U.S. Architectural Specifications for Hearing Loop Systems

1 Induction Loop Requirements

Supply and install the complete systems detailed within this specification. Install induction loop system(s) at the following locations and areas:

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The Hearing Loop system shall incorporate all necessary components and accessories, including but not limited to the following:

- Hearing Loop system design, including loop layout design;
- Hearing Loop drive equipment, ancillary components, and mounting accessories;
- Appropriate Audio Input systems, if not provided by Client;
- Hearing Loop wire or tape with appropriate fixings or containment and associated feed cables;
- Hearing Loop test equipment.

2 Compliance

The Hearing Loop system shall comply with:

- IEC 60118-4:2006

A Certificate of Conformity to this standard shall be issued for each Hearing Loop System in the project.

The Hearing Loop drivers shall comply with:

- IEC 62489-1

The selected Hearing Loop drivers have been measured and tested to this induction loop performance standard.

In addition, the system shall comply with:

- 2010 Americans with Disabilities Act (Section 706)
- 2012 International Building Code (Section 1108.2)

3 System Design

The Contractor shall:

- At the earliest opportunity in the project, provide evidence that the background magnetic noise in the areas designated for loop coverage is within the limits defined in the standard, IEC 60118-4:2006. The Contractor shall not proceed

without Client approval if the background magnetic noise exceeds -32dB re: 400mA/m^{-1} [-22dB for short-term use/localized applications].

- At the earliest opportunity in the project, The Contractor shall provide evidence that a **field-certified technical specialist has performed a site assessment** to determine the effect of metal within the structure of the building and that metal loss shall be compensated for by loop design and / or appropriate loop driver selection indicated in the bid.
- Design system to include the entirety of the room indicated in section 1. Contractor shall submit any areas of exclusion to indicate functional space that is not included. Areas of exclusion in the room must be indicated in signage to be posted to achieve certification.
- Before installation, provide calculations demonstrating that the proposed systems' field strength will meet the standard IEC 60118-:2006 requirements.

4 Audio Input

Audio inputs shall provide a clear pickup of all wanted audio signals while minimizing unwanted audio and background noise.

- The input system design shall provide selective amplification of the intended audio signal above the general sound level in the area.
- Where a sound reinforcement system is installed, a balanced XLR or line-level feed from the system to the hearing loop should be used where this is appropriate, which may include feeds from emergency evacuation systems.
- A single boundary microphone mounted on the ceiling is unlikely to reject background acoustic noise in most rooms sufficiently and should not be used unless it can be demonstrated that the system delivers tangible benefit to the hard of hearing.
- Input levels shall not be adjustable at the signal source or connection point.

5 Hearing Loop Drivers

Hearing Loop drivers shall be provided to amplify input audio signals and to drive the loop systems appropriately. The drivers shall meet the requirements for a type A or type B driver as defined below.

5.1 Type A: Large Area Hearing Loop Driver(s)

Where the horizontal loop area that must be covered is more than 6½ feet x 6½ feet for either a single-phase or dual-phase (phased array) system:

Each induction loop driver shall have the following characteristics:

- ‘Current drive’ output.
- The rated current and voltage can drive the designed loop without clipping or distortion of the signal with a total power bandwidth of up to at least 1.6kHz.

- Capable of delivering the rated current and voltage into a load with a 1kHz sinewave signal for 120 minutes without damage to the unit or interruption of the output signal.
- Frequency response from 100Hz to 5kHz
- THD+N less than 0.2% at 1kHz sine at full current.
- Input facilities of a type and connection suitable for the intended audio inputs to the system. Where input connections are to exceed 10 feet in length, balanced inputs shall be available. Balanced microphone inputs shall have phantom power available.
- Front panel indication of audio signal activity on the output of the unit and, where possible, the input.
- Adjustment of controls for commissioning shall be achievable without exposure to terminals carrying hazardous voltages.
- All AC-powered devices shall have passed testing at a Nationally Recognized Testing Laboratory (NRTL) for safety with reference to the current edition of UL 60065 and any other applicable safety standards.

Where two-phase systems are required, a single unit shall be provided that is capable of driving two separate outputs with a 90° phase shift accurate to ±1° from 100Hz to 5kHz, or two identical drivers shall be provided unless it can be demonstrated in the system design that this is not appropriate. If two identical drivers are appropriate, in addition to the requirements above, each driver shall have the following characteristics:

- The secondary input/output socket provides an insert point after the input AGC but before the output drive control.
- Auxiliary power outlet on the rear panel with ±15V dc, 150mA minimum capacity.
- Front panel indicators to indicate separate fault conditions of overload, overheating, and loop error

In a two-phase system, there shall be an independent 90° phase shift unit (to be provided) with the following characteristics:

- Derives power from a loop driver DC power outlet or self-powered internal device.
- Obtains input signal from one loop driver slave output or internally routed.
- Provides separate outputs to both primary and secondary driver inputs.
- Generates a constant 90° phase shift between the outputs or internal device that is selectable via a button 0° - 90°
- Accuracy ±1° from 100Hz to 5kHz

5.2 Type B: Counter / Local Area Hearing Loop Driver(s)

Where the loop system provides assistance to a single end user in a defined location, such as a retail counter or information point

Each hearing loop driver shall have the following characteristics:

- 'Current drive' output with current capability of at least 2.2A rms with 1KHz sine signal
- Voltage output of no less than 4.5V peak at maximum current.
- Frequency response from 80Hz to 6.5KHz
- Automatic gain control (AGC) optimized for speech with a dynamic range greater than 36dB
- Metal loss correction with an adjustable gain slope range of at least 0dB to +4.5dB / octave
- Minimum of 2 inputs: 1 microphone input and 1 input switchable between microphone or line
- Panel / wall mounting capability (using screws or other appropriate and reliable mounting)

6 Hearing Loops

Loops connected to the Hearing Loop system shall meet the following requirements:

- Be designed and implemented to meet all requirements of section 3 above.
- The implementation of the hearing loop design shall take into account the layout and construction materials of the building.
- Appropriate materials for the installation location shall be used (e.g., wire in the floor/ceiling, flat copper tape under floor coverings, or a purpose-designed loop coil inside a counter vertical front).
- Loop wire containment shall be of non-metallic construction (to avoid short circuit grounding paths parallel with the loop wire). This restriction does not apply to the loop feeder cables between a loop amplifier and the start of the loop, which may be installed in metal or non-metal containment.
- Where flat copper tape is accepted for use under carpet or other floor coverings, this does not require containment and shall be installed according to the manufacturer's recommendations and current best practices.
- Implementation of the loops shall follow best practices.

7 Hearing Loop Receivers and Test Equipment

7.1 Hearing Loop Receivers

For each hearing loop system, a hearing loop receiver shall be provided for operational staff to check and monitor the performance of the hearing loop system, as well as for use by those without a telecoil-enabled hearing device. The receiver shall have the following characteristics:

- A 3.5 mm headphone output.
- Include one pair if dual-ear headphones per unit,
- Include one neck lanyard per unit,
- Possess a low-frequency EMI filter.

The total number of receivers specified for this project is _____.

7.2 Field Strength Meter

If the Client or operational staff are required to set up, commission, or carry out a specified maintenance period (i.e., every 3, 6, 9, or 12 months), a field strength meter shall be provided capable of commissioning to the requirements of IEC 60118-4:2006. The meter shall have the following characteristics:

- Calibrated reading of 0dB at 400mA/m rms as per IEC 60118-4:2006
- True RMS measurement with 125mS time constant.
- Class 2 meter as defined in IEC 61672-1:2003 (Electroacoustics – Sound level meters)
- A-Weighted background noise range of at least -42dB to -12dB
- Field strength measurement range of at least -22dB to +8dB, with increments of 1dB from -3dB to +3dB
- Frequency band mode with 1/3 octave frequency bands centred on at least 100Hz, 1kHz and 5kHz meeting IEC 61260:1996 and IEC 60118-4:2006
- Headphone output for listening to the hearing loop signal.

8 Installation

The Contractor shall:

- Coordinate with other relevant contractors to ensure all appropriate audio signals are connected to the induction loop system and transmitted clearly.
- Provide appropriate cabling and/ or connection points for system integration.
- Wire and connect to all items of equipment in accordance with the manufacturers' recommendations.
- Ensure complete segregation of the Extra-Low Voltage (ELV) wiring system from any other ELV or Low Voltage (LV) system.

- Provide all necessary and supplementary grounding conductors and connections to each component or item of equipment.
- Follow good audio and other relevant practices to ensure that proper grounding and other cable system designs do not cause degradation of this or other system performance by allowing interference in inappropriate paths.
- Confirm locations of all local power supply requirements and equipment spatial requirements.
- All wiring of loops and between equipment locations shall be installed and concealed in appropriate containment.
- All wiring, including that inside equipment enclosures or racks, will be of a neat appearance. Wiring shall be identified at both ends of each cable.
- Ensure that all aspects are in accordance with the appropriate (AHJ) Authority Having Jurisdiction.

9 Commissioning

The Contractor shall:

- Include testing and commissioning of the complete system(s) in accordance with IEC 60118-4:2006
- Provide a method statement for testing and commissioning. Provide all necessary test equipment to complete the work. All test results are to be fully recorded, and copies are provided with the Operation and Maintenance manuals.
- Provide a minimum of 14 days' notice of all testing so that a Client's representative may have a reasonable option to attend and witness tests.
- Provide operating instructions for all items of equipment and installed systems. Demonstrate all systems and methods of use to the end user.
- Provide "As Installed" drawings and Operation and Maintenance manuals for all Hearing Loop Systems.
- When carrying out commissioning, use a Field Strength measurement tool with a minimum specification as in section 7.2 above.
- Issue Certificates of Conformity to IEC 60118-4:2006 that clearly state the testing results and whether the system performance meets the relevant requirements of the standard.

Where the induction loop wiring is to be installed before the driver/amplifier equipment, the loops shall be tested for continuity and isolation from electrical ground and metal structures/containment. The Client shall have the opportunity to witness these tests, which shall be recorded and documented.

10 Training and Maintenance

Training and instruction documentation shall be provided to enable operational staff to understand the proper use of the hearing loop system and how to ensure that people with Telecoil-equipped hearing devices can use the system effectively.

A test and maintenance schedule shall be provided.

Training and instruction documentation shall be provided for operational staff to use and perform regular functional tests on the system(s). This training shall include, but not be limited to, demonstrating the correct use of the test equipment and hearing loop drivers provided.

Sources:
Ampetronic, Generic Assistive Listening US Specification Hearing Loop Systems UP60007-11 US.