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SOUND TRANSMISSION TESTING CONDUCTED ON
Hilti Smoke and Acoustic Sleeve CS-SL SA

Hilti North America
5400 South 122nd Avenue
Tulsa, OK 74146

Date:	July 30, 2015
Author:	John Wegscheider
Report Number:	ESP019371P-2

Sound Transmission Class Testing (ASTM E90)

INTRODUCTION:

This report presents the results of acoustical testing of Hilti Smoke & Acoustic Sleeve CS-SL SA. This testing was requested by Mr. Josh Vandertook, and Mr. Chad Stroike, CFPS and was completed on March 26th 2015.

This report is a supplement to Report # ESP019371P-1 where in the prototype names for the products tested were used. Prototype names have been revised in this report to reflect the official product name per official letter from Hilti North America. The original report referenced was written on April 6, 2015.

This report must not be reproduced except in full with the approval of Element Materials Technology. The test results contained in this report pertain only to the specific assemblies tested and not necessarily to all similar constructions.

The results stated in this report represent only the specific construction and acoustical conditions present at the time of the test. Measurements performed in accordance with this standard on nominally identical constructions and acoustical conditions may produce different results.

TEST RESULTS SUMMARY:

				Test Results		
Test #	Slab	Hilti Device	Condition	STC	*Def*	OITC
1	Custom Baseline Filler Wall #1	--	--	63	27	53
6	Baseline Filler Wall #1 with 2" device	Hilti Smoke & Acoustic Sleeve CS-S SA 2"	Closed - Blank	59	30	53
7	Baseline Filler Wall #1 with 2" device	Hilti Smoke & Acoustic Sleeve CS-S SA 2"	Closed - 12 Wires	59	30	53
8	Baseline Filler Wall #1 with 2" device	Hilti Smoke & Acoustic Sleeve CS-S SA 2"	Closed - 24 Wires	59	29	53
22	Baseline Filler Wall #1 with 4" device	Hilti Smoke & Acoustic Sleeve CS-S SA 4"	Closed - Blank	59	24	43
23	Baseline Filler Wall #1 with 4" device	Hilti Smoke & Acoustic Sleeve CS-S SA 4"	Closed - 24 Wires	59	29	52
24	Baseline Filler Wall #1 with 4" device	Hilti Smoke & Acoustic Sleeve CS-S SA 4"	Closed - 48 Wires	59	32	52
25	Baseline Filler Wall #1 with 4" device	Hilti Smoke & Acoustic Sleeve CS-S SA 4"	Closed - 120 Wires	56	31	51
35	Gypsum Baseline Filler Wall #2	--	--	56	24	44
40	Baseline Filler Wall #2 with 2" device	Hilti Smoke & Acoustic Sleeve CS-S SA 2"	Closed - Blank	57	30	44
41	Baseline Filler Wall #2 with 2" device	Hilti Smoke & Acoustic Sleeve CS-S SA 2"	Closed - 12 Wires	57	31	45
42	Baseline Filler Wall #2 with 2" device	Hilti Smoke & Acoustic Sleeve CS-S SA 2"	Closed - 24 Wires	56	25	44
58	Baseline Filler Wall #2 with 4" device	Hilti Smoke & Acoustic Sleeve CS-S SA 4"	Closed - Blank	56	25	44
59	Baseline Filler Wall #2 with 4" device	Hilti Smoke & Acoustic Sleeve CS-S SA 4"	Closed - 24 Wires	56	25	44
60	Baseline Filler Wall #2 with 4" device	Hilti Smoke & Acoustic Sleeve CS-S SA 4"	Closed - 48 Wires	56	27	44
61	Baseline Filler Wall #2 with 4" device	Hilti Smoke & Acoustic Sleeve CS-S SA 4"	Closed - 120 Wires	55	25	43

Tabular and graphical presentations of the data are presented under "TEST RESULTS" below. Individual wall constructions are listed below.

Ear Controlled Data

SPECIMEN DESCRIPTION:

Baseline Wall #1 (Test #1): In order to create a baseline for testing a "filler wall" was constructed. Details of the filler wall are below. Materials are listed from the source room to receive room. This "filler wall" was used for tests 1-34.

- ½" Fiberous panel
- ½" Durock
- 2 Layers 5/8" Gypsum
- 2x4 wood studs
- R13 Fiberglass Insulation
-3/4" Space
- R-19 Fiberglass Insulation
- 2x8 Wood Studs
- 2 Layers 5/8" Gypsum
- 24" x 24" x 8" Thick Concrete Slab Placed Center of Wall and Perimeter Sealed

For Tests 6-8: A 2 ½ penetration was through the concrete slab for installation of the sleeve devices.
For Tests 22-25: A 4 ½" penetration was through the concrete slab for installation of the sleeve devices.

Baseline Wall #2 (Test #35): In order to create a baseline for testing a "filler wall" was constructed. Details of the filler wall are below. Materials are listed from source room to receive room. This "filler wall" was used for tests 35-70

- 2 layers 5/8" Gypsum
- 25 gauge 3 5/8" Steel Studs
- 3" Mineral Wool Acoustic Insulation
- 2 Layers 5/8" Gypsum

For Tests 40-42: A 2 ½" penetration was through the filler wall for installation of the sleeve devices.
For Tests 58-61: A 4 ½" penetration was through the filler wall for installation of the sleeve devices.

TEST PROCEDURE

Sound Transmission Test

ASTM:E90(09), "Laboratory Measurement of Airborne Sound Transmission of Building Partitions," was followed in every respect. The STC value was obtained by applying the Transmission Loss (TL) values to the STC reference contour of ASTM: E413(10), "Determination of Sound Transmission Class." The actual transmission loss at each frequency was calculated by the following equations:

$$TL = NR + 10 \log S - 10 \log A_2$$

where: TL = Transmission Loss (dB)
NR = Noise Reduction (dB)
S = Surface area common to both sides (sq. ft.)
A_2 = Sound absorption of the receiving room with the sample in place (sabins)

OITC Procedure

ASTM:E1332(10), "Determination of Outdoor-Indoor Transmission Class", was followed in every respect. Basically, the OITC was calculated by using the sound transmission loss values in the 80 to 4000 Hz range as measured in accordance with ASTM E-90(09). These transmission loss data are then used to determine the A-weighted sound level reduction of the specimen for the reference source spectrum specified in Table 1 of ASTM E1332(10). The appropriate calculations were made to determine the OITC value. TL measurements were obtained in a single direction, from Source Room to the Receiving room. The source room has a volume of 2948-ft^3 (83-m^3) and the receiving room has a volume of 5825-ft^3 (165-m^3).

TEST EQUIPMENT:

Item Description	ID #	Manufacturer/Model	Serial #	Calibration Due
1/2" Pressure Condenser Microphone	PT-162-095	BSWA/MP253	450007	9/16/15
1/2" Pressure Condenser Microphone	PT-162-075	GRAS/40AD	19220-1244	5/22/15
Microphone Calibrator	PT-162-076	Norsonic/1251	29144	5/22/15
Data Acquisition Module	PT-162-107	National Instruments/NI9234	195551B-01L	9/25/15
Temp and Humidity Transmitter	PT-162-077	Dwyer Instruments/Series RH	M90714-E4SV-Y	6/4/15
Temp and Humidity Transmitter	PT-162-079	Dwyer Instruments/Series RH	M93237-E09W-A	6/4/15

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-1
Customer:	Hilti Construction
Test Date:	03-23-2015
Specimen ID:	Baseline
Specimen Description:	Concete Block Concret Block 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	8" - lbs
Operator:	PAD

Data Table

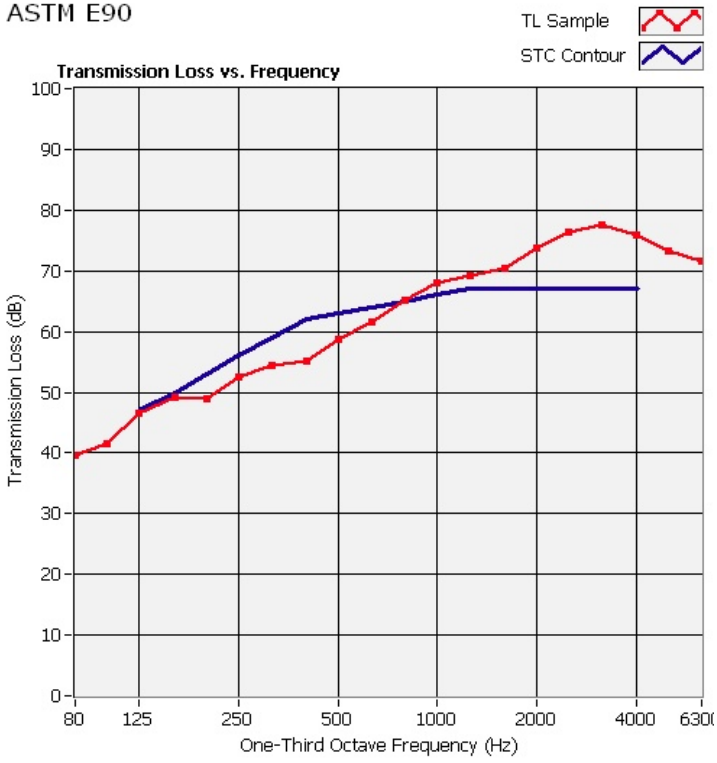
	TL (dB)	deficiencies	95% CI
80	40	-	1.69
100	41	-	2.35
125	47	0	2.32
160	49	1	2.28
200	49	4	0.89
250	52	4	0.88
315	54	5	0.65
400	55	7	0.52
500	59	4	0.59
630	62	2	0.53
800	65	0	0.42
1000	68	0	0.35
1250	69	0	0.47
1600	70	0	0.48
2000	74	0	0.51
2500	76	0	0.35
3150	78 #	0	0.58
4000	76 #	0	0.58
5000	73 #	-	0.68

background < 5.0 below receive room
* 95% Confidence Interval exceeded

Source Room
Temperature 21.8 °C
R.H. 47 %

Receive Room
Temperature 22.0 °C
R.H. 59 %

ATM 988 hPa



STC Rating	deficiencies	OITC
63	27	53

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-6
Customer:	Hilti Construction
Test Date:	03-24-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 2"
Specimen Description:	Blank Baseline Wall #1 Concrete 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	8" - lbs
Operator:	PAD

Data Table

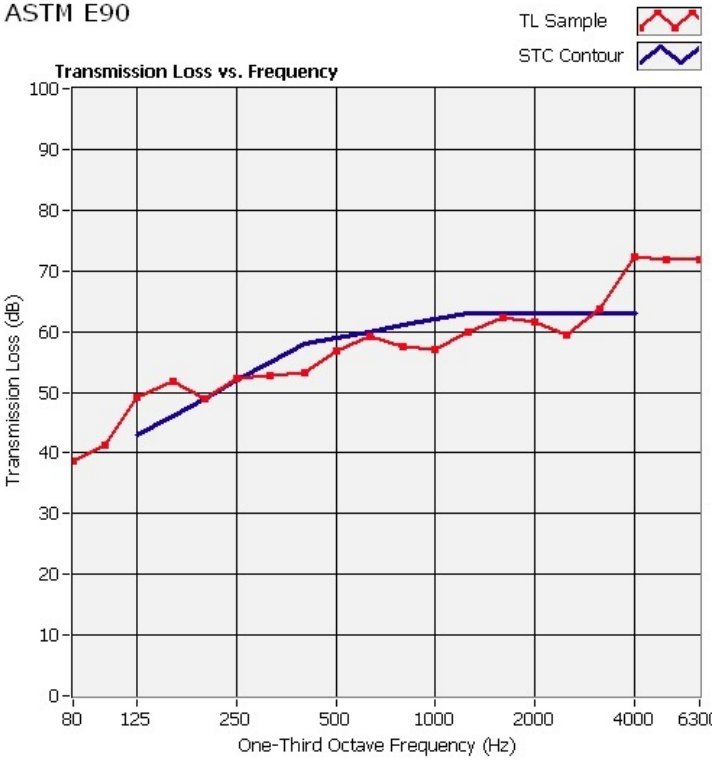
	TL (dB)	deficiencies	95% CI
80	39	-	2.40
100	41	-	1.85
125	49	0	1.09
160	52	0	2.32
200	49	0	0.57
250	52	0	0.83
315	53	2	0.50
400	53	5	0.40
500	57	2	0.47
630	59	1	0.59
800	57	4	0.46
1000	57	5	0.35
1250	60	3	0.37
1600	62	1	0.43
2000	61	2	0.43
2500	59	4	0.43
3150	64	0	0.59
4000	72	0	0.37
5000	72 #	-	0.49

background < 5.0 below receive room
* 95% Confidence Interval exceeded

Source Room
Temperature 21.9 °C
R.H. 54 %

Receive Room
Temperature 22.0 °C
R.H. 63 %

ATM
985 hPa



STC Rating	deficiencies	OITC
59	29	52

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-7
Customer:	Hilti Construction
Test Date:	03-24-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 2"
Specimen Description:	12 Cables Baseline Wall #1 Concrete 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	8" - lbs
Operator:	PAD

Data Table

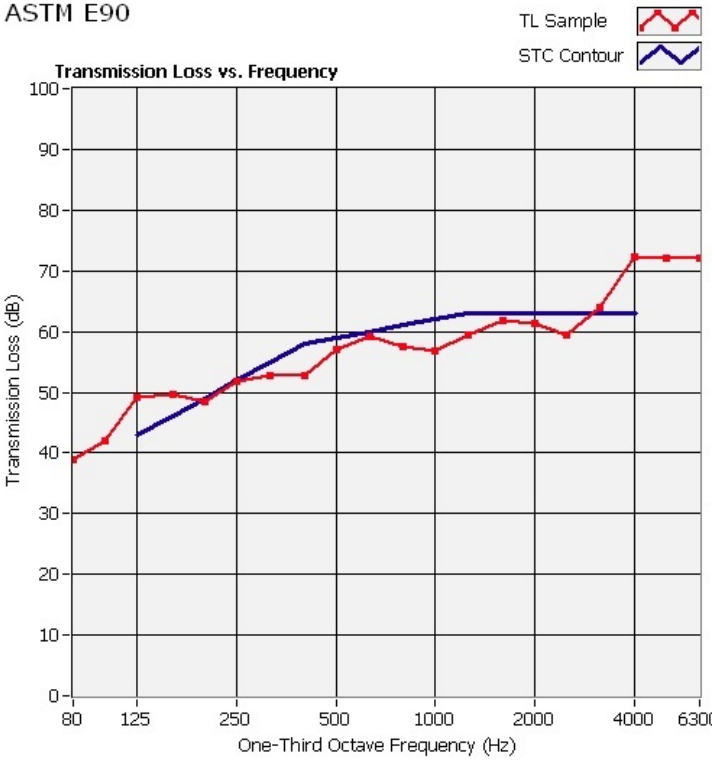
	TL (dB)	deficiencies	95% CI
80	39	-	2.08
100	42	-	1.58
125	49	0	1.80
160	50	0	1.40
200	48	1	0.76
250	52	0	0.90
315	53	2	0.56
400	53	5	0.45
500	57	2	0.51
630	59	1	0.52
800	58	3	0.41
1000	57	5	0.40
1250	59	4	0.31
1600	62	1	0.40
2000	61	2	0.50
2500	59	4	0.65
3150	64	0	0.70
4000	72	0	0.49
5000	72 #	-	0.48

background < 5.0 below receive room
* 95% Confidence Interval exceeded

Source Room
Temperature 21.8 °C
R.H. 56 %

Receive Room
Temperature 22.0 °C
R.H. 63 %

ATM
985 hPa



STC Rating	deficiencies	OITC
59	30	53

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-8
Customer:	Hilti Construction
Test Date:	03-24-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 2"
Specimen Description:	24 Cables Baseline Wall #1 Concrete 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	8" - lbs
Operator:	PAD

Data Table

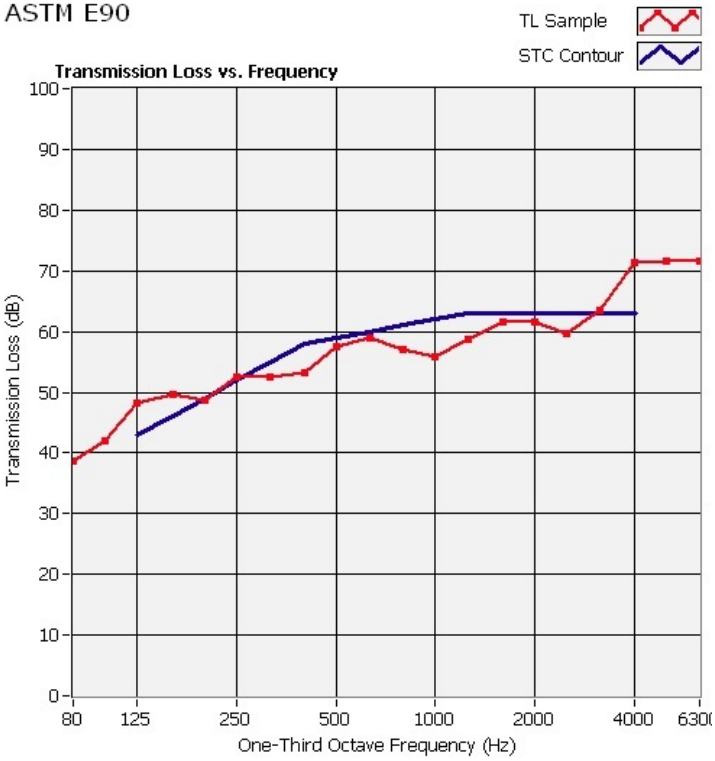
	TL (dB)	deficiencies	95% CI
80	39	-	1.98
100	42	-	1.54
125	48	0	1.82
160	50	0	1.68
200	49	0	0.87
250	52	0	0.90
315	53	2	0.75
400	53	5	0.58
500	57	2	0.43
630	59	1	0.54
800	57	4	0.28
1000	56	6	0.31
1250	59	4	0.27
1600	62	1	0.38
2000	62	1	0.28
2500	60	3	0.29
3150	63	0	0.37
4000	71	0	0.41
5000	72 #	-	0.39

background < 5.0 below receive room
* 95% Confidence Interval exceeded

Source Room
Temperature 21.9 °C
R.H. 50 %

Receive Room
Temperature 22.0 °C
R.H. 63 %

ATM
985 hPa



STC Rating	deficiencies	OITC
59	29	53

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-22
Customer:	Hilti Construction
Test Date:	03-24-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 4"
Specimen Description:	Blank Baseline Wall #1 Concrete 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	8" - lbs
Operator:	PAD

Data Table

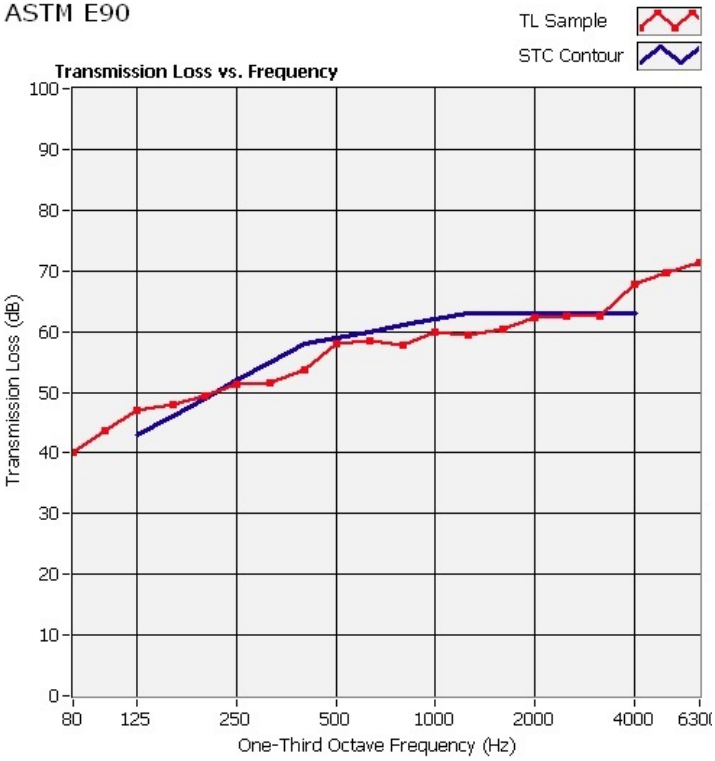
	TL (dB)	deficiencies	95% CI
80	40	-	2.04
100	44	-	1.56
125	47	0	2.18
160	48	0	1.62
200	49	0	1.11
250	51	1	0.87
315	52	3	0.71
400	54	4	0.51
500	58	1	0.50
630	59	1	0.41
800	58	3	0.41
1000	60	2	0.38
1250	59	4	0.38
1600	60	3	0.42
2000	62	1	0.56
2500	62	1	0.52
3150	63	0	0.59
4000	68	0	0.73
5000	70 #	-	0.77

Source Room
Temperature 22.2 °C
R.H. 52 %

Receive Room
Temperature 22.1 °C
R.H. 73 %

ATM
982 hPa

background < 5.0 below receive room
* 95% Confidence Interval exceeded



STC Rating	deficiencies	OITC
59	24	53

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-23
Customer:	Hilti Construction
Test Date:	03-24-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 4"
Specimen Description:	24 Cables Baseline Wall #1 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	8" - lbs
Operator:	PAD

Data Table

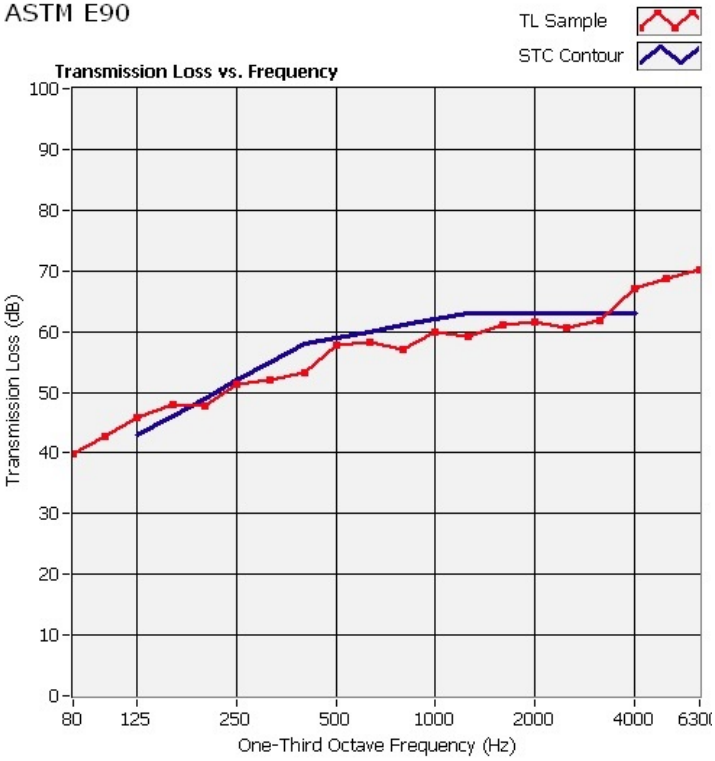
	TL (dB)	deficiencies	95% CI
80	40	-	1.62
100	43	-	1.41
125	46	0	2.42
160	48	0	1.51
200	48	1	1.10
250	51	1	0.85
315	52	3	0.77
400	53	5	0.67
500	58	1	0.38
630	58	2	0.41
800	57	4	0.32
1000	60	2	0.44
1250	59	4	0.42
1600	61	2	0.37
2000	62	1	0.37
2500	61	2	0.39
3150	62	1	0.48
4000	67	0	0.64
5000	69 #	-	0.69

Source Room
Temperature 22.1 °C
R.H. 51 %

Receive Room
Temperature 22.2 °C
R.H. 74 %

ATM
981 hPa

background < 5.0 below receive room
* 95% Confidence Interval exceeded



STC Rating	deficiencies	OITC
59	29	52

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-24
Customer:	Hilti Construction
Test Date:	03-24-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 4"
Specimen Description:	48 Cables Baseline Wall #1 Concrete 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	8" - lbs
Operator:	PAD

Data Table

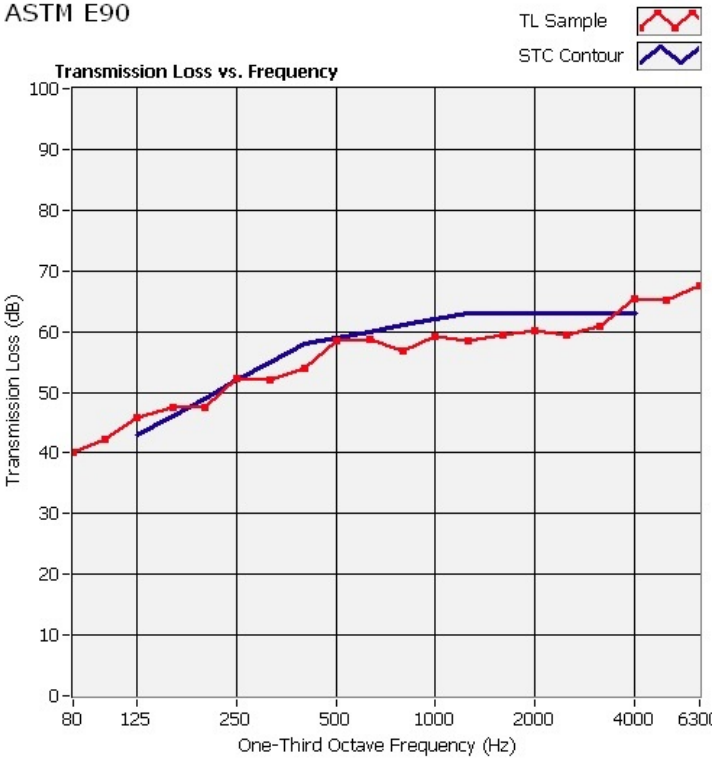
	TL (dB)	deficiencies	95% CI
80	40	-	1.26
100	42	-	1.67
125	46	0	2.37
160	48	0	1.50
200	48	1	0.83
250	52	0	0.96
315	52	3	0.56
400	54	4	0.55
500	58	1	0.51
630	59	1	0.44
800	57	4	0.47
1000	59	3	0.41
1250	59	4	0.27
1600	60	3	0.34
2000	60	3	0.49
2500	60	3	0.46
3150	61	2	0.51
4000	65	0	0.73
5000	65	-	0.81

Source Room
Temperature 22.2 °C
R.H. 50 %

Receive Room
Temperature 22.1 °C
R.H. 75 %

ATM
981 hPa

background < 5.0 below receive room
* 95% Confidence Interval exceeded



STC Rating	deficiencies	OITC
59	32	52

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-25
Customer:	Hilti Construction
Test Date:	03-24-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 4"
Specimen Description:	120 Cables Baseline Wall #1 Concrete 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	8" - lbs
Operator:	PAD

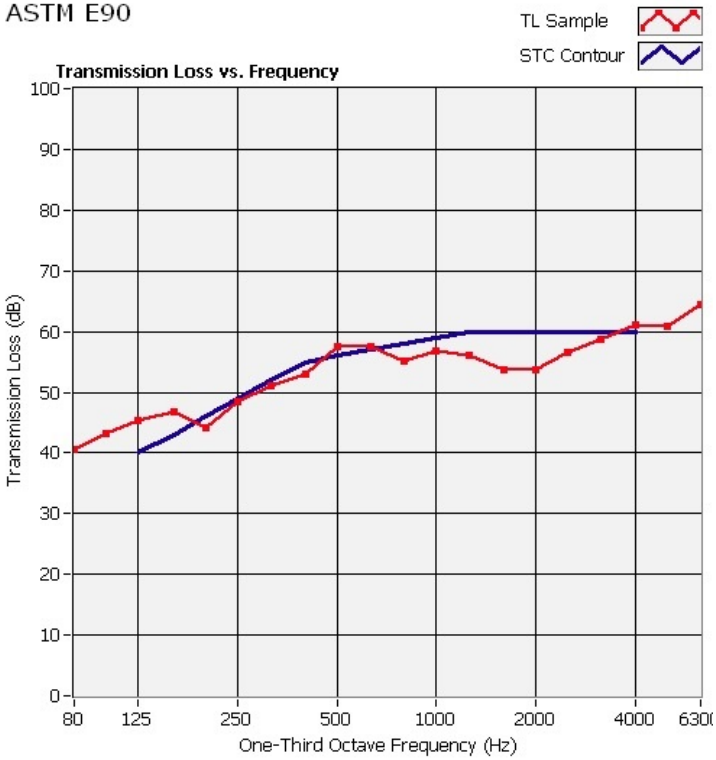
Data Table

	TL (dB)	deficiencies	95% CI
80	41	-	1.62
100	43	-	1.76
125	45	0	2.68
160	47	0	2.26
200	44	2	0.94
250	48	1	1.08
315	51	1	0.68
400	53	2	0.46
500	57	0	0.58
630	58	0	0.29
800	55	3	0.37
1000	57	2	0.44
1250	56	4	0.34
1600	54	6	0.37
2000	54	6	0.35
2500	57	3	0.37
3150	59	1	0.38
4000	61	0	0.64
5000	61	-	0.67

Source Room
Temperature 22.0 °C
R.H. 44 %

Receive Room
Temperature 22.2 °C
R.H. 75 %

ATM
981 hPa



STC Rating	deficiencies	OITC
56	31	51

background < 5.0 below receive room
* 95% Confidence Interval exceeded

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-35
Customer:	Hilti Construction
Test Date:	03-26-2015
Specimen ID:	Baseline
Specimen Description:	Gypsum Wall 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	8" - lbs
Operator:	SJM

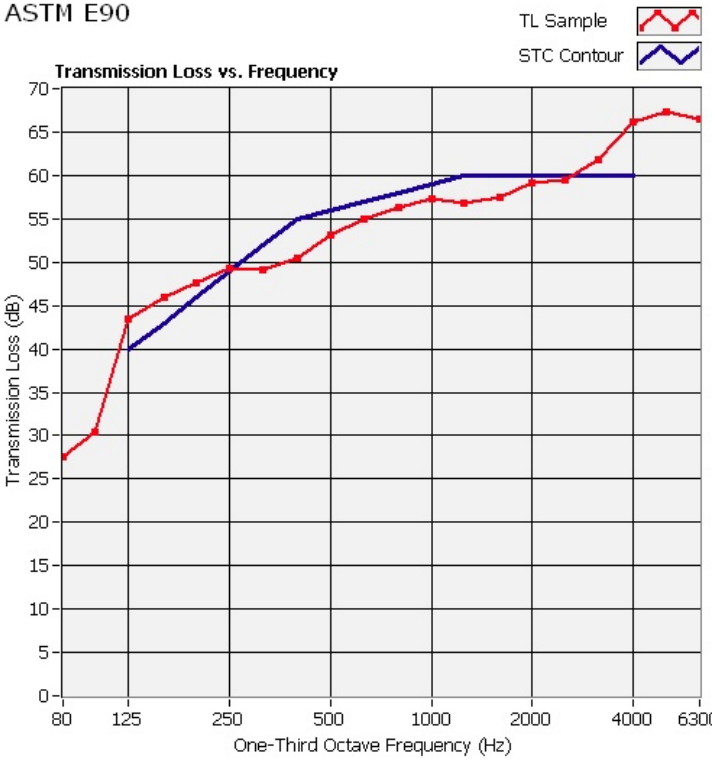
Data Table

	TL (dB)	deficiencies	95% CI
80	28	-	3.27
100	30	-	1.94
125	43	0	1.45
160	46	0	1.37
200	48	0	0.76
250	49	0	0.88
315	49	3	0.63
400	51	4	0.56
500	53	3	0.45
630	55	2	0.33
800	56	2	0.39
1000	57	2	0.39
1250	57	3	0.35
1600	57	3	0.25
2000	59	1	0.27
2500	59	1	0.35
3150	62	0	0.27
4000	66	0	0.25
5000	67 #	-	0.32

Source Room
Temperature 21.8 °C
R.H. 57 %

Receive Room
Temperature 22.1 °C
R.H. 57 %

ATM
983 hPa



STC Rating	deficiencies	OITC
56	24	44

background < 5.0 below receive room
* 95% Confidence Interval exceeded

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-40
Customer:	Hilti Construction
Test Date:	03-26-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 2"
Specimen Description:	Blank Baseline Wall #2 Gypsum 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	8" - lbs
Operator:	SJM

Data Table

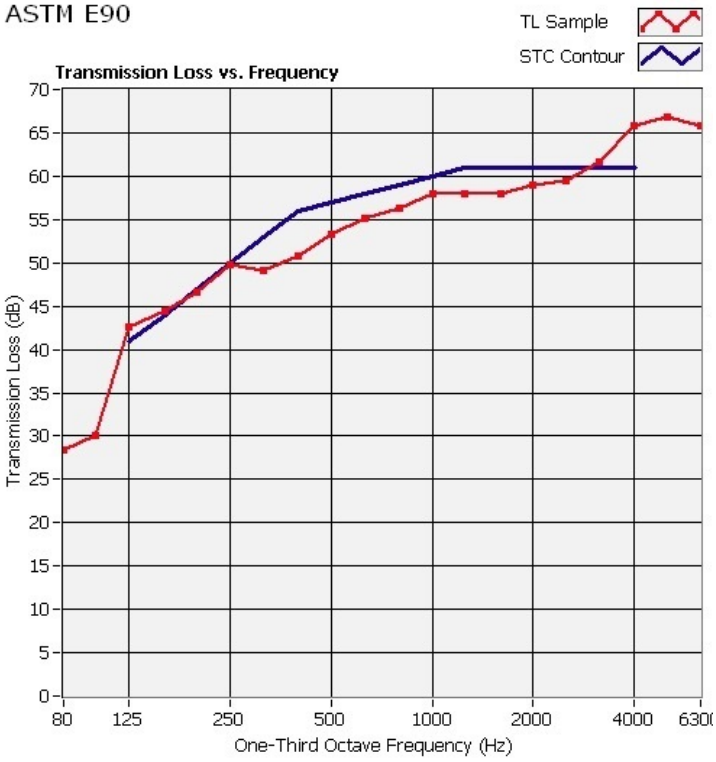
	TL (dB)	deficiencies	95% CI
80	28	-	3.32
100	30	-	1.74
125	43	0	1.69
160	44	0	1.03
200	47	0	0.93
250	50	0	1.10
315	49	4	0.90
400	51	5	0.45
500	53	4	0.46
630	55	3	0.46
800	56	3	0.46
1000	58	2	0.57
1250	58	3	0.77
1600	58	3	0.53
2000	59	2	0.29
2500	60	1	0.27
3150	62	0	0.32
4000	66	0	0.43
5000	67 #	-	0.48

background < 5.0 below receive room
* 95% Confidence Interval exceeded

Source Room
Temperature 21.8 °C
R.H. 51 %

Receive Room
Temperature 22.1 °C
R.H. 55 %

ATM 984 hPa



STC Rating	deficiencies	OITC
57	30	44

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-41
Customer:	Hilti Construction
Test Date:	03-26-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 2"
Specimen Description:	12 Cables Baseline Wall #2 Gypsum 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	8" - lbs
Operator:	SJM

Data Table

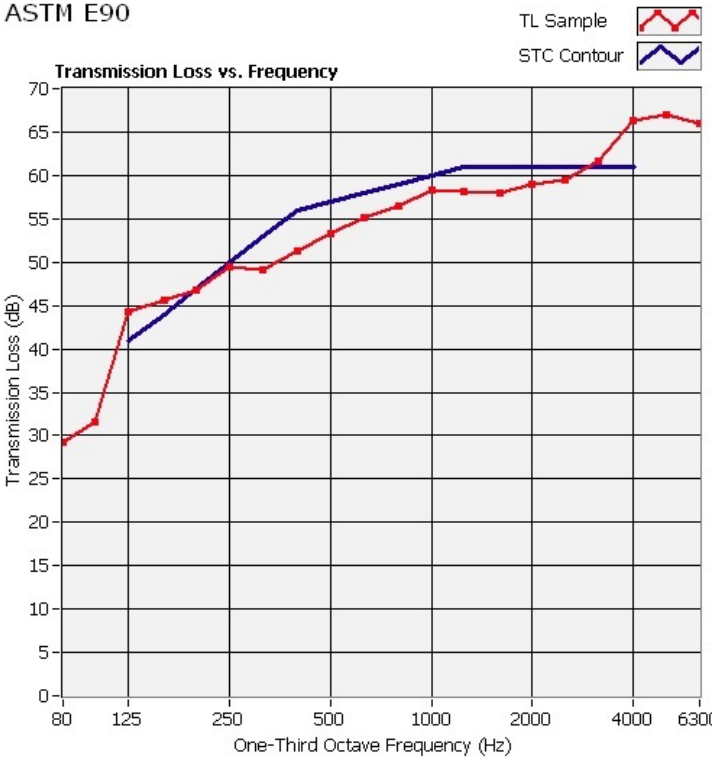
	TL (dB)	deficiencies	95% CI
80	29	-	3.13
100	32	-	1.70
125	44	0	1.58
160	46	0	1.19
200	47	0	1.06
250	49	1	1.00
315	49	4	0.69
400	51	5	0.42
500	53	4	0.37
630	55	3	0.39
800	57	2	0.30
1000	58	2	0.34
1250	58	3	0.32
1600	58	3	0.27
2000	59	2	0.23
2500	59	2	0.38
3150	62	0	0.37
4000	66	0	0.25
5000	67 #	-	0.22

background < 5.0 below receive room
* 95% Confidence Interval exceeded

Source Room
Temperature 21.8 °C
R.H. 50 %

Receive Room
Temperature 22.1 °C
R.H. 55 %

ATM 984 hPa



STC Rating	deficiencies	OITC
57	31	45

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-42
Customer:	Hilti Construction
Test Date:	03-26-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 2"
Specimen Description:	24 Cables Baseline Wall #2 Gypsum 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	8" - lbs
Operator:	SJM

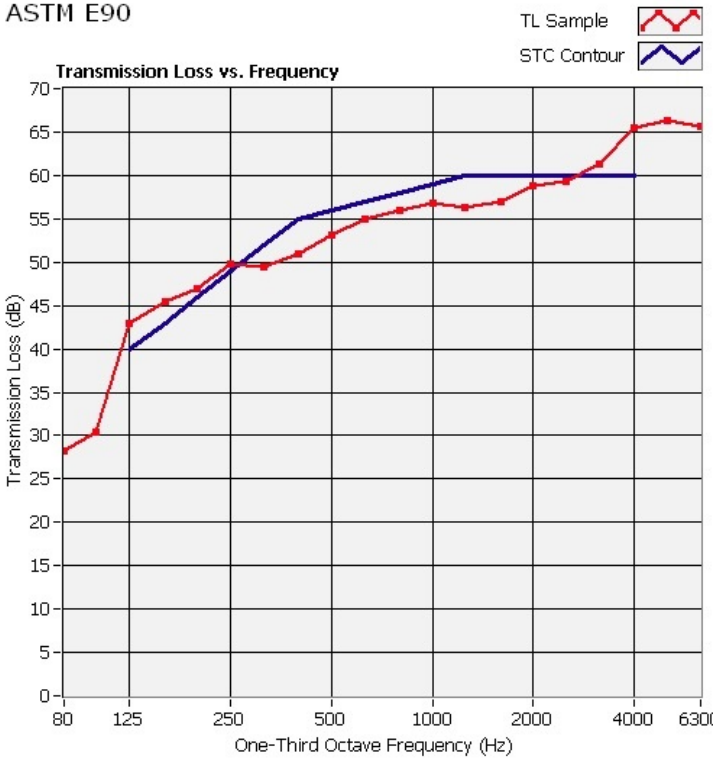
Data Table

	TL (dB)	deficiencies	95% CI
80	28	-	2.94
100	30	-	1.51
125	43	0	1.53
160	45	0	1.03
200	47	0	0.96
250	50	0	1.01
315	49	3	0.72
400	51	4	0.75
500	53	3	0.55
630	55	2	0.39
800	56	2	0.44
1000	57	2	0.59
1250	56	4	0.61
1600	57	3	0.49
2000	59	1	0.30
2500	59	1	0.30
3150	61	0	0.33
4000	65	0	0.56
5000	66 #	-	0.66

Source Room
Temperature 21.8 °C
R.H. 50 %

Receive Room
Temperature 22.0 °C
R.H. 54 %

ATM
984 hPa



STC Rating	deficiencies	OITC
56	25	44

background < 5.0 below receive room
* 95% Confidence Interval exceeded

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-58
Customer:	Hilti Construction
Test Date:	03-26-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 4"
Specimen Description:	Blank Baseline Wall #2 Gypsum 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	6" - lbs
Operator:	PAD

Data Table

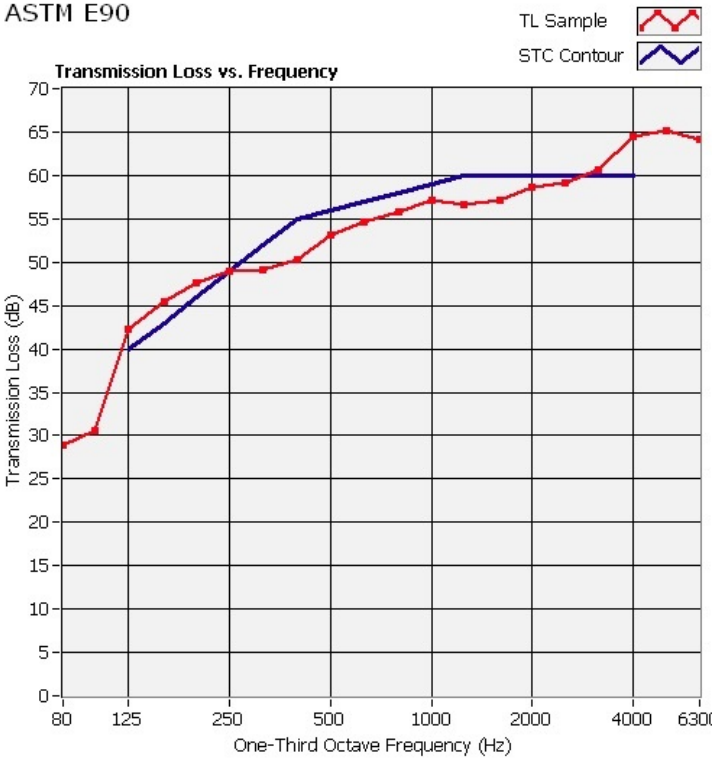
	TL (dB)	deficiencies	95% CI
80	29	-	3.12
100	31	-	2.06
125	42	0	1.24
160	45	0	0.81
200	48	0	1.14
250	49	0	1.01
315	49	3	0.84
400	50	5	0.60
500	53	3	0.50
630	55	2	0.45
800	56	2	0.31
1000	57	2	0.39
1250	57	3	0.36
1600	57	3	0.35
2000	59	1	0.27
2500	59	1	0.24
3150	61	0	0.28
4000	64	0	0.38
5000	65 #	-	0.42

background < 5.0 below receive room
* 95% Confidence Interval exceeded

Source Room
Temperature 22.0 °C
R.H. 41 %

Receive Room
Temperature 22.1 °C
R.H. 45 %

ATM
984 hPa



STC Rating	deficiencies	OITC
56	25	44

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-59
Customer:	Hilti Construction
Test Date:	03-26-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 4"
Specimen Description:	24 Cables Baseline Wall #2 Gypsum 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	6" - lbs
Operator:	PAD

Data Table

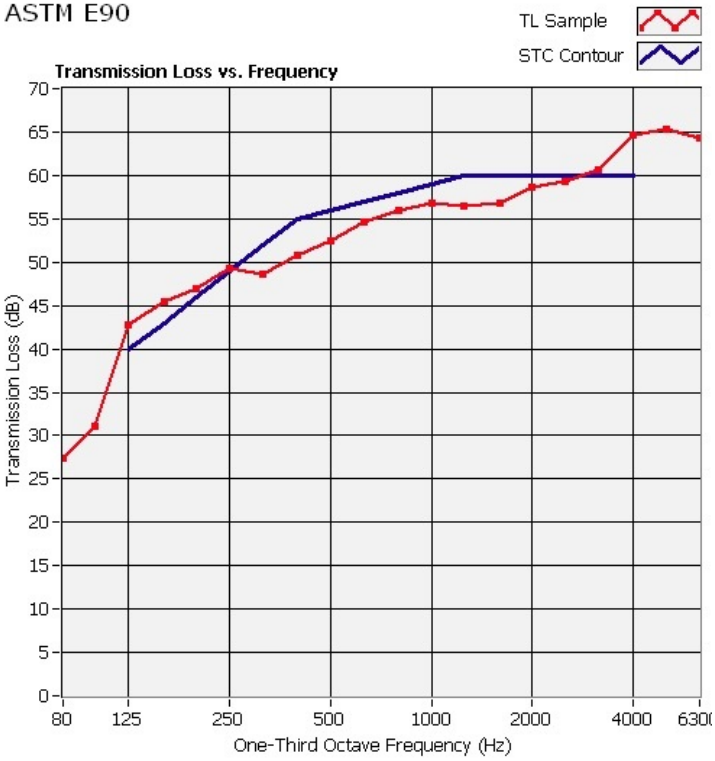
	TL (dB)	deficiencies	95% CI
80	27	-	3.44
100	31	-	1.92
125	43	0	1.87
160	45	0	1.28
200	47	0	0.93
250	49	0	0.96
315	49	3	0.70
400	51	4	0.57
500	52	4	0.41
630	55	2	0.31
800	56	2	0.27
1000	57	2	0.38
1250	57	3	0.48
1600	57	3	0.32
2000	59	1	0.29
2500	59	1	0.33
3150	61	0	0.24
4000	65	0	0.36
5000	65 #	-	0.40

background < 5.0 below receive room
* 95% Confidence Interval exceeded

Source Room
Temperature 21.9 °C
R.H. 41 %

Receive Room
Temperature 22.0 °C
R.H. 45 %

ATM
984 hPa



STC Rating	deficiencies	OITC
56	25	44

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-60
Customer:	Hilti Construction
Test Date:	03-26-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 4"
Specimen Description:	48 Cables Baseline Wall #2 Gypsum 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	6" - lbs
Operator:	PAD

Data Table

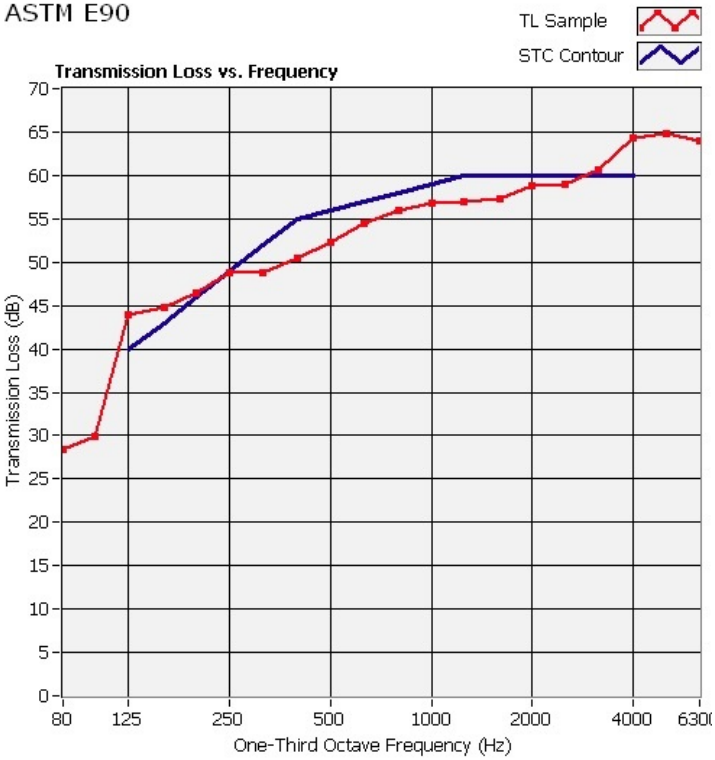
	TL (dB)	deficiencies	95% CI
80	28	-	3.37
100	30	-	2.38
125	44	0	1.43
160	45	0	0.82
200	46	0	1.08
250	49	0	1.28
315	49	3	0.76
400	50	5	0.63
500	52	4	0.41
630	54	3	0.46
800	56	2	0.28
1000	57	2	0.29
1250	57	3	0.28
1600	57	3	0.25
2000	59	1	0.36
2500	59	1	0.28
3150	61	0	0.34
4000	64	0	0.30
5000	65 #	-	0.41

background < 5.0 below receive room
* 95% Confidence Interval exceeded

Source Room
Temperature 21.9 °C
R.H. 41 %

Receive Room
Temperature 22.1 °C
R.H. 45 %

ATM
984 hPa



STC Rating	deficiencies	OITC
56	27	44

Ear Controlled Data

TEST RESULTS:

SOUND TRANSMISSION LOSS
ASTM E90

General Information

Project No.:	ESP019371P-61
Customer:	Hilti Construction
Test Date:	03-26-2015
Specimen ID:	Hilti Smoke and Acoustic Sleeve CS-S SA 4"
Specimen Description:	120 Cables Baseline Wall #2 Gypsum 108.40" W x 96.50" H - 72.64 ft²
Specimen (depth-weight):	6" - lbs
Operator:	PAD

Data Table

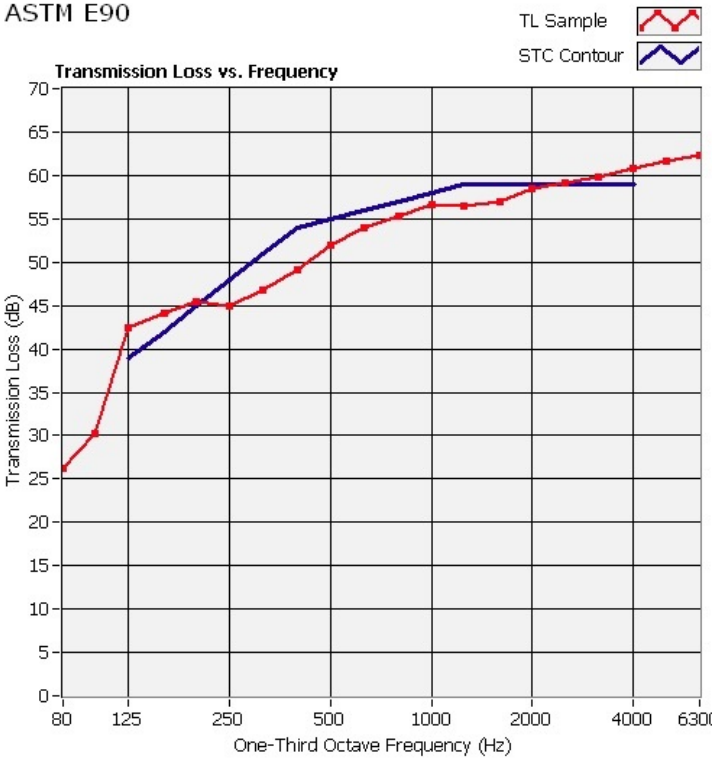
	TL (dB)	deficiencies	95% CI
80	26	-	3.75
100	30	-	2.36
125	42	0	1.52
160	44	0	1.08
200	45	0	0.91
250	45	3	1.10
315	47	4	0.67
400	49	5	0.49
500	52	3	0.36
630	54	2	0.36
800	55	2	0.32
1000	57	1	0.32
1250	56	3	0.35
1600	57	2	0.28
2000	59	0	0.26
2500	59	0	0.28
3150	60	0	0.26
4000	61	0	0.41
5000	62	-	0.40

Source Room
Temperature 21.9 °C
R.H. 41 %

Receive Room
Temperature 22.1 °C
R.H. 45 %

ATM
984 hPa

background < 5.0 below receive room
* 95% Confidence Interval exceeded



STC Rating	deficiencies	OITC
55	25	43

Ear Controlled Data