Short Form Work Paper WPSDGEREHC1067

**Revision 1**

**San Diego Gas & Electric**

**Energy Efficiency Engineering**

**Duct Seal and Test**

**November 05, 2018**

# SDG&E Duct Seal and Test

## Introduction

This short form workpaper updates WPSDGEREHC1067 Rev0 based on a discussion with CPUC staff on August 8th, 2018 during the monthly SDG&E call with the CPUC EAR team. CPUC staff stated the incidence factor from Energy Division Workpaper Disposition for Residential HVAC Quality Maintenance dated May 2, 2013 only was to be applied to bundled QM measures and was not intended for stand-alone measures. This workpaper will adopt savings directly from the READI v.2.5.1 energy impacts for Res-DuctSeal-MedToLow-wtd- Residential duct seal and test.

## Document Revision History

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| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 12/28/17 | Keith Valenzuela/SDGE Contractor | * Adopted READI v.2.4.7 energy impacts for DEER 2017 Res-DuctSeal-MedToLow-wtd |
| **1** | 11/05/18 | Keith Valenzuela/SDGE Contractor | * Updated workpaper to remove incidence factor adjustment from savings calculations. Savings are now directly from READI v.2.5.1 energy impacts for Res-DuctSeal-MedToLow-wtd |
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## Measure Summary

Table 1: Measure Summary Table

| **Section** | **Value** |
| --- | --- |
| **Summary & Purpose** | This short form workpaper documents ex-ante load impacts and cost-effectiveness values for testing and sealing the ducts of residential central forced air HVAC systems. The base energy consumption and measure energy consumption values are from READI v.2.5.1.  This short form workpaper details the energy impacts of testing the leakage of the duct system and when necessary sealing the ducts to prevent conditioned air from leaking from the ducts and cooling unconditioned spaces which waste energy. In addition, leaky return ducts can bring in air from unconditioned spaces which wastes energy by making the HVAC system work harder to cool the space. |
| **1.1 Measure & Baseline Data** | |
| **1.2 Technical Description** | This measure involves testing the leakage of the duct system and when necessary sealing the ducts to prevent conditioned air from leaking from the ducts and cooling unconditioned spaces which waste energy. In addition, leaky return ducts can bring in air from unconditioned spaces which wastes energy by making the HVAC system work harder to cool the space. |
| Measures | Measures:  421023-Duct Test and Seal 1976-1994 (Res-DuctSeal-MedToLow-wtd)  421024-Duct Test and Seal 1995-2005 (Res-DuctSeal-MedToLow-wtd) |
| Code for All Measures | ***Title 20:*** This measure does not fall under Title 20 of the California Energy Regulations.  ***Title 24:*** These measures do fall under Title 24 2016 of the California Energy Regulations. Under this regulation, the following is required for any new installation of air-cooled air conditioners and air-source heat pumps:  Duct systems must be sealed and verified if >40 feet of ducts in unconditioned space. Duct system leakage must be ≤15% in total, or ≤10% to the outside. Or, if unable to meet the sealing requirements, all accessible leaks must be sealed and verified by a HERS rater  Mandatory duct insulation requirements (R-6) apply to all new or replacement ducts (not existing or unaltered ducts). When replacing >40 feet of ducts in unconditioned space: CZ1-10 and 12-13: R-6 CZ11 and 14-16; R-8. HERS verification is required for insulated ducts in conditioned space.  In all climate zones, when new duct systems are installed in unconditioned space, leakage must be ≤6% of the air handler airflow.  ***Federal Standards:*** This measure does not fall under Federal DOE or EPA Energy Regulations. |
| Requirements | Per the SDG&E Quality Assurance and Quality Control Plan (QAQCP) technicians must receive training as follows:  **“**New technicians receive individual classroom training from the production supervisor and on-the-job training by serving as a helper from a certified trainer.  All technicians receive electrical training and follow safe electrical protocols, standards and practices.  The contractor regularly enrolls its technicians in technical training.  All technicians are required to attend a weekly tailgate meeting, plus a monthly technicians meeting for on-going training. The type of information that is covered in these training sessions would include measure and service standards, review of safety standards, motivation, customer service, and quality control instruction.  The production supervisor or assistant production manager also provides one-on-one training to technicians in the field.” |
| **1.3 Installation Type and Delivery Mechanisms** | |
| Installation Type | Retrofit Add-on (REA) |
| Delivery Mechanisms | Direct Install |
| **1.4.1 DEER Data** | |
| Net-to-Gross Ratio | Res-sAll-mDuctSeal |
| Effective and Remaining Useful Life | HV-DuctSeal  EUL= 18 years  RUL=EUL/3=6 |
| GSIA | Per Energy Division Workpaper Disposition for Residential HVAC Quality Maintenance dated May 2, 2013  “The statewide installation rate for DTS measures from the 2006-2008 evaluations is 0.463. This essentially means that more than half the installations have no benefit, even if, on those installations, some amount of duct sealing was performed that did not result in requisite reduction in duct leakage. In consideration of partial benefits as well as the likelihood that utilities have instituted improvements to installation and verification, staff believe that the installation rate should be increased by 50%, according to the following equation:  IRadj = 0.463 + 0.50 \* ( 1 – 0.463 ) = 0.73  Given the lack of precision in the analysis of installation rates, staff has used an installation rate of 0.75 for DTS measures.**”**  **\*Note:** The GSIA listed in READI v.2.5.1 for GSIA ID Res-DuctSeal-All is still 0.463 as referenced in the Energy Division Workpaper Disposition for Residential HVAC Quality Maintenance dated May 2, 2013. Therefore, we recommend the CPUC Staff to update the GSIA IDs to include a Duct Seal ID to have a value of 0.75. The closest available GSIA ID would be EUC\_GSIA\_0.75 but given its program specific, SDG&E will update once Commission Staff updates or creates a new GSIA ID for all Residential Duct Seal measures. |
| **Section 2. Calculation Methodology** | |
| Energy Savings/Peak Demand Reduction – All Measures | The annual energy and demand savings for the residential sector are based on the DEER measure savings from *Res-DuctSeal-MedToLow-wtd*, taken from the DEER 2017 READI v.2.5.1. |
| **Section 3. Load Shapes** | |
| Load Shape | SDGE:DEER:HVAC\_Eff\_AC Annual |
| **Section 4. Cost** | |
| **Section 4.1 Base and Measure Costs** | |
| Base Cost | The base case is the customer’s existing ducts; therefore, the base case cost is $0.00. |
| Measure Cost | The 2010-2012 WO17 Ex Ante Measure Cost Study provides duct test and seal per-dwelling costs.  The study provides costs per dwelling for duct seal and test of $71.45 for materials and $181.24 for labor for a total cost of $252.69/dwelling. Since the savings are per cap-tons the average tonnage of 3.31 per household using the 2008 DEER tonnage listed in the Energy Division Workpaper Disposition for Residential HVAC Quality Maintenance workbook titled “*20132014-ResidentialHVACMaintenance-SavingsValues-April2013-v1-2.xlsx*” was used to estimate the cost per ton of $76.34. |