

# **Enforcement of T-24 Compliance Pertaining to Residential Alterations**

## **1. Introduction:**

The identification of the lack of enforcement of the T-24 compliance requirements pertaining to residential alterations is far simpler than for residential new construction. The only real argument with the results pertaining to HERS verification of alterations would be about the methodology on which the estimates were based. Section 1673 (d) of T-20 (California Home Energy Rating System Regulations) require that a HERS Provider maintain a database of field verification and diagnostic testing services which are conducted by its certified HERS raters. Obviously based on this fact, there is a complete record of all verifications (CF-4R) completed by HERS raters in the State of California for residential alterations that fall under the T-24 alterations compliance requirements.

Section 10-103 (a) 2 A of the 2005 Building Energy Efficiency Standards (Standards) requires a building permit for all residential alterations. Also, Section 10-103 (a) 3 A of the Standards require that the installer certify the T-24 compliance of the installation with a CF-6R (Installation Certificate). Finally, Section 10-103 (e) 2 of the Standards indicate that a building department shall not provide final approval of the alteration that requires T-24 compliance until a CF-4R (Certificate of Field Verification & Diagnostic Testing) has been received.

In essence, there is complete visibility of all HERS rater verifications for alterations in California. The HERS rater verifications documented in the database of the one of the three HERS Providers is basically indisputable. The only disputable issue is the number of building permits that should have been issued in the effected climate zones.

## **2. Findings:**

The following are projections for 2006:

- Only about 12,095 HERS rater verifications will be conducted.
- This represents about 3.2% of an estimate of approximately 381,400 building permits that should have been issued.

It is estimated that about 6,740 HERS rater verifications were conducted during the first seven months of 2006. It is possible that some building permits were issued for alterations in the affected climate zones without HERS rater verification. Building permits issued without verification still reflect a lack of enforcement of the complete T-24 compliance process. This lack of enforcement only insures that much of the anticipated energy savings will not be realized.

## **3. Data Sources:**

The following are the data sources used in this analysis:

- 2004 Census data for housing by county (58 counties) and by select cities (474 cities)

- 2004 HVAC equipment sales in California from the Institute of Heating and Air Conditioning Industries (IHACI)
- 2004 California new construction in California from the California Building Industry Association (CBIA)
- 2006 HERS rater verification data from the California Building Performance Contractors Association (CBPCA) and California Home Energy Efficiency Rating Service (CHEERS) HERS Providers

#### 4. **Analysis Methodology:**

The following estimates were developed:

- Housing estimates for the affected climate zones –
  - 2 and 9 thru 16 for duct testing
  - 2 and 8 thru 15 for refrigerant charge of TXV
- Permit estimates for the affected climate zones
- HERS rater verification estimates for the affected climate zones

#### 5. **Housing Estimates:**

The 2004 Census housing data was used to develop estimates of housing in the affected climate zones. The 2004 Census data for housing by county provides estimates of total housing in the 58 counties in California. The 2004 Census data for housing by city provides estimates of housing in 474 selected cities in California. Joint Appendix II to the ACM Manual was used to assign climate zones designators to 474 select cities. The remaining housing in the county not accounted for in the city counts was allocated if there were multiple climate zones.

In 2004, the Census data indicated a total of 12,214,549 residential dwelling units in California:

- A total of 7,701,896 (or 63.1%) dwelling units could be directly assigned to the affected climates zones.
- A total of 3,117,694 (or 25.5%) dwelling units could be directly assigned to the unaffected climates zones.
- A total of 1,394,959 (or 11.4%) dwelling units could not be directly assigned to either the affected or unaffected climates zones. These dwelling units were allocated based on the ratio of the directly assigned.

The estimate for dwelling units in the affected climate zones is as follows:

- A total of 6,535,931 dwelling units in climate zones 2 and 9 thru 16
- A total of 1,884,303 dwelling units in climate zone 8
- For a total of 8,420,234 dwelling units in the affected climate zones

The estimate of total dwelling units in the affected climate zones may have an error rate in the range of 4 to 7%. This is based on the fact that 718,338 (or 9.3%) dwelling units were added by allocation to the original directly assigned dwelling units of 7,701,896.

**6. Permit Estimates:**

The 2004 HVAC equipment sales in California from IHACI and the 2004 California new construction in California from CBIA was used to develop an estimate of an HVAC equipment installation rate.

In California for 2004, HVAC equipment sales were 1,049,376 by unit type as follows:

- Furnaces – 463,543 units
- Split Systems – 484,569 units
- Package Units – 102,264 units

In California for 2004, 210,000 dwelling units were constructed. Single family and multi-family were 150,000 and 60,000 respectively. An estimate of HVAC equipment installed in new construction is provided in the following table. These estimates are primarily based on experience.

Description	New Housing (2004)	Furnaces		Split Systems				Package Units	
				A/C		HP			
		1	2+	1	2+	1	2+	1	2+
Homes	150,000	137,500	18,000	63,700	12,800	6,500	500	6,000	350
Multi-Family	60,000	55,800	1,500	24,300	1,100	2,200	100	2,000	75
Total	210,000	193,300	19,500	88,000	13,900	8,700	600	8,000	425
Total by Type		212,800		111,200				8,425	

The following table reconciles the distribution of HVAC equipment sales between new construction and alterations (Retrofit). The “Furnace & AC” column is an estimate of jointly installed furnace and air conditioner of 20%. The “Install Rate” of 5.3% (642,227/12,214,549) is an annual estimate of HVAC equipment installed in existing dwelling units. The total dwelling unit number was used in lieu of trying to deduct new construction contribution to total dwelling units in recent years. The HVAC equipment install rate estimate for existing dwelling units is probably low.

Description	Total	New Constr	Retrofit	Furnace & A/C	Installs	Install Rate
Furnaces	462,543	212,800	249,743		249,743	
Split Systems	484,569	111,200	373,369	74,674	298,695	
Package Units	102,264	8,425	93,839		93,839	
Total	1,049,376	332,425	716,951		642,277	5.3%

Various estimates of HVAC equipment for new construction and the percent of jointly installed furnace and air conditioner only incrementally changed the HVAC “Install Rate” by 0.3 or 0.4%.

#### 7. **HERS Rater Verification Estimates:**

The CBPCA and the CHEERS HERS Providers provided data on HERS rater verifications for additions and alterations for the first seven months of 2006. These results were used to estimate the total number of HERS rater verifications for the three HERS Providers for 2006. As indicated earlier, an estimated 6,740 HERS rater verifications were conducted during the first seven months of 2006. Monthly HERS verification data from the CBPCA HERS Provider was used to estimate a monthly seasonal trend for HVAC equipment installation for alterations. This seasonal trend was used to develop an annual estimate of 12,095 HERS rater verifications for 2006. With the limited amount of data, one could argue that this approach and the resulting estimate lacks a little in confidence. As a sanity check, an estimate was determined using a simple algebraic approach. This approach is presented below. This approach results in annual estimate of 11,555 HERS rater verifications for 2006.

A simple algebraic approach results in a slightly lower estimate.

**Annual Estimate** =  $6,740 / 0.583 = 11,555$  HERS rater verifications

**Where:**

1. 6,740 is seven month estimate of HERS rater verifications
2. Constant of 0.583 is  $[7 \text{ months} / 12 \text{ months} = 0.583]$ .

#### 8. **Summary of Estimate Results:**

The following is a summary of the results from the estimation steps described above:

- A total of 6,535,931 dwelling units in climate zones 2 and 9 thru 16
- A total of 1,884,303 dwelling units in climate zone 8
- HVAC equipment “Install Rate” of 5.3% for climate zones 2 and 9 thru 16
- HVAC equipment “Install Rate” of 2% for climate zone 8
- An estimate of approximately 381,400 building permits for 2006
  - $6,535,931 \times 0.0526 =$  approximately 343,700 for climate zones 2 and 9 thru 16
  - $1,884,303 \times 0.02 =$  approximately 37,700 for climate zone 8
- An annual estimate of 12,095 HERS rater verifications for 2006

The estimated HERS rater verification compliance rate for 2006 is 3.2% (12,095/381,400). Various assumptions pertaining to confidence of the estimates of the - (1) Dwelling Units, (2) Install Rates and (3) HERS Rater Verifications – were considered.

The estimate range for HERS rater verifications for 2006 is from 2.7 to 4.9%.

## 9. Conclusions:

In my opinion, the results in this analysis reflect the fact that there is a small group of HVAC contractors within California whose business ethics and standards compel them to comply with the T-24 alterations compliance requirements. This effort to comply is strictly based on their business ethics and standards and probably has little to do with an active effort of enforcement by the local building department. Without an increased effort by local building departments to enforce building permits, HERS verifications will not increase appreciably in either 2007 or 2008. Most HVAC contractors that I have dealt with in the last few months primarily have two complaints. Those complaints are:

- They are competing with other HVAC contractors who do not require dwelling unit owners to obtain the required building permits and thus avoid the cost of T-24 compliance.
- Because some local building departments have a lack of knowledge of the T-24 alterations compliance requirements, the HVAC contractors that are trying to comply are facing unreasonable compliance demands and scrutiny.

In fact, many local building departments are unaware of Chapter 7 of the 2005 Residential ACM Manual. Many rely on Chapter 2 of the 2005 Residential Compliance Manual as the T-24 compliance process that pertains to alterations. Many local building departments argue that sample testing is not allowed for alterations based on their interpretation of Chapter 2.

Without an increase in education and oversight of local building departments, the enforcement of T-24 alteration compliance requirements will continue to be dismal. Also, the important issue of the opportunity for energy savings will be totally lost.