Veneklasen Associates
Consultants in Acoustics | Noise | Vibration | AV | IT

Laboratory Acoustical Test Report

FC21-0306

Impact Insulation Class and Sound Transmission Class

ASTM E492, E90

September 17, 2021

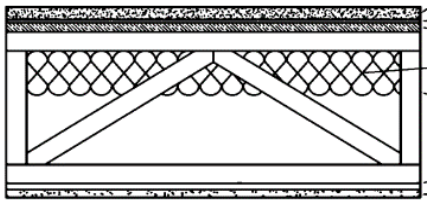
Test Assembly:

Daltile Ceramic Tile
USG Levelrock® 2500 Floor Underlayment
USG SAM-N25™ Sound Attenuation Mat
Oriented Strand Board Sheathing
Johns Manville Fiberglass Insulation
York PB Open Web Truss
CEMCO RC-1XD Resilient Channel
USG SHEETROCK® Brand FIRECODE® C Core Gypsum Panel

IIC-54
HIIC-55
STC-61

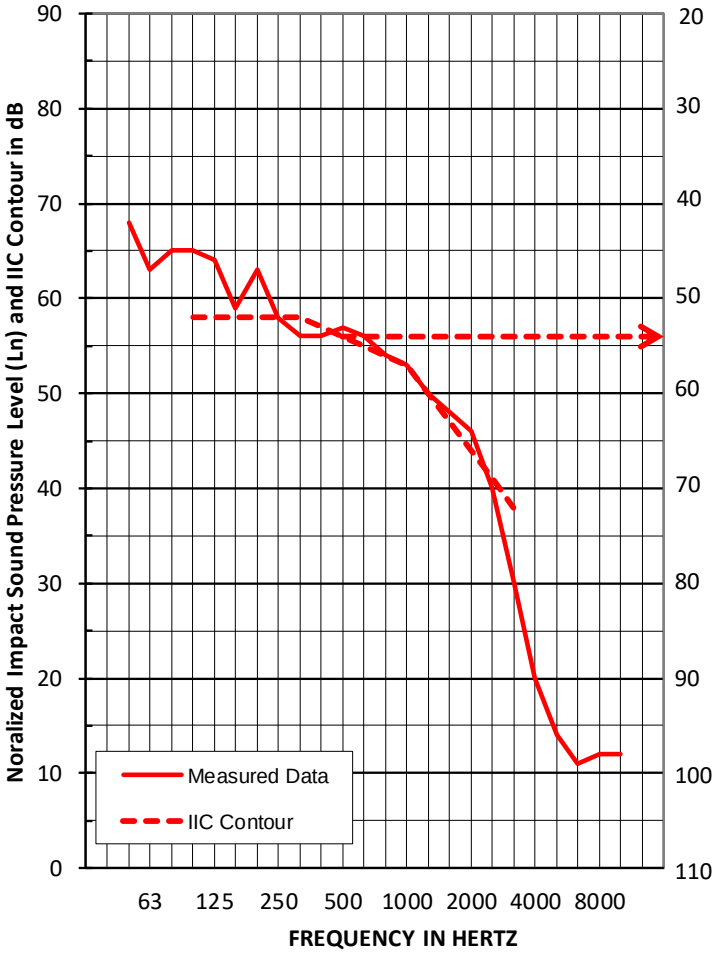
California Expanded Metal Company (CEMCO)
13191 Crossroads Parkway North Suite 325
City of Industry, CA 91746

Impact Insulation Class Test FC21-0306: IIC 54



Finish Flooring	10.5 mm Daltile Ceramic Tile
Underlayment	25.4 mm USG Levelrock Brand 2500 Floor Underlayment
Sound Mat	6.4 mm USG Levelrock Brand SAM-N25 Sound Attenuation Mat
Structural Sheathing	18.8 mm Oriented Strand Board Sheathing
Insulation	88.9 mm Johns Manville Unfaced R-13 Fiberglass Insulation
Structural Type	457.2 mm York PB Truss L/360 Open Web Truss
Resilient Attachment	12.7 mm CEMCO RC-1XD Resilient Channel
Gypsum Panel	15.9 mm USG SHEETROCK Brand FIRECODE C Core Gypsum Panel

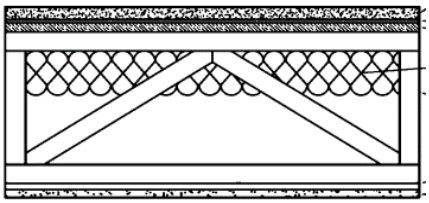
Test Date:	August 25, 2021	
Construction Date:	August 25, 2021	
Test Specimen Area:	11	sq.m.
Receiving Room Volume:	156	cu.m.
Receiving RoomTemperature:	22.3-22.4	degrees C
Receiving Room Relative Humidity:	70-70	percent



Freq	95% Confidence Limit	Ln
50	2.5	68
63	3.2	63
80	1.1	65
100	1.9	65
125	2.2	64
160	0.6	59
200	0.8	63
250	0.6	58
315	0.4	56
400	0.3	56
500	0.4	57
630	0.2	56
800	0.3	54
1000	0.3	53
1250	0.3	50
1600	0.3	48
2000	0.5	46
2500	0.7	40
3150	0.8	30
4000	0.8	20
5000	0.8	14
6300	0.6	11
8000	0.4	12
10000	0.3	12

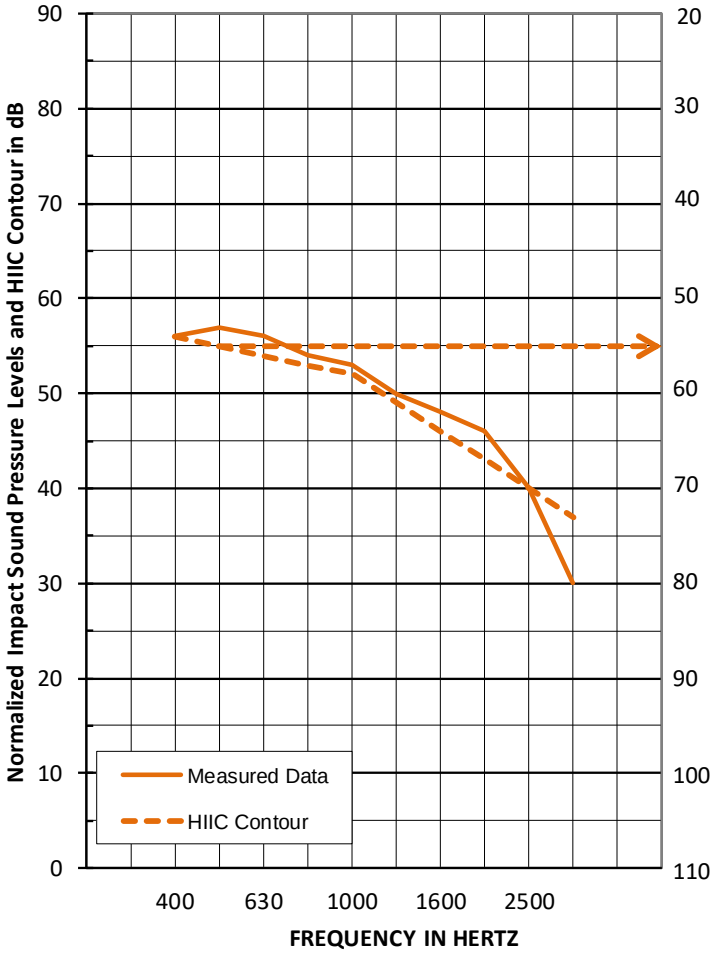
Background Affected

High-frequency Impact Insulation Class Test FC21-0306: HIIC 55



Finish Flooring	10.5 mm Daltile Ceramic Tile
Underlayment	25.4 mm USG Levelrock Brand 2500 Floor Underlayment
Sound Mat	6.4 mm USG Levelrock Brand SAM-N25 Sound Attenuation Mat
Structural Sheathing	18.8 mm Oriented Strand Board Sheathing
Insulation	88.9 mm Johns Manville Unfaced R-13 Fiberglass Insulation
Structural Type	457.2 mm York PB Truss L/360 Open Web Truss
Resilient Attachment	12.7 mm CEMCO RC-1XD Resilient Channel
Gypsum Panel	15.9 mm USG SHEETROCK Brand FIRECODE C Core Gypsum Panel

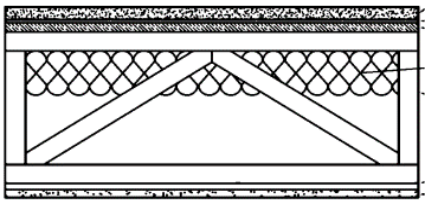
Test Date:	August 25, 2021	
Construction Date:	August 25, 2021	
Test Specimen Area:	11	sq.m.
Receiving Room Volume:	156	cu.m.
Receiving RoomTemperature:	22.3-22.4	degrees C
Receiving Room Relative Humidity:	70-70	percent



Freq	95% Confidence Limit	Ln
400	0.3	56
500	0.4	57
630	0.2	56
800	0.3	54
1000	0.3	53
1250	0.3	50
1600	0.3	48
2000	0.5	46
2500	0.7	40
3150	0.8	30

No Ln values were affected by background noise or flanking.

Sound Transmission Class Test FC21-0306: STC 61



Finish Flooring	10.5 mm Daltile Ceramic Tile
Underlayment	25.4 mm USG Levelrock Brand 2500 Floor Underlayment
Sound Mat	6.4 mm USG Levelrock Brand SAM-N25 Sound Attenuation Mat
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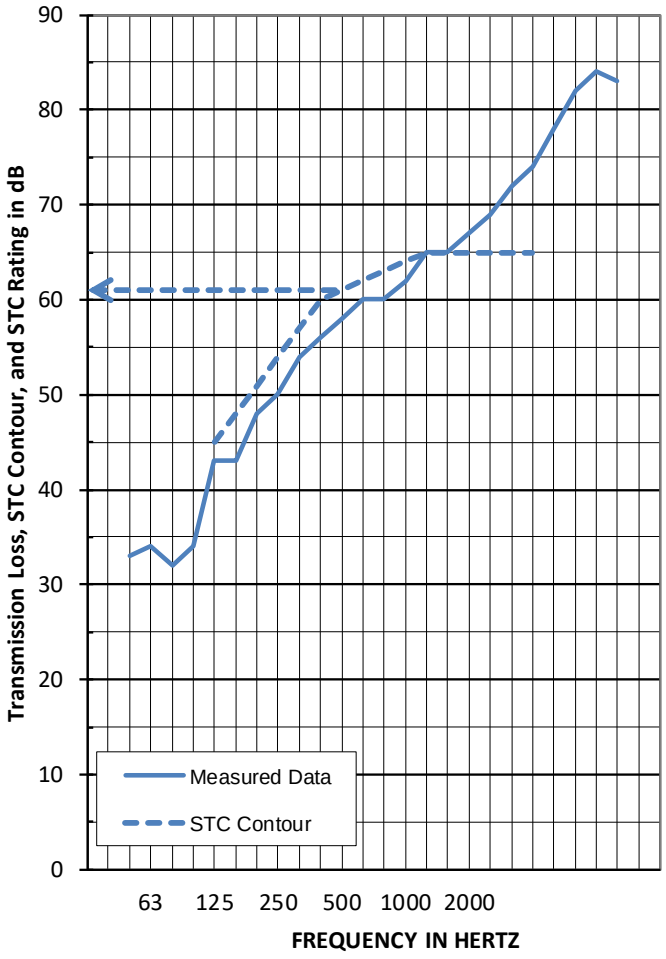
Insulation	88.9 mm Johns Manville Unfaced R-13 Fiberglass Insulation
Structural Type	457.2 mm York PB Truss L/360 Open Web Truss
Resilient Attachment	12.7 mm CEMCO RC-1XD Resilient Channel
Gypsum Panel	15.9 mm USG SHEETROCK Brand FIRECODE C Core Gypsum Panel

Test Date:	August 25, 2021	
Construction Date:	August 25, 2021	
Test Specimen Area:	11	sq.m.
Source/Receiving Room Volume:	190/156	cu.m.
Source/Receiving Room Temperature:	22.4/24.8	degrees C
Source/Receiving Room Relative Humidity:	70/70	percent



Freq	TL
50	**33**
63	**34**
80	32
100	**34**
125	**43**
160	**43**
200	**48**
250	**50**
315	**54**
400	**56**
500	58
630	60
800	60
1000	62
1250	65
1600	65
2000	67
2500	**69**
3150	72
4000	74
5000	**78**
6300	82
8000	84
10000	83

Background Affected

Flanking Affected

Background and Flanking Affected

1.0 TEST PROCEDURES

1.1 Impact Insulation Tests

All tests were conducted in accordance with ASTM E492, "Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine." The IIC is a single-number rating derived from the Impact Sound Pressure Level in accordance with ASTM E989, "Standard Classification for Determination of Impact Insulation Class (IIC)." Results are presented above.

95% confidence intervals represent uncertainty for microphone averaging, not tapping positions.

1.2 High-frequency Impact Insulation Class Tests

The HIIC is the High-frequency Impact Insulation Class and is meant to assess the high-frequency impact noise on a floor-ceiling assembly. The higher the value, the better the floor, meaning less noise from high-frequency impacts in the space below.

All tests were conducted in accordance with the requirements of ASTM E492, "Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine," using ASTM E3222 "Standard Classification for Determination of High-frequency Impact Sound Ratings" to calculate the High-frequency Impact Insulation Class (HIIC). Results are presented above.

1.3 Transmission Loss Tests

All tests were conducted in accordance with ASTM E90, "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions," using the single-direction method. STC is a single-number rating derived from measured values of Sound Transmission Loss through a test specimen in accordance with ASTM E413, "Classification for Rating Sound Insulation." Results are presented above.

2.0 TEST ASSEMBLY

2.1 Assembly Description

The test assembly consists of:

- Daltile Ceramic Tile;
- USG Levelrock® Brand 2500 Floor Underlayment;
- USG Levelrock® Brand SAM-N25 Sound Attenuation Mat;
- Oriented Strand Board Sheathing;
- Johns Manville Unfaced R-13 Fiberglass Insulation;
- York PB Truss L/360 Open Web Truss;
- CEMCO RC-1XD Resilient Channel;
- USG SHEETROCK® Brand FIRECODE® C Core Gypsum Panel.

Total mass of the floor-ceiling assembly was 1229 kg, having an area density of 99 kg/m^2. This represents the entire area.

Product/Element	Thickness	Dimensions	Area	Area Density
Ceramic Tile	11 mm	305 mm x 305 mm	10.98 m^2	21 kg/m^2
Floor Underlayment	25 mm	3023 mm x 3632 mm	10.98 m^2	50 kg/m^2
Sound Attenuation Mat	6 mm	3023 mm x 1003 mm	10.98 m^2	0.5 kg/m^2
Oriented Strand Board Sheathing	19 mm	1219 mm x 2438 mm	10.98 m^2	14 kg/m^2
Fiberglass Insulation	89 mm	521 mm x 3023 mm	10.98 m^2	1 kg/m^2
Open Web Truss	457 mm	89 mm x 2934 mm	7 trusses	19 kg/truss
Resilient Channel	13 mm	67 mm x 3632 mm	32.7 lin m	0.3 kg/m
Gypsum Board	16 mm	1219 mm x 3023 mm	10.98 m^2	12 kg/m^2

2.2 Installation

The materials were installed in the following manner:

- Daltile Ceramic Tile: A sheet of 2 mil polyethylene plastic was adhered to the subfloor topping with 3M Super 77 spray adhesive. Laticrete Permacolor grout was placed into the 6.35 mm joints between the ceramic tile and wiped clean. The ceramic tile was placed onto a bed of Laticrete Platinum 254 mortar. The mortar was set using a 6.35 mm by 6.35 mm trowel. Both the grout and mortar were allowed to cure to manufacturer's specifications.
- Floor Underlayment: Poured directly onto the subfloor underlayment, cured a minimum of 14 days. The gypsum panel had a closed cell foam perimeter isolation. No noticeable shrinkage or cracking was visible on the specimen.
- Sound Mat: Loose laid with seams overlapping and taped.
- Board Sheathing: Fastened to trusses with 76 mm by 3 mm framing nails on 203 mm centers along perimeter and 305 mm centers in the field.
- Fiberglass Insulation: Installed in the cavity between trusses, stapled flush with the subfloor.
- Open Web Truss: Installed on 610 mm centers using JUS414 hanger brackets. The test frame was isolated from the structure with a dense neoprene gasket.
- Resilient Channel: Installed on 406 mm centers perpendicular to the trusses.
- Gypsum Panel: Fastened to the channels on 305 mm centers with 25.4 mm Type S bugle head screws. The seams of the gypsum panels were sealed with Pecora AC-20 FTR caulk and covered with pressure sensitive tape.

The assembly was constructed on August 25, 2021.

3.0 TESTING PROTOCOL

This report summarizes laboratory acoustical testing contracted by Veneklasen to be completed for California Expanded Metal Company (CEMCO) on CEMCO RC-1XD Resilient Channel. The scope of the acoustical testing is for Impact Insulation Class (IIC), High-frequency Impact Insulation Class (HIIC), and Sound Transmission Class (STC), in accordance with ASTM standards E492, E90.

The tests were conducted on August 25, 2021. Details of the tests are contained in this report. Testing was completed in strict accordance with the following standards:

- ASTM E90, "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions"
- ASTM E413, “Classification for Rating Sound Insulation”
- ASTM E492, "Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine”
- ASTM E989, “Standard Classification for Determination of Impact Insulation Class (IIC)”
- ASTM E2235, “Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods”
- ASTM E3222, “Standard Classification for Determination of High-frequency Impact Sound Ratings.”

3.1 Equipment

Equipment list and information associated with this test, including calibration information, is included in the Appendix.

3.2 Accreditation and Reporting

Report must be distributed in its entirety except with written authorization from Veneklasen Associates. Test was conducted at IAS-accredited test facility; the full report is available upon request. Detailed test procedures, data for flanking limit tests, repeatability measurements, and reference specimen tests are available on request.

Veneklasen Associates provides no warranties, expressed or implied, regarding the structural integrity or fitness of these assemblies for a specific installation. Any advertising which utilizes this test report or test data must not imply product certification or endorsement by Veneklasen Associates, NVLAP, NIST or the U.S. Government.

Sincerely,
Veneklasen Associates, Inc.

John LoVerde, *FASA*
Principal

APPENDIX

Test Equipment and Photos

Instrument	Manufacturer	Model	Description	Serial Number	Calibration Date
Data acquisition unit	National Instruments	PXI-4462	Data acquisition card	63763-1	10/20
Data acquisition unit	National Instruments	PXI-4462	Data acquisition card	63763-4	10/20
Data acquisition unit	National Instruments	PXI-4462	Data acquisition card	65124	02/21
Microphone calibrator	Norsonic	1251	Acoustical calibrator	65105	09/20
Receive room microphone	PCB Piezotronics	378C20	Microphone and preamplifier	64340	11/20
Receive room microphone	PCB Piezotronics	378B20	Microphone and preamplifier	65617	09/20
Receive room microphone	PCB Piezotronics	378B20	Microphone and preamplifier	65968	01/21
Receive room microphone	PCB Piezotronics	378B20	Microphone and preamplifier	INT01089	02/21
Receive room microphone	PCB Piezotronics	378B20	Microphone and preamplifier	INT 00652	02/21
Receive room environmental indicator	Comet	T7510	Temperature and humidity transmitter	63810	10/20
				63811	10/20
Source room microphone	PCB Piezotronics	378C20	Microphone and preamplifier	65969	04/21
Source room microphone	PCB Piezotronics	378C20	Microphone and preamplifier	63742	03/21
Source room microphone	PCB Piezotronics	378C20	Microphone and preamplifier	63747	09/20
Source room microphone	PCB Piezotronics	378C20	Microphone and preamplifier	63745	09/20
Source room microphone	PCB Electronics	378C20	Microphone and preamplifier	63744	09/20
Source room environmental indicator	Comet	T7510	Temperature and humidity transmitter	63812	10/20
Tapping machine	Norsonic	Nor277	Tapping machine	INT00936	01/21

Test Chamber Receive Room Volume	156 m^3
Test Chamber Source Room Volume	190 m^3

Photo 1: View of Source Chamber, finish flooring installation observed

Photo 2: View of Receive Chamber, gypsum panel ceiling observed