

**ARCHITECTURAL AND
TRANSPORTATION BARRIERS
COMPLIANCE BOARD****36 CFR Part 1193**

[Docket No. 97-1]

RIN 3014-AA19

**Telecommunications Act Accessibility
Guidelines**

AGENCY: Architectural and
Transportation Barriers Compliance
Board.

ACTION: Notice of proposed rulemaking.

SUMMARY: The Architectural and Transportation Barriers Compliance Board (Access Board) proposes guidelines for accessibility, usability, and compatibility of telecommunications equipment and customer premises equipment covered by the Telecommunications Act of 1996. The Act requires manufacturers of telecommunications equipment and customer premises equipment to ensure that the equipment is designed, developed, and fabricated to be accessible to and usable by individuals with disabilities, if readily achievable. When it is not readily achievable to make the equipment accessible, the Act requires manufacturers to ensure that the equipment is compatible with existing peripheral devices or specialized customer premises equipment commonly used by individuals with disabilities to achieve access, if readily achievable. The guidelines will assist manufacturers to comply with the Act.

DATES: Comments should be received by June 2, 1997, but late comments will be considered to the extent practicable.

ADDRESSES: Comments should be sent to the Office of Technical and Information Services, Architectural and Transportation Barriers Compliance Board, 1331 F Street NW., suite 1000, Washington, DC 20004-1111. To facilitate posting comments on the Board's Internet site, commenters are requested to submit comments in electronic format, preferably as a Word or WordPerfect file, either by e-mail or on disk. Comments sent by e-mail will be considered only if they include the full name and address of the sender in the text. E-mail comments should be sent to docket@access-board.gov. Comments will be available for inspection at the above address from 9:00 a.m. to 5:00 p.m. on regular business days.

FOR FURTHER INFORMATION CONTACT:
Dennis Cannon, Office of Technical and

Information Services, Architectural and Transportation Barriers Compliance Board, 1331 F Street, NW., suite 1000, Washington, DC 20004-1111. Telephone number (202) 272-5434 extension 35 (voice); (202) 272-5449 (TTY). Electronic mail address: cannon@access-board.gov.

SUPPLEMENTARY INFORMATION:**Availability of Copies and Electronic
Access**

Single copies of this publication may be obtained at no cost by calling the Access Board's automated publications order line (202) 272-5434, by pressing 1 on the telephone keypad, then 1 again, and requesting publication S-33 (Telecommunications Act Accessibility Guidelines Notice of Proposed Rulemaking). Persons using a TTY should call (202) 272-5449. Please record a name, address, telephone number and request publication S-33. This document is available in alternate formats upon request. Persons who want a copy in an alternate format should specify the type of format (cassette tape, Braille, large print, or computer disk). This document is also available on the Board's Internet site (<http://www.access-board.gov/rules/telenprm.htm>).

This proposed rule is based on recommendations of the Board's Telecommunications Access Advisory Committee. The report can be obtained by contacting the Access Board and requesting publication S-32. The report is also available on the Board's Internet site (<http://www.access-board.gov/pubs/taacprt.htm>).

Background

On February 8, 1996, the President signed the Telecommunications Act of 1996. The Architectural and Transportation Barriers Compliance Board (Access Board) is responsible for developing accessibility guidelines in conjunction with the Federal Communications Commission (FCC) under section 255(e) of the Act for telecommunications equipment and customer premises equipment.

Section 255 provides that a manufacturer of telecommunications equipment or customer premises equipment shall ensure that the equipment is designed, developed, and fabricated to be accessible to and usable by individuals with disabilities, if readily achievable. A provider of telecommunications services shall ensure that the service is accessible to and usable by individuals with disabilities, if readily achievable.

Whenever either of these are not readily

achievable, such a manufacturer or provider shall ensure that the equipment or service is compatible with existing peripheral devices or specialized customer premises equipment commonly used by individuals with disabilities to achieve access, if readily achievable. Section 255(f) provides that the FCC shall have exclusive jurisdiction in any enforcement action under section 255. It also limits an individual's private right of action to enforce any requirement of section 255 or any regulation issued pursuant to section 255.

The Telecommunications Act requires the Board's accessibility guidelines to be issued by August 8, 1997. The Board is also required to review and update the guidelines periodically. The Board's guidelines for telecommunications equipment and customer premises equipment are required to principally address the access needs of individuals with disabilities affecting hearing, vision, movement, manipulation, speech, and interpretation of information.

This proposed rule is based on recommendations of the Telecommunications Access Advisory Committee (Committee or TAAC). The Committee was convened by the Access Board in June 1996 to assist the Board in fulfilling its mandate under section 255.

On May 24, 1996, the Access Board published a notice appointing members to the Committee. 61 FR 26155 (May 24, 1996). Between June 1996 and January 1997, the Committee held six meetings, each of three working days in length, during which members worked to develop recommendations for implementing requirements under section 255. In selecting members of the Committee, the Access Board sought to ensure representation from all parties interested in the promulgation of telecommunications accessibility guidelines. The Committee was composed of representatives of manufacturers of telecommunications equipment and customer premises equipment; manufacturers of specialized customer premises equipment and peripheral devices; manufacturers of software; organizations representing the access needs of individuals with disabilities; telecommunications providers and carriers; and other persons affected by the guidelines.

The following organizations served on the Committee:

American Council of the Blind
American Foundation for the Blind
American Speech-Language Hearing
Association

Arkenstone
 AT&T
 Cellular Telecommunications Industry Association
 Consumer Action Network and the Alexander Graham Bell Association for the Deaf
 Consumer Electronics Manufacturers Association
 Council of Organizational Representatives
 Ericsson
 Gallaudet University
 Inclusive Technologies
 Lucent Technologies
 Massachusetts Assistive Technology Partnership
 Microsoft Corporation
 Motorola
 National Association of State Relay Administration
 National Federation of the Blind
 NCR Corporation
 Netscape Communications
 Northern Telecom
 NYNEX Corporation
 Pacific Bell
 Pennsylvania Citizens Consumer Council
 Personal Communications Industry Association
 RESNA
 Self Help for Hard of Hearing People
 Siemens Business Communications Telecommunications Industry Association
 Trace Research and Development Center
 United Cerebral Palsy Associations
 United States Telephone Association
 World Institute on Disability

Each organization selected a principal member and an alternate. The Committee formed several subcommittees and task groups in which alternates and nonmembers were invited to participate. As a result, the actual group which developed the recommendations was broader than the formal membership. The result of the Committee's work was a report containing recommendations to the Access Board for implementing section 255 of the Telecommunications Act.

This proposed rule is based primarily on the recommendations of chapters four "Process Guidelines" and five "Performance Guidelines" of the Committee report. In preparing its recommendations, the Committee recognized that evolving telecommunications technologies often make it difficult to distinguish whether a product's functions and interfaces are the result of the design of the product itself, or are the result of a service provider's software or even an information service format. The Committee's recommendations also did

not differentiate between hardware and software implementations of a product's functions or features, nor was any distinction made between functions and features built into the product and those that may be provided from a remote server over the network. In response to a request from the Access Board, the FCC issued a Notice of Inquiry (FCC 96-382, September 17, 1996) to develop a record to assist the Board in the development of accessibility guidelines. In the Notice of Inquiry, the FCC also sought comment on issues raised when accessibility issues involve both telecommunications equipment and services.

The Committee report provides a broad overview of accessibility to telecommunications equipment and customer premises equipment and is intended to stand alone as a model for achieving such access. It, therefore, covers issues that go beyond the Board's jurisdiction. The report provides advice to the FCC in the areas of compliance and telecommunications service delivery, as well as recommendations to manufacturers, engineers, and design professionals.

The report recommends the establishment of a cooperative dialogue among manufacturers, product developers, engineers, academicians, individuals with disabilities, and others involved in the telecommunications equipment design and development process. The report also recommends the creation of a technical subgroup of a professional society which could train and eventually certify "accessibility specialists" or engineers. As a result of work by several Committee members, such a group has already been created. The National Association of Radio and Telecommunications Engineers recently formed the Association of Accessibility Engineering Specialists. This association is expected to sponsor conferences and workshops, disseminate information, and suggest course curricula for future training and certification. The association could also serve as an advisory resource to the FCC to help speed resolution of complaints.

With respect to complaints, the Committee report recommends that a Declaration of Conformity accompany each product. Such a Declaration, among other things, would state that the product has met the requirements of section 255 and provide information on how to contact the manufacturer to obtain information about the product's accessibility features. Since enforcement for section 255 is under the exclusive jurisdiction of the FCC, this rule does not address the Declaration of Conformity.

The Committee's recommendations also suggest that a "Market Monitoring" report be issued periodically to address the state of the art of customer premises equipment and telecommunications equipment and the progress of making this equipment accessible. The Access Board intends to compile such a report on a regular basis and make it available to the public.

The provisions of section 255 recognize that individuals with disabilities need improved access to telecommunications technology. Section 255 places an obligation on manufacturers to consider accessibility when designing, developing, and fabricating telecommunications equipment and customer premises equipment. Among other things, these proposed guidelines set forth factors to be considered throughout manufacturing processes to achieve accessibility. Because the pace of technological change is so rapid, it is expected that many aspects of accessibility which are not readily achievable today may become readily achievable in the future.

An important approach reflected in these proposed guidelines and in designing accessible products is called Universal Design. This is the practice of designing products so that they are usable by the broadest possible audience. Products designed in this manner are more usable by people with a wide range of abilities without reducing the product's usability or attractiveness for mass or core audiences. With Universal Design, the goal is to ensure maximum flexibility and ease of use for as many individuals as possible.

In the past, some products or designs developed with Universal Design principles have attracted a wider audience than may have otherwise been attracted by the product. For example, curb ramps, originally designed to ensure wheelchair access, are routinely used by people with strollers, bicyclists, and delivery personnel. Similarly, closed captioning on television programs, created for the benefit of individuals who are deaf or hard of hearing, sometimes is used in airports, restaurants, and other noisy locations where it is difficult to hear the audio portion of the program. Similarly, voice activated telephone dialers not only enable individuals with limited hand and finger mobility to place calls, they allow drivers to place calls while driving without requiring them to take their hands off the steering wheel. Also, vibrating pagers, which are accessible to deaf and hard of hearing persons, can alert users to calls without the audible

tones interrupting business meetings. Finally, an audio adjunct to caller ID not only enables individuals who are blind to learn the identity of a caller, but enables people eating dinner to identify callers without leaving the dinner table.

Manufacturers are increasingly finding that by making a product accessible for people with disabilities, the product becomes more usable by other customers as well. For example, a recent article (Murphy, "Investing in Voice", *Wired*, March 1997, at 100) highlights the growing importance of voice recognition technology. At least two of the companies cited for leading edge advances in this field originally developed the technology as peripheral devices and software to provide access for individuals with disabilities. However, it was quickly discovered that other customers benefitted from the change. Clearly, Universal Design works in both directions. Some members of TAAC reported that adding accessibility features (e.g., adding voice to caller ID) increased sales.

Question 1: The Board seeks any other available information on whether adding accessibility features has actually increased sales.

The Board encourages the use of Universal Design in the manufacture of telecommunications equipment and customer premises equipment. For some time, Pacific Bell has had a program to consider Universal Design in products and services, and Bell Atlantic and NYNEX recently held a joint press conference to announce their plans to embrace such principles. They stated that, if incorporated early enough in the design process, the cost of accessibility was insignificant.

In developing its recommendations to the Board, the Committee recommended that accessibility guidelines required by section 255, adhere to the following principles:

- The guidelines must be specific enough that one can determine when they have been followed.
- The guidelines must be sufficiently flexible to give manufacturers the freedom to innovate.
- Products should be made accessible to and usable by people with as wide a range of abilities or disabilities as is readily achievable.
- Whenever it is not readily achievable to make a product accessible, the manufacturer or provider of that product, shall ensure that the product is compatible with existing peripheral devices or specialized customer premises equipment commonly used by individuals with disabilities to achieve access, if readily achievable.

- It may not be readily achievable to make every type of product accessible for every type of disability using present technology; future technologies may result in accessibility where it is not currently readily achievable.

- Because telecommunications technology is changing so rapidly, it is expected that the guidelines will need to be updated on a regular basis.

- Guidelines must reflect the fact that computer, telephone, information, and tele-transaction systems may converge, such that single devices may simultaneously provide all of these functions.

- Guidelines should address process, performance, and compliance and coordination issues.

In proposing these guidelines, the Board believes that it has adhered to the above principles, within the framework of the Board's statutory authority.

Section-by-Section Analysis

This section of the preamble contains a concise summary of the rule which the Access Board is proposing. The text of the proposed rule follows this section. An appendix provides examples of non-mandatory strategies for addressing these guidelines.

Subpart A—General

Section 1193.1 Purpose

This section describes the purpose of the guidelines which is to provide specific guidance for the accessibility, usability, and compatibility of telecommunications equipment and customer premises equipment covered by the Telecommunications Act of 1996. Section 255(b) of the Act requires that manufacturers of telecommunications equipment or customer premises equipment shall ensure that the equipment is designed, developed, and fabricated to be accessible to and usable by individuals with disabilities, if readily achievable. Section 255(d) of the Act requires that whenever it is not readily achievable to make a product accessible, a manufacturer shall ensure that the equipment is compatible with existing peripheral devices or specialized customer premises equipment commonly used by individuals with disabilities to achieve access, if readily achievable. The requirement for the Board to issue accessibility guidelines is contained in section 255(e) which specifies the issuance of guidelines by August 8, 1997.

Section 1193.2 Scoping

This section provides requirements for accessibility, usability, and

compatibility of telecommunications equipment and customer premises equipment.

The guidelines apply to telecommunications equipment and customer premises equipment required by section 255(b) to be designed, developed, and fabricated to be accessible to and usable by individuals with disabilities, if readily achievable. By grouping "design, develop and fabricate" together, section 255(b) suggests that the requirement applies to new equipment designed, developed and fabricated after February 8, 1996. The FCC agrees that the requirement of section 255(b) became effective on that date. See Notice of Inquiry, FCC 96-382, page 3 (September 17, 1996). The application of these guidelines to new products designed, developed and fabricated between the effective date of the Act and the effective date of the Board's final guidelines is a matter for the FCC to determine.

These guidelines apply to all telecommunications equipment and customer premises equipment. Some members of the TAAC, and some comments to the FCC's Notice of Inquiry, argued that "equipment" can be interpreted as either singular or plural, therefore, allowing accessibility to be applied on a "product line" basis rather than to individual products. Manufacturers create multiple products in the same product line in order to offer customers a choice of options and features. The Board finds no evidence in the statute or its legislative history that Congress intended individuals with disabilities to have fewer choices in selecting products than the general public. Therefore, all products are subject to these guidelines.

Manufacturers periodically change, upgrade, or distribute new releases of existing products. Therefore, this section requires that when these events occur, manufacturers shall evaluate the accessibility features, and incorporate those features into existing products when readily achievable. Minor or insubstantial changes that do not affect functionality need not trigger accessibility reviews pursuant to these guidelines.

Section 1193.3 Definitions

With a few exceptions discussed below, the definitions in this section are the same as the definitions used in the Telecommunications Act of 1996.

Accessible. Subpart C contains the minimum requirements for accessibility. Therefore, the term accessible is defined as meeting the provisions of Subpart C.

Alternate Formats. Certain product information is required to be made

available in alternate formats to be usable by individuals with various disabilities. Common forms of alternate formats are Braille, large print, ASCII text, and audio cassettes. Further discussion of alternate formats is provided in section 1193.25 and in the appendix.

Alternate Modes. Alternate modes are different means of providing information to users of products including product documentation and information about the status or operation of controls. For example, if a manufacturer provides product instructions on a video cassette, captioning would be required. Further discussion of alternate modes is provided in sections 1193.25, 1193.31 through 1193.37, and in the appendix.

Compatible. Subpart D contains the minimum requirements for compatibility. Therefore, the term compatible is defined as meeting the provisions of Subpart D.

Customer Premises Equipment. This definition is taken from the Telecommunications Act. Equipment employed on the premises of a person, which can originate, route or terminate telecommunications, is customer premises equipment. "Person" is a legal term meaning an individual, corporation, or organization.

Customer premises equipment can also include certain specialized customer premises equipment which are directly connected to the telecommunications network and which can originate, route, or terminate telecommunications. Equipment with such capabilities is covered by section 255(b) and is required to meet the accessibility requirements of Subpart C, if readily achievable, or to be compatible with other specialized customer premises equipment and peripheral devices according to Subpart D, if readily achievable. Customer premises equipment may also include wireless sets.¹

Manufacturer. This definition is provided as a shorthand reference for a manufacturer of telecommunications equipment and customer premises equipment.

Peripheral Devices. Peripheral devices are referenced in section 255(d) of the Act, as equipment commonly used by individuals with disabilities to achieve access to telecommunications equipment and customer premises equipment. No definition is provided in

the Act but the term peripheral devices commonly refers to audio amplifiers, ring signal lights, some TTYs, refreshable Braille translators, text-to-speech synthesizers and similar devices. These devices must be connected to a telephone or other customer premises equipment to enable an individual with a disability to originate, route, or terminate telecommunications. Peripheral devices cannot perform these functions on their own.

Product. This definition is provided as a shorthand reference for telecommunications equipment and customer premises equipment.

Readily Achievable. The Telecommunications Act defines "readily achievable" as having the same meaning as in the Americans with Disabilities Act (ADA) but the ADA applies the concept in an entirely different context than the Telecommunications Act. The ADA applies the term to the removal of architectural barriers in an existing building or facility, whereas the Telecommunications Act applies the term to the design, development and fabrication of new telecommunications equipment and customer premises equipment. The factors which apply in the ADA context may not be appropriate here. Section 301(9) of the ADA defines readily achievable as follows:

"The term 'readily achievable' means easily accomplishable and able to be carried out without much difficulty or expense. In determining whether an action is readily achievable, factors to be considered include:

(A) the nature and cost of the action needed under this Act;

(B) the overall financial resources of the facility or facilities involved in the action; the number of persons employed at such facility; the effect on expenses and resources, or the impact otherwise of such action upon the operation of the facility;

(C) the overall financial resources of the covered entity; the overall size of the business of a covered entity with respect to the number of its employees; the number, type, and location of its facilities; and

(D) the type of operation or operations of the covered entity, including the composition, structure, and functions of the workforce of such entity; the geographic separateness, administrative or fiscal relationship of the facility or facilities in question to the covered entity." (42 U.S.C. 12181(9))

Since the ADA definition is intended to apply to the removal of architectural barriers in existing buildings and facilities, the factors relate to the cost of alterations, the financial resources of the

particular entity and its relationship to a parent entity, and the corporate structure which might affect the allocation of resources.

In implementing title III of the ADA, the Department of Justice (DOJ) adopted a slightly different wording for its definition, based, in part, on the extensive legislative history of the ADA. The DOJ definition of readily achievable is as follows:

"Readily achievable means easily accomplishable and able to be carried out without much difficulty or expense. In determining whether an action is readily achievable factors to be considered include—

(1) The nature and cost of the action needed under this part;

(2) The overall financial resources of the site or sites involved in the action; the number of persons employed at the site; the effect on expenses and resources; legitimate safety requirements that are necessary for safe operation, including crime prevention measures; or the impact otherwise of the action upon the operation of the site;

(3) The geographic separateness, and the administrative or fiscal relationship of the site or sites in question to any parent corporation or entity;

(4) If applicable, the overall financial resources of any parent corporation or entity; the overall size of the parent corporation or entity with respect to the number of its employees; the number, type, and location of its facilities; and

(5) If applicable, the type of operation or operations of any parent corporation or entity, including the composition, structure, and functions of the workforce of the parent corporation or entity." (28 CFR 36.104)

The DOJ definition makes clear the connection between parent entity and subdivision and includes safety considerations related to the possible disruption of construction or the inability to comply with the strict requirements of an accessibility standard.

Substituting "manufacturer" for "building", "facility", or "site" makes partial sense but does not clarify how the factors would be applied to the telecommunications industry. For one thing, the DOJ rule makes it clear that, in evaluating whether a particular structural modification is readily achievable, the covered entity starts with the alteration provisions of the ADA Accessibility Guidelines (ADAAG). Those provisions include the concept of "technical infeasibility" which relates to effects on the existing building's structural frame. The factors in either of the above definitions do not explicitly include technical

¹ See Declaratory Ruling, DA 93-122, 8 FCC Rcd 6171, 6174 (Com. Car. Bur. 1993) (TOCSIA Declaratory Ruling), recon. pending (finding that definition of "premises" includes "locations" such as airplanes, trains and rental cars, despite the fact that they are mobile).

infeasibility. The TAAC, therefore, considered explicitly including the concept of "technologically feasible" as a factor in determining what is readily achievable.

The definition of readily achievable in section 1193.3 includes only the first phrase from the ADA definition. The Board intends to include an appendix section in the final rule containing a discussion of factors for determining when an action is readily achievable. The FCC asked questions in its Notice of Inquiry regarding the readily achievable factors and their application to the telecommunications industry and intends to issue guidance on the application of the readily achievable limitation in the telecommunications context. The Board will coordinate its rulemaking with any FCC proceeding.

Question 2: The Board seeks comment regarding the definition of readily achievable in the telecommunications context. (a) What factors translate from the ADA or DOJ definition of readily achievable, which address the built environment, to the telecommunications industry? (b) Both the ADA and the DOJ definitions specify that overall resources and overall size of a covered entity are factors in determining whether an action is readily achievable. Should a large company be expected to provide more accessibility in its products than a small company with limited production capacity or narrow design experience? (c) If small companies are expected to provide less accessibility in its products than large companies, would small companies have a competitive advantage in the marketplace? (d) Is the concept of "technologically feasible" an appropriate factor? (e) In the ADA context, "resources" refer only to financial resources but are there other resources in the telecommunications context, such as information, design expertise, knowledge of specific manufacturing techniques or procedures, or availability of certain kinds of technological solutions? (f) Finally, are there other factors to be considered in defining "readily achievable" in these guidelines? Since the success of these guidelines depends largely upon the term "readily achievable" the Board is concerned that this term is appropriately applied. Further discussion of these issues is provided in section 1193.21.

Specialized Customer Premises Equipment. Section 255(d) of the Telecommunications Act requires that whenever it is not readily achievable to make a product accessible, a manufacturer shall ensure that the equipment is compatible with existing peripheral devices or specialized

customer premises equipment commonly used by individuals with disabilities to achieve access, if readily achievable. The Telecommunications Act does not define specialized customer premises equipment. As discussed above, the Act defines customer premises equipment as "equipment employed on the premises of a person (other than a carrier) to originate, route, or terminate telecommunications". The Board views specialized customer premises equipment as a subset of customer premises equipment.

The Act and its legislative history do not make it clear whether Congress intended to treat specialized customer premises equipment differently from peripheral devices. The Act appears to treat this equipment in the same manner as peripheral devices. However, certain specialized equipment, such as direct-connect TTYs, can originate, route, or terminate telecommunications without connection to anything else. Equipment which can independently originate, route or terminate telecommunications is customer premises equipment and must meet the requirements of Subpart C, if readily achievable. Where accessibility is not readily achievable, customer premises equipment (including specialized customer premises equipment) must be compatible with other devices.

If specialized customer premises equipment can originate, route, or terminate telecommunications, it appears that for purposes of these guidelines, the equipment should be treated the same as customer premises equipment.

Question 3: The Board seeks comment on how specialized customer premises equipment should be treated. Should this equipment be treated the same as peripheral devices or treated differently than peripheral devices?

TTY. This definition is taken from the ADA Accessibility Guidelines, primarily for consistency with other statutes and regulations.

Usable. This definition is included to convey the important point that products which have been designed to be accessible are usable only if an individual has adequate information on how to operate the product. Further discussion of usability is provided in section 1193.25.

Subpart B—General Requirements

Section 1193.21 Accessibility and Compatibility

This section provides that where readily achievable, telecommunications equipment and customer premises

equipment shall comply with the specific technical provisions of Subpart C. Where it is not readily achievable to comply with Subpart C, telecommunications equipment and customer premises equipment shall comply with the provisions of Subpart D, if readily achievable. This is a restatement of the Act and sets forth the readily achievable limitation which applies to all subsequent sections of these guidelines.

It is the responsibility of a manufacturer to determine whether compliance with any particular provision is readily achievable. Some of the factors which might be considered are those discussed under § 1193.3 in the definition of readily achievable. The possible factors include the cost of compliance, balanced with the financial resources of the manufacturer, taking into account whether compliance is technologically feasible. The resources to be considered might include those of any parent entity, depending on the extent to which those resources can be made available to the subsidiary.

In the telecommunications industry, the "resources" to be considered may be more than financial. Resources could include design expertise, knowledge of specific manufacturing techniques, or availability of certain kinds of technological solutions. On the other hand, absence of direct experience with, or knowledge of, accessibility solutions is not necessarily automatic grounds for determining that an action is not readily achievable. Manufacturers are expected to seek out information and develop expertise. In addition, manufacturers may be able to utilize expertise from outside sources rather than developing it in-house. The U.S. Department of Education's National Institute of Disability and Rehabilitation Research funds a research center focusing on access to telecommunications. Currently, the grantees consist of the Trace Research and Development Center, Gallaudet University, and the World Institute on Disability. The Trace Center maintains a site on the Internet (<http://trace.wisc.edu/world/telecomm/>) where information on accessible design solutions can be found. Some of those design solutions which have already been developed can be directly incorporated in telecommunications equipment and customer premises equipment. Thus, a manufacturer is not limited to relying only on its own resources to comply with these guidelines.

Since the provisions of these guidelines are largely performance based, a particular design solution may not be known at the outset, and it is

difficult to assess what it might cost before it is developed. Also, it may be difficult to assess the cost of information acquisition. For example, if a current employee is given the task of becoming familiar with access technology, and can do so with minimal negative impact on other work, such information acquisition is not an additional cost borne by the manufacturer. In fact, such acquisition is a positive asset to the company because it improves its competitive advantage. On the other hand, if this activity displaces other tasks, especially if another person must be hired, the cost of the new employee may be a direct cost attributable to the information task, insofar as the new employee's time is compensating for the additional work load. Moreover, such costs may not be associated with a particular product since the costs are part of future product design. Some of those costs are also not associated with this rule since the statute has already imposed them.

Question 4: The Board, seeks any information on the incremental costs which this proposed rule might add beyond normal product development costs and those already imposed by the statute.

In addition to available resources, the application of the readily achievable limitation might depend on what is technologically feasible. Since technology is constantly changing, what is not readily achievable now may be in the future. As a result, the evaluation of what is readily achievable is an ongoing activity. It is critical, therefore, that manufacturers incorporate accessibility consideration as early as possible into the design process. A design solution may be readily achievable if incorporated early enough, but may not be later in the process. Further discussion of these issues is provided in § 1193.23.

Furthermore, technological change is not the only factor that determines whether something is readily achievable. As the manufacturer's knowledge base and experience increase, certain things will become easier. Thus, some design solutions may not be readily achievable, not because the technology is lacking, but because the manufacturer has not yet fully implemented its design process.

Section 1193.23 Product Design, Development, and Evaluation

This section requires manufacturers to evaluate the accessibility, usability, and compatibility of telecommunications equipment and customer premises equipment and incorporate such evaluation throughout product design,

development, fabrication, and delivery, as early and consistently as possible. Manufacturers are required to develop a process to ensure that barriers to accessibility, usability, and compatibility are identified throughout product design and development, from conceptualization to distribution. The details of such a process will vary from one company to the next, so this section does not specify its structure or specific content. Instead, this section sets forth a series of factors that a manufacturer must consider in developing such a process. How, and to what extent, each of the factors is incorporated in a specific process is up to the manufacturer, so long as due consideration is given to each. This section does not require that such a process be submitted to any entity or that it even be in writing. The requirement is outcome-oriented, and a process could range from purely conceptual to formally documented, as suits the manufacturer.

In particular, a manufacturer must consider how it could include individuals with disabilities in target populations of market research. In this regard, it is important to realize that any target population for which a manufacturer might wish to focus a product contains individuals with disabilities, whether it is teenagers, single parents, women between the ages of 25 and 40, or any other subgroup, no matter how narrowly defined. Any market research which excludes individuals with disabilities will be deficient.

Similarly, including individuals with disabilities in product design, testing, pilot demonstrations, and product trials will encourage appropriate design solutions to accessibility barriers. In addition, such involvement may result in designs which have an appeal to a broader market.

Working cooperatively with appropriate disability-related organizations is a key recommendation of the TAAC and is one of the factors that manufacturers must consider in their product design and development process. The primary reason for working cooperatively is to exchange relevant information. This is a two-way process since the manufacturer will get information on barriers to the use of its products, and may also be alerted to possible sources for solutions. The process will also serve to inform individuals with disabilities about what is readily achievable. In addition, manufacturers will have a conduit to a source of subjects for market research and product trials.

Finally, manufacturers must consider how they can make reasonable efforts to validate any unproven access solutions through testing with individuals with disabilities or with appropriate disability-related organizations that have established expertise with individuals with disabilities. It is important to obtain input from persons or organizations with established expertise to ensure that input is not based merely on individual preferences or limited experience.

Section 1193.25 Information, Documentation, and Training

Paragraph (a) of this section requires that manufacturers provide access to information and documentation. This information and documentation includes user guides, installation guides, and product support communications, regarding both the product in general and the accessibility features of the product. Information and documentation should be provided to people with disabilities at no additional charge. Alternate formats or alternate modes of this information is also required to be available. Manufacturers are also required to ensure usable customer support and technical support, upon request, in the call centers and service centers, which support their products.

The specific alternate format or mode to be provided is that which is usable by the customer. Obviously, it does no good to provide documentation in Braille to someone who does not read it. While the user's preference is first priority, manufacturers are not expected to stock copies of all materials in all possible alternate formats and may negotiate with users to supply information in other formats. For example, Braille is extremely bulky and can only be read by a minority of individuals who are blind. Audio cassettes are usable by more people but are difficult for users to find a specific section or to skip from one section to the next. Documentation provided on disk in ASCII format can often be accessed by computers with appropriate software, but is worthless if the information sought is how to set up the computer in the first place. Of course, if instructions are provided by videotape, appropriate audio description would be needed for persons who are blind and captions would be needed for persons who are deaf or hard of hearing.

Ensuring usable customer support may mean providing a TTY number, since the usual complicated voice menu systems cannot be used by individuals who are deaf. Also, if such menu

systems require quick responses, they may not be usable by persons with other disabilities. See the appendix for guidance on how to provide information in alternate formats and modes.

Paragraph (b) requires manufacturers to include in general product information the name and telephone number of a contact point for obtaining the information required by paragraph (a). The name of the contact point can be an office of the manufacturer rather than an individual.

Paragraph (c) requires manufacturers to provide employee training appropriate to an employee's function. In developing, or incorporating existing training programs, consideration shall be given to the following factors: Accessibility requirements of individuals with disabilities; means of communicating with individuals with disabilities; commonly used adaptive technology used with the manufacturer's products; designing for accessibility; and solutions for accessibility and compatibility.

Obviously, not every employee needs training in all factors. Designers and developers need to know about barriers and solutions. Technical support and sales personnel need to know how to communicate with individuals with disabilities and what common peripheral devices are compatible with the manufacturer's products. Other employees may need a combination of this training. No specific program is required by this section and the manufacturer is free to address the needs in whatever way it sees fit, as long as the training results in the provision of effective information.

Section 1193.27 Information Pass Through

This section requires telecommunications equipment and customer premises equipment to pass through all codes, translation protocols, formats or any other information necessary to provide telecommunications in an accessible format. In particular, signal compression technologies shall not remove information needed for access or shall restore it upon decompression. Some transmissions include codes or tags embedded in "unused" portions of the signal to provide accessibility. For example, closed captioning information is usually included in portions of a video signal not seen by users without decoders. This section prohibits telecommunications equipment and customer premises equipment from stripping out such information or requires the information to be restored at the end point.

Section 1193.29 Prohibited Reduction of Accessibility, Usability, and Compatibility

This section provides that no change shall be undertaken which decreases or has the effect of decreasing the accessibility, usability, and compatibility of telecommunications equipment or customer premises equipment to a level less than the requirements of these guidelines.

Subpart C—Requirements for Accessibility

Section 1193.31 Accessibility

This section provides that, subject to the general provisions of Subpart B, manufacturers must design, develop and fabricate their products to meet the specific requirements of §§ 1193.33, 1193.35 and 1193.37.

Sections 1193.35 and 1193.37 are organized according to the recommendations contained in chapter five "Performance Guidelines" of the TAAC report and are divided according to input or output. This organization of functions is consistent with common computer functionality but may not be the most appropriate organization for designers and developers to apply.

Question 5: Other ways of organizing functions may be more appropriate. The Board seeks comment on other approaches to organizing functions and requirements that might be easier to understand and implement.

Section 1193.33 Redundancy and Selectability

This section requires that products incorporate multiple modes for input and output functions and that the user be able to select the desired mode. Since there is no single interface design that accommodates all disabilities, accessibility is likely to be accomplished through product designs which emphasize interface flexibility to maximize user configurability and multiple, alternative and redundant modalities of input and output.

Selectability is especially important where an accessibility feature for one group of individuals with disabilities may conflict with an accessibility feature for another. A conflict may arise between captions, provided for persons who are deaf or hard of hearing, and a large font size, for persons with low vision. The resulting caption would either be so large that it obscures the screen or need to be scrolled or displayed in segments for a very short time. This potential problem could be solved by allowing the user to switch one of the features on and off. Of course, it may not be readily achievable to

provide all input and output functions in a single product or to permit all functions to be selectable. For example, switching requires control mechanisms which must be accessible and it may be more practical to have multiple modes running simultaneously. Nevertheless, it is preferable for the user to be able to turn on or off a particular mode.

Section 1193.35 Input, Controls, and Mechanical Functions

This section requires product input, control and mechanical functions to be locatable, identifiable, and operable through at least one mode which meets each of the following paragraphs. This means each of the product's input, control and mechanical functions must be evaluated against each of paragraphs (a) through (i) to ensure that there is at least one mode that meets each of those requirements. Of course, there may be one mode which meets more than one of the specific provisions. This section does not specify how the requirement is to be met but only specifies the outcome. It provides a "checklist" for evaluating products. The appendix to this rule contains a set of strategies which may help in developing solutions. In some cases, a particular strategy may be directly applicable while a different strategy may be a useful starting point for further exploration.

Paragraph (a) requires product input, control and mechanical functions to be locatable, identifiable, and operable through at least one mode without requiring the user to see. Individuals with severe visual disabilities or blindness cannot locate or identify controls, latches, or input slots by sight or operate controls that require sight. Touchscreens, visual indicators or prompts, and flat keypads with undifferentiated keys are all barriers to individuals who are blind. On the other hand, many software programs include a tone or chord to accompany on-screen displays or upon start-up which alert users about the status of the product. Some telephones provide an intermittent tone to indicate that a call is on hold (although a flashing light is frequently the only way to know which line is active on a multi-line phone, a condition which would not meet this requirement). Providing voice output for on-screen display messages would satisfy this provision.

Paragraph (b) requires product input, control and mechanical functions to be locatable, identifiable, and operable through at least one mode by individuals who have low vision but are not legally blind, and which does not rely on audio output. Visual acuity of

20/70 after correction is commonly regarded as the beginning of low vision; visual acuity of 20/200 after correction is the beginning of legal blindness; a field of vision of less than 20 degrees after correction also constitutes legal blindness. Individuals with visual disabilities often also have hearing disabilities, especially older individuals, and cannot rely on audio access modes commonly used by people who are blind. However, some strategies for making functions accessible to persons who are blind will also satisfy the requirements of this paragraph.

Paragraph (c) requires product input, control and mechanical functions to be locatable, identifiable, and operable through at least one mode that does not require user color perception. Many people have an inability to see or distinguish between certain color combinations. Others are unable to see color at all. This requirement does not mean that color should not be used, but that it not be the only means of identifying, locating or operating functions.

Paragraph (d) requires product input, control and mechanical functions to be locatable, identifiable, and operable through at least one mode without requiring the user to hear. Individuals who are deaf or hard of hearing cannot always locate or identify those controls or functions that require hearing.

Paragraph (e) requires product input, control and mechanical functions to be locatable, identifiable, and operable through at least one mode that does not require fine motor control or simultaneous actions. Individuals with tremor, cerebral palsy, paralysis, arthritis, or artificial hands may have difficulty operating systems which require fine motor control, assume a steady hand, or require two hands or fingers for operation, such as requiring two keys to be pushed simultaneously.

Paragraph (f) requires product input, control and mechanical functions to be locatable, identifiable, and operable through at least one mode that is operable with limited reach and strength. Individuals with high spinal cord injuries, arthritis, and other conditions may have difficulty operating controls which require reach or strength. This provision does not specify limits on reach or strength. The ADA Accessibility Guidelines specify that controls and operating mechanisms not require “* * * tight grasping, pinching or twisting of the wrist” and limits the force required to five pounds. See ADAAG section 4.27.4.

Question 6: The Board seeks comment on whether the ADAAG provisions regarding tight grasping, pinching or

twisting of the wrist and the force required to operate controls, or some other provision, should be included in this paragraph.

Paragraph (g) requires product input, control and mechanical functions to be locatable, identifiable, and operable through at least one mode that does not require a sequential response within a three second period, or requires the response time to be selected or adjustable by the user over a wide range. Individuals with physical, sensory and cognitive disabilities may not be able to find, read and operate a control quickly. The three second time frame is derived from anecdotal evidence on the response time some individuals with disabilities need to activate sequential controls.

Question 7: The Board seeks comment on whether this three second period is adequate or whether some other time frame is more appropriate. If possible, please supply any information that supports this or any other time interval.

Paragraph (h) requires product input, control and mechanical functions to be locatable, identifiable, and operable through at least one mode that does not require speech. Products which require speech for operability, and which do not provide an alternate way to achieve the same function will not be usable by individuals who cannot speak or speak clearly.

Paragraph (i) requires product input, control and mechanical functions to be locatable, identifiable, and operable through at least one mode that minimizes the cognitive, memory, language, and learning skills required of the user to operate the product. Many individuals have reduced cognitive abilities either from birth, accident, illness, or aging. These include reduced memory, sequencing, reading, and interpretive skills.

Section 1193.37 Output, Displays, and Control Functions

Section 1193.37 applies to output, displays, and control functions which are necessary to operate products. This includes lights and other visual displays and prompts, alphanumeric characters and text, static and dynamic images, icons, screen dialog boxes, and tones and beeps which provide operating cues or control status.

Paragraph (a) requires voice communication to meet certain requirements for users of hearing aids and other similar technologies. Voice communication is the actual voice output from the transmission source, not the incidental operating sounds (e.g., tones, chords, and beeps) or synthetic speech generated by the

product itself to provide information about operation or control status.

Paragraph (b)(1) requires that information which is presented visually also be available in auditory form. Some individuals have difficulty seeing or reading, or cannot see or read. The flashing buttons on a multi-line phone which indicate which lines are open or holding are particularly problematic for individuals who are blind. Also, on-screen dialogue boxes and error messages are not usable without additional output.

Paragraph (b)(2) requires that information which is provided through a visual display shall not require visual acuity better than 20/70 and shall not rely on audio.

Paragraph (b)(3) requires that text which is presented in a moving fashion also be available in a static presentation mode at the option of the user. Moving text can be an access problem because individuals with low vision, or people with physical or sensorimotor disabilities find it difficult or impossible to track moving text with their eyes. This provision does not apply to the text on a TTY since that text is controlled directly by the sender. A recipient who has difficulty perceiving moving text can ask the sender to type slower or pause periodically.

Paragraph (b)(4) requires that information which is provided auditorially be available in visual form and, where appropriate, in tactile form. Individuals who are deaf or hard of hearing may be unable to hear auditory output or to hear mechanical and other sounds that are emitted by a product which may be needed for its safe or effective operation.

Paragraph (b)(5) requires information which is provided auditorially to be available in enhanced auditory fashion (i.e., increased amplification, or increased signal-to-noise ratio). Individuals who are hard of hearing may prefer to use their residual hearing as an alternative to access strategies used by people who are deaf. The direct voice output of a caller is specified further in paragraphs (b)(9) and (b)(10).

Paragraph (b)(6) requires that flashing visual displays and indicators shall not exceed a frequency of 3 Hz to avoid triggering a seizure in an individual with photosensitive epilepsy. Individuals with photosensitive epilepsy can have a seizure triggered by displays which flicker or flash, particularly if the flash has a high intensity and is within certain frequency ranges. The maximum flash rate of 3 Hz is derived from research the Access Board sponsored on visual fire

alarms which typically use high intensity Xenon strobes.

Question 8: The Board seeks comment on whether the 3 Hz value is appropriate for these guidelines or whether some other value is more appropriate. If possible, please supply information that supports this or any other value.

Question 9: The TAAC also recommended a similar provision for non-inducement of seizures triggered by auditory stimuli. However, the Board does not have information to set the parameters for such a requirement. The Board seeks comment on whether such a requirement should be included and any information that supports a provision.

Paragraph (b)(7) requires products which use audio output modes, to have an industry standard connector for headphones or personal listening devices which cuts off the audio speakers when a handset is picked up or the headphones are plugged in. Individuals using the audio output mode, as well as individuals using a product with the volume turned up, need a way to limit the range of audio broadcast.

Paragraph (b)(8) requires that products shall not cause interference to hearing technologies (including hearing aids, cochlear implants, and assistive listening devices) which are used by a product user or bystanders. In the fall of 1995, the FCC formed a steering committee to initiate a summit on hearing aid compatibility and accessibility to digital wireless telecommunications. The purpose of this summit was to continue and formalize discussions among organizations representing people with hearing loss, hearing aid manufacturers, and the digital wireless telephone industry, with the ultimate goal of resolving the issues involved.

A summit meeting was held on January 3–4, 1996, in Washington, DC. At this summit meeting three working groups were formed. The long-term solutions user and bystander interference group reached a consensus that a standards project was needed to document the definition of and method of measurement for hearing aid compatibility and accessibility to wireless telecommunications.

Subsequently, the American National Standards Institute's (ANSI) C63 Committee was petitioned to undertake a joint standards project documenting the methods of measurement and defining the limits for hearing aid compatibility and accessibility to wireless telecommunications. At its April 1996 meeting, ANSI C63

established a task group under its subcommittee on medical devices to work toward the development of such standards. The C63.19 task group is continuing to develop its standard, C63.19–199X, American National Standard for Methods of Measurement for Hearing Aid Compatibility with Wireless Communications Devices. When the standard is completed, the Board intends to reference it in the appendix to these guidelines.

Paragraph (b)(9) requires products providing auditory output by an audio transducer which is normally held up to the ear to provide a means for effective wireless coupling to hearing aids. Generally, this means the earpiece generates sufficient magnetic field strength to induce an appropriate field in a hearing aid T-coil. The output in this case is the direct voice output of the transmission source, not the "machine language" such as tonal codes transmitted by TTYs.

Paragraph (b)(10) requires products to be equipped with volume control that provides an adjustable amplification ranging from 18–25 dB of gain. The gain is to the voice output intended to be heard by the listener, not Baudot, ASCII, or other machine codes. The proposed level of amplification is different from that required under the Hearing Aid Compatibility Act and the FCC's regulations. The FCC requires volume control that provides, through the receiver in the handset or headset of the telephone, 12 dB of gain minimum and up to 18 dB of gain maximum, when measured in terms of Receive Objective Loudness Rating. (See 47 CFR 68.317(a)).

Question 10: Since functions requiring voice communication are more specific than the general output functions covered by this section, the Board seeks comment on whether moving the requirements of paragraphs (b)(9) and (b)(10) to a different section would be less confusing to designers and manufacturers.

Subpart D—Requirements for Compatibility With Peripheral Devices and Specialized Customer Premises Equipment

Section 1193.41 Compatibility

Section 1193.41 requires that when it is not readily achievable to make a product accessible, the product must be compatible with existing peripheral devices or specialized customer premises equipment commonly used by individuals with disabilities to achieve access, if readily achievable.

Paragraph (a) requires information needed for the operation of a product

(including output, alerts, icons, on-line help, and documentation) to be available in a standard electronic text format on a cross-industry standard port. It also requires that all input to and control of a product shall allow for real time operation by electronic text input into a cross-industry standard external port and in cross-industry standard format which do not require manipulation of a connector by the user. Products shall also provide a cross-industry standard connector which may require manipulation.

Some individuals with severe or multiple disabilities are unable to use the built-in displays and control mechanisms on a product and may need to attach a peripheral device. For example, the requirement for a standard electronic text format could mean that the product could be controlled and operated through a laptop computer or similar device that was adapted to the needs of a specific individual. The requirement for cross-industry standardization means that the product cannot employ odd or proprietary protocols or codes. Manufacturers must use industry standards where they exist. In fact, a number of industry standards already exist such as IrDA standard 1.1 and standard RJ–11 phone connectors. In addition, if audio output is delivered through a standard 9 mm phone jack, it can be used by any common personal audio headset on the market.

The cross-industry standard port has two components, one which does not require manipulation of a connector by the user, and one which may. The intent is to move toward the use of wireless connection technologies, such as infrared, because some individuals with disabilities will have difficulty manipulating plugs and connectors. However, the Telecommunications Act requires compatibility with devices " * * * commonly used by individuals with disabilities" to achieve access. Many devices in use today are not equipped with infrared or other wireless ports. That is why the cross-industry standard port can also require manipulation, such as a plug.

For some peripheral devices, a simple infrared transceiver can be plugged into a convenient serial or parallel port. Providing such a device to consumers with the appropriate peripheral devices may allow manufacturers to meet both requirements.

Paragraph (b) requires products providing auditory output to provide the auditory signal through an industry standard connector at a standard signal level. Individuals using amplifiers, audio couplers, and other audio processing devices need a place to tap

into the audio generated by the product in a standard way.

Paragraph (c) requires that products not cause interference to hearing technologies (including hearing aids, cochlear implants, and assistive listening devices) of a product user or bystander. Individuals who are hard of hearing use hearing aids and other assistive listening devices, but they cannot be used if products introduce noise into the listening aids because of stray electromagnetic interference. See the discussion at section 1193.37(b)(8) regarding a technical standard for acceptable interference levels which is currently being developed through the American National Standards Institute.

Paragraph (d) requires touchscreen and touch-operated controls to be operable without requiring body contact or close body proximity. Individuals who have artificial hands or use headsticks or mouthsticks to operate products have difficulty with capacitive or heat-operated controls which require contact with a person's body.

Paragraph (e) requires that products which provide a function allowing voice communication and which do not themselves provide a TTY functionality shall provide a standard non-acoustic connection point for TTYs. It shall also be possible for the user to easily turn any microphone on the product on and off to enable the user who can talk to intermix speech with TTY use. Individuals who use TTYs to communicate must have a non-acoustic way to connect TTYs to telephones in order to obtain clear TTY connections, such as through a direct RJ-11 connector. When a TTY is connected directly into the network, it must be possible to turn off the acoustic pickup (microphone) to avoid having background noise in a noisy environment mixed with the TTY signal. Since some TTY users make use of speech for outgoing communications, the microphone on/off switch should be easy to flip back and forth or a push-to-talk mode should be available.

Paragraph (f) requires products providing voice communication functionality to be able to support use of all cross-manufacturer non-proprietary standard signals used by TTYs. Some products compress the audio signal in such a manner that standard signals used by TTYs are distorted or attenuated, preventing successful TTY communication. Use of such technology is not prohibited as long as the compression can be turned off to allow undistorted TTY communication. In addition, this paragraph would require computer

modems to support protocols which are compatible with TTYs.

Regulatory Process Matters

Executive Order 12866

Under Executive Order 12866, the Board must determine whether these guidelines are a significant regulatory action. The Executive Order defines a "significant regulatory action" as one that is likely to result in a rule that may:

"(1) Have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order."

For significant regulatory actions that are expected to have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities, a written assessment must be prepared of the costs and benefits anticipated from the regulatory action and any potentially effective and reasonably feasible alternatives to the planned regulation.

These guidelines have been developed to assist manufacturers of telecommunications equipment and customer premises equipment comply with section 255 of the Telecommunications Act of 1996. Manufacturers are required to comply with section 255, and therefore these guidelines, to the extent that it is readily achievable, to the extent that it is readily achievable. As discussed earlier in the preamble under § 1193.3 (Definitions) and § 1193.21 (Accessibility and Compatibility), the term "readily achievable" means "easily accomplishable and able to be carried out without much difficulty or expense." Each manufacturer will have to determine the extent to which compliance is readily achievable, balancing costs and available resources. The guidelines are also largely performance based and give manufacturers considerable flexibility in achieving design solutions. For these

reasons, it is difficult to assess the costs that may be attributable to the guidelines. Questions are included in the proposed rule to elicit specific information on the costs and benefits of the guidelines. At this stage of the rulemaking, the Board has determined that the proposed rule is not expected to have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities. The Board will analyze the information submitted during the comment period and other available data, and if it is determined at the final rule stage that the guidelines are expected to have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities, the required written assessment will be prepared.

The Board and the Office of Management and Budget (OMB) have determined that the proposed rule meets the other criteria for a significant regulatory action (i.e., the proposed rule raises novel legal or policy issues arising out of legal mandates), and OMB has reviewed the proposed rule.

The guidelines adhere to the principles of the Executive Order. The Board has utilized an advisory committee comprised of representatives of the telecommunications industry and disability groups to develop the guidelines. The guidelines are based on the consensus recommendations of the advisory committee, and represent a balanced and reasonable means of achieving the objectives of section 255 of the Telecommunications Act of 1996.

The Board has provided a 45 day comment period, instead of the usual 60 day period, due to the statutory deadline for issuing a final rule by August 8, 1997. As noted above, the guidelines have been developed through an advisory committee process. The public was invited to attend the advisory committee meetings and participate in subcommittees and task groups. A listserv site was also established on the Internet to allow the advisory committee and the public to conduct discussions between meetings. The public has been afforded a meaningful opportunity to participate in the development of the guidelines.

Regulatory Flexibility Act

The Board has determined that the proposed rule will not have a significant economic impact on a substantial number of small entities, and that it is therefore not necessary to prepare an initial regulatory flexibility analysis. As discussed above, manufacturers of telecommunications equipment and customer premises equipment are required to comply with section 255 of the Telecommunications Act of 1996, and therefore these guidelines, to the extent that it is "readily achievable", which means that it is "easily accomplishable and able to be carried out without much difficulty or expense." By its terms, the statute recognizes differences in the size and resources of manufacturers and minimizes the economic impact on small entities. Questions are included in the proposed rule to elicit information on how the size of an entity should affect what is readily achievable. The Board will analyze the information submitted during the comment period, and if it is determined at the final rule stage that the guidelines will have a significant economic impact on a substantial number of small entities, a final regulatory flexibility analysis will be prepared.

Unfunded Mandates Reform Act

Under the Unfunded Mandates Reform Act, Federal agencies must prepare a written assessment of the effects of any Federal mandate in a proposed or final rule that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of \$100 million or more in any one year. As discussed above, at this stage of the rulemaking, the Board has determined that the proposed rule is not a significant regulatory action that will reach the \$100 million or more level. The proposed rule seeks specific information on the costs and benefits of the guidelines. The Board will analyze the information submitted during the comment period and other available information, and if it is determined at the final rule stage that the \$100 million or more level is reached, the required written assessment will be prepared.

Paperwork Reduction Act, Collection of Information: Telecommunications Act Accessibility Guidelines

Section 1193.25 contains information collection requirements. As required by the Paperwork Reduction Act of 1995, the Board has submitted a copy of this section to the Office of Management and Budget (OMB) for its review.

The public reporting and record keeping burden for this collection of information is estimated to be 1,350 hours in order for manufacturers of telecommunications equipment and customer premises equipment to provide (1) a description of the accessibility and compatibility features of the equipment on request; and (2) the name and telephone number of a contact point for obtaining information concerning the accessibility and compatibility features of the equipment, alternate formats and customer and technical support for the equipment.

The estimated burden associated with providing a description of the accessibility and compatibility features of the equipment on request was calculated as follows:

Respondents.....	150
Average responses.....	×60
Hours per response.....	×.08 (5 minutes)
Annual reporting burden	720 hours

The estimated burden associated with providing the name and telephone number of a contact point for obtaining information concerning the accessibility and compatibility features of the equipment, alternate formats and customer and technical support for the equipment was calculated as follows:

Respondents.....	150
Average responses.....	×3000
Hours per response.....	×.0014 (5 seconds)
Annual reporting burden	630 hours
Total annual burden hours.....	1,350 hours

Organizations and individuals desiring to submit comments on the information collection requirements should direct them to the Office of Information and Regulatory Affairs, OMB, Room 10235, New Executive Office Building, Washington, DC 20503; Attention: Desk Officer for the Architectural and Transportation Barriers Compliance Board.

The Board will consider comments by the public on this proposed collection of information in:

- Evaluating whether the proposed collection of information is necessary for the proper implementation of Section 255 of the Telecommunications Act of 1996, including whether the information will have a practical use;
- Evaluating the accuracy of the Board's estimate of the burden of the proposed collection of information, including the validity of the methodology and assumptions used;
- Enhancing the quality, usefulness, and clarity of the information to be collected; and
- Minimizing the burden of collection of information of those who are to respond, including through the use of appropriate automated electronic,

mechanical, or other technological collection techniques or other forms of information technology (e.g., permitting electronic submission of responses).

OMB is required to make a decision concerning the collection of information contained in these proposed guidelines between 30 and 60 days after publication of this document in the **Federal Register**. Therefore, a comment to OMB is best assured of having its full effect if OMB receives it within 30 days of publication. This does not affect the deadline for the public to comment to the Board on the proposed guidelines.

List of Subjects in 36 CFR Part 1193

Communications, Communications equipment, Individuals with disabilities, Reporting and recordkeeping requirements, Telecommunications.

Authorized by vote of the Access Board on March 12, 1997.

Patrick D. Cannon,

Chair, Architectural and Transportation Barriers Compliance Board.

For the reasons set forth in the preamble, the Board proposes to add part 1193 to chapter XI of title 36 of the Code of Federal Regulations to read as follows:

PART 1193—TELECOMMUNICATIONS ACT ACCESSIBILITY GUIDELINES

Subpart A—General

Sec.

- 1193.1 Purpose.
- 1193.2 Scoping.
- 1193.3 Definitions.

Subpart B—General Requirements

- 1193.21 Accessibility and compatibility.
- 1193.23 Product design, development, and evaluation.
- 1193.25 Information, documentation, and training.
- 1193.27 Information pass through.
- 1193.29 Prohibited reduction of accessibility, usability, and compatibility.

Subpart C "Requirements for Accessibility

- 1193.31 Accessibility.
- 1193.33 Redundancy and selectability.
- 1193.35 Input, controls, and mechanical functions.
- 1193.37 Output, displays, and control functions.

Subpart D "Requirements for Compatibility With Peripheral Devices and Specialized Customer Premises Equipment

- 1193.41 Compatibility.

Appendix to Part 1193—Advisory Guidance

Authority: 47 U.S.C. 255(e).

Subpart A—General**§ 1193.1 Purpose.**

This part provides guidelines for accessibility, usability, and compatibility of telecommunications equipment and customer premises equipment covered by the Telecommunications Act of 1996 (47 U.S.C. 255).

§ 1193.2 Scoping.

This part provides requirements for accessibility, usability, and compatibility of new products and existing products which undergo substantial change or upgrade, or for which new releases are distributed. This part does not apply to minor or insubstantial changes to existing products that do not affect functionality.

§ 1193.3 Definitions.

Terms used in this part shall have the specified meaning unless otherwise stated. Words, terms and phrases used in the singular include the plural, and use of the plural includes the singular.

Accessible. Telecommunications equipment or customer premises equipment which comply with the requirements of subpart C of this part.

Alternate formats. Alternate formats may include, but are not limited to, Braille, ASCII text, large print, and audio cassette recording.

Alternate modes. Alternate modes may include, but are not limited to, voice, fax, relay service, TTY, Internet posting, captioning, text-to-speech synthesis, and audio description.

Compatible. Telecommunications equipment or customer premises equipment which comply with the requirements of subpart D of this part.

Customer premises equipment. Equipment employed on the premises of a person (other than a carrier) to originate, route, or terminate telecommunications.

Manufacturer. A manufacturer of telecommunications equipment or customer premises equipment.

Peripheral devices. Devices employed in connection with telecommunications equipment or customer premises equipment to translate, enhance, or otherwise transform telecommunications into a form accessible to individuals with disabilities.

Product. Telecommunications equipment or customer premises equipment.

Readily achievable. Easily accomplishable and able to be carried out without much difficulty or expense.

Specialized customer premises equipment. (See *Peripheral devices*)

Telecommunications. The transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received.

Telecommunications equipment.

Equipment, other than customer premises equipment, used by a carrier to provide telecommunications services, and includes software integral to such equipment (including upgrades).

Telecommunications service. The offering of telecommunications for a fee directly to the public, or to such classes of users as to be effectively available directly to the public, regardless of the facilities used.

TTY. An abbreviation for teletypewriter. Machinery or equipment that employs interactive text based communications through the transmission of coded signals across the standard telephone network. TTYS can include, for example, devices known as TDDs (telecommunication display devices or telecommunication devices for deaf persons) or computers with special modems. TTYS are also called text telephones.

Usable. Means that individuals with disabilities have access to instructions, product information (including accessible feature information), documentation, and technical support functionally equivalent to that provided to individuals without disabilities.

Subpart B—General Requirements**§ 1193.21 Accessibility and compatibility.**

Where readily achievable, telecommunications equipment and customer premises equipment shall comply with the requirements of subpart C of this part. Where it is not readily achievable to comply with subpart C of this part, telecommunications equipment and customer premises equipment shall comply with the requirements of subpart D of this part, if readily achievable.

§ 1193.23 Product design, development, and evaluation.

(a) Manufacturers shall evaluate the accessibility and usability of telecommunications equipment and customer premises equipment and shall incorporate such evaluation throughout product design, development, fabrication, and delivery, as early and consistently as possible. Manufacturers shall identify barriers to accessibility and usability as part of such a product design and development process.

(b) In developing such a process, manufacturers shall consider the following factors, as appropriate:

(1) Including individuals with disabilities in target populations of market research;

(2) Including individuals with disabilities in product design, testing, pilot demonstrations, and product trials;

(3) Working cooperatively with appropriate disability-related organizations; and

(4) Making reasonable efforts to validate any unproven access solutions through testing with individuals with disabilities or with appropriate disability-related organizations that have established expertise with individuals with disabilities.

§ 1193.25 Information, documentation, and training.

(a) Manufacturers shall provide access to information and documentation including user guides, installation guides for end-user installable devices, and product support communications, regarding both the product in general and the accessibility features of the product, at no additional charge; and shall take such other steps as necessary including:

(1) Providing a description of the accessibility and compatibility features of the product upon request, including, as needed, in alternate formats or alternate modes;

(2) Providing end-user product documentation in alternate formats or alternate modes upon request; and

(3) Ensuring usable customer support and technical support, upon request, in the call centers and service centers which support their products.

(b) Manufacturers shall include in general product information the name and telephone number of a contact point for obtaining the information required by paragraph (a) of this section.

(c) Manufacturers shall provide employee training appropriate to an employee's function. In developing, or incorporating existing training programs, consideration shall be given to the following factors:

(1) Accessibility requirements of individuals with disabilities;

(2) Means of communicating with individuals with disabilities;

(3) Commonly used adaptive technology used with the manufacturer's products;

(4) Designing for accessibility; and

(5) Solutions for accessibility and compatibility.

§ 1193.27 Information pass through.

Telecommunications equipment and customer premises equipment shall pass through all codes, translation protocols, formats or any other information necessary to provide

telecommunications in an accessible format. In particular, signal compression technologies shall not remove information needed for access or shall restore it upon decompression.

§ 1193.29 Prohibited reduction of accessibility, usability, and compatibility.

No change shall be undertaken which decreases or has the effect of decreasing the accessibility, usability, and compatibility of telecommunications equipment or customer premises equipment to a level less than the requirements of this part.

Subpart C—Requirements for Accessibility

§ 1193.31 Accessibility.

When required by subpart B of this part, telecommunications equipment and customer premises equipment shall be accessible to and usable by individuals with disabilities and shall comply with §§ 1193.33, 1193.35, and 1193.37 as applicable.

§ 1193.33 Redundancy and selectability.

Telecommunications equipment and customer premises equipment shall provide redundancy such that input and output functions are available in more than one mode. Alternate input and output modes shall be selectable by the user.

§ 1193.35 Input, controls, and mechanical functions.

Input, controls, and mechanical functions shall be locatable, identifiable, and operable through at least one mode that complies with the following:

(a) *Operable without vision.* Functions shall not require user vision.

(b) *Operable with low vision.* Functions shall not require user visual acuity better than 20/70, and shall not rely on audio output.

(c) *Operable with little or no color perception.* Functions shall not require user color perception.

(d) *Operable without hearing.* Functions shall not require user auditory perception.

(e) *Operable with limited manual dexterity.* Functions shall not require fine motor control or simultaneous actions.

(f) *Operable with limited reach and strength.* Functions shall be operable with limited reach and strength.

(g) *Operable without time-dependent controls.* Functions shall not require a sequential response less than three seconds. Alternatively, any response time may be selected or adjusted by the user over a wide range.

(h) *Operable without speech.* Functions shall not require speech.

(i) *Operable with limited cognitive skills.* Functions shall minimize the cognitive, memory, language, and learning skills required of the user.

§ 1193.37 Output, displays, and control functions.

(a) Voice telecommunications shall comply with paragraphs (b)(9) and (b)(10) of this section.

(b) All information necessary to operate and use the product, including text, static or dynamic images, icons, or incidental operating cues, shall be provided through at least one mode that complies with the following:

(1) *Availability of visual information.* Information which is presented visually shall also be available in auditory form.

(2) *Availability of visual information for low vision users.* Information which is provided through a visual display shall not require user visual acuity better than 20/70, and shall not rely on audio.

(3) *Access to moving text.* Text, other than text output of a TTY, which is presented in a moving fashion shall also be available in a static presentation mode at the option of the user.

(4) *Availability of auditory information.* Information which is provided in auditory form shall be available in visual form and, where appropriate, in tactile form.

(5) *Availability of auditory information for people who are hard of hearing.* Information which is provided in auditory form shall be available in enhanced auditory fashion (i.e., increased amplification, or increased signal-to-noise ratio).

(6) *Prevention of visually-induced seizures.* Flashing visual displays and indicators shall not exceed a frequency of 3 Hz.

(7) *Availability of audio cutoff.* Products which use audio output modes shall have an industry standard connector for headphones or personal listening devices (e.g., phone-like handset or earcup) which cuts off speakers when used.

(8) *Non-interference with hearing technologies.* Products shall not cause interference to hearing technologies (including hearing aids, cochlear implants, and assistive listening devices) of the user or bystanders.

(9) *Hearing aid coupling.* Products providing auditory output by an audio transducer which is normally held up to the ear shall provide a means for effective wireless coupling to hearing aids.

(10) *Availability of enhanced audio.* Products shall be equipped with volume control that provides an adjustable amplification ranging from 18–25 dB of gain.

Subpart D—Requirements for Compatibility With Peripheral Devices and Specialized Customer Premises Equipment

§ 1193.41 Compatibility.

When required by subpart B of this part, telecommunications equipment and customer premises equipment shall be compatible with peripheral devices and specialized customer premises equipment commonly used by individuals with disabilities to achieve accessibility, and shall comply with the following provisions, as applicable:

(a) *External electronic access to all information and control mechanisms.* Information needed for the operation of products (including output, alerts, icons, on-line help, and documentation) shall be available in a standard electronic text format on a cross-industry standard port and all input to and control of a product shall allow for real time operation by electronic text input into a cross-industry standard external port and in cross-industry standard format. The cross-industry standard port shall not require manipulation of a connector by the user. Products shall also provide a cross-industry standard connector which may require manipulation.

(b) *Connection point for external audio processing devices.* Products providing auditory output shall provide the auditory signal at a standard signal level through an industry standard connector.

(c) *Non-interference with hearing technologies.* Products shall not cause interference to hearing technologies (including hearing aids, cochlear implants, and assistive listening devices) of the user or bystanders.

(d) *Compatibility of controls with prosthetics.* Touchscreen and touch-operated controls shall be operable without requiring body contact or close body proximity.

(e) *TTY connectability.* Products which provide a function allowing voice communication and which do not themselves provide a TTY functionality shall provide a standard non-acoustic connection point for TTYs. It shall also be possible for the user to easily turn any microphone on and off to allow the user to intermix speech with TTY use.

(f) *TTY signal compatibility.* Products providing voice communication functionality shall be able to support use of all cross-manufacturer non-proprietary standard signals used by TTYs.

Appendix to Part 1193—Advisory Guidance

Introduction

1. This appendix provides examples of strategies and notes to assist in understanding the guidelines and are a source of ideas for alternate strategies for achieving accessibility. These strategies and notes are not mandatory. A manufacturer is not required to incorporate all of these examples or any specific example. Manufacturers are free to use these or other strategies in addressing the guidelines. The examples listed here are not comprehensive, nor does adopting or incorporating them guarantee an accessible product. They are meant to provide a useful starting point for evaluating the accessibility of a product or conceptual design and are not intended to inhibit innovation. For a more complete list of all of the published strategies to date, as well as for further information and links to on-going discussions, the reader is referred to the National Institute on Disability and Rehabilitation Research's Rehabilitation Engineering Center on Access to Telecommunications System's strategies Web site (<http://trace.wisc.edu/world/telecomm/>).

2. This appendix is organized to correspond to the sections and paragraphs of the guidelines in this part to which the explanatory material relates. This appendix does not contain explanatory material for every section and paragraph of the guidelines in this part.

Subpart B—General Requirements

Section 1193.25 Information, Documentation, and Training

Paragraph (a)

Alternate Formats and Alternate Modes

1. This section requires that manufacturers provide access to information and documentation. The information and documentation includes user guides, installation guides, and product support communications, regarding both the product in general and the accessibility features of the product. Information and documentation should be provided to people with disabilities at no additional charge. Alternate formats or alternate modes of this information is also required to be available. Alternate formats may include, but are not limited to, Braille, ASCII text, large print, and audio cassette recording. Alternate modes may include, but are not limited to, voice, fax, relay service, TTY, Internet posting, captioning, text-to-speech synthesis, and audio description.

2. In considering how to best provide product information to people with disabilities, it is essential that information be provided in an alternate format or mode that is usable by the person needing the information. For example, some individuals who are blind might require a manual in Braille to understand and use the product effectively. Other persons who are blind may prefer this information on a computer disk. Persons with limited reading skills may need this information recorded on audio cassette tape so they can listen to the manual. Still other persons with low vision may be able to

read the text version of the manual if it is provided in a larger font. Likewise, persons who are deaf may require a captioned tutorial video, if one is provided, so that they will understand how to use the product effectively. Finally, individuals who rely on TTYs will need direct TTY access to a customer service line so they can ask questions about a product like everyone else.

3. This portion of the appendix explains how to provide information in alternate formats (Braille, ASCII text, large print, audio cassette) to persons with disabilities.¹ The Access Board maintains a list of disability-related organizations that can provide information on local companies that produce information in alternate formats. The list is available by contacting the Access Board.

Braille

4. Some persons who are blind rely on the use of Braille in order to obtain information that is typically provided in print. These persons may need Braille because of the nature of their disability (such as persons who are deaf-blind) or because of the complexity of the material. Most large urban areas have companies or organizations which can translate printed material to Braille. On the other hand, manufacturers may wish to consider producing Braille documents "in house" using a personal computer, Braille translation software, and a Braille printer. The disadvantage is the difficulty in ensuring quality control and accuracy. Software programs exist which can translate common word processing formats directly into Braille, but they are not always error free, especially if the document contains special characters, jargon, graphics, or charts. Since the typical office worker will not be able to proofread a Braille document, the initial apparent cost saving may be quickly lost by having to re-do documents. The Braille translation software costs approximately \$500 and Braille printers range from \$10,000 to \$60,000 depending on the speed and other features. A Braille printer in the \$10,000 to \$20,000 range should be adequate for most users. By using automatic translation software, individuals who do not have knowledge of Braille or who have limited computer skills may be able to produce simple Braille documents without much trouble. If the document is of a complex format, however, such as a text box over multiple columns, a sophisticated knowledge of Braille translation software and formatting will be required.

Electronic Text

5. People who are blind or have low vision and who have access to computers may be able to use documents in electronic form. Electronic text must be provided in ASCII or a properly formatted word processor file. Using electronic text allows this information to be transmitted through e-mail or other on-line telecommunications. Blind or low vision persons who have access to a personal computer can then read the document using synthetic speech, an electronic Braille display, a large print computer monitor, or

they can produce a hard copy in large print or Braille.

6. Documents prepared for electronic transmission should be in ASCII. Documents supplied on disk should also be provided in either ASCII or a word processor format usable by the customer. Word processing documents should be properly formatted before distribution or conversion to ASCII. To be correctly formatted, the document should be in Courier 10 CPI (10 pitch) and formatted for an 80 character line. Tables should be converted to plain text. Graphics or text boxes should be deleted and explained or described in text format. This will allow the reader to understand all of the documentation being presented. Replace bullets (•) with "*" or "—" and convert other extended ASCII characters into text. When converting a document into ASCII or word processor formats, it is important to utilize the appropriate "tab key" and "centering key" rather than using the space bar. This is necessary because Braille translation software relies on the proper use of commands to automate the formatting of a Braille document.

Large Print

7. Persons with low vision may require documentation to be provided in large print. Large print documents can easily be produced using a scalable font from any good word processing program and a standard laser printer. Using the document enlargement option on a photocopier will usually yield unsatisfactory results.

8. To obtain the best results follow these guidelines:

a. Paper should not be larger than standard 8½ – 11 inches. Always use 1 inch margins. Lines longer than 6½ inches will not track well for individuals who must use a magnifier.

b. The best contrast with the least glare is achieved on very pale yellow or cream-colored non-glossy paper, such as paper that is used for photocopying purposes. To produce a more aesthetic looking document, an off-white paper may be used and will still give good contrast while producing less glare than white. Do not use dark colors and shades of red. Double-sided copying (if print does not bleed through) will produce a less bulky document.

c. Remove formatting codes that can make reading more difficult. For example, centered or indented text could be difficult to track because only a few words will fit on a line. All text should begin at the left margin. Use only left margin justification to maintain uniform spacing across lines. Right margin justification can produce uneven spacing between letters and words. Use 1¼ (1.25) line spacing; do not double space. Replace tabs with two spaces. Page numbering should be at the top or bottom left. Avoid columns. If columns are absolutely necessary, use minimum space between columns. Use dot leaders for tabular material. Remove graphics, tables, and charts, but include descriptions, information, or data in text.

d. There is no standard typeface or point size. For more universal access, use 18 point type; anything larger could make text too choppy to read comfortably. Use a good

¹ This information was provided by the American Foundation for the Blind.

strong bolded typeface. Do not use italics, fine, or fancy typefaces. Fonts similar to Helvetica/Swiss Bold or Dutch/Times Roman Bold are good. Do not use compressed typefaces; there should be normal "white space" between characters.

e. Use upper and lowercase letters.

f. Using these instructions, one page of print (11–12 point type) will equal approximately three pages of large print (14–18 point) depending on the density of the text.

Cassette Recordings

9. Some persons who are blind or who have learning disabilities may require documentation on audio cassettes. Audio materials can be produced commercially or by utilizing the assistance of volunteer organizations which record material on tape. Agencies sometimes record material in-house and purchase a high speed tape duplicator (\$1,000–2,000) which is used to make cassette copies from the master. The cost of a duplicator can be higher depending upon the number of copies produced on a single run, and whether the duplicator can produce standard speed two-sided copies or half-speed four-sided copies. Although unit costs can be reduced by using the four-track, half-speed format, this will require the reader to use a specially designed playback machine. Tapes can also be produced with "tone indexing" to allow a user to skip back and forth from one section to another. By following a few simple guidelines for selecting readers and creating recordings, most organizations will be able to successfully record most simple documents. There is no legal definition of a qualified reader.

10. The American Foundation for the Blind offers this guidance:

a. The reader should be proficient in the language being recorded.

b. The reader should be familiar with the subject. Someone who is familiar with the technical aspects of a product but who can explain functions in ordinary language would be a logical person to record an audio cassette.

c. The reader should have good diction. Recording should be done in a conversational tone and at a conversational pace; neither too slow nor too fast.

d. The reader should be familiar with the material to minimize stumbling and hesitation.

e. The reader should not editorialize. When recording a document, it should be read in full. Graphic and pictorial information available to sighted readers should be described in the narrated text. Tables and charts whose contents are not already contained in text should be converted into text and included in the recording.

f. The reader should spell difficult or unusual words and words of foreign origin.

g. At the beginning of the tape, identify the reader, i.e., "This document is being read by John Smith."

h. On each side of the tape, identify the document and the page number where the reader is continuing, i.e., "tape 2, side 1, Guide to Barrier Free Meetings, continuing on page 75."

Alternate Modes

11. Information is provided increasingly through a variety of means including television advertisements, Internet postings, information seminars, and telephone. This portion of the appendix explains how to provide information in some alternate modes (captioning, audio description, Internet postings, relay service, and TTY).

Captioning

12. When manufacturers of telecommunications equipment or customer premises equipment provide videos with their products (such as tutorials or information explaining various components of a product) the video should be available with captioning. Closed captioning refers to assistive technology designed to provide access to television for persons with hearing disabilities that is visible only through the use of a decoder. Open captions are visible at all times. Captioning is similar to subtitles in that the audio portion of a television program is displayed as printed words on the television screen. Captions should be carefully placed to identify speakers, on- and off-screen sound effects, music and laughter. Increased captioning was made possible because of the Television Decoder Circuitry Act which requires all television sets sold in the United States with screens 13 inches or larger to have built-in decoder circuitry.

13. Although captioning technology was developed specifically to make television and video presentations accessible to deaf and hard of hearing people, there has been widespread interest in using this technology to provide similar access to meetings, classroom teaching, and conferences. For meetings, video-conferences, information seminars, and the like, real-time captioning is sometimes provided. Real-time captioning uses a stenographic machine connected to a computer with translation software. The output is then displayed on a monitor or projected on a screen.

Audio Description

14. Just as manufacturers of telecommunications equipment and customer premises equipment need to make their videos accessible to persons deaf or hard of hearing, they must also be accessible to persons who are blind or have low vision. This process is known as descriptive video service (DVS), or audio description, in which a "video soundtrack" is inserted unobtrusively into pauses in the regular audio portion of the video. This extra narration provides otherwise unavailable descriptions such as how to properly place a disk into a new computer. DVS is accessed by pushing a button on a stereo television set or VCR which has a standard feature called Second Audio Program (SAP) channel. No additional special equipment is needed and there is no extra cost to the end-user.²

Internet Postings

15. The fastest growing way to obtain information about a product is through use

of the Internet, and specifically the World Wide Web. However, many Internet users with disabilities have difficulty obtaining this information if it is not correctly formatted. This section provides information on how to make a World Wide Web site more accessible to persons with disabilities.³ Because of its structure, the Web provides tremendous power and flexibility in presenting information in multiple formats (text, audio, video, and graphic). However, the features that provide power and elegance for some users present potential barriers for people with sensory disabilities. The indiscriminate use of graphic images and video restrict access for people who are blind or have low vision. Use of audio and non-captioned video restrict access for people who are deaf or hard of hearing.

16. The level of accessibility of the information on the Web is dependent on the format of the information, the transmission media, and the display system. Many of the issues related to the transmission media and the display system cannot be affected by the general user. On the other hand, anyone creating information for a Web server has control of the accessibility of the information. Careful design and coding of information will provide access to all people without compromising the power and elegance of the Web site.

17. A few suggestions are:

a. Every graphic image should have associated text. This will enable a person using a character-based program, such as Lynx, to understand the material being presented in the graphical format. It also allows anyone who does not want to wait for graphics to load to have quick access to the information on the site.

b. Provide text transcriptions or descriptions for all audio output. This will enable people who are deaf or hard of hearing to have access to this information, as well as individuals who do not have sound cards.

c. Make any link text descriptive, but not verbose. For example, words like "this", "here", and "click" do not convey enough information about the nature of the link, especially to people who are blind. Link text should consist of substantive, descriptive words which can be quickly reviewed by the user. Conversely, link text which is too long bogs down efficient browsing.

d. Provide alternate mechanisms for on-line forms. Forms are not supported by all browsers. Therefore, it is important to provide the user with an opportunity to select alternate methods to access such forms.

e. All Web pages should be tested using multiple viewers. At a minimum, pages should be tested with one version of Mosaic and one version of Lynx. Ideally, pages should be tested with several versions of Mosaic, both versions of Lynx, and on other Web browsers. Pages should also be tested in DOS, Windows, and Unix environments.

²This information was provided by the WGBH Foundation which specializes in closed captioning and descriptive video for persons with disabilities.

³This information is based on the document "Writing HTML Documents and Implementing Accessibility for the World Wide Web" by Paul Fountaine, Center for Information Technology Accommodation, General Services Administration. For further information, see <http://www.gsa.gov/coca>.

Telecommunications Relay Services (TRS)

18. By using telecommunications relay services (TRS), it has now become easier for persons with hearing and speech disabilities to communicate by the telephone. TRS links TTY users with those who do not have a TTY and use standard telephones. With TRS, a TTY user communicates with another person with the help of a communications assistant. The communications assistant reads the message typed by the TTY user, or the TTY user speaks for herself. The communications assistant then types the response from the non-TTY user to be read on the visual display of the TTY.

19. There are now TRS programs in every state. Although TRS is very valuable, it does have limitations. For example, relay calls take longer, since they always involve a third party, and typing words takes longer than speaking words.

Text Telephones (TTYs)

20. A TTY also provides direct two-way typed conversations. The cost of these devices begins at approximately \$200, for a peripheral device to which a standard telephone can be attached, and they can be operated by anyone who can type. Using a TTY skillfully, especially for communicating technical information, will require some training, especially to become familiar with the conventions of TTY usage.

21. The following information is excerpted from the brochure "Using a TTY" which is available free of charge from the Access Board:

a. If the TTY line is also used for incoming voice calls, be sure the person who answers the phone knows how to recognize and answer a TTY call. You will usually hear silence, a high-pitched, electronic beeping sound, or a pre-recorded voice message when it is a TTY call. If there is silence, assume it is a TTY call.

b. TTYs should be placed near a standard telephone so there is minimal delay in answering incoming TTY calls.

c. To initiate a TTY call, place the telephone headset in the acoustic cups of the TTY adapter. If the TTY unit is directly connected to the phone line, there is no need to put the telephone headset in the acoustic cups. Turn the TTY on. Make sure there is a dial tone by checking for a steady light on the TTY status indicator.

d. Dial the number and watch the status indicator light to see if the dialed number is ringing. The ring will make a long slow flash or two short flashes with a pause in between. If the line is busy, you will see short, continuous flashes on the indicator light. When the phone is answered, you will see an irregular light signal as the phone is picked up and placed in the cradle. If you are calling a combination TTY and voice number, tap the space bar several times to help the person on the other end identify this as a TTY call.

e. The person who answers the call is the first to type. Answer the phone as you would by voice, then type "GA".

f. "GA" means "I'm done, go ahead and type". "HD" means hold. "GA or SK" means "Is there anything more, I'm done". "SK" means stop keying. This is how you show that the conversation is ended and that you

will hang up. It is polite to type good-bye, thank you for calling, or some other closing remark before you type "SK". Stay on the line until both parties type SKSK.

22. Because of the amount of time it takes to send and receive messages, it is important to remember that short words and sentences are desired by both parties. With some TTY calls it is often not possible to interrupt when the other person is typing. If you get a garbled message in all numbers or mixed numbers and letters, tap the space bar and see if the message clears up. If not, when the person stops typing, you should type, "Message garbled, please repeat." If the garbled messages continue, this may mean that one of the TTYs is not working properly, there is background noise causing interference, or that you may have a bad connection. In this case you should say something like, "Let's hang up and I'll call you back."

23. The typical TTY message will include many abbreviations and jargon. The message may also include misspelled words because, if the meaning is clear, many callers will not bother to correct spelling since it takes more time. Also, some TTY users communicate in American sign language, a language with its own grammar and syntax. English may be a second language. Extend the same patience and courtesy to TTY callers as you do to all others.

Subpart C—Requirements for Accessibility*Section 1193.35 Input, Controls, and Mechanical Functions**Paragraph (a)**Operable Without Vision*

1. Individuals who are blind or have low vision cannot locate or identify controls, latches, or input slits by sight or operate controls that require sight. Products should be manufactured to be usable independently by these individuals. For example, individuals who cannot see must use either touch or sound to locate and identify controls. If a product uses a flat, smooth touch screen or touch membrane, the user without vision will not be able to locate the controls without auditory or tactile cues.

2. Once the controls have been located, the user must be able to identify the various functions of the controls. Having located and identified the controls, individuals must be able to operate them.

3. Below are some examples of ways to make products accessible to persons with visual disabilities:

a. If buttons are used on a product, make them discrete buttons which can be felt and located by touch. If a flat membrane is used for a keyboard, provide a raised edge around the control areas or buttons to make it possible to locate the keys by touch. Once an individual locates the different controls, he or she needs to identify what the keys are. If there is a standard number pad arrangement, putting a nib on the "5" key may be all that is necessary for identifying the numbers. On a QWERTY keyboard, putting a tactile nib on the "F" and "J" keys allows touch typists to easily locate their hands on the key.

b. Provide distinct shapes for keys to indicate their function or make it easy to tell them apart. Provide Braille labels for keys and controls for those who read Braille to determine the function and use of controls.

c. Provide large raised letters for short labels on large objects. Where it is not possible to use raised large letters, a voice mode selection could be incorporated that announces keys when pressed, but does not activate them. This would allow people to turn on the voice mode long enough to explore and locate the item they are interested in, then release the voice mode and press the control. If it is an adjustable control, voice confirmation of the status may also be important.

d. Provide tactile indication on a plug which is not a self-orienting plug. Wireless connections, which eliminate the need to orient or insert connectors, also solve the problem.

e. Avoid buttons that are activated when touched to allow an individual to explore the controls to find the desired button. If touch-activated controls cannot be avoided (for example, on a touch screen), provide an alternate mode where a confirm button is used to confirm selections (for example, items are read when touched, and activated when the confirm button is pressed). All actions should be reversible, or require confirmation before executing non-reversible actions.

f. Once controls have been located and users know what the functions are, they must be operable. Some types of controls, including mouse devices, track balls, dials without markings or stops, and push-button controls with only one state, where the position or setting is indicated only by a visual cue, will not be usable by persons who are blind or have low vision. Providing a rotational or linear stop and tactile or audio detents is a useful strategy. Another is to provide keyboard or push-button access to the functions. If the product has an audio system and microprocessor, use audio feedback of the setting. For simple products, tactile markings may be sufficient.

g. Controls may also be shaped so that they can easily be read by touch (e.g., a twist knob shaped like a pie wedge). For keys which do not have any physical travel, some type of audio or tactile feedback should be provided so that the individual knows when the key has been activated. A two-state key (on/off) should be physically different in each position (e.g., a toggle switch or a push-in/pop-out switch), so the person can tell what state the key is in by feeling it.

h. If an optional voice mode is provided for operating a product, a simple "query" mode can also be provided, which allows an individual to find out the function and state of a switch without actually activating it. In some cases, there may be design considerations which make the optimal mode for a sighted person inaccessible to someone without vision (e.g., use of a touch screen or mouse). In these cases, a primary strategy may be to provide a closely linked parallel method for efficiently achieving the same results (e.g., keyboard access) if there is a keyboard, or "SpeedList" access for touch screens.

*Paragraph (b)**Operable With Low Vision*

1. Individuals with low vision often also have hearing disabilities, especially older individuals. These persons cannot rely solely on audio access modes commonly used by people who are blind. Tactile strategies are still quite useful, although many older persons may not be familiar with Braille. The objective, therefore, is to maximize the number of people who can use their residual vision, combined with tactile senses, to operate a product.

2. Strategies for addressing this provision may include the following:

a. Make the information on the product easier to see. Use high-contrast print symbols and visual indicators, minimize glare on the display and control surfaces, provide adequate lighting, position controls near the items they control to make them easy to find, and use Arabic instead of Roman numerals.

b. The type-face and type-spacing used can greatly effect legibility. The spacing between letters should be approximately $\frac{1}{16}$ the height of uppercase letters and the spacing should be uniform from one label to the next. Also, symbols can sometimes be used which are much more legible and understandable than fine print.

c. Where the display is dynamic, provide a means for the user to enlarge the display and to "freeze" it. In addition to making it easier to see, there are strategies which can be used to reduce the need to see things clearly in order to operate them.

d. A judicious use of color-coding, always redundant with other cues, is extremely helpful to persons with low vision. These cues should follow standard conventions, and can be used to reduce the need to read labels (or read labels more than the first time). In addition, all of the tactile strategies discussed under § 1193.35 (a) can also be used here.

*Paragraph (c)**Operable With Little or No Color Perception*

1. Many people have an inability to see or distinguish between certain color combinations. Others are unable to see color at all.

2. Strategies for addressing this provision include:

a. Eliminate the need for a person to see color to operate the product. This does not eliminate the use of color completely but rather requires that any information essential to the operation of a product also be conveyed in some other fashion.

b. Avoid color pairs such as red/green and blue/yellow, that are indistinguishable by people with limited color perception.

c. Provide colors with different hues and intensity so that colored objects can be distinguished even on a black and white screen by their different appearance. Depending upon the product, the manufacturer may also be able to allow users to adjust colors to match their preferences and visual abilities.

d. Avoid colors with a low luminance.

*Paragraph (d)**Operable Without Hearing*

1. Individuals who are deaf or hard of hearing cannot locate or identify controls that require hearing. Products that provide only audio prompts cannot be used by individuals who are deaf or hard of hearing. For example, a voice-based interactive product that can be controlled only by listening to menu items and then pressing buttons is not accessible. By addressing the output issues under § 1193.37(b)(4) many accessibility problems that affect input under this section can be solved.

2. Some strategies include:

a. Text versions of audio prompts could be provided which are synchronized with the audio so that the timing is the same.

b. If prompts are provided visually and no speech or vocalization is required, most problems associated with locating, identifying, and operating controls without hearing will be solved.

*Paragraph (e)**Operable With Limited Manual Dexterity*

1. Individuals may have difficulty manipulating controls on products for any number of reasons. Though these disabilities may vary widely, these persons have difficulty grasping, pinching, or twisting objects and often have difficulty with finer motor coordination. Some persons may use a headstick, mouthstick, or artificial limb.

2. Below are some strategies which will assist in designing products which will meet the needs of these persons:

a. Provide larger buttons and controls, or buttons which are more widely spaced, to reduce the likelihood that a user will accidentally activate an adjacent control.

b. Provide guard bars between the buttons or near the buttons so that accidental movements would hit the guard bars rather than accidentally bumping switches.

c. Provide an optional mode where buttons must be depressed for a longer period of time (e.g., SlowKeys) before they would accept input to help separate between inadvertent motions or bumps and desired activation.

d. Where two buttons must be depressed simultaneously, provide an option to allow them to be activated sequentially (e.g., StickiKeys).

e. Avoid buttons which are activated merely by touch, such as capacitance switches. Where that is difficult to do (e.g., with touchscreens), provide a "confirm" button which an individual can use to confirm that the item touched is the desired one. Also, make all actions reversible, or request confirmation before initiating non-reversible actions.

f. Avoid latches, controls, or key combinations which require simultaneous activation of two or more buttons, or latches. Also, avoid very small controls or controls which require rotation of the wrist or pinching and twisting. Where this is not possible, provide alternate means for achieving the same functions.

g. Controls which have non-slip surfaces and those that can be operated with the side of the hand, elbow or pencil can be used to minimize physical activity required. In some

cases, rotary controls can be used if they can be operated without grasping and twisting (e.g., a thin pie slice shape control or an edge control). Providing a concave top on buttons makes them easier to use.

h. Make it easier to insert cards or connectors by providing a bevel around the slot or connector, or use cards or connectors which can be inserted in any orientation or which self-center or self-align. Placing the slot or connector on the front and near a ledge or open space allows individuals to brace their hands or arms to make use of the slot or connector easier.

i. For some designs, controls which pose problems for individuals with disabilities may be the most efficient, logical or effective mechanism for a majority of users. In these cases, provide alternate strategies for achieving the same functions, but which do not require fine manipulation. Speech input or voice recognition could be provided as an alternate input, although it should not be the only input technique (see § 1193.35 (h)).

*Paragraph (f)**Operable With Limited Reach and Strength*

1. Some individuals may have difficulty operating systems which require reach or strength. The most straight-forward solution to this problem is to place the controls where they can be easily reached with minimal changes to body position. Many products also have controls located on different parts of the product.

2. When this is the case, the following strategies may be used:

a. Allow the functions to be controlled from the keyboard, which is located directly in front of the user.

b. Allow voice recognition to be used as an option. This provides input flexibility, but should never be the only means for achieving a function.

c. Provide a remote control option that moves all of the controls for the product together on a unit that can be positioned optimally for the individual. This allows the individual to operate the product without having to move to it. If this strategy is used, a standard communication format would be important to allow the use of alternate remote controls for those who cannot use the standard remote control.

d. Reduce the force needed to operate controls or latches and avoid the need for sustained pressure or activity (e.g., use guards rather than increased strength requirements to avoid accidental activation of crucial switches).

e. Provide arm or wrist rests or supports, create short cuts that reduce the number of actions needed, or completely eliminate the need to operate controls wherever possible by having automatic adjustments.

*Paragraph (g)**Operable Without Time-Dependent Controls*

1. Many persons find it very difficult to operate time-dependent controls.

2. Some strategies which address this problem include:

a. Avoid any timed-out situations or provide instances where the user must respond to a question or moving display in

a set amount of time or at a specific time (e.g., a rotating display).

b. Where timed responses are required or appropriate, allow the user to adjust them or set the amount of time allotted to complete a given task. Warn users that time is running out and allow them to secure extended time.

c. If the standard mode of operation would be awkward or inefficient, then provide an alternate mode of operation that offers the same functions.

Paragraph (h)

Operable Without Speech

1. Many individuals cannot speak or speak clearly. Products which require speech in order to operate them should also provide an alternate way to achieve the same function.

2. Some strategies to achieve this include:
a. Provide an alternate mechanism for achieving all of the functions which are controlled by speech. If a product includes speech identification or verification, provide an alternate mechanism for this function as well.

b. Include individuals who are deaf or who have speech disabilities in the subject populations that are used to develop voice recognition algorithms, so that the algorithms will better accommodate a wider range of speech patterns.

Paragraph (i)

Operable With Limited Cognitive Skills

1. Many individuals have reduced cognitive abilities, including reduced memory, sequence tracking, and reading skills. This does not necessarily prevent these persons from using a telecommunications product or feature.

2. The following strategies are extensions of techniques for making products easier for everyone to learn and use:

a. Use standard colors and shapes and group similar functions together. On products which have some controls that are used by everyone and other controls which would only be used by advanced users, it is generally good practice to separate the two, putting the more advanced features behind a door or under a separate menu item.

b. Products which read the contents of the display aloud, or controls which announce their settings, are easier for individuals who have difficulty reading.

c. Design products that are self-adjusting to eliminate additional controls which must be learned, and reduce the visual clutter.

d. On products which have sign-in procedures, allow user settings to be associated with them when they sign in or insert their identification card. The system can then autoconfigure to them. Some new "smart cards" are being designed with user preferences encoded on the card.

e. Where a complex series of steps is required, provide cuing to help lead the person through the process. It is also helpful to provide an "undo" or back up function, so that any mistakes can be easily corrected. Most people will find this function helpful.

f. Where functions are not reversible, request some type of confirmation from the user before proceeding. On labels and instructions, it is helpful to use short and

simple phrases or sentences. Avoid abbreviations wherever possible. Eliminate the need to respond within a certain time or to read text within a certain time.

Section 1193.37 Output, Displays, and Control Functions

Paragraph (b)(1)

Availability of Visual Information

1. Just as persons with visual or cognitive disabilities need to be able to operate the input, controls, and mechanical functions of a product, they must also have access to the output functions.

2. The following are strategies for addressing this provision:

a. Provide speech output of all displayed text and labels. For information which is presented in non-text form (e.g., a picture or graphic), provide a verbal description unless the graphic is just decorative. When speech output is provided, allow for the spoken message to be repeated if the message is very long. A message for stepping through menus is also helpful.

b. Providing Braille labels for controls is an extremely effective mechanism for those individuals who read Braille.

c. Large raised print can also be used but is generally restricted to rather large objects due to the size of the letters.

Paragraph (b)(2)

Availability of Visual Information for Low Vision Users

1. Individuals with low vision often also have hearing disabilities, especially older individuals. These persons cannot rely solely on audio access modes commonly used by people who are blind. Tactile strategies are still quite useful. Many people who have low vision but are not legally blind can use their vision to access visually presented information on a product.

2. Strategies for meeting this provision involve:

a. Provide larger, higher contrast text and graphics. Individuals with 20/200 vision can see lettering if they get close to it, unless it is very small or has very poor contrast. Although 14 or 18 point type is recommended for visual displays, it is usually not possible to put this size text on small products.

b. Make the lettering as large and high contrast as possible to maximize the number of people who can use the product.

c. On displays where the font size can be varied, allow the user to increase the font size, even if it means that the user must pan or move in order to see the full display.

Paragraph (b)(3)

Access to Moving Text

1. Moving text can be an access problem because individuals with low vision, or other disabilities may find it difficult or impossible to track moving text with their eyes.

2. Strategies to address this requirement may include the following:

a. Provide a mechanism for freezing the text. Thus, persons could read the stationary text and obtain the same information.

b. Provide scrolling to display one full line at a time, with a pause before the next line replaces it.

c. Provide the same information in another type of display which does not move. The right-to-left scrolling text on a TTY does not usually present a problem because it can be controlled by asking the sender to type slower or pause at specified intervals.

Paragraph (b)(4)

Availability of Auditory Information

1. Individuals who have hearing disabilities are unable to receive auditory output, or mechanical and other sounds that are emitted by a product. These sounds are often important for the safe or effective operation of the product. Therefore, information which is presented auditorially should be available to all users.

2. Some strategies to achieve this include the following:

a. Provide a visual or tactile signal that will attract the person's attention and alert the user to a call, page, or other message, or to warn the user of significant mechanical difficulties in the product.

b. In portable products, a tactile signal such as vibration is often more effective than a visual signal because a visual signal may be missed. An auxiliary vibrating signaler might be effective if it is not readily achievable or effective to build vibration into a portable product.

c. For stationary products, a prominent visual indicator in the field of vision (e.g., a screen flash for a computer, or a flashing light for a telephone) is effective. To inform the user of the status of a process (e.g., line status on a telephone call, power on, saving to disk, or disconnected), text messages may be used. It is also desirable to have an image or light that is activated whenever acoustic energy is present on a telephone line.

d. Speech messages should be portrayed simultaneously in text form and displayed where easily seen by the user. Such captions should usually be verbatim and displayed long enough to be easily read. If the product provides speech messages and the user must respond to those messages (e.g., interactive voice response and voice mail), a TTY accessible method of accessing the product could be provided. If the product provides interactive communication using speech and video, it would be helpful to provide a method and channel for allowing non-speech communication (e.g., text conversation) in parallel with the video.

e. Certain operations of products make sounds that give status information, although these sounds are not programmed signals. Examples include the whir of an operating disk drive and the click of a key being pushed. Where sounds of this type provide information important for operating the product, such as a "beep" when a key is activated, provide a light or other visual confirmation of activation.

Paragraph (b)(5)

Availability of Auditory Information for People Who Are Hard of Hearing

1. People who are hard of hearing but not deaf can often use their hearing to access auditory information on a product.

2. Strategies for addressing this requirement may include the following:

- Improve the signal to noise ratio by making the volume adjustable, increasing the maximum undistorted volume, and minimizing background noise by such methods as better coupling between the signal source and the user.

- Alerting tones are most likely to be heard if they involve multiple tones, separated in frequency, which contrast with the environment.

- Occasionally, varying tones may be preferred for attracting attention. If speech is used, it is best to test its intelligibility with individuals who are hard of hearing to maximize its clarity and ease of understanding. Provide the ability for the user to have any messages repeated or to repeat the message if no response is received from the user.

- For essential auditory information, the information might be repeated and an acknowledgment from the user requested.

- The intelligibility of the output can also be maximized by the location of the speakers and by keeping the speakers away from noise sources. However, visual displays are often more desirable than loud prompts or alerts, because the latter reduce privacy and can annoy others unless the amplified signal is isolated by means of a headphone, induction coupling, direct plug-in to a hearing aid, or other methods.

- The use of a telephone handset or earcup which can be held up to the ear can improve intelligibility without disturbing others in the area. If a handset or earcup is used, making it compatible with a hearing aid allows users to directly couple the auditory signal to their hearing aids. If the microphone in the handset is not being used, turning it off will also reduce the amount of background noise which the person hears in the earpiece. Providing a headphone jack also allows individuals to plug in headphones, induction loops, or amplifiers which they may use to hear better.

Paragraph (b)(6)

Prevention of Visually-Induced Seizures

- Individuals with photo-sensitive epilepsy can have a seizure triggered by displays which flicker or flash, particularly if the flash has a high intensity and within certain frequency ranges.

- Strategies to address this requirement involve reducing or eliminating screen flicker or image flashing. In particular, the 6–30 Hz range is the most sensitive frequency range, and should be avoided. A maximum frequency of 3 Hz has usually been set for visual fire alarms to provide a margin of safety. The chance of triggering seizures can also be reduced by avoiding very bright flashes which occupy a large part of the visual field (particularly in the center of the visual field) in order to minimize the impact on the visual cortex.

Paragraph (b)(7)

Availability of Audio Cutoff

- Individuals using the audio access mode, as well as those using a product with the volume turned up, need a way to limit the range of audio broadcast.

- If an audio headphone jack is provided, a cut-off switch can be included in the jack so that insertion of the jack would cut off the speaker. If a telephone-like handset is used, the external speakers can be turned off when the handset is removed from the cradle.

Paragraph (b)(8)

Non-Interference With Hearing Technologies

- Individuals who are hard of hearing use hearing aids and other assistive listening devices but these devices cannot be used if a telecommunications product introduces noise into the listening aids because of stray electromagnetic interference.

- Strategies for reducing this interference (as well as improving hearing aid immunity) are being researched. The most desirable strategy is to avoid the root causes of interference when a product is initially designed. If the root sources of interference cannot be removed, then shielding, placement of components to avoid hearing aid interference, and field-canceling techniques may be effective. Standards are being developed to limit interference to acceptable levels, but complete elimination for some technologies may not yet be practical.

Paragraph (b)(9)

Hearing Aid Coupling

- Many individuals who are hard of hearing use hearing aids with a T-coil (or telecoil) feature to allow them to listen to audio output of products without picking up background noise and to avoid problems with feedback, signal attenuation or degradation.

- The Hearing Aid Compatibility (HAC) Act defines a telephone as hearing aid compatible if it provides internal means for effective use with hearing aids and meets established technical standards for hearing aid compatibility.

- The technical standards for HAC telephones are specified in ANSI/EIA-504-1989, "Magnetic Field Intensity Criteria for Telephone Compatibility with Hearing Aids," ANSI/TIA/EIA-504-1-1994, "An Addendum to EIA-504," which adds the HAC requirements, and the FCC regulations at 47 CFR 68.317(a).

- A good strategy for addressing this requirement for any product held up to the ear would be to meet these same technical requirements. If not readily achievable to provide built-in telecoil compatibility, an accessory or other means of providing the electro-magnetic signal is the next strategy to be considered.

Paragraph (b)(10)

Availability of Enhanced Audio

- Strategies for addressing this provision are the same as for paragraph (b)(5) of this section.

Subpart D—Requirements for Compatibility With Peripheral Devices and Specialized Customer Premises Equipment

Section 1193.41 Compatibility

Paragraph (a)

External Electronic Access to All Information and Control Mechanisms

- Some individuals with severe or multiple disabilities are unable to use the built-in displays and control mechanisms on a product.

- The two most common forms of manipulation-free connections are an infrared connection or a radio frequency connection point. Currently, the Infrared Data Association (IrDA) infrared connection point is the most universally used approach. A cross-industry standard for alternative control and display does not exist, however a standard protocol is under development.

Paragraph (b)

Connection Point for External Audio Processing Devices

- Individuals using audio peripheral devices such as amplifiers, telecoil adapters, or direct-connection into a hearing aid need a standard, noise free way to tap into the audio generated by a product.

- Individuals who cannot hear well can often use products if they can isolate and enhance the audio output. For example, they could plug in a headphone which makes the audio louder and helps shut out background noise; they might feed the signal through an amplifier to make it louder, or through filters or frequency shifters to make it better fit their audio profile. If they are wearing a hearing aid, they may directly connect their hearing aid to the audio signal or plug in a small audio loop which allows them to couple the audio signal through their hearing aid's built-in T-coil.

- Devices which can process the information and provide visual and/or tactile output are also possible. The most common strategy for achieving this requirement is the use of a standard 9 mm miniature plug-in jack, common to virtually every personal tape player or radio. For small products, a subminiature phone jack could be used.

Paragraph (c)

Non-Interference With Hearing Technologies

- Strategies for addressing this provision are the same as those for § 1193.37 (b)(8) of this appendix.

Paragraph (d)

Compatibility of Controls With Prosthetics

- Individuals who have artificial hands or use headsticks or mouthsticks to operate products have difficulty with capacitive or heat-operated controls which require contact with a person's body rather than a tool. Individuals who wear prosthetics are unable to operate some types of products because they either require motions that cannot easily be made with a prosthetic hand, or because products are designed which require touch of the human skin to operate them (e.g., capacitive touchscreen kiosks), making it impossible for individuals with artificial

arms or hands to operate, except perhaps with their nose or chin. Some individuals who do not have the use of their arms use either a headstick or a mouthstick to operate products. Controls and mechanisms which require a grasping and twisting motion should be avoided.

Paragraph (e)

TTY Connectability

1. Acoustic coupling is subject to interference from ambient noise, as many handsets do not provide an adequate seal with TTYs. Therefore, alternate (non-acoustic) connections are needed. Control of the microphone is needed for situations such as pay-phone usage, where ambient noise picked up by the mouthpiece often garbles the signal. For the use of voice carry-over, where the person can speak but not hear, the user needs to be able to turn the microphone on to speak and off to allow them to receive the TTY text replies.

2. A TTY can be connected to and used with any telecommunications product supporting speech communication without requiring purchase of a special adapter, and

the user is able to intermix speech and clear TTY communication. The most common approach today is to provide a RJ-11 jack. On very small products, where there may not be room for this large jack, a miniature or subminiature phone-jack wired as a "headset" jack (with both speaker and microphone connections) could be used as an alternate approach. In either case, a mechanism for turning the phone mouthpiece (microphone) on and off would reduce garbling in noisy environments, while allowing the user to speak into the microphone when desired (to conduct conversations with mixed voice and TTY). For equipment that combines voice communications, displays, keyboards and data communication functions, it is desirable to build in direct TTY capability.

Paragraph (f)

TTY Signal Compatibility

1. Some telecommunications systems compress the audio signal in such a manner that standard signals used by a TTY is distorted or attenuated preventing successful TTY communication over the system. A TTY

can be used with any product providing voice communication function.

2. The de facto standard of domestic TTYs is Baudot which has been defined in ITU-T Recommendation V.18. Although the V.18 standard has been adopted, products are not yet available which meet its requirements.

3. This provision can be addressed by ensuring that the tones used can travel through the phones compression circuits undistorted. It is even more desirable to provide undistorted connectivity to the telephone line in the frequency range of 390 Hz to 2300 Hz (ITU-T Recommendation V.18), as this range covers all of the TTY protocols known throughout the world. An alternate strategy might be to recognize the tones, transmit them as codes, and resynthesize them at the other end. In addition, it should be possible for individuals using TTYs to conduct conversations with mixed voice and TTY, and to control all aspects of the product and receive any messages generated by the product.

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