Energy Efficiency Regulations for Commercial and Industrial Air Compressors

Our webinar will begin at the top of the hour.

This slide deck will be posted on
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California Energy Commission

Commercial and Industrial Air Compressors

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Participation Guidelines

To ensure a successful webinar for participants:

- Use the chat/raise hand feature for questions/comments:
  - **Online: Raise your hand**, host will give you the ability to speak, then caller must unmute self
  - **Cell phone: Raise your hand by pressing *9**, host will give you the ability to speak, then **caller must press *6 to mute and unmute**
- Provide your **name and affiliation** when speaking
- All **lines are muted**, to comment – **raise hand to speak**
- For clarifying questions, **type your question in the Q&A section**
- Please hold questions until the end of the webinar

Contact us for further information at appliances@energy.ca.gov

Goals of Webinar

- Understand commercial and industrial air compressor regulations
- Highlight effective date of regulations
- Explain testing requirements
- Identify additional resources
- Answer questions

Topic Areas

- Scope
- Definitions
- Test Method
- Performance Requirements
- Marking and Certification Requirements

Scope

Scope

- Rotary air compressors, lubricated, water or air cooled with a fixed or variable speed brushless motor
- Full-load operating pressure greater or equal to 75 pounds per square inch gauge (psig) but less than or equal to 200 psig
- Effective date: January 1, 2022

Definitions

Definitions (Section 1602(a))

“Commercial and industrial equipment” means an article of equipment, regardless of whether it is in fact distributed in commerce for industrial or commercial use, of a type which:

(1) In operation consumes, or is designed to consume energy;

(2) To any significant extent, is distributed in commerce for industrial or commercial use; and

(3) Is not a consumer product, as defined in title 20 section 1602(a).

Definitions (Section 1602(s))

"**State-regulated compressor**" means commercial and industrial equipment that meets all of the following criteria:

(1) is an air compressor,

(2) is a rotary compressor,

(3) is not a liquid-ring compressor,

(4) is driven by a brushless electric motor,

(5) is a lubricated compressor,

(6) has a full-load operating pressure greater than or equal to 75 psig and less than or equal to 200 psig,

(7) is not designed and tested to the requirements of the American Petroleum Institute standard 619, "Rotary-Type Positive-Displacement Compressors for Petroleum, Petrochemical, and Natural Gas Industries"

Definitions (Section 1602(s))

Continued definition of "state regulated compressor"

(8) has full-load actual volume flow rate greater than or equal to 35 cubic feet per minute (cfm), or is sold or offered for sale with a compressor motor nominal horsepower greater than or equal to 10 horsepower (hp),

(9) has a full-load actual volume flow rate less than or equal to 1,250 cfm, or is sold or offered for sale with a compressor motor nominal horsepower less than or equal to 200 hp,

(10) is driven by a three-phase electric motor,

(11) is manufactured alone or as a component of another piece of equipment, and

(12) is one of the equipment classes listed in title 20 section 1605.3(s)(2) Table S-5.

Definitions (Section 1602(s))

"**Basic model**" of a state-regulated compressor means all units of a class of compressors manufactured by one manufacturer, having the same primary energy source, the same compressor motor nominal horsepower, and essentially identical electrical, physical, and functional (or pneumatic) characteristics that affect energy consumption and energy efficiency.

Definitions (Section 1602(s))

"**Air-cooled compressor**" means a compressor that utilizes air to cool both the compressed air and, if present, any auxiliary substance used to facilitate compression, and that is not a liquid-cooled compressor.

"**Liquid-cooled compressor**" means a compressor that utilizes liquid coolant provided by an external system to cool both the compressed air and, if present, any auxiliary substance used to facilitate compression.

Definitions (Section 1602(s))

"**Brushless electric motor**" means a machine that converts electrical power into rotational mechanical power without use of sliding electrical contacts.

"**Fixed-speed compressor**" means an air compressor that is not capable of adjusting the speed of the driver continuously over the driver operating speed range in response to incremental changes in the required compressor flow rate.

Definitions (Section 1602(s))

"**Positive displacement compressor**" means a compressor in which the admission and diminution of successive volumes of the gaseous medium are performed periodically by forced expansion and diminution of a closed space(s) in a working chamber(s) by means of displacement of a moving member(s) or by displacement and forced discharge of the gaseous medium into the high-pressure area.

Definitions (Section 1602(s))

"**Rotary compressor**" means a positive displacement compressor in which gas admission and diminution of its successive volumes or its forced discharge are performed cyclically by rotation of one or several rotors in a compressor casing.

"**Lubricated compressor**" means a compressor that introduces an auxiliary substance into the compression chamber during compression.

Test Method

Test Method
Title 20 section 1604(s)

- Uniform Test Method for Certain Air Compressors, 10 CFR 431, Subpart T, Appendix A

- Allowance of Alternative Efficiency Determination Methods (AEDM) to reduce testing burden

Testing Appliances (Number of units tested)

Only a single unit of the appliance needs to be tested for certification purposes, except in the following instances:

- Enforcement testing may require two units to be tested, if the first unit fails to meet the efficiency standards or efficiency levels reported to the Modernized Appliance Efficiency Database System (MAEDbS)
- When using the alternative efficiency determination method (AEDM), the U.S. Department of Energy (DOE) requires the testing of at least two units.

Performance Requirements

Performance Requirements Title 20 section 1605.3(s)(2)

Equipment Class	Minimum Package Isentropic Efficiency	η_{Regr} (Package Isentropic Efficiency Reference Curve)	d (Percentage Loss Reduction)
Rotary, lubricated, air-cooled, fixed-speed compressor	$\eta_{Regr} + (1 - \eta_{Regr}) * (\frac{d}{100})$	$-0.00928 * ln^2(.4719 * V_1) + 0.13911 * \ln(.4719 * V_1) + 0.27110$	-15
Rotary, lubricated, air-cooled, variable-speed compressor	$\eta_{Regr} + (1 - \eta_{Regr}) * (\frac{d}{100})$	$-0.01549 * ln^2(.4719 * V_1) + 0.21573 * \ln(.4719 * V_1) + 0.27110$	-10

Performance Requirements Title 20 section 1605.3(s)(2)

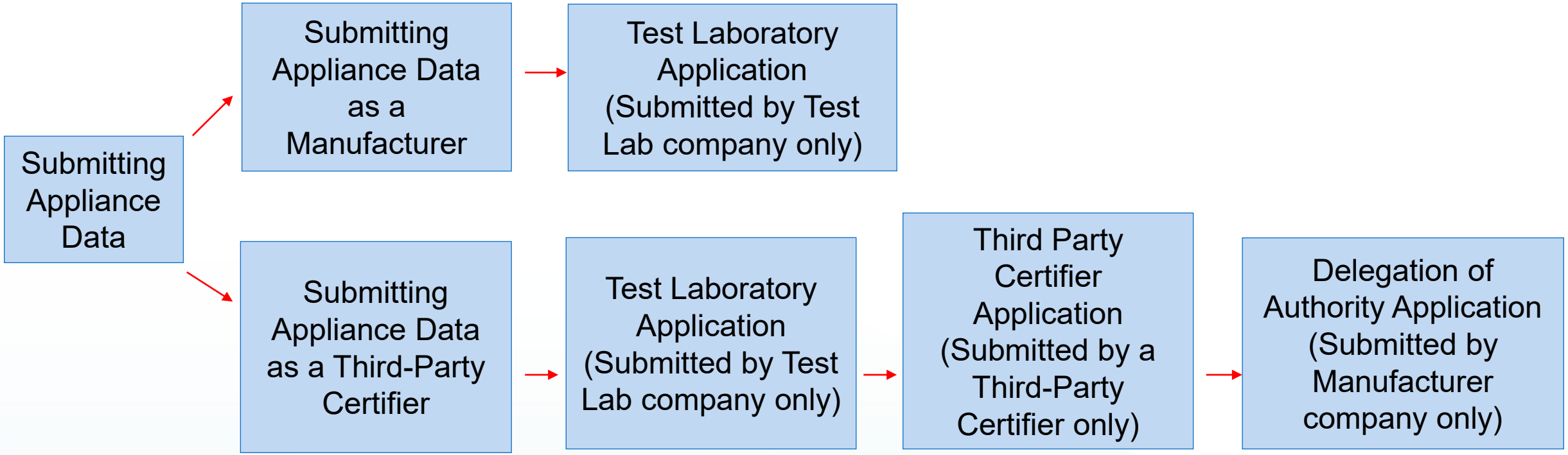
Equipment Class	Minimum Package Isentropic Efficiency	η_{Regr} (Package Isentropic Efficiency Reference Curve)	d (Percentage Loss Reduction)
Rotary, lubricated, liquid-cooled, fixed-speed compressor	$\eta_{Regr} + (1 - \eta_{Regr}) * (\frac{d}{100})$	$-0.00928 * ln^2(.4719 * V_1) + 0.13911 * \ln(.4719 * V_1) + 0.27110$	-15
Rotary, lubricated, liquid-cooled, variable-speed compressor	$\eta_{Regr} + (1 - \eta_{Regr}) * (\frac{d}{100})$	$-0.01549 * ln^2(.4719 * V_1) + 0.21573 * \ln(.4719 * V_1) + 0.27110$	-15

Marking and Certification Requirements

Certification Requirements Title 20 section 1606

- All models must be certified to the MAEDbS
- Failure to certify is an enforceable violation
- Fines can be levied for regulated appliances sold or offered for sale in California and not certified to MAEDbS

Data Submittal Requirements



General instructions for certifying to MAEDbS can be found at:
MAEDbS general instructions

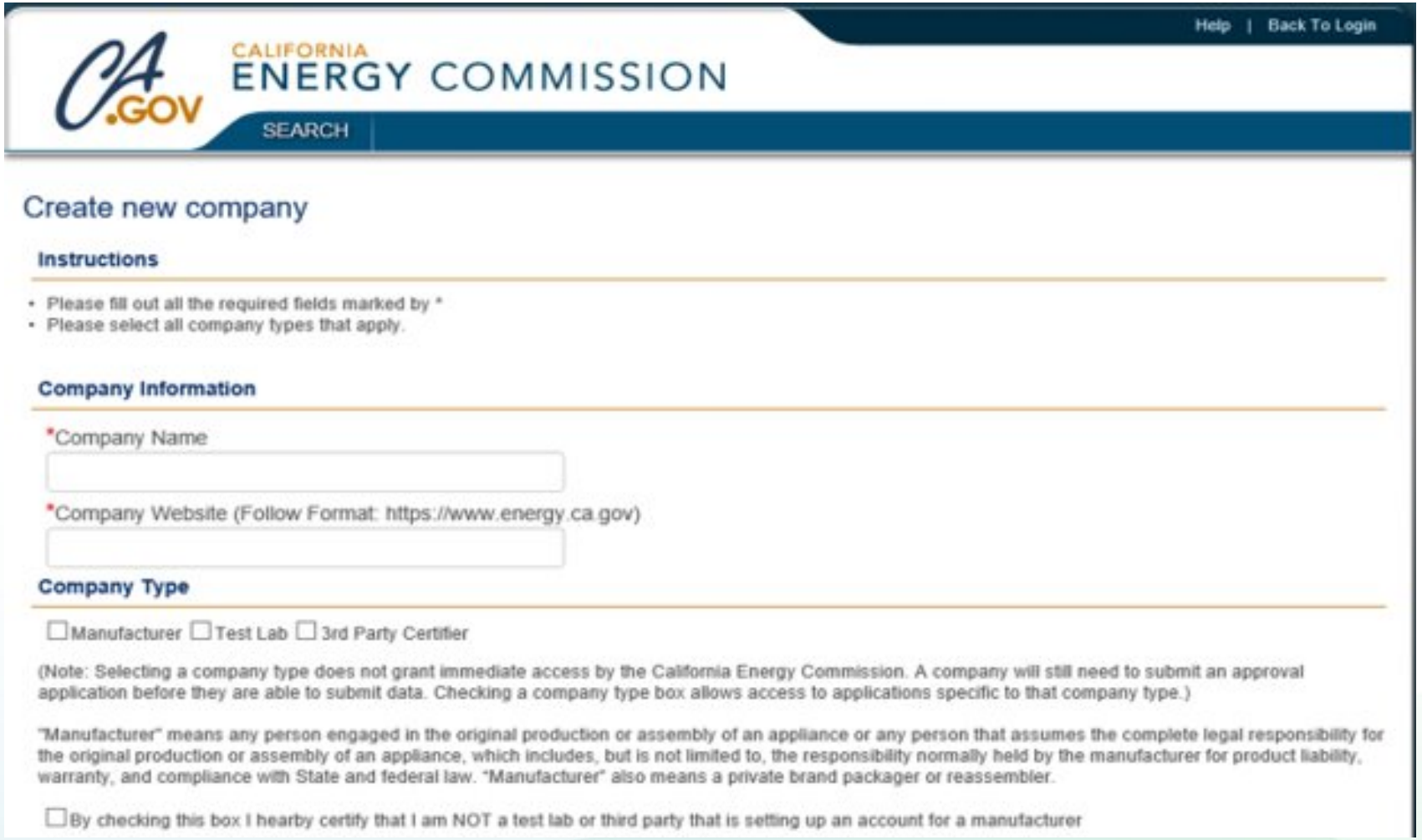
Test Lab Application

- For information on how to submit test lab applications to MAEDbS, see general instructions
- Manufacturer may act as a test lab
- Manufacturer may delegate third-party lab as a test lab
- Test labs must appear in MAEDbS

Company Account Setup

Company Information

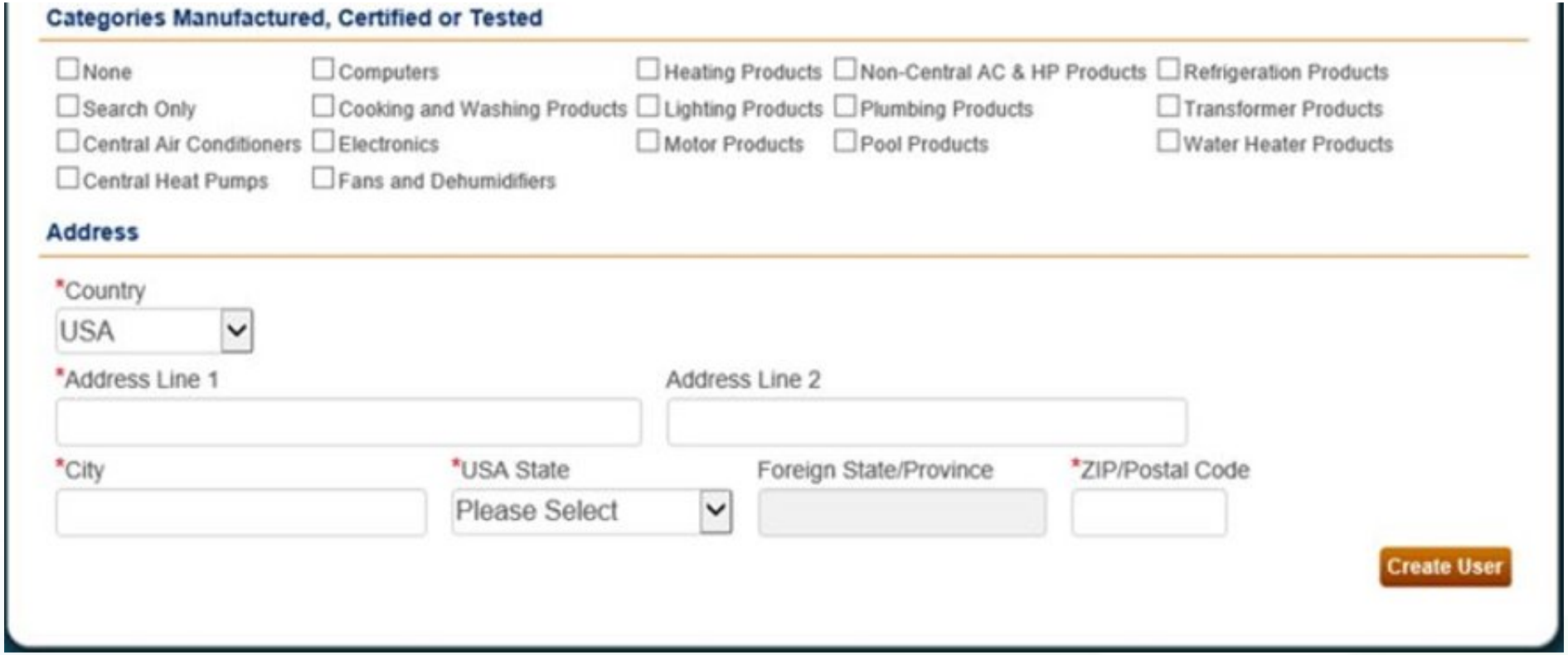
Company Type



Company Account Setup

Categories →

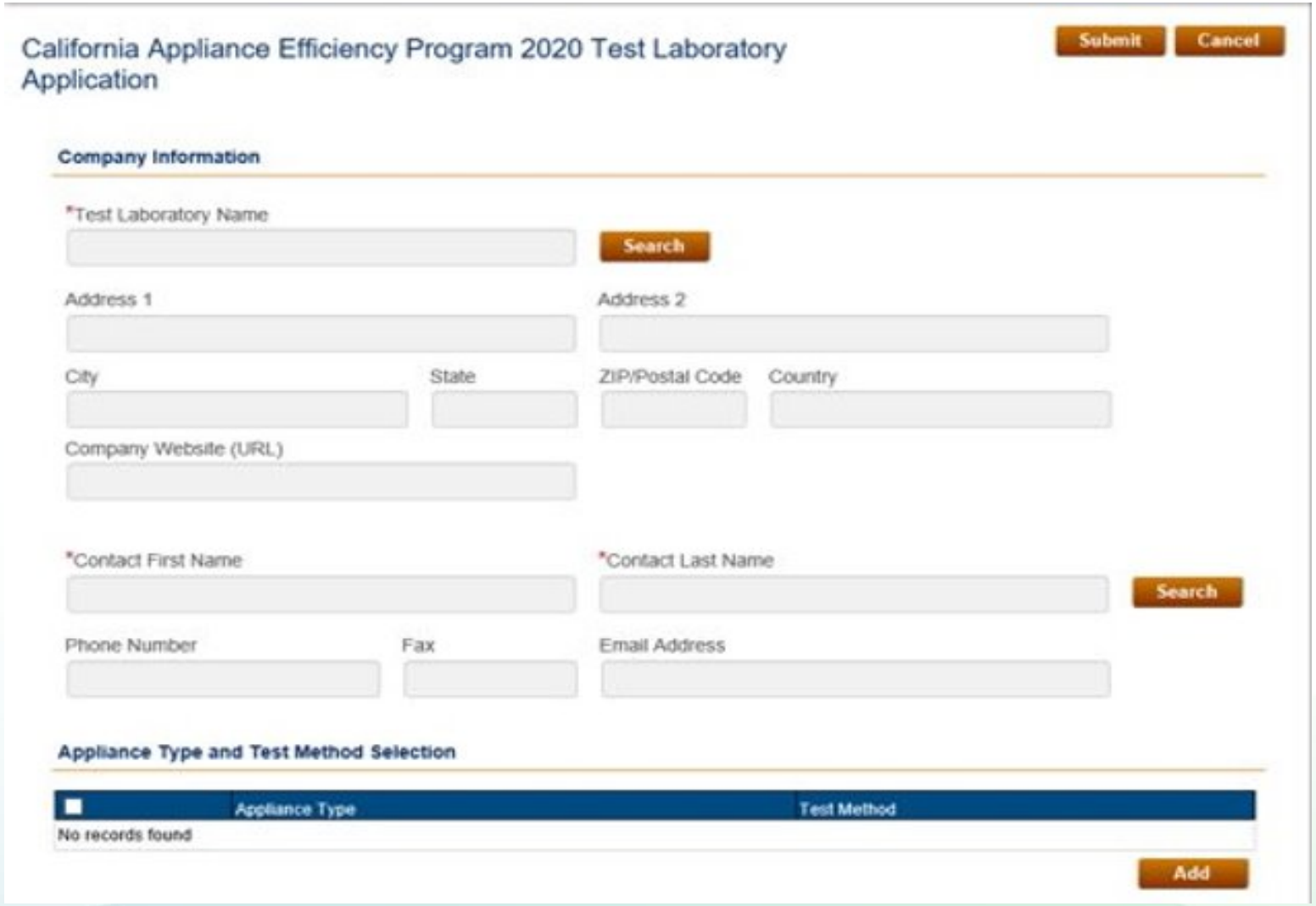
Address →



Test Lab Application

Company Information

Appliance type and test method selection



CERTIFICATION REQUIRES SIGNING A BINDING DECLARATION ON BEHALF OF YOUR COMPANY

Declaration

☐ I declare under penalty of perjury of the laws of the State of California, that:All the information in this statement is true, complete, accurate, and in compliance with all applicable provisions of Sections 1601-1609 of Title 20 of the California Code of Regulations; andI am authorized to make this declaration, and to file this application, on behalf of (Test Lab Not Selected)

☐ It agrees to and does interpret and apply the applicable test method set forth in Section 1604 precisely as written;

☐ It has, and keeps properly calibrated and maintained, all equipment, material, and facilities necessary to apply the applicable test method precisely as written;

☐ It agrees to and does maintain copies of all test reports, and provided any such report to the Executive Director on request, for all basic models that are still in commercial production; and

☐ It agrees to and does allow the Executive Director to witness any test of such an appliance on request, up to once per calendar year for each basic model.

☐ It has conducted tests using the applicable test method(s) specified on the first page of this application within the previous 12 months;

☐ It agrees to, and will follow, all applicable provisions of the California Energy Commission's Appliance Regulations (Section 1601-1609 of Title 20 of the California Code of Regulations), in carrying out all testing pursuant to this application.

NOTICE: **Test labs approvals are valid until December 31st of each year and then expire. Test labs must apply annually for approval to the California Energy Commission. Test lab applications for the next certification year become available on November 1st each year.**

*Name	*Title	*Date

Certification Requirements Title 20 section 1606

To comply with information found in the California Code of Regulations, Title 20 section 1606 Table X, submit information for certifying state-regulated compressors:

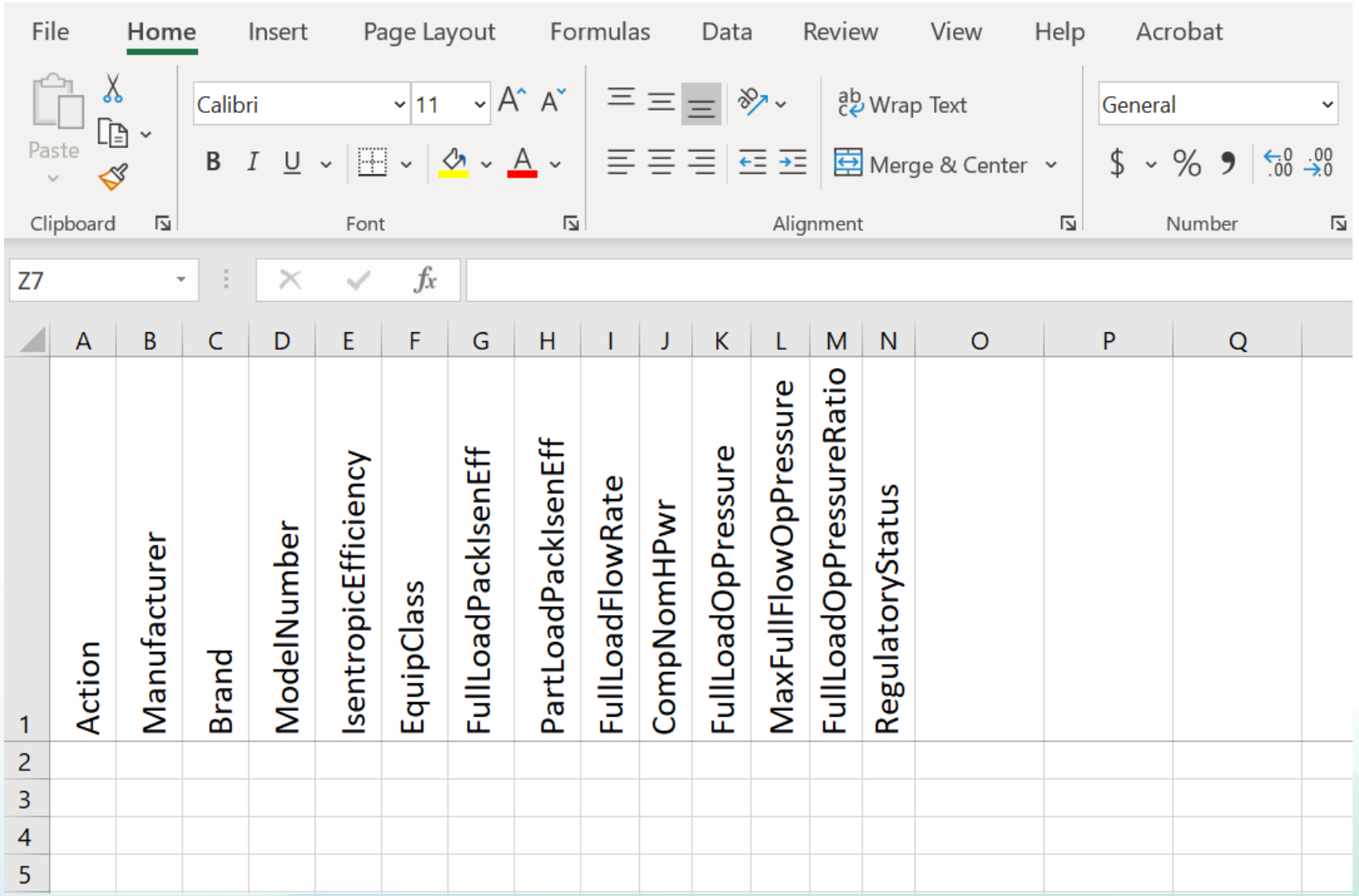
1. Isentropic Efficiency
2. Equipment Class
3. Full-load package isentropic efficiency (fixed-speed compressor only) or part-load package isentropic efficiency (variable-speed compressor only)
4. Full-load actual volume flow rate (CFM)
5. Compressor motor nominal horsepower (HP)

Certification Requirements Title 20 section 1606

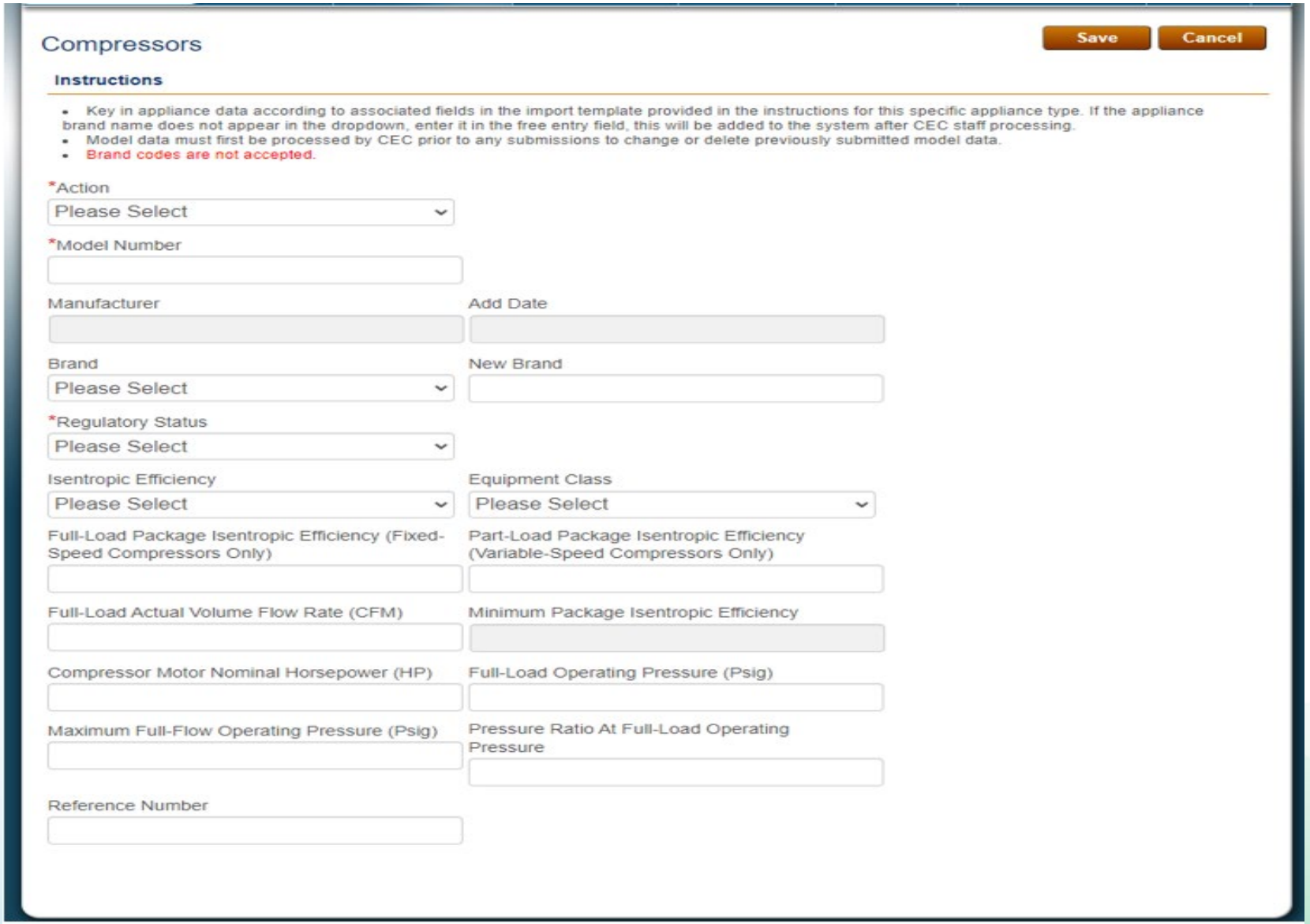
Certification requirements continued:

6. Full-load operating pressure (psig)
7. Maximum full-flow operating pressure (psig)
8. Pressure ratio at full-load operating pressure

Data Submittal Requirements



Data Submittal Requirements



Marking Requirements Title 20 section 1607(b)(2)

The following information shall be permanently, legibly, and conspicuously displayed on an accessible place on each unit:

1. Manufacturer's name *or* brand name *or* trademark
2. Model number
3. Date of manufacture

Resources

Title 20 Compliance Assistance Hotline
Toll free inside California **(888) 838-1467**
From outside of California **(916) 651-7100**
appliances@energy.ca.gov

Title 20 Compliance Assistance List Server
Efficiency Division List Server

Webinar Documents
Appliance outreach and education webinars

General Instructions for Submitting Appliance Data
MAEDbS general instructions for submitting appliance data

Energy Code Ace
Energy Code Ace Fact Sheets

Questions?