

## ACOUSTICAL PROPERTIES OF HOLLOW CORE FLOOR SLABS

### 7.1 Glossary

Airborne Sound – sound that reaches the point of interest by propagation through air.

Background Level – the ambient sound pressure level existing in a space.

Decibel (dB) – a logarithmic unit of measure of sound pressure or sound power. Zero on the decibel scale corresponds to a standardized reference pressure (20  $\mu$ Pa) or sound power ( $10^{-12}$  watt).

Flanking Transmission – transmission of sound by indirect paths other than through the primary barrier.

Frequency (Hz) – the number of complete vibration cycles per second.

Impact Insulation Class (IIC) a single figure rating of the overall impact sound insulation merits of floor-ceiling assemblies in terms of a reference contour (ASTM E989).

Impact Noise – the sound produced by one object striking another.

Noise – unwanted sound.

Noise Criteria (NC) – a series of curves, used as design goals to specify satisfactory background sound levels as they relate to particular use functions.

Noise Reduction (NR) – the difference in decibels between the space-time average sound pressure levels produced in two enclosed spaces by one or more sound sources in one of them.

Noise Reduction Coefficient (NRC) – the arithmetic average of the sound absorption coefficients at 250, 500, 1000 and 2000 Hz expressed to the nearest multiple of 0.05 (ASTM C423).

Reverberation – the persistence of sound in an enclosed or partially enclosed space after the source of sound has stopped.

Room Criteria (RC) Curves – a revision of the NC curves based on empirical studies of background sounds.

Sabin – the unit of measure of sound absorption (ASTM C423).

Sound Absorption Coefficient ( $\alpha$ ) – the fraction of randomly incident sound energy absorbed or otherwise not reflected off a surface (ASTM C423).

Sound Pressure Level (SPL) – ten times the common logarithm of the ratio of the square of the sound pressure to the square of the standard reference pressure of 20  $\mu$ Pa. Commonly measured with a sound level meter and microphone, this quantity is expressed in decibels.

Sound Transmission Class (STC) – the single number rating system used to give a preliminary estimate of the sound insulation properties of a partition system. This rating is derived from measured values of transmission loss (ASTM E413).

Sound Transmission Loss (TL) – ten times the common logarithm of the ratio, expressed in decibels, of the airborne sound power incident on the partition that is transmitted by the partition and radiated on the other side (ASTM E90).

Structureborne Sound – sound that reaches the point of interest over at least part of its path by vibration of a solid structure.

### 7.2 General

The basic purpose of architectural acoustics is to provide a satisfactory environment in which desired sounds are

clearly heard by the intended listeners and unwanted sounds (noise) are isolated or absorbed.

Under most conditions, the architect/engineer can determine the acoustical needs of the space and then design the building to satisfy those needs. Good acoustical design utilizes both absorptive and reflective surfaces, sound barriers and vibration isolators. Some surfaces must reflect sound so that the loudness will be adequate in all areas where listeners are located. Other surfaces absorb sound to avoid echoes, sound distortion and long reverberation times. Sound is isolated from

rooms where it is not wanted by selected wall and floor-ceiling constructions. Vibration generated by mechanical equipment *must be isolated from the structural from of the building.*

Most acoustical situations can be described in terms of (1) sound source, (2) sound transmission path, and (3) sound receiver. Sometimes the source strength and path can be controlled and the receiver made more attentive by removing distraction or made more tolerant of disturbance. Acoustical design must include consideration of these three elements.

| Assembly No. | Description   | STC | IIC |
|--------------|---|-----|-----|
| 1.           | 6 in (150 mm) hollow core slabs   | 48  | 23  |
| 2.           | <u>Assembly 1</u> with carpet and pad   | 48  | 69  |
| 3.           | <u>Assembly 1</u> with ½ in (13 mm) wood block flooring adhered directly  | 48  | 48  |
| 4.           | <u>Assembly 1</u> with ½ in (13 mm) wood block flooring adhered to ½ in (13 mm) sound-deadening board underlayment adhered to concrete                                    | 49  | 49  |
| 5.           | <u>Assembly 1</u> with ¾ in (19 mm) gypsum concrete   | 50  | 41  |
| 6.           | <u>Assembly 1</u> with ¾ in (19 mm) gypsum concrete on ½ in (13 mm) sound-deadening board underlayment adhered to concrete  | 50  | 50  |
| 7.           | <u>Assembly 1</u> with carpet and pad on ¾ in (19 mm) gypsum concrete   | 50  | 72  |
| 8.           | on ½ in (13 mm) sound-deadening board underlayment adhered to concrete  | 50  | 28  |
|              |   | 50  | 73  |
|              | 8 in (200 mm) hollow core slabs   | 51  | 47  |
| 9.           | <u>Assembly 8</u> with carpet and pad   | 52  | 54  |
| 10.          | <u>Assembly 8</u> with ½ in (13 mm) wood block flooring adhered directly  |     |     |
| 11.          | <u>Assembly 8</u> with ½ in (13 mm) wood block flooring adhered to ½ in (13 mm) sound-deadening board underlayment adhered to concrete                                    | 52  | 55  |
| 12.          | <u>Assembly 8</u> with ½ in (13 mm) wood block flooring adhered to ½ in (13 mm) plywood adhered to 7/16 in (11 mm) sound-deadening board underlayment adhered to concrete | 50  | 51  |
| 13.          | <u>Assembly 8</u> with 5/16 in (8 mm) wood block flooring adhered to ¼ in (6 mm) polystyrene underlayment adhered to concrete   | 50  | 51  |
| 14.          | <u>Assembly 8</u> with vinyl tile adhered to ½ in (13 mm) plywood adhered to 7/16 in (11 mm) sound-deadening board underlayment adhered to concrete                       | 50  | 51  |
| 15.          | <u>Assembly 8</u> with vinyl tile adhered to ¼ in (6 mm) inorganic felt supported cushion underlayment adhered to concrete  | 50  | 58  |
| 16.          | <u>Assembly 8</u> with vinyl tile adhered to ⅛ in (3 mm) polyethylene foam underlayment adhered to concrete   | 50  | 76  |
|              |   | 50  | 44  |
| 17.          | <u>Assembly 8</u> with 1½ in (38 mm) concrete topping with carpet and pad   |     |     |
| 18.          | <u>Assembly 8</u> with 1½ in (38 mm) concrete topping with vinyl tile adhered to concrete   | 52  | 55  |
| 19.          | <u>Assembly 8</u> with 1½ in (38 mm) concrete topping with vinyl tile adhered to 3/8 in (9 mm) plywood adhered to ½ in (13 mm) sound-deadening board adhered to concrete  | 51  | 53  |
| 20.          | <u>Assembly 8</u> with 1½ in (38 mm) concrete with ½ in (13 mm) wood block flooring adhered to ½ in (13 mm) sound-deadening board adhered to concrete                     | 51  | 54  |
| 21.          | <u>Assembly 8</u> with 1½ in (38 mm) concrete with 5/16 in (8 mm) wood block flooring adhered to foam backing adhered to concrete   | 50  | 53  |
| 22.          | <u>Assembly 8</u> with ¾ in (19 mm) gypsum concrete with 5/16 in (8 mm) wood block flooring adhered to foam backing adhered to concrete                                   | 59  | 61  |
|              |   | 60  | 54  |
| 23.          | <u>Assembly 11</u> with acoustical ceiling  |     |     |
| 24.          | <u>Assembly 8</u> with quarry tile, ¼ in (32 mm) reinforced mortar bed with 0.4 in (10 mm) nylon and carbon black spinerette matting                                      | 61  | 62  |
| 25.          | <u>Assembly 24</u> with suspended 5/8 in (16 mm) gypsum board ceiling with 3½ in (90 mm) insulation   |     |     |