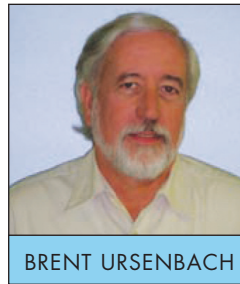


MECHANICAL CODE DISCUSSION

International Residential Code – 50 CFM Bath Fans Requirements



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In this issue we'll revisit a subject addressed several times. As I've received numerous calls regarding *IRC Table M1506.2, Duct Length*, it may be useful to address the subject in a written discussion. Too often code officials and contractors misunderstand the requirements.

Please be aware, the code refers to the external resistance created by friction in duct work, in terms of inches water column ("wc.), or sometimes inches water gage ("wg.) Some documentation may refer to this friction or resistance in terms of inches static pressure ("SP). Don't be confused, all three terminologies are correct and equal. Let's begin with a review a couple of code sections:

M1506.2 Duct length. The length of exhaust and supply ducts used with

we find moving 50 CFM through a 3" flex duct requires an air velocity of 1050 feet per minute and a fan capable of moving 50 CFM against 1.3" wc. The cheap fans are rated at 50 CFM at 0.1" wc. Obviously, they don't work.

Next code section:

M1507.4 Local exhaust rates. *Local exhaust systems* shall be designed to have the capacity to exhaust the minimum air flow rate determined in

TABLE M1507.4
MINIMUM REQUIRED LOCAL EXHAUST RATES FOR ONE- AND TWO-FAMILY DWELLINGS

AREA TO BE EXHAUSTED	EXHAUST RATES
Kitchens	100 cfm intermittent or 25 cfm continuous
Bathrooms-Toilet Rooms	Mechanical exhaust capacity of 50 cfm intermittent or 20 cfm continuous

accordance with Table M1507.4.

When we consider this section and Table, it's important to recall, the IRC continues to have exceptions for bath fans (R303.3) and kitchen exhaust (M1503.1-3). *Where Local Exhaust is installed, it must comply with Table M1507.4. Please note, the required exhaust rate for a bathroom is 50 CFM intermittent.* If an installed

bathroom fan is rated at 70 CFM, 80 CFM, or more, the code only requires that fan move a minimum 50 CFM. Additionally, that 70 or 80 CFM fan is often rated at 0.10" wc. If you look closely at the specifications, the CFM will be lower at 0.25" wc., the static pressure required by Table M1506.2. *As the code requirement is 50 CFM, the correct column to use for bathroom duct sizing is the 50 CFM column. The inspector should not require you to use the 70, or 80 CFM*

column.

Let's consider a couple of examples which work. Refer to the specification sheets at these links:

<http://www.airkinglimited.com/specsheets/AS70Spec.pdf>

<http://www.airkinglimited.com/specsheets/BFQ80Spec.pdf>

First, is Model AS70, rated at 70 CFM @ 0.10" wc.

- Notice in the highlighted expanded performance, the air flow at 0.25" wg. is 62 CFM.
- Great, the fan meets, actually slightly exceeds the 50 CFM requirement at 0.25" wg.
- The 3" collar creates a challenge, as the Table tells us only 5' of smooth pipe and no elbows is allowed. Per footnote 'c', 15' must be deducted for each elbow.
- The duct must immediately increase to 4", and lengths including elbows must meet the 50 CFM lengths to comply.

Second, considering the Model BFQ80, rated at 80 CFM @ 0.10" wc.

- From the highlighted expanded performance, the air flow at 0.25" wg is 66 CFM.
- Also notice the expanded performance shows the air flow drops as the resistance increases. Increasing beyond 0.25" wc. results in a rapid drop in air flow, a drop so great, the manufacturers don't provide the data or recommend high static pressure drops on this type of fan.
- The 4" collar will not require an

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TABLE M1506.2
DUCT LENGTH

DUCT TYPE	FLEX DUCT						SMOOTH WALL DUCT									
	50	80	100	125	150	200	250	300	50	80	100	125	150	200	250	300
Fan airflow rating (CFM @ 0.25 inch wc.)																
Diameter (inches)	Maximum length** (feet)															
3	X	X	X	X	X	X	X	X	5	X	X	X	X	X	X	X
4	56	4	X	X	X	X	X	X	114	31	10	X	X	X	X	X
5	NL	81	42	16	2	X	X	X	NL	152	91	51	28	4	X	X
6	NL	NL	158	91	55	18	1	X	NL	NL	NL	168	112	53	25	9
7	NL	NL	NL	NL	161	78	40	19	NL	NL	NL	NL	NL	148	88	54
8 and above	NL	NL	NL	NL	NL	189	111	69	NL	NL	NL	NL	NL	198	133	

For SL 1 foot = 304.8 mm.
 a. Fan airflow rating shall be in accordance with ANSI/AMCA 210-ANSI/ASHRAE 51.
 b. For non-rigid ducts, calculate the diameter as four times the cross-sectional area divided by the perimeter.
 c. This table assumes that elbows are not used. Fifteen feet of allowable duct length shall be deducted for each elbow installed in the duct run.
 d. NL = no limit on duct length of this size.
 e. * = not allowed. Any length of duct of this size with assumed losses and fittings will exceed the rated pressure drop.

ventilating equipment shall not exceed the lengths determined in accordance with Table M1506.2.

It's common knowledge, the cheap (\$12-\$15) fans installed for decades in homes make more noise than move air. Adding to the issue is the use of 3" flex duct, often in long lengths, with no effort to eliminate numerous sags and bends. Tests show the typical actual CFM on these fans ranges from 5 to 20 CFM. Referring to duct design charts,



Mobile Distraction is Not Just a Road Problem

WHETHER ON AN ACTIVE construction site, on a fast-paced manufacturing floor, or in any situation where several activities are taking place simultaneously, attention from everyone is key to helping keep a work environment safe.

Distractions on the job can have catastrophic consequences. And while distractions are all around, there is one type that can be easily eliminated: mobile devices.

The Myth of Multitasking

Safety-minded businesses generally take the necessary step of prohibiting mobile device use while operating machinery or while in areas where potentially hazardous activities are taking place. But without providing context, you run the risk of an employee ignoring the rule and causing an otherwise preventable disaster.

Tell your employees this simple fact: People cannot multitask. Sure, the human brain can switch swiftly from task to task. However, it can't focus on more than one task at a time,

even though it appears that way to an outside observer.

Imagine a forklift moving a heavy load through a warehouse. The driver can be doing everything correctly — sounding the horn at intersections, driving at a reasonable speed, scanning his or her path for obstructions, etc. — but if other people in the area have their heads down, reading a text message or checking the weather, there's no telling what could happen.

Hands-Free, but Not Worry-Free

With increased awareness of the dangers new technology can present, solutions like hands-free accessories have popped up. But the problem is far from solved. Much of the research on using hands-free technology has focused on use while driving, but the lessons learned are easily transferrable to nearly any situation. Even with a Bluetooth headset in his or her ear, a mobile device user is still distracted.

Removal: The Best Solution

The best practice is to eliminate the

temptation to use mobile devices altogether and require your employees to either keep their phones in their pockets or, better yet, store them away from the hustle and bustle of the work site.

Practice what you preach. Job site foremen, managers, and other authority figures should model safe behavior, signaling to employees that casual use of mobile devices without a business purpose has no place on the job.

Keeping attention on this important topic is key. Post signs, dedicate a safety meeting to the subject — do whatever you can to let your employees know that mobile devices can be a threat to the safety of everyone on the site.

This article is for general information and risk prevention only and should not be considered legal or other expert advice. The recommendations herein may help reduce, but are not guaranteed to eliminate, any or all risk of loss. The information herein may be subject to, and is not a substitute for, any laws or regulations that may apply. Qualified counsel should be sought with questions specific to your circumstances. © 2019 Federated Mutual Insurance Company. ■

upsizing if the equivalent length, including elbows, fall within the 50 CFM column.

Summarizing, additional comments:

1. The bathroom requirement is 50 CFM – size bathroom fan ducts using the 50 CFM column.
2. The manufacturer might claim 70 to 80 CFM, but most likely is at a lower static pressure- 0.10" wc. Insure documentation is provided, listing at least 50 CFM at 0.25" wc.

If the fan doesn't meet this, it's non-compliant.

3. If flexible duct is used, it must be installed as straight as possible. Add up all of the angles created by poorly ran flex, adding 15' for each 90-degree bend. Flex duct installation standards do not allow more than 1/2" sag per foot of flex.
4. Flex connector cannot exceed 14', while flex duct does not have a length limit, other than the limits

placed by Table M1506.2.

5. If the home requires mechanical ventilation, due to air tightness verified by blower door testing, there may be a CFM requirement other than the 50 CFM.

Please feel free to contact me if you have questions or comments on this or other energy/mechanical related subjects. Email or text is always best as I'm not typically available to take a phone call. —Thanks, Brent ■