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CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

Investigation Report Number 2-06

Standards Compliance Branch Investigation Report

Investigation Information

Investigator: Kenzo Minami

Subject(s) of Investigation (Rater, Provider, Other): HERS Raters, Contractors

Type of Service Offered by Subject of Investigation: Field Verification & Diagnostic Testing Services, Installation services

Facts Investigated

Staff investigated the CHEERS data from duct leakage forms (MCH20aH) for new construction in the 2019 Energy Code cycle.

Findings of Fact:

Nearly 50 percent of all registration number were completed using delegation of signature authority (DoSA).

Of the 2618 DoSA registration numbers, 100 percent of them recorded identical measurements between the Certificates of Installation (CF2R) and Certificates of Verification (CF3R) for the maximum duct leakage allowed and actual duct leakage values.

Of the 2678 non-DoSA registration numbers, over 98 percent recorded identical measurements.

Only 32 registration numbers recorded a different actual duct leakage value between the 2R and 3R.

A Home Energy Rating System (HERS) rater company advertises CF2R testing services that include inputting data into the CF2R (see Appendix A).

In a sample of more than 5000 unique registration numbers, more than 99 percent used either of two nominal system calculation methods over actual measurement of system airflow.

Only 42 registration numbers actually measured the system airflow to determine the maximum duct leakage allowed.

The average of these cases yielded 21 percent less leakage than the maximum allowed.

The average percent difference between actual and allowable duct leakage is less (14 percent) for the vast majority of registration numbers (using the nominal calculation rather than measured airflow) than it is for the case where 2Rs and 3Rs register different results (21 percent) (see Appendix B).

Histogram shows that actual duct leakage values skew toward the maximum allowable (see Appendix C).

HERS Raters tend to record tightly grouped values even far from population averages.

A particular rater recorded almost half of their duct leakage tests as 1 cubic foot per minute (cfm) below the allowable value (this observation is an instance in the larger analysis showing frequent discrete, whole values being recorded (see Appendix D)).

Using the nominal airflow method, 0.2 percent failed duct leakage tests whereas using the measure airflow method 40.5 percent would have failed (see Appendix E).

Documents Reviewed and Submitted by Investigator:

Data from the Compliance Document Repository

Appendix A: Screen capture of Rating company advertising CF2R services

Appendix B: Average Compliance Margin of Three Different Test Situations

Appendix C: Histograms of Actual Duct Leakage % under Allowable

Appendix D: Trends in Whole Number Compliance Margins

Appendix E: Nominal vs Measure Compliance Pathways.

Summary of CEC's Investigation steps taken:

Date	Staff	Investigatory action taken
2021	CEC Staff	Staff recorded issues as they were observed, through staff's implementation of the regulations and program oversight, and compiled them into this report.

Steps taken by CEC as a result of findings:

It is staff's opinion that a rulemaking is needed to remedy these findings.

Was this report provided to complainant (Yes/No)?:

No.

Report prepared by:

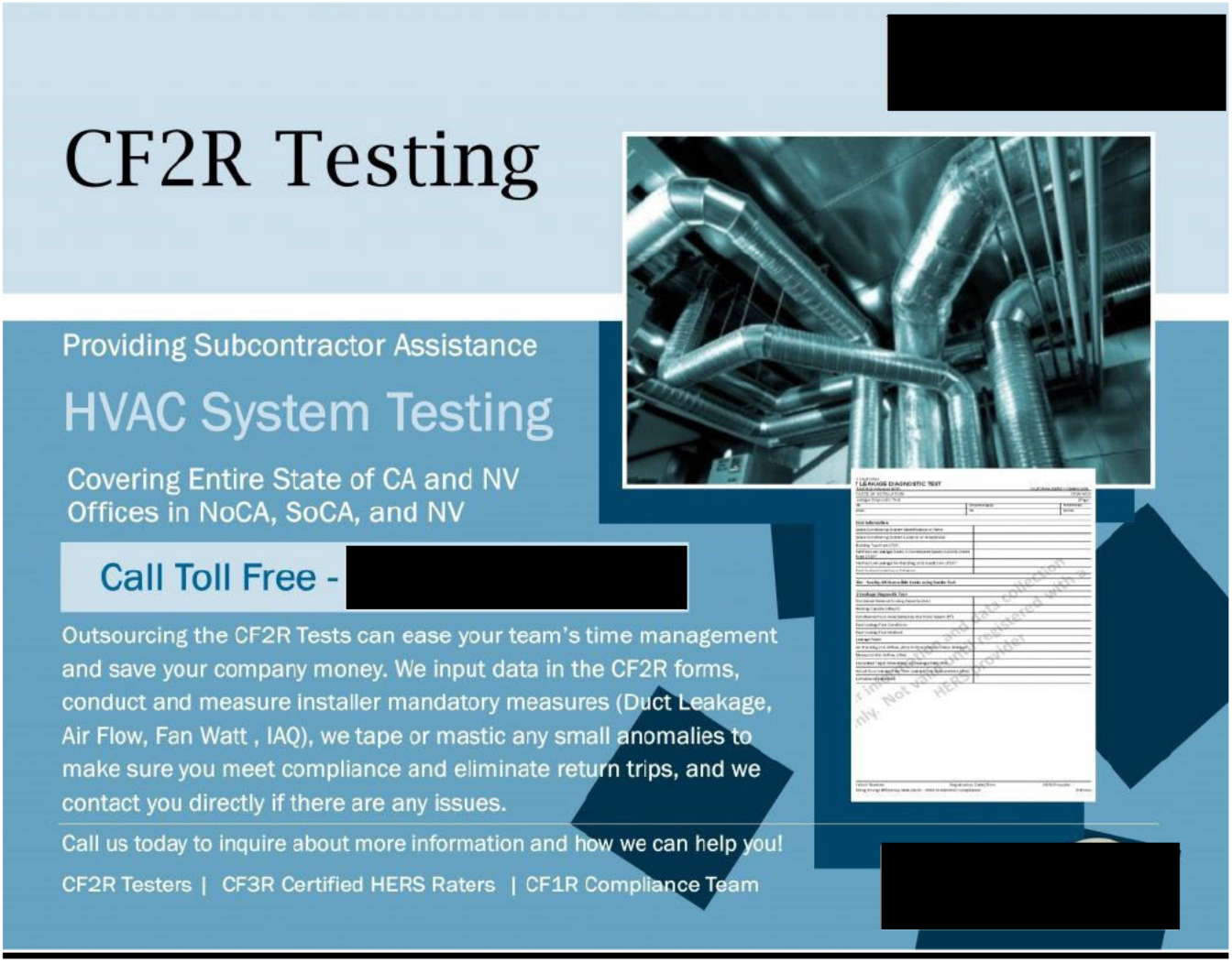
Name: Maxwell Crosby

Title: Associate Energy Specialist (TED)

Date: 10/07/2022

APPENDIX A

Screen capture of Rating Company 2R Service



APPENDIX B

Average Compliance Margins

Average Compliance Margin of 3 Different Test Situations

Category of Sample	Compliance Margin (Percentage under Maximum Duct Leakage Allowed)
CF2R and CF3R with different Duct Leakage Actual values	-21 percent
CF3Rs using Measured Airflow Method	-21 percent
CF3Rs using Nominal Airflow Method	-14 percent

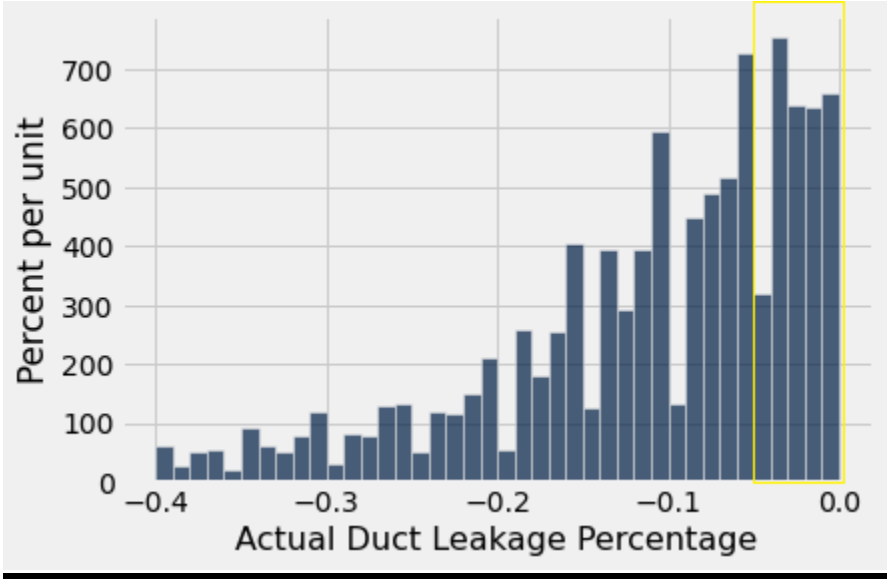
The first two samples most closely reflect regulatory intent: projects that recorded different values between the CF2R and CF3R, and projects that used the Measured Airflow Method. Their compliance margin passes more comfortably than the oft-used Nominal Airflow Method.

Source: Commission Compliance Document Repository, CHEERS 2019 Code Cycle, Duct Leakage Test MCH20aH

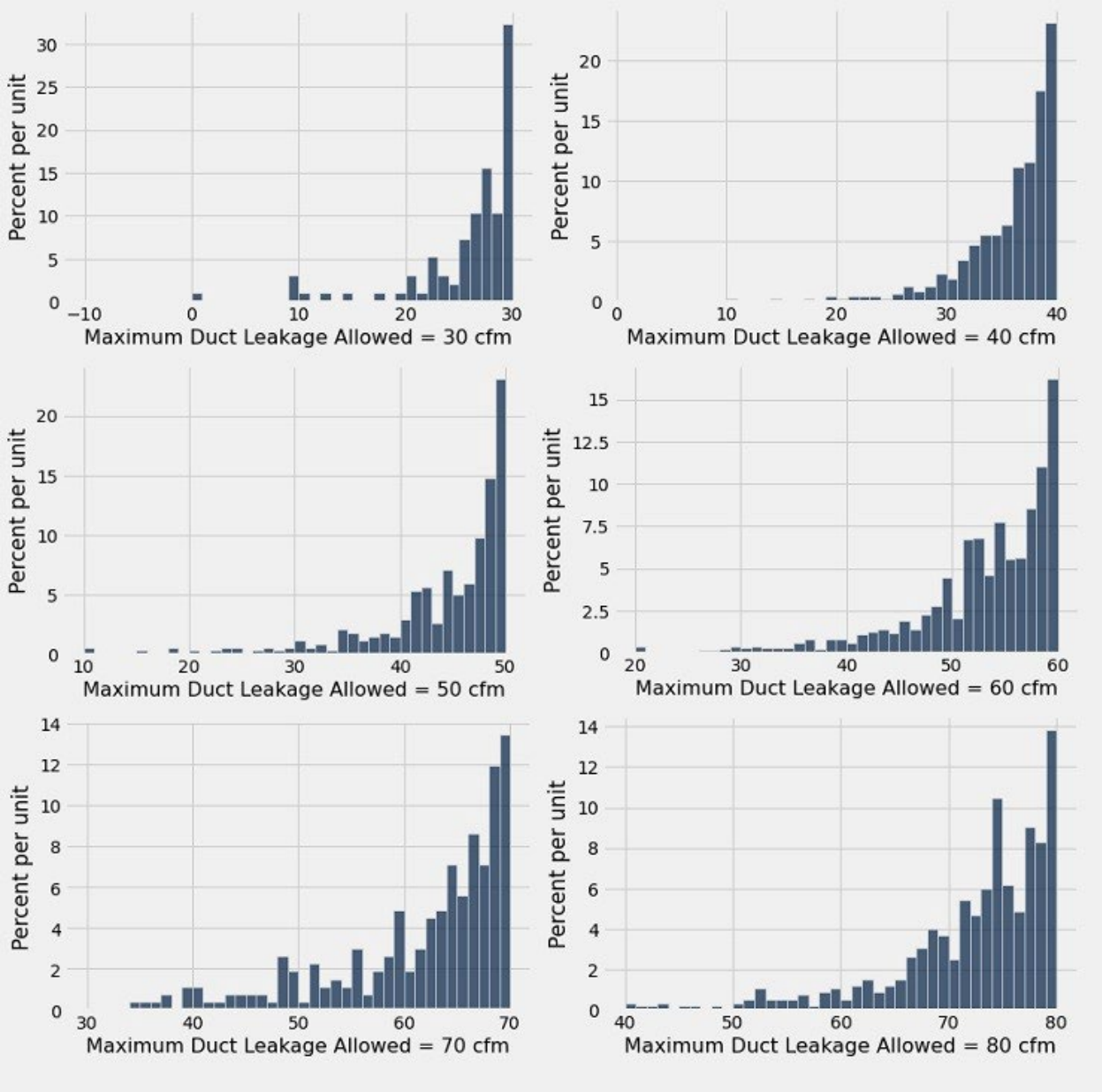
APPENDIX C

Histograms of Actual Duct Leakage

Histogram of all Actual Duct Leakage Percentages Under the Maximum Duct Leakage Allowed Limit



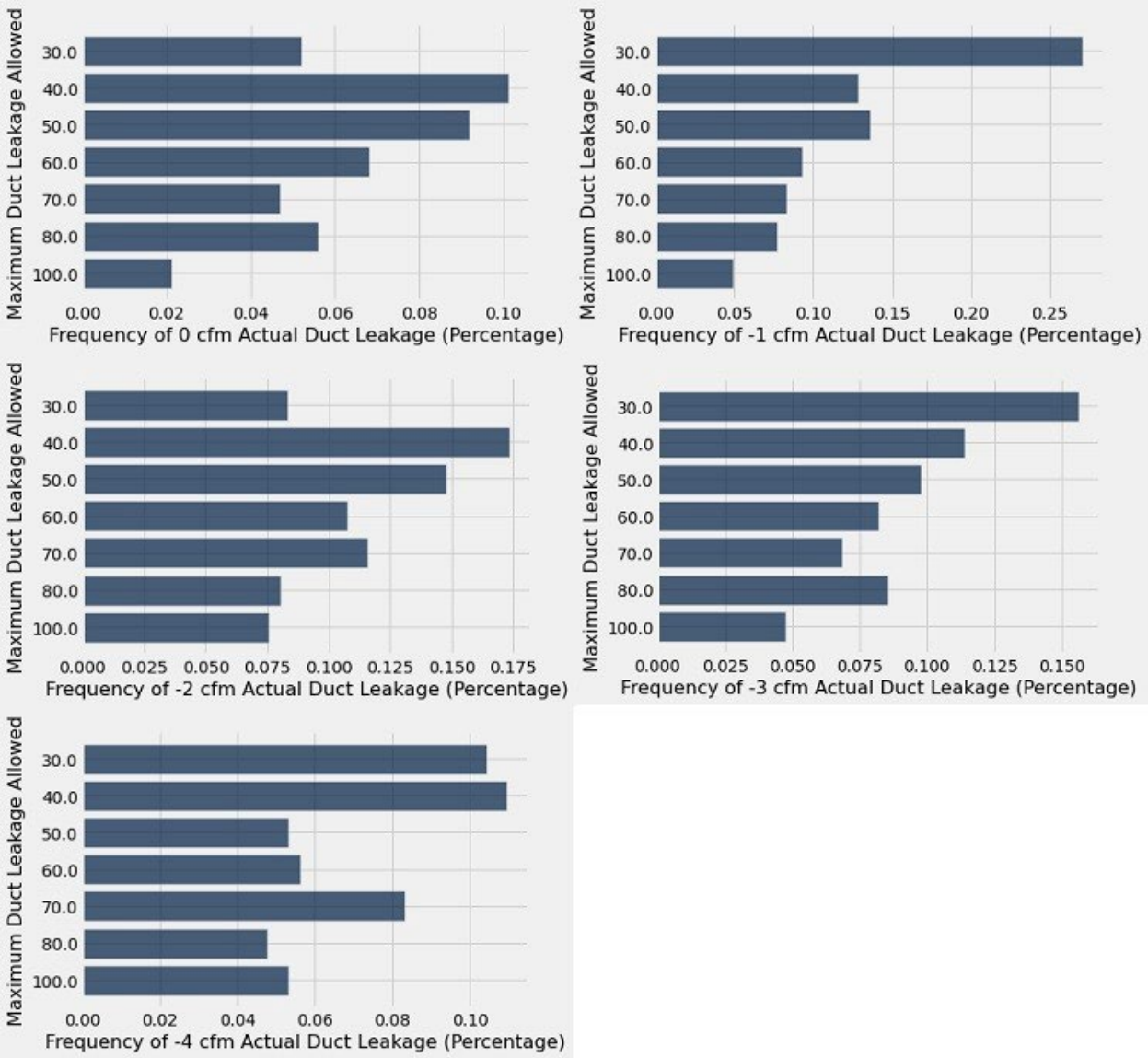
Histograms of Actual Duct Leakage Values for the 6 Most Frequently Occurring Maximum Duct Leakage Allowed Limits



Appendix D

Trends in Whole Number Compliance Margins

Bar Charts Displaying Frequency of Recording a Compliance Margin of 0 cfm, -1 cfm, -2 cfm, -3 cfm, or -4 cfm



Appendix E

Nominal vs Measure Compliance Pathways

Fail Rates Under Current Compliance Pathways

Compliance Pathway Type	Fail Rate
Nominal Airflow Method	0.2 percent
Measured Airflow Method	40.5 percent

Under current practice of using Nominal Airflow Method, less than a dozen tests fail the Duct Leakage Test. For systems that required an Airflow Test (MCH23aH) and therefore already had a test value for the Measured Airflow Method to determine a more accurate and system-specific Maximum Duct Leakage Allowed, 40 percent would fail the Duct Leakage Test.