though a reprint of a book first published in 1965, remains the classic reference on survey sampling methods and is still widely cited. It explains how to design and execute valid samples and how to avoid biases in the sample. It includes practical tips and scientifically based principles.

Krueger (1988) is a short and readable book on how to conduct focus groups. Kreuger defines and explains the purpose of focus groups, describes the process, and discusses issues and concerns that may arise.

Lyberg, et al. (1997) provide a good treatment of survey design issues. The 33-chapter book is organized under the major topics of questionnaire design, data collection, post survey processing and operations, quality assessment and control, and error effects on estimation, analyses, and interpretation.

Nielsen (1997) has an informative chapter in *The Handbook of Human Factors and Ergonomics* (Salvendy, 1997) on usability testing. It explains how to plan and conduct various testing procedures. Nielsen (1993) provides a more extended treatment in a book, titled *Usability Engineering*.

Patton (1990) covers a variety of qualitative research methods including observational and interviewing methods.

Rubin and Rubin (1995) provide a comprehensive treatment of in-depth interview methods. They discuss the design of the interview, interviewing techniques, and analyzing the findings.

Checklist

This checklist is meant to help you identify some of the key requirements and considerations throughout the process of instruction development, including preparation and planning, document design, and evaluation and testing. References to sections of this guide that provide further guidance and background information appear below each question heading.

Planning the Instructions

What Tasks Should Be Included in the Instructions?

See Section 2: Planning the Instructions – What Are the Goals of the Instructions?

- ☐ Do you understand the product and its functions?
- ☐ Have you defined the scope of the instructions?
- ☐ Have you identified the key tasks users must perform and the desired outcome for each?
- ☐ Have you identified the steps involved in each task?
- ☐ Have you defined the sequence of the tasks and their steps?
- ☐ Have you determined the knowledge, skills, and resources (e.g., time, tools) required to perform each task and its steps?
- ☐ Have you identified potential errors associated with these tasks and the consequences of those errors?
- ☐ Have you defined specific, measurable criteria for success (e.g., time to complete, accuracy) for each task?

Who Are the Users of the Instructions?

See Section 2: Planning the Instructions – Who Is the Audience?

- ☐ Have you identified the foreseeable users of the product and instructions, including users other than the purchaser?
- ☐ Have you identified the potentially relevant characteristics of these users, including, but not limited to, age, sex, and literacy?
- ☐ Have you determined how familiar these users are likely to be with the product and with similar products or features?
- ☐ Do you understand the abilities, limitations, and preferences of these users?
- ☐ Have you determined the environments in which users are likely to use the instructions, and what tools and other resources they are likely to have available?

What Are the Foreseeable Uses of the Product?

See Section 2: Planning the Instructions

- ☐ Have you conducted focus groups, observations, and other qualitative analyses to identify how consumers understand the product and are likely to use it under real-world conditions?
- ☐ Have you searched for consumer feedback and marketing research on the product or on similar products?
- ☐ Have you performed systematic analyses, such as fault-tree analyses and failure modes and effects analyses, to identify reasonably foreseeable hazards?
- ☐ Have you reviewed comparable products or products with similar features to understand their hazards?
- ☐ Have you reviewed existing incident data associated with the product or with similar products and product features?

What Constraints Are Imposed Upon the Instructions?

See Section 2: Planning the Instructions – What Are the Constraints?

- ☐ Have you examined potentially relevant government regulations, guidance, and recommendations?
- ☐ Have you considered potentially relevant legal requirements, including the duty to warn?
- ☐ Have you examined potentially relevant voluntary standards and industry-recommended practices?
- ☐ Have you identified company requirements or practices that will be imposed upon the instructions?

Designing the Instructions**Are the Instructions Attention-Getting?**

See Section 3: Capturing and Maintaining Attention – What Gets the Instructions Noticed?

- ☐ Are the instructions placed where consumers must encounter them to use the product?
- ☐ Are the physical features of the document (e.g., contrast with background, name and model of the product, presence of bold graphic elements) attention getting?
- ☐ Have you considered including supplemental materials, such as hang tags or product labels, that point to the full instructions?
- ☐ Have you considered delivery of the instructions prior to the product, if the product is not immediately available?

Are the Instructions Inviting and User-Friendly?

See Section 3: Capturing and Maintaining Attention

- ☐ Is the layout appealing?
- ☐ Are text and graphics legible?
- ☐ Are the document's size, page stock, and colors appropriate?
- ☐ Did you consider creating multiple documents?

Are the Instructions Organized From the Users' Perspective?

See Section 3: Capturing and Maintaining Attention and Section 4: Securing Comprehension

- ☐ Are actions stated in terms of users' goals?
- ☐ Are tasks presented in a logical sequence?
- ☐ Is the document structure logical and evident?

Did You Include Appropriate Structural Elements?

See Section 4: Securing Comprehension – What Structure Is Helpful?

- ☐ Should you include a table of contents?
- ☐ Should you include an index?
- ☐ Should you include a glossary?
- ☐ Should you include cross-references?
- ☐ Should you include a checklist?

Is the Text Appropriate for Your Application and Your Audience?

See Section 4: Securing Comprehension

- ☐ Are words simple and understandable?
- ☐ Are sentences simple and understandable?
- ☐ Did you give names to components and procedures that will be meaningful to consumers?
- ☐ Did you name components and procedures consistently throughout the instructions?
- ☐ Did you consider providing instructions in multiple languages?

Are the Graphics Appropriate for Your Application and Your Audience?

See Section 4: Securing Comprehension – When Are Graphics Effective?

- ☐ Do the graphics express and support the message?
- ☐ Are the graphics easy to understand?

Do the Instructions Appear Credible and Encourage Compliance?

See Section 5: Motivating Compliance

- ☐ Are the instructions personally relevant to users?
- ☐ Will users see you as credible and as motivated by their needs?
- ☐ Do you emphasize benefits of following the instructions and minimize barriers to compliance?
- ☐ Are the instructions designed to help users remember important information?

Are Safety Messages Presented Properly?

See Section 6: Presenting Safety Information

- ☐ Do you include an up-front message telling users to read the instructions?
- ☐ Do you provide safety messages immediately before they are needed?
- ☐ Are the messages immediately recognizable as important for personal safety?
- ☐ Have you distinctly and consistently formatted the messages throughout the instructions?
- ☐ Have you considered the use of formal labeling elements, such as safety alert symbols, borders, or graphics?
- ☐ Do the messages include a signal word (CAUTION, WARNING, or DANGER) to indicate hazard severity?
- ☐ Will users clearly understand the hazard, the consequences of exposure to the hazard, and how to avoid the hazard?
- ☐ Will users see the message as personally relevant?

Evaluating the Instructions**What Should Be Considered Prior to Testing?**

See Section 7: Evaluating the Instructions – What Should Be Considered?

- ☐ Have you verified the accuracy of the instructions?
- ☐ Do you understand the criteria for success—that is, the goals—you set for the instructions during planning of the instructions?
- ☐ Have you found experts to perform all formal tests on the instructions?

What Should Be Considered During Testing?

See Section 7: Evaluating the Instructions - What Should Be Considered?

- ☐ Do the participants represent the target audience?
- ☐ Do the participants include critical subgroups of foreseeable users (e.g., the elderly, non-English-literate users)?
- ☐ Do participants have access to the product during testing?
- ☐ Is testing taking place in a real-life setting?
- ☐ Are the instructions being evaluated and tested for all key performance criteria, such as conspicuity, understandability, errors, and compliance?
- ☐ Are the instructions revised and retested until they meet the goals defined during planning?

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