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*Comment Received From: Bruce  
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**Time for a New Business Model for HVAC Contractors**

*Additional submitted attachment is included below.*

# Time for a New Business Model for HVAC Contractors

**Without a CSLB rule interpretation of “Incidental Work”,  
we will not meet California’s SB350 and compliance goals.**

By Bruce Severance, Regulatory Compliance Engineer, Mitsubishi Electric US  
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## **The QI problem in the Residential HVAC Market**

Commercial HVAC installation quality (QI) maintains high standards because building managers understand the energy savings ramifications of accepting substandard work. A dollar saved today may mean five lost tomorrow. This grasp of the math of ROI and energy savings drives higher quality work. In the residential HVAC replacement sector, contractors like to fly below the radar of building department oversight and the customer is less savvy about the significance of energy savings, and they are more easily persuaded to save money by forgoing permits and HERS testing. Often the client even insists on it and is not able to grasp or believe the energy savings issues. This customer and contractor focus on lowest repair cost turns the competition into a race to the bottom. All the competitive bids attempt to eliminate any additional costs, driving the field to work down to the lowest price rather than up to a quality standard. Contractors have come to accept this as the status quo, and do not feel that “selling quality” works, and although they may be aware of the efficiency and safety issues, they are not well versed in educating residential clients, or feel it is futile to do so.

Consequently, the scope of work is reduced to changing out the box in the hall closet rather than addressing the 30% duct leakage in the attic, (the state average due to pre-UL181 tape failures), and pervasive health and safety concerns like rodent infestations and asbestos. Residents remain largely skeptical that spending more money is necessary or cost-beneficial. What is needed to address this problem is a significant change in CSLB rules that allows contractors to make money for doing the right thing: replacing ducts, properly designing systems, and selling smaller “right-sized” equipment. The current licensing rules and interpretations of them discourage – or even prevent this from happening.

## **The Lost Efficiency Opportunity at Time of Emergency Replacement**

Every furnace replacement represents a lost opportunity to greatly increase HVAC system efficiencies at point of sale, perhaps for a similar price. Once missed, such an opportunity does not arise again for another 20 to 22 years, the average life of a gas furnace.\*<sup>1</sup> Typically, contractors are aware that pre-UL181 tapes cause significant duct leakage and they are oversizing the replacement furnace equipment to overcome these existing conditions, which leads to high static pressures, lower fan efficiencies and even higher rates of duct leakage. What they may not be aware of is the energy and IAQ implications of duct leakage which burns kilo-Watt-hours (kWh) while mechanically driving unconditioned air infiltration through attics and crawl spaces resulting in both IAQ issues and unwanted heat loss.

The average home with a crawl space gets 40% of its make-up air from the crawl space. Most of the rest of the make-up air comes from the attic, neither of which are healthy sources of air. It is common to find a small 1200 sq. ft. home with a new 80,000 btu furnace in the hall closet with several code violations: missing particle traps, the use of wall cavities as ducts, open stud plenums and condensate pans full of mold located inside the return plenums. Burned out high-limit switches are pervasive due to the commonplace problems of furnace oversizing relative to loads, while oversizing relative to existing ducts stresses heat exchangers and risks premature failure of the equipment. Quality and quality training are

scarce. Most contractors do not own sizing and duct design software such as WrightSoft and do not know how to use it. And with California's current focus on doubling energy efficiency by 2050 due to climate concerns, these lost opportunities are truly tragic and it is time to change licensing definitions and continuing education requirements to facilitate a new HVAC business model that embraces the system optimization methods that the CEC has so carefully tested and documented but which are not sufficiently incentivized in the field.

### **The Pressure to Turn a Profit in a Highly Competitive Market**

Seasonal variations in work and cash flows also impose stresses on HVAC contractors and in this we find even more quality disincentives that accelerate the race to the bottom. For years HVAC contractors all over North America have tacitly subscribed to the same business model, simply stated: "Wait for the phone to ring". This wait for the phone call strategy amounts to the HVAC contractor keeping themselves busy changing filters during mild seasons, and scramble the first day of winter or summer when the onset of severe weather triggers a rash of "emergency service calls" with numerous customers facing extreme discomfort or fear of freezing unless the furnace or AC is replaced before sunset. Like squirrels gather nuts for winter, service teams scurry to install as many furnaces or AC systems as they can during the busy season to make up for the cash flows of the off season. Because their survival depends on the haul they can quickly take in, there is always an emphasis on replacing as many units as possible, often at the expense of quality and the care that customers would normally expect – and often disregarding the lower profit repair items for the lower labor items such as equipment.

The result of these conspiring disincentives is that HVAC contractors dispatch their crews with strict time commitments, allocating a crew only a few hours onsite to "swap boxes" and move onto the next job. Systems are not commissioned. Refrigerant is not verified. System sizing relative to loads and existing ducts and static pressure are not checked. Duct leakage and the energy savings gained by fixing them are completely ignored. Rodents and their remains are left in the attic. Bad air from the damp crawl space infiltrates due to pressures induced by duct leakage. Asbestos is thrown to the side. Bath fans that vent to the attic without code-compliant roof caps are left unaddressed. These types of quality failures are common and pervasive. The average installed efficiency in the US is only 58% of the equipment rated efficiency.\*<sub>2</sub> Why? The HVAC contracting business model must change.

In order to meet both SB350 efficiency goals and to improve HVAC installation quality (QI) and code compliance, it is critical that the CEC and CSLB consider every tool in the tool box to meet these efficiency mandates. A critical challenge is the "business-as-usual" approach of HVAC contractors who continue to perform the lion-share of HVAC replacements without proper system design, computer modeling load calcs, permits and verification that they have been obligated by law to provide to their clients for years. If the state is not going to appropriately fund big-stick enforcement strategies, or finds it politically unpalatable to do so, "big carrots" should be deployed to assure compliance, and there are cost effective means to do so. It *IS* possible for the CEC and CSLB work together to remove the disincentives that currently discourage HVAC contractors from delivering quality installation by making compliance more profitable.

How can HVAC contractors make more money if improved efficiency takes more time and usually means downsizing the equipment? Let them make money on any repairs to the residence that improve indoor air quality (IAQ) or the building shell efficiency which lowers heating and cooling loads and downsizes equipment. This would include the right to directly hire other subcontractors to: 1) remove rat-contaminated or damaged insulation; 2) air-sealing the attic floor and crawl space subfloor; 3) asbestos abatement; 4) repair of leaky ducts; 5) install adequate attic ventilation; 6) reinstall attic insulation.

## **New-School HVAC Optimization Opportunities**

The CEC has been sponsoring research by HVAC gurus like Rick Chitwood, Mike McFarland and Dan Perunko for years. Chitwood has written the definitive work on optimizing HVAC performance, and has methods to double HVAC energy savings that are well documented and simple to execute<sup>3</sup>: 1) Oversizing returns to improve filtration and fan performance; 2) Deeply burying supply ducts in R-50 insulation; 3) Installing bar-type grills without dampers to lower static pressure; 4) Have every supply duct home run to the supply plenum with individual damper control (for balancing); 5) Proper load calcs and duct sizing (as required by code). With this formula, Chitwood and friends have been able to more than double system efficiencies for either gas or heat-pump systems, often installing capacities at 1000sf/ton rather than 400sf/ton –with improved comfort and IAQ and twice the energy savings and high returns on investment.

The problem is, HVAC contractors don't feel it is within their scope to consider this "whole-house" approach – even though every element of it relates directly to load calcs and indoor air quality. Add to the complexity the fact that the diverse set of attic and crawl space upgrades that need to "wrap around" HVAC work to optimize performance don't currently fall under any existing CSLB license classification. General contractors in good times are making too much money on custom homes and remodels to consider halting what they are doing to accommodate an HVAC contractor's attic upgrade needs, and during economic downturns, they may work on such repairs to stay alive, but homeowners are less inclined to invest at in bad times. So there is a general contractor "Catch-22" that seems to call loudly for a new energy upgrade contractor license classification to fill the need for HVAC contractor "wrap-around" services in the attic and crawl space. During an economic boom, when unemployment is at a historic low, and when state mandates call for a forty-fold increase in the number of energy upgrades performed statewide, we need to get creative about how we recruit to create this much needed army of efficiency contractors who will work affordably at the service of higher performance HVAC contractors.

Current CSLB rules require that subcontractors only perform work within the trade in which they are licensed, with some flexibility given to work that may be "incidental" to the work a contractor must perform to complete their primary scope. For example, an electrician or plumber is allowed to remove and replace a patch of drywall in the course of making repairs, because it is necessary to the completion of their primary work, but they are not allowed to offer a contract to install drywall in new construction. So the interpretation of "incidental" exceptions to the usual scope of work raises a question: If an HVAC contractor's right to hire a subcontractor to remove rodent remains and 'rodent-proof' an attic is incidental to delivering indoor air quality, and the rodents can and often do penetrate the flex duct to nest within the ducting, shouldn't an HVAC contractor have the right to hire that subcontractor? Doesn't he have an obligation to educate the client about the indoor air quality issues and get the rats out? Is it sufficient to install a high performance filtration device and ignore the rats? When properly framed, the need to reinterpret the "Incidental Rule" seems obvious. The rats must go. Contractors don't address the rodents they see in the attic or crawl space because they are not told by the CSLB that it is the contractor's moral obligation to do something about it to assure the health of the home. The crews aren't fixing the obvious air leaks and broken attic hatches for similar reasons. They are given neither a mandate nor permission to address such problems even if they conspire with duct leakage to create potential asbestos, biotoxin infiltration and energy losses.

In order to realize the potential energy savings and IAQ that the Chitwood Method promises, the CSLB must empower HVAC contractors with the right to act as a primary contractor to address all of the problems they may encounter in the attic and crawl space that affect their system design, load calcs, and

indoor air quality. When HVAC loads drive peak demand on the grid, a CSLB interpretation of the “Incidental Rule” to empower and incentivize HVAC contractors to deliver quality installs that double energy savings is critical if SB350 goals are ever to be met. It is critical to the states climate mitigation objectives that the best minds at the CEC meet with the best at the CSLB on this issue.

### **Proposed Changes to CSLB Rules**

In light of these realities and failures of the current licensing norms, the following recommendations are proposed for consideration by the CSLB working in concert with the CEC to facilitate higher code compliance in the State of California as required by SB1477:

- 1) Make an administrative ruling to interpret the “Incidental Rule” to allow HVAC contractors across the state to act as primary contractors and allowing them to mark-up costs and profit from any subcontractor work in the attic or crawl space that improves system performance, affects load calculations, or impacts indoor air quality.
- 2) Create a certification program that designates “HVAC Performance Contractors” to have the above primary contracting privileges, and teach them basic building science, Chitwood’s HVAC optimization methods including software load calculation tools in a 6 to 8 week evening class format. This curriculum should be broadly disseminated through IOU Energy Centers, the roughly forty community college HVAC programs, and union training programs to make the training more accessible to contractors without significant impact on work schedules. This certification should be easier to complete than full BPI certification but cover the same breadth of material and include the CEC’s data on the Chitwood Method.
- 3) Institute continuing education requirements (CEUs) for HVAC contractors AND their crew leads on system optimization, controls and other key evolving technologies such as higher flammability refrigerants that are being phased-in in 2023.
- 4) Facilitate approval of basic HVAC contractor training that would allow them to be approved to install both electrical and plumbing elements to replace gas water heaters with HP water heaters. HVAC contractors already have more cross training than either plumbers or electricians and frequently perform both plumbing and electrical tasks in their daily routines. Electrification of gas water heaters currently requires dual licensing by plumbers and electricians or coordination between these trades in the field. Streamlining cross licensing for specifically for HPWH installations for all of these trades would facilitate electrification of these appliances.
- 5) Allow unlicensed contractors, so-called “handymen” to demonstrate proficiency with power tools, and use affidavits as proof of their prior handyman experience to allow them a fast-track training path to a new “energy upgrade contractor” license, thereby creating an army of subcontractors to serve under HVAC Performance Contractors direction on needed attic improvements, including: 1) Insulation removal; 2) Duct and equipment removal; 3) Attic cleaning; 4) Adding attic ventilation; 5) Air-sealing; 6) Non-invasive electrical inspection (creating checklists of issues); 7) Adding bath vent ducts where missing; 8) Soffit baffles (keep attic soffit vents open when blowing insulation); 9) Service platform and gang installation; 10) Attic and hatch repairs and insulation dams; 11) Minor repairs to existing ducts that do not require complete replacement.

The above suggestions are critical to achieving quality installation standards and changing mindsets in the field. The days of a contractor going through an apprenticeship program once and never again having to crack a book or take a class should be ended. License classifications need to evolve to the changing needs of society, and indeed the reality of the peer-reviewed climate science and state mandates such as SB1477 *REQUIRE* such considerations. The request for change is urgent. The need for changing the disincentives of

the current system are great. With an obvious need to ramp up energy upgrades and HVAC performance in the state, the time for some institutional flexibility is now.

**FOOTNOTES:**

\*1 HVAC Permit and Code Compliance Market Assessment, CPUC Study by DNV-GL Energy, September 22, 2017, CALMAC Study#CPU0172.02, p.A-7

\*2 Sensitivity Analysis of Installation Faults on Heat Pump Performance, Nat. Institute of Standards and Technology, by Piotr A. Domanski, Hugh Henderson and W. Vance Payne, Sept. 2014, - also supported by studies by National Comfort Institute and ACCA.

\*3 Measured Home Performance, A Guide to Best Practices for Home Energy Retrofits in California, by Rick Chitwood, Nov. 2011