How long does it take to clear the air in an isolation or high-risk procedure room?

Adequate time must pass before staff without respiratory protection or patients enter an isolation or high-risk procedure room after it has been occupied by an unmasked suspect or known infectious tuberculosis (TB) patient. Anyone entering the room before airborne particles have been cleared is at risk for TB infection.

The Centers for Disease Control and Prevention (CDC) recommend that patients and staff allow sufficient time for at least 99% of airborne particles to be removed after a suspected or known infectious TB patient leaves. The primary factors affecting clearance time required include:

- Room air change rate
- Air mixing factor

The worksheet on the next page will help you to estimate the clearance time you need.

This information is available at our website: www.nationaltbcenter.edu

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FAQ

Frequently Asked Questions

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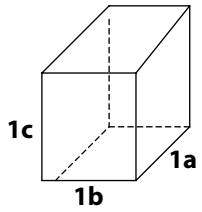
Room Clearance Time Calculation Worksheet

Room or Booth # _____

1. Calculate Room Volume



1a.	Room Length	**1a.** _____ft
1b.	Room Width	**1b.** _____ft
1c.	Room Height	**1c.** _____ft
1d.	**1a** x **1b** x **1c** = volume	**1d.** _____ft^3

2. Calculate Air Changes per Hour (ACH)

2a.	Measured exhaust airflow rate	**2a.** _____CFM
2b.	**2a** x 60 minutes	**2b**. _____ft^3 per hr
2c.	**2b** ÷ **1d**	**2c.** _____ACH

3. Calculate Room Clearance Time

3a) **Find the Uncorrected Clearance Time**

Using Table S3-1 of the CDC Guidelines (see **next page**), follow the first column down until the ACH value on line 2c is found. Follow this row horizontally to the third column (99% removal efficiency). Record this value (the number of minutes).

3a. _____ minutes

3b) **Estimate the mixing factor**

(Mixing factors can vary from one, for ideal mixing, to ten for poor mixing. As a rule of thumb, a mixing factor of three can be assumed for a room with 12 ACH and good air movement.)

3b. _____

3c) **Estimate room clearance time**

3a x **3b** **3c**. _____ minutes

This is the amount of time which should elapse before staff or other patients enter a sputum induction area (booth hood or room) or isolation room after a suspect or known infectious TB patient leaves.

TABLE S3-1. Air changes per hour (ACH) and time in minutes required for removal efficiencies of 90%, 99%, and 99.9% of airborne contaminants*

ACH	Minutes required for a removal efficiency of: 90%	99%	99.9%
1	138	276	414
2	69	138	207
3	46	92	138
4	35	69	104
5	28	55	83
6	23	46	69
7	20	39	59
8	17	35	52
9	15	31	46
10	14	28	41
11	13	25	38
12	12	23	35
13	11	21	32
14	10	20	30
15	9	18	28
16	9	17	26
17	8	16	24
18	8	15	23
19	7	15	22
20	7	14	21
25	6	11	17
30	5	9	14
35	4	8	12
40	3	7	10
45	3	6	9
50	3	6	8

*This table has been adapted from the formula for the rate of purging airborne contaminants (99). Values have been derived from the formula $t_1 = [\ln (C_2 \div C_1) \div (Q \div V)] \times 60$, with $T_1 = 0$ and $C_2 \div C_1$ - (removal efficiency ÷ 100), and where:

t_1 = initial timepoint
C_1 = initial concentration of contaminant
C_2 = final concentration of contaminants
Q = air flow rate (cubic feet per hour)
V = room volume (cubic feet)
Q ÷ V = ACH

The times given assume perfect mixing of the air within the space (i.e., mixing factor = 1). However, perfect mixing usually does not occur, and the mixing factor could be as high as 10 if air distribution is very poor. The required time is derived by multiplying the appropriate time from the table by the mixing factor that has been determined for the booth or room. The factor and required time should be included in the operating instructions provided by the manufacturer of the booth or enclosure, and these instructions should be followed.

(Excerpt from: Centers for Disease Control and Prevention's *Guideline for preventing the transmission of Mycobacterium tuberculosis in health-care facilities,* 1994, p. 72)

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