From: iain walker <iswalker@lbl.gov>
To: Jeff Miller <Jmiller@energy.state.ca.us>
Date: 1/3/2012 11:43 AM
Subject: Re: Proposed Flow Hood spec's in RA3 for measurement of central forced air system return grille airflow

On Dec 20, 2011, at 4:33 PM, Jeff Miller wrote:

> Iain,
> Thank you for your responses below in the string - very helpful to us.
>
> Could you clarify whether the typical 20% to 30% RMS error reported
> for commercially available standard flow hoods (quoted below in the
> string) is applicable to measurements of airflow at the return
> grille? Russ King's comments below have questioned whether the
> research reports cited are valid justification for disallowing use
> of standard flow hoods. Shall we stand firm on disallowing use of
> standard flow hoods for measuring airflow at the return grilles of
> residential central forced air systems?
> thanks again
> jeff
>

For return air flow measurement there are four key issues (reflected in the results reported in LBNL 47382):
1. Placement over the grille. If the return grille fits entirely within the flow hood opening then we are OK. If not, then it becomes problematic to measure all the flow. You would need to split the grille into two or more sections and perform a measurement for each section of the grille. This results in underpredictions of the air flow because any non-powered flow hood restricts the flow into that part of the grille. Our results showed that in one instance this led to a small error (about 1%), but in two other cases to large errors (24%).
2. Multiple returns. The added flow restriction of a flow hood over one grille will reduce the air flow at that grille (with a corresponding increase at the uncovered grilles). I do not have any specific data in LBNL 47382 on this (or other reports). We really need to do some field testing of this effect.
3. Limited capacity. Some flow hoods specifically marketed for residential applications have smaller dimensions (to get a better signal at low flows) and have very high air flow resistance at typical return air flows. In our testing the return flows were near the manufacturers recommended upper limit for air flow measurements and resulted in large errors (underprediction of 17%) suggesting that the manufacturer should have set a much lower upper limit for this device. You could specify that flow hoods can only be used in a restricted range of the manufacturers listed acceptable range. But without additional data we could not say what this limit should be.
4. Calibration issues. One flow hood we tested in the laboratory has consistent reading >30% above the correct reading over a range of flows from 1000 to 2000 cfm. We suspect this was a calibration error from the manufacturer (we were unable to confirm this).

Given all of the above, it is possible to make good measurements of

return flows if the manufacturer has a good calibration (which is hard to know unless you check it), the grilles can be completely covered by the flow hood, and if the air flows are not too high compared to the manufacturer stated upper limit. Until we get more data and/or language that deals with these issues then I think you do need to stand firm in disallowing standard flow hoods. Having said that, I am more than happy to enter into a discussion of what we could put in the code that would allow the use of acceptable performing flow hoods - so we need to get more info from Russ and possibly engage him and other contractors in a series of field tests of powered and passive flow hoods. This would be a great project for some PIER research (so long as that program exists?). If not PIER, then maybe we should reach out to the utilities. Possibly PG&E (Charles Segerstrom) would be interested in sponsoring some work?

- Iain

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