Digital Solutions Division

ACT Government | ACT Health

St-16 Hearing Augmentation Standard

Version 2021.1.1 Approved

User Support: 02 5124 5000 | Division Administration: 02 5124 9000

Please Read

IMPORTANT COMPLIANCE REQUIREMENTS

Note: The following instruction applies to all documents in this library.

1. This is a controlled document and is reviewed every two years. The last review was carried out in March 2021. If you are viewing this document after March 2023, you will need to contact the sender to confirm you are working from the latest revision.
2. It is the responsibility of the contractor/vendor to read and adhere to the procedures, processes and guidelines set out in the following document when quoting for or carrying out work for the ACT Public Health System Sites.
3. If you have questions or require clarification of any of the procedures, processes or guidelines in the following document please contact the sender of the document in writing with your questions so that a formal response can be provided. If any specific requirement is unclear, it is expected that clarification will be sought from the ACT Public Health System's Digital Solutions Division (DSD) Critical Systems Infrastructure (CSI) Hub - Information Communications and Technology (ICT) architect(s), rather than a decision made and a design implemented and based on unclarified assumptions.
4. These standards are applicable to ALL ACT Public Health System Sites or any work funded by ACT Health Directorate (ACTHD) (e.g. Calvary, ACTHD provided NGO sites) unless specifically exempt.
5. All Greenfield ACT Public Health System Sites are expected to be fully compliant with all appropriate standards.
6. Brownfield ACT Public Health System Sites undergoing refurbishment should be fully compliant unless an exemption is provided by DSD's CSI Hub.
7. In the event of any design non-compliance issues, a Departures document must be completed and submitted to DSD's CSI Hub. These issues should be resolved, in consultation with DSD's CSI Hub, as soon as possible within the project process and explicitly prior to site handover.
8. While some test cases have been cited within these documents as examples, the list is not exhaustive, and all appropriate test procedures shall be formulated, approved prior to testing and testing shall be performed by the client system administrators before full acceptance can be signed off by the Senior Director CSI Hub.

IMPORTANT:

Any departure from the standard, whether intentional or in error shall require a completed Departures Document to be submitted to DSD's CSI Hub for approval.

Any non-compliant designs without a pre-approved Departures Document by completion of the project or a nominated milestone or gateway, will require remediation by the Head Contractor at the Head Contractors cost.

Document review high level

Version	Summary of Changes	Author	Date
2020.1.0	Released version	Manfred Kahl	30/03/2020
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Document default review cycle

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Contents

1. Introduction 5
1.1. Context and Background 5
1.2. Document Audience and Purpose 5
2. Solution Requirements 7
2.1. Definition of Hearing Augmentation and Hearing Augmentation options 7
2.2. Intent of the Building Code of Australia (BCA) Hearing Augmentation "Deemed to Satisfy" provisions 7
2.3. When are Hearing Augmentation Systems Required? 7
2.4. Coverage of Hearing Augmentation Systems 7
2.5. Number of Receivers Required (IR and FM Systems) 8
2.6. Signage 8
2.7. Selection of a Suitable Hearing Augmentation System 8
2.8. Factors to Consider when Selecting a System 9
3. Solution types 10
3.1. Communications between two people 10
3.1.1. Introduction 10
3.1.2. Solutions 10
3.2. Communications within a small group 11
3.2.1. Introduction 11
3.2.2. Solutions 11
3.3. Communications for large meetings and conferences 12
3.3.1. Introduction 12
3.3.2. Portable solution 12
3.3.3. Retro Fitting Hearing Augmentation into an existing room 12
3.3.4. Installing Hearing Augmentation into a new build 13
Appendix A : Document Details 15
References 15
Abbreviated terms 15
Amendment history 16
Appendix B : Details of Changes 17

1. Introduction

1.1. Context and Background

The purpose of the document is to define and reference the legal requirements and standards that need to be complied with, to the provisioning of hearing augmentation solutions such as hearing loops, systems such as wide area, personal and integrated frequency modulation, infrared and visual alert. Also, consideration must be given to signage into both public and private spaces and/or areas under the control of the ACT Public Health System.

Hearing augmentation can best be defined as a transmitting and receiving system for enhancing intelligibility of speech, conversation or music at the ear of the listener to achieve a significantly improved signal to noise ratio by increasing volume and reducing reverberations and background noise.

For people with hearing impairment, a system of this type is of immense benefit as even the best public address and amplifications systems will not provide, in many instances, clear reception as the sound from normal speakers reflects off the room walls. A person who is not hearing impaired can easily discern the direct signal from the reverberations, yet to a person with hearing loss, the sound is virtually unintelligible, having enough volume but cannot be understood.

The above is, in most instances, due to the construct of the building and as a direct result, the amplification type. Optimum sound conditions for partially deaf persons with or without hearings aids require minimum echo and/or reverberation. In most public locations, the walls are acoustically "hard" and many ceilings are also prone to echo. Hearing aids compound the problem due to the sensitive omnidirectional microphone in the hearing aid. To counter this, the preferred room finish is carpeting and seating in soft fabrics. Sound amplification should utilise multiple lower-level speakers, strategically located, in lieu of the louder two front of house type that just exacerbate the existing acoustic problems.

This document will define the most effective and efficient solution from the available range to address the needs of those who have a hearing impairment.

1.2. Document Audience and Purpose

This document provides guidelines and best practice-based solutions for meeting place of set size and whether it is a retrofit or a new installation.

The offerings will be tailored to a set of predefined specifics designed in response to a solution to meet requirements rather than the more common compliance metrics set out in most standards which are based on a binary type of pass or fail criteria. The issue with construction and building standards such as those defined within the relevant sections of the National Construction Code (NCC) or the Building Code of Australia (BCA) is that these provide a means to meet compliance so that a certificate of occupancy can be issued for the building. This raises an important issue in that these standards are a point in time measure only.

The Disability Discrimination ACT (1992) (DDA) was enacted after Australia became a signatory to the United Nations Declaration on the Rights of the Mentally Retarded Persons and the Rights of Disabled Persons. This Act makes it unlawful to discriminate against people because to their disability. The DDA places these rights into an Australian context, the results of which is the introduction of concept of dignity that is, the inherent right of persons to exercise self-determination, decision making and choice. Consequently, the DDA extends the standards defined within the NCC and BCA to apply for the duration of the existence of the building and compliance may be tested at any time against the concept of the diminishment of a person's dignity. For example, an auditorium may have a set number of seats

configured for use by persons requiring hearing augmentation and so is compliant. A disabled person who occupies one of these seats will naturally feel that all the other patrons know that he or she has special needs and may therefore feel that his or her dignity has been diminished, never mind wanting to sit somewhere else and therefore being able to exercise some modicum of free choice. Any chair not fitted with hearing augmentation is therefore not compliant. In conclusion, although NCC and BCA compliance is mandatory in order to be issued with a certificate of occupancy, the DDA compliance may be tested anytime throughout the existence of the building in a court of law.

The application of these standards gives rise to a more wholistic approach to solutions allowing for a greater degree of flexibility towards compliance that take advantage of new technologies, methodologies and/or materials.

This document is aimed at anyone who is involved in the development or design of a hearing augmentation solution be they stakeholders, interested parties, architects, implementors, quality assurance or governance personnel.

2. Solution Requirements

2.1. Definition of Hearing Augmentation and Hearing Augmentation options

Hearing augmentation can be defined as a transmitting and receiving system for enhancing the intelligibility 'of sound' (such as speech, conversation or music) at the ear of the listener to achieve a significantly improved signal to noise ratio (S/N) by increasing volume and reducing reverberation and background noise for people who are hearing impaired.

- Hearing loop systems (hearing aid T switches can be used, or loop receivers provided to those without a T switch on their hearing aids);
- Frequency modulation (individual receivers worn by users to receive radio waves (i.e. a Frequency Modulation (FM) transmitter / receiver systems); and
- Infra-red (emitters / receivers' system, where individual receivers are worn by users to receive infra-red beam by a direct line of sight).

2.2. Intent of the Building Code of Australia (BCA) Hearing Augmentation "Deemed to Satisfy" provisions.

It is to provide an effective hearing augmentation system to assist people with a hearing impairment to access communications considering variables ranging from the building materials to the size of the meeting space.

A hearing augmentation system installed under the 'deemed-to-satisfy' provisions of the BCA will cater for people with moderate to profound hearing loss but will not cater for all people who are deaf. For example, a hearing loop system under the BCA would be of no benefit to those people who are so deaf that a hearing aid or cochlear implant is of no use to them.

The design of a hearing augmentation system for any room or space needs to make sure that people who are hearing impaired, with moderate to profound hearing loss, have communications transmitted through the inbuilt amplification system, then relayed and amplified to them through the hearing augmentation system.

2.3. When are Hearing Augmentation Systems Required?

Hearing augmentation systems must be provided where an inbuilt amplification system is provided (other than one used only for emergency warning). They are required in the following locations (BCA Clause D3.7(a) and Premises Standards Part D3.7(1) (under the Disability Discrimination Act).

- In a room in a Class 9b building (that is an assembly building such as a school, university or trade workshop);
- In an auditorium, conference room, meeting room, place of worship, or room for judicial purposes;
- At any ticket office, teller's booth, reception areas and similar areas where the public is screened from the service provider; and
- Refer to the Deafness Forum of Australia article for more information on signage, and examples, at http://www.deafnessforum.org.au/publications.

2.4. Coverage of Hearing Augmentation Systems

Where an induction hearing loop is provided, it must cover at least 80% of the floor area of the room or space that is served by the inbuilt amplification system (BCA Clause D3.7(b)(i) and Premises Standards Part D3.7(2)(a)).

For hearing augmentation systems using audio receivers, such as Infra-Red (IR) or radio frequency FM transmitter / receiver systems, the system must cover at least 95% of the floor area of the room or space served by the inbuilt system, and a minimum number of receivers must be provided in a ratio depending on the number of people who may be accommodated in the room (BCA Clause D3.7(b)(ii) and Premises Standards Part D3.7(2)(b)).

2.5. Number of Receivers Required (IR and FM Systems)

Receivers to be provided in the following ratios in each room or space served by an inbuilt amplification system (BCA Clause D3.7(b)(ii) and Premises Standards Part D3.7(2)(b)):

No. of occupants in room or space	**No. of receivers required**
Up to 500	1 receiver for every 25 persons or part thereof, or 2 receivers whichever is greater
More than 500 persons, but not more than 1,000 persons	20 receivers, plus 1 receiver for every 33 persons or part thereof in excess of 500 persons
More than 1,000 persons, but not more than 2,000 persons	35 receivers, plus 1 receiver for every 50 persons or part thereof in excess of 1,000 persons
More than 2,000 persons	55 receivers, plus 1 receiver for every 100 persons or part thereof in excess of 2,000 persons

2.6. Signage

Clause D3.6 of the BCA and Part D3.6(a) of the Premises Standards requires Braille and tactile signage to identify a room or space with a hearing augmentation system. The signage must identify the type of system, the area covered and if any receivers are being used where the receivers can be obtained from (BCA, Clause D3.6 (b)).

The signage must also include the International Symbol of Deafness in accordance with AS1428.1.

Refer to the Deafness Forum of Australia article for more information on signage, and examples, at

http://www.deafnessforum.org.au/publications.

2.7. Selection of a Suitable Hearing Augmentation System

Although the BCA and DDA Premises Standards include several prescriptive parameters for the installation of a hearing augmentation system, they unfortunately do not consider a number of critical factors such as:

- Sound reverberation and the acoustic quality of finishes;
- Background noise;
- Sound source distances;
- Volume; and
- Shape of rooms.

It is also important to consider the specific use and layout of the building to determine a suitable hearing augmentation system.

The current preferred hearing augmentation solution for meeting or conference rooms and auditoriums which have been fitted out with an inbuilt amplification system is an underfloor induction loop. The main reasons for this are:

- There is no additional equipment either with or on the person that may identify him or her as having a hearing disability;
- The solution is fixed and permanently on. All that is required is for the user to enter the room and for the speaker to use the amplification system;
- Venue staff/management are not required to maintain any additional equipment; and
- The equipment is very low maintenance and very cost effective to install into a new room.

2.8. Factors to Consider when Selecting a System

With a wide range of different hearing augmentation systems available, the decision on which type of system to use will depend on several factors, such as the size and use of the space, external interferences and building materials used.

There is a constant stream of new solutions entering the market with the greatest number leveraging mobile phone technology. Unfortunately, the new technology that uses mobile phones is suffering teething issues with latency between the source signal and what is heard by the phone user. Latency needs to be less than twenty-five milliseconds otherwise there is the potential for confusion as most hearing-impaired people lip read and hence the mismatch between what they hear and see.

When considering the suitability of an hearing loop system it is important to note that the spill-over of the signal of any induction loop system can occur for up to ten metres outside the designated coverage area, unless the system is specifically designed for adjacent loop operation, using low spill phased arrays.

Portable infra-red systems provide the ability to position the device in a direct line of sight within each room or space and thereby reduces any potential spill-over or leakage of transmissions interfering with an adjoining room served by an identical system. Provisioning requires a high degree of technical expertise, as failure to configure this system effectively could initiate a potential DDA complaint. For this reason, infrared is recommended only for locations which require absolute confidentiality.

Conversely, the spill-over of an FM transmitting system can occur for some distance (AS1428.5, Clause 4.3.7), however, the ability to make use of different frequency ranges addresses this issue by zoning selected area. This solution is most often used in cinemas, schools and universities.

3. Solution types

The solutions presented herein, will at least in some measure comply with BCA Clause **D3.7**(a) and Premises Standards Part **D3.7**(1) (under the Disability Discrimination Act) as defined in 2.3 in previous sections of this document.

ACT Public Health System is hesitant to commit to either Infra-Red (IR) or Frequency Modulation (FM) based solutions based on the concept that wearing or merely carrying equipment that identifies them has having a hearing disability could cause further stigmatisation and for that reason would prefer to install induction loops wherever possible. Having stated this position, there may well be compelling reasons to turn to other technologies.

The solution types presented here are dictated by the number of people involved in the conversations or meetings and set out in the following sections.

3.1. Communications between two people

3.1.1. Introduction

These communications are typically one to one where participants are in close proximity such as at Reception desks and Information areas, interviews of various types, small meeting rooms, home visits and the like.

3.1.2. Solutions

3.1.2.1. Introduction

The preferred option here would be a small desktop type induction loop such as a Univox Cross the Counter (CTC) SmartLoop. The SmartLoop is offered in two variants:

- A totally portable option; or
- A small loop transmitter installed into the desk.

These devices are short range transmitters for telecoil enabled hearing aid users.

These solutions can be retro fitted or installed new without changes to the infrastructure.

3.1.2.2. Portable System

The advantages of the Portable Cross the Counter (PCTC) system are:

- Compact and easy to use;
- Automatic gain control (Dual Action AGC) for smoother sound;
- Powered by a Lithium Polymer battery;
- Fitted with an integrated microphone;
- Ability to fit external headsets, lapel or omni-directional conference microphones via a 3.5mm input;
- Low spillage due to defined spreading with the minimum distance between two instances is one metre; and
- Cost effective.

The disadvantages of this system are:

- In most cases the loop is just too small for requirements;
- The amplification device is underpowered; and

- The microphones are not of a sufficient quality to provide a clear and succinct transmission of the speaker's voice only.

Instead of procuring an off-the-shelf it may prove more cost effective to have a customised instance developed to meet the specific needs of the instance. This may involve the following:

- Match an amplifier/a driver with a wireless microphone and receiver to provide the best possible match. It might be advantageous to look at several instances if there is disparity between locations causing underperformance in certain instances; and
- Procure customised cable loop lengths specifically designed for the various locations.

The above will provide the very best return on investment but noting that "installation fatigue" may set in as typically, set up and break down times are twenty and ten minutes respectively. As a result, many institutions who have opted for customised portable units, have installed fixed loops for the equipment to connect to.

3.1.2.3. Fixed System

The advantages of the fixed SmartLoop (CTC) are:

- Easy installation into a variety of situations where this type of solution will meet the requirements;
- User friendly in that there is no need for adjustments;
- To ensure privacy, both parties must use unidirectional microphones;
- Separate amplifier/driver allows for a certain degree of system customisation; and
- Cost effective.

Note: These devices do not comply with BCA D3.7 since they do not provide 80% floor coverage as per BCA Clause D3.7(b)(i) and DDA Premises Standards Part D3.7(2)(a). However, a strong case can be made that compliance may be set aside in preference to the notion of the "Deemed to Satisfy" option defined within the Building Codes Australia standards.

3.2. Communications within a small group

3.2.1. Introduction

These are typically small meetings with up to ten persons gathered in controlled environments such as around a desk and small meeting rooms with 6 to 10 people.

3.2.2. Solutions

As with the two person instance, both the portable and fixed versions of the SmartLoop would provide a suitable solution remembering that the general seating arrangement should be such that the person requiring this service should be located within the amplification area and microphone placed to ensure that all participants will be picked up by it. As noted at the time, the long-term best return on investment will be to procure customised instances.

3.2.2.1. Fixed System

The preferred option is to install, either as a retrofit or new, a fixed system as the loop amplifier/driver can accept more than one audio input which would allow for participants as well as tele/videoconferencing equipment to be connected into the loop.

The only requirement would be access to electrical services and this may determine positioning of the equipment and consequently, the length and routing of cabling to the loop, microphone and other equipment.

Advantages and disadvantages of these solutions have been detailed in section 3.1.

Note: The disadvantage of these devices is that they do not comply with BCA D3.7 since they do not meet coverage areas as per BCA Clause D3.7(b)(i) and DDA Premises Standards Part D3.7(2)(a). As noted earlier a strong case can be made that compliance may be set aside in preference to the notion of the "Deemed to Satisfy" option defined within the Building Codes Australia standards.

3.3. Communications for large meetings and conferences

3.3.1. Introduction

Provide hearing augmentation into large rooms such as conference centres and auditoriums. There are three potential scenarios as outlined in the following sections.

3.3.2. Portable solution

3.3.2.1. Introduction

In instances where no permanent hearing augmentation solution is required such as a temporary venue or training /demonstrations in locations that normally would not be used for a purpose such as this, there are portable loop systems on the market that address this need. Note that these systems are not just scaled up versions of personal portable systems.

3.3.2.2. Solution

The Univox P-Loop 2.0 offers such as solution for areas up to one hundred and fifty square metres and consists of loop technology comparable with fixed systems but contained within a roller case that includes the cabling, loop driver/amplification equipped with multiple audio lines in, dual action AGC and several microphone options.

3.3.2.3. Advantages

The advantages of this solution are:

- State of the art loop technology;
- Ease of deployment;
- A wide variety of inputs including XLT and RCA;
- RCA output;
- Indicators for mins power, input level and loop current; and
- Wireless microphone options.

3.3.2.4. Disadvantages

Disadvantages of this solution are:

- General care and maintenance of the system;
- Cost of the solution can potentially be over five thousand dollars and will need to be assessed on a cost to benefit basis if this option is selected; and
- Availability and support for the P-Loop 2.0 in Australia is very limited.

3.3.3. Retro Fitting Hearing Augmentation into an existing room

As stated prior, ACTHD is hesitant to commit to either Infra-Red (IR) or Frequency Modulation (FM) based solutions based on the concept that wearing or merely carrying equipment that identifies them has having a hearing disability could cause further stigmatisation and for that reason would prefer to install induction loops wherever possible. Having stated this position, there may well be compelling reasons to turn to other technologies.

3.3.3.1. Solution

Should it be determined that for some reason or another ranging from installation complexity to budget, an underfloor induction loop is not an option, an alternative solution may be the installation of a Listen Technologies Listen Everywhere hearing augmentation system. Listen Everywhere is a Wi-Fi based audio streaming solution that requires the following:

- A dedicated server;
- A Wi-Fi infrastructure; and
- Clients who possess a smart phone.

Basically, audio is captured and optimised by the server and routed, via the local, internal, WiFi network, to a smart phone which has the Listen App installed. The client uses the phone's or aftermarket Bluetooth type earphones to listen to the content. The Listen App is fully customisable from text banners, promotional content, welcome signage, additional content such as agendas, maps, PDFs and so on. To access content, the client starts the app, scans the venue and selects the audio channel.

3.3.3.2. Advantages

The advantages of this solution are:

- It is simple to deploy and use;
- Effective for hearing augmentation but may also be used for language interpretation;
- App is available for both iPhones and Android;
- Exhibits low latency; and
- Can support up to one thousand concurrent users.

3.3.3.3. Disadvantages

The disadvantages of the solution are:

- Potential high latency especially for Android phones; and
- Potential dropouts as well.
- Users may feel stigmatised which is something that ACT Health is at great pains to avoid, however the circumstances have dictated that this solution be deployed.

3.3.4. Installing Hearing Augmentation into a new build

3.3.4.1. Introduction

In this instance, hearing augmentation is being installed as part of a new build and realistically, the only option available is an underfloor low spillage induction loop.

3.3.4.2. Solution

All vendors offer a loop-based product which is installed before the carpet or other floor covering is laid. Part of the installation process is determining the final location of the amplifier/driver as this is where the loop is terminated.

The amplifier/driver is a 1 Rack Unit (RU) sized unit that can be mounted in a variety of ways and if correctly installed will provide a low to no maintenance solution for hearing augmentation. Drivers for large areas come fitted with numerous inputs, self-diagnosing capabilities, light weight components and so on.

3.3.4.3. Advantages

The advantages of this solution are:

- The solution is customised and optimally tuned to the room;
- No intervention is required. All audio out is channelled into the loop and hearing augmentation is available on demand; and

- This solution complies with all relevant standards and codes.

3.3.4.4. Disadvantages

The disadvantages of the solution are:

- Provisioning this solution can be costly;
- Repair to a damaged loop or coil will be expensive; and
- It cannot be easily relocated.

Appendix A : Document Details

References

Following is a list of Standards applicable at the time of writing this document. However, it is incumbent on the vendors to use the latest Standard in each category prior to system implementation.

Which Hearing Augmentation standards do I need to comply with?
https://clearasound.com.au/wp-content/uploads/2018/01/ClearaSound-Printacall-Communications-Which-Hearing-Augmentation-Standards-ver-3.pdf

What is an inbuilt amplification System?
https://clearasound.com.au/wp-content/uploads/2018/01/ClearaSound-Printacall-Communications-What-is-an-Inbuilt-Amplification-System-ver-3.pdf

Basic hearing loop checklist
https://clearasound.com.au/wp-content/uploads/2018/01/ClearaSound-Printacall-Communications-Basic-Hearing-Loop-Checklist-ver-3.pdf

Univox across the counter solutions
https://www.hearingloop.com.au/shop/ctc-solutions/univox-portable-ctc/ and
https://www.hearingloop.com.au/shop/packages/univox-ctc/

Univox P-Loop 2.0 product information
https://univox.eu/product/p-loop-2-0/

Abbreviated terms

Glossary of Term	Definition
ACT	Australian Capital Territory
ACTHD	ACT Health Directorate
AGC	Automatic Gain Control
BCA	Building Code of Australia
CHS	Canberra Health Services
CSI	Critical Systems and Infrastructure
CTC	Cross the Counter
DDA	The Disability Discrimination ACT (1992)
DSD	Digital Solutions Division
FM	Frequency Modulation
ICT	Information and Communications Technology
IR	Infra-Red
NCC	National Construction Code
PCTC	Portable Cross the Counter
RU	Rack Unit
S/N	signal to noise ratio

Amendment history

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2019.0.1	Document creation	Manfred Kahl	16/12/2019
2019.0.2	Removal of some costings, changes to the formatting	Manfred Kahl	18/12/2019
2019.0.3	Changes to the formatting	Manfred Kahl	18/12/2019
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Appendix B : Details of Changes

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2019.0.4	24/03/2020	Manfred Kahl	Additional Info		Additional Info		Additional Information Supplied
2020.1.1	22/12/2020	Alkesh Hemrajani	Reviewed as per PO		Review		Reviewed the docs per PO's comments
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Main Page with picture	1	Removed page footer words
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Blank page removed	2	Blank page has been removed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Please Read	3 & 4	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Document Reference	5	Heading has been removed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Document Default Review	5	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Document Owner	5	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	1.1	Context and Background	7	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	2.2	Intent Of the Building Code	9	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments	3	Solution types	12	Non-Technical words and Font formats has been changed
2020.1.1	22/12/2020	Alkesh Hemrajani	PO's Comments		Amendment History	18	Non-Technical words and Font formats has been changed