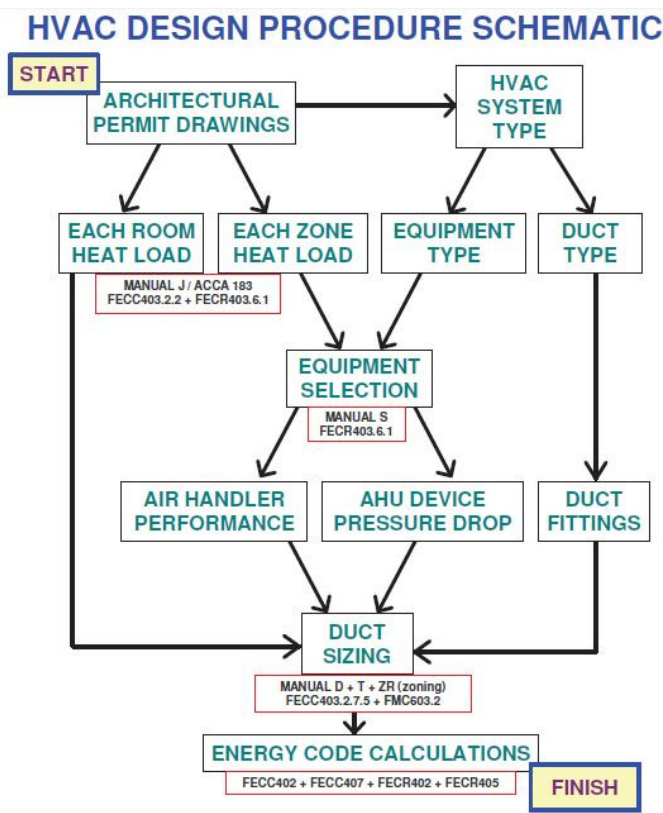


Spotting a fake HVAC design is simple for an experienced designer by reviewing the math that makes up a great hvac design. Math is the only reliable method to determine each of the 5 HVAC design processes, the chart below shows the 4 hvac design manuals along with the final calculation – the energy code calculation.



Before the 1980's few HVAC designs were based on any math at all - even though the hvac design manuals have been published since the 1960's. The days of hand held calculators and endless math forms for computing room by room heat load calculations are long gone – thankfully – as it could take an entire day to compute a single building.

Prior to computers, most HVAC contractors simply guessed on the hvac using a simple square feet per ton, this inaccurate “design” method of using a square foot per ton allowance had no chance of working well because no two buildings have the same demand on a square foot basis. As a designer in the 1980's- the average square foot per ton, based on thousands of actual heat load calculations and not guessing, would vary from 400 to 700 depending mostly on the GFA (glass to floor area) and the glass

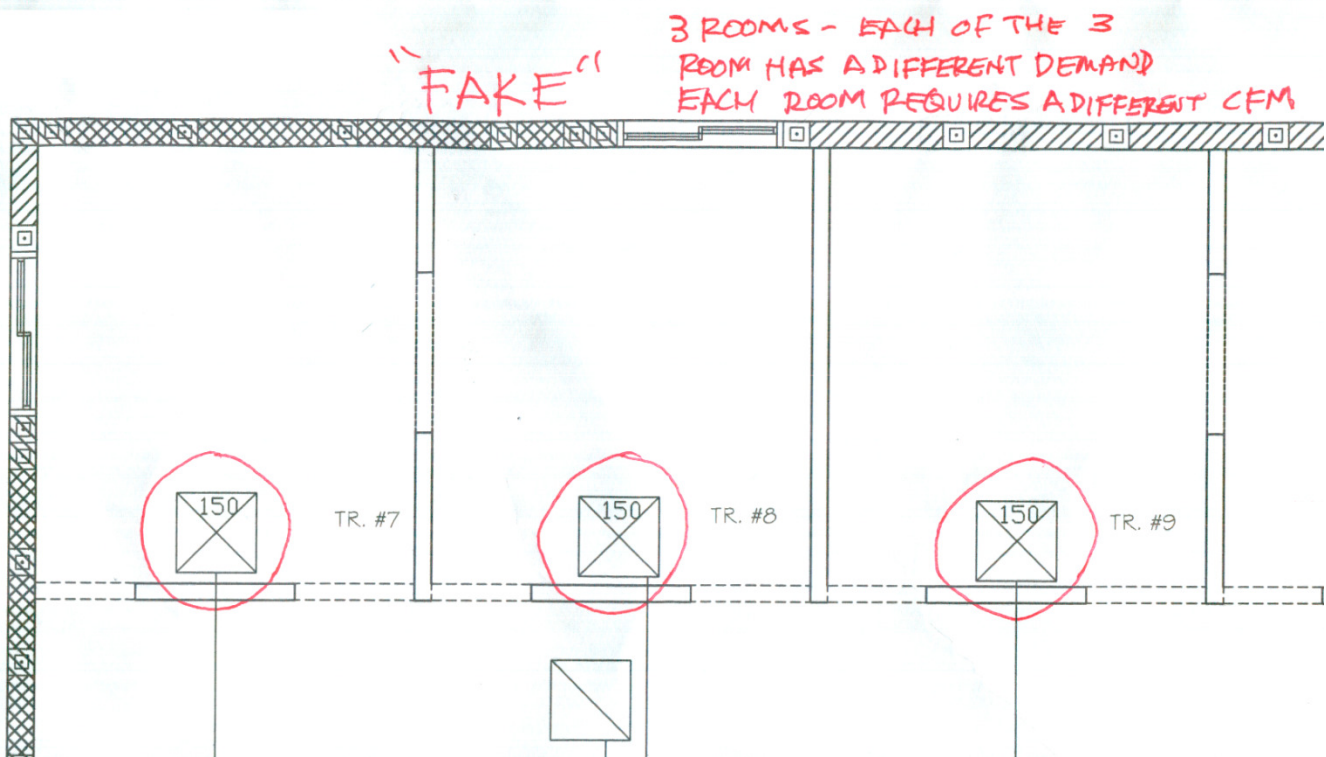
orientation – (this was long before double pane low e glass glass) – today we perform 3d cad energy models that reflect the exact geometry and building component material make up, resulting in homes that average 700 to 1300 square feet per ton. The square feet per ton for any building is established **after** the room by room heat load calculation is performed and not before. A correctly designed hvac system for any building requires many hours performing the 5 calculations now required by both the Florida building codes and the International building codes. So a properly designed hvac system will contain a lot of math and the hvac drawing that shows this math “graphically”. My standard simple home design package will contain about 20 pages of math (Manual's J,D,S,T,ZR + Florida energy code forms) and the intelligent HVAC cad drawing that is data linked to the math – a precise match.

Spotting the Fake

The first item to look at is the room airflow values listed – if the listed values are neatly rounded up to a value like “150 cfm” – or any value that would end with a nice rounded number. Rounded values are an indication that no heat load calculations were performed on the room and the values were simply guessed at. Room air flow values are derived from the room by room heat load calculations and math prevents the values from ending up with a neatly rounded value. Second item is the math documents, Manual's J,D,S,T,ZR + Florida energy code forms, be sure they are all provided together in a single package. Performing the

energy code forms only without the supporting hvac design manuals is surely a fake. Third, look for a scaled hvac drawing showing every part and piece of the hvac system, energy calculations rely on math from the prerequisite hvac design manuals, a great example is the amount of duct work square feet for the building, the amount of both supply and return air ducts is required in both the energy code calculation and the heat load calculations. This means that a scaled duct design complying with Manual D would be required to establish the real amounts. I see many contractors simply guess on the amount of ducts instead of the required effort of a duct design that truly matches the building. So be sure that your design package includes all 5 design manuals and a full set of hvac drawings, otherwise it's a fake based on several guesses!

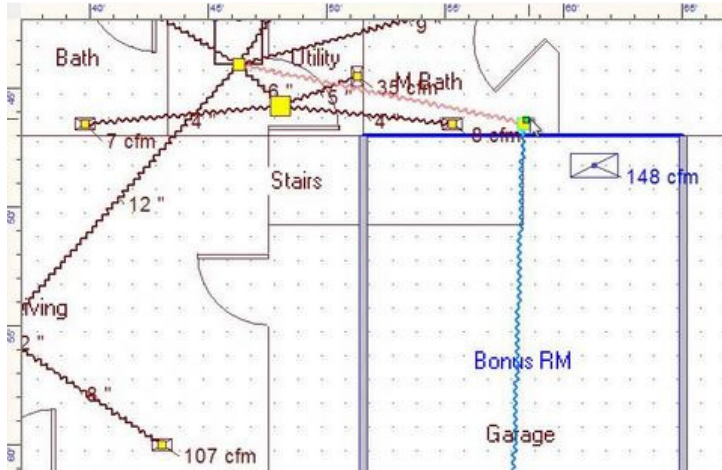
Here is look at some fakes – picture below was sealed by a PE – you can see that all three rooms show the same nicely **rounded cfm value**.



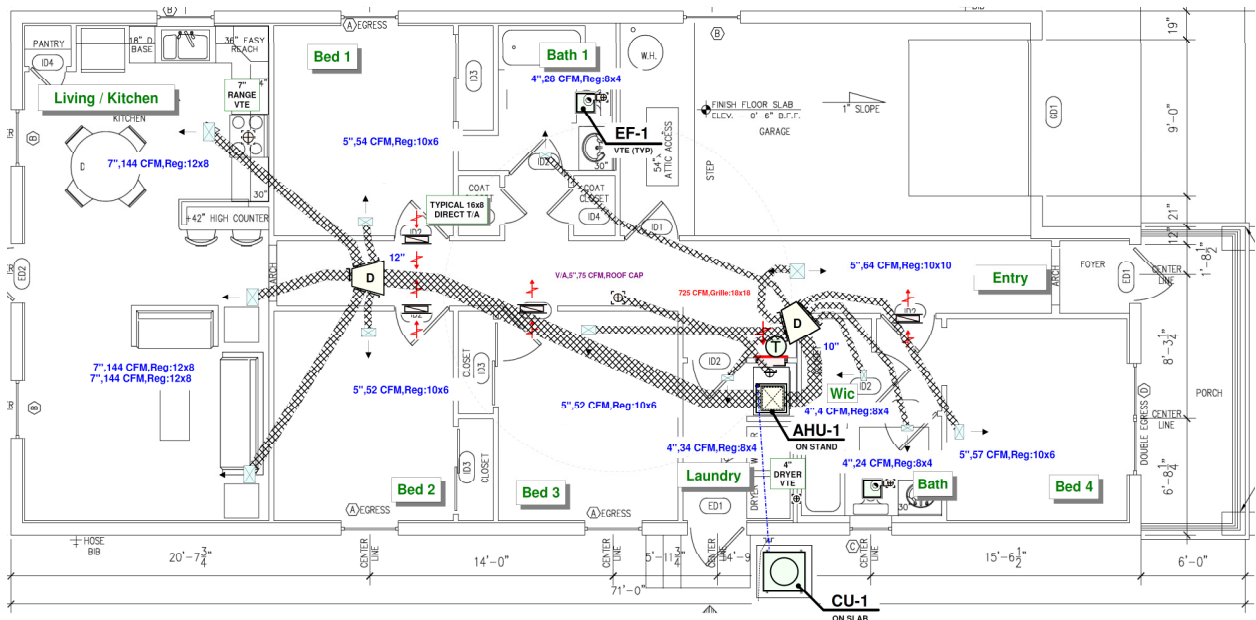
This is a mathematical impossibility because the 3 rooms do not have exactly the same exposure even though each room usage is the same – so the heat load (demand) for each room will be significantly different, the rooms required air flow value should match the demand for that particular room. The actual heat load math for this building showed that the corner room required more airflow than the center room with a window, and the room to the right required the least amount of air – all do to the building envelope exposure.

Another fake item to look for is the **“chicken scratch” drawing** – usually provided by the hvac contractor using his design tool incorrectly. The picture on the top is the fake – and the picture on the bottom was performed by hvac designs inc. You should be able to see the difference easily – the fake design makes no attempt to create a duct design that reflects field installation (reality) – instead the fake design shows the minimum effort by a designer who seeks a quick permit, surely the duct fittings shown on the fake design will not account for the actual fittings being installed – meaning the manual D used for air handler selection could be

“off” by more than 25% on total static pressure required – and the duct heat load would be short too.



Fake “chicken scratch” drawing showing inaccurate allowances for duct Fittings – and a “zero” cfm shown in M Bath is not possible – the improper use of this popular hvac design tool will result in hot spots, the computer output is only as accurate as the designers input! This design has no chance of working properly.



Correctly designing the hvac system should look like the drawing above, room by room heat load using Manual J 8th edition, Fitting by Fitting duct design using Manual D graphic duct design, Equipment Selection using Manual S equipment selection procedure, Air device selection using Manual T room air device selection, Manual ZR used (if zoning is required or desired) and energy calculations using FSEC energy gauge software tool. You can see the room air flow values exactly match the room by room demand – no rounded off values – each duct fitting is shown and will match the installation – a most accurate working drawing that’s connected to each design manual using 3d cad energy modeling software.