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

# Laboratory Acoustical Test Report

*FC21-0015*

Impact Insulation Class and Sound Transmission Class

ASTM E492, E90

June 29, 2021

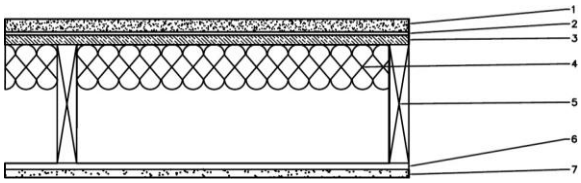
## Test Assembly:

Maxxon Gypsum Concrete
Maxxon Acousti-Mat 1/4 Underlayment
2x10 Dimensional Lumber
CertainTeed R-13 Fiberglass Insulation
Cemco RC1-XD Resilient Channel
Pabco SoundCurb Type X

***IIC-55***
***HIIC-53***
***STC-60***

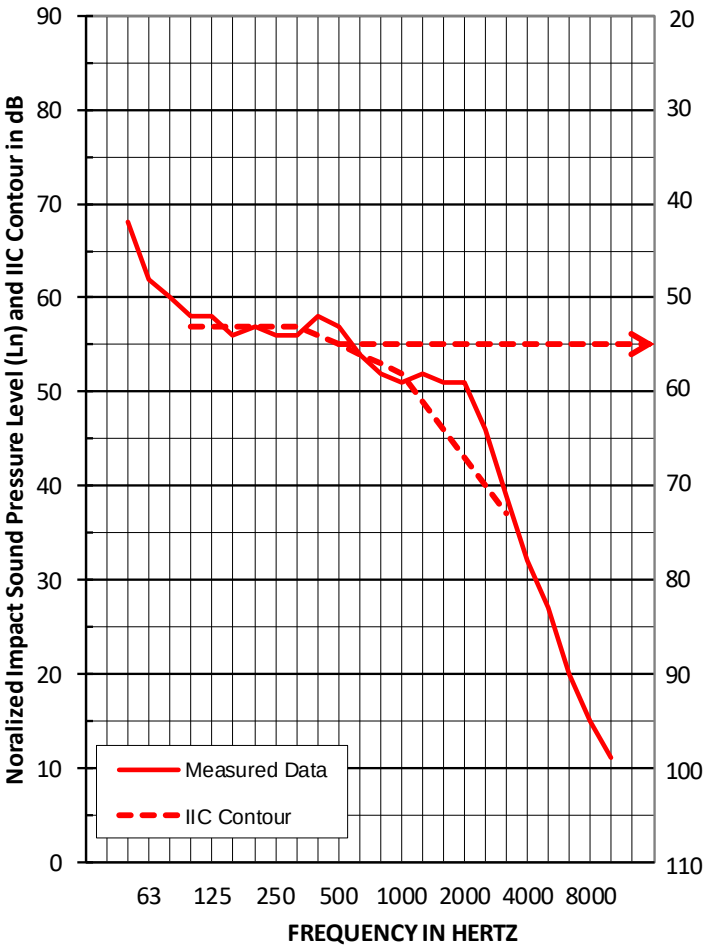
**California Expanded Metal Company (CEMCO)**
13191 Crossroads Parkway North Suite 325
City of Industry, CA 91746

# Impact Insulation Class Test FC21-0015: IIC 55




| | |
|---|---|
| Finish Flooring | n/a |
| Gypsum Topping | 25 mm Maxxon Gyp-Crete® Gypsum Concrete |
| Sound Mat | 6 mm Maxxon Acousti-Mat 1/4 |
| Structural Sheathing | 19 mm Plywood |
| Structure Type | 235mm Dimensional Lumber |
| Insulation | 89 mm CertainTeed R-13 Fiberglass Insulation |
| Resilient Attachment | 13 mm CEMCO RC1-XD Resilient Channel |
| Finish Ceiling Layer 1 | 19 mm Pabco® Sound Curb™ Type X Gypsum Board |

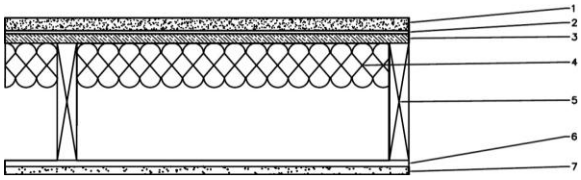
| | | |
|---|---|---|
| Test Date: | February 16, 2021 | |
| Construction Date: | February 16, 2021 | |
| Test Specimen Area: | 11 | sq.m. |
| Receiving Room Volume: | 158 | cu.m. |
| Receiving RoomTemperature: | 25.6-25.6 | degrees C |
| Receiving Room Relative Humidity: | 56-57 | percent |




| Freq | 95% Confidence Limit | Ln |
|---|---|---|
| 50 | 2.2 | 68 |
| 63 | 3.5 | 62 |
| 80 | 1.8 | 60 |
| 100 | 0.8 | 58 |
| 125 | 1.5 | 58 |
| 160 | 1.2 | 56 |
| 200 | 0.6 | 57 |
| 250 | 0.9 | 56 |
| 315 | 0.6 | 56 |
| 400 | 0.6 | 58 |
| 500 | 0.4 | 57 |
| 630 | 0.5 | 54 |
| 800 | 0.5 | 52 |
| 1000 | 0.3 | 51 |
| 1250 | 0.3 | 52 |
| 1600 | 0.2 | 51 |
| 2000 | 0.4 | 51 |
| 2500 | 0.4 | 46 |
| 3150 | 0.5 | 39 |
| 4000 | 0.8 | 32 |
| 5000 | 0.6 | 27 |
| 6300 | 0.2 | 20 |
| 8000 | 0.3 | 15 |
| 10000 | 0.3 | 11 |

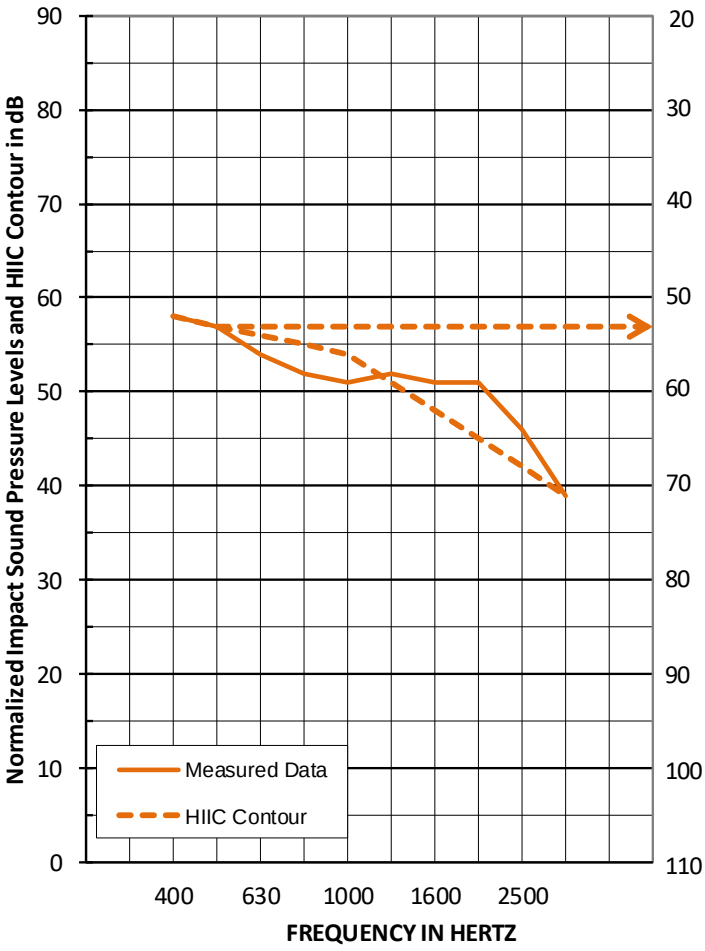
Background Affected

# High-frequency Impact Insulation Class Test FC21-0015: HIIC 53




| | |
|---|---|
| Finish Flooring | n/a |
| Gypsum Topping | 25 mm Maxxon Gyp-Crete® Gypsum Concrete |
| Sound Mat | 6 mm Maxxon Acousti-Mat 1/4 |
| Structural Sheathing | 19 mm Plywood |
| Structure Type | 235mm Dimensional Lumber |
| Insulation | 89 mm CertainTeed R-13 Fiberglass Insulation |
| Resilient Attachment | 13 mm CEMCO RC1-XD Resilient Channel |
| Finish Ceiling Layer 1 | 19 mm Pabco® Sound Curb™ Type X Gypsum Board |

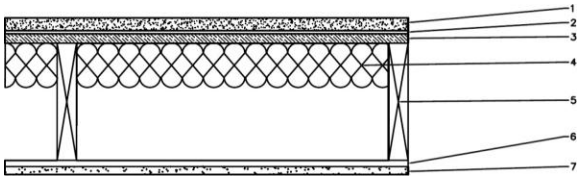
| | | |
|---|---|---|
| Test Date: | February 16, 2021 | |
| Construction Date: | February 16, 2021 | |
| Test Specimen Area: | 11 | sq.m. |
| Receiving Room Volume: | 158 | cu.m. |
| Receiving RoomTemperature: | 25.6-25.6 | degrees C |
| Receiving Room Relative Humidity: | 56-57 | percent |




| Freq | 95% Confidence Limit | Ln |
|---|---|---|
| 400 | 0.6 | 58 |
| 500 | 0.4 | 57 |
| 630 | 0.5 | 54 |
| 800 | 0.5 | 52 |
| 1000 | 0.3 | 51 |
| 1250 | 0.3 | 52 |
| 1600 | 0.2 | 51 |
| 2000 | 0.4 | 51 |
| 2500 | 0.4 | 46 |
| 3150 | 0.5 | 39 |

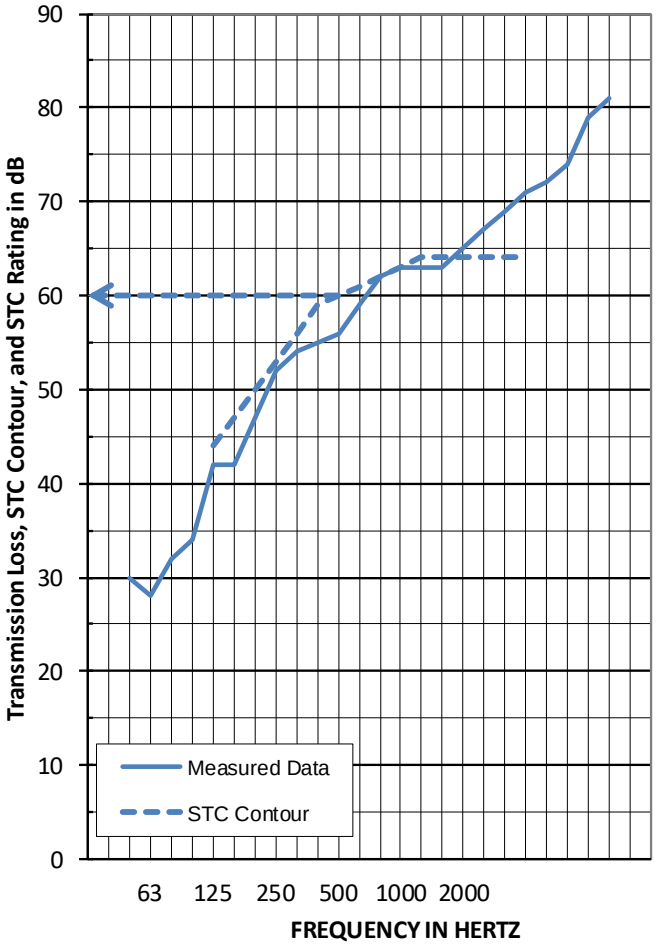
No Ln values were affected by background noise or flanking.

# Sound Transmission Class Test FC21-0015: STC 60




| | |
|---|---|
| Finish Flooring | n/a |
| Gypsum Topping | 25 mm Maxxon Gyp-Crete® Gypsum Concrete |
| Sound Mat | 6 mm Maxxon Acousti-Mat 1/4 |
| Structural Sheathing | 19 mm Plywood |
| Structure Type | 235mm Dimensional Lumber |
| Insulation | 89 mm CertainTeed R-13 Fiberglass Insulation |
| Resilient Attachment | 13 mm CEMCO RC1-XD Resilient Channel |
| Finish Ceiling Layer 1 | 19 mm Pabco® Sound Curb™ Type X Gypsum Board |

| | | |
|---|---|---|
| Test Date: | February 16, 2021 | |
| Construction Date: | February 16, 2021 | |
| Test Specimen Area: | 11 | sq.m. |
| Source/Receiving Room Volume: | 190/158 | cu.m. |
| Source/Receiving Room Temperature: | 19.6/18.6 | degrees C |
| Source/Receiving Room Relative Humidity: | 47/47 | percent |




| Freq | TL |
|---|---|
| 50 | 30 |
| 63 | 28 |
| 80 | 32 |
| 100 | **34** |
| 125 | **42** |
| 160 | **42** |
| 200 | **47** |
| 250 | **52** |
| 315 | **54** |
| 400 | 55 |
| 500 | 56 |
| 630 | 59 |
| 800 | 62 |
| 1000 | 63 |
| 1250 | 63 |
| 1600 | 63 |
| 2000 | 65 |
| 2500 | 67 |
| 3150 | 69 |
| 4000 | 71 |
| 5000 | 72 |
| 6300 | 74 |
| 8000 | 79 |
| 10000 | 81 |

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:

- Maxxon Corporation Gyp-Crete®;
- Maxxon Corporation Acousti-Mat® 1/4;
- Plywood;
- CertainTeed R-13 Fiberglass Insulation;
- 2x10 Dimensional Lumber;
- CEMCO RC1-XD Resilient Channel;
- Pabco® Sound Curb™ Type X Gypsum Board.

Total mass of the floor-ceiling assembly was 954.5 kg, having an area density of 80.18 kg/m$^2$. This represents the entire area, which was separated into quadrants for the test.

| Product/Element | Thickness | Dimensions | Area | Area Density |
|---|---|---|---|---|
| Maxxon Gyp-Crete® | 25 mm | 3023 x 3632 | 10.98 m$^2$ | 49 kg/m$^2$ |
| Maxxon Acousti-Mat® 1/4 | 6 mm | 3023 x 3632 | 10.98 m$^2$ | 0.3 kg/m$^2$ |
| Plywood | 19 mm | 1219 mm x 2438 mm | 10.98 m$^2$ | 10.25 kg/m$^2$ |
| Fiberglass Insulation | 89 mm | 2940 mm x 406 mm | 10.98 m$^2$ | 1.03 kg/m$^2$ |
| Dimensional Lumber | 235 mm | 2940 mm x 38 mm | 26.5 lin m | 4.3 kg/m |
| CEMCO RC1-XD Resilient Channel | 13 mm | 3632 mm x 67 mm | 32.69 lin m | 0.34 kg/m |
| Gypsum Board | 19 mm | 1219 mm x 3023 mm | 10.98 m$^2$ | 15.14 kg/m$^2$ |

## 2.2 Installation

The materials were installed in the following manner:

- Gypsum Concrete: Poured directly on top of the sound control mat, cured a minimum of 14 days. No noticeable shrinkage or cracking was visible on the specimen.
- Flooring underlayment: Loose laid with seams taped.
- Plywood: Fastened to joists with 76 mm by 3 mm framing nails on 203 mm centers along perimeter and 305 mm centers in the field.
- Fiberglass insulation: Stapled to bottom of subfloor.
- Dimensional Lumber: Fastened to perimeter frame on 406 mm centers using 18-gauge joist hangers and 9- gauge 31.75 mm nails.
- Resilient Channel: Installed on 406 mm centers perpendicular to the trusses. The measured thickness of the metal was 0.7 mm.
- Gypsum Board: Fastened with 25.4 mm fine thread drywall screws on 305 mm centers. Seams and perimeter sealed with Pecora AC-20® Acoustical Sealant and covered with pressure-sensitive tape.

The assembly was constructed on the test date February 16, 2021.

## 3.0 TESTING PROTOCOL

This report summarizes laboratory acoustical testing contracted by Veneklasen to be completed for California Expanded Metal Company (CEMCO) CEMCO RC1-XD 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 February 16, 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 | 65124 | 12/18 |
| Data acquisition unit | National Instruments | PXI-4462 | Data acquisition card | INT01524 | 04/19 |
| Data acquisition unit | National Instruments | PXI-4462 | Data acquisition card | INT01525 | 04/19 |
| Microphone calibrator | Norsonic | 1251 | Acoustical calibrator | 65105 | 09/20 |
| Receive room microphone | PCB Piezotronics | 378C20 | Microphone and preamplifier | 65029 | 03/20 |
| Receive room microphone | PCB Piezotronics | 378B20 | Microphone and preamplifier | 63742 | 03/20 |
| Receive room microphone | PCB Piezotronics | 378B20 | Microphone and preamplifier | 65968 | 01/21 |
| Receive room microphone | PCB Piezotronics | 378B20 | Microphone and preamplifier | 63740 | 04/20 |
| Receive room microphone | PCB Piezotronics | 378B20 | Microphone and preamplifier | 63739 | 04/20 |
| 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 | 63741 | 06/20 |
| Source room microphone | PCB Piezotronics | 378C20 | Microphone and preamplifier | 65969 | 04/20 |
| 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 | 01/20 |

| | |
|---|---|
| Test Chamber Receive Room Volume | 157.83 $m^3$ (5573.68 $ft^3$) |
| Test Chamber Source Room Volume | 190 $m^3$ (6709.79 $ft^3$) |

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

*Photo 2: View of Receive Chamber*