

TITLE 32: ENERGY
CHAPTER II: ILLINOIS EMERGENCY MANAGEMENT AGENCY
SUBCHAPTER b: RADIATION PROTECTION

PART 406
CERTIFICATION AND OPERATION OF
RADIOCHEMISTRY LABORATORIES

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SUBPART A: GENERAL PROVISIONS

Section 406.10 Scope and Applicability

This Part establishes the standards applicable to radiochemistry laboratories involved in radiochemical analyses of samples of water from public water supplies and their sources.

Section 406.20 Definitions

For purposes of this Part, unless otherwise specifically defined or the context clearly requires a different meaning:

"Analyst" means any person who performs analyses for parameters on samples submitted to the radiochemistry laboratory and who meets the qualifications set forth in Section 406.200 of this Part.

"Analyst Assistant" means a person who performs certain analyses on samples submitted to the radiochemistry laboratory and who meets the qualifications set forth in Section 406.200 of this Part.

"Certification" means a status of approval granted to a radiochemistry laboratory that meets the criteria established by this Part or in accordance with a reciprocity agreement entered into pursuant to Section 406.140 of this Part. Certification is not a guarantee of the validity of the data generated.

"Certification Officer" means any person who is designated by the Department to inspect and evaluate radiochemistry laboratories for compliance in meeting the criteria set forth in this Part. Certification officers shall meet the educational and experience qualifications for laboratory directors as set forth in Section 406.200 of this Part.

"Deficiency" means a failure of a radiochemistry laboratory to meet any applicable requirement of this Part.

"Department" means the Department of Nuclear Safety.

"Director" means the Director of the Department of Nuclear Safety.

"Laboratory Director" means the person who is responsible for the operation of an radiochemistry laboratory and who meets the qualifications set forth in Section 406.200 of this Part.

"Major Remodeling" means any remodeling of the laboratory facility which

requires the acquisition of a local building permit.

"Parameter" means a chemical element, chemical compound or radionuclide.

"Performance Evaluation Sample (PES)" means a sample used to determine accuracy, prepared either by the certifying agency or an authority recognized by the certifying agency, in which the true value and acceptance limits are unknown to the laboratory at the time of analysis.

"Provisional Certification" means a certification status granted to a radiochemistry laboratory in order to allow time for the correction of a deficiency. Failure to correct a deficiency during the provisional certification period allows the Department to revoke certification as specified in Section 406.80 of this Part. While on provisional certification, a radiochemistry laboratory remains approved for the analyses covered by its certification.

"Public Water Supply" means all mains, pipes and structures through which water is obtained and distributed to the public, including wells and well structures, intakes and cribs, pumping stations, treatment plants, reservoirs, storage tanks and appurtenances, collectively or severally, actually used or intended for use for the purpose of furnishing water for drinking or general domestic use and which serve at least 15 service connections, or which regularly serve at least 25 persons at least 60 days per year.

"Radiochemistry Laboratory" means any facility that performs radiochemical analyses on environmental samples in order to determine the quality of food, milk, public water supplies, surface water, ground water, recreational waters, wastewater, air or land.

Section 406.25 Incorporations by Reference

All rules, standards and guidelines of agencies of the United States or nationally recognized organizations or associations that are incorporated by reference in this Part are incorporated as of the date specified in the reference and do not include any later amendments or editions. Copies of these rules, standards and guidelines that have been incorporated by reference are available for public inspection at the Department of Nuclear Safety, 1035 Outer Park Drive, Springfield, Illinois.

AGENCY NOTE: In this Part, the Department has specifically incorporated by reference the methods listed in the table in Section 141.25(a), "Analytical Methods for Radioactivity", 40 CFR 141, National Primary Drinking Water Regulations effective as of March 5, 1997. This table was originally published at 62 FR 10173 - 10174 (March 5, 1997). The Department further incorporates the latest publication of the "Determination of Radium-228 in Drinking Water", August 1990, in lieu of the reference publication date shown in footnote 10 on page 10174. Additionally, in footnote 12 on page 10174, the correct scientific number should read pCi/μg.

Section 406.30 Certification Procedures

- a) A radiochemistry laboratory that meets or exceeds the minimum criteria for certification may receive certification from the Department for any radiological parameter for which a methodology has been specified in this Part, or for which an alternative methodology has been approved in accordance with the provisions of this Part.
- b) The operational aspects of a radiochemistry laboratory that will be evaluated in considering a request for certification are:
 - 1) laboratory facilities;
 - 2) personnel;
 - 3) methodology and instrumentation;
 - 4) data handling; and
 - 5) quality assurance program.
- c) In seeking certification, the petitioning radiochemistry laboratory shall:
 - 1) Submit a formal request for certification to the Department;
 - 2) File with the Department, on the applicable administrative questionnaires furnished by the Department, if available, or otherwise in a form approved by the Department, complete information on the five categories listed in subsection (b) of this Section;
 - 3) Analyze all performance evaluation samples required in accordance with Section 406.100 and Section 406.260(c) and (d) of this Part and report the results of such analyses to the Department; and
 - 4) Permit and cooperate in an on-site visit by Department authorized certification officers. Certification officers shall provide the radiochemistry laboratory with official identification and credentials. The initial visit will be arranged at the mutual convenience of both parties. The Department reserves the right to make subsequent visits without prior notice during regular working hours.
- d) Approval or denial of certification may be made only after the procedure described in subsection (c) of this Section has been completed. Denial of certification shall be in the form of a narrative, giving information as to how deficiencies may be corrected, along with a completed survey form on which all deficiencies are clearly identified.

- e) Radiochemistry laboratories in jurisdictions not having reciprocal agreements with the Department under Section 406.140 of this Part may receive certification from the Department under this Part and shall pay all of the expenses to be incurred by the Department, including travel expenses, prior to evaluation.

Section 406.40 Conditions Governing the Use of Certificates

- a) Certification of radiochemistry laboratories under this Part shall be effective for a 3-year period from the date of issue, unless modified or revoked by the Department. Application for timely renewal of certification shall be made to the Department no later than 90 days prior to the applicable expiration date. Approval of a renewal application shall be contingent upon the radiochemistry laboratory meeting all of the factors considered in granting the original certification, including acceptable results on performance evaluation samples required under this Part. When a certified radiochemistry laboratory has made timely and sufficient application for renewal of certification or certification for additional parameters, the existing certification shall, unless otherwise modified or revoked in accordance with this Part, continue in full force and effect until the final decision of the Department on the application has been made.
- b) Certification shall be limited to those parameters for which a radiochemistry laboratory has been approved and which are listed on the certificate of approval.
- c) The certificate of approval shall be posted or displayed in a prominent place in the laboratory facility.
- d) Information related to the certification of a radiochemistry laboratory shall be accurately represented if used in any advertising and shall prominently include the statement that "Certification by the State of Illinois is not an endorsement or a guarantee of the validity of the data generated." Such information shall also specify the parameters for which the radiochemistry laboratory has been certified. The advertising shall not include any representation that the radiochemistry laboratory is certified to perform a type of analysis for which it lacks proper certification.
- e) A radiochemistry laboratory may surrender its certification voluntarily by notifying the Department in writing and returning the certificate.

Section 406.50 Provisional Certification

- a) Whenever a deficiency is found, a certified radiochemistry laboratory may be placed on provisional certification. Provisional certification may be imposed for the following periods:
 - 1) From 7 to 30 days if the deficiency could compromise the quality of

analytical data generated by the radiochemistry laboratory; or

- 2) From 90 days to one year for any other type of deficiency.
- b) A provisionally certified laboratory may continue to analyze samples for compliance purposes, but shall notify its clients of its provisionally certified status by providing that information in writing, as soon as practicable, but in no event later than 3 working days after the imposition of provisionally certified status and shall also include such information on any report of any analysis performed during the period of provisional certification.

Section 406.60 Preliminary Certification

The Department may grant written preliminary certification to a radiochemistry laboratory that has demonstrated compliance with the applicable provisions of this Part after completion of the procedures specified in Section 406.30(c)(1) through (c)(3) of this Part. Preliminary certification would be available in instances where it would be impractical for the Department to schedule an on-site visit within 6 months from the date of a laboratory's submission of satisfactory analysis results for performance evaluation samples. Unless modified or revoked in accordance with this Part, preliminary certification shall remain in effect until certification has been approved or denied in accordance with Section 406.30 of this Part.

Section 406.70 Changes in Ownership or Operations

- a) Certification shall not be transferable. In the event of a change of ownership, director or principal supervisor of analysts, or relocation or major remodeling of the physical plant of a radiochemistry laboratory, the Department shall be notified in writing within 15 days and shall be provided with the resume of any new owner, director and supervisor and a description of any relocation or remodeling of the physical plant.
- b) After receiving notification of any of the changes listed in subsection (a) of this Section, the Department may review the resume of any new owner, director or principal supervisor of analysts, or make an on-site visit. However, the Department may waive any of these actions if it finds such actions to be unwarranted in a specific case. Examples of when such waivers would be appropriate include the following circumstances:
 - 1) Waiver of submittal of a summary of education and experience when personnel transferring from one certified laboratory to another are responsible for dealing with the same analytical methods and equivalent equipment; and
 - 2) Waiver of an on-site visit if the pertinent test procedures involve simple techniques and equipment.

Section 406.80 Revocation of Certification

- a) The Department may revoke all or any part of a radiochemistry laboratory's certification. Any of the following shall be cause for partial or total revocation of certification:
 - 1) Expiration of a period of provisional certification, provided the laboratory has not corrected the deficiencies after being placed on provisional certification in accordance with the provisions of Section 406.50 of this Part;
 - 2) Unsatisfactory analyses of performance evaluation samples as specified in Section 406.100 of this Part;
 - 3) Failure to notify the Department within 15 days after any of the changes listed in Section 406.70 of this Part have occurred;
 - 4) Failure to comply with the requirements regarding advertising as specified in Section 406.40(d) of this Part;
 - 5) Failure to use the analytical methodology specified in this Part or approved in accordance with this Part;
 - 6) Failure to provide notice in accordance with Section 406.50 of this Part or its status as a provisionally certified radiochemistry laboratory; or
 - 7) Falsification of results of testing of performance evaluation samples or any other information material to the certification.

- b) The following factors shall be taken into account by the Department in determining what action shall be taken against a certified or provisionally certified radiochemistry laboratory for failing to comply with the requirements of this Section:
 - 1) The length of time during which the deficiency has existed;
 - 2) The laboratory's prior record of deficiencies and response in correcting deficiencies noted by the Department;
 - 3) Whether the laboratory knowingly caused or allowed the deficiency; and
 - 4) The potential effect of the deficiency on the quality of analytical data generated by the laboratory.

Section 406.90 Subcontracting by Certified Laboratories

- a) The name of the laboratory actually performing the analysis shall be specified on all reports of analytical results.
- b) For those tests that are required to be performed under certification, any laboratory with which a certified radiochemistry laboratory subcontracts shall also be a certified radiochemistry laboratory.

Section 406.100 Performance Evaluation Samples

A radiochemistry laboratory is required to participate in performance evaluation sample analyses for each analytical parameter or method for which it seeks or wishes to maintain certification in accordance with the certification procedures of Section 406.30 and Section 406.260(c) and (d) of this Part and the certification renewal procedures of Section 406.40 of this Part. Within 90 days after receipt of a performance evaluation sample, the radiochemistry laboratory shall analyze such sample and report the test results to the Department. There shall be no fee charged to the Department for such analyses. Failure to provide results proving satisfactory precision and accuracy in two successive samples shall be cause for revocation of certification for the parameter or method not within satisfactory limits.

Section 406.110 Authority of Certification Officers

Certification officers shall have all of the following authority with regard to radiochemistry laboratories:

- a) To inspect such laboratories in on-site visits;
- b) To require the laboratory to provide information regarding the technical operation of such laboratory relevant to certification;
- c) To inspect quality assurance records and any other pertinent records;
- d) To observe and question analysts at work on parameters or methods for which certification is sought; and
- e) To grant or deny certification based upon the completion of the evaluation process.

Section 406.120 Hearing, Decision and Appeal

The following procedures are established for those Department certification actions that law requires to be preceded by notice and opportunity for hearing:

- a) Prior to revocation or partial revocation, the Department shall give written notice to the laboratory director or owner. This notice shall include a description of the proposed action, the facts or conduct upon which the Department will rely to support its proposed action and the procedures for requesting a hearing.

- b) Notice given under subsection (a) of this Section and any hearing requested following issuance of such notice shall be in accordance with 32 Ill. Adm. Code 200.
- c) If, however, the Department finds that an emergency situation warrants immediate action, summary suspension as provided for by Section 10-65(d) the Illinois Administrative Procedure Act [5 ILCS 100/10-65(d)] may be ordered pending revocation proceedings. An emergency situation warrants immediate action if there is substantial risk to public health, safety or welfare resulting from laboratory deficiencies that are compromising or are likely to compromise the analytical results obtained.
- d) A final decision of the Director is appealable to the Circuit Courts under the Illinois Administrative Review Act [735 ILCS 5/Art. III].

Section 406.130 Liability

Representatives of the Department shall not waive the right to seek recovery for injuries incurred while inspecting a radiochemistry laboratory facility.

Section 406.140 Reciprocity Agreements

Notwithstanding any other provision in this Part, the Director may elect to enter into agreements with the governments of other states or with federal governmental units for recognition of their radiochemistry laboratory inspections and certifications if such certification program uses equivalent controls over sample collection, data handling, quality control, analytical methods and personnel as required of radiochemistry laboratories within Illinois.

SUBPART B: RADIOCHEMISTRY ANALYSES OF PUBLIC WATER SUPPLY SAMPLES

Section 406.200 Personnel Requirements

- a) The laboratory director shall be a person holding a minimum of a bachelor's degree in natural or physical sciences with at least 24 semester hours in chemistry or microbiology or both, and shall have had a minimum of 5 years experience in an environmental laboratory.
- b) An analyst is a full-time employee holding a minimum of a bachelor's degree in chemistry, radiochemistry, radioisotope technology or related natural science fields and having had at least 2 years of experience in radiation and radiochemical procedures.
- c) An analyst assistant is a person holding a high school diploma or its equivalent and having had a minimum of 6 months of training or experience or both in routine radiochemistry. Analyst assistants can perform the measurement of gross

alpha and gross beta radioactivity. Analyst assistants may assist in routine sample preparation and radioanalytical procedures provided that such work is supervised and validated by an analyst or principal supervisor.

- d) An analyst trainee is a person holding a high school diploma or its equivalent. During the period of training, an analyst trainee shall work under the direct supervision of a principal supervisor, an analyst or an analyst assistant, but shall not exercise independent judgement.

Section 406.210 Laboratory Facilities

The laboratory facilities shall meet the following specifications:

- a) A minimum of 150 square feet of floor space shall be provided for each analyst.
- b) A minimum of 15 linear feet of usable bench space shall be provided for each analyst.
- c) In areas where radioactive standards are prepared, bench tops shall be of an impervious material which may be covered with disposable absorbent paper, or impervious trays lined with absorbent paper shall be available.
- d) The laboratory shall include a sink with hot and cold running water. All water supply outlets shall be protected by approved vacuum breakers.
- e) An adequate electrical supply for operation of instruments and mechanical needs shall be provided. The certification officer may require verification from an official inspector or other qualified person that the laboratory meets local and national electrical codes.
- f) All electrical outlets shall be properly grounded.
- g) Instruments shall be properly grounded with an internal or external regulated power supply available to each instrument.
- h) All plumbing shall meet local and state plumbing codes. The certification officer may require verification from an official inspector or other qualified person that the laboratory meets such codes.
- i) A natural gas, LP gas, or propane gas supply shall be available.
- j) The laboratory shall include a vacuum source.
- k) A source of distilled water or deionized water or both shall be readily available.
- l) The laboratory shall include at least one fume hood.

- m) Counting instruments shall be located in a room separate from all other analytical activities. The temperature of such room shall be maintained between 60° F (16° C) and 80° F (27° C) and shall not vary under normal operating conditions by more than 3° C.

Section 406.220 Laboratory Equipment and Instrumentation

Instruments that are needed to analyze for the parameters for which the laboratory is being certified shall meet the following minimum specifications.

- a) An analytical balance shall have a precision of plus or minus 0.1 mg or better and a scale readability of 0.1 mg or better.
- b) A pH meter shall have an accuracy of plus or minus 0.1 units or better, and a scale readability of plus or minus 0.1 units or better. The pH meter may be either line/bench or battery/portable operated.
- c) A specific ion meter shall have an accuracy and scale readability of plus or minus 0.1 mV or better and shall have expanded millivolt scale capability. The specific ion meter may be either line/bench or battery/portable operated.
- d) A conductivity meter and cell combination, suitable for checking distilled water quality, shall be readable in ohms or mhos, and have a range of up to 4 megohm/cm or greater (conductivity down to 0.1 micromhos/cm) plus or minus 1 percent. The conductivity meter may be either line/bench or battery/portable operated.
- e) A drying oven shall be of the gravity convection type.
- f) A desiccator may be a glass, glass and metal, or plastic model, depending upon the particular application.
- g) A hot plate shall have a selectable temperature control for safe heating of samples and laboratory reagents.
- h) Glassware which is used for purposes that may subject it to damage from heat or chemicals shall be of borosilicate glass. All volumetric glassware shall be Class A, denoting that it meets federal specifications and is certified by the manufacturer as meeting the standards established by the American Society for Testing and Materials (ASTM).
- i) A muffle furnace shall be automatically controlled with a chamber capacity of at least 2200 cubic centimeters. The maximum operating temperature of the muffle furnace shall be at least 1100° C intermittent and 1000° C continuous.

- j) A centrifuge shall be capable of attaining a speed of at least 3000 rpm and shall have a loading option of 4 x 50 mL capacity.
- k) A fluorometer shall be capable of detecting 0.0005 micrograms of uranium.
- l) A liquid-scintillation system shall be such that the sensitivity of the radioanalysis meets or exceeds the standards specified in this Part.
- m) A gas-flow proportional counting system or other low background alpha-particle and beta-particle counting system shall have a cosmic guard detector operated in anticoincidence with the signal from the sample detector and shielding, such that the alpha-particle background will not exceed 0.2 cpm and the beta-particle background will not exceed 2.0 cpm for a 2 inch diameter counting planchet geometry. The system shall be such that the sensitivity of the radioanalysis will meet or exceed the standards specified in this Part.
- n) A scintillation system designed for alpha-particle counting and used for the measurement of gross alpha activities or radium-226 shall include a Mylar disc coated with a phosphor (silver-activated zinc sulfide) which is placed either directly on the sample or on the face of a photomultiplier tube and is enclosed in a light-tight container. The system shall also include appropriate electronics (high voltage supply, amplifier, timer and scaler).
- o) A scintillation cell system for the specific measurement of radium-226 by the radon emanation method shall include a light-tight enclosure capable of accepting the scintillation cells, a detector (phototube) and the appropriate electronics (high voltage supply, amplifier, timer and scaler).
- p) A gamma-ray spectrometer system shall include a thallium-activated sodium iodide (NaI(Tl)) crystal, a solid state lithium drifted germanium (Ge(Li)) detector, a high purity germanium detector or a gamma-X photon detector connected to a multichannel pulse-height analyzer.
 - 1) If a sodium iodide detector is used, the crystal shall be, at minimum, a 7.5 cm x 7.5 cm cylindrical crystal, or preferably, a 10 cm x 10 cm crystal. A minimum shielding equivalent to 10 cm of iron shall surround the detector. The multichannel pulse-height analyzer, in addition to appropriate electronics, shall contain a memory of not less than 250 channels and at least one readout device.
 - 2) If a lithium-drifted germanium detector, a high purity germanium detector or a gamma-X photon detector is used, a minimum shielding equivalent to 10 cm of iron shall surround the detector. The multichannel analyzer, in addition to appropriate electronics, shall contain a memory of not less than 2000 channels and at least one readout device.

Section 406.230 General Laboratory Practices

- a) Prior to use, all plastic or glass labware shall be washed in a warm detergent solution and thoroughly rinsed, first in tap water and then in distilled or deionized water. Cleaned labware shall be stored in a manner to keep it clean. This cleaning procedure is sufficient for most analytical needs, but the procedures specified for individual parameters shall be referred to for more elaborate precautions to be taken against contamination of labware.
- b) Distilled or deionized water shall have resistivity values of at least 1.0 megohm/cm (conductivity less than 1.0 micromhos/cm) at 25° C.
- c) When commercially available, chemicals certified by the manufacturer as being "analytical reagent grade" as specified by the American Chemical Society (ACS) or higher quality chemicals shall be used for all procedures.
- d) An enclosed, properly labeled area shall be available for the safe storage of radioactive materials.
- e) There shall be a designated area within the laboratory for preparation of radioactive standards and samples. Appropriate precautions shall be taken in this area to minimize radiation exposure and to prevent radioactive contamination. Provisions shall be made for safe storage and disposal of radioactive wastes and for monitoring the work area.

Section 406.240 Analytical Methodology

- a) The methods listed in the table in Section 141.25(a), "Analytical Methods for Radiocativity", 40 CFR 141, National Primary Drinking Water Regulations effective as of March 5, 1997, published at 62 FR 10173 - 10174 are to be used to determine compliance with this Part (see Agency Note in Section 406.25 of this Part).
- b) When the identification and measurement of radionuclides other than those listed in subsection (a) of this Section is required, the methods designated for water analysis in the following references are to be followed:
 - 1) H. L. Krieger and S. Gold, "Procedures for Radiochemical Analysis of Nuclear Reactor Aqueous Solutions," EPA-R4-73-014, U.S. Environmental Protection Agency, Cincinnati, Ohio (May 1973); or
 - 2) John H. Harley, ed., "HASL Procedure Manual," HASL-300, Environmental Measurement Laboratory, New York, New York (1997).
- c) For the purpose of monitoring radioactivity concentrations in drinking water, the required sensitivity of the radioanalysis is defined in terms of a detection limit.

The detection limit shall be that concentration which can be counted with a precision of plus or minus 100 percent at the 95 percent confidence level (1.96 sigma (s) where sigma (s) is the standard deviation of the net counting rate of the sample). The standards for detection limits of radioanalyses are as follows:

- 1) To determine compliance with maximum allowable concentration levels for radium-226 and radium-228, the detection limit shall not exceed 1 pCi/L.
- 2) To determine compliance with maximum allowable concentration levels for gross alpha activity (including radium-226, but excluding radon and uranium) the detection limit shall not exceed 3 pCi/L.
- 3) To determine compliance with maximum allowable concentration levels for beta-particle and photon radioactivity, the detection limits shall not exceed the following concentrations:

Radionuclide	Detection Limit
Tritium	1000 pCi/L
Strontium-89	10 pCi/L
Strontium-90	2 pCi/L
Iodine-131	1 pCi/L
Cesium-134	10 pCi/L
Gross beta	4 pCi/L
Other radionuclides ^a	¹ / ₁₀ of the applicable limit

AGENCY NOTE:

^a As calculated from "Maximum Permissible Body Burdens and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure," National Bureau of Standards Handbook 69, August 1963, U.S. Department of Commerce.

- d) To determine compliance with the applicable maximum contaminant levels, averages of data shall be used and shall be rounded to the same number of significant digits as stated in the maximum contaminant level established for the substance in question.
- e) The Department may, upon written application, approve the use of an alternative analytical technique. An alternative analytical technique shall not be approved unless the Department determines that the technique is substantially equivalent to the prescribed test both in precision and accuracy as it relates to the determination of compliance with the applicable maximum contaminant level. Such approval shall be in writing and shall not be effective without the concurrence of the

Administrator of the U.S. Environmental Protection Agency.

Section 406.250 Sample Collection, Handling and Preservation

The following requirements for container types and preservation shall be met for each individual parameter ^a:

Parameter	Preservative ^b	Container ^c
Gross alpha	Conc HCl or HNO ³ to pH less than 2 ^d	P or G
Gross beta	Conc HCl or HNO ³ to pH less than 2 ^d	P or G
Strontium-89	Conc HCl or HNO ³ to pH less than 2	P or G
Strontium-90	Conc HCl or HNO ³ to pH less than 2	P or G
Radium-226	Conc HCl or HNO ³ to pH less than 2	P or G
Radium-228	Conc HCl or HNO ³ to pH less than 2	P or G
Cesium-134	Conc HCl to pH less than 2	P or G
Iodine-131	None	P or G
Tritium	None	P or G
Uranium	Conc HCl or HNO ³ to pH less than 2	P or G
Phonton emitters	Conc HCl or HNO ³ to pH less than 2	P or G

AGENCY NOTES:

- ^a If a laboratory has no control over these factors, the laboratory director must reject any samples not meeting these criteria and so notify the authority requesting the analyses.
- ^b Preservative shall be added to the sample at the time of collection, unless suspended solids are to be measured or unless the concentrated acid specified for preservation cannot be added because of shipping restrictions. If it is necessary to ship the sample unpreserved to the laboratory or storage area, acidification may be delayed up to 5 days. After acidification, samples shall be thoroughly mixed and then preserved for a minimum of 16 hours before analysis.
- ^c P = Plastic, hard or soft; G = Glass, borosilicate or flint.
- ^d If HCl is used to acidify samples to be analyzed for gross alpha or gross beta activity, the acid salts shall be converted to nitrate salts before transfer of samples to planchets.

Section 406.260 Quality Assurance

- a) A written description of the current laboratory quality assurance program shall be

maintained and made available to analysts in an area of the laboratory where analytical work takes place. A record of analytical quality assurance tests and quality assurance checks on materials and equipment shall be prepared and retained for at least 3 years.

- b) A laboratory manual containing complete written instructions for each parameter or method for which the laboratory is certified shall be maintained and made available to analysts in an area of the laboratory where analytical work takes place.
- c) The laboratory shall participate at least twice per year in those U.S. Environmental Protection Agency Performance Evaluation Studies that include parameters and methods for which the laboratory is or desires to be certified. Analytical results shall be within 1.73 times the standard deviation of the specific analysis as described in "Environmental Radioactivity Laboratory Intercomparison Studies Program, Fiscal Year 1981-1982," EPA-600/4-81-004, Table 3, U.S. Environmental Protection Agency (1982). Results shall be provided to the Department within 90 days after receipt of the performance evaluation sample.
- d) The laboratory shall participate at least once per year in the blind Performance Evaluation Study administered by the U.S. Environmental Protection Agency. Analytical results shall be within 1.73 times the standard deviation of the specific analysis as described in "Environmental Radioactivity Laboratory Intercomparison Studies Program, Fiscal Year 1981-1982," EPA-600/4-81-004, Table 3, U.S. Environmental Protection Agency (1982), for each parameter or method for which the laboratory is or desires to be certified. Results shall be provided to the Department within 90 days after receipt of the blind performance evaluation sample.
- e) Operating manuals and calibration protocols for counting instruments shall be available to laboratory personnel.
- f) Calibration data and maintenance records on all radiation instruments shall be maintained in a permanently bound record.
- g) The following quality control procedures shall be utilized by the laboratory on a daily basis:
 - 1) To verify internal laboratory precision for a specific analysis, 10 percent or more duplicate analyses shall be performed. If the difference between duplicate analyses exceeds two times the standard deviation of the specific analysis as described in "Environmental Radioactivity Laboratory Intercomparison Studies Program, Fiscal Year 1981-1982," EPA-600/4-81-004, Table 3, U.S. Environmental Protection Agency (1982), prior measurements are suspect, calculations and procedures shall be examined

and samples shall be re-analyzed when necessary.

- 2) When 20 or more specific analyses are performed each day, a performance standard and a background sample shall be measured with each 20 samples. If less than 20 specific analyses are performed each day, a performance standard and a background sample shall be measured along with the samples, except for low level gamma counting.
- 3) Quality control performance charts or records shall be maintained for each instrument.
- h) Weights certified by the manufacturer as meeting the requirements established by the American Society for Testing and Materials (ASTM) for Class "1" weights shall be available at the laboratory and used to make periodic checks on balances.
- i) Chemicals shall be dated upon receipt of shipment and replaced before shelf life has been exceeded.
- j) The laboratory should prepare and follow a written quality assurance (QA) plan. The following items should be addressed in each QA plan:
 - 1) Sampling procedures;
 - 2) Sample handling procedures, which specify the methods used to maintain the integrity of all samples (i.e., tracking samples from receipt by laboratory through analysis to final disposition), and provide for maintaining and documenting the chain of custody of samples identified to the laboratory as likely to be the basis for enforcement actions;
 - 3) Instrument or equipment calibration procedures and frequency of their use;
 - 4) Analytical procedures;
 - 5) Data reduction, validation and reporting, including conversion of raw data to final reported results, insuring accuracy of data transcription and calculations, and procedures and format for reporting data to water supply operators, the Department, and other state and federal agencies;
 - 6) Types of quality control checks and frequency of their use, which may include preparation of calibration curves, instrument calibrations, replicate analyses, use of quality control samples or calibration standards, and use of quality control charts;
 - 7) Preventive maintenance procedures and schedules;

- 8) Specific routine procedures used to determine data precision and accuracy for each contaminant measured. Precision is determined based on the results of replicate analyses. Accuracy is normally determined by comparison of results with known concentrations in reagent water standards and by analyses of water matrix samples before and after adding a known contaminant spike;
 - 9) Corrective action contingencies, specifying the laboratory's response to obtaining unacceptable results from analysis of performance evaluation samples and from internal quality control checks;
 - 10) Laboratory organization and responsibility, including a chart or table showing the laboratory organization and line of authority, and listing the key individuals who are responsible for ensuring the production of valid measurements and for the routine assessment of measurement systems for precision and accuracy (e.g., who is responsible for internal audits and reviews of the implementation of the plan and its requirements).
- k) The quality assurance plan may be a separately prepared quality assurance document or may incorporate by reference already available standard operation procedures (SOPs) that are approved by the laboratory director and that address the items listed in subsection (j) of this Section. If a particular listed item is not relevant, the quality assurance plan should state this and provide a brief explanation (e.g., some laboratories do not collect samples and thus are not required to describe sampling procedures). A laboratory quality assurance plan should be concise but responsive to the items listed in subsection (j) of this Section. Minimizing paperwork while improving the dependability and quality of data are the intended goals.

Section 406.270 Record Maintenance

- a) Compliance monitoring activities shall be performed using the analytical methodology specified in Section 406.240(a) and (b) of this Part or approved in accordance with Section 406.240(e) of this Part. These activities shall be in accordance with written procedures for sample handling. These procedures shall provide for establishing and maintaining an accurate written record that documents the possession and handling of samples.
- b) Records of radiochemical analyses shall be kept by the laboratory for at least 3 years. This includes raw data, calculations, quality assurance data and reports. Actual laboratory reports may be kept. However, data, with the exception of the results of testing the compliance check samples required by Section 406.260(c) and (d) of this Part, may be transferred to tabular summaries that shall include the following information:
 - 1) Date, place and time of sampling;

- 2) Name of person who collected the sample;
 - 3) Identification of the sample origin, such as routine distribution sample, check sample, raw or process water sample, surface or ground water sample or other special purpose samples;
 - 4) Date of receipt of sample;
 - 5) Date of sample analysis;
 - 6) Name of the persons responsible for performing the analysis;
 - 7) Analytical techniques or methods used; and
 - 8) Results of the analysis.
- c) Computer programs designed and developed in-house shall be verified initially by manual calculations and the calculations shall be available for inspection.
- d) The disposal of all records subject to the Local Records Act [50 ILCS 205] must be in accordance with the provisions of that Act.

Section 406.280 Action Response to Laboratory Results

When action response is a designated responsibility of the laboratory and laboratory results indicate that a maximum allowable concentration of any parameter has been exceeded, the laboratory shall notify the person requesting the analysis within 2 business days after obtaining the unsatisfactory sample result.