Designation: E 989 – 89 (Reapproved 1999)

Standard Classification for Determination of Impact Insulation Class (IIC)[1]

This standard is issued under the fixed designation E 989; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This classification covers the determination of a single-figure rating that can be used for comparing floor-ceiling assemblies for general building design purposes. The rating is called impact insulation class (IIC). This classification is applicable only to one-third octave band impact noise data obtained using the standard tapping machine described in Test Method E 492. This rating may be used with data obtained in the laboratory or field.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

E 492 Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine[2]

3. Significance and Use

3.1 The IIC system rates floor-ceiling structures in ascending degrees of impact sound insulation. Thus, IIC values increasing in magnitude indicate a correspondingly increasing degree of impact sound insulation under tapping machine test. The IIC rating can be used by architects, builders, and specification and code authorities for acoustical design purposes in building constructions.

4. Basis of Classification

4.1 To determine the impact insulation class (IIC) of a floor-ceiling assembly, its normalized impact sound pressure levels in the 16 test frequency bands are compared with those of the IIC reference contour. The contour is illustrated in Fig. 1 and tabulated in Table 1. The test frequency bands are a series of one third octaves centered on 100 to 3150 Hz.

NOTE 1—Use of this classification for the purpose of comparing or rating test data based on octave band measurements may cause confusion and result in erroneous or misleading evaluations. Therefore this classification cannot be used with octave band data.

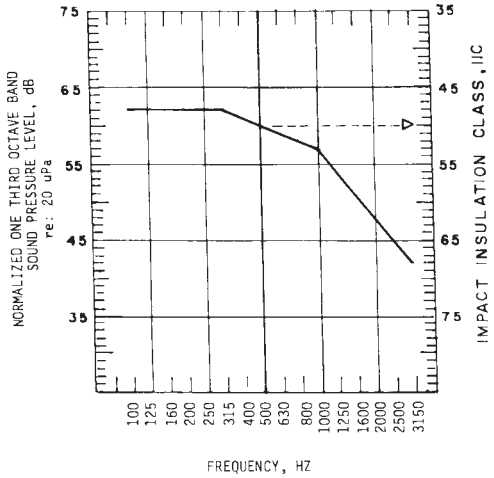

FIG. 1 Typical IIC Contour (IIC-50)

4.2 *Graphical Determination of IIC*—If the normalized sound pressure levels for the test specimen are plotted in a graph (see Note 2), the impact insulation class may be determined by using a transparent overlay on which the IIC contour is drawn. The IIC contour is shifted vertically relative to the test data until the following conditions are fulfilled: (*1*) the sum of the deviations above the contour do not exceed 32 dB, and (*2*) the maximum deviation at a single test frequency shall not exceed 8 dB. The normalized sound pressure level at the intersection of the contour and the 500 Hz ordinate is subtracted from 110 to obtain the impact insulation class or may be read directly from the right-hand ordinate scale (see Fig. 1).

4.3 *Numerical Determination of IIC*—Table 1 lists the normalized one-third octave band sound pressure levels (L_n) corresponding to a range of IIC contours. This range may be extended upwards or downwards by adding or subtracting increments of 1 dB. The test data are compared with the rows of L_n values given in the table to determine the maximum row for which the conditions given in 4.2 are met.

5. Presentation of Results

5.1 It is recommended that the test data be plotted in a graph together with the corresponding IIC contour obtained as

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[2] *Annual Book of ASTM Standards,* Vol 04.06.

TABLE 1 Normalized One-Third Octave Band Sound Pressure Level Versus Frequency for a Range of IIC Contours

100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	IIC
85	85	85	85	85	85	84	83	82	81	80	77	74	71	68	65	27
84	84	84	84	84	84	83	82	81	80	79	76	73	70	67	64	28
83	83	83	83	83	83	82	81	80	79	78	75	72	69	66	63	29
82	82	82	82	82	82	81	80	79	78	77	74	71	68	65	62	30
81	81	81	81	81	81	80	79	78	77	76	73	70	67	64	61	31
80	80	80	80	80	80	79	78	77	76	75	72	69	66	63	60	32
79	79	79	79	79	79	78	77	76	75	74	71	68	65	62	59	33
78	78	78	78	78	78	77	76	75	74	73	70	67	64	61	58	34
77	77	77	77	77	77	76	75	74	73	72	69	66	63	60	57	35
76	76	76	76	76	76	75	74	73	72	71	68	65	62	59	56	36
75	75	75	75	75	75	74	73	72	71	70	67	64	61	58	55	37
74	74	74	74	74	74	73	72	71	70	69	66	63	60	57	54	38
73	73	73	73	73	73	72	71	70	69	68	65	62	59	56	53	39
72	72	72	72	72	72	71	70	69	68	67	64	61	58	55	52	40
71	71	71	71	71	71	70	69	68	67	66	63	60	57	54	51	41
70	70	70	70	70	70	69	68	67	66	65	62	59	56	53	50	42
69	69	69	69	69	69	68	67	66	65	64	61	58	55	52	49	43
68	68	68	68	68	68	67	66	65	64	63	60	57	54	51	48	44
67	67	67	67	67	67	66	65	64	63	62	59	56	53	50	47	45
66	66	66	66	66	66	65	64	63	62	61	58	55	52	49	46	46
65	65	65	65	65	65	64	63	62	61	60	57	54	51	48	45	47
64	64	64	64	64	64	63	62	61	60	59	56	53	50	47	44	48
63	63	63	63	63	63	62	61	60	59	58	55	52	49	46	43	49
62	62	62	62	62	62	61	60	59	58	57	54	51	48	45	42	50
61	61	61	61	61	61	60	59	58	57	56	53	50	47	44	41	51
60	60	60	60	60	60	59	58	57	56	55	52	49	46	43	40	52
59	59	59	59	59	59	58	57	56	55	54	51	48	45	42	39	53
58	58	58	58	58	58	57	56	55	54	53	50	47	44	41	38	54
57	57	57	57	57	57	56	55	54	53	52	49	46	43	40	37	55
56	56	56	56	56	56	55	54	53	52	51	48	45	42	39	36	56
55	55	55	55	55	55	54	53	52	51	50	47	44	41	38	35	57
54	54	54	54	54	54	53	52	51	50	49	46	43	40	37	34	58
53	53	53	53	53	53	52	51	50	49	48	45	42	39	36	33	59
52	52	52	52	52	52	51	50	49	48	47	44	41	38	35	32	60
51	51	51	51	51	51	50	49	48	47	46	43	40	37	34	31	61
50	50	50	50	50	50	49	48	47	46	45	42	39	36	33	30	62
49	49	49	49	49	49	48	47	46	45	44	41	38	35	32	29	63

described in Section 4. In this way attention is drawn to the frequency regions that limit the impact insulation performance of the test specimen.

NOTE 2—If results are presented in graphical form, it is recommended that the ordinate scale be 2 mm/dB and the abscissa scale be 50 mm/decade. If it is necessary to use a larger or smaller scale, the same aspect ratio should be used.

6. Keywords

6.1 floors; IIC; impact noise; impact rating; tapping machine