SECTION 27 51 26

ASSISTIVE LISTENING SYSTEMS

**BASED ON DFD MASTER SPEC DATED 03/01/21**

Notes to A/E:

This section has been written to cover most (but not all) project conditions that you will encounter. Depending on the project, you may need to add material, delete items, or modify what is currently written.

This document is structured to automatically update the Table of Contents when printed or in response to an “Update Field” command (right mouse click on TOC opens menu) in MS-Word. Confirm that changes to the document outline are reflected in the TOC. TOC entries are Hyperlinks and can be used to navigate the document.

The hearing loop system described in this section is one type of Assistive Listening System for spaces intended to be used for gatherings of 15 or more people and where audible communications are integral to the use of the space. Consider available alternative measures for Assistive Listening Systems in lieu of installation of permanent hearing loop systems.

Revision History:

New section 06/15/20.

1. GENERAL

Scope

Provide “Hearing Loop” type Assistive Listening System(s) as indicated on the drawings and as specified herein. The technology consists of a physical loop system that generates a magnetic field in the looped area and transmits signals directly to telecoils in hearing aids, cochlear implants, and other listening devices.

Included are the following topics:

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Related Work

Applicable provisions of Division 1 govern work under this Section.

Section 01 91 01 or 01 91 02 – Commissioning Process

Section 26 05 26 – Grounding and Bonding for Electrical Systems

Section 26 05 29 – Hangers and Supports for Electrical Systems

Section 26 05 33 – Raceway and Boxes for Electrical Systems

Section 26 05 53 – Identification for Electrical Systems

References

ADA Americans with Disabilities Act 2010 (Section 706)

ANSI A117.1 Standard for Accessible and Usable Buildings and Facilities

IBC 1108.2 International Building Code 2015 (Section 1108.2)

IEC 60118-4 Electroacoustics - Hearing Aids - Part 4: Induction-Loop Systems for Hearing Aid Purposes - System Performance Requirements

SPS Chapter 316 Wisconsin Dept. of Safety and Professional Services Electrical Code

Manufacturer Provided Services

A manufacturer-trained service technician shall provide the following installation supervision. This Techni­cian shall be certified by the equipment manufacturer and shall have a minimum of two (2) years of service experience in the assistive listening system industry.

The service technician shall be responsible for the following items:

* Pre‑installation visit to the job site to confirm conditions as described in PART 3 and verify method by which the systems is to be installed.
* Periodic job site visits to verify installation and wiring of systems.
* Upon completion of wiring, oversee final equipment connections, final checkout and certification of the systems.
* Participate in Agency Training as described in PART 3.

Qualifications

All equipment shall be supplied by a company which specializes in Assistive Listening Systems with a minimum of five (5) years-documented experience. The company shall be an authorized distributor of the proposed equipment.

All work shall be performed by a certified contractor who is regularly engaged in the installation and servicing of Assistive Listening Systems. Proof of five (5) years documented experience and of factory authorization to furnish and install the proposed equipment shall be furnished with the submittals.

Submittals

Provide, at a minimum, the following:

Cover Sheet including the submittal date, specification section, contractor name, system vendor name, and the project number and name.

Equipment list, including quantity, manufacturer, manufacturer part numbers, and equipment descriptions.

* + Spare parts shall be listed separately and labeled as spares.
	+ A separate equipment list shall be provided for each Assistive Listening System.

Manufacturer’s data sheets, wiring diagrams, and installation manuals for each piece of equipment provided. Data sheets shall be bound in the order they occur in the equipment list.

* + If an item occurs more than once in the equipment list, only one data sheet is needed.
	+ Data sheets shall be clearly marked, noting which item or items on that sheet are being provided.

Wiring Diagrams illustrating system equipment inter-connections.

* + Wiring diagrams shall be job specific and show the wiring points of origin, wire function, and wire type.

Applicable signage. Provide samples and identify where each Sign Type is to be placed.

Contractor qualifications as described under the “QUALIFICATIONS” heading above.

Documentation / Operations and Maintenance Data as described in PART 3.

Submit quantities required by Division 1 and Section 26 05 00.

Provide documents in electronic format (Adobe Acrobat pdf) and, when requested, hard copy.

1. PRODUCTS

System Design

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

* Audio Input systems,
* Hearing Loop drive equipment, ancillary components and mounting accessories,
* Hearing Loop wire or flat copper tape with appropriate mounting accessories and associated feed cables,

Final design of the system and integration of all equipment is the responsibility of the contractor.

Compliance

The system and components, as applicable, shall comply with the Standards, Codes and requirements referenced in PART 1 of this section.

Audio Input

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

The system shall support:

* Selective amplification of the intended audio signal relative to the general (ambient) sound level in the area.
* An auto-mixing system where multiple un-attended microphones may be used.
* Connection to a sound reinforcement system via a balanced, line level XLR feed.

Hearing Loops

Hearing Loop Drivers (Amplifiers)

Hearing Loop drivers shall be provided to amplify input audio signals and to drive the loop system(s).

Drivers shall, as applicable, meet the requirements for a Type A or Type B driver as defined below.

* Type A – Area Coverage Hearing Loop Driver(s)

Where the horizontal loop area that must be covered is in excess of 6½ feet x 6½ feet, for either a one-phase (perimeter) or two-phase (phased array) system, each induction loop driver shall have the following characteristics:

* + ‘Current drive’ output.
	+ Rated current and voltage capable of driving the designed loop without clipping or distortion of the signal with full power bandwidth up to at least 5kHz.
	+ Capable of delivering the rated current and voltage into a load with 1kHz and 5kHz sine wave signal continuously without damage to the unit or interruption of the output signal.
	+ Frequency response from 80Hz to 6.5kHz.
	+ THD+N less than 0.2% at 1kHz sine at full current.
	+ Automatic Gain Control (AGC) optimized for both speech and music, with a dynamic range greater than 36dB.
	+ Metal loss correction with an adjustable gain slope range of at least 0dB to +3dB per octave.
	+ 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 the input.
	+ Controls for commissioning shall all be located on the front of the unit and commissioning shall be achievable without exposure of terminals carrying hazardous voltages.
	+ Height no greater than 3.5 inches (i.e. 2 unit of standard 19-inch rack space) per unit.
	+ 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, provide an assembled unit that is capable of driving two separate outputs with a 90° phase shift accurate to ±1° from 100Hz to 5kHz.

* Type B – Counter / Local Area Hearing Loop Driver(s)

Where the loop system provides listening assistance for 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 A rms with 1KHz sine signal
	+ Voltage output of no less than 4.0V peak at maximum current.
	+ Earthed chassis or ground plane
	+ Frequency response from 80Hz to 6.5KHz
	+ Automatic gain control (AGC) optimized for speech
	+ Minimum of 2 inputs: 1 microphone input and 1 fully isolated line input
	+ Panel / wall mounting capability (using screws or other appropriate and reliable mounting)

Hearing Loop Receivers

Receivers shall have the following characteristics:

* Capability to be clipped to a belt and have a lanyard for wearing around the neck.
* Operate for up to 200 hours with Alkaline or NiMH batteries.
* Green power LED which will blink when the battery is low.
* Battery recharge capability utilizing drop-in chargers. Chargers NIC.
* Have a 3.5 mm headphone jack and be provided with headphones.
* On/off volume control.
* Tone control.
* Active low frequency cut filter.

Loop Wire

Provide per Assistive Listening System manufacturer’s recommendations, installation environment, and drawings as applicable.

Signage

Signage shall be compliant with applicable accessibility codes. Coordinate all signage type, location, text, and mounting requirements with agency.

Signage shall have the following characteristics:

* Hard plastic or acrylic ADA wall plaque, approximately 8" (H) x 5.5" (W).
* High-contrast white-on-blue colors with a matte finish.
* Include the tactile International Symbol of Access for Hearing Loss.
* [Include braille text].
* [Be bilingual – English and Spanish.]

An example sign follows:

Hearing Assistance Available

*Asistencia Auditiva Disponible*



This facility is equipped with a hearing

assistance system. Please ask for a receiver

 or switch your hearing aid to T-coil.

*Este establecimiento está equipado con un sistema*

*de asistencia auditiva. Solicite un receptor*

*o cambie su audífono a ‘T-coil’ por favor.*

Test Equipment

Field Strength Meter

If the Agency 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. Otherwise, replace the following content with “Not applicable to this Project”.

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.
* A-Weighted background noise range of at least -50dB to -12dB.
* Field strength measurement range of at least -56dB to +8dB, with increments better than 1dB from -6dB to +6dB.
* Frequency band mode with 1/3 octave frequency bands centered on at least 100Hz, 1kHz and 5kHz meeting IEC 61260:1996 and IEC 60118-4:2006.
* Headphone output for both listening to the hearing loop signal and use with a spectrum analyzer if needed.

Documentation shall include instructions for setting up, maintaining and trouble-shooting a Hearing Loop System to IEC 60118-4:2006 by use of the field strength meter.

1. EXECUTION

General

Provide Assistive Listening System(s) in each space indicated on the drawings and as specified herein.

The complete installation shall be done in a neat, workmanlike manner in accordance with Division 26 of these documents and manufacturer's recommendations.

A factory authorized technician shall supervise the installation and connection of all products furnished under this Section and shall perform start-up services and acceptance testing of the same.

Coordination

Coordinate installation with User Agency and with other trades. Verify rough-in and installation requirements with manufacturer.

Installation

Pre-Installation Checks

Prior to installation:

* Demonstrate that cross-talk between adjacent looped areas (whether part of this contract or not), and that magnetic spill from any Hearing Loop System where the signal is defined as ‘confidential’ will, by design, be less than -32dB peak with normal signal levels.
* Provide evidence that the effect of metal within the structure of the building has been adequately assessed and compensated for by loop design and / or appropriate loop driver selection. Where necessary, the effect of metal shall be assessed by site survey and using test loops on relevant construction, carried out by a competent test specialist.
* Provide a pre-install test data sheet to demonstrate that the field strength of the proposed systems will meet the requirements of the standard IEC 60118-4:2006.
* Demonstrate that all seating areas will be covered by the hearing loop.

General

Coordinate with other relevant contactors to ensure that 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) wiring system.
* All wiring, including that inside equipment enclosures or racks, shall be of a neat and tidy appearance.
* Identify all wiring at both ends of each cable.

Follow industry-recognized relevant practice to ensure that proper grounding and other cable system design does not cause degradation of audio or other system performance by allowing interference in inappropriate paths.

* Provide all necessary and supplementary grounding conductors and connections to each component or item of equipment.

Confirm locations and spatial requirements of all local power supplies and equipment.

Conceal and contain all wiring of loops and between equipment locations.

Hearing Loops

Loops connected to the system shall be designed and implemented to meet all requirements of PART 2, HEARING LOOPS.

Implementation plan for the hearing loop shall take the building layout and construction materials into account. Refer to drawings for building layout and materials used in constructing the building.

Appropriate materials for the installation environment 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 PVC conduit, or 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 itself, which shall be installed in metal (EMT) conduit.

Where flat copper tape is accepted for use under carpet or other floor coverings, this does not require the use of containment and shall be installed according to the manufacturer’s recommendations and current best practice.

Audio Input

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

The input system design shall allow for selective amplification of the intended audio signal relative to the general (ambient) sound level in the area.

Where multiple un-attended microphones are used, an auto-mixing system shall be included.

The number of open microphones should be kept as low as possible while maintaining system performance.

A single, ceiling-mount boundary microphone shall never be used.

Where a sound reinforcement system is installed, provide a balanced, line level feed from the system to the hearing loop. Interface shall be XLR type connection.

Hearing Loop Receivers

Provide for each room supplied with a Hearing Loop System, a minimum of two (2) Hearing Loop Receivers with headphones. This is to support attendees who do not have compatible hearing aids.

The number of Hearing Loop Receivers shall be based on the seating capacity (occupants) of the room:

Room Capacity Receiver Qty.

≤ 200 occupants Two (2)

201 – 500; Five (5)

501 – 1000 Nine (9)

>1000 Fourteen (14) up to 2000, plus (1) per 400 beyond 2000.

Identification and Labeling

Label all components and cables – microphones, drivers (amplifiers), hearing loops, and hearing loop receivers – identifying their function as part of the Assistive Listening System.

Label as per specification Section 26 05 53 – Identification for Electrical Systems.

Signage

Provide signage that indicates ‘Assistive Listening System Available’ at the entrance(s) to each room where the system is in place.

Provided signage should match the equipment type(s) installed.

Confirm all Sign Types and location of each with agency.

COMMISSIONING AND Acceptance Testing

General

Include Commissioning of the completed system(s) in accordance with the referenced Standards, Codes and requirements

Conduct acceptance testing according to a schedule coordinated with the Agency and DFDM.

* Provide a minimum of 14 days notice of all testing in order that the Agency’s representative may have reasonable option to attend and witness tests.

Supply all equipment and personnel necessary to conduct the acceptance tests.

Document all tests. Include Summary and Results in the Operation and Maintenance manual.

Demonstrate that all required Signage is approved by the facility and installed.

Upon completion of all acceptance testing and inspection, Issue Certificates of Conformity to IEC 60118-4:2006 that clearly state the results of testing and confirmation that the system performance meets the relevant requirements of the standard.

Acceptance Testing

The contractor shall:

* Provide prior to testing a written description of the intended testing and commissioning.
* Demonstrate all systems and methods of use to the end user.
* Demonstrate that all seats within the facility meet the IEC 60118-4 standard.

When carrying out commissioning tests, use a Field Strength measurement tool with a minimum specification as described in PART 2.

Where the induction loops are to be installed prior to the driver/amplifier equipment, test the loops for continuity and for isolation from electrical ground and metal structures/containment.

Agency Training

Provide Training and Documentation such that operational staff are able to:

* Understand the proper use of the system and ensure that people with Telecoil or T-Coil equipped hearing aids can make use of the system effectively.
* 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 installed. Where Test Equipment is provided as part of the project, include instruction specific to that equipment.

Provide a schedule documenting recommended testing and maintenance.

Training shall comply with the format, general content requirements and submission guidelines specified under Section 01 91 01 or 01 91 02.

DOCUMENTATION / Operation & Maintenance Data

All operations and maintenance data shall comply with the submission and content requirements specified in Division 1, GENERAL REQUIREMENTS.

At minimum, O&M Manuals shall include:

* Wiring Diagrams (as built)
* Approved Submittals
* Operating instructions
* Testing Summary and Documentation of Results
* Certificates of Conformity

Warranty

See Division 1, GENERAL CONDITIONS, and GENERAL REQUIREMENTS - Guarantee Documents for general requirements.

The Guarantee shall cover the following for a period of one (1) year from date of substantial completion of this work:

* All provided materials and equipment
* Installation of all equipment, hardware, wiring and related components.

Warranties shall include labor, materials, and travel time.

END OF SECTION