ASSOCIATION OF BUILDING COMPLIANCE

CODE OF PRACTICE

Code of Practice for

Hearing Assistance Systems

SS12

The Association of Building Compliance would like to acknowledge Gordon Prier of Soundwise Ltd who was key in the development of this Code of Practice. The Association wishes to thank Gordon for his contribution and appreciate the numerous hours he has spent working on this COP.

Prepared by the Association of Building Compliance

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2. PREAMBLE

The Association of Building Compliance has drafted this Code of Practice to set parameters around how hearing assistance systems shall be designed, installed, maintained and certified.

The document is prompted by a need to update standards and to cover areas not covered by the current documents.

The Code of Practice offers good practice methods for the compliant installation of these systems, to advise service contractors of to the requirements for maintenance and to guide IQPs for the certification of the systems for building warrant of fitness (BWoF) purposes.

3. DEFINITIONS

BACKGROUND NOISE LEVEL	Unwanted noise adversely affecting the communication channel and degrading the quality of the received audio. For an Induction Loop noise can be from; mains wiring in the building, motors, transformers, lighting ballasts, other nearby loops. For Infra-Red noise can be from; sunlight, low signal levels, Plasma TV displays, LED lighting (including exit signs). The noise level is measured in dBA and needs to be below -32dBA.
BUILDING	Building has the meaning given to it by sections 8 and 9 of the Building Act 2004.
BUILDING ACT 2004	Building Act 2004 (the Building Act) means the principal legislation dealing with building controls in New Zealand.
BUILDING CODE	Building Code means the regulations made under section 400 of the Building Act 2004.
BUILDING CONSENT	Building Consent means consent to carry out building work granted by a Building Consent Authority under section 49 of the Building Act 2004.
BUILDING CONSENT AUTHORITY (BCA)	Building Consent Authority has the meaning ascribed to it by section 7 of the Building Act 2004.
COUNTER LOOP	A small local induction loop used at an information counter, checkout counter, ticket booth or similar location for the purpose of easy communication with people who have hearing aids equipped with T coils. It will have a connected amplifier and a microphone.
FM SYSTEM	A system including an FM transmitter and matching receivers to transmit an audio signal by using modulated FM radio signals to the receiver and connected to headphones, a neck loop or directly to the hearing aid.
FREQUENCY RESPONSE	Users of hearing assistance systems require a flat frequency response from 100 Hz to 5 kHz. The reference frequency is 1 kHz and the permitted deviation is + or - 3dB.

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3. DEFINITIONS *cont.*

HEARING ASSISTANCE SYSTEM	A system installed in a building for the purpose of providing hearing assistance for people with a hearing disability
HEARING SYMBOL	See picture below, 10.2. This includes the "T" to indicate that the Hearing Aid should be set to "T" position. For other types the letter T would not be used. FM would indicate an FM type System, IR for an Infra-red System or WI-FI for a WI-FI type system.
INDEPENDENT QUALIFIED PERSON (IQP)	A person— (a) who is accepted by a Territorial Authority as being qualified to— (i) carry out or supervise all or some of the inspection, maintenance, and reporting procedures required for a specified system stated in a compliance schedule; and (ii) certify that those procedures have been fully complied with; and (b) whose acceptance under paragraph (a) has not been withdrawn by the Territorial Authority
INDUCTION LOOP SYSTEM.	A system including an amplifier and an array of cables installed to create a magnetic field in the space occupied by an audience and carrying the audio information to be coupled to pick-up coils located within receivers or hearing aid devices.
INFRA-RED SYSTEM	A system including an emitter and matching receivers to transmit an audio signal by using modulated infra-red light to the receiver and connected to headphones, a neck loop or directly to the hearing aid.
MAGNETIC FIELD STRENGTH	This is the magnetic field strength in the listening position, measured at ear level for the user, and is referenced to a magnetic force equal to 400mA per metre as a 0dB reference level.
NECK LOOP	A device similar to a necklace worn around the neck to carry the current from the output of a receiver and create a local induction loop in the vicinity of the person's head and hearing aids.
PS1	(Producer Statement) A statement from the designer of a system that the system is designed to fully comply with the relevant standards and building code.
PS3	(Producer Statement) A statement from the person testing the installed system that the system is installed correctly and complies with the requirements of the relevant standards and the building code.
RASTI	Rapid Speech Transmission Index
SPECIFIED SYSTEM	A system as defined in section 7 of the Building Act 2004 and as listed in Schedule 1 of the Building (Specified Systems, Change the Use, and Earthquake-prone Buildings) Regulations 2005.
STIPA	Speech Transmission Index for Public Address.
"T" COIL	"T" COIL The term is an abbreviation for Telecoil. This is the pick-up coil inside a hearing aid to pick up signals from an induction loop or a telephone handset.
WI-FI SYSTEM	A system including a modulator and Wi-Fi access points to transmit an audio signal by using Wi-Fi to the smartphone or similar device and connected to headphones, a neck loop or directly to the hearing aid.

4. PURPOSE AND SCOPE

To clarify and elaborate on the existing NZ Standard for Access (NZS4121:2001) and the Compliance Schedule Handbook to clearly define the requirements for the installation, maintenance and certification of Hearing Assistance Systems and in doing so provide a benchmark for Designers, Installers, Territorial Authorities (TA), Building Consent Authorities (BCAs), IQPs and building owners.

The aim is to ensure that the systems installed work to enable clear communication and full participation by people with a hearing disability.

THE CODE OF PRACTICE DOES NOT:

- Seek to define standards for buildings falling outside the types of building required to provide these systems as defined in the Building Code G5.3.5 and 5.3.6.

THE CODE OF PRACTICE DOES:

- Aim to be used as a reference document to summarise all requirements for Hearing Assistance System including the new options not already covered.
- Ensure that people with hearing disabilities are able to carry out normal activities and processes within buildings.
- Define ways to determine what equipment must be provided.
- Define the existing standards and clarify them for interpretation.
- Seek to remove confusion over sections that are not clear in the documents.

5. DESIGN

5.1 GENERAL

The installation of Hearing Assistance Systems is a type of building work relating to a specified system and, as there is no exemption for this type of work, requires a Building Consent from a BCA (Building Consent Authority) before work can begin. In some cases, an exemption can be granted, but it is not the norm, and a good case is required.

Systems shall be installed in accordance with the manufacturer's instructions and in a trades-like manner. Appropriate consideration shall be given to such issues as cable, background noise from installed wiring, daylight levels for IR systems, the requirement for privacy in some venues, ease of use.

The design of any system needs to provide full coverage of the audience zone.

Induction Loops and related Hearing Assistance Systems are included in the Compliance Document for the New Zealand Building Code Clause G5 2001, and as such are required to be included on a building's compliance schedule.

Building Consent applications that include Hearing Assistance Systems shall include a design specification which shows that the design complies with all aspects of the Building Code, NZS4121:2001 and the need to provide an effective working system. A system which complies with this Code of Practice shall be deemed to comply with the requirements of the above.

Hearing Assistance Systems must only be installed in accordance with the Consented plans for the building. It is essential that the designer of a Hearing Assistance System is familiar with the requirements for the specific site. This may include Audio Visual Systems to be installed on the site by other contractors. The designer needs to plan for connection to all systems that will be reproducing audio into the space. The equipment installed needs to comply with the New Zealand regulations for such systems, and if it is an Induction Loop, it should include a reference to the standard AS 60118.4-2007 which is identical to IEC 60118.4-2006. RF Equipment needs to conform to the NZ standards for transmitting devices and have been approved by Radio Spectrum Management MBIE for use in New Zealand. Infra-Red Systems are outside the Radio Regulations but must perform to the performance requirements of a Hearing Assistance System. Wi-Fi systems use RF transmission, and the Wi-Fi equipment must comply with the New Zealand Radio Regulations.

5.2 ASSEMBLY SPACES IN RETIREMENT VILLAGES

The requirements for Hearing Assistance in these places applies to spaces that can be occupied by more than 20 persons and have an installed Audio System. (An installed television receiver is an installed Audio System). These hearing assistance systems should be simple to use and maintain. Often the staff are not familiar with the systems and may also require training in how to fit and adjust the receiving equipment, or how to set hearing aids to the "T" setting.

See Compliance Document for New Zealand Building Code Clause G5.3.5 and G5.3.6 and also see NZS4121 section 12.2.2. Both of these documents need to be applied. (If there is no amplification system installed in a space (or television installed in the space) there is nothing to connect to the Hearing Assistance System – therefore it is ineffective and not required, as per NZS4121.)

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5.3 COMMUNAL NON-RESIDENTIAL ASSEMBLY SPACES

Communal Non-residential assembly spaces occupied by more than 250 people, and any theatre, cinema or public hall. G5.3.6 (a & b)

As in 5.2, this needs to be read in conjunction with the NZS4121 section 12.2.2.

Note: with facilities that include a stage or specified performance area that is not a part of the audience area this may need to be excluded from an Induction Loop coverage zone as Induction Loops do interfere with some musical instruments.

5.4 INPUT TO LISTENING SYSTEM

All audio producing devices which are supplying amplified audio to the room (including television displays) need to also be connected to the listening system, so users get the benefit of the system.

(With some new construction, the Hearing Assistance contractor may not be the A.V. system contractor, and so contractors need to coordinate with each other to ensure this requirement is achieved.)

5.5 CHOOSING AN ASSISTIVE LISTENING SYSTEM

The current range of choices includes: Induction Loops, Infra-Red Systems, FM systems, Wi-Fi based systems. Other systems may become available in the future.

Although Induction Loops are the older system, they are still a good choice and the main type used in the UK and Europe. In the USA, they are becoming a more popular option than they have been. There are places Induction Loops do not work well. In a retro installation, they may be an expensive option to install if it is necessary to remove floor coverings to install the loop array and then replace the floor coverings.

Infra-Red Systems are a good choice for many locations as they do not interfere with radio systems and yet work well. They can be designed to be multi-channel systems should translation be required as well as hearing assistance.

FM radio systems are good for stadiums and larger areas but not ideal for where privacy is critical (unless an encrypted system is installed). Note: FM radio systems must operate on frequencies approved for use in New Zealand. They must not interfere with licenced users of the Radio Spectrum. (If they operate in the television band they will need to avoid the locally used frequencies).

Wi-Fi systems require the user to connect to the Wi-Fi system, to have the correct app installed and to have suitable headphones or way to convey the audio to the user. For Retirement Village type locations and for Primary Schools these may not be an ideal choice. In retirement villages where people are not so familiar with the Internet users who require hearing assistance may find WI-FI too difficult. In a primary school, it is not so common to find users who have cell phones. All locations that install Wi-Fi should provide receivers, neck loops and headphones to those who require them. These will need to be maintained.

There are a number of factors to consider when making the choice of which system to use in a venue.

1. Is privacy required?

If it is, then eliminate FM and possibly Induction Loop systems. Infra-red is the best option. (Ultra Low Spill Loop Arrays will have some leakage outside the specific room for a short distance. Also, leakage occurs vertically above and below the room. An FM system that uses digital encryption may be a viable option.)

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2. Will the space be exposed to direct sunlight?

Are there large windows facing North, East or West. Will sunlight spill onto the audience? The options are Induction Loop, FM, or Wi-Fi.

3 Does the space suffer from Electromagnetic Interference?

If the level exceeds -32dBA, then an Induction Loop is not acceptable. If the background noise level exceeds -46dBA, then the noise may be irritating to users if they will be listening for extended periods of time. Look at Infra-red, FM or Wi-Fi. A survey of any site to check for this is recommended before committing to an Induction Loop as the considerable expense of installing a Loop is wasted if it cannot be used. In some cases, the cause of the interference can be treated. With a new building check the location for the main electrical cables entering the site. If these pass under or over the room with the induction loop, this may cause the system to fail the Noise test.

4 Is the site very large?

An FM solution is likely to be the best option as these can cover stadiums if the correct equipment is installed.

5 Who are the likely users of this system?

For elderly people or primary school applications, a simple-to-use system is needed – is the system one that these people will manage easily?

6 What installed systems could conflict with the proposed system?

Some sites use many radio systems, and adding another radio system may not be a good option. (Either lack of suitable frequencies or RF intermodulation problems may arise.)

7 If WI-FI is being considered, requirements that need to be considered include:

RF signal level over the entire space, will it meet the system requirements?

Will it work when the space is fully occupied by people carrying cell phones?

Will this be a stand-alone system, or will it use an already installed Wi-Fi system?

If so, does the Wi-Fi system meet the requirements for the number of users the system will need to support?

8 Does the building have large amounts of steel in the structure, including reinforcing steel in floors, "Rondo" steel support for ceilings, Drop ceiling grids, Iron or metal roofing above the listening area, Steel deck to support the floor slab, including floors above the level the induction loop is to be installed on? In cases, with significant amounts of steel, the designer must include these in the calculations to prove the design will work in the space. This may require assistance from the equipment manufacturer.

5.5.1 WI-FI SYSTEMS

At the time of writing this document, the current Wi-Fi based systems suffer from excessive latency, commonly in excess of 100 milliseconds (100ms). In many cases, the latency varies with the type of receiver and with the number of users connected to the system. This results in late arrival of the Hearing Assistance system information at the user compared to the direct audible path which causes a disturbing echo and degrades audio clarity or intelligibility. Also, people with a hearing problem often rely on partial lip-reading, and this latency can make lip-reading difficult. The IEC Code of Practice TR63079 amendment 2, recommends the

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difference in time to be less than 30mS and has a limit of 50mS. This means that Wi-Fi systems with latency in excess of 50mS may be unsuitable for many sites where a hearing assistance system is required. (There may be locations where no live audio is amplified, and the latency of the Wi-Fi system can be configured to match the sound from the audio system. If this cannot be achieved, then consider using one of the other options for the hearing assistance system. Some sites may be so large that no system can meet this requirement over the entire listening area.

At the time of writing, it seems that the latency of Wi-Fi systems is not consistent and cannot be accurately predicted.)

5.5.2 INDUCTION LOOP SYSTEMS

The design of an induction loop is complex, and the system designer must be informed of all loops in the vicinity, all metal in the vicinity of the loop, floor wall, ceiling and roofing above the loop. Many parts of New Zealand are earthquake-prone, and new construction in these zones will include heavy reinforcing of concrete floors. It is important that this must be accounted for by the designer. (Overhead metal structure and roofing must be included in loss calculations.)
When the room allows for it, an Induction Loop has some advantages over the other options.

These include:

- Direct connection to hearing aids when the aid is set to the "T" setting. (Not all aids have a "T" setting.)
- Simple for users to connect to.
- Well understood system
- Low management requirements.
- Because the users hearing aid is correcting for the specific hearing loss of the user, this has benefits over systems that do not use the listeners Hearing Aid.

NZS 4121:2001 section 2.3.3 has a requirement that the system shall be usable by people who do not have hearing aids. This requires sites to have some receivers for users who do not have a "T" coil equipped hearing aid.

Types of Loop commonly used include:

- Perimeter Loop – for very small loops or buildings with very low metal content.
- Figure 8 Loop – for larger buildings with low metal content or small loops in rooms with some metal content.
- Cancellation Loop – for rooms where a perimeter loop can be used but there is an area that must not get the loop signal, such as a stage or an adjoining room with a loop in there also.
- Array Loops or Figure 8 Loops – these are only appropriate for rooms with fixed seating so that the nulls between loops can be located in positions where people do not sit. If the seating is moveable, then this system should not be used.
- Phased Array Systems – for buildings with high metal content and for tight control of loop spill outside the loop area. These systems require the use of a special 90-degree phase shifter and two amplifier channels.

These systems need to conform to the AS 60118.4:2007 performance standard over the audience area of the room. Rooms with a designated stage or performance area are best to not include this zone in the loop coverage if it is likely that musical instruments will be used in this zone. (Loops installed after 1987 but before 2007 must conform to AS 1088.4-1987).

5.5.3 INFRA-RED SYSTEMS

For many rooms, this is a good option as it has simple installation requirements and does not interfere with other AV systems that may be in use in the space. Sunlight

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or open sky can result in noise problems for users near windows if these allow direct sunlight onto the audience. In many cases, the reflected infrared signal makes the coverage better than line of sight and fills in coverage into areas that would not receive the direct signal from the Emitter. Larger spaces may require more than one Emitter. Most of the current systems use common modulation frequencies and can have a variety of types of receiver used with the Emitter. Some systems only provide Headphone/Headset receivers. This does not work well for all Hearing Aid users. Most modern Hearing Aids can use this type but not all. Where the room has acceptable Electromagnetic noise levels, good practice would dictate that some Neck Loops are also be provided.

5.5.4 FM SYSTEMS

The FM systems are probably the simplest system to install and also are suitable for very large spaces when the right equipment is used. These mainly use FM modulation, although there are a number that use digital encoding and modulation. As these use Radio frequencies, the system must comply with the current Radio Spectrum plan for New Zealand and the equipment must be approved for use by the Radio Spectrum Management section of MBIE in Wellington. From time to time, the regulations are reviewed and changed. If a system is then found to be outside the radio regulations, the system will have to change the frequency or be replaced with a system that complies. Normally these systems have dedicated receivers that can be connected to either a neck loop or a set of headphones. Some countries set aside frequencies for Hearing Assistance systems, but New Zealand does not precisely follow the overseas frequency allocation. This means that most of the manufactured systems cannot be imported into New Zealand as they are capable of transmitting on frequencies we are not permitted to use here. Where a number of radio systems are used on a site, and they are operating on frequencies close to the Hearing Assistance frequencies some Frequency Co-ordination may be required to prevent intermodulation of these systems. Where the room has acceptable Electromagnetic noise levels, some Neck Loops should also be provided.

5.6 HOW MANY RECEIVERS TO PROVIDE FOR SYSTEMS OTHER THAN INDUCTION LOOP?

New Zealand does not currently have any standards for this, and neither does the UK or Europe. Both the USA and Australia do have standards. Having investigated the two options, the ADA (Americans with Disabilities Association) standard for accessible design Table 219.3 is a practical guide. This includes both Receivers and Neck loops for use with the receivers. Sites need both Headphones and Neck Loops. Earbuds are not an option as these have greater hygiene issues and are more difficult to clean effectively. Also, they are not possible to use where there is a hearing aid installed in an ear. Where possible rechargeable systems will be preferred as they provide a way to ensure systems are kept charged and ready for use, and these reduce the possibility of a system being flat and non-functioning when required. Rechargeable batteries reduce the waste of disposing of flat batteries.

5.7 PROVISION FOR NON "T" EQUIPPED USERS.

The standard NZS 4121:2001 section 2.3.3 requires the provision of receivers for use by people who do not have hearing aids, suitable for a range of severity of hearing impairment, safe and easy to use/control, suitable for intended use, maintained regularly. This means where any system

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is installed; it needs to cater to those with "T" equipped hearing aids and also those who do not have this facility. This requirement has not been well applied in the past. Consideration needs to be given to this so that systems can be used by those without "T" coil equipped hearing aids. Infra-red systems, FM systems and other options need to provide for "T" equipped hearing aid users and non "T" coil equipped users. (Exceptions will be sites where background electromagnetic interference makes any loop-type receiver unusable.)

5.8 LOCATIONS WHERE A LOOP MAY NOT BE SUITABLE

There are a number of places where loops may not be the best choice of system. These include locations where the background electromagnetic interference is above the minimum of -32dBA and preferable better than -46dBA (often due to the location of main electrical feeder cables close to the loop zone that are not containing these fields effectively, also large transformers, or electric motors can cause this problem). Also, the placement of loops directly above or below another loop, or beside another loop must be looked at closely to ensure that there is enough separation to prevent the loops interfering with the loops nearby (called overspill). Low spill arrays help here, but there are limits to where they will work. Loops may not be suitable where a high level of privacy is required. (Courtrooms and similar places frequently choose Infra-red for this reason.) When loops are located near other loops, an overspill test should be carried out. The location and level should be recorded on the test sheet for the site. Within the room that is in the overspill zone, the level from the interfering room should be -40dBA where the audience is located.

5.9 FIRE ALARM INTERFACE

Where required by the fire engineer, a system must be able to mute during activation of the fire alarm. This must work and be easy to test for correct operation. It is ideal for this to display a muted LED on a panel so that the inspection of the Fire alarm will confirm the operation of this function.

5.10 SIGNS

The Building Code Section F8-5.0.3 specifies where signs are required. At the main door(s) to the building and entrance doors to the room. If a door is only an exit door, then it should not require a sign.

NZS4121:2001 section 4.8 includes a height range for locating signs, 1400mm to 1700mm to the lower edge of the sign plate. Appendix E includes the International symbol. This is not copyrighted.

Note: New Zealand does have a specified colour or size for these. This may be changed when required as long as there is sufficient contrast to be effective. Signs must include the international deafness symbol. They can also include additional information such as the type of system installed, and directions where to get receivers for the installed system. For Wi-Fi type systems there can be a QR code to direct users to the Software for the specific system.

6. INSTALLATION PRACTICE

Note: The designer's plans and instructions should be followed accurately for the system. Any changes to design need to be approved by the designer.

6.1 INDUCTION LOOPS

The type and size of loop cable and feed cable needs to be followed because their specifications have been calculated and the layout designed to match the system.

The loop cable layout on the floor needs to be within 50mm where possible. Where a part of the structure of the building is in the path of the loop cable, it will be necessary to go around the obstruction. The installer must observe the direction the cables are laid and make sure the plan is followed, so the resulting electromagnetic fields work as intended. Do not install cables smaller than specified in the design. When Induction Loops are laid in a concrete floor slab, it is important to not run the wires against and parallel to the steel reinforcing, but tie the loop cable into the centre of the squares of the mesh, using cables ties to secure wires in place. For use in Concrete slab do not use PVC insulated cables but a cable type appropriate for the purpose. In cases where polystyrene is installed, it may be possible to fix directly to the surface of the polystyrene as long as a suitable cable is used. Fence staples may be a way to achieve this. For a ceiling loop, the loop cables must be kept away from steel "Rondo" ceiling grid or a grid for a drop ceiling. This may require the use of Catenary wires. These catenary wires should be insulated and not form a complete square but be separate runs for each side of the system.

Where feed cables link the output from the loop amplifier to the Floor Loop these need to be twisted cables to minimise the losses and reduce interference with other circuits including data and low-level audio signals, keep these cables away from low-level signal cables. All audio inputs to the loop amplifier should be balanced where possible and unbalanced inputs must be kept short. (Feedback or instability can result if this is not observed.)

6.2 INFRA-RED SYSTEMS

These should be considered as "line of sight" systems and a location selected where the Emitter is visible to all of the audience. In locations where there are theatre curtains or a proscenium, the Emitter must be on the audience side and not blocked when the curtains are closed. A high location will help to achieve a line of sight to the audience further back in the room. Check with the manufacturer's data for coverage angles when selecting the locations and when aiming the Emitter. Do not enclose the Emitter in a plastic box, as the heat generated will need to escape. A box will also reduce the Infra-Red output of the system.

6.3 FM SYSTEMS

The location of the transmitter can be quite flexible in many cases, but for large areas, the guidance of an RF engineer may be required to get full coverage with the limited RF power output permitted. Where a dipole antenna is used, often it is best to mount this vertical to achieve the required coverage pattern. A long coaxial cable between the Transmitter and Antenna will require the selection of a suitable low loss cable.

6.4 WI-FI BASED SYSTEMS

These can be set up using the installed Wi-Fi system if it meets the equipment manufacturers specifications. Otherwise, a dedicated system will be required. Where the site has an existing system, it will be necessary to work closely with the IT staff who look after the site. Do consult the manufacturer's data for required signal strength over the entire listening area and remember that the

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level may change once an audience is in the room. These systems require certain settings and ports to be open on the Wi-Fi hardware, and the IT staff may need to be warned against changing them as this is a specified system and must work as designed.

6.5 FIRE ALARM MUTING INTERFACE

The link between the fire alarm panel and the Audio system should preferably be set up, so the system operates when the relay is closed at the alarm panel, and when the relay is open at the alarm panel, then the Audio System is muted. Some engineers will ask for a visual indication of the status of the audio system so they can check it without requiring an SS12 IQP being present to prove the muting is working.

6.6 AS-BUILT DRAWINGS

As-built drawings clearly identifying each system, their location, make and model of the installed hardware and the connections to the Audio system shall be provided to the BCA when the system is installed, and this plan shall be included as part of the Compliance Schedule and made available to the owner or IQP as required.

7. TESTING AND MAINTENANCE

7.1 GENERAL

It is required that all Hearing Assistance systems are maintained and checked for correct operation and performance by an appropriately qualified IQP who will also attend as required to any failures of the system.

Building owners need to ensure that batteries, neck loops and headsets for all receivers are in good working condition and all receiver headsets are cleaned and hygienic. (Check that the site has a hygiene policy.)

The Compliance Schedule Handbook under section SS12/2 FM radio frequency systems and infrared beam transmission systems B.1 asks for a signal transmission strength test, but has no pass or fail metric. A meaningful measurement is the signal to noise measurement, the Induction Loop standard AS60118.4-2007 has a pass or fail signal-to-noise ratio test, which can be useful here.

Note: The standards that apply when a system is installed are the standards that the system must comply with throughout the life of that system. The IQP testing the systems needs to have copies of current and previous standards and be aware of the installation date of the system they are inspecting.

7.2 INSPECTIONS

The following inspection and maintenance procedures shall be included in the building's compliance schedule and completed for the provision of a Certificate of Compliance (Form 12A) for a building warrant of fitness. However, the BCA or TA may increase the frequency of IQP inspections depending on the risk within the occupancy or use of the building.

Minimum inspections shall include:

SIX-MONTHLY (BY IQP)

- All receivers shall be checked to confirm they are: fully functional and effective and work over the full area of the system.
- All signage related to the location of the Hearing Assistance system is checked and replaced if damaged or missing.
- Performance of the total system be checked for the following:
  - Full coverage of the Audience zone, (If this is not full, then a map showing the coverage zone is required at the room entrance.)
  - Frequency Response (for induction loops in a room a number of spots should be tested). With reference to 1000 Hz, the limit is plus or minus 3dB at 100Hz and 5kHz.
  - Level of Signal (For induction Loops see AS/NZS60118.4:2007).
  - Signal-to-noise ratio A-weighted. Must be -23dBA or better.
  - A listening test using speech, preferably to check for distortion and clarity.
  - Where possible Infra-red, FM and Wi-Fi systems should also be tested for the Frequency response, and signal to noise ratio and these should meet or exceed the performance of Induction Loops systems.
- For Wi-Fi systems, the latency of the system should be checked to confirm it is within the 40mS limit compared to the Audible sound. This may require specialised test equipment and Software to verify so may not be

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required to be repeated once the latency has been checked. Very large venues may not be able to meet this requirement over the whole listening area.

- The accuracy of the compliance schedule, plans and specifications shall be checked, and if necessary, an application for amendment (Form 11) submitted to the owner to be provided to the Territorial Authority.
- RASTI Test (Compliance Schedule Handbook Page 43- B.3). This asks for a test of the sound amplification system in the room. The problem is that there is no standard for a pass or fail. The RASTI standard is obsolete, and the current standard is STIPA. The Building Code has no requirement for an audio amplification system to be designed to meet any standards at all. Very few people have the tools to test RASTI. IEC TR 6.079 Annex I includes this measurement. They have no pass or fail metric for the test.

7.3 COMPLIANCE

Only systems which have been maintained in accordance with section 7.2 are deemed to comply with this standard for the purpose of certification for a Building Warrant of Fitness.

The installation shall be carried out by competent personnel who have a proven industry training record in Audio and Hearing Assistance systems. The installer shall complete a Producer Statement Construction (PS3) on completion, and provide a set of as-built plans for Code Compliance.

8. REFERENCES

New Zealand Building Code documents:

- Compliance Document for New Zealand Building Code Clause G5, Interior Environment G5.3.5, 5.3.6
- Clause F8, Signs 5.0.2, 5.0.3
- F8.3.1
- Compliance Schedule Handbook SS12
- NZS4121:2001 Standard for Access
- Building Act 2004
- IEC Code of Practice TR 63079 Amendment 2
- 2010 ADA Standards for Accessible Design
- AS1088.4-1987 This Induction Loop performance standard is referred to in some documents. It was replaced in 2007 by the following document. All systems designed and installed after 2007 should be using the standard below. Apply AS 1088.4-1987 to systems installed from 1987 – 2007.
- AS 60118.4-2007. This has a specification for interference noise level which was not part of the previous standard.
- GURL-Short Range Devices 2019 (Radio Spectrum for Short range devices).

9. APPENDIX

9.1 SAMPLE INSPECTION SHEET

Certificate of Conformity

Company Name Here

for Induction Loop Hearing Assistance System

BWOF Date

1	Volume of Use	Seated		Typical: 1.2m range 1 to 1.4m
		Standing		Typical: 1.7m range 1 to 2m

Sketch of floorplan, indicate scale.

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9. APPENDIX *cont.*

9.1 SAMPLE INSPECTION SHEET *cont.*

2	Measurement points	A	B	C	D	E
	Height (in metres)					
	Noise dBA					
	Frequency response 100Hz					
	1 kHz					
	5 kHz					

	Final Signal Strength					
	Overspill Test	Is test required?			Yes	No
	Equipment					
	Signage at Entrances					

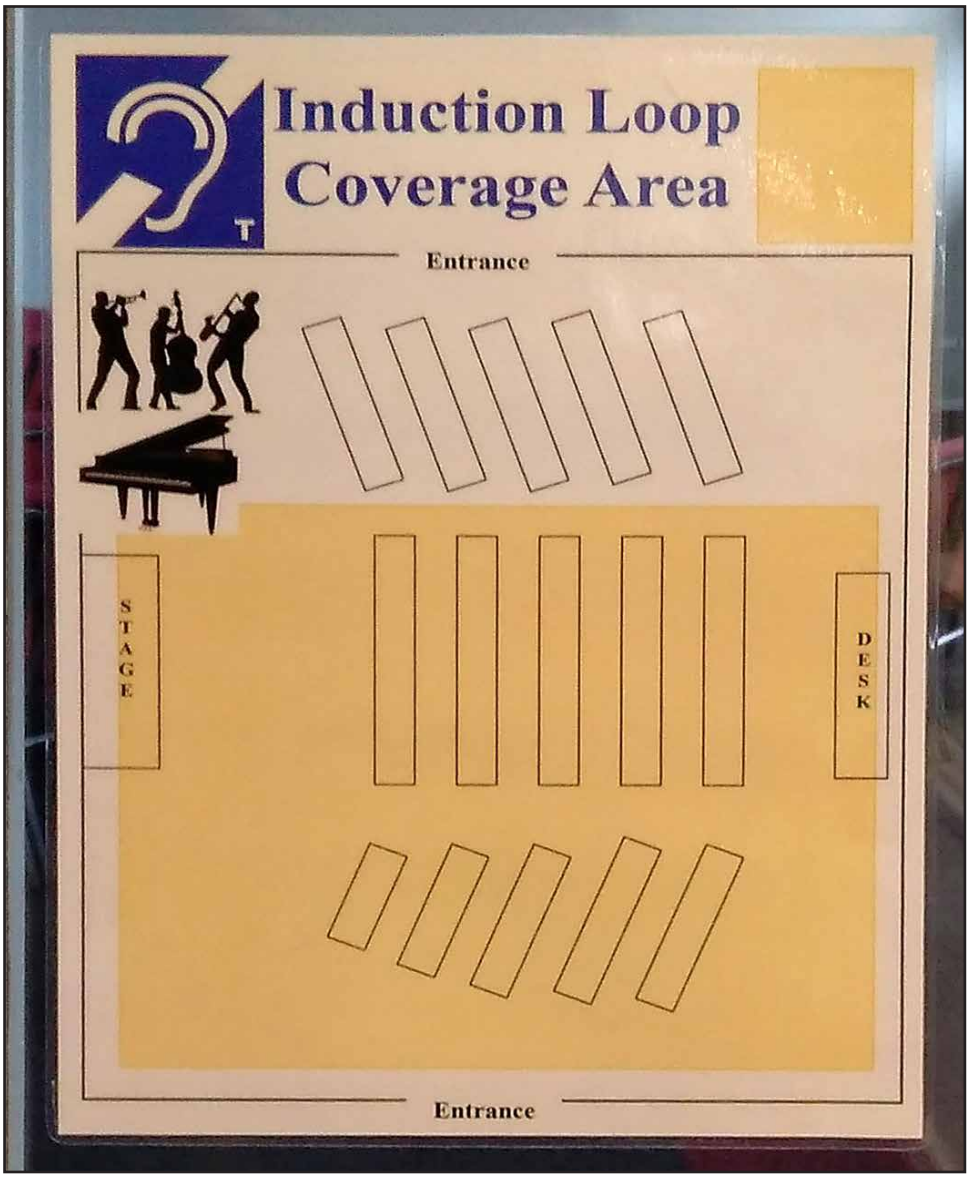
3		
	Customer	
	Venue	
	Installation by	
	Inspection by	
	Comments	*Notes*
	Pass / Fail	

Declaration that the system has been tested to achieve performance as required by Compliance Schedule Handbook	Signed	Date

- A modified version can be used for FM, Infra-red or WI-FI systems.

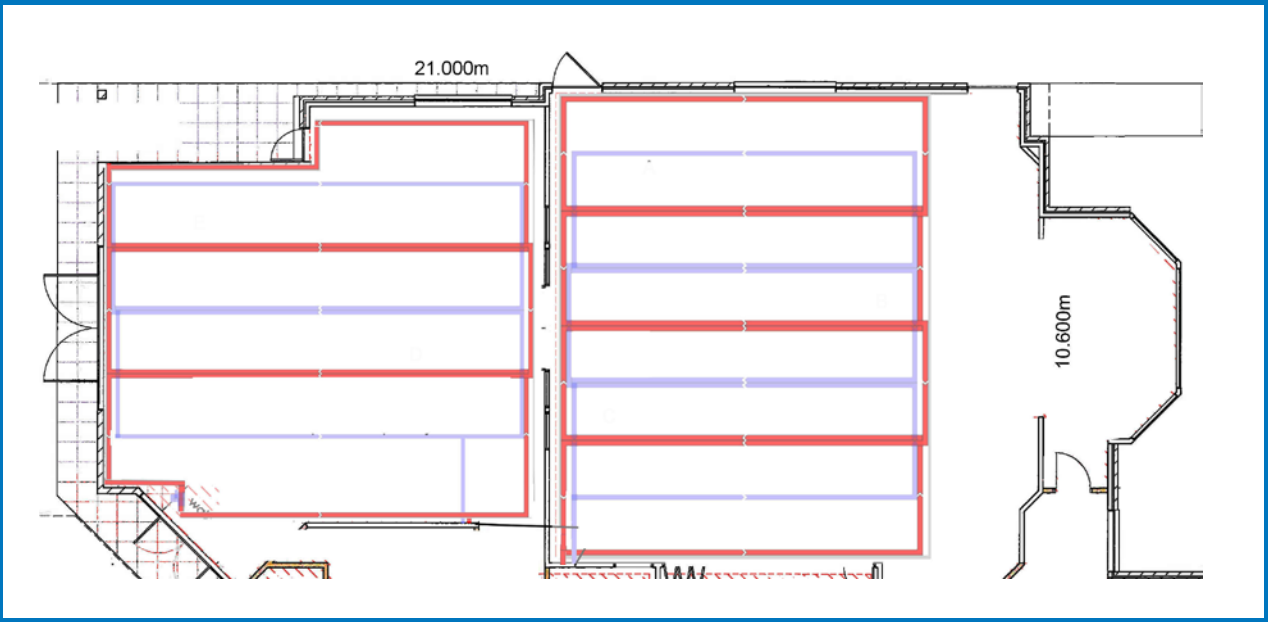
9.2 EXAMPLES OF SIGNAGE

- The colour is specified as Safety Blue BS 525 colour No. 18E53. Other colours may be used to fit with décor, but contrast must be sufficient to make the sign clearly visible.
- The Letter is optional and adds information on the installed system.
- Further information can be printed to assist users to locate and use the installed systems.



9. APPENDIX *cont.*

9.3 EXAMPLES OF FLOOR PLAN



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