

IFHOH - International Federation of Hard-of-Hearing People

Position Paper

Hearing Accessibility Guidelines

**For Hard-of-Hearing Persons
and
For Event Organizers**

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The International Federation of Hard-of-Hearing people (**IFHOH**) is a coalition of National Associations of hard-of-hearing people. IFHOH was founded for the purpose of providing a platform for cooperation and exchange of information and to promote greater understanding among hard-of-hearing people worldwide. As an umbrella organization and through its individual organizations, IFHOH works for accessibility for hard-of-hearing people worldwide.

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" Technology makes things **easier** for most of us.
Technology makes things **possible** for persons with disability ”

1. Introduction

According to the March 2018 estimations¹ by the World Health Organization (WHO):

- There are 466 million persons in the world with disabling hearing loss (6.1% of the world's population)
- 432 million (93%) of these are adults (242 million males, 190 million females)
- 34 million (7%) of these are children
- Approximately one-third of persons over 65 years are affected by disabling hearing loss
- Unless action is taken, it is likely that the number of people with disabling hearing loss will grow over the coming years. Projections show that the number could rise to 630 million by 2030 and maybe over 900 million in 2050.
- 1.1 billion young people (aged between 12–35 years) are at risk of hearing loss due to exposure to noise in recreational settings.

Most HOH persons can benefit from hearing aids, but only a minority of them use hearing aids. Here is Prof. Frank Lin from the USA on this topic:

“The prevalence of hearing loss in the United States doubles with every decade of age, resulting in two out of three people over the age of 70 experiencing some level of hearing impairment, yet only 15 to 20 percent of the hearing impaired use hearing devices – a figure that has not changed in three decades, said Frank Lin, Associate Professor of Otolaryngology, Geriatric Medicine, Mental Health, and Epidemiology at Johns Hopkins University.”²

As of May 2019, 177 countries all over the world have ratified the UN Convention on the Rights of Persons with Disabilities (CRPD).

Several articles from the CRPD clarify the rights of Persons With Disability (PWD). They are relevant to HOH persons as well:

¹ www.who.int/pbd/deafness/estimates/en

² longevity.stanford.edu/wp-content/uploads/2017/12/Hearing-Proceedings-12_06_2017-1.pdf

- Article 5 - Equality and non-discrimination of PWD
- Article 8 - Awareness to the rights of PWD. Combat stereotypes and prejudices.
- Article 9 - Accessibility to transportation, schools, hospitals, workplaces, and information and communications technologies (ICT).
- Article 24 - Accessibility to Education.
- Article 27 - Accessibility to work and employment.
- Article 29 - Accessibility to political and public life.
- Article 30 - Accessibility in cultural life, recreation, leisure, and sport.

2. Who is this paper for

This paper is written as a guide to persons who want to know and understand how to make hearing accessibility:

- Accessibility consultants
- event organizers
- Accessibility students

3. Types of hearing loss

3.1. Hard-Of-Hearing Persons (HOH)

The term “Hard-of-Hearing” is used to define all groups of people with some level of hearing loss, including persons with:

- Mild, Moderate and Profound hearing loss;
- late-deafened;
- Cochlear implants;
- Menier;
- Tinnitus.
- Auditory Processing Disorder

HOH prefers communication in spoken language. If they cannot understand spoken language even with amplification, they prefer written language (captions). A few of them know SL and can understand it.

HOH meet more challenges these days, due to:

- More use of noise-inducing machinery.
- More demanding voice and sound environments like office, central station, mall.

- New voice and sound sources like smartphones, PC, VR, and hearable devices.
- Living longer lives, which increases the prevalence of Hearing Loss.
- Listening to music at high volume in concerts, clubs, and with earphones.

3.2. Mild Hearing Loss

People with a mild hearing loss can often manage without hearing aids but are dependent on specific conditions that enable good communication, such as good room acoustics, no background noise, ample lighting, and clear speech.

Numerous people within this group have progressive hearing losses and eventually, the use of hearing aids is necessary. For many of these individuals, the initial step to getting their first hearing aid is a difficult decision and one that they tend to put off. The longer they wait to receive assistance, the more prominent other difficulties become, which can result in such things as job loss, failure in education, social isolation, and loss of self-esteem. It is therefore imperative for professionals and organizations to educate society about hearing loss and the problems and solutions associated with it.

3.3. Moderate to Severe Hearing Loss

A good hearing aid fit is the most crucial factor to consider for those with moderate to severe hearing loss. A hearing aid can be used in conjunction with other assistive listening devices, such as induction loops, remote microphones, and direct connection to a telephone.

Hearing aids must be fitted appropriately to suit the level of hearing loss. Hearing aid user has to know how to insert it, how to clean it and how to maintain it.

Other factors that need to be considered include the individual's finger and hand dexterity and other health conditions. Older people often have problems with hearing aids being too small, with too small buttons, and too complicated to operate.

3.4. Late Deafened People (LD)

LD are those who have lost all or most of their hearing ability after they have developed spoken language. They usually search for ways to continue and use oral communication.

Like all other HOH or deaf people, LD Can use HA, CI, ALD, Captions, or SL if they know it. Because of their hearing memory, they have a better chance to get good results with CI.

Supportive signing can be very helpful for LD. Supportive signs must not be mistaken for deaf sign language. Deaf sign language is used by people who are deaf from birth or an

early age and it is a complete language that can be used without speaking. Supportive signs are used to assist spoken language. Training courses on supportive signing should be provided (In some countries this service is given free of charge) to family and friends of the hard-of-hearing person. This skill would be very useful to LD people who are generally heavily dependent on visual information and captions.

3.5. Recommendations for hard-of-hearing persons

The following recommendations can improve listening and communication for hard-of-hearing persons:

- A well-fitted hearing aid.
- Good room acoustics.
- Good lighting.
- ALS based on HL, FM, IR, BT, or WiFi, to transmit the voice in large venues.
- Visual information when relevant.
- Captioning if audio is not good enough.
- Safety equipment with vibrating alarms and/or flashing lights.
- Training courses for speech (or lip) reading and supportive signing.

4. Assistive Listening Devices (ALD)

4.1. Hearing-Loop (HL)

An HL (sometimes called induction-loop) consists of a wire loop that acts as a transmitter and a telecoil (TC) that acts as a receiver. The Hearing Loop is usually a big wire loop on the floor, or on the ceiling of the room. The TeleCoil is usually in the hearing aid, or in the CI, of the listening person. HL helps hard-of-hearing people to hear sounds more clearly by reducing or cutting out background noise (improving sound to noise ratio). For example, at home, a loop can be used to pick up sound from televisions, sound systems, or radios. A loop can also be set up with a microphone to help hearing aid users hear conversations in noisy places. Similarly, in a theater with the appropriate setup, a loop can help individuals hear the performance more clearly. One drawback of using a loop is that it is limited to one channel, so it cannot provide stereo sound. Another drawback is the loops sensitivity to electromagnetic interferences, which is usually higher than in other transmission methods.

Here are some common uses of hearing loops:

- In large venues: The transmitting HL is usually on the floor, in complicated patterns to maximize transmission strength, minimize energy use and minimize disturbances to other HL in the area. The receiving TeleCoils are in the hearing aids of the

listening persons, or in special receivers used with earphones by persons without hearing aids.

- A remote microphone, connected to a transmitter, can transmit a signal (usually FM signal) to a receiver, which is usually on the listening person. This receiver converts the FM waves to Audio frequencies and feeds them to a neckloop, which is a small HL on the neck of the listener. This neckloop transmits the audio signal to the TeleCoil in the Hearing Aid of the listener.
It is recommended that this remote microphone will be close to the speaker, to improve the sound-to-noise ratio.
- The same example as the one with the remote microphone, but instead of a Neckloop, the listener can use an ear hook or Silhouette. This Silhouette is hung on the ear, close to the Hearing Aid, so it can easily transmit to the TeleCoil inside the Hearing Aid.
- Every telephone has an earphone. Many earphones act as a hearing loop. They transmit the audio waves as Electromagnetic Waves. These Electromagnetic Waves can be received by the TeleCoil in the listener Hearing Aids. So many telephones can be heard by Hearing Aids users in Telecoil mode, without any additional components.
- In large venues, it is usually preferred to arrange the loop wire in specially designed patterns on the floor. In this way, the loop cover is more even in the areas where it is needed and is less leaking into nearby rooms or areas where it might be disturbing.

4.2. How Hearing Loop Works

A Hearing Loop is basically an electric wire. When an alternating electric current is flowing in this wire, it transmits electromagnetic waves. Usually, it is used by creating a loop with the electric wire. It can be a large loop around a room, or it can be a small loop around the neck, or even a smaller loop inside a Silhouette. These electromagnetic waves from the loop can be received by any other electric wire, close to the loop. The TeleCoil, which is a thin long electric wire coiled inside the Hearing Aid (or CI, or BAHA implant, etc.), receives the transmission of the Hearing Loop and transfer it back to electric current. This electric current is amplified in the hearing aid and played to the ears of the Hearing Aid user.

Hearing Loop system usually contains these components:

- A sound source like a speaker person, a music instrument, a recording, etc.
- A microphone if needed to convert the acoustic waves to electric waves.
- An amplifier to amplify the electric waves and prepare them for the Hearing Loop.
- A Hearing Loop, fed by the amplifier and transmitting electromagnetic waves.
- TeleCoil that receives the transmission of the Hearing Loop.

- An amplifier to amplify the signal from the TeleCoil for the (HA) earphone, to the CI implant, or the skull bone in a BAHA implant.
- This amplified signal is fed to the earpiece of the HA (or the inner implant of a CI, or to the skull bone by a BAHA).

4.3. Desktop Loop

A desktop loop is a small Hearing Loop that covers a small area and can be placed on or under a desk. They are important for communication in such places as ticket offices, information desks, hotel counters, banks, post offices, pharmacies, and many more places. Desktop loops make it possible for hard-of-hearing people to receive information directly to the telecoil and help to limit misunderstandings.

Desktop loops are often bought and used by offices that operate service stations. Staff need to be trained, in order to properly use this type of loops.

4.4. Neck Loop

Like the desktop loop, a neck loop is also a small induction loop. It is worn around the neck, enabling the listener to use personal equipment like FM systems, mobile phones, MP3 players, etc. It can also be used together with stationary equipment (like telephone and TV).

4.5. Infra-Red System (IR)

An IR system is another type of wireless system that can be used to help HOH persons. Like a hearing loop system, it has a transmitter and a receiver. The transmitter is usually high on the wall and there can be many receivers for the HOH persons who use them. Sound is fed to the transmitter in the same way as with the loop system, either by a direct electrical connection or via a microphone. It is then transmitted as invisible infrared electromagnetic radiation to the listening receiver worn by the HOH individual.

Unlike other systems that are reviewed here, IR systems need a direct line of vision between the transmitter and the receiver. It can be an advantage when you have several close rooms to cover. IR does not cross walls so you can use systems with the same frequencies at the same time in two or more adjacent rooms. On the other hand, it needs careful design of the place of the transmitters so that they have a direct vision line with every place in the room.

Another limitation of IR system is that it is not possible to use it in direct sun light.

If you use such a system, it is recommended that the receivers will be able to support both telecoils and regular earphones, so that any HOH person, with or without HA, will be able to enjoy the IR system.

4.6. FM System

An FM system is a portable radio wave system (with a microphone, transmitter, and receiver) that can be used in all settings and gives people with hearing loss the ability to listen and follow conversations in settings where signal to noise ratio is bad. This system is especially useful when listening to lectures, meetings or when participating in guided tours. The Hard-of-Hearing individual wears the receiver with either headphones or a neck loop and the transmitter which includes a microphone is given to the individual that is talking. Discussions are easier to follow when the microphone is directed to each person in a conversation.

4.7. Personal Sound Amplifier

A personal sound amplifier is very helpful for older people who cannot manage a hearing aid. It is easy to use and gives some amplification of speech. It is easy to adjust, even for people with poor mobility in hands and fingers. Unfortunately, it is usually not adjusted to the specific hearing loss of the user.

Personal sound amplifier usually works with earphones, but neckloops are also possible.

4.8. Alerting / Alarm Systems

There are 3 different alarm systems for hard-of-hearing people:

- Acoustic signal (strengthened ringing signal)
- Optic signal (flashing light)
- Tactile signal (vibrating alarm to wear or to put under the pillow)

All these systems can be used individually or in combination. These features are often incorporated in individual alarm clocks to help hard-of-hearing people wake up in the mornings. Moreover, one single alarm system can be connected to various devices such as a smoke alarm, a doorbell, a telephone, a baby cry transmitter, and more. The set up of such a system in the home, office, or other environments is crucial in allowing the hard-of-hearing individual to be aware of what is occurring in the environment and is vital also from a safety perspective in that it alerts to potential dangers, such as fires.

4.9. Landline Telephones

Most hard-of-hearing people are still able to use voice telephone, but often only if the telephone allows for suitable adjustments. The following are a number of important telephone features and characteristics, that help hard-of-hearing persons communicate effectively on the telephone:

- Adjustable ringing volume and pitch.
- Built-in or external telephone amplifiers that amplify the incoming speech.
- Captioned telephone services where incoming speech is also displayed as text on a screen (in use only in some countries).
- Earpiece that transmit like a loop, so that a telecoil can receive it.
- Tone adjustment to improve of the voices for hard-of-hearing persons.
- The bandwidth of telephone sounds is limited to about 400-4000 Hz.

4.10. Mobile Phones

Mobile phones can be used for voice communication, but all mobile phones and networks also support SMS (short message service) service. And if you have an Internet connection, you can have many other communication options, with apps like WhatsApp, Messenger, Skype and others, which can also transfer text, pictures, voice messages and video conversations. The non-verbal communication options can be very useful to hard-of-hearing people wanting to communicate without voice, or to be able to see the other side while talking, to see the body language and read lips.

For HOH persons who can understand phone conversations, some mobile phones offer better tone and volume adjustment than others so it is recommended to try and select a phone in which the voice sounds better.

Some mobile phones can cause considerable interference when used near a hearing aid. In such a case, a neck loop can help. The neck loop connects to the mobile phone and helps to reduce interference by keeping the mobile phone at a distance from the hearing aid. Neck loops work with almost many hearing aids that have a Telecoil.

Before purchasing a mobile phone, it is imperative that each individual tests the phone in the shop to make sure that it has all the features needed and that (if required) it works well with the users' hearing aid.

A new trend of communication between the mobile phone and the hearing aid is by using Bluetooth. The latest models of hearing aids can connect directly to the mobile phone

without any intermediation. This is very comfortable, enabling clear sound and even stereo streaming of music if you have two hearing aids.

4.11. Internet Telephony

More and more people are making and receiving calls over the Internet. In the past, it was called VoIP (Voice over Internet Protocol) or VoB (Voice over Broadband). It is done by using applications like Skype, Zoom, Google Meet, and Microsoft Teams.

HOH users should try out these services and make sure that they work well for them. Call quality can be as good as or even better than normal landline or mobile phone, but not all software and hardware solutions provide full tone and volume adjustments or suitable alerting tools. In addition, with some services, it is not possible to make emergency calls.

4.12. Relay services

Not all hard-of-hearing people are able to use voice conversations on the phone. Almost all smartphones can run applications like WhatsApp, Messenger, Skype, and many others. These applications are used for text messages over the Internet, but they also allow video conversations, voice messages, and document transfer.

HOH or deaf people, who cannot understand speech on the phone, enjoy very much from this non-verbal communication. But when a voice call is needed, they have a problem. To overcome this limitation some countries have relay services. When using a relay service to call a hearing person a relay operator will join the line. The text user can type or speak, the hearing person will speak and the relay operator will type (or sign with video) exactly what is being said by the hearing person.

Most text services used on the Internet, sent the text line by line and not letter by letter (real time text). For a relay service, real-time text is much preferred. There are some systems that aim to bring the real-time text to mobile and internet devices, such as TalkByText. There are also more common services like Google Docs that enable real-time text.

There are dedicated text telephones that were used more in the past. They are used less often today, as young people prefer using mobile phones and Internet services to send and receive messages.

Action is needed at both national and international levels to ensure that universal technical solutions are introduced to ensure that deaf, hard-of-hearing, and speech-impaired people are able to communicate through real-time character by character text (interactive text), between mobile phones, PSTN text phones, Internet Telephones, and PCs. Interactive

texting will allow these people to have the same type of telephone experience that people using voice have.

There is a new wave of relay services that uses Artificial-Intelligence based Automatic Speech Recognition (ASR). In these services, the human mediator that translates the speech to text, is replaced by the ASR system. There are many advantages to using such systems. They are always available without scheduling, they cost much less and it is much easier to build. But HOH and deaf persons who use them still prefer a human mediator because of the better quality of the translation from speech to text. See IFHOH ASR statement³ on this topic.

5. Other Measures

5.1. Lighting

Good lighting makes it easier to lip-read. It is therefore important that the speaker's face is well lit. The best position in a room is one where the hard-of-hearing person has his back towards the window so the light from the window falls on the speaker's face.

5.2. Acoustics

Special building materials and curtains can be used to improve room acoustics by helping to reduce the echo and make listening easier in meeting rooms and the like.

There are standards and requirements in some countries, that needs to be followed.

5.3. Visual Information

Visual information is of great importance in all situations in which information is conveyed via a loudspeaker. The information can be presented visually on a monitor, an information board, as a message on the smartphone, or in any other form of acceptable display.

All public transport systems generate noise, both acoustic and electromagnetic, which creates a challenging listening situation for hard-of-hearing individuals. In a noisy train station, bus terminal, or airport, it is very important that it is possible to be able to read all information that is conveyed over the speaker system. This information must be equivalent in terms of both content and timing. If the visual system is implemented accurately many circumstances of uncertainty and confusion, which are often caused by the miscommunication of information relating to delays and changes to services, can be

³ See IFHOH ASR Statement - March 2018, in this link: <https://www.ifhoh.org/position-papers>

prevented. As such, it is important for all trains, trams, busses, and metros to have visual information displays that provide up-to-date details about platform numbers, lines, upcoming stops, delays, and emergency situations.

5.4. Captioning

Television is important media for sports, entertainment, information, and politics. Hard-of-hearing people should not be excluded from making use of one of the most pervasive entertainment and information mediums of this day and age. The arguments about costs and lack of technical solutions for live captioning are often incorrect and ultimately not relevant, as the cost of exclusion has been proven to be much larger than the cost of providing access services.

Videos on the Internet are growing quickly and many people use them. These videos should be captioned, so that HOH persons can see and understand them.

The live captions systems available today are mainly manual-based, using either a standard keyboard or high-speed input methods such as stenotype, velotype, or palantype. It is also possible to use automatic speech recognition (ASR) programs to assist the operators in generating the output. But as for now, the quality of ASR systems alone are not good enough for public events or television broadcasting⁴.

Captioning can either be open (always visible with no option to hide them), or closed (can be switched on or off by the user). Closed captions are usually preferred, especially on the Internet, as they enable multiple languages and closing them for hearing people who don't want to see them. Open captions are also acceptable, mainly in situations where the user does not have control over the system that plays the video/movie/TV.

5.5. An Accessible Society for Hard-of-Hearing People

Amongst the most important tasks for organizations of deaf and hard-of-hearing people is educating and raising awareness about the profile, needs, abilities and preferences of hard-of-hearing individuals in modern society. The focus should not only be on reducing existing barriers, but also on preventing the creation of new barriers to opportunity and fulfillment for hard-of-hearing persons.

⁴ Same as footnote 3.

5.6. Integration of Accessibility for all Social Plans

Accessibility and inclusion should be a key part of all societal planning, design implementation, deployment and maintenance.

All theaters, cinemas, concert halls, and rooms for public meetings should have induction loops or equivalent.

All museums and exhibition halls should have assistive listening systems. If visitors use audio-guides or receive other voice information, the ticket office should provide a neck loop or similar equipment for people wearing hearing aids. If the visitors watch films, DVDs or video shows of some kind, a loop system or equivalent should be installed in the showroom.

All parts of the public transport systems, including information and ticket offices and the relay of information during travel should be made fully accessible through visual information, induction loops, and staff training.

Stations, terminals, and airports should have areas and help points with induction loops and visual displays providing real-time information.

Hotels should have accessible rooms with induction loops and alarm facilities suitable for hard-of-hearing people

All ships carrying passengers should have accessible cabins with appropriate communication and alerting systems. Communal passenger areas onboard the ship should be equipped with visual information displays.

All television programs and films should be captioned. Equipment for both standard and high definition televisions should fully support closed captions.

All phones, phone networks, applications and services should be accessible to HOH persons, even if they cannot understand speech on the phone. This can be achieved by following these guidelines:

- different kinds of ringing in different frequencies and with high enough volume.
- High enough volume of the voice.
- Ability to adapt the sound to the audiogram of the HOH person, at least by having a sound equalizer. Especially during a phone call.
- Different types of strong enough vibrations in the phone.
- Support of real-time text.
- Access to text relay services with user choice of human or ASR translation of the speech to text.
- Any improvement should be backward compatible with previous solutions until the HOH users themselves decide that the previous solution can be abandoned.

5.7. Concluding remarks

The above-mentioned issues are relevant to people who are hard-of-hearing universally. There are however numerous factors, including economic situations, level of education, level of reading, and degree of technological development that make some of the discussed issues less pertinent in some countries compared to others. It is important to recognize this unfortunate imbalance and to endeavor to provide accessible communities for all hard-of-hearing people worldwide.

If you have any comments, suggestions, useful information or questions about this document, please contact us via e-mail: info@ifhoh.org

6. Glossary

IFHOH -	International Federation of Hard-Of-Hearing people
EFHOH -	E uropean Federation of Hard-Of-Hearing people
APFHD -	A ssia P acific Federation of H ard-of-hearing and D eafened
IFHOHYP -	International Federation of Hard-Of-Hearing Young People
UN -	United Nations
WHO -	World Health Organization
ITU -	International Telecommunication Union
CRPD -	Convention on the Rights of Persons with Disabilities
SDG -	Sustainable Development Goals
ALD -	Assistive Listening Device
ALS -	Assistive Listening System
CI -	Cochlear Implant
FM -	Frequency Modulation
HA -	Hearing Aid
HL -	Hearing Loss
HL -	Hearing Loop
HOH -	Hard-Of-Hearing
IR -	Infra-Red
TC -	TeleCoil
DWC -	Digital Wireless Communication
Bluetooth -	DWC for a range of several meters
BT -	Bluetooth
WiFi -	DWC for a range of several tens of meters
NFC -	DWC for a range of several centimeters (N ear F ield C ommunication)

7. References

Valente, Michael. "The Telecoil: The Lonely Transducer That Is a Big Producer Michael Valente." *AudiologyOnline*, 24 June 2013, www.audiologyonline.com/articles/telecoil-lonely-transducer-that-big-11911.

WHO estimated the number of people with disabling hearing loss in 2018 and also made projections on this until the year 2050. www.who.int/pbd/deafness/estimates/en

IMPROVING COMMUNICATION FOR PEOPLE WITH HEARING LOSS. March 14-15, 2017. Stanford University. CONFERENCE PROCEEDINGS. longevity.stanford.edu/wp-content/uploads/2017/12/Hearing-Proceedings-12_06_2017-1.pdf

IFHOH ASR Statement - March 2018, in this link: <https://www.ifhoh.org/position-papers>

About loop/FM/IR systems:

https://docs.google.com/document/d/1O_M7MW40gLUSkQ7j_lbB5KvOP8jL_I330xDsBqPzL_/

EFHOH position paper: <https://efhoh.org/wp-content/uploads/2017/04/EFHOH-Accessibility-Guidelines.pdf>