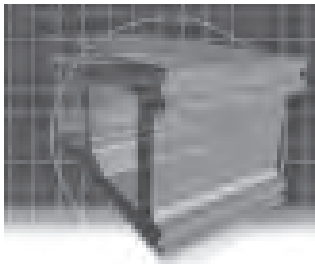




Canadian Concrete Masonry Producers' Association

Sound Properties & Design Details



Canadian Concrete Masonry Producers' Association Sound Properties & Design Details

SOUND TRANSMISSION CLASS RATINGS

The difference in sound (noise) levels from one side of a wall to the other indicates the sound transmitted loss through the wall. For example, if the sound generated inside a room is 80 decibels (db) and 30 db is measured on the other side of the wall (adjoining room), then a reduction of 50 db is achieved.

Acoustic tests relate sound loss through a wall at various frequencies. The results are averaged to provide a single absolute value number. This rating system is necessary when one wishes to compare other wall systems with a specific wall design. This absolute value is known as Sound Transmission Class (STC).

The Ontario Building Code requires an STC rating of 50 as a minimum acceptable value, and STC 55 in specific areas. Due to the changing life styles i.e. condominium living, many builders prefer to design for STC 55 or more if end users are demanding and willing to pay for a higher quality of accommodation.

In addition to the above reasons for selecting a higher STC level, STC findings are based on laboratory results under ideal working conditions. On-site construction conditions are not the same therefore wall assemblies constructed in the field may be significantly less than laboratory ratings.

Lower ratings may result from sound leaks, (a hole representing less than 0.01% of total wall area can reduce the sound blocking ability of the wall from 50 db to 22 db or 56% reduction in performance), departure from design, poor workmanship, damaged materials(s) etc.

Changes to wall construction should not be made based on "gut" feeling without consulting an acoustic professional. Adding extra layers of material, i.e. drywall, to an assembly to reduce sound transmission can in some cases increase sound transmission.

**Table 7.1
SOUND TRANSMISSION RATINGS FOR CONCRETE BLOCK WALLS**

SIZE CODE	CCMPA BLOCK TYPE					
	HOLLOW		75% SOLID		SOLID	
	A or B	Type C or D	Type A or B	Type C or D	Type A or B	Type C or D
10	43	40	45	42	47	45
15	46	43	50	47	52	50
20	50	46	53	51	56	53
25	51	49	56	54	58	56
30	53	50	58	56	58	58

NOTES:

- 1.0 Sound transmission loss through a barrier (wall) varies with frequency and use of sound absorbing materials.
- 2.0 Increased separation and sound absorbing material in the cavity adds to the wall performance.
The sound transmission loss of a cavity wall is frequently about 8 db better than a solid wall of equal weight.

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STC RATINGS WITH 20 cm HOLLOW AND 15 cm 75% SOLID CONCRETE BLOCK

TABLE 7.2 - INTERIOR FINISH ON BOTH SIDES

CONSTRUCTION TECHNIQUE	STC RATING
G12.7-WF38-GFB38-BLK140-WF38-GFB38-G12.7	57
G16-WF40-GFB38-BLK190-G16	57
GWF40-GFB38-BLK190-WF40-GFB38-G16	59
G16-ZC50-GFB50-BLK190-ZC50-GFB50-G16	64
G16-ZC75-GFB75-BLK190-SS65-G16	66
G16-SS65-GFB65-BLK140(75%)-WF40-GFB38-G13	67
G16-SS65-GFB65-BLK190-SS65-GFB65-G16	72
G16-ZC75-GFB75-BLK190-SS65-GFB65-G16	73

TABLE 7.3 - INTERIOR FINISH ON ONE SIDE

CONSTRUCTION TECHNIQUE	STC RATING
PAI-BLK190-G16	50
BLK190-RC13-GFB19-G16	54
BLK190-WF40-GFB38-G16	55
BLK140(75%)-WF40-GFB38-G13	55
PAI-BLK140(100%)-WF40-GFB38-G13	58
BLK190-ZC50-GFB50-G16	59
BLK190-SS65-GFB65-G16	60
BLK140(75%)-SS65-GFB65-G16	61

TABLE 7.4 - CAVITY WALL SYSTEMS

CONSTRUCTION TECHNIQUE	STC RATING
BLK90-AIR25-GFRP65-BLK90-G16	62
BLK90-AIR125-BLK90-G16	69
BLK90-AIR60-GFB65-BLK90	73
BLK90-AIR60-GFRP65-BLK90-G16	77
BLK90-AIR100-GFRP65-BLK190-G16	79

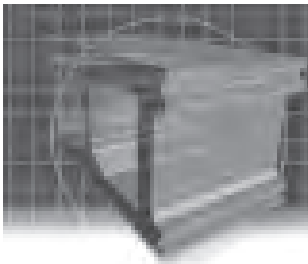
Abbreviations:

- BLK . . . Concrete Block
- G Gypsum Board
- WF . . . Wood Furring
- RC . . . Resilient Metal Channel
- GFB . . Glass Fibre Batts
- PAI . . . Paint
- ZC . . . Z-bars
- SS . . . Steel Studs
- AIR . . . Air Space
- GFRP Glass Fibre Panels
(semi-rigid) Cavity Wall Insulation

NOTES:

- A. The numbers following the abbreviations indicate the thickness in millimetres; e.g. GFB65 = Glass Fibre Batts 65mm.
- B. The systems' components are arranged in sequence.
- C. Hollow Concrete Block is referenced unless otherwise noted; e.g. BLK140(75%) = 140mm Concrete Block, 75% Solid.

* Denotes Type A Concrete



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Sound Absorption

Sound absorption reduces the sound energy reverberating within a room. The surface of a masonry wall can absorb a certain portion of sound energy rather than reflect the sound. Sound striking the surface of an open textured concrete masonry wall is trapped within the small pores of the block. Tests at different sound frequencies determine the sound absorption coefficient (SAC).

Noise Reduction Coefficient (NRC) is found by averaging the SAC values at frequencies of 250, 500, 1000 and 2000 HZ. The coefficient factor is an indication of the sound absorbing efficiency of a surface. If a surface can absorb 100% of the sound energy, the wall would have a Noise Reduction Coefficient of 1. Similarly, a wall surface absorbing 45% of the initial sound would have a NRC of 0.45. Listed below you will find approximated NRC values for average textured masonry units.

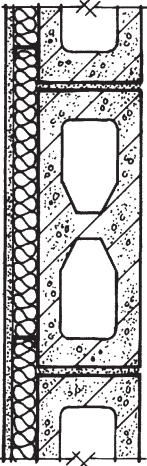
TABLE 7.5 - NRC VALUES FOR CONCRETE MASONRY UNITS

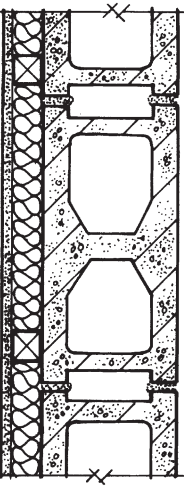
CONCRETE	SURFACE TEXTURE	APPROXIMATE NRC VALUES	DIRECT db LOSS
Type C or D Unpainted	Coarse	0.50	3.00
	Medium	0.45	2.62
	Fine	0.40	2.25
Type A Unpainted	Coarse	0.28	1.50
	Medium	0.27	1.45
	Fine	0.26	1.40

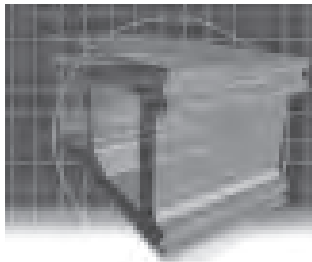
NOTES:

- 1.0 It should be noted that the principal uses of sound-absorbing materials are for the control of sound within a space and not for the control of sound transmission loss between spaces.
- 2.0 Selective absorption that matches the frequency of an unwanted sound is obtained by slotting or drilling the face shell of the unit and/or may not require sound absorbing insulation in the block cores.
- 3.0 It is difficult to lose much more than 5 db of sound by absorption.
- 4.0 A 5 db level decrease of sound within a room will reduce the loudness by 33% (sound pressure level)
- 5.0 Sound absorption occurs when sound energy is converted to heat energy.

Sound Wall

 <p>STC 51</p> <ul style="list-style-type: none"> • 140mm NW CONCRETE BLOCK • METAL RESILANT CHANNELS - ONE SIDE • ABSORPTIVE MATERIAL - ONE SIDE • 12.7mm GYPSUM BOARD - ONE SIDE <p>SOURCE: NATIONAL RESEARCH COUNCIL (IRC)</p>	PROJECT
	SOUND WALL
	BLOCK TYPE
	HOLLOW

 <p>STC 53</p> <ul style="list-style-type: none"> • 190mm NW CONCRETE BLOCK • 38mm X 38mm WOOD STRAPPING - ONE SIDE • ABSORPTIVE MATERIAL - ONE SIDE • 12.7mm GYPSUM BOARD - ONE SIDE <p>SOURCE: NATIONAL RESEARCH COUNCIL (IRC)</p>	PROJECT
	SOUND WALL
	BLOCK TYPE
	HOLLOW



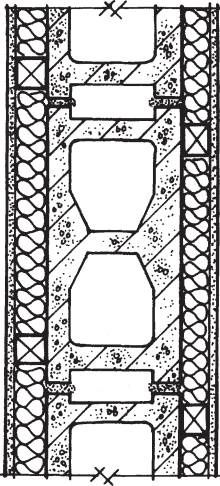
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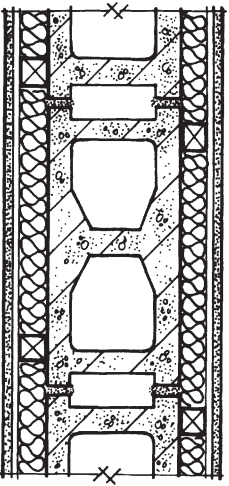
Sound Wall

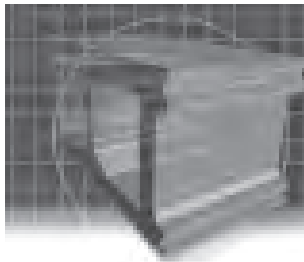
	<h2 style="text-align: center;">STC 55</h2> <ul style="list-style-type: none"> • 140mm NW CONCRETE BLOCK • 38mm X 38mm WOOD STRAPPING - ONE SIDE • ABSORPTIVE MATERIAL - ONE SIDE • 12.7mm GYPSUM BOARD - ONE SIDE <p style="font-size: small; margin-top: 10px;">SOURCE: NATIONAL RESEARCH COUNCIL (IRC)</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="height: 40px;"> </td></tr> <tr><td style="font-size: x-small;">PROJECT</td></tr> <tr><td style="font-size: x-small;">SOUND WALL</td></tr> <tr><td style="font-size: x-small;">BLOCK TYPE</td></tr> <tr><td style="font-size: x-small;">75% SOLID</td></tr> </table>		PROJECT	SOUND WALL	BLOCK TYPE	75% SOLID
PROJECT							
SOUND WALL							
BLOCK TYPE							
75% SOLID							

	<h2 style="text-align: center;">STC 57</h2> <ul style="list-style-type: none"> • 140mm NW CONCRETE BLOCK • 38mm X 38mm WOOD STRAPPING - TWO SIDES • ABSORPTIVE MATERIAL - TWO SIDES • 12.7mm GYPSUM BOARD - TWO SIDES <p style="font-size: small; margin-top: 10px;">SOURCE: NATIONAL RESEARCH COUNCIL (IRC)</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="height: 40px;"> </td></tr> <tr><td style="font-size: x-small;">PROJECT</td></tr> <tr><td style="font-size: x-small;">SOUND WALL</td></tr> <tr><td style="font-size: x-small;">BLOCK TYPE</td></tr> <tr><td style="font-size: x-small;">HOLLOW</td></tr> </table>		PROJECT	SOUND WALL	BLOCK TYPE	HOLLOW
PROJECT							
SOUND WALL							
BLOCK TYPE							
HOLLOW							

Sound Wall

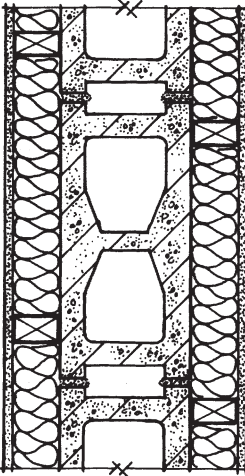
 <p style="text-align: center;">STC 59</p> <ul style="list-style-type: none"> • 190mm NW CONCRETE BLOCK • 38mm X 38mm WOOD STRAPPING - TWO SIDES • ABSORPTIVE MATERIAL - TWO SIDES • 12.7mm GYPSUM BOARD - TWO SIDES <p>SOURCE: NATIONAL RESEARCH COUNCIL (IRC)</p>	PROJECT
	SOUND WALL
	BLOCK TYPE
	HOLLOW

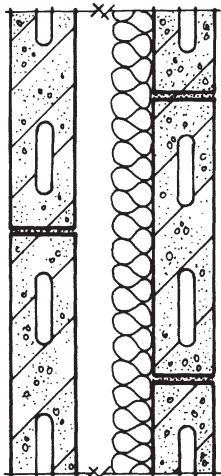
 <p style="text-align: center;">STC 64</p> <ul style="list-style-type: none"> • 190mm NW CONCRETE BLOCK • 38mm X 38mm WOOD STRAPPING PLUS RESILIENT CHANNELS - TWO SIDES • ABSORPTIVE MATERIAL - TWO SIDES • 12.7mm GYPSUM BOARD - TWO SIDES <p>SOURCE: NATIONAL RESEARCH COUNCIL (IRC)</p>	PROJECT
	SOUND WALL
	BLOCK TYPE
	HOLLOW



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 <p>STC 70</p> <ul style="list-style-type: none"> • 190mm NW CONCRETE BLOCK • 38mm X 64mm WOOD STRAPPING - TWO SIDES • ABSORPTIVE MATERIAL - TWO SIDES • 12.7mm GYPSUM BOARD - TWO SIDES <p>SOURCE: NATIONAL RESEARCH COUNCIL (IRC)</p>	PROJECT
	SOUND WALL
	BLOCK TYPE
	HOLLOW

 <p>STC 77</p> <ul style="list-style-type: none"> • 90mm NW CONCRETE BLOCK • 65mm ABSORPTIVE MATERIAL • 50mm AIR SPACE • 90mm NW CONCRETE BLOCK <p>SOURCE: NATIONAL RESEARCH COUNCIL (IRC)</p>	PROJECT
	SOUND WALL
	BLOCK TYPE
	75% SOLID