

**Kansas Water Flowmeter Regulations
(Excerpted from Kansas Administrative Regulations, Article 5)**

K.A.R. 5-1-1. Definitions. As used in these regulations and the Kansas water appropriation act, and by the division of water resources in the administration of the Kansas water appropriation act, unless the context clearly requires otherwise, the following words and phrases shall have the meanings ascribed to them in this regulation.

(z) "Diversion" means the act of bringing water under control by means of a well, pump, dam, or other device for delivery and distribution for the proposed use.

(aa) "Diversion works" means any well, pump, power unit, power source, dam, and any other devices necessary to bring water under control for delivery to a distribution system by which the water will be distributed to the proposed use and any other equipment required as a condition of the permit, including a check valve, water level measurement tube, meter, or other measuring device.

(bb) "Division" means the division of water resources of the Kansas department of agriculture.

(gg) "Flow-straightening vanes" means vanes, or other device installed at the upstream throat of a measuring chamber for the purpose of aligning all velocity components of flow parallel with the flow in the measuring chamber at the water flowmeter sensor location.

(nn) "In compliance" means that a water flowmeter does not meet any of the criteria of K.A.R. 5-1-9 for being out of compliance.

(ss) "Measuring chamber" means a cylindrical chamber in which a water flowmeter is installed that is calibrated to match the measuring element of the water flowmeter and the nominal size of the pipe in which it is installed.

(uu) "Nonvolatile memory" means the ability of a water flowmeter to retain the values stored in the mechanical or electronic memory if all power, including backup battery power, is removed.

(vv) "Normal operating range" means the range of flow rates for which the water flowmeter will meet the accuracy requirements of K.A.R. 5-1-4 (a), as certified by the water flowmeter manufacturer.

(aaa) "Point of diversion" means the point at which water is diverted or withdrawn from a source of water supply.

(ooo) "Register" means an integral or remote device that displays the quantity of water passing the water flowmeter sensor and is part of the water flowmeter.

(bbbb) "Straight pipe" means a straight length of pipe free of all internal obstructions, including size changes, valves, cooling coils, injection ports, sand or foreign material, and any other condition that would cause a disturbance of the internal velocity profile in the pipe. Internal obstructions shall not include properly designed, constructed, and installed straightening vanes and inspection ports.

(hhhh) "Totalizer" means the mechanical or electronic portion of the register that displays the total quantity of water that has passed the water flowmeter sensor.

(nnnn) "Water flowmeter" means the combination of a flow-sensing device, measuring chamber, integral or remote display device or register, and any connecting parts required to make a working assemblage to measure, record, and allow determination of flow rate and total quantity of water flowing past the water flowmeter sensor.

K.A.R. 5-1-4. Water flowmeter specifications. (a) Each water flowmeter required by the chief engineer, or required pursuant to a regulation adopted by the chief engineer, on or after the effective date of this regulation shall meet the following minimum requirements:

(1)(A) The water flowmeter has been certified by the manufacturer to register neither less than 98 percent nor more than 102 percent of the actual volume of water passing the water flowmeter when installed according to the manufacturer's instructions. This requirement shall be met throughout the water flowmeter's normal operating range without further adjustment or calibration.

(B) The manufacturer has certified to the chief engineer that it has an effective quality assurance program, including wet testing a random sample of production line water flowmeters with water flowmeter test equipment. The minimum number of samples to be tested shall be determined using a confidence interval of 90 percent, an expected compliance of 95 percent, and an acceptable error of two percent. The minimum number of samples of each model that shall be tested shall be calculated by multiplying 1,300 times the annual production of that model of water flowmeter divided by Q. Q equals four times the annual production of that water flowmeter plus 1,300.

(C) The manufacturer has certified that the water flowmeter test equipment described in paragraph (a)(1)(B) has been tested annually and found accurate by standards traceable to the national institute of standards and technology (NIST). Documentation of the testing required in paragraphs (a)(1)(A) and (B) shall be maintained by the manufacturer for a period of at least five years and shall be made available to the chief engineer upon request during normal business hours.

(2) The water flowmeter shall be designed and constructed so that it will meet the following criteria:

(A) Maintain the accuracy required by the chief engineer in paragraph (a)(1)(A) through (C) and K.A.R. 5-1-9(a)(1);

(B) be protected by the following:

(i) A seal installed by the manufacturer or an authorized representative of the manufacturer; or

(ii) a way that makes it impossible to alter the totalizer reading without breaking the seal or obtaining the authorization of the manufacturer, an authorized representative of the manufacturer, or the chief engineer;

(C) clearly indicate the direction of water flow;

(D) clearly indicate the serial number of the water flowmeter;

(E) have a weatherproof register that is sealed from all water sources;

(F) have a register that is readable at all times, whether the system is operating or not;

(G) be able to be sealed by an authorized representative of the chief engineer to prevent unauthorized manipulation of, tampering with, or removal of the water flowmeter;

(H) be equipped with a manufacturer-approved measuring chamber through which all water flows. Except for positive displacement water flowmeters, full-bore electromagnetic water flowmeters, and multijet water flowmeters, flow-straightening vanes shall be installed at the upstream throat of the water flowmeter chamber. The flow-straightening vanes shall meet either of the following criteria:

(i) Be designed and installed by the manufacturer, or an authorized representative of the manufacturer; or

(ii) consist of at least three vanes that are longer, when placed parallel to the length of the pipe, than the inside diameter of the pipe, are equally spaced radially on the inner periphery of the pipe, and are wider in diametrical distance than one-fourth of the inside diameter of the pipe;

(l) be equipped with an inspection port if the straightening vanes are not designed, constructed, and installed by the manufacturer or an authorized representative of the manufacturer. The port shall be of sufficient size and placement to allow determination of the following:

(i) The proper installation of the flow-straightening vanes; and

(ii) the inside diameter of the pipe in which the water flowmeter sensor is installed;

(J) remain operable without need for recalibration to maintain accuracy throughout the operating life of the water flowmeter; and

(K) have a totalizer that meets the following criteria:

(i) Is continuously updated to read directly only in acre-feet, acre-inches, or gallons;

(ii) has sufficient capacity, without cycling past zero more than once each year, to record the quantity of water diverted in any one calendar year;

(iii) reads in units small enough to discriminate the annual water use to within the nearest 0.1 percent of the total annual permitted quantity of water;

(iv) has a dial or counter that can be timed with a stopwatch over not more than a 10-minute period to accurately determine the rate of flow under normal operating conditions; and

(v) has a nonvolatile memory.

(3) Each water flowmeter that is required to be installed by the chief engineer, or that was required to be installed as a condition of either an approval of application or an order of the chief engineer, or pursuant to a regulation adopted by the chief engineer before the effective date of this regulation, shall meet the following minimum specifications:

(A) Each water flowmeter shall be of the proper size, pressure rating, and style, and shall have a normal operating range sufficient to accurately measure the water flow passing the water flowmeter under normal operating conditions.

(B) Each water flowmeter shall meet the accuracy requirements of K.A.R. 5-1-9(a)(1). If the water flowmeter does not meet the accuracy requirements of K.A.R. 5-1-9(a)(1), then the water flowmeter shall meet either of the following criteria:

(i) Be repaired so that it meets the accuracy requirements of K.A.R. 5-1-9(a)(1); or

(ii) be replaced with a water flowmeter meeting all of the requirements of K.A.R. 5-1-4 and installed in a manner that meets the requirements of K.A.R. 5-1-6.

(b) A water flowmeter installed in the diversion works or a distribution system for a water right authorized for municipal use shall not be subject to the requirements of paragraph (a)(2)(B) if an accurate record of water use can be determined by readings from at least one alternate water flowmeter in the same diversion works or distribution system. (Authorized by K.S.A. 82a-706a;

implementing K.S.A. 82a-706a and K.S.A. 82a-706c; effective Sept. 22, 2000; amended Oct. 24, 2003; amended May 21, 2010.)

K.A.R. 5-1-5. Variances from water flowmeter specifications. (a) A variance from the chief engineer's water flowmeter specifications may be granted by the chief engineer if the water right owner furnishes detailed specifications of a proposed water flowmeter and demonstrates to the chief engineer all the following:

(1) A water flowmeter meeting the specifications of K.A.R. 5-1-4 will not satisfactorily serve the water user's needs.

(2) The proposed water flowmeter will meet the accuracy requirements of K.A.R. 5-1-4(a) and (b).

(3) The proposed water flowmeter will provide a reliable and accurate water use record for that point of diversion.

(b) Variances shall be granted only on a site-by-site, case-by-case basis. No general variances shall be granted for any brand or model of water flowmeter, except as set forth in subsection (c).

(c) A limited variance shall be granted by the chief engineer for a period of up to three years to allow that specific brand and model of a water flowmeter to be tested in the field and to serve as a water flowmeter required by the chief engineer if all of the following conditions are met:

(1) The manufacturer demonstrates to the chief engineer that a particular model and brand of water flowmeter utilizes new technology, does not meet one or more of the requirements of K.A.R. 5-1-4, and is likely to be as reliable, or more reliable, than water flowmeters currently meeting all of the requirements of K.A.R. 5-1-4.

(2) The manufacturer agrees to install not more than 50, nor less than 10, water flowmeters to test the new technology.

(3) The manufacturer agrees to collect data for at least one year that is sufficient to allow the chief engineer to determine whether that brand and model of water flowmeter meets the reliability and accuracy specifications of K.A.R. 5-1-4. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c; effective Sept. 22, 2000.)

K.A.R. 5-1-6. Water flowmeter installation specifications. (a) Each water flowmeter required by the chief engineer to be installed or required pursuant to a regulation adopted by the chief engineer, on or after the effective date of these regulations shall meet the following minimum water flowmeter installation specifications:

(1) Each water flowmeter shall be installed in a manner that meets the following criteria:

(A) Meets or exceeds the instructions of the manufacturer; and

(B) except for a multijet and a positive displacement water flowmeter, is installed so that there are at least five pipe diameters of straight pipe upstream and at least two pipe diameters of straight pipe downstream of the sensor portion of the water flowmeter, regardless of the manufacturer's installation specifications.

(2) Each water flowmeter shall be sized and installed so that full pipe flow will be maintained through the water flowmeter and so that water velocity in the measuring chamber will be within the normal operating range of the water flowmeter at all times while water is being diverted.

(3) If a water flowmeter is located downstream of a water storage device, there shall be at least seven diameters of straight pipe upstream of the water storage device where a water flowmeter may be installed for a field test by the chief engineer.

(4) Each water flowmeter shall be installed at a location at which the flowmeter measures all water diverted from the source of supply and does not measure water or other discharge, including tailwater and sewage effluent.

(b) Each water flowmeter that is required by the chief engineer to be installed, or that was required to be installed as a condition of either an approval of application or an order of the chief engineer, or pursuant to a regulation adopted by the chief engineer, before the effective date of these regulations, shall meet the following minimum installation specifications:

(1) Each water flowmeter shall be installed in a manner that meets or exceeds the instructions of the manufacturer and, except for a multijet and a positive displacement water flowmeter, shall be installed so that there are at least five pipe diameters of straight pipe upstream and at least two pipe diameters of straight pipe downstream of the sensor portion of the water flowmeter, regardless of the manufacturer's installation specifications.

(2) Each water flowmeter shall be sized and installed so that full pipe flow will be maintained through the water flowmeter and so that water velocity in the measuring chamber will be within the normal operating range of the water flowmeter at all times while the water is being diverted.

(3) Each water flowmeter shall be installed at a location at which the flowmeter measures all water diverted from the source of supply and does not measure water or other discharge, including tailwater and sewage effluent. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 82a-706c; effective Sept. 22, 2000; amended Oct. 24, 2003.)

K.A.R. 5-1-7. Requirement to install a water flowmeter or other suitable watermeasuring device. (a) All nondomestic, nontemporary wells and pump sites operated under the authority of an approval of application issued on or after the effective date of this regulation shall be equipped with a water flowmeter that meets or exceeds the specifications of the chief engineer effective at the time the application is approved by the chief engineer.

(b)(1) All nondomestic, nontemporary gravity diversions of water, including irrigation ditches, operating under the authority of an approval of application issued on or after the effective date of this regulation shall be equipped with a continuous recording gauge, or other suitable water-measuring device located at or near the headgate. Before installation, the water right owner shall submit plans and specifications for the proposed gauge, or other suitable watermeasuring device, to the chief engineer and shall receive approval in writing from the chief engineer before installing the gauge or other suitable water-measuring device.

(2) The gauge or other suitable water-measuring device shall meet the following criteria:

(A) Register not less than 94% and not more than 106% of the actual volume of water passing the device under normal operating conditions when compared to a field test made by, or approved by, the chief engineer;

(B) be installed in accordance with the installation requirements of the chief engineer; and

(C) be maintained in a satisfactory operating condition any time water can reasonably be expected to be diverted.

(c) An approval of a nondomestic application for change in place of use, the point of diversion, or the use made of the water, or any combination of these, shall require the owner of the water right to install a water flowmeter on all points of diversion authorized by the water right or approval of application, unless any of the following conditions is met:

(1) The applicant demonstrates to the chief engineer that the application to change the place of use meets the requirements of K.A.R. 5-5-11(e).

(2) The applicant demonstrates to the chief engineer both of the following:

(A) Installation of a water flowmeter meeting these specifications is not physically feasible.

(B) The applicant agrees to implement a reasonable, objective alternative of measuring the quantity of water diverted that is acceptable to the chief engineer.

(3) The water is being diverted from multiple points of diversion authorized by one water right that does not limit the maximum annual quantity and maximum rate of diversion by point of diversion, and all of the water flows to a common point where a water flowmeter meeting the requirements of K.A.R. 5-1-4 and K.A.R. 5-1-6 measures all of the water pumped from all of the points of diversion authorized by that water right.

(4) An application for change in point of diversion only is filed to change the point of diversion of only one well, when more than one well is authorized by the approval of application or water right that authorizes the well for which a change in point of diversion is sought. In this case, only the well that is being relocated shall be required to have a water flowmeter.

(5) The water is being diverted from multiple points of diversion, and all of the following conditions are met:

(A) All points of diversion deliver water to only one distribution system.

(B) Each point of diversion can reasonably be expected to operate simultaneously and for the same total amount of time each calendar year.

(C) Each individual point of diversion has a tested diversion rate of less than 400 gallons per minute.

(D) A water flowmeter is installed that will measure 100 percent of the water pumped from all points of diversion.

(E) If the flow rate has not been tested within the last five years by the chief engineer or a person approved by the chief engineer, the owner shall have each point of diversion tested by a person approved by the chief engineer pursuant to K.A.R. 5-1-11. If the chief engineer becomes aware of information that the tested rates could no longer be correct, the chief engineer, or someone approved by the chief engineer pursuant to K.A.R. 5-1-11, may retest the rate of diversion produced by each point of diversion and those flow rates shall subsequently be used to determine the quantity diverted by each point of diversion.

(F) The owner has signed a consent agreement with the chief engineer that includes the following:

(i) A determination of the percentage of flow that will be attributed to each point of diversion if future administration becomes necessary; and

(ii) an agreement that the chief engineer may require a water flowmeter for each point of diversion if the chief engineer determines there are issues concerning impairment, violations of the conditions of the permit or water right, or a violation of the Kansas water appropriation act and its regulations.

(G) All uses of water are authorized by either a vested water right or a water right that has been certified pursuant to K.S.A. 82a-714, and amendments thereto.

(d) Except as set forth in subsection (c), if an approval of an application for change requires the installation of a water flowmeter, the requirement to install a water flowmeter shall also be placed on all other water rights and approvals authorizing diversion of water from the same point of diversion.

(e) If any water right or approval of application has a condition requiring development, adoption, and implementation of a water conservation plan pursuant to K.S.A. 82a-733 and amendments thereto, a water flowmeter or suitable water-measuring device shall be installed on each authorized point of diversion in compliance with these regulations.

(f) The owner of a water right, including a domestic water right, or an approval of application shall also be required by the chief engineer to install a water flowmeter or other suitable water-measurement device that meets the requirements of these regulations on each authorized point of diversion if it is necessary for the chief engineer to effectively administer water rights to prevent impairment, to protect minimum desirable stream flows, to conserve water, or to otherwise carry out the duties of the chief engineer as set forth in the Kansas water appropriation act, K.S.A. 82a-701 et seq., and amendments thereto.

(g) Except as set forth in subsection (c), if a water flowmeter is required by the chief engineer, each point of diversion authorized by the approval of application or water right shall be required to have a separate meter. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c; effective Sept. 22, 2000; amended Oct. 31, 2008.)

K.A.R. 5-1-8. Water flowmeter maintenance. If a water right owner is required by the chief engineer to install a water flowmeter, the water right owner shall maintain the water flowmeter in compliance, as defined by K.A.R. 5-1-1, whenever diversion of water can reasonably be expected to occur. If at any time the required water flowmeter fails to function properly, the owner shall promptly initiate action to repair or replace the meter, or to correct any problems with the installation. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c; effective Sept. 22, 2000.)

K.A.R. 5-1-9. Criteria to determine when a water flowmeter is out of compliance. (a) A water flowmeter shall be considered to be out of compliance if any of the following criteria is met:

(1) The water flowmeter registers less than 94 percent or more than 106 percent of the actual volume of water passing the water flowmeter. If necessary, this determination may be made by a field test conducted by, or approved by, the chief engineer.

(2) The seal placed on the totalizer by the manufacturer or the manufacturer's authorized representative has been broken, or the totalizer value has been reset or altered without the authorization of the manufacturer, an authorized representative of the manufacturer, or the chief engineer.

(3) A seal placed on the water flowmeter or totalizer by the chief engineer has been broken.

(4) The water flowmeter register is not visible or is unreadable for any reason.

(5) There is not full pipe flow through the water flowmeter.

- (6) Flow-straightening vanes have not been properly designed, manufactured, and installed.
- (7) The water flowmeter is not calibrated for the nominal size of the pipe in which the flowmeter is installed.
- (8) The water flowmeter is not installed in accordance with the manufacturer's installation specifications. However, five diameters of straight pipe above the water flowmeter sensor and two diameters below the water flowmeter sensor shall be the minimum spacing, regardless of the manufacturer's installation specifications.
- (9) A water flowmeter is installed at a location at which the flowmeter does not measure all of the water diverted from the source of supply.
- (b) A water flowmeter installed in the diversion works or a distribution system for a water right authorized for municipal use shall not be subject to the requirements of paragraphs (a)(2) and (3) if an accurate record of water use can be determined by readings from at least one alternate water flowmeter in the same diversion works or distribution system. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 82a-706c; effective Sept. 22, 2000; amended Oct. 24, 2003; amended May 21, 2010.)

K.A.R. 5-1-10. Duties of water right owner when a water flowmeter is out of compliance. (a) A water right owner, or the water right owner's authorized designee, shall promptly notify the chief engineer if any water flowmeter required by the chief engineer is out of compliance.

- (b) Within 30 days after the date on which the out-of-compliance water flowmeter has been repaired or replaced, the water right owner or the water right owner's authorized designee shall notify the chief engineer in writing of the following information:
 - (1) The date the water flowmeter became out of compliance;
 - (2) the water flowmeter reading at the time the water flowmeter became out of compliance;
 - (3) if the water flowmeter was replaced, the following information:
 - (A) The brand, model, size, and serial number of the new water flowmeter;
 - (B) the units in which the new water flowmeter reads;
 - (C) the reading of the new water flowmeter at the time of installation; and
 - (D) the location of the new water flowmeter on the diversion works or delivery system;
 - (4) if the water flowmeter was repaired, the water flowmeter reading immediately before the repair and the reading of the water flowmeter at the time it was reinstalled or the repair was completed on site;
 - (5) the date the repair or replacement was completed; and
 - (6) the amount of water diverted while the water flowmeter was out of compliance.
- (c) If the water right owner does not maintain a record of diversions of water that is sufficient to reasonably estimate the quantity of water diverted while the water flowmeter was out of compliance, it shall be assumed, for the sole purposes of enforcement of the terms, conditions, and limitations of

the approval of application or water right, and priority administration of water rights among water users, that the diversion works were operated continuously at the tested rate of diversion during the entire period the water flowmeter was out of compliance. If the rate of diversion has not been tested by the chief engineer, then it shall be assumed that the diversion works were operated continuously at the authorized rate of diversion during the entire time the water flowmeter was out of compliance. The assumption set forth in this subsection shall not apply to the determination of the annual quantity of water diverted for the purpose of perfecting a water right.

(d) If the water right owner is required by the chief engineer to repair or replace an inoperable water flowmeter, it shall be the duty of the water right owner to ensure that the repaired or replaced water flowmeter is in compliance with K.A.R. 5-1-4 and K.A.R. 5-1-6. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c; effective Sept. 22, 2000.)

K.A.R. 5-1-11. Water flowmeter testing by a nonagency person. If a water right owner desires to have a water flowmeter flow rate test done by a nonagency person for any reason, a person may be approved by the chief engineer to perform a water flowmeter flow rate test if the person demonstrates to the chief engineer both of the following:

- (a) The person has the training, skills, and experience necessary to properly conduct the test.
- (b) The person has the appropriate water flowmeter to do the test, and the water flowmeter has been tested for accuracy with water flowmeter test equipment that has been found to be accurate using standards traceable to the national institute of standards and technology (NIST). The equipment shall have been tested and found to be accurate within 12 months of performing the water flowmeter test. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706c; effective Sept. 22, 2000.)

K.A.R. 5-1-12. List of water flowmeters certified by the manufacturer to meet the specifications of the chief engineer. (a) A list of all makes and models of water flowmeters that have been certified by the water flowmeter manufacturer to meet the specifications of the chief engineer shall be maintained by the chief engineer. This list shall be made available by the chief engineer to the public upon request.

(b) A water flowmeter shall be placed on the list only if the manufacturer has submitted to the chief engineer all of the following information for each water flowmeter model:

- (1) The water flowmeter manufacturer's name, address, contact person's name, and telephone number;
- (2) the water flowmeter model name or number;
- (3) proof that a random sample of water flowmeters of each model has been tested in accordance with the requirements of K.A.R. 5-1-4(a);
- (4) the last date that the water flowmeter test equipment was tested and found to be accurate by standards traceable to the national institute of standards and technology (NIST);
- (5) verification that the water flowmeter is designed and constructed so that accuracy will be maintained over the life of the water flowmeter;
- (6) verification that the water flowmeter serial number and direction of flow are clearly indicated on the water flowmeter;
- (7) verification that the register is weatherproof and sealed from all water sources;

- (8) verification that the totalizer will read only in acre-feet, acre-inches, or gallons;
 - (9) the number of active digits in the totalizer;
 - (10) verification that the memory is nonvolatile;
 - (11) verification that the totalizer cannot be reset without breaking the manufacturer's seal or obtaining the authorization of the manufacturer, an authorized representative of the manufacturer, or the chief engineer;
 - (12) verification that the water flowmeter and register are constructed in such a manner that they can be sealed by the chief engineer;
 - (13) a description of the measuring chamber provided for each water flowmeter model;
 - (14) specifications of the flow-straightening vanes installed in the measuring chamber;
 - (15) the spacing recommendations for each water flowmeter model in terms of pipe diameters of straight pipe required upstream and downstream of the water flowmeter sensor; and
 - (16) the normal operating range of the water flowmeter.
- (c) A brand or model of a water flowmeter shall be removed from the list of water flowmeters specified in subsection (a) of this regulation if it has been demonstrated to the chief engineer that the brand or model of water flowmeter does not reliably and consistently meet the accuracy standards of K.A.R. 5-1-9(a). (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 82a-706c; effective Sept. 22, 2000; amended Oct. 24, 2003.)