199—20.7 (476) Standards of quality of service.

20.7(1) Standard frequency. The standard frequency for alternating current distribution systems shall be 60 cycles per second. The frequency shall be maintained within limits which will permit the satisfactory operation of customer's clocks connected to the system.

20.7(2) Voltage limits retail. Each utility supplying electric service to ultimate customers shall provide service voltages in conformance with the standard at 20.5(2)*"d."*

20.7(3) Voltage balance. Where three-phase service is provided the utility shall exercise reasonable care to assure that the phase voltages are in balance. In no case shall the ratio of maximum voltage deviation from average to average voltage exceed .02.

20.7(4) Voltage limits, service for resale. The nominal voltage shall be as mutually agreed upon by the parties concerned. The allowable variation shall not exceed 7.5 percent above or below the agreed-upon nominal voltage without the express approval of the board.

20.7(5) Exceptions to voltage requirements. Voltage outside the limits specified will not be considered a violation when the variations:

a. Arise from the action of the elements.

b. Are infrequent fluctuations not exceeding five minutes, duration.

c. Arise from service interruptions.

d. Arise from temporary separation of parts of the system from the main system.

e. Are from causes beyond the control of the utility.

f. Do not exceed 10 percent above or below the standard nominal voltage, and service is at a distribution line or transmission line voltage with the retail customer providing voltage regulators.

20.7(6) Voltage surveys and records. Voltage measurements shall be made at the customer's entrance terminals. For single-phase service the measurement shall be made between the grounded conductor and the ungrounded conductors. For three-phase service the measurement shall be made between the phase wires.

20.7(7) Each utility shall make a sufficient number of voltage measurements, using recording voltmeters, in order to determine if voltages are in compliance with the requirements as stated in 20.7(2), 20.7(3), 20.7(4). All voltmeter records obtained under 20.7(7) shall be retained by the utility for at least two years and shall be available for inspection by the board's representatives. Notations on each chart shall indicate the following:

a. The location where the voltage was taken.

b. The time and date of the test.

c. The results of the comparison with a working standard indicating voltmeter.

20.7(8) Equipment for voltage measurements.

a. *Secondary standard indicating voltmeter.* Each utility shall have available at least one indicating voltmeter maintained with error no greater than 0.25 percent of full scale.

b. *Working standard indicating voltmeters.* Each utility shall have at least two indicating voltmeters maintained so as to have as-left errors of no greater than 1 percent of full scale.

c. *Recording voltmeters.* Each utility must have readily available at least two portable recording voltmeters with a rated accuracy of 1 percent of full scale.

20.7(9) Rescinded IAB 12/11/91, effective 1/15/92.

20.7(10) Extreme care must be exercised in the handling of standards and instruments to assure that their accuracy is not disturbed. Each standard shall be accompanied at all times by a certificate or calibration card, duly signed and dated, on which are recorded the corrections required to compensate for errors found at the customary test points at the time of the last previous test.

20.7(11) Planned interruptions shall be made at a time that will not cause unreasonable inconvenience to customers, and interruptions planned for longer than one hour shall be preceded by adequate notice to those who will be affected.

20.7(12) Power quality monitoring. Each utility shall investigate power quality complaints from its customers and determine if the cause of the problem is on the utility's systems. In addressing these

problems, each utility shall implement to the extent reasonably practical the practices outlined in the standard given at 20.5(2)*"f."*

20.7(13) Harmonics. A harmonic is a sinusoidal component of the 60 cycles per second fundamental wave having a frequency that is an integral multiple of the fundamental frequency. When excessive harmonics problems arise, each electric utility shall investigate and take actions to rectify the problem. In addressing harmonics problems, the utility and the customer shall implement to the extent practicable and in conformance with prudent operation the practices outlined in the standard at 20.5(2)*"g."*

This rule is intended to implement Iowa Code sections 476.2 and 476.8.