



CALIFORNIA STATEWIDE UTILITY CODES AND STANDARDS PROGRAM

2016 Title 24 Codes & Standards Enhancement (CASE) Proposal

Residential HVAC Field Verification and Diagnostics

Stakeholder Webinar, May 21st, 2014

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Agenda

- Proposed code change overview
- Initial data and findings
- Proposed code change language
- Specific stakeholder requests



Proposed Code Change Overview

Residential HVAC Verification and Diagnostics

- Four (4) measures to clarify refrigerant charge related language
 1. 150.1(c)7Aib, 150.2, and JA6.1 — Rename Charge Indicator Displays (CIDs) to Fault Indicator Displays (FIDs)
 2. RA3.2.1 and Compliance Manual – Clarify that installer and HERS Raters must use same charge verification instructions
 3. 150.1(c)7Ai and RA3.2 – Require liquid line filter
 4. RA2.4.4 – Clarify protocol for delaying charge verification until warm weather



Related Industry Organizations

- Western HVAC Performance Alliance
 - Advisory group composed of manufacturers, consultants, researchers, distributors, and contractors
- ASHRAE Standard Project Committee 207
 - Provides a method to define and test performance of fault detection and diagnostic (FDD) tools function
 - For commercial air-cooled packaged equipment
 - Launch in 2012, goal is a public review draft by January 2015



Initial Data and Findings

- Field and lab findings
 - Split systems with inside coil and outdoor compressor bearing unit are common
 - Installed on-site without production line QC
 - 2012 study indicates testing, diagnosing, and repairing faults are not done properly

- DNV KEMA, WO32 EM&V Interim Findings Memo for Commercial Quality Maintenance – Volume 1 - Field Observations, From WO32 EM&V Team to HVAC Project Coordination Group. August 14, 2013.



1. Rename CIDs to FIDs

- CEC approval process allows devices that meet a generic set of criteria
- Change name to Fault Indicator Display (FID)
 - Improper charge is not the only fault detectable
 - Primarily commercial fault detection devices on the market
 - Compressor operation
 - Surface temperature
 - Vibrations
 - Performance degradation



Proposed Code Change Language

Section 150.1(c), 150.2(b), and JA6.1: CIDs to FIDs

JA6.1 – HVAC System Fault Detection and Diagnostic Technology - ~~Fault-Charge~~ Indicator Display (~~FCID~~)

JA6.1.1 Purpose and Scope
[...]

~~FaultCharge~~ indicator display technologies other than what is described in Section JA6.1 are possible, and when vapor compression air conditioner and heat pump system refrigerant charge, metering device and airflow operating performance can be reliably determined by methods and instrumentation other than those specifically defined in section JA6.1 such alternative ~~charge-fault~~ indicator display technologies may be allowed for ~~Charge-Fault~~ Indicator Display compliance credit if the manufacturer of the product requests approval from the Energy Commission. The Commission may grant such approval after reviewing submittals from the applicant.

RA1.1 *Special Case Protocol Approval*

Field verification and diagnostic test protocols other than those described in Reference Residential Appendix RA3 are possible, and when field verification or diagnostic testing measurements can be reliably determined by methods, procedures or instrumentation other than those specified in Reference Residential Appendix RA3, such alternative protocols shall be allowed if approved by the Commission. The Commission may grant such approval after reviewing submittals from the applicant. Special Case Protocols that are approved by the Commission shall be published as an addendum to Reference Residential Appendix RA1.

RA1.1.1 Special Case Refrigerant Charge Verification Protocol Approval

The applicant for a special case refrigerant charge verification protocol shall provide information that specifies:

- (a) the required instrumentation,
- (b) the instrumentation accuracy,
- (c) the parameters measured,
- (d) the required calculations,
- (e) the target values for system operating parameters for verification of optimum system operation,
- (f) the allowable deviations from target values for system operating parameters,
- (g) the requirements for reporting system faults.

Manufacturers that elect to utilize a special case protocol for compliance with refrigerant charge verification requirements in the Standards shall certify to the Energy Commission that use of the special case refrigerant charge verification protocol produces equipment performance at a sensible EER at AHRI Standard 210/240



Proposed Code Change Language

Section 150.1(c), 150.2(b), and JA6.1: CIDs to FIDs

150.1 - PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR NEWLY CONSTRUCTED RESIDENTIAL BUILDINGS

(c) Prescriptive Standards/Component Package [...]

7. Space Heating and Space Cooling [...]

A. Refrigerant Charge. When refrigerant charge verification or **charge fault** indicator display is shown as required by TABLE 150.1-A,

i air-cooled air conditioners and air-source heat pumps (including but not limited to ducted split systems, ducted packaged systems, and mini-split systems) shall comply with the following requirements if the procedures are applicable to the system:

a. Have measurement access holes (MAH) [...]; or,

b. Be equipped with a **charge fault** indicator display (**CFID**) device that provides a clearly visible indication to the occupant when the air conditioner fails to meet the required system operating parameters specified in the applicable section of Reference Joint Appendix JA6 for the installed **CFID** technology. The **CFID** indication shall be constantly visible and within one foot of the air conditioner's thermostat. **CFID** installations shall be confirmed by field verification and diagnostic testing utilizing the procedures specified in Reference Residential Appendix RA3.4.2.



Proposed Code Change Language

Section 150.1(c), 150.2(b), and JA6.1: CIDs to FIDs

150.1 - PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR NEWLY CONSTRUCTED RESIDENTIAL BUILDINGS

(c) Prescriptive Standards/Component Package [...]

CONTINUED: TABLE 150.1-A COMPONENT PACKAGE-A Standard Building Design

			Climate Zone								
			1	2	3	4	5	6	7	8	9
HVAC SYSTEM	Space Heating ⁸	Electric-Resistance Allowed	No	No	No	No	No	No	No	No	No
		If gas, AFUE	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
		If Heat Pump, HSPF ⁶	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
	Space cooling	SEER	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
		Refrigerant Charge Verification or Charge Fault Indicator Display	NR	REQ	NR	NR	NR	NR	NR	REQ	REQ
		Whole House Fan ⁷	NR	NR	NR	NR	NR	NR	NR	REQ	REQ
	Annual Energy Cost										



Proposed Code Change Language

Section 150.1(c), 150.2(b), and JA6.1: CIDs to FIDs

150.2 – ENERGY EFFICIENCY STANDARDS FOR ADDITIONS AND ALTERATIONS

(b) Alterations [...]

1. Prescriptive approach. [...]

F. Altered Space-Conditioning System - Mechanical Cooling: [...]

Additionally, these systems shall comply with the following requirements as applicable:

i. In Climate Zones 2, 8, 9, 10, 11, 12, 13, 14, and 15, air-cooled air conditioners and air-source heat pumps (including but not limited to ducted split systems, ducted package systems, and minisplit systems) shall have proper refrigerant charge field verified in accordance with all applicable procedures specified in Reference Residential Appendix Section RA3.2.2, or Reference Residential Appendix RA1 if the procedures in Section RA3.2.2, or RA1 are applicable to the system, or be equipped with a **GFID** that meets the requirements in Section 150.1(c)7Aib if the **GFID** is applicable to the system.

a. Systems that do not comply with the minimum 300 cfm per ton airflow requirement as specified in Reference Residential Appendix Section RA3.2.2.7.2 shall comply with the procedures in Section RA3.2.2.7.3;
[...]



2. Charge Verification Instructions

- Refrigerant charging protocols using generic tables have uncertainty of 40%
 - Manufacturer instructions should be used when available
- Installation manuals available for new equipment
 - Hard copies left with condenser
 - Online
- Clarifications to use manufacturer's instructions
 - Manufacturers may elect to use Special Case Protocol
 - Manufacturers shall provide documentation upon request
 - HERS Raters shall use same charge verification procedures as installer



2. Charge Verification Instructions

RA1.1 Special Case Protocol Approval

Field verification and diagnostic test protocols other than those described in Reference Residential Appendix RA3 are possible, and when field verification or diagnostic testing measurements can be reliably determined by methods, procedures or instrumentation other than those specified in Reference Residential Appendix RA3, such alternative protocols shall be allowed if approved by the Commission. The Commission may grant such approval after reviewing submittals from the applicant. Special Case Protocols that are approved by the Commission shall be published **in a location easily accessible to technicians and HERS Raters as an addendum to Reference Residential Appendix RA1.**

RA1.1.1 Special Case Refrigerant Charge Verification Protocol Approval

The applicant for a special case refrigerant charge verification protocol shall provide information that specifies:

- (a) the required instrumentation,
- (b) the instrumentation accuracy,
- [...]

Manufacturers that elect to utilize a special case protocol for compliance with refrigerant charge verification requirements in the Standards shall certify to the Energy Commission that use of the special case refrigerant charge verification protocol produces equipment performance at a sensible EER at AHRI Standard 210/240 standard rating conditions (80°F indoor dry-bulb, 67°F indoor wet-bulb, and 95°F outdoor dry-bulb) that deviates less than or equal to 5 percent from the sensible EER determined by laboratory testing at the AHRI Standard 210/240 standard rating conditions when the air conditioner is charged with the manufacturer's specified refrigerant charge determined by measurement of the weight of the specified refrigerant charge. The deviations from the manufacturer's target values of system operating parameters, that correspond to the maximum allowable 5 percent deviation in sensible EER shall be determined and reported to the Energy Commission by the manufacturer, and shall be **utilized as the required compliance criteria for HERS Rater refrigerant charge verification.** Deviations of system operating parameters from the manufacturer's target values for less than 5 percent deviation in sensible EER (tighter tolerances) may be specified by the manufacturer for use by the installing contractor.

Manufacturers using special case refrigerant charge verification protocols shall, **upon request, provide comprehensive engineering specification documentation,** installation and technical field service documentation, and user instructions documentation to installers and service personnel that utilize the procedure.



2. Charge Verification Instructions

Table RA3.2-1 – Refrigerant Charge Verification Protocols and Compliance Criteria

Case	User Application	Compliance Criteria	Procedure(s)
Standard Charge Verification Procedure - Fixed Metering Device Systems	Installer Testing at Final	$55^{\circ}\text{F} \leq \text{Outdoor Air Dry-bulb Temp} \leq 115^{\circ}\text{F}$ Return Air Dry-bulb Temp $\geq 70^{\circ}\text{F}$ Return Air Wet-bulb Temp $\leq 78^{\circ}\text{F}$ Superheat tolerance $\pm 5^{\circ}\text{F}$ of the specified target	RA3.2.2.6.1
Standard Charge Verification Procedure - Fixed Metering Device Systems	HERS Rater Testing	$55^{\circ}\text{F} \leq \text{Outdoor Air Dry-bulb Temp} \leq 115^{\circ}\text{F}$ Return Air Dry-bulb Temp $\geq 70^{\circ}\text{F}$ Return Air Wet-bulb Temp $\leq 78^{\circ}\text{F}$ Superheat tolerance $\pm 8^{\circ}\text{F}$ of the specified target	RA3.2.2.6.1
Standard Charge Verification Procedure - Variable Metering Device Systems	Installer Testing at Final	$55^{\circ}\text{F} \leq \text{Outdoor Air Dry-bulb Temp} \leq 120^{\circ}\text{F}$ Return Air Dry-bulb Temp $\geq 70^{\circ}\text{F}$ Subcooling tolerance $\pm 3^{\circ}\text{F}$ of the manufacturer-specified target ¹ Metering Device tolerance: Superheat meets the Manufacturer's specifications or $4^{\circ}\text{F} \leq \text{Superheat} \leq 25^{\circ}\text{F}$	RA3.2.2.6.2
Standard Charge Verification Procedure - Variable Metering Device Systems	HERS Rater Testing	$55^{\circ}\text{F} \leq \text{Outdoor Air Dry-bulb Temp} \leq 120^{\circ}\text{F}$ Return Air Dry-bulb Temp $\geq 70^{\circ}\text{F}$ Subcooling tolerance $\pm 6^{\circ}\text{F}$ of the manufacturer-specified target ¹ and Subcooling $\geq 2^{\circ}\text{F}$ Metering Device tolerance: Superheat meets the Manufacturer's specifications or $3^{\circ}\text{F} \leq \text{Superheat} \leq 26^{\circ}\text{F}$	RA3.2.2.6.2



2. Charge Verification Instructions

RA3.2 Field Verification and Diagnostic Testing of Refrigerant Charge for Air Conditioners and Heat Pumps

RA3.2.2 Standard Charge Verification Procedure

RA3.2.2.6 Refrigerant Charge and Metering Device Calculations

The following steps describe the calculations to determine if the system meets the required refrigerant charge and metering device function using the measurements determined in Section RA3.2.2.5. If a system fails, then remedial actions must be taken by the HVAC system installer. Be sure to run the air conditioner for 15 minutes after the final adjustments before taking any measurements.

RA3.2.2.6.1 Fixed Metering Device Calculations - Superheat Charging Method

The Superheat Charging Method is used only for systems equipped with fixed metering devices. These include capillary tubes and piston-type metering devices.

a) Calculate Actual Superheat as the suction line temperature minus the evaporator saturation temperature.

Actual Superheat = T_{suction} – $T_{\text{evaporator, sat}}$.

(b) Determine and record the Target Superheat using Table RA3.2-2 or the manufacturer's superheat chart using the return air wet-bulb temperature ($T_{\text{return, wb}}$) and condenser air dry-bulb temperature ($T_{\text{condenser, db}}$).



Proposed Code Change Language

RA3.2 Field Verification and Diagnostic Testing of Refrigerant Charge for Air Conditioners and Heat Pumps

RA3.2.1 Purpose and Scope

- (a) The procedures in Appendix RA3.2 are for use for residential air-cooled air conditioners and air-source heat pumps to verify the systems have the required refrigerant charge.
- (b) For dwelling units with multiple air conditioners or heat pumps, the procedures shall be applied to each system separately.
- (c) Appendix RA3.2 defines two procedures, the Standard Charge Verification Procedure in Section RA3.2.2 and the Weigh-in Charging procedure in Section RA3.2.3.
- (d) Failure to follow the manufacturer's installation and charging instructions may result in significant refrigeration system faults that may invalidate refrigerant charge and metering device verification results. The installer shall certify that he/she has conformed to the manufacturer's instructions and specifications for charging the system prior to proceeding with the verification procedures in this appendix. In the case where the manufacturer has certified to the Commission a "Special Case Refrigerant Charge Verification Protocol" meeting the requirements of RA1.1.1, HERS Rater refrigerant charge verification procedures shall adhere to approved special case protocol.



Proposed Code Change Language

RA3.2 Field Verification and Diagnostic Testing of Refrigerant Charge for Air Conditioners and Heat Pumps

*RA3.2.1.1 Scope of the **Standard Charge Verification Procedure** (RA3.2.2)*

- (a) The procedures in Section RA3.2.2 are applicable to ducted split system air-cooled air conditioners and ducted split system air-source heat pumps, and may be applicable to packaged air-cooled air conditioners and packaged air-source heat pumps.
- (b) The procedures in Section RA3.2.2 require verification of the applicable minimum system airflow rate across the cooling coil when refrigerant charge is verified as specified in Section RA3.2.2.7.
- (c) The procedures in Section RA3.2.2 require verification (for applicable systems) that the metering device is operating properly.
- (d) The procedures in Section RA3.2.2 may be used when the outdoor air temperature is 55°F or above.
- (e) When refrigerant charge verification is required for compliance, the applicable procedures in Section RA3.2.2 shall be used by the HVAC installer after installing a new HVAC system or after altering refrigerant-containing components in an existing HVAC system, and after charging the air conditioner or heat pump system in accordance with the manufacturer's instructions and specifications.
- (f) The applicable procedures in Section RA3.2.2 shall always be used by the HERS Rater for verification of the system's refrigerant charge when HERS verification is required for compliance unless ~~an applicable alternate procedure a Special Case Protocol~~ is ~~available in Reference Residential Appendix RA1 approved and listed by the Energy Commission~~, or the Standards specify the Section RA3.2.3.2 procedure (observation of weigh-in) as mandatory for compliance, or as an available option for compliance and the HVAC installer elects to use the RA3.2.3.2 procedure for HERS verification.
- (g) When the procedures in Section RA3.2.2.7.3 (alternative to compliance with minimum system airflow) are utilized for compliance, HERS verification compliance shall not use group sampling.



Proposed Code Change Language

RA3.2 Field Verification and Diagnostic Testing of Refrigerant Charge for Air Conditioners and Heat Pumps

RA3.2.1.2 Scope of the Weigh-In Charging Procedure (RA3.2.3)

- (a) The procedures in Section RA3.2.3 are applicable to air-cooled air conditioners or air-source heat pumps.
- (b) The weigh-in charging procedure is an acceptable method for demonstrating compliance at any outdoor temperature.
- (c) Use of the Section RA3.2.3 procedure does not exempt the system from compliance with all applicable minimum airflow verification requirements.
- (d) When the procedures in Section RA3.2.3 are utilized by the HVAC installer, HERS verification compliance shall not use group sampling.
- (e) The procedures in Section RA3.2.3.1 may be used by the HVAC installer as an alternative to the Standard Charge Verification Procedure in RA3.2.2, ~~or as an alternative to any applicable Special Case Refrigerant Charge Verification Protocol in Reference Residential Appendix RA1.~~
- (f) The procedures in Section RA3.2.3.1 shall be used by HVAC installers when refrigerant charge verification is required for compliance when the outdoor air temperature is below 55°F, and there is no applicable Special Case Refrigerant Charge Verification Protocol ~~in Reference Residential Appendix RA1~~ available for use with the system for outdoor temperatures below 55°F.
- (g) The procedures in Section RA3.2.3.1 shall be used by HVAC installers when refrigerant charge verification is required for compliance when the standard charge verification procedure in RA3.2.2 is not applicable to the system that must demonstrate compliance, and there is no applicable alternative Special Case Refrigerant Charge Verification Protocol ~~in Reference Residential Appendix RA1~~ available for use with the system.
- (h) The procedures in Section RA3.2.3.1 shall not be utilized by HERS Raters for verification of refrigerant charge.
- (i) The procedures in Section RA3.2.3.2 shall be utilized by HERS Raters for verification of refrigerant charge only when the Standards specify that the RA3.2.3.2 procedure shall be used for HERS verification compliance, otherwise only when the Standards specify the RA3.2.3.2 procedure is an available option, and the HVAC installer elects to use the RA3.2.3.2 procedure for HERS verification compliance.



3. Require Liquid Line Filter

- Mitigates damage from debris and moisture in refrigerant due to improper installation
- Standard practice
 - OEMs typically ship and require installation
 - Sometimes omitted
- Easily verified



Proposed Code Change Language

Section 150.1(c)7Ai and RA3.2: Require liquid line filter installation

150.1 - PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR NEWLY CONSTRUCTED RESIDENTIAL BUILDINGS

(c) Prescriptive Standards/Component Package [...]

7. Space Heating and Space Cooling [...]

A. Refrigerant Charge. When refrigerant charge verification or fault indicator display is shown as required by TABLE 150.1-A,

i air-cooled air conditioners and air-source heat pumps (including but not limited to ducted split systems, ducted packaged systems, and mini-split systems) shall comply with the following requirements if the procedures are applicable to the system:

a. Be equipped with a liquid line filter if required per manufacturer's instructions; and,

ba. Have measurement access holes (MAH) [...]; or

cb. Be equipped with a fault indicator display (FID) device ...



Proposed Code Change Language

Section 150.1(c)7Ai and RA3.2: Require liquid line filter installation

RA3.2.2 Standard Charge Verification Procedure

- RA3.2.2.1 – Minimum Qualifications
- RA3.2.2.2 – Instrumentation Specifications
- RA3.2.2.3 – Measurement Access Hole Specification
- RA3.2.2.4 – Calibration
- **RA3.2.2.5 – Liquid Line Filter Installation**
- RA3.2.2.~~56~~ – Charge Verification Measurements
- RA3.2.2.~~67~~ – Refrigerant Charge and Metering Device Calculations

RA3.2.3 Weigh-in Charging Procedure

- RA3.2.3.1.1 – Procedure Options
- RA3.2.3.1.2 – Minimum Qualifications
- RA3.2.3.1.3 – Instrumentation Specifications
- RA3.2.3.1.4 – Calibration
- **RA3.2.2.1.5 – Liquid Line Filter Installation**
- RA3.2.3.1.~~56~~ – Weigh-in Procedure



4. Delayed Charge Verification

- Residential Appendices 2.4.4 improves protocol for delaying charge verification until warmer weather
- HERS Provider Data Registry can support tracking of delayed refrigerant charge verification



4. Delayed Charge Verification

RA2.4.4 and Acceptance Tests: Clarify and support delayed charge verification

Appendix RA2 – Residential HERS Verification, Testing, and Documentation Procedures

RA2.4 Summary of Responsibilities

RA2.4.4 Enforcement Agency

If necessary to avoid delay of approval of dwelling units completed when outside temperatures are below 55°F, the enforcement agency may approve compliance with the refrigerant charge verification requirements when installers have used the **Weigh-in Charging Method** described in Reference Residential Appendix RA3, Section **RA3.2.3.1** and have not used the **Section RA3.2.3.2** option for HERS verification compliance. This approval will be on the condition that installers submit to the enforcement agency a registered Certificate of Installation that includes a signed declaration indicating agreement to return to correct refrigerant charge if a HERS Rater determines at a later time when the outside temperature is 55°F or above, that correction is necessary. The HERS Provider shall track these projects to ensure a HERS Rater conducts the required refrigerant charge verification for all such systems. **When the outdoor temperature is 55°F or above, the HERS Rater shall use the RA3.2.2 standard charge verification procedure, or a procedure approved by the HVAC system manufacturer and Energy Commission for the refrigerant charge verification.** The HERS Rater shall report the diagnostic results on the applicable Certificate of Verification, and shall register the certificate with the HERS Provider. When refrigerant charge verification testing performed by the HERS Rater indicates adjustment to the charge is required, the HERS Provider shall notify the installer, and the builder or building owner that corrective action is required. The HERS Provider may also notify the enforcement agency that corrective action is required. All aircooled air conditioners and air-source heat pumps that utilize the Weigh-In Method shall be verified by a HERS Rater using one of the applicable refrigerant charge verification procedures. Compliance with HERS verification requirements cannot utilize group sampling procedures when the installer utilized the Weigh-In Method.



Proposed Code Change Language

RA2.4.4 and Acceptance Tests: Clarify and support delayed charge verification

Appendix RA2 – Residential HERS Verification, Testing, and Documentation Procedures

RA2.4 Summary of Responsibilities

RA2.4.4 Enforcement Agency

If necessary, to avoid delay of approval of dwelling units completed when outside temperatures are below 55°F, the enforcement agency may approve compliance with the refrigerant charge verification requirements when installers have used ~~when installers have used the Weigh-in Charging Method described in Reference Residential Appendix RA3, Section RA3.2.3.1 and have not used the Section RA3.2.3.2 option for HERS verification compliance.~~ This approval will be on the condition that installer submits to the enforcement agency a ~~registered~~ Certificate of Installation registered with a HERS Provider that includes a signed declaration indicating agreement to return to correct refrigerant charge when the outside temperature is above 55°F, if a HERS Rater determines that ~~at a later time when the outside temperature is 55°F or above,~~ correction is necessary. The HERS Provider shall track these projects to ensure a HERS Rater conducts the required refrigerant charge verification for all such systems. When the outdoor temperature is 55°F or above, the HERS Rater shall use the same charging verification method used by the installer (RA3.2.2 Standard Charge Verification Procedure, RA3.2.3.2 Weigh-in Charging Method, or a ~~procedure a~~ Special Case Charge Verification Protocol approved by the HVAC system manufacturer and Energy Commission under RA1.1) for the refrigerant charge verification. The HERS Rater shall report the diagnostic results on the applicable Certificate of Verification, and shall register the certificate with the HERS Provider. When refrigerant charge verification testing performed by the HERS Rater indicates adjustment to the charge is required, the HERS Provider shall notify the installer, and the builder or building owner that corrective action is required. The HERS Provider may also notify the enforcement agency that corrective action is required.



Proposed Code Change Language

RA2.4.4 and Acceptance Tests: Clarify and support delayed charge verification

Request to the Enforcement Agency for Approval to Final a Permit on Receipt of the CF-6R-Mech-26 HERS Installation Certificate-Alternate Measurement Procedure

Note to Homeowner: We're not done yet!

Congratulations on your new Air-Conditioning system! Your new system is much more efficient than older systems, and it has been installed to industry guidelines, ensuring many years of comfort and efficient service.

One thing you need to know, however, is that the installation process is not complete! Because your unit was installed when the outside air temperature was too low to fine tune the air conditioner, the unit must be serviced and verified when the weather is warmer.

This requires your cooperation. You need to allow access to the unit for your Installer and/or HERS Rater (verifier) to verify that the refrigerant charge and airflow are set correctly. Your project is not considered finished until this verification takes place. If it is not done, **your unit may cost more to operate, may not heat and cool as effectively, and may not last as long.**

You will be contacted within the next few months to schedule this service. If you do not hear something after a few months of warmer weather, please contact your Installer. Enjoy your new system!

Homeowner/builder: _____

Project Address: _____

Permit Number: _____

Agreement

The permit can be finalled by the local building department, because the undersigned all agree that:

- The HERS Rater will return to test the refrigerant charge and airflow at a later time when the outside temperature is above 55°F,
- The Installer will return if the HERS Rater determines that correction is necessary, and, at the Installer's expense, will correct refrigerant charge and airflow, and
- The Homeowner will provide access to the home for the HERS Rater and/or Installer at a mutually convenient time.



Requests from Stakeholders

- What residential devices can continuously monitor AC systems and report faults?
- Are manufacturer charging instructions typically available and/or used?
- How often are liquid line filters installed?
- How often is HERS charge verification rescheduled when outdoor air temperatures are below 55°F?



Questions?

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