

Premium Efficiency Cooling Program



Contractor Manual

Commercial HVAC Tune-ups, Quality Maintenance and Related Measures

Version 1.7 – March 7, 2018

CLEAResult

Change Record

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Notice: This program will end December 31, 2018 or when funds are no longer available. Contractors must submit all completed data and documentation no later than December 15, 2018 to help ensure payment. Incentives are paid first-come, first-served, based on complete and accurate data submittals and passing data validations and/or field inspections. As funds diminish, the program will notify participating contractors by e-mail and take steps to reduce commitments by adjusting the amount and/or duration of contractor allocations, discontinuing the issuance of new reservations. Neither CLEARResult nor SDG&E will pay incentives to contractors after funds are exhausted.

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1. Introduction

The goal of this manual is to serve as a reference guide for the Contractor regarding Commercial HVAC Tune-up and Quality Maintenance activities performed under the Premium Efficiency Cooling Program (“Program”). This manual is a complement to the guidelines provided in the Contractor Participation Agreement and is supplemented by the website documentation, Customer Incentive Application, Contractor Incentive Application and training materials.

The target audience for this document is Contractor employees and subcontractors who will perform tasks under the Program, all of whom are referred to as “Contractor” throughout the document. In some specific cases there are references to Contractor Salesperson and Technicians.

Manual Section	Description
1 - Introduction	
2 - Program Overview	General description of the objectives of the program, customer benefits, and CLEAResult contact information
3 - Incentive Summary	Incentive definition, amounts and basic requirements
4 - Get Started	One -time steps conducted by the Contractor and CLEAResult to get the Contractor ready to offer this Program to Customers
5 – Signing Up Customers	Steps required for enrolling customers for Tune-up Services
6 - Standards for Performing Tune-Ups	Treatments and repairs required to bring units to the “Baseline Performance Level” or above. Concludes with incentives paid to the Contractor and/or Customer.

2. Program Overview

The Premium Efficiency Cooling Program is designed to support the California Long Term Energy Efficiency Strategic Plan. Launched September 30, 2011, the Commercial HVAC Tune-up and Quality Maintenance (QM) Program is designed to optimize the performance of all major energy-using components of commercial heating, ventilation, and air conditioning (HVAC) units. Equipment efficiencies are improved by applying diagnostic methods and the detailed HVAC inspection and maintenance tasks of American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air Conditioning (ASHRAE)/Air Conditioning Contractors of America (ACCA) Standard 180 (2012). The Premium Efficiency Cooling Program offers SDG&E customers a choice of receiving one-time incentives for tune-up services or a comprehensive package of incentives for maintenance services provided over three years.

Tune Up measures include a thorough unit assessment and performance diagnostics above and beyond routine HVAC unit maintenance. The methods provided allow contractors enrolled in the Program to precisely evaluate commercial customers' HVAC units and subsequently improve unit efficiency and realize energy savings.

Maintenance services are driven by agreements between customers and contractors. The program incorporates training, marketing and incentives to help contractors understand and communicate the value of HVAC quality maintenance and energy efficiency. The Program is also supported by commercial customer referrals from SDG&E Account Executives.

Customer Benefits:

- Energy and operating cost savings
- Improved indoor air quality
- Improved thermal comfort
- Fewer unplanned service calls
- Reduced equipment downtime and increased equipment life
- Environmental benefits associated with reduced energy use and emissions

2.1. Program Contact Information

For more information please:

<u>Visit the Program website:</u>	www.premiumcooling.com
<u>Contact the Program Implementer:</u>	CLEAResult
<u>Telephone:</u>	(888) 369-1608
<u>E-mail:</u>	premiumcooling@CLEAResult.com

3. Incentive Summary

The Program offers tune-up and maintenance services to participating customers and contractors. Silver Tune-up Services include Standard 180 Table 5-22 (2012) and limited contractor incentives for performing one-time maintenance tasks and system diagnostics.

3.1. List of Energy Efficiency Tasks (EE) Eligible for Incentives in 2018

EE Tasks Eligible for Tune-up Incentives	Qualified Unit Size			
	Under 3 tons	3-5 Tons	6-25 Tons	Over 25 Tons
Coil cleaning (Evaporator and Condenser Coils)	\$22.00	\$72.00	\$90.00	\$90.00
Fan Maintenance	\$22.00	\$22.00	\$31.00	\$40.00
Refrigerant system test only	\$22.00	\$22.00	\$31.00	\$40.00
Refrigerant system service (includes test-in and test-out)	\$48.00*	\$139.00	\$220.00	\$283.00

All Tune-up services must be executed within sixty days from initial test in date. If test out is beyond 60 days from test in, unit will be ineligible for payment. Incentive payments may be held until all inspections have been completed. Contractors must submit data through a participating Verification Service Provider (VSP) at a cost negotiated with the VSP Provider. VSPs are required to agree to program terms and conditions and provide a minimum level of service.

* Paid by the half ton

Note: Site must have an active account for 5 years to qualify for incentive payments. Overpayments will be deducted from future payments.

4. Get Started

4.1. Overview of Start-up Process and Timeline

The following table lists key start-up steps after Contractor Participation Agreement is signed

Activity	Expected Timeframe
1. Contractor reviews the Technician Toolkit and procures the items for each technician that will be participating in the program.	Before first Technician Training session
2. Contractor reviews Eligibility Requirements on Contractor Participation Agreement and submits technician qualifications to CLEAResult. CLEAResult reviews confirms eligibility and updates enrollment status.	
3. Contractor signs up for Sales and Operations Training and provides a list of users that will need access to the IT Tools. Contractor designated personnel will attend Sales and Operations training. At the training CLEAResult will provide: <ul style="list-style-type: none"> • Unit Stickers • Sales and Operations Training Manual CLEAResult will send Portal login information to Contractor Sales and Operations team	Within 2 weeks of Contractor Enrollment Confirmation
4. Contractor selects Verification Service Provider (VSP)	Prior to technician training
5. Contractor’s Technician(s) will complete Classroom Technician Training with CLEAResult.	After first customer reservation received
6. Contractor’s technicians will attend the Rooftop Technician Training with VSP , bringing their VSP toolkit. <i>CLEAResult will provide the Technician Training Manual</i>	Within 2 weeks after contractor completes Classroom Training
7. CLEAResult will schedule the Side by Side Technician Observation with Contractor. Technicians are tested on knowledge and skills.	Within 2-4 weeks after Rooftop Technician Training.

4.2. Logo Requirements

Contractors may download and use the Premium Efficiency Cooling Program logo on approved marketing materials. The SDG&E® logo or name may not be used to market the program verbally, through e-mail or on contractor marketing materials. CLEAResult provides contractors with approved marketing materials that include the CPUC disclaimer statement which describes SDG&E’s role in this program.

4.3. Contractor Team

The following table describes the typical roles and functions of Contractor’s employees who will play a role

Role	Function
Management	Ensure that staff members: <ul style="list-style-type: none"> • Understand what is required to provide quality maintenance and tune up services under the Program. • Support the Program objectives related to raising awareness of the value of quality maintenance and the Program’s energy efficiency measures. • Help resolve Customer issues and complaints. • Provide feedback and suggestions to promote continuous improvement in the Program design and delivery.
Sales	<ul style="list-style-type: none"> • Market program and energy efficiency measures to potential customers. • Conduct the initial inventory of HVAC equipment for estimating incentives and screening our ineligible equipment. • Provide customers with reports on the work completed.
Technician(s)*	<ul style="list-style-type: none"> • Conduct HVAC unit inspection and maintenance in accordance with the ACCA/ASHRAE/ANSI 180 Standard, this Contractor Manual, and all applicable safety standards and codes. • Educate customers on the value of quality maintenance and energy efficiency measures. • Provide excellent customer service.
Operations	<ul style="list-style-type: none"> • Maintain files of Program documents, such as agreements, incentive applications, and invoices. • Submit data to CLEAResult via VSP or other program approved methods • Track incentive payments • Schedule inspection and maintenance work

in the program. In many instances, multiple functions are performed by a single individual.

*All Technicians participating in the Program must meet the Program’s Technician Eligibility Criteria, as specified in the Contractor Participation Agreement. Prior to adding any new technicians to the program, they must meet program eligibility requirements and complete requisite training. Contractor must notify CLEAResult when employees are no longer eligible to participate in the Program.

Contractor must keep an updated list of enrolled employees in the program and identify those who are performing Silver Tune-ups and Quality Maintenance tasks and/or performing sales and operational work.

4.4. Training

The following table provides an overview of the training sessions offered by the Program

Course Title & Description	Contractor Attendees	Approx. Duration	Delivery Method	Timing	Prerequisites
Sales Training: <ul style="list-style-type: none"> • Overview of program and Standard 180-based services; what they are and how they differ from typical HVAC service • Value proposition for contractor and customer • Sales Cycle • Marketing support and strategy 	Sales Staff	1 hours	Contractor office, if suitable; CLEAResult office; or Webinar	Within 2 weeks of Contractor eligibility and enrollment confirmed.	✓ Approved Contractor Participation Agreement
Operations Training <ul style="list-style-type: none"> • Administrative requirements to qualify for incentives • Program Documentation • Incentive Payment Process and Timelines • Scheduling: expected time to complete maintenance 	Operational Staff	1 hours			
Initial Technician Training <ul style="list-style-type: none"> • CLEAResult Introduction • Program Objectives • Overview of Standard 180 and Program Requirements. • Review of Program Expectations and Inspection Process • Review of Acceptable and Unacceptable Workmanship 	Eligible technicians (Rooftop training can accommodate no more than 4 technicians per trainer)	3-4 hrs	Classroom (contractor office, if suitable or CLEAResult office)	After contractor completes Sales and Operations Training	✓ Approved Customer Reservation
Rooftop Technician Training <ul style="list-style-type: none"> • Practice using skills and tools required to complete the inventory, inspection, and maintenance in Standard 180. • Practice with VSP Tools 	Eligible technicians (Rooftop training can accommodate no more than 4 technicians per trainer) VSP Representative	6-8 hrs	Rooftop	After technicians complete classroom training	✓ Approved Customer Reservation ✓ Technicians completed classroom training ✓ The Technician brings the VSP Toolkit for the rooftop portion
Side by Side Follow-up Technician Training: <ul style="list-style-type: none"> • Skills Test: proficiency in Standard 180 inspection method and satisfactory completion of program measures. 	Technicians who have completed Initial Technical Training	3-4 hours	Customer Site	Within 2-4 weeks after completing initial technical training	✓ Technicians must have completed the Initial Technical Training

The training location(s) will be defined between Contractor and CLEAResult. The Contractor must be able to provide access to an eligible Unit equipped with a functional economizer for the technician training.

Technicians who successfully complete the training and demonstrate competency in performing the work will be approved for participation in the Program. Technicians who do not demonstrate proficiency may receive support coaching and additional training as determined by CLEAResult.

4.5. Technician Tool Kits

Each Contractor will need to make sure that each of their HVAC technician is equipped with the following items, as needed to perform the Energy Efficiency (EE) Tasks. These tools will not be provided by the Program:

4.5.1. Tools and Supplies

- Cell phone, Wi-Fi hot spot, Bluetooth® modem or other device to ensure Internet connectivity, if needed
- Refrigerant fill and recovery tanks for R-22 and R-410a
- Brass schrader valve caps
- Small section, ~8 inches, of refrigerant pipe insulation
- Sandpaper and/or sand-cloth to clean piping area before adding measurement probes
- Digital multimeter that measures AC/DC voltages and resistance
- Standard safety gear, including safety goggles, hardhat, rubber gloves, lock-out tags, etc.
- Tools for cleaning coils, including appropriate coil cleanser and pressurized water as need for the job either from a portable tank or hose
- Wire nuts and miscellaneous wire connectors
- Fin straightener/Fin Comb
- Inspection Mirror
- Button flush-style plugs (if drilling holes in the HVAC unit to measure pressures and temperatures)
- Shurtape® duct foil and foam insulation tapes, UL181 compliant pressure sensitive tape
- Spray adhesive suitable for securing loose insulation to unit panels
- Economizer lubricant Spray
- Standard HVAC service and hand tools, appropriate for the equipment being serviced
- Drill and Unibit® (step drill) with the ability to drill a 5/8 inch hole
- Sheet metal hex-head screws (Replacement fasteners)
- Screwdrivers, wrenches, ratchet and sockets, etc.
- Digital camera
- Permanent marker
- Sheet metal hex-head screws for replacement panel fasteners
- VSP-provided diagnostic tools and software (required for Tune-ups))

4.5.2. Measurement Instruments

A. Accuracy Specifications and Calibration Intervals for Instruments

Field instruments shall include the ability to measure the following parameters to the specified accuracy and be calibrated according to the manufacturer's specifications.

Measured Variables	Units	Accuracy Specification
Supply Air (Dry Bulb)	F	±1.8
Return Air (Dry Bulb)	F	±1.8
Outside Air (Dry Bulb)	F	±1.8
Supply Air (RH)	%	±3.0
Return Air (RH)	%	±3.0
Suction Line (Dry Bulb)	F	±1.8
Liquid Line (Dry Bulb)	F	±1.8
Suction Pressure	psig	±1.0
Discharge Pressure	psig	±1.0
Duct Static Pressure – Supply/Return	iwc	±0.02
Static Pressure – Evaporator Coil Inlet/Outlet	iwc	±0.02
Static Pressure – Filter Inlet/Outlet	iwc	±0.02
Condenser Amps (True RMS)	% of rdg	±3.0
Compressor Amps (True RMS)	% of rdg	±3.0
Supply Blower Motor Amps (True RMS)	% of rdg	±3.0
Charging Scale	% of rdg	±0.5

B. Instruments that Meet Program Requirements

The following instruments meet Program requirements. Contractors must provide Technicians with one instrument from each of the six categories below. If Contractor has a question about whether your instruments meet Program requirements, contact CLEAResult. The tools listed are not endorsed by CLEAResult, but rather approved due to accuracy and durability.

✓ **Temperature Sensors**

- Fieldpiece_ ATA1 K- type Thermocouple with alligator clip
- Fieldpiece_ ATB1 K-type bead thermocouple
- Fieldpiece_ ATR1 piercing type thermocouple for ventilation ducts
- Fluke 80PK-1 bead probe
- Fluke 80PK-11 Velcro K-type temperature probe
- Testo 0613 4611 Velcro pipe wrap probe
- Cooper Atkins 4011 Pipe Strap Probe – type K
- Oakton WD-08516-75 detachable probe – Radiation shielded thermocouple probe
- Transcat TC805 – Radiation shielded thermocouple probe
- All Fieldpiece, Fluke, Cooper and similar “clamp” style sensors that adhere to Program specifications and tolerances.

✓ **Psychrometer with Wet Bulb Temperature Calculation Humidity**

- Amprobe-THWD-5 Temperature and RH Sensor
- Omegaette HH314 Temperature and RH Sensor
- Testo 605-H2 Humidity Stick with Wet-Bulb Calculation
- Fieldpiece SDP2 Dual Probe In-duct Psychrometer

✓ **Temperature**

- Amprobe THWD-5 Temperature and RH Sensor
- Omegaette HH314 Temperature and RH Sensor
- Fluke 50 Series I & II thermometer, models 50S and 50D
- Oakton Acorn Temp JKT Thermocouple Thermometer

✓ **Pressures**

- Digi-Cool_DRSA1200_Digital system Analyzer
- Fieldpiece SMAN2 Digital System Analyzer
- Fieldpiece SMAN3 Digital System Analyzer
- Testo 520 Digital System Analyzer
- Testo 560 Digital System Analyzer
- Testo 570 Digital System Analyzer
- All other Digital Analyzers that are comparable to the above systems.

✓ **Differential Static Pressure**

- Omega HHP 2080 Series
- Testo 435 Series
- Energy Conservatory DG 700

✓ **Multi-Meters**

- Fieldpiece HS-35 Stick Meter
- Fieldpiece HS-36 Stick Meter
- Fluke 375 Multi-meter
- Fluke 376 Multi Meter
- Amprobe ACD-14 TRMS-FX Clamp-on Multi Meter
- Amprobe ACD-14 FX Clamp-on Multi Meter
- All Fieldpiece, Amprobe, and Fluke True RMS with PF

The above is a sample list of qualifying meters; the main requirements of meters are:

- At least CAT.III Safety Rated,
- At Least $\pm 1.8^{\circ}\text{F}$ accuracy on thermocouple,
- At Least $\pm 3.0\%$ accuracy for relative humidity,
- At Least Within 3% of reading accuracy measuring voltage and amps,
- At Least ± 1.0 psig accuracy for low side refrigerant pressure, ± 3.0 psig on high side, and
- At Least ± 0.02 IWC accuracy for differential static pressure.
- Any questions should be directed to CLEAResult Field Manager.

5. Signing up Customers

5.1. Overview

Sales/Service Cycle Steps for Tune-Ups	
Prior to offering Tune-up: <ul style="list-style-type: none"> • Be approved as a Participating Contractor • Selected a Verification Service Provider (VSP) 	
1.	Contractor or other party submits a reservation request form to confirm Customer Site Eligibility at http://www.premiumcooling.com/commsservices/form.php
2.	Contractor salesperson discusses opportunity with Customer using marketing collateral and Standard 180 Table 5-22 maintenance list
3.	Customer agrees to the programs terms and conditions (signed agreement required) – within 30 days of Reservation Approval to hold funds.
4.	If first customer, Contractor schedules Initial Technician Training with CLEAResult. Technician completes Rooftop Technician Training at first Customer site.
5.	Contractor performs HVAC Services on eligible units at Customer Site and submits to CLEAResult through VSP.
6.	Provide Customer with a comprehensive report of HVAC units inventoried and serviced, including conditions found, services performed and recommendations.
7.	CLEAResult schedules Inspection with contractor or customer.

5.2. Customer Eligibility

A Customer is defined as an owner, facility manager, **account holder** or authorized building or business representative with a non-residential building that meets the minimum criteria below and has not received tune-up services (on a specific unit) in the prior five years through any SDG&E, Premium Efficiency Cooling, Mobile Clinic or other utility programs. Program services may only be performed for units on a building that:

- ✓ Is equipped with an active electric meter and
- ✓ Receives electric service from SDG&E.

5.3. Unit Eligibility Criteria

The table below lists eligible and ineligible units.

Eligible Units	Ineligible Units
<ul style="list-style-type: none"> ✓ Rooftop units and split systems ✓ Air-source heat pumps ✓ Up to 63.3 tons per circuit 	<ul style="list-style-type: none"> - Chilled/hot water fed units - Variable speed compressor units - Water or ground-source heat pumps - Units that have received incentives under the Premium Efficiency Cooling Program or the AC Time Program are not eligible for a period of five (5) years. - Units less than one year old - PTAC/PTHP - Mini-splits - Multi-splits - VRV and VRF systems

5.3.1. Determining Prior Participation

Units that have participated programs within the last five years should have identification stickers on the unit panel. These provide clear evidence that Contractors can use to inquire further as to the unit’s eligibility in the Program. Although stickers indicate prior participation, the absence of stickers does not guarantee site or unit eligibility. The only way to determine eligibility is through the reservation process.

Program stickers clearly state the name of the Program (Premium Efficiency Cooling Program) and include a unique identifying number and a telephone number to check the date and services performed. When any of these stickers are present, the unit should not be serviced without written confirmation that the unit sticker number has been checked and services were performed more than five years prior.

Some units may have Verification Service Provider Stickers or may have participated in the Mobile Clinic Program. Please contact the telephone number on the sticker to obtain a written confirmation of eligible service date prior to proceeding.

5.3.2. Using the HVAC Unit Nameplate

If the nameplate is in good condition, most of the unit information required to receive incentives (equipment type, refrigerant type, age, tonnage, number of compressors and if present, an economizer) can be found on the nameplate. On the following page is a picture of a typical nameplate with the needed information circled.

1. **Equipment type** – Equipment type can be determined from the model number. Typically, the first or second digit represents the equipment type. Most equipment types should be submitted as DXGF (Direct Expansion Gas-Fueled), PKHP (Packaged Heat Pump), or PVAV (Packaged Variable Air Volume).
2. **Refrigerant type** – Refrigerant type can be found on the nameplate.

3. **Age** – Age can be determined from the equipment serial number. Where the date of production will be embedded in the serial number will depend on the manufacturer. For the example below the first four digits represent the production year and month respectively. Therefore, this unit was produced in May 2004.
4. **Tonnage** – Tonnage can often be determined from the model number. Typically, the first three digits represent the cooling capacity in kBtu/hr. However sometimes only 2 digits are given. Tonnage can be calculated by dividing by 12. In this example the tonnage is equal to 36 kBtu/hr /12 = 3 tons. Tonnage is recorded (as a whole number), or rounded to the nearest half ton (i.e. 7.5 tons). Some nameplates provide the cooling capacity in BTU. In these cases, divide by 12,000 to get tonnage. If the calculated tonnage is a fraction of a ton, round to the manufacturer’s nominal tonnage for the unit (from the unit nomenclature key).

If the nameplate is unreadable the tonnage can be roughly estimated from the size of the ducts connected to the unit. In the table below, we assumed airflow of 400 CFM per ton and a maximum air velocity of 1080 fpm. This is a rough estimation that should only be used if no additional information is available.

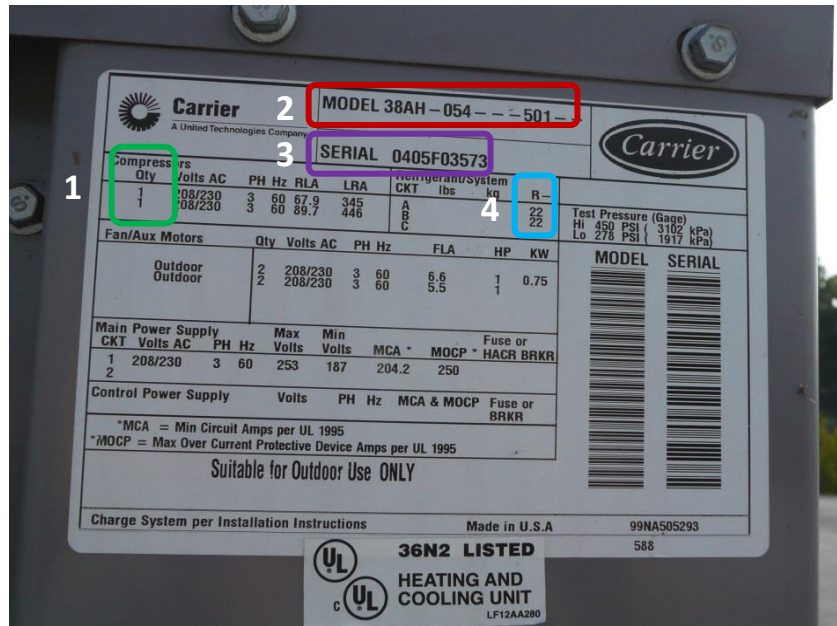
Tonnage	Duct Face Area	Duct Dimensions
< 6	< 320 in ²	< 18 x 18 inches
6 – 25	320 – 1330 in ²	18 x 18 – 36 x 36 inches
> 25	> 1330 in ²	> 36 x 36 inches

5. **Number of Compressors** – The number of compressors can also be found on the nameplate. Typically, the nameplate will list all components and their size. Here we see only one compressor listed and therefore this is a single stage Roof Top Unit (RTU).

If the nameplate is unreadable the number of compressors can be determined by opening the panel near the condenser coil.

6. **Economizer** – The model number may also indicate whether there is an economizer. Consult the manufacturer’s nomenclature legend to determine which digit represents the presence of an economizer. It may be easier to look for motorized economizer dampers. In some cases, it may be necessary to remove a panel to determine whether an economizer has been installed. The figures below show an economizer for a 5-ton RTU. From the picture on the left it is not clear that an economizer has been installed. The economizer dampers will be located near the outside air intake.

1. Number of Compressors
2. Model Number
3. Serial Number
4. Refrigerant Type



1: Example nameplate

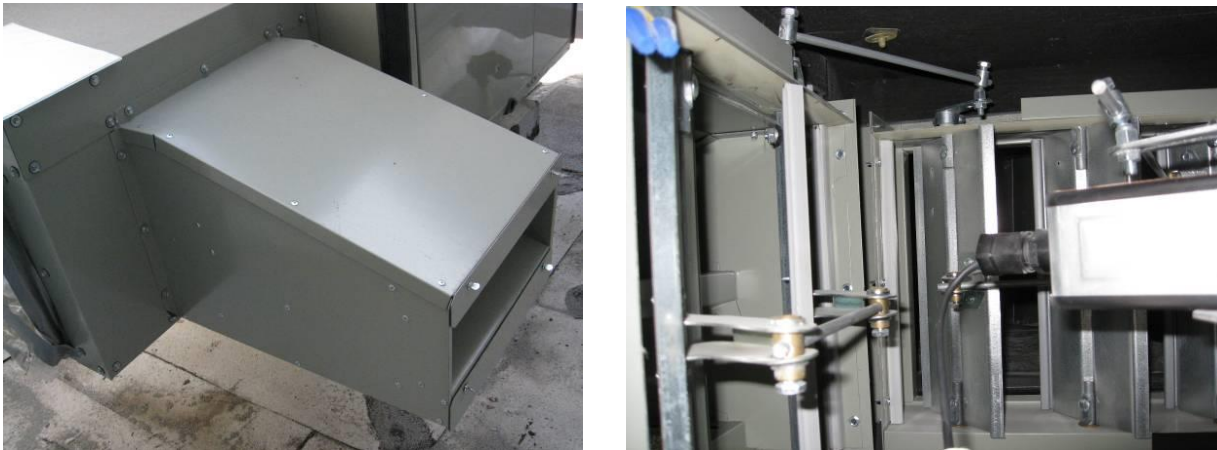


Figure 2: Example of an outside air intake (left) and economizer dampers & actuator (right) for the same small RTU.

5.3.3. Program Sticker

Use the Program Stickers provided in the Contractor Sales Training, the Contractor must apply the HVAC Unit Sticker for each unit serviced.

Place the Program Sticker on the on the outside unit panel of HVAC unit. Preferably next to the nameplate or on the north-facing side.

6. Standards for Performing Tune-ups

Tune-up services are based on, but not limited to, ANSI/ASHRAE/ACCA Standard 180. To qualify for program incentives, the basic expectation is that:

- 1) Units must be **operating as designed**. Superheat, subcooling and approved airflow or temperature-split measurements are within manufacturer and/or accepted industry or California Title 24 specifications.
 - Using a Verification Service Provider is required to ensure the units meet these specifications. Contractors may contract with these providers independently of the program.
 - Program inspectors will be looking for evidence that the refrigerant circuits were properly analyzed, such as freshly sanded copper lines where temperature probes were placed.
- 2) Refrigerant ports have brass Schrader valve caps with O-rings in good condition.
- 3) Fan Housing is free of obstructions, such as insulation, that impede airflow.
- 4) Filters are of the proper size for the existing filter housing.
- 5) Outdoor and indoor coils are clean.
- 6) Technicians indicate that each of the components of the unit are in **acceptable condition** and/or do not require attention. Technicians address any items identified as not acceptable by notifying customer of unacceptable conditions and attempt to remedy the situation at the customer's expense if not covered by utility incentives. This is confirmed through random visual inspections and side by side observations.

Units that do not meet the requirements above are not considered to meet baseline performance and are not eligible for program incentives.

Further detail is available in the Addendum of this Contractor Manual (Appendix B) and Participation Agreement, but the following items are fundamental prerequisites for payment:

- 1) Complete and accurate data must be submitted to CLEAResult in an acceptable format.
- 2) Contractor must comply with all program terms and conditions, including participating in quality assurance activities and providing access for inspections as requested.

As these programs evolve, CLEAResult looks to the HVAC industry and organizations such as ASHRAE, ACCA and the WHPA to further define performance indicators and acceptable baseline conditions consistent with Standard 180. These standards are evolving and will be continuously incorporated into the program. As changes are implemented, contractors will be notified by e-mail and/or invited to participate in a workshop or meeting to review program updates.

6.1. *Payment Information*

CLEAResult verifies each application for EE Task Incentives and performs random inspections. Upon approval, CLEAResult sends incentive payment to contractor within 6-8 weeks.*

**Payments are subject to verification and validation of submitted data and may be delayed or withheld due to rejected data, failed inspections, account closure, customer refusal of inspection, customer service concerns, calibration issues or testing conditions that do not meet program parameters. In all cases, CLEAResult issues a detailed accept/reject report that provides contractors with reasons for failures and*

action items required to cure units that have not met acceptable baseline performance criteria. Any disputes should be taken up with the assigned Account Manager.

6.2. Treatment Guidelines

All units must be serviced according to the ANSI/ASHRAE/ACCA Standard 180 Table 5-22 (2012) prior to the payment of any program incentives. Detailed procedures follow. Limited exceptions apply and must be obtained in writing from the CLEAResult Program Manager or Account Manager.

Contractor must discuss any repairs not fully covered by the Program with the Customer prior to performing services.

6.2.1. Coil Cleaning

The direct expansion cooling coil, heating coil and air-cooled condenser coil shall be cleaned/maintained in good working order to maximize the performance and energy efficiency of the heating and cooling system. The evaporator coil shall be cleaned/maintained with the appropriate cleaning agent as needed and shall be free of dirt, dust and debris. Check for evidence of build-up, fouling or scaling on all heat exchanger surfaces and clean as needed. Proper access shall be achieved, and obstructions removed as necessary to achieve acceptable cleanliness to ensure proper airflow and heat transfer.

*Check if any of the filters need to be replaced using appropriate sizes. The date (month, day and year) and the technician's initials must be written on the replacement filter. **Clean filter and coils are required for refrigerant testing.***

6.2.2. Fin Combing

The evaporator and condenser coil fins shall be restored and/or straightened as necessary. If small sections of fins are damaged they may be ignored as long as their total area is less than 15% of the total coil surface.

6.2.3. Fan Maintenance

The supply fan or blower shall be maintained to ensure adequate air flow. The fan blades or blower wheel shall be cleaned. All blades shall be free of deformation and attached securely. The belt should be replaced with a notched V-belt if worn (eligible for incentives if existing belt is not a cogged V-belt) and the tension shall be adjusted to prevent slippage and excessive wear. The motor and fan sheaves should be securely mounted and aligned to prevent wobbling. Finally, the motor-fan assembly should operate without excessive vibration and noise.

The fan maintenance incentive may be claimed if either an improvement of at least 15% or within +/- 10 CFM of the target of 400 CFM per ton or a smooth belt is replaced with notched V-belts. Detail on procedures is provided in the Contractor Manual Addendum (Appendix B).

6.2.4. Refrigerant System Test and Service

The refrigerant system shall be tested for refrigerant charge. An adjustment of refrigerant charge should be performed if the charge is not within ± 3 for subcooling and ± 5 for superheat. Detail on testing procedures is provided in Appendix B.

Source Documents

PG&E Contractor Manual. 2011. Pacific Gas and Electric Company, San Francisco, CA.

2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings. California Energy Commission. June 2015. CEC-400-2016-037-CMF

Reference Appendices for the 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings. Joint Appendices Effective January 1, 2017. December 2008. CEC-400-2016-038-CMF.

Carrier Corporation, 1986. Required Superheat Calculator GT24-01 020-434. Syracuse, N.Y.: Carrier Corporation.

Carrier Corporation, 1994. Charging Procedures for Residential Condensing Units 020-122 Syracuse, N.Y.: Carrier Corporation.

ANSI/ASHRAE/ACCA Standard 180-2008. Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems. ISSN 1041-2336

KEMA Services, Inc. Economizer Repair and Verification Procedure. AC TIME Program. 2007-08.

Appendix A. Definitions

Air Conditioning Contractors of America (ACCA) – a non-profit association serving more than 60,000 professionals and 4,000 businesses in the HVAC community. ACCA was incorporated over 40 years ago and has state and local chapters throughout the country, including several in California. It promotes professional contracting, energy efficiency, and healthy, comfortable indoor environments.

American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) – Founded in 1894, ASHRAE is an international organization of over 51,000 persons. ASHRAE advances heating, ventilation, air conditioning and refrigeration to serve humanity and promote a sustainable world through research, standards writing, publishing and continuing education. ASHRAE has chapters throughout the U.S. and internationally, including several in California.

American National Standards Institute (ANSI) – a Washington, DC-based, nonprofit organization that oversees the creation, promulgation, and use of voluntary consensus standards that improve productivity, increase efficiency and reduce cost. Although ANSI itself does not develop American National Standards, it provides all interested U.S. parties with a neutral venue to come together and work towards common agreements. This process is guided by the principles of consensus, due process and openness and depends heavily upon data gathering. The Institute ensures that access to the standards process, including an appeals mechanism, is made available to anyone directly or materially affected by a standard that is under development.

ANSI/ASHRAE/ACCA Standard 180: Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems (2008). Standard 180 defines quality maintenance for the HVAC industry and Customers.

California Long Term Energy Efficiency Strategic Plan (CLTEESP) – Approved by the CPUC in September 2008, the CLTEESP sets forth a roadmap for energy efficiency in California through the year 2020 and beyond. It articulates a long-term vision and goals for each economic sector and identifies specific near-term, mid-term and long-term strategies to assist in achieving those goals. It was developed through a collaborative process involving the CPUC's regulated utilities – Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), San Diego Gas & Electric Company (SDG&E) and Southern California Gas Company (SoCal Gas) – and over 500 individuals and organizations working together.

California Public Utilities Commission (CPUC) – regulates privately owned electric, natural gas, telecommunications, water, railroad, rail transit, and passenger transportation companies. The CPUC serves the public interest by protecting consumers and ensuring the provision of safe, reliable utility service and infrastructure at reasonable rates, with a commitment to environmental enhancement and a healthy California economy.

California State Licensing Board (CSLB) – protects consumers by licensing and regulating California's construction industry. There are more than 310,000 licensed Contractors in the state operating under 43 licensing classifications. CSLB educates consumers about Contractors and construction law, administers examinations to test prospective licensees, issues licenses, investigates complaints against licensed and unlicensed Contractors, issues citations, suspends or revokes licenses, and seeks administrative, criminal, and civil sanctions against violators.

Circuit (or AC Circuit or Compressor Circuit) – A circuit is defined as all compressors tied to a common suction header. To verify refrigerant charge, all compressors tied to a common suction header must be operating.

Condenser and evaporator coils – Both coils have copper tubing with aluminum fins and contain refrigerant inside. The condenser coil is very hot (100F to 130F) and dumps heat to the outside air that is pulled in by a condenser fan. The evaporator coil is very cold (45F to 60F); it cools the air delivered to the room and removes humidity.

Customer – A Customer is defined as the purchaser of the Quality Maintenance Service Agreement. The QM service must be performed for a building that is equipped with an active electric meter and receives service from SDG&E.

Economizer (air) – a ducting arrangement, including dampers, linkages, and an automatic control system that allows a cooling supply fan system to supply outside air to reduce or eliminate the need for mechanical cooling [Source: Title 24].

Economizer (water) – a system by which the supply air of a cooling system is cooled directly or indirectly by evaporation of water, or other appropriate fluid, in order to reduce or eliminate the need for mechanical cooling [Source: Title 24].

Energy Efficiency (EE) Measure – An EE measure is a product or service that reduces energy use and/or increases the energy efficiency of equipment when installed/performed at the Customer’s site.

Energy Efficiency Rating (EER) – the ratio of BTUs cooling per watt of power input for air conditioners, based on specified test conditions. The higher the EER number, the more efficient the equipment.

Energy Efficiency Tasks (EET) - refer to tasks performed on Customers HVAC systems that are designed to save energy and reduce peak period energy demand

Energy savings – The amount of energy in kilowatts (kW), kilowatt-hours (kWh) or therms that are saved by installing/adopting an energy efficiency measure.

HVAC – The heating, ventilation and air conditioning system(s) in a building used for controlling indoor air temperature and quality.

HVAC Contractor or Contractor – In the context of this Program, a Contractor is licensed by the State of California State Licensing Board (CSLB) with a C-20 license to perform HVAC work on non-residential dwellings.

Implementer (or Program Implementer) – The firm contracted by SDG&E to help implement the program. For the SDG&E Commercial HVAC Quality Maintenance Program, the Implementer is CLEAResult (CLEAResult).

Incentive or Program Incentive – Funds paid by CLEAResult to the Customer or Contractor for Market Transformation or Energy Efficiency Measures that are completed in accordance with the requirements specified in this Program Manual.

Initial Inventory – HVAC unit inventory completed for a site prior to the execution of the QM Service Agreement.

kW – kilowatt.

kWh – kilowatt hour.

North American Technician Excellence (NATE) – The leading non-profit certification program for Technicians in the heating, ventilation, air-conditioning, and refrigeration (HVAC/R) industry and the only certification body supported by the entire HVAC/R industry.

Maintenance Plan – In accordance with ANSI/ASHRAE/ACCA Standard 180 Section 4.2.2, the Maintenance Plan describes the Customers’ performance objectives for the HVAC system (such as acceptable temperature range), indicators of unacceptable system conditions that could lead to failure or performance degradation (by task), inspection and maintenance tasks, task frequencies, and documentation. For a given facility, the maintenance plan shall be written and developed specifically to meet the size, design, scope and complexity of the system(s) serving that facility. The plan shall describe each required task, identify the party responsible for performing the task, specify the authorizing party, document its completion, and subsequently monitor the results. In this program, it is included in the QM Addendum (template provided) attached to the QM Service Agreement.

Market Transformation – “long-lasting sustainable changes in the structure or functioning of a market by reducing barriers to the adoption of energy efficiency measures to the point where further publicly-funded intervention is no longer appropriate in that specific market” [source: CLTEESP].

Measurement and Verification (M&V) –the process whereby energy savings are measured, verified, and attributed to program measures after the measures have been implemented. This is typically done by a third party M&V Contractor. “Early M&V” is conducted before the end of the program, to assess the accuracy of *ex ante* savings estimates and allow for adjustments in the program design and implementation strategy as needed to achieve savings targets.

Minimum Performance Level - The Qualified Unit meets the baseline level of performance in accordance with ANSI/ASHRAE/ACCA Standard 180, the Maintenance Plan other required Program tasks prescribed by Contractor Manual and the documentation provided by the Qualified Unit’s manufacturer

Participating Contractor/Technician – an HVAC Contractor or Technician that has met the program’s eligibility criteria, been trained and tested on program requirements, formally enrolled, and is in good standing with the program.

SDG&E – San Diego Gas & Electric

Program – In this case, the Premium Efficiency Cooling Program.

Program Manager – CLEAResult designated individual(s) responsible for the management of this Program.

Program Management Metrics – a list of program-specific indicators and targets designed to help the Implementer and SDG&E assess progress toward expected results. Program Management Metrics are primarily tracked by the Implementer for internal management purposes, with the exception of energy savings that are measured and verified by a 3rd party hired by SDG&E or the CPUC.

Qualifying/Qualified Site – A non-residential Customer facility/site that has not participated in any SDG&E or third-party HVAC maintenance program over the past five (5) years. This includes participation in the Premium Efficiency Cooling Program, the AC TIME program, the Mobile Clinic program, the Direct Installation Program or any other utility or third-party programs offering businesses HVAC tune-ups or maintenance services.

Qualified/Qualifying Units– An HVAC unit installed at the Customer site that is either: (i) a rooftop unit, or (b) a split-system unit with equal to or greater than three tons of cooling capacity. Qualified Units do not include units that are fed chilled or hot water from a chiller or boiler or those that have a heat pump or variable speed compressor.

QA/QC – Quality assurance and quality control.

Quality Maintenance (QM) – Performing comprehensive HVAC maintenance in accordance with the ANSI/ASHRAE/ACCA 180: *Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems* (2008).

QM Addendum – A document attached to the QM Service Agreement that complies with the ANSI/ASHRAE/ACCA Standard 180 requirements for a “QM Program” (template provided).

QM Service Agreement – an HVAC maintenance contract signed between a Contractor and Customer participating in this program that complies with program requirements. It has an attached QM Addendum.

Refrigerant charge – the number of pounds of refrigerant (such as R-22 or R-410) required in the HVAC unit’s compressor and coils for it to operate efficiently. This number is typically specified by the manufacturer.

Rooftop Unit (RTU) – a unitary packaged HVAC unit located on the rooftop of a non-residential building.

Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) – an international association of union Contractors, with over 1,800 members in 101 chapters throughout the United States, Canada, Australia and Brazil. Split-System Unit - An air conditioning system that comprises outdoor and indoor components: an outdoor condenser (a condenser coil, condenser fan, and air conditioning compressor) and an indoor evaporator coil (with an evaporator or supply fan).

Supply fan - the large fan system (fan, motor and drive belt) that moves the room air and outside air from the economizer damper into the evaporator coil to be cooled before being supplied to the room.

T24 TSTAT – Title 24 compliant programmable thermostat. Section 112(c) of Title 24 states that all unitary heating and/or cooling systems including heat pumps that are not controlled by a central energy management control system (EMCS) shall have a setback thermostat with a clock mechanism that allows the building occupant to program the temperature set points for at least four periods within 24 hours.

Appendix B. Contractor Manual Addendum

Technical Specifications and Incentive Payment Requirements

All customer incentives will be paid directly to the respective party or to whomever is designated by the customer as the payee. SDG&E and CLEAResult reserve the right to change this payment structure. VSP payments are to be negotiated among the Participating Contractor and the VSP. VSPs must agree to program terms and conditions to be eligible for participation. Minimum levels of service are detailed in the VSP agreement.

Incentives for Qualifying Units are contingent upon the contractor ensuring that each unit is properly charged, in addition to performing all required Tune-Up Energy Efficiency tasks specified in the Contractor Manual. Failure to bring a unit to proper charge levels will result in non-payment for all measures submitted for the unit.

- 1.1. This Addendum provides the minimum technical and order of operations requirements to ensure that a unit is properly serviced. The measures offered on the Premium Efficiency Cooling Program are NOT stand-alone measures and must be performed in conjunction with Quality Maintenance protocols established by ANSI/ASHRAE/ACCA Standard 180, Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems (2012). Please review this standard prior to performing program measures. The latest copies may be purchased from ASHRAE (www.ashrae.org) or ACCA (www.acca.org).
- 1.2. Customer Reports. For tune-up and/or QM services, Contractors must provide customers with an inventory of HVAC units evaluated and tested, complete documentation of work performed, and charges invoiced to the Customer, and a checklist or computerized report of the standard inspection and maintenance tasks performed, itemized repairs and recommendations.

Contractors may, at their discretion, provide customers with energy performance information for work performed and estimated energy savings or efficiency improvements for recommended measures. These figures are estimates based on the technical platforms provided by the Verification Service Providers and must be clearly marked with the notation “Estimated Savings. Actual Results Will Vary.”

Although commercial benchmarking is not a prerequisite for customer participation or contractor payment on the Premium Tune-up Program, this valuable service may be offered by contractors to differentiate their services from those of other vendors.

1.3. **Coil Cleaning Incentives**

A one-time incentive will be paid for Evaporator and Condenser Coil cleaning performed on an eligible HVAC system provided that:

- (1) A visual inspection is performed on the qualifying HVAC system;
and
 - A. The system is found to be in need of coil cleaning; **and**
 - B. The evaporator and condenser coil was cleaned according to the technical specification provided below; **and**
 - C. Before and after measurement data are collected, documented and submitted according to all program requirements in the Contractor Participation Agreement.
- (2) Coil cleaning is performed in conjunction with RCA Test-in or Test-and-correction work in accordance with program requirements.
- (3) Contractor and technician meet all Program requirements as specified in the Participation Agreement.

1.4. **Fan Maintenance Incentives**

A one-time incentive will be paid for Fan Maintenance performed on an eligible HVAC system. Contractor may complete one of the two paths to meet requirements: (1) Improving Airflow, (2) Installing Notched V-belt where the existing belt is smooth.

1.4.1. **Improving Airflow:** A one-time “Fan Maintenance” incentive will be paid under the following conditions:

- (1) After the coils have been cleaned and are dry and the filters have been changed, the total air flow of the unit must be calculated. This can be done by several means which are listed below.
- (2) Target air flow is 400 CFM per ton and to qualify the initial test reading must be outside a tolerance of +/- 25 CFM.
- (3) If/when fan maintenance is done, the refrigerant charge must not be documented or adjusted until after the fan maintenance has been completed to ensure maximum airflow.
- (4) After the fan maintenance has been performed, an improvement of at least 15% must be realized or within +/- 10 CFM of the target of 400 CFM per ton.
- (5) A measurement of total ESP will be required and documented as well to ensure that it is within a reasonable operating range which should fall within 25% of manufacturer rating. This step should ensure that the fan maintenance has not created a situation that could damage the unit.
- (6) The air flow calculation will be determined by the device used to perform the measurement where the ESP measurement will be performed by standard industry measures with a manometer. The data collection ports created to measure DB/WB in the supply and return will also be used for static pressure measurements.
- (7) The total air flow can be determined by performing a test with a Manometer (only when the manufacturers Blower Performance data is available), Flow Hood, Large Vane/Hot Wire Anemometer or a Flow Plate/Grid.

1.4.2. **Installing Notched V-Belt:** A one-time “Fan Maintenance” incentive will be paid under the following conditions:

- (1) Unit must not already have a cogged V-belt installed
- (2) Install a notched V-belt
 - a. Only “A” and “B” V-belts are eligible for replacement. A typical “A” V-belt is replaced by a cogged “AX” V-belt and a “B” is replaced by a “BX.”
- (3) Charge must be tested/adjusted if belt installation affects airflow
- (4) No airflow calculation required, but belts must be tensioned properly using industry standards and methods.

1.5. **Refrigerant Charge and Airflow Incentives**

A one-time incentive will be paid for each Refrigerant Charge and Airflow (RCA) service performed on an eligible HVAC system. Contractor incentives will be paid on a per-unit basis, based on the size (cooling capacity) of the HVAC unit serviced. Two incentive levels apply, commensurate with the type of service provided: (1) RCA Test-In, (2) RCA Correction. **The Qualifying Unit must be eligible to receive this incentive to receive any other incentives associated with maintenance conducted on the unit.**

1.5.1. **RCA Test-In Incentive:** A one-time “RCA Test-In” incentive will be paid under the following conditions:

- (1) An initial test is performed on an eligible HVAC system; **and**
 - A. The system is found to be properly charged and does not require charge and airflow correction **and**

- B. Program-issued stickers are affixed to each unit tested.
 - C. The results of the test confirm that the HVAC unit meets the technical specifications provided below; **and**
 - D. The test results are collected, documented and submitted according to all program requirements in the Contractor Participation Agreement.
- (2) Contractor and technician meet all Program requirements as specified in the Contractor Participation Agreement.

1.5.2. **RCA Correction Incentive:** A one-time “RCA Correction” incentive will be paid under the following conditions:

- (1) An initial test is performed on an eligible HVAC system and the system is found to require charge correction; **and**
- A. Customer opts to have the correction made; **and**
 - B. A final charge and airflow test is performed after the correction work is completed; **and**
 - C. Filters are clean or new and brass caps with neoprene O-rings are installed on each qualifying unit **and**
 - D. Program-issued stickers are affixed to each unit tested.
 - E. The results of the final test confirm that the correction work has been completed to technical specifications provided below; **and**
 - F. The initial and final test results are collected, documented and submitted according to all program requirements in the Contractor Participation Agreement.
- (2) Contractor and technician meet all Program requirements as specified in the Participation Agreement.

General Information

If condenser coil cleaning is to be performed on any unit that will or may also have RCA correction performed the coils must be cleaned first, as coil cleaning may affect heat transfer and air flow which may also affect charge measurements. Contractors are advised to test-in after coil cleaning to determine if units will require RCA correction service.

Any unit that is to receive RCA must be completely functional and free of leaks. All compressors, evaporator fans, condenser fans, and all controls necessary to operate the unit as the manufacturer intended must be functional. The initial superheat value must be positive. Any repairs necessary to ensure this level of functionality must be made prior to any program measures being performed. Sufficient refrigerant charge must be present to obtain test-in data that enables the technician or CLEAResult technical staff to calculate superheat, subcooling, condenser saturation temperature, evaporator saturation temperature, and temperature split measurements. The technician must be able to measure and record all necessary data to provide the above measurements and calculations.

The Program field procedures are a compilation of procedures from a variety of sources, as listed below. They have been modified to allow a variety of technologies to perform these tests. These modifications do not affect the intent or accuracy of the test, but only serve to broaden the variety of suitable technologies.

Leak Inspection and Correction

If an air conditioner has a substantial leak, refrigerant charge correction will not result in long-term improvement in its efficiency. Therefore, prior to performing any charge correction it is necessary to perform a leak inspection. An electronic leak detector shall be used to inspect the system for leaks prior

to performing charge correction. In addition to using an electronic leak detector, a visual inspection for oily areas that could indicate leaks should be performed.

Leaks at Schrader valves can be mitigated by tightening the valve core. If the valve still leaks after being tightened, the valve core should be replaced.

If system leaks are found through this inspection that cannot be corrected through Schrader valve maintenance, and the refrigerant charge is low, then the leaks should be repaired prior to correcting the refrigerant charge.

Brass Valve caps with secondary seals should be placed securely over both Schrader valves at the completion of all refrigerant charge verification. Locking caps such as NoVent are not a requirement under the program but are strongly recommended and are installed at the customer's expense.

Specifications for Multiple Compressors and Zoned Systems

When performing charge adjustments on larger systems where multiple compressors or circuits are present the procedures listed below must be followed.

- Outside air dampers and economizers must be at their minimum outside air settings
- All return air dampers must be set to the fully open position
- All indoor fans must be operating at the speed necessary for the maximum cooling air flow rate
- All condenser fans must be operating at full speed
- All compressors must be operating fully loaded for at least fifteen minutes
- If one of the approved direct air flow methods was used to calculate system airflow, charge may be checked and adjusted for individual circuits running fully loaded
- Refrigeration charge diagnostics must be performed on each refrigeration circuit independently
- Charge adjustment values shall be given as the total of charge added or removed from each circuit
- Systems with zoned or variable air volume distribution must have all zones calling for maximum cooling

Condenser Coil Cleaning Procedures

- (1) Perform chemical coil cleaning according to the equipment manufacturer and the cleaning product's recommended procedure.
- (2) Chemicals applied should remain on the coil for at least ten minutes before rinsing.
- (3) NOTE: It is essential that the entire coil surface is cleaned. This may be difficult to determine on systems that have multiple coil rows and many fins per inch. Technicians must ensure that the chemicals used for cleaning and the water used to rinse the coil is passing completely through the entire coil surface. This may sometimes necessitate the partial dismantling of the unit to access the entire coil. Accessories such as hail guards may need to be removed prior to cleaning.
- (4) NOTE: Be certain that any chemicals used in the cleaning process will not adversely affect any substances, landscape, equipment, asphalt or any other surface it may contact part of the cleaning process.
- (5) Products used to clean the coil must conform to all federal, state and local laws and ordinances.
- (6) Allow the system to run (at least fifteen minutes) until the condenser coil is completely dry.
- (7) Attach a temperature sensor to measure the condenser (entering) air dry-bulb temperature. The sensor shall be placed so that it records the average condenser air entering temperature and is shaded from direct sun.
- (8) Connect the refrigerant gauge manifold (and pressure transducers, if used) to the service valves.
- (9) Measure and record the condenser entering air temperature (Tenteringdb 2).

- (10) Using the liquid line pressure ($P_{\text{condenser}}$), determine the condenser saturation temperature ($T_{\text{condenser sat 2}}$) from the refrigerant chart.
- (11) If a service port is not available at the liquid line and the unit has a discharge pressure service port and the manufacturer's pressure drop across the coil is available calculate the condenser saturation temperature ($T_{\text{condenser sat 2}}$) as discharge pressure minus manufacturer's specifications for condenser pressure drop and use that value to determine the condenser saturation temperature.
- (12) When only discharge pressure is available, and the manufacturer's pressure drop across the condenser coil is not available use the discharge pressure to measure and record the condenser saturation temperature from the refrigerant chart. ($T_{\text{condenser sat 2}}$)

Evaporator Coil Cleaning Procedure

- (1) Turn power off to unit.
- (2) Remove access panel to the evaporator coil.
- (3) Inspect evaporator coil for dust or debris accumulation. If no visible signs of accumulation, indicate that no service was required by logging "N" in the Evaporator Coil Cleaned field. If the evaporator coil appears dirty, log "Y" in the Evaporator Coil Cleaned field and continue with the cleaning procedure.
- (4) Perform chemical coil cleaning according to the equipment manufacturer and the cleaning product's recommended procedure. Use environmentally friendly cleaning products as recommended by the manufacturer.
- (5) NOTE: The dwell time (the length of time) for the chemical cleaning product will vary by manufacturer. In most cases, at least five minutes of dwell time is necessary for proper coil cleaning.
- (6) NOTE: Be certain that any chemicals used in the cleaning process will not adversely affect any substances, landscape, equipment, asphalt or any other surface it may come in contact with as part of the cleaning process. Make sure refrigerant gauges and temperature sensors do not come in contact with chemicals and that temperature sensors are not wet when recording condenser entering air temperature.
- (7) NOTE: Be certain that any products used to clean the coil conform to all federal, state and local laws and ordinances.
- (8) NOTE: Be certain that all precautions have been taken to ensure that no chemicals used for cleaning can enter the return or supply ducts and that any surfaces that may come in contact with cleaning chemicals are completely protected
- (9) Restore power to the unit.

Fan Coil Fin Combing Procedure

Incentives are no longer available for this measure. However, damaged fins may affect performance and should be corrected as part of the Standard 180 checklist for Gold or Silver Tune-ups.

- (1) Turn off the power to the unit by turning off a circuit breaker, fuse, or disconnect feeding it. Having a condenser come on in the middle of cleaning could pose a serious safety hazard.
- (2) Perform a thorough visual inspection of the entire fin array to determine if the unit is suitable for the procedure. Fins that are obviously corroded, damaged and/or disintegrating should not be touched. The found condition should be recorded and the procedure for that unit should be abandoned.
- (3) Record the condition of the fins and whether fin combing is required and advised. Fins that are new/like new should not be combed, nor should fins that are irreparable. Only fins that are bent or damaged (and otherwise in good condition) should be combed. If not advised or required,

record “N” in the Condenser Coil Fins Combed field. Otherwise, record “Y” and proceed with this measure.

- (4) If the coils and fins are in acceptable condition and bent fins are present, proceed by first clearing any debris that surrounds the condenser coil and fin surface. Be sure the fins are cleared all the way through to the inside of the coil.
- (5) Next, carefully comb and straighten the bent or damaged fins with the combing tool, moving in deliberate strokes with the run of the fins.
- (6) Upon completion, do another visual inspection to ensure no damage has occurred.
- (7) Record status for this measure as complete.
- (8) Replace any grills or panels which may have been removed for access. Be certain the energized status of the unit is exactly as it was found. If the main switch or breaker was on, then it should be returned to that position.

Refrigerant Charge Measurements, Non-TXV Metering Devices Procedures

Refer to: <http://www.energy.ca.gov/2015publications/CEC-400-2015-038/CEC-400-2015-038-CMF.pdf>

Temperature Split Airflow Verification

The temperature split test method is designed to provide an efficient check to see if airflow is above the required minimum for a valid refrigerant charge test. The following steps describe the calculations that the calculations software must perform. In order to have a valid charge test, the airflow shall be verified by passing the temperature split test. Alternatively, one of the three measurements in RA3.3 in Attachment 1 may be used with a measured airflow in excess of 300cfm/ton. The following steps describe the calculations using the measurement procedure described in Title 24, Section RA3.2.2.5. If a system fails, then remedial actions must be taken. If the airflow is changed and the refrigerant charge has previously been tested, then the refrigerant charge shall be re-tested. Be sure to run the air conditioner for 15 minutes after the final adjustments before taking any measurements. Both the airflow and charge must be re-tested until they simultaneously pass.

- (1) Calculate the Actual Temperature Split as the return air dry-bulb temperature minus the supply air dry-bulb temperature.
(Actual Temperature Split = $T_{\text{return, db}} - T_{\text{supply, db}}$)
- (2) Determine the Target Temperature Split from Table RA3 or equivalent using the return air wet-bulb temperature ($T_{\text{return, wb}}$) and return air dry-bulb temperature ($T_{\text{return, db}}$).
- (3) If a dash mark is read from Table RA3, then there probably was an error in the measurements because the conditions in this part of the table would be extremely unusual. If this happens, re-measure the temperatures. If re-measurement results in a dash mark, complete one of the alternate airflow measurements in Section 1.6.8 below.
- (4) Calculate the difference between target and actual temperature split (Actual Temperature Split - Target Temperature Split). If the difference is within plus 3°F and minus 3°F, then the system passes the adequate airflow criteria.
- (5) If the difference is greater than plus 3°F on the initial test, then the system does not pass the adequate airflow criteria and the airflow shall be increased by the installer. Increasing airflow can be accomplished by eliminating restrictions in the duct system, increasing blower speed, cleaning filters, or opening registers. For systems with adjustable pulleys, the pulley must be adjusted or replaced to achieve the maximum cooling air flow. When adjusting or replacing pulleys care should be taken to not exceed the maximum amperage of the blower motor. After corrective measures are taken, repeat measurement procedure as often as necessary to establish adequate airflow range. Allow system to stabilize for 15 minutes before repeating measurement procedure.

- (6) If the difference is between minus 3°F and minus 100°F, then the measurement procedure shall be repeated making sure that temperatures are measured in a manner that obtains the average temperature in the airflow.
- (7) If the re-measured difference is between plus 3°F and minus 3°F the system passes the adequate airflow criteria. If the re-measured difference is between minus 3°F and minus 100°F, the system passes, but it is likely that the capacity is low on this system (it is possible, but unlikely, that airflow is higher than average).
- (8) If the re-measured difference is greater than plus 3°F, the system passes if registers were opened, filters were cleaned or replaced, or the blower speed was set at maximum.

Direct Airflow Measurement

Direct airflow measurements may be performed independently of the refrigerant charge tests; these measurements are not dependent on verifying that the refrigerant charge is correct.

Direct airflow measurements can be accomplished using one of the following methods. Whichever method is used, the data must be entered into the calculations software and the technician must use the output to determine if proper airflow has been achieved.

The system passes the airflow verification test if the fan flow measured using one of the following methods is greater than 400 cfm/ton or 450 cfm/ton for a dry coil. The Wet Coil criteria shall be used if the air conditioner is operating and conditions are such that the coil is wet. Otherwise the Dry coil criteria shall be used.

Diagnostic Fan Flow Using Flow Grid Measurement

Fan flow measurement shall be performed using the following procedures:

- (1) With the system fan on at the maximum speed used in the installation (usually the cooling speed when air conditioning is present) measure the pressure difference (in Pascal) between the supply plenum and the conditioned space (P_{sp}). If there is no access to the supply plenum, then place the pressure probe in the nearest supply duct. Adjust the probe to achieve the highest pressure and then firmly attach the probe (e.g., with duct tape) to ensure that it does not move during the fan flow test.
- (2) The flow grid shall be attached at a point where all the fan air flows through the flow grid.
- (3) Re-measure the system operating pressure with the flow grid in place.
- (4) Measure the air flow through the flow grid (Q_{grid}) and the test pressure (P_{test}).
- (5) The following equation for air handler flow shall be used to correct flow through the flow grid and pressure (Q_{grid} and P_{test}) to operating condition at operating pressure (P_{sp}).

$$Q_{ah} = Q_{grid} \times (P_{sp}/P_{test})^{.5}$$

Diagnostic Fan Flow Using Flow Capture Hood

Fan flow measurement must be performed using the following procedures: all registers shall be fully open, and the air filter shall be installed. Turn on the system fan at the maximum speed used in the installation (usually the cooling speed when air conditioning is present) and measure the fan flow at the return grille(s) with a calibrated flow capture hood to determine the total system return fan flow. The system fan flow (Q_{ah} , cfm) shall be the sum of the measured return flows. If there is leakage between the return grille(s) and the unit, the measured airflow may be less than the flow through the unit.

However, the criteria for passing the airflow test remains unchanged at 400 cfm/ton or 450 cfm/ton for a dry coil.

Airflow Measurement Using Plenum Pressure Matching

Fan flow measurement must be performed using the following procedures:

- (1) If the fan flow meter is to be connected to the air handler outside the conditioned space, then the door or access panel between the conditioned space and the air handler location shall be opened.
- (2) With the system fan on at the maximum speed used in the installation (usually the cooling speed when air conditioning is present), measure the pressure difference (in Pascal) between the supply plenum and the conditioned space (Psp). Psp is the target pressure to be maintained during the fan flow tests. If there is no access to the supply plenum, then place the pressure probe in the nearest supply duct. Adjust the probe to achieve the highest pressure and then firmly attach the probe (e.g., with duct tape) to ensure that it does not move during the fan flow test. Block the return duct from the plenum upstream of the air handler fan and the fan flow meter. Filters are often located in an ideal location for this blockage.
- (3) Attach the fan flow meter device to the duct system at the air handler. For many air handlers, there will be a removable section that allows access to the fan that is suitable for this purpose.
- (4) Turn on the system fan and the fan flow meter, adjust the fan flow meter until the pressure between supply plenum and conditioned space matches Psp.
- (5) Record the flow through the flow meter (Qah, cfm) - this is the unit airflow. In some systems, typical system fan and fan flow meter combinations may not be able to produce enough flow to reach Psp. In this case record the maximum flow (Qmax, cfm) and pressure (Pmax) between the supply plenum and the conditioned space. The following equation shall be used to correct measured system flow and pressure (Qmax and Pmax) to operating condition at operating pressure (Psp).

$$\text{Air Handler Flow } Q_{ah} = Q_{max} \times (P_{sp}/P_{max})^{.5}$$

Repeat tests after charge adjustments

After the initial refrigerant charge tests have been completed, the customer has chosen to have the correction made and charge has been corrected, the refrigerant charge test and the temperature split airflow test (if used) must be repeated. Data for these repeated tests must be collected as before. Final submitted data should include the initial test-in readings and the final test-out readings. Interim readings need not be submitted.

Visual Inspection

Identify all sensors and dampers. Check the following:

- (1) Components (including linkages, motors, drives, actuators, sensors and wiring) for any signs of damage such as corrosion, breakage, excessive wear, etc.
- (2) Excessive “play” in the dampers.
- (3) Any signs the dampers have been tampered with (e.g. propped open, disconnected linkage, etc.).
- (4) Signs of over or under pressurization in the supply and return plenums and immediate ductwork (i.e. burst, “imploded” or disconnected ducts)

Should there be any obvious damage, repair before proceeding with any testing. Any damage to ductwork as described in #4 above indicates the system has been running with improper damper positions. This must be corrected, and ductwork repaired, prior to any functional testing.

Position of Dampers

Damper Position with Air Handling Unit (AHU) OFF

- (1) Turn unit OFF.
- (2) Verify outside air and exhaust/relief dampers are completely closed.
- (3) Verify return air damper is open to its maximum position.
- (4) Repair unit if any of these criteria are not met.

Damper Position with AHU ON

- (1) Turn unit ON.
- (2) Adjust cooling set point below actual space temperature.
- (3) Note position of outside air, return air and exhaust/relief dampers. Unless it's a differential system, the following two damper positions are possible:
- (4) Outside air damper open - return damper closed, exhaust/relief damper open
- (5) Outside air damper closed (to minimum position) – return air damper open, exhaust/relief damper closed
- (6) Note inconsistencies with damper positions.
- (7) Take outside air temperature reading.
- (8) To assure full operation of the sensor, change the temperature at the outside air sensor and note change in damper positions:
- (9) If the outside air damper is open, heat the outside air sensor using a heat gun or hair dryer and note change in damper positions. Outside air damper should close to its minimum position. Verify exhaust/relief and return damper positions are consistent with #3 above.
- (10) If the outside air damper is closed, cool the outside air temperature sensor using an ice pack or "cold spray" (designed for troubleshooting electronic components) and note change in damper positions. Outside air damper should become fully open. Verify exhaust/relief and return damper positions are consistent with #3 above.
- (11) On differential systems, the dampers may not open and close to their full positions. Heating and cooling the outside air temperature sensor should still cause the dampers to change positions depending on the return air temperature (or enthalpy). If this occurs, note locations of all temperature (or enthalpy) sensors (e.g. return air, relief air, supply air) and note actual damper positions (e.g. 50% open outside air damper) during the test.
- (12) Repair any components that fail to operate properly.
- (13) Retest per number 1 through 4 above. Continue to test and perform any necessary repairs until the economizer is operating correctly.
- (14) If after making the necessary repairs, the dampers are opening and closing properly, check the settings to ensure that they are not locked at the minimum outside air setting. If this is the case, consult the manufacturer specifications and adjust settings to Econo-Lockout=NO, DB limit = 68, Max OSA = 100%.
- (15) *If settings are NOT locked at the minimum outside air setting, the technician should assume that the settings are as originally commissioned or as appropriate for EMS controllers. Do not adjust the settings without testing the unit under the full range of operating conditions.* If signs point to likely or probable problems with the existing settings, recommend testing and retro commissioning under the full range of conditions at the customer's expense, as appropriate.
- (16) Note in "comments" or "notes" field the specific repairs made to the unit including parts replaced or repaired. These should also be documented on the customer's report.

Title 24 RA3.2-2 Tables

Table RA3.2-2 Target Superheat (Suction Line Temperature - Evaporator Saturation Temperature)

Condenser Air Dry-Bulb Temperature (°F) (T condenser, db)	Return Air Wet-Bulb Temperature (°F) (T return, wb)																										
	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
	55	8.8	10.1	11.5	12.8	14.2	15.6	17.1	18.5	20.0	21.5	23.1	24.6	26.2	27.8	29.4	31.0	32.4	33.8	35.1	36.4	37.7	39.0	40.2	41.5	42.7	43.9
56	8.6	9.9	11.2	12.6	14.0	15.4	16.8	18.2	19.7	21.2	22.7	24.2	25.7	27.3	28.9	30.5	31.8	33.2	34.6	35.9	37.2	38.5	39.7	41.0	42.2	43.4	44.6
57	8.3	9.6	11.0	12.3	13.7	15.1	16.5	17.9	19.4	20.8	22.3	23.8	25.3	26.8	28.3	29.9	31.3	32.6	34.0	35.3	36.7	38.0	39.2	40.5	41.7	43.0	44.2
58	7.9	9.3	10.6	12.0	13.4	14.8	16.2	17.6	19.0	20.4	21.9	23.3	24.8	26.3	27.8	29.3	30.7	32.1	33.5	34.8	36.1	37.5	38.7	40.0	41.3	42.5	43.7
59	7.5	8.9	10.2	11.6	13.0	14.4	15.8	17.2	18.6	20.0	21.4	22.9	24.3	25.7	27.2	28.7	30.1	31.5	32.9	34.3	35.6	36.9	38.3	39.5	40.8	42.1	43.3
60	7.0	8.4	9.8	11.2	12.6	14.0	15.4	16.8	18.2	19.6	21.0	22.4	23.8	25.2	26.6	28.1	29.6	31.0	32.4	33.7	35.1	36.4	37.8	39.1	40.4	41.6	42.9
61	6.5	7.9	9.3	10.7	12.1	13.5	14.9	16.3	17.7	19.1	20.5	21.9	23.3	24.7	26.1	27.5	29.0	30.4	31.8	33.2	34.6	35.9	37.3	38.6	39.9	41.2	42.4
62	6.0	7.4	8.8	10.2	11.7	13.1	14.5	15.9	17.3	18.7	20.1	21.4	22.8	24.2	25.5	27.0	28.4	29.9	31.3	32.7	34.1	35.4	36.8	38.1	39.4	40.7	42.0
63	5.3	6.8	8.3	9.7	11.1	12.6	14.0	15.4	16.8	18.2	19.6	20.9	22.3	23.6	25.0	26.4	27.8	29.3	30.7	32.2	33.6	34.9	36.3	37.7	39.0	40.3	41.6
64	-	6.1	7.6	9.1	10.6	12.0	13.5	14.9	16.3	17.7	19.0	20.4	21.7	23.1	24.4	25.8	27.3	28.7	30.2	31.6	33.0	34.4	35.8	37.2	38.5	39.9	41.2
65	-	5.4	7.0	8.5	10.0	11.5	12.9	14.3	15.8	17.1	18.5	19.9	21.2	22.5	23.8	25.2	26.7	28.2	29.7	31.1	32.5	33.9	35.3	36.7	38.1	39.4	40.8
66	-	-	6.3	7.8	9.3	10.8	12.3	13.8	15.2	16.6	18.0	19.3	20.7	22.0	23.2	24.6	26.1	27.6	29.1	30.6	32.0	33.4	34.9	36.3	37.6	39.0	40.4
67	-	-	5.5	7.1	8.7	10.2	11.7	13.2	14.6	16.0	17.4	18.8	20.1	21.4	22.7	24.1	25.6	27.1	28.6	30.1	31.5	33.0	34.4	35.8	37.2	38.6	39.9
68	-	-	-	6.3	8.0	9.5	11.1	12.6	14.0	15.5	16.8	18.2	19.5	20.8	22.1	23.5	25.0	26.5	28.0	29.5	31.0	32.5	33.9	35.3	36.8	38.1	39.5
69	-	-	-	5.5	7.2	8.8	10.4	11.9	13.4	14.8	16.3	17.6	19.0	20.3	21.5	22.9	24.4	26.0	27.5	29.0	30.5	32.0	33.4	34.9	36.3	37.7	39.1
70	-	-	-	6.4	8.1	9.7	11.2	12.7	14.2	15.7	17.0	18.4	19.7	20.9	22.3	23.9	25.4	27.0	28.5	30.0	31.5	33.0	34.4	35.9	37.3	38.7	39.9
71	-	-	-	-	5.6	7.3	8.9	10.5	12.1	13.6	15.0	16.4	17.8	19.1	20.3	21.7	23.3	24.9	26.4	28.0	29.5	31.0	32.5	34.0	35.4	36.9	38.3
72	-	-	-	-	-	6.4	8.1	9.8	11.4	12.9	14.4	15.8	17.2	18.5	19.7	21.2	22.8	24.3	25.9	27.4	29.0	30.5	32.0	33.5	35.0	36.5	37.9
73	-	-	-	-	-	5.6	7.3	9.0	10.7	12.2	13.7	15.2	16.6	17.9	19.2	20.6	22.2	23.8	25.4	26.9	28.5	30.0	31.5	33.1	34.6	36.0	37.5
74	-	-	-	-	-	-	6.5	8.2	9.9	11.5	13.1	14.5	15.9	17.3	18.6	20.0	21.6	23.2	24.8	26.4	28.0	29.5	31.1	32.6	34.1	35.6	37.1
75	-	-	-	-	-	-	5.6	7.4	9.2	10.8	12.4	13.9	15.3	16.7	18.0	19.4	21.1	22.7	24.3	25.9	27.5	29.1	30.6	32.2	33.7	35.2	36.7
76	-	-	-	-	-	-	-	6.6	8.4	10.1	11.7	13.2	14.7	16.1	17.4	18.9	20.5	22.1	23.8	25.4	27.0	28.6	30.1	31.7	33.3	34.8	36.3
77	-	-	-	-	-	-	-	5.7	7.5	9.3	11.0	12.5	14.0	15.4	16.8	18.3	20.0	21.6	23.2	24.9	26.5	28.1	29.7	31.3	32.8	34.4	36.0
78	-	-	-	-	-	-	-	-	6.7	8.5	10.2	11.8	13.4	14.8	16.2	17.7	19.4	21.1	22.7	24.4	26.0	27.6	29.2	30.8	32.4	34.0	35.6
79	-	-	-	-	-	-	-	-	5.9	7.7	9.5	11.1	12.7	14.2	15.6	17.1	18.8	20.5	22.2	23.8	25.5	27.1	28.8	30.4	32.0	33.6	35.2
80	-	-	-	-	-	-	-	-	6.9	8.7	10.4	12.0	13.5	15.0	16.6	18.3	20.0	21.7	23.3	25.0	26.7	28.3	29.9	31.6	33.2	34.8	36.4
81	-	-	-	-	-	-	-	-	-	6.0	7.9	9.7	11.3	12.9	14.3	16.0	17.7	19.4	21.1	22.8	24.5	26.2	27.9	29.5	31.2	32.8	34.4
82	-	-	-	-	-	-	-	-	5.2	7.1	8.9	10.6	12.2	13.7	15.4	17.2	18.9	20.6	22.3	24.0	25.7	27.4	29.1	30.7	32.4	34.0	35.7
83	-	-	-	-	-	-	-	-	-	6.3	8.2	9.9	11.6	13.1	14.9	16.6	18.4	20.1	21.8	23.5	25.2	26.9	28.6	30.3	32.0	33.7	35.4
84	-	-	-	-	-	-	-	-	-	5.5	7.4	9.2	10.9	12.5	14.3	16.1	17.8	19.6	21.3	23.0	24.8	26.5	28.2	29.9	31.6	33.3	35.0
85	-	-	-	-	-	-	-	-	-	-	6.6	8.5	10.3	11.9	13.7	15.5	17.3	19.0	20.8	22.6	24.3	26.0	27.8	29.5	31.2	32.9	34.6
86	-	-	-	-	-	-	-	-	-	5.8	7.8	9.6	11.3	13.2	15.0	16.7	18.5	20.3	22.1	23.8	25.6	27.3	29.1	30.8	32.6	34.3	36.0
87	-	-	-	-	-	-	-	-	-	5.0	7.0	8.9	10.6	12.6	14.4	16.2	18.0	19.8	21.6	23.4	25.1	26.9	28.7	30.4	32.2	34.0	35.7
88	-	-	-	-	-	-	-	-	-	-	6.3	8.2	10.0	12.0	13.9	15.7	17.5	19.3	21.1	22.9	24.7	26.5	28.3	30.1	31.8	33.6	35.4
89	-	-	-	-	-	-	-	-	-	5.5	7.5	9.4	11.5	13.3	15.1	17.0	18.8	20.6	22.4	24.3	26.1	27.9	29.7	31.5	33.3	35.1	36.9

Shaded area requires return plenum temperature of 70°F or higher.

Reference Appendices for the 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings. Joint Appendices Effective January 1, 2017. June 2015. CEC-400-2015-038-CMF.

Table RA3.2-2 Target Superheat (Suction Line Temperature - Evaporator Saturation Temperature)

Table RA3.2-2 Target Superheat (Suction Line Temperature - Evaporator Saturation Temperature)

		Return Air Wet-Bulb Temperature (°F)																										
		(T return, wb)																										
		50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
Condenser Air Dry-Bulb Temperature (°F) (T condenser, db)	90	-	-	-	-	-	-	-	-	-	-	-	-	-	6.8	8.8	10.9	12.8	14.6	16.5	18.3	20.1	22.0	23.8	25.6	27.5	29.3	31.1
	91	-	-	-	-	-	-	-	-	-	-	-	-	-	6.1	8.1	10.3	12.2	14.1	15.9	17.8	19.7	21.5	23.4	25.2	27.1	28.9	30.8
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	5.4	7.5	9.8	11.7	13.5	15.4	17.3	19.2	21.1	22.9	24.8	26.7	28.5	30.4
	93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.8	9.2	11.1	13.0	14.9	16.8	18.7	20.6	22.5	24.4	26.3	28.2	30.1
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.2	8.7	10.6	12.5	14.4	16.3	18.2	20.2	22.1	24.0	25.9	27.8	29.7
	95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.6	8.1	10.0	12.0	13.9	15.8	17.8	19.7	21.6	23.6	25.5	27.4	29.4
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5	9.5	11.4	13.4	15.3	17.3	19.2	21.2	23.2	25.1	27.1	29.0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.0	8.9	10.9	12.9	14.9	16.8	18.8	20.8	22.7	24.7	26.7	28.7	
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.4	8.4	10.4	12.4	14.4	16.4	18.3	20.3	22.3	24.3	26.3	28.3	
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.8	7.9	9.9	11.9	13.9	15.9	17.9	19.9	21.9	24.0	26.0	28.0	
	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.3	7.3	9.3	11.4	13.4	15.4	17.5	19.5	21.5	23.6	25.6	27.7	
	101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.8	8.8	10.9	12.9	15.0	17.0	19.1	21.1	23.2	25.3	27.3	
	102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.2	8.3	10.4	12.4	14.5	16.6	18.6	20.7	22.8	24.9	27.0	
	103	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.7	7.8	9.9	11.9	14.0	16.1	18.2	20.3	22.4	24.5	26.7	
	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.2	7.2	9.3	11.5	13.6	15.7	17.8	19.9	22.1	24.2	26.3	
	105	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.7	8.8	11.0	13.1	15.2	17.4	19.5	21.7	23.8	26.0	
	106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.2	8.3	10.5	12.6	14.8	17.0	19.1	21.3	23.5	25.7	
	107	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.7	7.9	10.0	12.2	14.4	16.6	18.7	21.0	23.2	25.4	
	108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.2	7.4	9.5	11.7	13.9	16.1	18.4	20.6	22.8	25.1	
	109	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.9	9.1	11.3	13.5	15.7	18.0	20.2	22.5	24.7		
110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.4	8.6	10.8	13.1	15.3	17.6	19.9	22.1	24.4			
111	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.9	8.1	10.4	12.6	14.9	17.2	19.5	21.8	24.1			
112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.4	7.6	9.9	12.2	14.5	16.8	19.1	21.5	23.8		
113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	9.5	11.8	14.1	16.4	18.8	21.1	23.5		
114	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.7	9.0	11.4	13.7	16.1	18.4	20.8	23.2		
115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.2	8.6	10.9	13.3	15.7	18.1	20.5	22.9		

Reference Appendices for the 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings. Joint Appendices Effective January 1, 2017. June 2015. CEC-400-2015-038-CMF.

Table RA3.2-3 Target Temperature Split (Return Dry-Bulb – Supply Dry-Bulb)

Table RA3.2-3 Target Temperature Split (Return Dry-Bulb – Supply Dry-Bulb)

		Return Air Wet-Bulb (°F) (T _{ram,wb})																											
		50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	
Return Air Dry-Bulb (°F) (T _{ram,db})	70	20.9	20.7	20.6	20.4	20.1	19.9	19.5	19.1	18.7	18.2	17.7	17.2	16.5	15.9	15.2	14.4	13.7	12.8										
	71	21.4	21.3	21.1	20.9	20.7	20.4	20.1	19.7	19.3	18.8	18.3	17.7	17.1	16.4	15.7	15.0	14.2	13.4	12.5									
	72	21.9	21.8	21.7	21.5	21.2	20.9	20.6	20.2	19.8	19.3	18.8	18.2	17.6	17.0	16.3	15.5	14.7	13.9	13.0	12.1								
	73	22.5	22.4	22.2	22.0	21.8	21.5	21.2	20.8	20.3	19.9	19.4	18.8	18.2	17.5	16.8	16.1	15.3	14.4	13.6	12.6	11.7							
	74	23.0	22.9	22.8	22.6	22.3	22.0	21.7	21.3	20.9	20.4	19.9	19.3	18.7	18.1	17.4	16.6	15.8	15.0	14.1	13.2	12.2	11.2						
	75	23.6	23.5	23.3	23.1	22.9	22.6	22.2	21.9	21.4	21.0	20.4	19.9	19.3	18.6	17.9	17.2	16.4	15.5	14.7	13.7	12.7	11.7	10.7					
	76	24.1	24.0	23.9	23.7	23.4	23.1	22.8	22.4	22.0	21.5	21.0	20.4	19.8	19.2	18.5	17.7	16.9	16.1	15.2	14.3	13.3	12.3	11.2	10.1				
	77	-	24.6	24.4	24.2	24.0	23.7	23.3	22.9	22.5	22.0	21.5	21.0	20.4	19.7	19.0	18.3	17.5	16.6	15.7	14.8	13.8	12.8	11.7	10.6	9.5			
	78	-	-	-	24.7	24.5	24.2	23.9	23.5	23.1	22.6	22.1	21.5	20.9	20.2	19.5	18.8	18.0	17.2	16.3	15.4	14.4	13.4	12.3	11.2	10.0	8.8		
	79	-	-	-	-	-	24.8	24.4	24.0	23.6	23.1	22.6	22.1	21.4	20.8	20.1	19.3	18.5	17.7	16.8	15.9	14.9	13.9	12.8	11.7	10.6	9.4	8.1	
	80	-	-	-	-	-	-	25.0	24.6	24.2	23.7	23.2	22.6	22.0	21.3	20.6	19.9	19.1	18.3	17.4	16.4	15.5	14.4	13.4	12.3	11.1	9.9	8.7	
	81	-	-	-	-	-	-	-	25.1	24.7	24.2	23.7	23.1	22.5	21.9	21.2	20.4	19.6	18.8	17.9	17.0	16.0	15.0	13.9	12.8	11.7	10.4	9.2	
	82	-	-	-	-	-	-	-	-	25.2	24.8	24.2	23.7	23.1	22.4	21.7	21.0	20.2	19.3	18.5	17.5	16.6	15.5	14.5	13.4	12.2	11.0	9.7	
	83	-	-	-	-	-	-	-	-	-	25.3	24.8	24.2	23.6	23.0	22.3	21.5	20.7	19.9	19.0	18.1	17.1	16.1	15.0	13.9	12.7	11.5	10.3	
	84	-	-	-	-	-	-	-	-	-	25.9	25.3	24.8	24.2	23.5	22.8	22.1	21.3	20.4	19.5	18.6	17.6	16.6	15.6	14.4	13.3	12.1	10.8	

Appendix C. (Gold) 3 YR Quality Maintenance Services

The (Gold) 3 YR Quality Maintenance (QM) option is aligned with the Statewide Commercial HVAC Quality Maintenance Program. The Statewide Commercial HVAC Quality Maintenance Program is compliant with 2012 Standard 180 Table 5-22 and Section 4, with the exception that the Statewide Program currently does not require gas combustion services or offer incentives for gas burner and combustion chamber diagnostics or repairs.

Gold QM Process Overview

Successful participation in the Premium Efficiency Cooling Program Gold Maintenance Service will result in multiple incentive payments to participating Customers or their designees.

- In addition to the Contractor Maintenance Agreement and Customer Incentive Application, the following inventory data are required in the Customer Maintenance Agreement Calculator:
 - number of eligible units
 - Sticker Number
 - Unit age
 - Unit tonnage
 - number of compressors
 - presence of an economizer.
- Incentives are paid after:
 - (a) Customer Reservation is submitted, and eligibility verified.
 - (b) Approval of the Customer Incentive Application, which requires a three-year signed Service Agreement (one year with automatic renewal is acceptable as long as continuous three-year coverage is maintained);
 - (c) Submission of QM Addendum
 - (b) Approval and/or verification of completed unit Inventory, complete with program stickers;
 - (c) All enrolled QM HVAC units are brought to baseline performance and pass quality assurance review through data validations and/or field inspections.
 - i. Silver Tune-Ups may be completed on enrolled QM units to assist with achieving acceptable baseline performance.
 - (d) All QM tasks on the units are complete and brought up to Minimum Performance Level (Operating as designed)
- \$125 will be paid to the Payee and 20% of the total Customer Service Agreement Incentive will be paid within 6 to 8 weeks of the completion of the above steps.
- 35%, 25%, and 20% of the total Customer Service Agreement Incentive is then paid at the end of years one, two, and three if all units are in continuous conformance with the Service Agreement. If any unit is not in conformance, the incentive payment will be reduced accordingly, or the payment held until the units are treated per the maintenance plan.
- All incentives above can be estimated using the Program Incentive Calculators.

- Please see important Terms and Conditions on the Customer Incentive Application. Payment of Customer Incentives is generated by SDG&E and additional terms and conditions on the Customer Incentive Application apply.

Gold QM Process Timeline	
1.	Contractor submits Contractor Participation Agreement and Technician eligibility criteria. Program accepts participation agreement and authorized contractor to complete Sales and Operations training.
2.	Contacto r r is provided the Customer Maintenance Incentive Calculator, and program marketing materials from program website.
3.	Contractor submits a reservation request form to confirm Customer/Site Eligibility at www.premiumcooling.com <i>Reservations are active for up to 30 days from date of application approval.</i>
4.	Contractor salesperson discusses opportunity with Customer using Marketing collateral (Incentive Calculator and Customer Brochure)
5.	Contractor’s Salesperson works with Customer to determine terms of service and prepare a 3-year Maintenance Agreement consistent with Tables 5-22 and 5-12 of the ANSI/ASHRAE/ACCA 180 Standard (2012).
6.	Contractor submits completed and signed documents to CLEAResult <ul style="list-style-type: none"> ✓ Contractor Maintenance Agreement ✓ Quality Maintenance Addendum (attachment to the Contractor Service Agreement) ✓ Customer Incentive Application
7.	Contractor schedules first maintenance and completes Initial Unit Inventory (number and type of eligible units). Contractor places Program Stickers on the inventoried units.
8.	Contractor completes repairs approved by the Customer to bring the unit to the baseline performance level within 6 months of the effective date of the QM Addendum . At this time, the Contractor may also choose to perform a Tune Up on the units and submit their testing data and completed measures to their VSP.
9.	Contractor submits the Customer Maintenance Incentive Calculator to CLEAResult with the customer incentive calculator outputs based on the verified unit inventory and baseline status. Units that did not reach the baseline performance level will not be included on the calculator.
10.	CLEAResult and/or SDG&E perform QA/QC on submitted materials and perform random inspections to verify unit inventory and baseline condition. Satisfactory data review and/or inspections trigger initial contractor and customer incentive payments. <i>Upon approval, contractor and customer incentive payments will be issued within 6-8 weeks.*</i>
<p>*Payments are subject to verification and validation of submitted data and may be delayed or withheld due to rejected data, failed inspections, account closure, customer refusal of inspection, customer service issues, or HVAC removal or replacement. In all cases, CLEAResult issues a detailed accept/reject report that provides contractors with reasons for failures and action items required to correct units that are have not met acceptable baseline performance criteria.</p>	

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| 11. Contractor performs ongoing maintenance services according to terms outlined in the Maintenance Agreement. Contractor will submit copies of all completed maintenance work orders and up to date inventory of units being maintained annually as proof of compliance with the Maintenance Agreement. |
| 12. CLEAResult and/or SDG&E perform ongoing QA/QC . Field inspections are conducted on a random sample. |
| 13. CLEAResult processes annual installments of the Customer Maintenance Agreement Incentive and SDG&E issues payments. |

The incentive processing procedure for Gold Maintenance services is triggered as outlined in the table below. **All incentives are paid one-time/per qualifying unit.**

Incentive Name	Incentive Amount	Purpose	Required Documentation (in additional to general conditions)
Customer Maintenance Agreement Incentive	<u>Up to \$3,836</u> (20% after baseline performance is met 25% at Year 1 35% at Year 2 20% at Year 3)	<ul style="list-style-type: none"> • Decrease customer’s additional cost to upgrade to a QM Agreement. • Keep the Maintenance Agreement in place and units maintained at baseline performance level by Contractor for 3 years. 	<ul style="list-style-type: none"> • Complete Customer Application • Unit Inventory • Signed Maintenance Agreement • Signed QM Addendum • Signed W9 • Customer Maintenance Incentive Calculator
Contractor Service Agreement and QM Tasks Incentive	<u>\$125</u>	<ul style="list-style-type: none"> • Offset initial contractor documentation and data collection costs. • Meet Standard 180 Section 4 requirements. • Reduce some of the additional costs of minor repairs that are required but not eligible for incentives. 	<ul style="list-style-type: none"> • Customer Maintenance Agreement Incentive Calculator • Customer Incentive Application • Approved reservation • W9 form • Contractor Participation Agreement • Final Inventory Data

Maintenance Agreement and the Quality Maintenance Addendum

Customer must sign a three-year Maintenance Agreement with a participating Contractor. If the Agreement is less than three-years, the Customer must commit to renewing it for a total period of 3 years without lapse. Contractor must alert customer that:

- No unit will receive this incentive for more than three years.
- Incentives can be transferred to a new Maintenance Agreement when there is a change of building ownership or a new HVAC Contractor participating in the Program, in which case the eligibility period will be prorated for the new agreement.
- Units must be operating as designed and adequately maintained; deferred maintenance and repairs will cause forfeiture of incentives.
- Incentive amount may be adjusted as unit eligibility is re-evaluated during the Program lifecycle.

The Quality Maintenance (QM) addendum is an attachment to the Maintenance Agreement.

Purpose:

- Connect the Maintenance Agreement to the Program
- Apply ACCA 180 Standards to the Maintenance Agreement
- Require that units are maintained under the agreement for a three-year period
- Allow CLEAResult and SDG&E to verify that there is Quality Maintenance Agreement in place

Customer Incentive Application

The Contractor must submit to CLEAResult a preliminary output of estimated incentives from Customer Maintenance Agreement Incentive Calculator a. The Customer Incentive Application will be provided. Final incentives will be determined based on an eligible equipment inventory verified by the contractor's technicians after the first maintenance and possibly confirmed by Program field staff.

Customers with multiple buildings under one Maintenance Agreement

The Contractor must verify whether the units that will be covered in the Maintenance Agreement are in multiple buildings, in multiple building types, or under more than one electric or gas service ID. If so, the contractor must contact CLEAResult for assistance.

Bring Units to the Baseline Performance Level (operating as designed)

Quality Maintenance tasks and frequencies are based on ANSI/ASHRAE/ACCA Standard 180. CLEAResult does not plan to issue formal standards or requirements to further define Standard 180 beyond the contractor training, manuals and addendum (provided to all participating HVAC contractors). To qualify for program incentives, the basic expectation is that within 6 months of the effective date of the QM Addendum:

- 1) Units must be **operating as designed**. Superheat, subcooling and approved airflow or temperature-split measurements are within manufacturer and/or accepted industry specifications.
 - Using a Verification Service Provider (VSP) is strongly recommended, but not required, to ensure the units meet these specifications. The program currently accepts the VSP services of Field Diagnostics and Enalaysys. Contractors may contract with these providers independently of the program and have a portion of their program incentives assigned to their provider for services rendered.

- 2) Technicians indicate that each of the components of the unit are in **acceptable condition** and/or do not require attention, including accessories such as economizers. Technicians address any items identified as not acceptable by performing the maintenance tasks identified in Standard 180. This is confirmed through random visual inspections and side by side observations.

Units that do not meet **both** requirements above are not considered to meet baseline performance and are not eligible for program incentives.

Further detail is available in this Contractor Manual and Participation Agreement, but the following items are fundamental prerequisites for payment:

- 1) Complete and accurate data must be submitted to our program in an acceptable format.
- 2) Contractor must comply with all program terms and conditions, including participating in quality assurance activities and providing access for inspections as requested.

As these programs evolve, CLEAResult looks to the HVAC industry and organizations such as ASHRAE, ACCA and the WHPA to further define performance indicators and acceptable baseline conditions consistent with Standard 180. These standards are evolving and will be continuously incorporated into the program. As changes are implemented, contractors will be notified by e-mail and/or invited to participate in a workshop or meeting to review program updates.

Technicians must evaluate the initial condition of each unit and only perform appropriate repairs as indicated by the initial condition and consistent with the maintenance plan condition indicators.

Maintaining Baseline Performance Level

Units must be maintained by Contractor in accordance with the agreed Maintenance Agreement.

Final Inventory

A final inventory of all units to be serviced is required. Inventory must include at least the following information:

- Customer Name
- Site Address, City, State, Zip
- Site Contact Name, Phone and Email
- Unit Sticker Number
- Baseline/Eligibility Status
- Tonnage
- Number of Compressors
- Unit Age
- Economizer (Y/N)

Repairs and Option to Drop Units

If inspections detect condition indicators of unacceptable unit performance, as defined in the Maintenance Agreement, the Technician must inform of the Customer of necessary repairs and the unit must be brought up

to minimum performance level. If the Customer declines to undertake the necessary repairs, the unit will become ineligible for incentives and any outstanding incentive payments will be forfeited.

Adding Units to a Maintenance Agreement

A unit may be added to the QM Service Agreement and Maintenance Plan during the program period, and would be eligible for Program incentives subject to the Program’s terms and conditions.

Renewing Maintenance Agreements

If the Customer’s Service Agreement is for a period of less than three years, the Contractor should ensure that the Service Agreement is renewed and re-submit the new agreement and proof of renewal to CLEAResult annually.

Exceptions - Customer Issues Resolution Process

Customers and contractors can notify the program of any concerns by calling the Program’s telephone number (888-369-1608)

If the complaint or incident relates to program delivery issues in the field:

- Contractor must immediately notify CLEAResult and gather information or address the issue within 24 hours.
- No-cooling or No-heating calls must be resolved as soon as possible and the day that the call is dispatched.
- CLEAResult reserves the right to dispatch service calls to a different provider in cases such as emergency no-cooling or no-heating calls, in situations where the customer explicitly requests a different provider, or when the contractor of record cannot be reached or does not confirm receipt of the complaint.
- CLEAResult may send a program inspector or an independent HVAC contractor to assess situations on site and/or provide remedies to the customer’s satisfaction.

Extenuating Circumstances

Definition: An event/situation or series of events/situations that is beyond the contractor’s control and that prevents the contractor from completing required tasks at the frequencies required to qualify for incentives.

All services must be completed, and units brought to baseline prior to payment of the first customer installment. However, any of the following events may affect a contractor’s ability to meet quarterly or annual maintenance requirements. In these cases, the process below applies.

Examples include:

- **Safety** - Any condition that would present a significant safety risk to the contractor’s staff or building/grounds occupants, including but not limited to hazardous materials (HazMat) spills.
- **Geo-systems** events such as severe earthquakes, storms, floods, extreme heat or cold, etc.
- **On site blocked access**; for example, by the customer, tenant, police, etc.
- **Off-site blocked access**; for example, governmental/law enforcement closures, roadwork, etc.

- **Changes in ownership and contract:** contractor closes down business, sale of customer’s property to new owner, and/or reassignment of Maintenance Agreement.
- **Delays due to Measurement and Verification Activities and Metering**

Approval Process: To obtain an extension of the six-month deadline to complete all tasks to bring the HVAC units to the Minimum Performance Level, the contractor shall:

- Submit to the Implementer in writing a request for a baseline treatment extension, stating the extenuating circumstance(s), date(s) that it occurred, and timeline for completing baseline treatments. Include documentation evidencing the nature of the circumstances and expected impacts on work completion.
- The Implementer will review the submission and notify the contractor if an extension is granted.

Reports for Contractors and Customers

For each of the services, Contractors must provide customers with an inventory of HVAC units evaluated and tested, complete documentation of work performed, and charges invoiced to the Customer, as well as a checklist or computerized report of the standard inspection and maintenance tasks performed, itemized repairs and recommendations.

The ANSI/ASHRAE/ACCA Standard 180 requires customers to maintain documentation of their HVAC maintenance regimen, the frequency of treatments, and the condition of the HVAC systems.

Appendix D. Contractor Conduct and Public Relations

1. Please see SDG&E's Supplier Code of Conduct for the detailed policy governing contractors, their employees and technicians in the course of participating on this Program. This policy is updated annually and can be found here: <http://www.sempira.com/pdf/about/scc.pdf>
2. An adult (18 and over) must be present when Contractor is inside the Customer's facility. If an adult is initially present at a Customer's facility but leaves after Contractor has begun Work, Contractor shall stop Work immediately and vacate the facility. (Contractors may conduct rooftop work without the presence of an adult.)
3. Contractor shall respect the rights of the general public, and SDG&E Customers, at all times. Contractor shall strive at all times to be courteous to all SDG&E Customers affected by the Work performed under this Contract as well as all members of the general public. The Contractor shall ensure that its conduct of the employees is of a professional manner, and shall not allow its employees to use profanity, use abusive language, or display gestures which could be interpreted by the SDG&E Customer of the general public as offensive or obscene.
4. Conflicts between the general public and SDG&E Customers and the Contractor will not be tolerated. If, in the opinion of the SDG&E Program Manager, the Contractor or its employees is determined to be unsatisfactory or unfit, Contractor or Contractor's Representative shall remove immediately said employee from performing any Work under this Contract. It is understood that this provision in no way requires the Contractor to terminate the employment of any employee replaced under the terms of this section. Nor, by the terms of this section, does SDG&E expressly or impliedly endorse or approve the termination of employment with the Consultant / Contractor of any employee replaced under the terms of this section.
5. Due to the ongoing business relationship between SDG&E and its Customers, Contractor shall perform all Work in a timely, conscientious and businesslike fashion with a minimum of delays and disputes. Contractor shall resolve any disputes with Customers in accordance with the provisions of Section 9.1 TIME IS OF THE ESSENCE.
6. Cleaning Up: With respect to its operation, Consultant / Contractor shall maintain all worksites and related structures, equipment, and facilities in a clean, orderly condition during progress of the Work and clean up debris to the reasonable satisfaction of PGE& and Customer. Any unused or leftover materials, garbage and debris shall be promptly removed from Customer's site by Contractor and disposed of at Consultant's / Contractor's expense.

Appendix E. VSP Responsibilities

Participating VSP agrees to:

- (i) Comply with the terms and conditions of participation as itemized in the Agreement. Submit all required documents, including site and installation data.
- (ii) Ensure that all VSP services are performed in a safe and professional manner.
- (iii) Provide excellent customer service to all Participating Contractors and conduct business transactions in accordance with the Sempra Supplier Code of Business Conduct. This document is available at <http://www.sempra.com/pdf/about/scc.pdf>
- (iv) Require all employees and subcontractors (if any) to present employee identification upon the start of VSP services on a Site.
- (vii) Immediately report to CLEAResult or its representatives, all Participating Contractor conflicts that are not resolved to all party's full satisfaction.
- (ix) Ensure all Participating Contractor technicians receive adequate training and technical assistance in the use of the VSP's equipment and data collection process.
- (x) Validate data collected by the Participating Contractor to ensure completeness and accuracy in accordance with data definitions and validation as defined by the Contractor Manual .
- (xi) Properly calculate required thermodynamic indices and detect and diagnose multiple system faults in accordance with manufacturer specifications. Where manufacturer specifications are not readily available, methods and reference tables provided in California Title 24 Part 6 RA3.2.2 shall apply.
- (xi) Ensure VSP's HVAC system fault detection and diagnostic methods adhere to guidance given in California Title 24 Part 6 Joint Appendix JA6.1.6.1.3, JA6.1.6.2, JA6.1.6.3 regarding parameters to be measured, metering device and airflow calculations, and system fault indication. <http://www.energy.ca.gov/2015publications/CEC-400-2015-038/CEC-400-2015-038-CMF.pdf>
- (xiv) Ensure only Qualified HVAC Technicians use the VSP's equipment.

The Premium Efficiency Cooling Program is funded by California utility customers and administered by San Diego Gas & Electric Company (SDG&E®) under the auspices of the California Public Utilities Commission, through a contract awarded to CLEAResult. California customers who choose to participate in this program are not obligated to purchase any additional services offered by the contractor. The trademarks used herein are the property of their respective owners.