# 9.0 Acoustics

## 9.1 General

The design and construction should address acoustic aspects of the work environment. The major design issues to be considered include:

- Workplaces should be designed to minimize the occupant's exposure to noise; noisy machines and activities should be remote or isolated from other work areas.
- Noisy equipment should be acoustically enclosed where practicable
- Noisy work areas such as workshops should have acoustically absorbent ceilings to reduce the amount of noise other staff working nearby are exposed to
- Noise levels of equipment should be an integral part of equipment selection /purchasing procedures
- Consideration should be given to the impact of ultrasonic noise generation.

Specialist advice from a qualified Acoustic Engineer is recommended.

## 9.2 Recommended Provisions

The Engineering Services and the building components should be selected to achieve an acceptable noise level. Unless other requirements are stated in other parts of these Guidelines, the ambient sound levels should not exceed those stated by local regulatory authorities.

**Acoustic Guidelines for Healthcare Facilities***

| No. | Room/Space | BNL[a)] (dBA) | RT[a)] (sec) |
|---|---|---|---|
| 1 | Assembly/preparation, Reception/clerical Lounge/ Activity room, Waiting room | 40-50 | ≤ 0.5 |
| 2 | Staff room, Staff station | 40-45 | ≤ 0.7 |
| 3 | Interview room, Consult room | 35-45 | ≤ 0.5 |
| 4 | Office, Staff & technical support | 35-45 | ≤ 0.7 |
| 5 | Treatment room, procedure room, Angiography procedure, Operating room, Birthing room-LDR, Multi-patient bed room, Patient bay | 40-50 | ≤ 0.6 |
| 6 | Quiet lounge/seclusion room, Private/single bedroom, Observation room | 35-45 | ≤ 0.6 |
| 7 | Laboratories, ECG, Echo room trans oesophageal, Radiopharmacy, CT/ MRI scanning room, Dental plant room, EP laboratory/ Microbiology Lab | 45-55 | ≤ 0.6 |
| 8 | Multi-function activity room, Occupational therapy room, Gymnasium, Dental surgery, Library/ study area, play area | 40-45 | ≤ 0.6 |
| 9 | Audiology testing room [c)] | < 35 | ≤ 0.4 |
| 10 | Clean-up/ Decontamination, Sterilising/Dental sterilising | 40-45 | ≤ 0.5 |
| 11 | Courtyard, Secure courtyard, Corridor | 40-50 | ≤ 0.6 |
| 12 | Pharmacy counter | 45-50 | ≤ 0.5 |
| 13 | Staff dinning | 50-55 | ≤ 0.6 |
| 14 | Meeting room | 30-40 | ≤ 0.6 |
| 15 | Record processing, Pantry/servery | 40-50 | ≤ 0.7 |

*Source*: Armstrong World Industries (India) Pvt Ltd*

Notes:
a) BNL and RT denote the background noise level and reverberation time, respectively.

| Acoustic Solutions for Healthcare Facilities* | | | | | | |
|---|---|---|---|---|---|---|
| No | Room/ Space | Typical Maximum Area ($m^2$) | Typical Head-room | Acoustical Finishes Ceiling Solutions | | |
| | | | | NRC | CAC | Armstrong Products (Selected Examples) |
| 1 | Assembly/preparation, Reception/clerical Lounge/Activity room, Waiting room | 60 | 2.4 | ≥ 0.70 | ≥ 35 dB | Bioguard Acoustic, Ultima, Fine Fissured Hi-NRC, Cirrus |
| 2 | Staff room, Staff station | 35 | 2.7 | ≥ 0.50 | ≥ 30 dB | Bioguard Acoustic, Class Lite, Dune, ANF |
| 3 | Interview room, Consult room | 16 | 2.7 | ≥ 0.70 | ≥ 35 dB | Bioguard Acoustic, Ultima, Fine Fissured Hi-NRC, Cirrus |
| 4 | Office, Staff & technical support | 70 | 2.7 | ≥ 0.50 | ≥ 30 dB | Bioguard Acoustic, Class Lite, Dune, ANF |
| 5 | Treatment room, procedure room, Angiography procedure, Operating room, Birthing room-LDR, Multi-patient bed room, Patient bay | 70 | 3 | ≥ 0.70 | ≥ 35 dB | Bioguard Acoustic, Ultima, Fine Fissured Hi-NRC, Cirrus |
| 6 | Quiet lounge/seclusion room, Private/single bedroom, Observation room | 28 | 2.7 | ≥ 0.60 | ≥ 35 dB | Bioguard Acoustic, Fine Fissured, Suprema |
| 7 | Laboratories: ECG, Echo room-transoesophageal, Radiopharmacy, CT/MRI scanning room, Dental plant room, EP laboratory/Microbiology Lab | 150 | 3 | ≥ 0.70 | ≥ 35 dB | Bioguard Acoustic, Ultima, Fine Fissured Hi-NRC, Cirrus |
| 8 | Multi-function activity room, Occupational therapy room, Gymnasium, Dental surgery, Library/study area, play area | 80 | 3 | ≥ 0.70 | ≥ 35 dB | Bioguard Acoustic, Ultima, Fine Fissured Hi-NRC, Cirrus |
| 9 | Audiology testing room [b)] | 14 | 3 | ≥ 0.85 | - | Optra, Soundscapes Basic, Soundsoap Acoustical Wall Panel |
| 10 | Clean-up/ Decontamination, Sterilising/Dental sterilising | 40 | 2.4 | ≥ 0.70 | ≥ 35 dB | Bioguard Acoustic |
| 11 | Courtyard, Secure courtyard, Corridor | 180 | 2-2.4 | ≥ 0.60 | ≥ 35 dB | Bioguard Acoustic, Fine Fissured, Suprema |
| 12 | Pharmacy counter | 20 | 2.7 | ≥ 0.60 | ≥ 35 dB | Bioguard Acoustic, Fine Fissured, Suprema |
| 13 | Staff dining | 100 | 3 | ≥ 0.65 | - | Metalwork |
| 14 | Meeting room | 55 | 2.7 | ≥ 0.70 | ≥ 35 dB | Bioguard Acoustic, Ultima, Fine Fissured Hi-NRC, Cirrus |

| Acoustic Solutions for Healthcare Facilities* | | | | | | |
|---|---|---|---|---|---|---|
| No | Room/ Space | Typical Maximum Area ($m^2$) | Typical Head-room | Acoustical Finishes Ceiling Solutions | | |
| | | | | NRC | CAC | Armstrong Products (Selected Examples) |
| 15 | Record processing, Pantry/servery | 50 | 2.7 | ≥ 0.50 | ≥ 30 dB | Bioguard Acoustic, Class Lite, Dune, ANF |
| 16 | Rest rooms, Store rooms, Staircase, and other noise insensitive areas | NA | NA | NA | NA | Bioguard, Health Zone Basic, Materialworks |

*Source*: Armstrong World Industries (India) Pvt Ltd*

Notes:
a) NRC value should be adjusted, if the headroom and area of the room exceed the typical values suggested above.
b) For audiology testing room, acoustic treatment on ceiling solely is not enough. Acoustic wall panels are needed.

### 9.2.1 *Typical Wall Types*

Typical dry wall types capable of achieving the above ratings are listed below; these are not mandatory and are subject to correct detailing and construction.

Type 1 – STC Rating – 35

Standard grade plasterboard 13 mm thick (minimum mass); 8.5 g/ m2 each side of 92 mm steel studs.

Type 2 – STC Rating – 40

Two options are available:

- Two layers of 13 mm thick standard grade plasterboard one side of 92 mm steel studs, one layer of 13 mm thick standard grade plasterboard on the other side.
- One layer 13 mm thick standard grade plasterboard on each side of 92 mm steel stud. Cavity infill of:
    - 60 mm (500 g/ m2 ) polyester.
    - 50 mm (10 kg /m3) glasswool.

Type 3 – STC Rating – 45

Two layers of 13 mm thick standard grade plasterboard on one side of 92 mm steel studs, one layer of 13 mm thick standard grade plasterboard on the other side.
Cavity infill of:

- 60 mm (500 g/m2) polyester.
- 50 mm (10 kg/ m3) glasswool, or
- Light or heavy Masonry.

Type 4 – STC Rating – 50

Two layers of 13 mm thick standard grade plasterboard each side of 92 mm steel studs.
Cavity fill of:

- 70 mm (600 g/m2) polyester
- 75 mm (10 kg/ m3) glasswool.

Type 5 – STC Rating – 55

Staggered stud system using two layers thickness of standard grade plasterboard each side of 92 mm studs and 92 mm tracks.
Cavity infill of:

- 70 mm (600 g/m2) polyester
- 75 mm (10kg/ m3) glasswool.

Where a high degree of impact / abrasion resistance is required, such as in Hospital corridors, a 9 mm thick fibrous cement sheeting may be substituted for 13 mm thick standard grade plasterboard. The acoustical performance for 9 mm fibrous cement sheet approximates that of 16 mm thick fire grade plasterboard.

The maximum sound rating achievable for partition construction to the underside of a continuous plasterboard ceiling is STC 40. If a layer of 75 mm thick polyester or glass wool 2400 mm wide is provided over the ceiling on the partition below, a sound rating of STC 45 is achievable. Partitions with sound ratings above STC 45 must be constructed full height from floor slab to underside of floor slab.

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