

## Acoustical System Analysis of a Fan/Duct System

### Example

Item No.	Fan/Duct System Element	Octave Band – Hz						
		63	125	250	500	1000	2000	4000
<b>1</b>	<b>Supply Fan</b> – Model XYZ	93	93	91	88	84	81	77
<b>2</b>	<b>Plenum</b> 68" × 55" × 90" long 47" × 20" outlet, 30° and 96" from inlet 30% absorption	-9	-11	-12	-11	-11	-11	-10
<b>3</b>	<b>Duct Breakout</b> 46" × 20" high × 10 ft long 22 ga. duct							
3.1	Duct Lw (1+2)	84	82	79	77	73	70	67
3.2	Duct Breakout Calculation	-7	-10	-13	-16	-19	-25	-31
3.3	Room Effect for 20 ft × 20 ft × 10 ft high room	-7	-8	-9	-10	-11	-11	-12
3.4	Lp after breakout (3.1 + 3.2 + 3.3)	70	64	57	51	43	34	24
3.5	NC-35 Criterion	-60	-52	-45	-40	-36	-34	-33
3.6	<b>(Breakout) Insertion Loss</b> required to meet Criteria (3.4+3.5)	10	12	12	11	7	0	0
<b>4</b>	<b>Rectangular Mitered Elbow</b> 20" Elbow Dimension with no turning vanes	0	-1	-5	-7	-5	-3	-3
<b>5</b>	<b>Rectangular Mitered Elbow</b> 46" Elbow Dimension with short turning vanes	-1	-3	-3	-2	-2	-2	-2
<b>6</b>	<b>Branching of Ductwork</b> - 3% of airflow	-15	-15	-15	-15	-15	-15	-15
<b>7</b>	<b>End Reflection</b> 8" circular opening, flush	-14	-10	-5	-2	0	0	0
<b>8</b>	<b>Room Effect</b> for 12 ft x 10 ft x 10 ft high room 2 outlets in room	0	-1	-2	-3	-3	-4	-5
<b>9</b>	<b>Resultant Lp in Room</b> prior to silencing (1+2+4+5+6+7+8)	54	52	49	48	48	46	42
<b>10</b>	<b>NC-35 Criterion</b>	-60	-52	-45	-40	-36	-34	-33
<b>11</b>	<b>(Duct borne) Insertion Loss</b> required to meet Criterion (9+10)	0	0	4	8	12	12	9
<b>12</b>	<b>Combined Insertion Loss</b> required to meet Criterion (item 3.6 vs. item 11: worst case octave by insert loss required)	<b>10</b>	<b>12</b>	<b>12</b>	<b>11</b>	<b>12</b>	<b>12</b>	<b>9</b>