(Effective July 1, 2023)

WAC 51-11C-41200 Section C412—Compressed air systems.

C412.1 General. All new *compressed air systems*, and all additions or alterations of *compressed air systems* where the total combined horsepower (hp) of the compressor(s) is 25 hp or more, shall meet the requirements of this section. These requirements apply to the compressors, related piping systems, and related controls that provide compressed air and do not apply to any equipment or controls that use or process the compressed air.

EXCEPTION: Medical gas compressed air systems in health care facilities.

C412.2 Trim compressor and storage. The compressed air system shall be equipped with an appropriately sized trim compressor and primary storage to provide acceptable performance across the range of the system and to avoid control gaps. The compressed air system shall comply with 1 or 2 below:

1. The *compressed air system* shall include one or more variable speed drive (VSD) compressors. For systems with more than one compressor, the total combined capacity of the VSD compressor(s) acting as trim compressors must be at least 1.25 times the *largest net capacity increment* between combinations of compressors. The *compressed air systems* hall include *primary storage* of at least one gallon per actual cubic feet per minute (acfm) of the largest trim compressor; or

2. The *compressed air system* shall include a compressor or set of compressors with total effective trim capacity at least the size of the *largest net capacity increment* between combinations of compressors, or the size of the smallest compressor, whichever is larger. The total effective trim capacity of single compressor systems shall cover at least the range from 70 percent to 100 percent of rated capacity. The effective trim capacity of a compressor is the size of the continuous operational range where the specific power of the compressor (kW/100 acfm) is within 15 percent of the specific power at its most efficient operating point. The total effective trim capacity of the system is the sum of the effective trim capacity of the trim compressors. The system shall include *primary storage* of at least 2 gallons per acfm of the largest trim compressor.

EXCEPTIONS:
1. Alterations where the total combined added or replaced compressor horsepower is less than the average per-compressor horsepower of all compressors in the system.
2. Alterations where all added or replaced compressors are variable speed drive (VSD) compressors and *compressed air systems* includes *primary storage* of at least one gallon per acfm of the largest trim compressor.
3. *Compressed air systems* that have been pre*approved* as having demonstrated that the system serves loads for which typical air demand fluctuates less than 10 percent.
4. Alterations of existing *compressed air systems* that include one or more centrifugal compressors.

C412.3 Controls. *Compressed air systems* with three or more compressors and a combined horsepower rating of more than 100 hp, shall operate with controls that are able to choose the most energy efficient combination and loading of compressors within the system based on the current compressed air demand.

C412.4 Monitoring. *Compressed air systems* having a combined horsepower rating equal to or greater than 100 hp shall have an energy and air demand monitoring system with the following minimum requirements:

1. Measurement of system pressure.
2. Measurement of amps or power of each compressor.
3. Measurement or determination of total airflow from compressors in cfm.

4. Data logging of pressure, power in kW, airflow in cfm, and *compressed air system* specific efficiency in kW/100 cfm at intervals of five minutes or less.

5. Maintained data storage of at least the most recent 24 months.

6. Visual trending display of each recorded point, load and specific efficiency.

C412.5 Leak testing of compressed air piping. *Compressed air system* piping greater than 50 adjoining feet in length shall be pressure tested after being isolated from the compressed air supply and end-uses. The piping shall be pressurized to the design pressure and test pressures shall be held for a length of time at the discretion of the local jurisdiction, but in no case for less than 30 minutes, with no perceptible drop in pressure.

If dial gauges are used for conducting this test, for pressure tests less than or equal to 100 psi (689 kPa) gauges shall be incremented in units of 1 psi (7 kPa) less, for pressure tests greater than 100 psi (689 kPa) gauges shall be incremented in units less than 2 percent of the test pressure. Test gauges shall have a pressure range not exceeding twice the test pressure.

Piping less than or equal to 50 adjoining feet in length shall be pressurized and inspected. Connections shall be tested with a noncorrosive leak-detecting fluid or other leak-detecting methods as pre*approved* by the local jurisdiction.

C412.6 Pipe sizing. Compressed air piping greater than 50 adjoining feet in length shall be designed and installed to minimize frictional losses in the distribution network. These piping installations shall meet the requirements of Section C412.6.1 and either Section C412.6.2 or C412.6.3.

C412.6.1 Service line piping. Service line piping shall have inner diameters greater than or equal to 3/4 inch. Service line piping are pipes that deliver compressed air from distribution piping to end uses.

C412.6.2 Piping section average velocity. Compressor room interconnection and main header piping shall be sized so that at coincident peak flow conditions, the average velocity in the segment of pipe is no greater than 20 ft/sec. Compressor room interconnection and main header piping are the pipes that deliver compressed air from the compressor outlets to the inlet to the distribution piping. Each segment of distribution and service piping shall be sized so that at coincident peak flow conditions, the average velocity in the segment of pipe is no greater than 30 ft/sec. Distribution piping are pipes that deliver compressed air from the compressor room interconnection piping or main header piping to the service line piping.

C412.6.3 Piping total pressure drop. Piping shall be designed such that piping frictional pressure loss at coincident peak loads are less than 5 percent of operating pressure between the compressor and end use or end use regulator.

C412.6 Compressed air system acceptance. Before an occupancy permit is granted for a *compressed air system*, a certificate of acceptance shall be submitted to the enforcement agency that certifies that the equipment and systems meet the requirements of this code.

[Statutory Authority: RCW 19.27A.020, 19.27A.025, 19.27A.160 and chapters 19.27A and 19.27 RCW. WSR 22-14-091, § 51-11C-41200, filed 7/1/22, effective 7/1/23.]